Technical Appendix C1

Flora and Vegetation

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

FLORA AND VEGETATION

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Summary

A total of 68 families, 180 genera and 406 vascular plant taxa have been recorded on Barrow Island (Attachment A). The total of 406 vascular plant species, subspecies and varieties constitutes approximately 23 per cent of the flora recorded for the Pilbara region. Fourteen vascular plant species have been introduced to the Island, the majority of which have been recorded in the vicinity of previously disturbed sites.

No Declared Rare Flora species, as listed under subsection (2) of Section 23F of the Western Australian *Wildlife Conservation Act 1950* and as listed by the Department of Conservation and Land Management (2003a, 2004a), have been found on Barrow Island. Two Priority species have been collected on Barrow Island: *Helichrysum oligochaetum* (Priority 1) and *Corchorus interstans* ms (Priority 3).

The Priority 1 species *Helichrysum oligochaetum* is known to occur on Barrow Island and was searched for during post cyclonic rain surveys (April and May 2004) to check for potential presence on the proposed development site. *Corchorus interstans* ms (Priority 3) was recorded within the proposed gas processing plant site and the proposed North White's Beach pipeline. *Corchorus interstans* ms is widely distributed on parts of the Island and the mainland and 'has also been observed to regenerate successfully on rehabilitated sites' (Astron Environmental 2002).

No vegetation communities listed under The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* have been recorded or are known to occur on Barrow Island. No threatened ecological community as listed by CALM's Threatened Ecological Database (2003c) has been recorded or is known to occur on Barrow Island.

Barrow Island's vegetation has been previously classified by Buckley (1983) into eight major vegetation units. They were subsequently divided into 34 vegetation types based on major landforms, soil types and species composition by Mattiske (1993b). In recent, more detailed mapping of the vegetation on the proposed development area and associated infrastructure corridors, 83 vegetation communities (Attachment B and Attachment C) were defined and mapped within the proposed gas processing facility and wider study area and the proposed pipeline routes.

Flora and vegetation communities, especially those of particular significance located within the proposed development area, are discussed in this technical appendix to the ERMP for the Gorgon Gas Development.

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1 Introduction

Barrow Island is approximately 70 km off the coast of Western Australia and falls within the Fortescue Botanical District, which itself is a component of the Eremaean Botanical Province (Beard 1980). Climate, landforms and soils determine the distribution of vegetation and plant communities within the Fortescue Botanical District (Beard 1975, Beard 1990).

Barrow Island consists primarily of an undulating limestone plateau (Beard 1975). The southern end of the island is low lying and sandy with Quaternary beach sands and sandy bays. The central part of the island consists of many small limestone ridges and slopes. The northern and eastern sides of the island consist of low cliffs with intervening sandy flats and bays. The western side of the island is more exposed and consists of deeper drainage valleys within the limestone plateau and sandy beaches and narrow near-coastal dune systems.

This report details the findings of a series of vegetation surveys of the proposed gas processing facility and surrounding areas on the eastern side of the island (Figure 2-1) and of three proposed pipeline routes, which extend to the western and northern boundaries of Barrow Island (Figure 3-1 to 5-2), as detailed below:

- the proposed CO_2 reinjection pipeline deviates north from the proposed feed gas pipeline and runs north to Cape Dupuy (Figure 3-1 to 3-6) *this option has since been dropped from Development plan*,
- the proposed feed gas pipeline route runs from a northerly point on the proposed CO_2 reinjection line north-west to North White's Beach (Figure 5-1 and 5-2).
- an alternative feed gas pipeline route runs from the east side of the island close to the 'Terminal Tanks', west to Flacourt Bay (Figure 4-1 to 4-4) ,

The methodology for the above surveys is detailed in Section 2.2. The findings of a preliminary vegetation survey of the proposed pipeline corridor on the mainland on Mardie Station are also discussed in this report.

This appendix is a stand alone document as per EPA Guidance No. 51. A summary of the report is included in the ERMP document.

2 Methods

2.1 Historical Data

A series of vegetation and flora studies have been undertaken on Barrow Island since the 1960's (Butler (1970), Buckley (1983), West Australian Petroleum Pty Ltd (1988), Mattiske and Associates (1993a, 1993b) and Astron (2002)).

Many available species lists from the series of studies undertaken on Barrow Island (Attachment F) were merged and the names checked against those currently accepted by the Western Australian Herbarium using the MAX database and the Department of Conservation and Land Management's (2003b, 2004b) FloraBase and in consultation with other experienced botanists working on the island including Vicki Long, Arthur Weston and Libby Mattiske. Peer review of the species lists for the technical report were

undertaken by Vicki Long and review of the technical report was undertaken by Arthur Weston as per EPA Guidance No. 51.

The amalgamated list, including historical synonyms was used by the team to assist in facilitating plant identifications and to identify gaps in existing collections.

While undertaking a review of the amalgamated species list for the island, substantial changes in identifications and in taxonomic nomenclature were noted.

2.2 Field Program

The initial botanical surveys conducted for the proposed Gorgon development areas were undertaken by botanists with significant survey experience, as per EPA Guidance No. 51. The botanical team consisted of a team of eight botanists with vast collective botanical survey experience. Members of the team have been coordinating and participating in botanical surveys in excess of 5 years for most individuals and more than 10 and 30 years botanical survey experience for others. The botanical team contained individuals with significant botanical experience, including significant experience in the Pilbara region. Members of the original survey team were used for all subsequent botanical surveys for the project.

2.2.1 Proposed Gas Processing Facility Site

The wider study area for this study is located on the eastern side of the island, approximately halfway between the northern and southern ends of the island (Figure 2-1). It covers a rectangular area of approximately 1683 ha and is bound on the eastern side by the island's coast. The proposed gas processing facility falls within the eastern side of this area and covers approximately 134 ha.

The field program was designed in consultation with CALM to ensure consistency with other regional studies and databases.

Plots were selected to represent undisturbed vegetation within the proposed development area and surrounding areas. Areas of previous disturbance, for example by seismic lines or clearing, were avoided. The plots were selected on the basis on aerial photography, GIS information and field observations.

In September and October 2003, fifty six 50 m x 50 m plots, each divided into 10 m x 10 m quadrats were established within the proposed gas processing facility site and wider study area. Gaps in representation of vegetation communities within the wider study area were identified through preliminary analysis and a further fifteen plots were established in the area in January 2004. This resulted in a total of seventy two plots.

The data collected in the January 2004 survey were collected in an identical manner to the September and October 2003 surveys, by members of the original field team to ensure continuity in the datasets.

Physical limitations precluded establishing 50 m x 50 m square plots in some communities. In small or linear communities (e.g. coastal, dunes, creeks), the plots consisted of abutting and continuous 10 m x 10 m quadrats within the community boundary, with as many quadrats as possible (up to 25).

The establishment of 10 m x 10 m quadrats allowed comparison with previously established 20 m x 20 m plots on the island (Mattiske 1993b) and with data collected by Trudgen (1989).

Two post-cyclonic rain surveys of the proposed development area were undertaken in April and May 2004, approximately six to eight weeks after Cyclone Monty passed over Barrow Island. Two post-cyclonic rain surveys were undertaken in accordance with EPA Guidance No. 51, in order to complement the initial survey which was undertaken after a long dry period. The first post-cyclonic rain survey focussed primarily on collection of annual grass species and the second on general annual species that may have germinated as a result of the recent rains. The 50 m x 50 m vegetation plots established within the proposed gas processing facility were reassessed as part of the post-cyclonic rain surveys.

In each 10 m x 10 m quadrat the percentage foliage cover was recorded, instead of numbers of individuals, due to difficulties in accurately counting *Triodia* hummocks.

Flora of interest that occurred outside the recording sites was noted during the field surveys.

2.2.2 Proposed Pipeline Routes

A continuous transect, at least twice the width of the proposed pipeline easement, was surveyed for the three proposed pipeline routes:

- the feed gas pipeline from Flacourt Bay to the gas processing facility,
- the alternate feed gas pipeline from North White's Beach to the proposed gas processing facility and,
- the proposed CO_2 reinjection pipeline from the proposed gas processing facility to Cape Dupuy.

The entire length of each of the proposed pipeline routes (Figure 3-1 to Figure 5-2) was surveyed on foot, with either a new site recorded with every change in vegetation or notes taken with reference to the recurrence of a previously observed community.

Percentage foliage cover and height range of each species were recorded and photographs and GPS locations were taken at the Northwest corner at each site.

2.3 Plant Identifications

All plant specimens were processed (pressed and dried) on site and then returned to Perth for identification.

Plant specimens were identified by experienced botanists and all specimens were compared with plant collections at the Western Australian Herbarium. Some plant identifications required further specialist input. *Corchorus* specimens were sent to Dr David Halford at the Queensland Herbarium for identification. *Acacia* specimens were confirmed by Dr Bruce Maslin of the Western Australian Herbarium and specimens of *Chenopodiaceae* were identified by Dr Paul Wilson of the Western Australian Herbarium.

Liaison with the Western Australian Herbarium was undertaken as per EPA Guidance No. 51 and specimens collected as part of the surveys on Barrow Island will be

submitted for mounting, and will be included in the Western Australian Herbarium and Karratha regional herbarium collections.

2.4 Data Analyses

The data were loaded into a proprietary SQL-compliant database. All taxon names were corrected against the names in the most recent CALM census.

Basic statistics of the percentage cover observations were calculated using the SYSTAT statistical software package. These included means, ranges and medians. Histograms of each taxon were prepared in order to check statistical distributions of the taxa. Box and whisker plots were produced for each taxon in order to identify any outliers in the data set. These outliers were then rechecked for validity against the field sheets, and corrected as necessary.

PATN software was used to analyse both the data recorded in the vegetation plots within the proposed gas processing facility plant area and a merged data set which included previous survey data. Initial data analyses were undertaken on presence/absence, percentage live foliage cover and total percentage foliage cover, by plot and by individual quadrat.

Hierarchical clustering was undertaken using two principal association measures, Bray and Curtis and Cosine (or Ochiai). Hierarchical fusion clustering was undertaken using a number of strategies. Nearest Neighbour, Furthest Neighbour, Flexible WPGMA (weighted pair group arithmetic averaging), Flexible UPGMA (unweighted pair group arithmetic averaging) using beta = -0.1, UPGMC (unweighted pair group centroid) and WPGMC (weighted pair group centroid) were evaluated.

Dendrograms were produced for each combination of association measure and clustering strategy. A TWINSPAN run was undertaken using the plot data. All of the clustering was undertaken on both plots and quadrats (Q mode). Some R mode clustering was investigated on taxa.

Outputs were then compared and interpreted in relation to other data, notes and aerial photographs.

2.5 Vegetation Mapping

2.5.1 Proposed Gas Processing Facility Development and Wider Study Areas

Vegetation within the proposed gas processing facility development and wider study areas (Figure 2-1) was mapped from detailed observations, aerial photograph interpretation and data from the detailed recording sites.

Vegetation along the proposed pipeline options was mapped from detailed site observations, aerial photograph interpretation and plant specimen collections. Plots were not established along the proposed pipeline routes and therefore statistical and cluster analyses of the proposed pipeline routes were not undertaken for this area of the study.

Barrow Island was classified into eight major vegetation units by Buckley (1983). These were subsequently refined and mapped as 34 vegetation types, based on major landforms, soil type and species composition, by Mattiske and Associates (1993b) (Figure 6-1 to

Figure 6-2). The Mattiske mapping units were based on vegetation components, as follows:

M Marine — 1 vegetation type

T Tidal — 2 vegetation types

C Coastal Complex and Dunes Systems — 7 vegetations types

D Drainage lines and creeks — 3 vegetation types

F Flats — 7 vegetation types,

L Limestone Ridges and Slopes — 10 vegetation types,

S Clay Pans — 2 vegetation types,

V Valley Slopes and Escarpment Slopes — 2 vegetation types.

Trudgen's (2002) adaptation of Aplin's (1979) modification of Specht's (1970) vegetation classification system was used in order to allow cover of species with less than two per cent cover to be considered. This system allows for the 'low cover of many strata in the vegetation of more arid areas' (Trudgen 2002). Species with greater than 0.5 percent cover were included in vegetation descriptions for this study.

Vegetation communities were mapped in accordance with EPA Guidance No. 51.Vegetation communities for the proposed gas processing facility and wider study area were described on the basis of the relationships between plots in the cluster analysis, tables of alive and dead species, covers and original field plot community descriptions, and Trudgen's (2002) vegetation classification system. The term 'tall' is substituted for 'high' in vegetation descriptions in this report.

2.6 Limitations

The initial surveys followed a significant period without substantial rains and consequently, the full floral diversity, of annual species in particular, would have been underestimated. Further surveys undertaken after cyclonic rain improved the representation of ephemeral flora. However it is assumed that additional species would be found after several 'good' seasons.

Although plots were established extensively within the proposed gas processing facility area and the wider surrounding study area, it was not logistically possible to establish plots for analysis of vegetation over the whole island. For this reason, analysis was undertaken using data from vegetation plots established in the current survey and that from plots established previously on the island to assist in the assessment of representation of vegetation on the island. Some temporal variation in vegetation would be introduced by using data from different years. This may reduce the accuracy of our assessment of representation of vegetation communities on the island.

3 Flora

3.1 Barrow Island

The Eremaean nature of the flora on Barrow Island is demonstrated by the dominance of families such as Poaceae (grasses), Chenopodiaceae (chenopods), Papilionaceae (peas), Malvaceae and Asteraceae (daisies). The dominant flora, namely *Triodia* and *Acacia*, are typically Eremaean (Mattiske 1997).

The Department of Conservation and Land Management (2004a, 2004b) currently has 1733 records of flora taxa for the Pilbara region, which covers about 178 017 km^2.

The flora of Barrow Island is typical of the arid Pilbara region but has floral affinities with the Cape Range area on the mainland (Trudgen 1989; Mattiske Consulting 1997), particularly in coastal areas, and with the Pilbara and Kimberley regions for other flora (Table 3-2).

Trudgen (1989) based the similarities between the vegetation of Cape Range and Barrow Island on the dominance of *Melaleuca* with *Triodia* hummock grasses and the presence of selected species such as *Acanthocarpus verticillatus, Lechenaultia divaricata, Olearia* sp. and *Scaevola crassifolia*. The *Lechenaultia* sp. highlighted by Trudgen (1989) may correspond to an unidentified *Lechenaultia* sp. on Barrow Island (Attachment F).

These floral linkages reflect the diversity of the environments on Barrow Island, as well as the past linkages to the mainland.

A total of 68 families, 180 genera and 406 vascular plant taxa have been recorded on Barrow Island (Attachment A). The flora includes 250 perennial species, 75 annual species and 81 species which are considered to be annual or perennial species (Attachment A and Attachment F). The Barrow Island flora constitutes approximately 23 per cent of the flora records for the Pilbara region. Fourteen vascular plant taxa have been introduced to the island, the majority of which have been recorded in the vicinity of previously disturbed sites.

Table 3-1 (below) summarises the number of vascular plant taxa recorded from the various studies that have been undertaken on Barrow Island, as shown in full in Attachment F.

Table 3-1 – Number of Vascular Plant Taxa on Barrow Island

Data Source	No. of Vascular Plant Taxa
Barrow Island records	201
Western Australian Herbarium ^	199
Karratha Herbarium ^	124
Buckley and Butler ^(Buckley 1980)	215
Lewis and Grierson ^(1989)	56
M.E. Trudgen (1989)	69
Mattiske & Associates (1993a)	76
Mattiske & Associates (1993b)	166
Astron Environmental (2002, 2004)	213
RPS Bowman Bishaw Gorham (2003, 2004)	164
Pilbara Region – CALM Florabase (2004b)	1733
Current Barrow Island Flora Tally	**406**

Note: ^ Many voucher plant specimens were not relocated – totals are an overestimate of potential numbers.

It is estimated that at least 90 per cent of the total vascular plant flora of the island has been documented through these studies. Approximately 20 to 30 per cent of the species on the island would occur only after cyclonic rain or as ephemerals after fires.

Table 3-2 summarises the geographical spread of species recorded on Barrow Island. The table is expanded further in Attachment A.

Table 3-2 – Geographical Affinities of Species and Taxa Recorded on Barrow Island with Other Parts of the Region

Regional Distribution	Number of Species/Taxa
Potentially restricted to Barrow Island (section 3.2)	17
Kimberley	122
Pilbara	193
Cape Range and southern districts	50
Widespread (multiple botanical districts)	115

The flora of Barrow Island is regionally significant because there are species or taxa that:

- appear to be restricted to the island
- represent the southern limit of plants of the Kimberley region
- represent the western limit of plants of the Pilbara region
- represent the northern limit of the plants of Cape Range and southwards.

3.1.1 Rare and Priority Flora

No protected plant taxa listed under Section 179 of the EPBC Act and no Declared Rare Flora species, listed under subsection (2) of Section 23F of the *Wildlife Conservation Act* or listed by CALM (2004a) were located during surveys on Barrow Island.

Two Priority Flora species have been collected on Barrow Island:

- *Helichrysum oligochaetum* (Priority One), and
- *Corchorus interstans* ms (Priority Three).

Helichrysum oligochaetum was recorded on the flats south of the proposed gas processing facility and north of the current ChevronTexaco camp (Mattiske & Associates 1993b). This species is only known from six records at the Western Australian Herbarium and was not found within the proposed gas processing facility footprint or proposed pipeline routes during the initial or post cyclonic rain surveys.

Corchorus interstans ms is represented by only four collections in the Western Australian Herbarium but is widespread on Barrow Island and known to extend into the Pilbara region. It was recorded in 18 of the 24 vegetation communities defined in the wider study area, in eight of the nine communities located within the proposed gas processing facility area, along the Flacourt Bay feedgas pipeline route and on the proposed CO_2 reinjection line (Attachment G and Attachment H). The Herbarium collection will be supplemented by collections from the current study.

Specimens collected on the proposed pipeline routes which were potentially *Corchorus interstans* ms were recently identified as *Corchorus congener*, *Corchorus* ?*congener, Corchorus walcottii* and *Corchorus* sp. Further collection of *Corchorus* specimens along the proposed pipeline routes would be required to confirm the identification of the *Corchorus* sp. collections and to determine the potential distribution of *Corchorus interstans* ms along these routes.

3.1.2 Restricted Flora

The plant species listed in Table 3-3 are considered to have restricted distributions. They either have a limited distribution on Barrow Island or occur as range extensions from other botanical regions in Western Australia.

Table 3-3 – Restricted Flora on Barrow Island and their Presence in the Gorgon Development Areas

Taxa	Regional Range and Barrow Island Occurrence	Present in Proposed Gorgon Development Area
Acacia cowleana	Appears to extend from Barrow Island to the Kimberley region. Restricted to one small population on the island.	This species was not located in the proposed development areas.
Acacia inaequilatera (dwarf form)	This variant is restricted to the south-west corner of the island and differs from the mainland variant.	This variant was not located in the proposed development areas.

Taxa	Regional Range and Barrow Island Occurrence	Present in Proposed Gorgon Development Area
Acacia synchronicia	Is very restricted on Barrow Island but appears to be widespread in mainland areas.	This species was not located in the proposed development areas, but occurs to the north and northeast of the existing airstrip.
Cassytha capillaris	This creeper extends from Barrow Island to the Kimberley and Pilbara regions.	This species was not located in the proposed development areas.
Cullen patens (formerly known as *Psoralea patens*)	Extends from Barrow Island to the Pilbara and southern areas. This species is relatively restricted on the island.	This species was not located in the proposed development areas.
Dichanthium sericeum subsp. *humilius*	This subspecies extends from Barrow Island to the Kimberley and Pilbara regions.	This subspecies was recorded within the proposed gas processing facility area in recent post-cylonic rain surveys.
Dysphania kalpari	This species is widespread on the mainland, but its distribution on Barrow Island is unknown.	This species was not located in the proposed development areas.
Erythrina vespertilio	This species is restricted on the island to five main populations and localised scattered trees. Although this species is considered to be relatively widespread in the State, on Barrow Island it is very restricted. The main areas were initially defined and mapped as vegetation community F4 (Mattiske and Associates, 1993b).	The species was recently mapped within vegetation community F4a along the proposed CO_2 reinjection pipeline.
Eucalyptus xerothermica ms	This species is restricted to localised patches, three main small populations and a few scattered trees on the island. This species is widespread in the Pilbara region.	This species was not located in the proposed development areas.
Euphorbia sp. A	This species requires further taxonomic investigations.	This species was not located in the proposed development areas.
Ficus opposita var. *aculeata* (formerly recorded as *Ficus opposita* var. *micrantha)*	This species is known from only one location in the south-west section of the island and from three recent collections on the island This species extends in distribution to the Pilbara and Kimberly regions.	This species was not located in the current proposed development areas.
Gossypium australe	This species extends from Barrow Island to the Kimberley and Pilbara regions.	This species was not located in the proposed development areas.
Grevillea pyramidalis subsp. *leucadendron*	Scattered populations of this subspecies occur in the middle of the island, near the central east coast and in the northwest of the island.	This subspecies was recorded in communities L6b, L6c and L6d on the proposed North White's Beach pipeline route and in community L6a, south-east of the proposed camp area.

Taxa	Regional Range and Barrow Island Occurrence	Present in Proposed Gorgon Development Area
Hakea lorea subsp. *lorea*	This subspecies was previously located in scattered populations in the central part of the island and is recognised as being widespread in the Pilbara region. It is now known to occur in a range of vegetation community types on the island.	This subspecies occurs in several communities associated with a range of site conditions from valleys (V1m and V3b) to drainage systems (D1a) and limestone slopes and ridges (L3i, L5a and L6a) within the proposed development area.
Halosarcia indica subsp. *julacea*	This subspecies extends from Barrow Island to the Kimberley. Restricted to tidal flood areas of the island.	This subspecies was not located in the proposed development area.
Hibiscus sturtii var. *platychlamys*	This variety extends from Barrow Island to the Pilbara region. Located on edges of red sandy areas and in gullies on western and northern edges of the island.	This variety was not located in the proposed development area.
Hybanthus aurantiacus	This species extends from Barrow Island to the Kimberley and Pilbara regions. Previously located on a disturbed site on northern section of the island.	This species was located in communities L3a, L5a and V1m in the proposed gas processing facility footprint and wider study area and within plot 15 under the proposed footprint. This species is a relatively short-lived plant, which occurs after favourable seasonal rains.
Isotropis atropurpurea	This species extends from Barrow Island to the Kimberley and Pilbara. Localised occurrence on the island.	This species was not located in the proposed development area.
Mallotus dispersus (formerly recorded as *Mallotus didmochryseus*)	This species is restricted on Barrow Island and extends to the Kimberley.	This species was not located in the proposed development area.
Santalum murrayanum	Restricted to one valley on the island. This species extends from Barrow Island southwards.	This species was not located in the proposed development area.
Sporobolus mitchellii	This species, although restricted in occurrence on Barrow Island, is widespread on the mainland. It has only been recorded in the south-west of the island.	This species was not located in the proposed development area.
Stemodia glabella	This species is relatively widespread on the mainland, but its distribution on Barrow Island is unknown. It extends from Barrow Island to the Kimberley and Pilbara regions.	This species was not located in the proposed development areas. Further investigations are required to clarify the taxonomy of the *Stemodia* species on the island.
Whiteochloa airoides	This species extends from Barrow Island to the Kimberley and Pilbara regions. This species has been recorded on the western coastal area and inland. It appears that this grass may be grazed in some areas and therefore may be more widespread following favourable seasonal conditions for establishment and growth.	This species was located on the proposed feed gas pipeline area.

An additional 17 taxa are potentially restricted to Barrow Island and require further attention in order to confirm their classification, distribution and conservation status (Attachment A). This group includes variants of *Acacia bivenosa* and *Corchorus* sp. and the following:

- *Abutilon* sp. (VL-2706-09)
- *Calandrinia* aff. *remota*
- *Euphorbia* aff. *drummondii* (Boodie Island)
- *Ficus brachypoda* (hairy variant – ex *Ficus platypoda* var. *lachnocaula*)
- *Heliotropium* sp. (VL-2104-19)
- *Isolepis* sp.
- *Lechenaultia* sp. (VL-BW103-13)
- *Marsilea ?hirsuta*
- *Ptilotus obovatus* (adherent prostrate from on island)
- *Scaevola* sp. (VL-2104-26)
- *Sida* sp. (VL-2709-14).

Species that tend to be restricted to creek beds and gullies on Barrow Island are of conservation significance, due to the historical loss of this habitat through anthropogenic disturbance. The taxa associated with these habitats include *Abutilon otocarpum, Dysphania kalpari, Euphorbia* sp. A, *Gossypium australe* and *Hibiscus sturtii* var. *platychlamys.*

3.1.3 Introduced Species

Fourteen plant species have been introduced to Barrow Island (Table 3-4).

Table 3-4 – Introduced Species Previously Recorded on Barrow Island

FAMILY	GENUS AND SPECIES
AMARANTHACEAE	*Aerva javanica* (Kapok bush)
ASTERACEAE	*Arctotheca calendula* (Cape weed)
	Conyza sumatrensis (Tall fleabane)
	Pseudognaphalium luteoalbum (Jersey cudweed)
	Sonchus oleraceus (Milk thistle)
CYPERACEAE	*Isolepis marginata* (Coarse club-rush)
MALVACEAE	*Malvastrum americanum* (Spiked Malvastrum)
MYRTACEAE	*Eucalyptus gomphocephala* (native to SW EA – planted)
PASSIFLORACEAE	*Passiflora foetida* var. *hispida* (Wild passionfruit)
POACEAE	*Cenchrus ciliaris* (Buffel grass)
	Cynodon dactylon (Couch grass)
	Setaria verticillata (Whorled pigeon grass)
POLYGONACEAE	*Emex australis* (Doublegee)
SOLANACEAE	*Solanum nigrum* (Blackberry nightshade)

Astron Environmental (2002) notes that *Malvastrum americanum* was rated by CALM in 1999 as being 'moderate' in its potential to invade and endure, and that the weed has become naturalised on the Pilbara mainland.

3.2 Proposed Development Areas

3.2.1 Species of Conservation Significance in Proposed Development Areas

The occurrence of restricted species within the proposed development areas is detailed at Table 3-3 above. The significant species recorded within the proposed development areas are further described below:

Species restricted to specific areas on the island

Erythrina vespertilio occurs within vegetation community F4a on the proposed CO_2 reinjection pipeline (Figure 3-1) and an isolated tree of this species was located near the proposed North White's Beach pipeline.

Grevillea pyramidalis subsp. *leucadendron* occurs within community L6a near the proposed camp site (Figure 2-1) and communities L6b, L6c and L6d along the proposed North White's Beach pipeline (Figure 5-1, Figure 5-2). Scattered populations have been recorded in the centre of Barrow Island (Mattiske and Associates 1993b).

Hakea lorea subsp. *lorea* occurs in several communities associated with a range of site conditions from valleys (V1m and V3b) to drainage systems (D1a) and limestone slopes and ridges (L3i, L5a and L6a) within the proposed gas processing facility area, the proposed feed gas pipeline corridor and the proposed CO_2 reinjection pipeline corridor. Prior to this study it was recorded by Mattiske (1993b) as occurring only in scattered populations in the middle of the island, but has since been recorded in a variety of communities.

Melaleuca cardiophylla occurs in vegetation communities D1a, F8a, L3h, L7a, L7b, V1d, V1k and V1m, of which communities D1a, F8a, V1d, V1k and V1m occur within the proposed gas processing facility footprint (Figure 2-1). This species was recorded within approximately 1583ha of vegetation type L7 (Mattiske and Associates 1993b). This species is now known to be widely distributed on the island, but remains significant due to its ecological function as fauna habitat.

Dichanthium sericeum subsp. *humilius* is an annual grass that was recorded in two locations within the proposed gas processing facility area during the post cyclonic rain surveys. Mattiske and Associates (1993b) also found the species amongst the chenopod fringes of Barrow Island. This subspecies extends from Barrow Island to the Kimberley and Pilbara regions and is expected to be widely distributed on the island, but distribution on the island is unknown.

Hybanthus aurantiacus occurs in vegetation community V1m within the proposed gas processing facility area and in communities L3a, L5a and V1m in the wider study area. This species extends from Barrow Island to the Kimberley and Pilbara regions and is also located on a disturbed site in the northern part of Barrow Island. It is a relatively short-lived species which occurs after favourable seasonal rains. Although some populations will be affected by the proposed gas processing facility, the majority of the populations will not be affected.

Whiteochloa airoides grows on the proposed feedgas pipeline route. This species extends from Barrow Island to the Kimberley and Pilbara regions and has been recorded on the western coastal area and in the centre of the island. It appears that this grass is heavily grazed and therefore is likely to be more widespread following favourable seasonal conditions for establishment and growth.

Several different forms of *Acacia bivenosa* were recorded in the survey of the proposed gas processing facility and wider study areas. Two forms of *Acacia bivenosa* were apparent in the collections — a 'normal' variant and an 'elongate phyllode variant' (Bruce Maslin, Western Australian Herbarium, personal communication). Further assessment of these forms and other *Acacia* species on Barrow Island is anticipated in the future to determine whether they are genetic variants.

Table 3-5 summarises the number of vascular plant taxa and families recorded within the proposed development areas. Attachment G and Attachment H show the taxa recorded in plots within the proposed gas processing facility.

Table 3-5 – Numbers of Plant Taxa and Families Recorded within Proposed Gorgon Development Areas

Proposed Development Area	No. Taxa	No. Families	Dominant Families
Proposed gas processing facility wider study area	115	38	Poaceae (13 taxa), Asteraceae (11 taxa), Tiliaceae (10 taxa), Mimosaceae (6 taxa), Euphorbiaceae (7 taxa) and Papilionaceae (6 taxa)
Proposed gas processing facility footprint (species recorded in six vegetation plots within footprint)	48	26	Euphorbiaceae (7 taxa), Poaceae (5 taxa), Asteraceae (3 taxa), Papilionaceae (4 taxa)
Proposed CO_2 reinjection pipeline	68	30	Poaceae (9 taxa), Asteraceae (4 taxa), Mimosaceae (4 taxa) and Papilionacae (5 taxa)
Proposed feed gas pipeline	60	27	Poaceae (12 taxa), Asteraceae (5 taxa) and Papilionaceae (4 taxa)
Proposed North White's Beach pipeline	67	27	Chenopodiaceae (9 taxa), Poaceae (9 taxa) and Asteraceae (7 taxa)

Table 3-6 shows the numbers of annual and perennial species recorded within vegetation plots in the proposed gas processing facility area, before and after the post-cyclonic rain surveys.

Thirteen additional species were recorded in the proposed gas processing facility and wider study areas. Eleven additional species were recorded on the proposed feed gas pipeline area, 16 additional species were recorded on the proposed CO_2 reinjection pipeline area and 11 additional species were recorded on the proposed North White's Beach pipeline as a result of post-cyclonic rain surveys.

Table 3-6 – Annual and Perennial Species Recorded in Plots within the Proposed Development Area Before and After Post-cyclonic Rains

	Plot 1		Plot 2		Plot 3		Plot 15		Plot 46		Plot 47	
Annual/Perennial	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
A	0	3	1	3	0	0	0	1	0	3	0	2
P	5	7	10	11	13	14	12	16	9	9	9	10
A/P	1	4	1	8	1	2	0	3	0	0	0	0
total	6	14	12	22	14	16	12	18	9	12	9	12
Increase # species after rain	-	8	-	10	-	2	-	6	-	3	-	3
% species increase	-	133.3	-	83.3	-	87.5	-	50	-	33.3	-	33.3

Note: Pre = number of annuals/perennials in initial plot surveys (September/October/ December 2003),
Post = number of annuals/perennials in post rain surveys (April/May 2004)

New Records for Barrow Island

Nine new records or confirmed identities for Barrow Island were added to the list of vascular plant species as a result of the post-cyclonic rain surveys on the island.

These new records and confirmations are described in the following.

Tephrosia clementii has not previously been recorded for Barrow Island and was found in limestone community F5d (Figure 3-1) on the proposed CO_2 pipeline route. This species differs from *Tephrosia rosea* var. *clementii*, which was previously recorded on Barrow Island. The Western Australian Herbarium's current MAX database lists four varieties of *Tephrosia rosea*: var. *clementii*, var. *glabrior*, var. *rosea* and var. *venulosa*. Both *Tephrosia clementii* and *Tephrosia rosea* var. *clementii* names are current.

The recent collections of *Tephrosia clementii* were very small and herbaceous. Only five collections of the species are lodged at the Western Australian Herbarium. The limited collections and knowledge of the distribution of this species suggests that listing by CALM as a Priority species may be considered. Further survey work will be required to determine the distribution of this species on the island.

The Southern Pilbara — Carnarvon Coastal form of *Eriachne flaccida* (Trudgen 2002), was collected from the clay pan community S1a on the proposed CO_2 reinjection pipeline and confirms the identity of the previous collection from the same area. Trudgen (2002) noted that the *Eriachne* specimen from Barrow Island differs from the inland Pilbara material for *Eriachne flaccida* in seven ways. However, it is the same as R. Buckley's collection of the species from Barrow Island and a few coastal specimens from the Carnarvon area.

An unidentified *Isolepis* sp. was found within the proposed gas processing facility footprint after the post-cyclonic rains, in the south-west corner of the proposed footprint, and at two locations outside the proposed footprint. The Barrow Island

specimens do not match any known *Isolepis* specimen held in the Western Australian Herbarium (Cate Tauss (pers. comm.)), apart from a specimen recently collected in Perth. There is potential for the species to be a new native species, or a cosmopolitan species of Asian origin. Further investigation of this species is required to resolve its taxonomic and biogeographical affinities.

Tribulus hirsutus was recorded within community F8a in the wider study area (Figure 2-1) and Community F5c on the proposed CO_2 reinjection pipeline. It appears to be a new record for the island. The species has a distribution that extends from the Pilbara to parts of the Kimberley.

Corchorus congener was added to the species list for the island after recent identifications of *Corchorus* specimens by David Halford of the Queensland Herbarium. This species has been recorded near Exmouth but had not been previously recorded on Barrow Island.

Corchorus congener was found within the proposed gas processing facility footprint. Specimens tentatively identified as *Corchorus congener* were also located within the wider study area surrounding the proposed gas processing facility footprint (Figure 2-1) and on the proposed North White's Beach pipeline route. Further survey and collections would be required to determine the distribution of this species on the island.

The other taxa added to the Barrow Island flora list after the recent post-cyclonic rain surveys include *Evolvulus alsinoides* var. *villosicalyx*, *Ptilotus fusiformis* var. *fusiformis* and introduced species *Setaria verticillata*. None of these three records appear to be significant range extensions. However, the collection of a new introduced species (*Setaria verticillata*) near the proposed North White's Beach pipeline corridor warrants further investigation.

Little is known about the non-vascular plant species in the Pilbara region. Fruiting bodies of an unidentified fungus were observed on a termite mound on the proposed CO_2 reinjection pipeline route (Plate 1). No non-vascular plant species were observed within the proposed development area during post-cyclonic rain surveys.

3.2.2 Proposed Gas Processing Facility

Forty eight taxa, from 26 families were recorded from six plots within the proposed facility footprint, after post-cyclonic rain surveys. These totals probably underestimate the number of species within the gas processing facility footprint and represent less than half of the taxa in the area.

No introduced species were recorded in the proposed gas processing facility or the wider study area.

3.2.3 Proposed Pipeline Corridors

Each of the three pipeline routes yielded more than 60 plant taxa (Table 3-5). One introduced species, *Setaria verticillata,* was recorded outside the proposed North White's Beach pipeline in the post-cyclonic rain surveys.

The flora values in these pipeline areas will be assessed further as part of the finalisation of the alignment of the pipelines.

3.2.4 Proposed Mainland Pipeline Corridor

A preliminary flora and vegetation survey of the proposed mainland pipeline route, adjacent to the existing Apache pipeline on Mardie Station south of Karratha, was undertaken in May 2003. Preliminary vegetation assessment of this area, which has coastal mangrove and samphire communities, salt pans and inland terrestrial vegetation communities, is shown in section 4.2.3 of this report and in Appendix J and Chapter 11 of the main report. Further collections and identifications are required to complete a species list for the proposed mainland pipeline survey area.

4 Vegetation

Generally, the vegetation of the near-coastal environments are relatively consistent within the Pilbara region. The typical pattern of vegetation comprises mangroves in tidal areas, *Spinifex longifolius* assemblages on the foredunes, halophytic communities on the saline flats, stunted vegetation on the near-coastal rocky headlands, and hummock grasslands of *Triodia* on the inland areas. The grass species and emergent shrubs and trees in these hummock grasslands reflect local patterns in landforms, soils and moisture availability.

4.1 Vegetation Types of Barrow Island

The 34 vegetation types mapped by Mattiske and Associates (1993b) were further refined to create 83 mapping units after surveys of the proposed development areas (Figures 1-1 to 1-4). The mapping codes for the vegetation communities were linked to previous mapping studies by Mattiske and Associates (1993a) and Astron Environmental (2002).

Additional vegetation communities that were delineated and mapped within and near the proposed development area were the rocky headlands (mapping unit R) and disturbed areas (Dist). Disturbed areas include roads, areas of recent disturbance, seismic lines and areas of historical disturbance where partial regrowth of vegetation had occurred, well pad areas and areas of disturbance around the Terminal Tanks and the old airport (Figure 2-1).

The ground-truthing and high resolution aerial photography used in the current survey facilitated the clarification of some vegetation types and hence there are some discrepancies between the various maps. For example it facilitated the definition of the new vegetation type (F8) on the flats near the proposed gas processing facility footprint.

4.2 Proposed Development Area

4.2.1 Proposed Gas Processing Facility

Figure 2-1 shows the distribution of vegetation communities in the vicinity of the proposed gas processing facility footprint (including proposed plant, camp area and adjoining road).

Table 4-1 shows the areas of the 11 vegetation communities, areas of disturbance and unvegetated rocks which will potentially be impacted by the proposed gas processing facility.

Table 4-1 – Vegetation Communities and Areas Potentially Impacted by the Proposed Gas Processing Facility Footprint

Vegetation Community	Area (ha)
C2a	0.20
C2b	0.002
C5a	0.58
D1a	0.09
Disturbed Areas	0.66
F8a	47.86
L3a	1.34
L3f	6.24
L3i	28.06
L7b	2.20
Rocks (unvegetated)	0.50
V1d	3.15
V1k	10.70
V1m	31.77

The dominant communities within the proposed gas processing facility area as shown in the table above are V1m, F8a and L3i. Community V1m consists of *Melaleuca* and *Acacia* heath over mixed *Triodia* hummock grassland on limestone slopes and ridges. Community F8a consists of *Acacia bivenosa* shrubland over mixed *Triodia* hummock grassland on flats and valley floors. Community L3i consists of *Acacia bivenosa* shrubland over mixed *Triodia* hummock grassland on limestone slopes, small rises and flats.

Vegetation within a wider study area surrounding the proposed gas processing facility footprint was mapped to provide context and guidance for the location of the proposed gas processing facility footprint. The wider study area totals approximately 1483 ha (Figure 2-1). Of this, approximately 64ha has been previously cleared or disturbed for roads, terminal tanks and oil remediation areas. A further 40 ha has been disturbed within the wider study area by the removal of drainage soil material for road works and well sites.

The wider study area contains 26 vegetation communities. Substantial areas of communities such as F8a (*Acacia bivenosa* and *Triodia wiseana* 'flats') occur in the east, with ten undulating limestone slope and ridge communities and eight valley slope communities with minor drainage lines in the west. Small pockets of the limestone community (L6a), dominated by *Grevillea pyramidalis* subsp. ?*leucadendron* and *Triodia angusta,* are located in the south-east of the wider study area (Figure 2-1).

Several major drainage gullies occur within the wider study area and flow towards the east coast of the island. Some of these drainage gullies have been disturbed as a result of 'borrowing' of soil material. The east coast of the island forms the eastern edge of the

wider study area and supports four coastal dune vegetation communities and one coastal limestone cliff vegetation community (Figure 2-1).

Data Analyses

Dendrograms (Figure 7-1 to 7-3) were used as a means of checking groupings and the resulting vegetation communities for the proposed gas processing facility and for a comparison of this area with the remainder of Barrow Island.

The results for some of the more distinct vegetation communities reflected sharp boundaries in site conditions, whilst other less-distinct vegetation communities were related and reflected only subtle differences in species composition. In general, there was a reliance on experience of the ecologists in delineating the less-distinctive communities.

In delineating the groups the following trends were observed:

- Although plots established in dune areas were located both on top of dunes and in swales between the dunes, and aerial photography showed the two areas as differing in appearance, several of these plots were linked closely in the output of the analysis. It appears that the composition and percentage cover of species in these differing parts of the dune system were sufficiently similar to allow the grouping of the plots into the same vegetation community.
- Although plot 47 was not linked closely in the dendrogram with the other plots containing *Melaleuca cardiophylla*, it was grouped within *Melaleuca* community V1m as a result of the presence of this dominant species and certain other species, and its topographical position in the landscape.
- Although the *Melaleuca* plots were linked closely in the dendrograms, the plots were divided into upper slope, valley and flats communities.
- Plot 12 was not linked closely to other dune plots as it was a transect that traversed several different coastal communities adjacent to a major creek line.

4.2.2 Proposed Pipeline Corridors

Proposed CO_2 Reinjection Pipeline

The corridor surveyed for the proposed CO_2 reinjection pipeline extends from near the proposed gas processing facility footprint almost to Cape Dupuy at the northern end of the island, and has an approximate width of 60m (Figure 3-1 to 3-6). Of the 70 ha mapped within the pipeline survey area, approximately half of that would be expected to be impacted by the proposed pipeline. Forty three vegetation communities were mapped within the proposed corridor survey area, approximately six hectares of which has been previously disturbed or cleared for roads.

Vegetation along the corridor consists predominantly of 13 'flats' communities, located more commonly in the north of the island, with 11 valley slopes communities and 11 undulating limestone slopes and ridge communities in the southerly extent of the corridor (Figure 3-1 to 3-6). Of the 'flats' communities recorded along this corridor, one community (F4a) is dominated by *Erthyrina vespertilio*, *Triodia wiseana* and *Triodia angusta.* Approximately 0.3 ha of this community is expected to be impacted by the proposed pipeline corridor.

Six drainage communities occur intermittently along this route, of which 1.5 ha of major drainage is likely to be impacted by the proposed corridor. One coastal community was recorded at the northern end of the proposed pipeline corridor. A clay pan community (S1a) was also recorded in this corridor, 0.3 ha of which is likely to be impacted by the proposed corridor.

Proposed Feed Gas Pipeline

The proposed feed gas pipeline corridor extends from near the proposed gas processing facility footprint to Flacourt Bay, on the west coast of the island (Figure 4-1 to 4-4). The area surveyed for this pipeline was approximately 50 m wide. It includes 23 vegetation communities over an area of about 44 ha, of which approximately 22 ha is expected to be impacted by the proposed corridor. Approximately 3.5 ha of this area has been previously disturbed or cleared for roads.

For much of the corridor length, vegetation consists predominantly of seven undulating limestone slope and ridge communities and seven valley slope communities.

The proposed corridor intersects two major and two minor drainage vegetation communities and additional minor drainage lines within the limestone and valley slope communities. Approximately 0.5 ha of major drainage lines are expected to be impacted by the proposed corridor. The undulating limestone communities toward the western end of the proposed corridor drop away steeply to Flacourt Bay, which supports five coastal vegetation communities; C1d, C2e, C5b, C5c and C4e, which are restricted to the small erodible beach dunes and limestone flats (Figure 4-1 to 4-4).

Proposed North White's Beach Pipeline

The proposed North White's Beach pipeline corridor is located in the north of the island. It extends west from the proposed CO_2 reinjection pipeline to the northern end of White's Beach on the west coast of the island (Figure 5-1 to 5-2). The area surveyed for this pipeline is approximately 50 m wide and includes 20 vegetation communities over an area of about 20 ha, of which approximately 10 ha is likely to be impacted by the proposed pipeline. Of this area, less than 0.03 ha has previously been disturbed.

The proposed North White's Beach pipeline corridor contains two valley slope vegetation communities and seven undulating limestone vegetation communities, of which three are dominated by *Grevillea pyramidalis* subsp. ?*leucadendron* over *Triodia epactia* or *Triodia wiseana.* A total of about 3ha of communities containing *Grevillea pyramidalis* subsp. ?*leucadendron* is likely to be impacted by the proposed pipeline. Several of the valley slope and limestone vegetation communities contain minor drainage lines.

The vegetation opens out into two 'flats' communities near the west coast, separated in parts by a small area of limestone vegetation community (L3c) containing scattered herbs and grasses, of which approximately 0.1 ha is likely to be impacted by the proposed pipeline. A third 'flats' community is located further east on the proposed corridor.

The proposed North White's Beach pipeline corridor supports eight coastal vegetation communities, including elevated dunes, swales and flats (Figure 5-1 and 5-2).

4.2.3 Proposed Mainland Pipeline Corridors

The proposed mainland pipeline route is adjacent to an existing Apache pipeline on Mardie Station, south of Karratha. Preliminary vegetation mapping of the proposed pipeline route showed intertidal vegetation in this area, including mangroves consisting of *Avicennia marina* subsp. ?*eucalyptifolia*, *Bruguiera exaristata* and *Rhizophora stylosa*, areas of samphires consisting of a low shrubland of *Halosarcia halocnemoides* subsp. *tenuis, Halosarcia indica* and *Suaeda arbusculoides* and unvegetated tidal flats (Plate 69, Plate 70 and Plate 71).

Preliminary assessment of the inland vegetation along the proposed mainland pipeline route includes communities consisting of the following:

- A Grassland of *Triodia epactia* and ?*Cenchrus* sp. with *Eragrostis dielsii* and *Eragrostis falcata* with occasionally emergent *Acacia farnesiana*, *Acacia trachycarpa, Lawrencia viridigrisea* and *Neobassia astrocarpa* shrubs on raised red earth mounds (Plate 72).
- A Low Open Shrubland including *Acacia* sp. over grassland with *Dicanthium sericeum* subsp. *humilius*, *Eriachne flaccida*, *Aristida holathera* var *holathera* and *Eriachne benthamii* over a Very Open Herbland including *Rhynchosia minima* and *Neptunia dimorphantha* on red earth flats (Plate 73).
- An Open Shrubland to Tall Open Shrubland of *Acacia trachycarpa*, *Acacia ancistrocarpa*, *Acacia elachantha*, *Acacia victoriae* and *Acacia xiphophylla* over a Grassland of *Triodia epactia* and ?*Cenchrus* sp. over mixed herb species on red sandy flats (Plate 74). This community was recorded at the eastern end of the proposed mainland pipeline route, near the existing compressor station.

Confirmation of the identification of the ?*Cenchrus* sp. specimen and other specimens collected in the preliminary survey is likely to indicate the significant presence of introduced species *Cenchrus ciliaris* along this proposed route; Arthur Weston (pers.comm) notes that it is almost certainly this species. Detailed vegetation mapping and Declared Rare and Priority Flora searches should be undertaken prior to finalisation of the route.

4.3 Vegetation Representation on Barrow Island

4.3.1 Dendrogram Outputs

In reviewing the dendrograms the initial letter and first number code were consistent among recent and historical vegetation studies on the island, however, an additional letter was added for the vegetation communities defined for the proposed gas processing facility site as the studies were then undertaken at a more detailed sampling level. Therefore C2 and L3 (Mattiske 1993b) can be compared with C2a and L3a to L3i respectively.

The dendrogram for the sites on the proposed gas processing facility reflected some key groupings (Figure 7-1 to 7-3). For example, the coastal communities C1a, C2a and C5a were delineated in the first of the groupings.

The dendrogram for the sites on the proposed gas processing facility area and the wider island reflects the complexity of the vegetation on Barrow Island. As for the proposed gas processing facility site, some of the groupings reflect overlap with similar vegetation community types, whilst others were grouped with apparently dissimilar community types. In general, although the samples were based on different survey times, some

general trends were consistent, for example, the valley (V) and drainage (D) types overlapped in some of the groupings, and the coastal (C) and flat (F) types overlapped or merged due to the species' composition, reflecting similar underlying soil types.

The results for the D2 and V1 communities in Figure 6-1 reflect the concentrated effort of Trudgen in 1989 (sites prefixed by MET) on the vegetation in the valleys and gullies.

4.3.2 Representation of Vegetation Communities

In reviewing the representation of the vegetation communities on the island it is important to recognise the different data sets used. To address the differences between the data sets, the various mappings undertaken to date were related through the vegetation mapping codes in Attachment C. The use of related mapping codes also allowed linkage of similar vegetation descriptions from work undertaken by Astron Environmental (2002) and vegetation descriptions for the current study. Codes for similar units mapped by Astron Environmental in 2002 units were given a prefix 'A' (Attachment C).

4.3.3 Representation of Significant Vegetation Communities

The vegetation communities on the proposed development area were assessed by comparison of the 2003/2004 studies with previous findings on the vegetation of the island (Mattiske and Associates 1993b). The communities and representation are summarised in Attachment C and discussed in the following.

4.4 Significant Vegetation Types

Criterion 2 of the 'Guidelines for applying criteria to assess the level of threat to ecological communities' (Environment Australia 2004) uses a total of 1000 ha as an indicative threshold for identifying terrestrial vegetation communities with small distributions as 'very restricted'.

Based on the combined areas of the vegetation types as defined by Mattiske (1993b) only eight vegetation types defined for Barrow Island cover more than 1000 ha (D2, F1, F5, L1, L3, L7, L9 and V1), with the remaining 26 vegetation types covering less than 1000 ha (M1, T1, T2, C1, C2, C3, C4, C5, C6, C7, D1, D3, F2, F3, F4, F6, F7, L2, L4, L5, L6, L8, L10, S1, S2 and V2). All of the vegetation communities mapped recently in the proposed development area, including F8 and V3, which were not defined and mapped prior to the current survey, cover less than 1000 ha. These communities are well represented on the island and the 1000 ha guideline has not been adopted in the current assessment.

In assessing the representation of vegetation types and vegetation communities, the scale of definition is critical in applying criteria defined by others. At this point, the vegetation mapping by Mattiske and Associates (1993b) as the vegetation type scale, the regional mapping by Beard (1975) and the extensive botanical experience by various authors (Astron, Trudgen and Mattiske) provide a wider context in which to assess the significance of the vegetation on Barrow Island. Therefore, the representation and significance of the vegetation communities in the proposed development area have been assessed against the broader vegetation types that have been defined for Barrow Island.

Comparisons were also made with previous studies on the seismic lines and drainage areas (Mattiske and Associates 1993a; Mattiske Consulting 1997; Trudgen 1989). The significance of these relationships with the environment has been used in the interpretation of representation.

Previous broad-scale mapping on the island undertaken by Mattiske and Associates (1993b) used prefixes to categorise the vegetation assemblages. For example, limestone outcropping ridge and slope community descriptions are grouped as 'L', valley systems as 'V', drainage areas as 'D', coastal communities as 'C' and communities on the extensive sandy flats as 'F' . Astron Environmental (2002) further expanded this coding system to define communities within the broader units, for example C1a. This methodology has been employed for the current study to enable linkage to previous studies.

The representation of the vegetation types within those defined and mapped previously by Mattiske and Associates (1993b), and for the recently mapped proposed development, are reviewed below.

- **'Marine' community (M1 vegetation type)** occurs within localised pockets (covering approximately 24.67 ha) on the fringes of the more protected southern and eastern coastlines (Mattiske and Associates 1993b). On current knowledge of regional communities, this vegetation type is well represented on the mainland. This type was not recorded in the proposed development area.
- **'Tidal' communities (T vegetation types)** occur in very localised pockets (covering approximately 16.6 ha) on the tidal areas scattered around the island (Mattiske and Associates 1993b). These vegetation types have similarities with halophytic communities on the mainland, although further regional comparisons are required. These types were not recorded within the proposed development area.
- **'Coastal' communities (C vegetation types)** occur in very localised pockets (covering approximately 1536.8 ha) on the island. Some have similarities with mainland coastal communities, whilst others appear to differ from those on the mainland. Further regional studies and comparisons with coastal areas in the Pilbara and Cape Range areas are required. Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 0.5 per cent of the combined 'C' types on the island occur within the proposed development area.
- **'Drainage and creekline' communities (D vegetation types)** occur in linear patterns (covering approximately 1137.56 ha) along the floors of broader valley systems. These communities have been widely disturbed by historical activities on Barrow Island and this significance has been highlighted by Trudgen (1989). Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 0.6 per cent of the combined 'D' types on the island may occur within the proposed development area.
- **'Flats' communities (F vegetation types)** occur on broad sandy flats, largely located on the northern, eastern and southern fringes (covering approximately 72.1 ha) of the island. Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 1.8 per cent of the combined 'F' types on the island occur within the proposed development area.
- **'Limestone' communities (L vegetation types)** occur on the shallow limestone ridges and slopes located mainly on the central part of the island (covering

approximately 9444.1 ha). Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 0.9 per cent of the combined 'L' types on the island occur within the proposed development area.

- **'Clay Pan' communities (S1 and S2 vegetation types)** occur on the localised clay plans located on flow lines and flats on the island (covering approximately 193.2 ha). Similar clay pan communities have been recorded by Trudgen and Mattiske in the Pilbara region and are generally associated with significant shifts in the local floristic composition of the communities. Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 0.3 per cent of the combined 'S' types on the island occur within the proposed development area.
- **'Valley slopes and escarpment slopes' communities (vegetation types V1 and V2)** occur on the various slopes of the narrow and broad valley systems. Based on recent vegetation community mapping (Figure 2-1 to 5-2) and estimates of vegetation types (Mattiske and Associates 1993b), 1.2 per cent of the combined 'V' types on the island occur within the proposed development area.

Although several halophytic communities occur south of the proposed North White's Beach pipeline route and will not be impacted by the current proposal, it is important to highlight their presence in the event that a change of pipeline route is considered. Halophytic communities have been identified as one of the restricted communities on the island and should be avoided by proposed developments.

4.4.1 Significant Vegetation Communities

Communities with Restricted Distribution or Threatened or Restricted Species

Beyond the extent of representation of a vegetation community, flora and vegetation may be significant for a variety of reasons, including the presence of rare, threatened or geographically-restricted species or restricted distribution of the community. While there are recognised limitations with respect to representation of vegetation on Barrow Island, the vegetation communities located within the proposed development considered to be of particular significance (Figure 8-1 to 8-4) include the following:

- *Erythrina vespertilio* has a restricted distribution on Barrow Island, and consequently vegetation community F4a, which was recorded on the proposed CO_2 reinjection pipeline in the current survey, is considered to be locally significant. Of this community, 0.6 ha may be impacted by the proposed development. 127.6 ha within five main populations of the broader F4 unit have been mapped previously on Barrow Island (Mattiske and Associates 1993) (Plate 20).
- *Grevillea pyramidalis ?*subsp. *leucadendron* has a patchy and restricted distribution on Barrow Island, and consequently vegetation communities L6a, L6b, L6c and L6d which contain the species *Grevillea pyramidalis* subsp. ?*leucadendron* are considered to be locally significant. Two small areas of community L6a are located south of the proposed gas processing facility, in the south-east part of the wider study area (Plate 49).

  The proposed campsite, to the south of the proposed gas processing facility, was relocated during the design stage to avoid community L6a. Of communities L6b, L6c

and L6d, 1.2 ha, 1.5 ha and 0.19 ha respectively are likely to be impacted by the North White's Beach pipeline route (Figure 5-1 to 5-4).

Major Drainage Areas

The proposed feed gas pipeline and proposed CO_2 reinjection pipeline cross several areas of major drainage line which are restricted in distribution as a result of historical 'borrowing' of soil material. Approximately 0.5 ha and 1.5 ha of these communities are likely to be impacted by the proposed feed gas pipeline and proposed CO_2 reinjection lines, respectively (Figure 3-1 to 4-4). A drainage area of 0.092 ha may be affected by the proposed camp site (Plate 10 to 19).

Otherwise Significant Vegetation Communities

Previously mapped vegetation type L7 as defined by Mattiske and Associates (1993b) contains *Melaleuca cardiophylla,* which is significant for supporting the restricted and endemic White-winged fairy-wren (*Malurus leucopterus edouardi*) which is listed as Vulnerable under the Western Australian Wildlife Conservation Act and the EPBC Act. In recent mapping of the wider study area the species was recorded in vegetation communities D1a, F8a, L3h, L7a, L7b, V1d, V1k and V1m, of which five communities; D1a, F8a, V1d, V1k and V1m, totalling 93.57 ha were mapped beneath the proposed gas processing facility footprint (Figure 2-1). A total of 1583.84 ha of vegetation type L7 has been previously mapped for the island (Mattiske and Associates 1993b).

Communities Requiring Further Investigation

A range of communities within the proposed development area are either patchy or very restricted in area and require further investigation to clarify their significance. These communities include:

- A range of coastal communities defined and mapped at the western end of the proposed feed gas pipeline, including communities C1d, C2e, C5b, C5c and C4e, which are restricted to the near-coastal areas. Total areas of 0.13 ha, 0.19 ha, 0.22 ha, 0.07 ha and 0.38 ha respectively, would be affected by the proposed pipeline route. (Plate 2, Plate 7, Plate 8). Only one other small area with strong affinities with these communities has been found.
- The clay pan community S1a (Plate 55) recorded on the proposed CO_2 reinjection pipeline. Of this community, 0.3 ha may be impacted by the proposed pipeline. Community S1a relates to broader scale mapping unit S1 (Mattiske and Associates 1993b) which is represented by 192.3 ha on Barrow Island. This community is significant as it supports a combination of grasses that are restricted to the northern clay pans.
- Limestone community L3c is located on the proposed North White's Beach pipeline (Figure 5-1 and 5-2). Of this community, 0.1 ha is likely to be impacted by the proposed pipeline. This community is very restricted and requires further investigation to determine its wider distribution on the island.
- Communities which contain species that germinated after recent post-cyclonic rains and appear to be restricted. Such communities include limestone communities F5d and F5e on the proposed CO_2 reinjection pipeline. One of these communities is known and another presumed to contain *Tephrosia clementii*, which appears to be

restricted on the island. These limestone communities appear to be restricted in distribution and further work is required to determine their extent.

- Vegetation communities in the proposed CO_2 reinjection well sites areas on Barrow Island and the proposed pipeline corridor on the mainland, the significance of which is to be assessed when the locations have been confirmed.

4.5 Vegetation Condition

Most of the vegetation in the proposed development area is in excellent-to-pristine condition, with little apparent disturbance. Exceptions are along main tracks and seismic lines that run across the proposed gas processing facility site and wider study areas and, to a lesser degree, along the proposed pipeline routes.

Vegetation has regenerated to varying degrees on the seismic lines. Table 4-2 shows the areas of vegetation communities within the proposed gas processing facility and wider study area (Figure 2-1) affected by seismic line disturbance.

Table 4-2 – Areas of Vegetation Communities Affected by Seismic Lines and Roads within the Proposed Gas Processing Facility Footprint and Wider Study Area

Vegetation Community	Area of Pre 1994 Seismic lines (ha)	Area of 1994 Seismic lines (ha)	Area of roads (ha)	Total area (ha)
C1a	0.05	0.11	0.01	0.18
C2a	0.56	0.56	0.26	1.38
C2b	0.24	0.41	0.43	1.08
C2c	0.00	0.01	0.00	0.01
C5a	0.04	0.16	0.49	0.68
D1a	0.87	0.98	3.75	5.60
D1a dist	0.05	0.14	31.43	31.62
Dist	0.23	0.56	27.49	28.28
F8a	1.87	2.58	2.85	7.30
L3a	0.16	0.20	0.20	0.56
L3f	0.58	0.57	0.75	1.90
L3h	0.18	0.29	0.31	0.78
L3i	0.99	1.96	1.20	4.15
L4a	1.53	2.18	1.52	5.23
L5a	0.37	0.28	0.37	1.02
L6a	0.01	0.04	0.02	0.07
L7a	0.02	0.06	0.05	0.12
L7b	1.32	2.30	2.22	5.84
L9a	0.08	0.11	0.08	0.28
R	0.00	0.04	0.55	0.59

Vegetation Community	Area of Pre 1994 Seismic lines (ha)	Area of 1994 Seismic lines (ha)	Area of roads (ha)	Total area (ha)
V1a	0.41	0.84	0.51	1.76
V1c	0.01	0.29	0.11	0.40
V1d	0.05	0.10	0.15	0.31
V1k	0.77	1.57	1.77	4.12
V1m	1.68	2.67	2.55	6.89
V1n	0.13	0.17	0.33	0.64
V3a	0.66	0.47	0.73	1.87
V3b	0.48	1.00	0.59	2.07
Total	13.34	20.65	80.72	**114.14**

5 Discussion and Conclusions

The majority of vegetation communities mapped within the proposed development areas extend well beyond the proposed development area and the areas of the communities are larger outside the proposed corridors and gas processing facility than within these areas.

Some work has been undertaken in accurately determining the extent of significant vegetation communities in the vicinity of the proposed development areas, however the extent of these communities over the island requires further clarification. Consideration should be given to, where possible, avoiding those communities identified as being of particular significance within the proposed development areas.

The F4a *Erythyrina vespertilio* community, F5d and F5e *Scaevola cunninghamii* limestone communities, the L6b, L6c and L6d *Grevillea pyramidalis* communities, S1a Clay pan community and L3c Limestone communities mapped within the proposed development area appear to be restricted in distribution on the island. Five coastal vegetation communities recorded at the western end of the proposed feed gas pipeline at Flacourt Bay (C1d, C2e, C5b, C4e and C5c) appear to be restricted to the near coastal areas at Flacourt Bay. Community C2e occurs just outside the proposed pipeline corridor and any changes to the proposed pipeline routes should take into account these five coastal communities.

The *Grevillea pyramidalis* subsp. ?*leucadendron* communities on the proposed North White's beach pipeline corridor appear to extend well beyond the expected area of impact, however the distribution of these communities over the island appears to be limited.

Limited searching in the vicinity of community L3c on the proposed North White's Beach pipeline route were recently undertaken, however limited knowledge of the extent the community shows that it appears to be locally restricted at this stage. Limited searches have been undertaken on the west coast of the island to find other occurrences of community C5c. This community appears at this stage to be locally restricted.

The species composition of the clay pan communities in the south west of the island differed significantly from the S1a clay pan community on the proposed CO_2 reinjection

pipeline. Further investigation is required to determine whether other clay pan areas mapped previously by Mattiske and Associates (1993) differ significantly from the S1a community on the proposed pipeline route.

Impacts on major drainage lines in the vicinity of the proposed development should be minimised, given the historical disturbance of major drainage communities on the island.

Neither of the two Priority species recorded on Barrow Island (*Corchorus interstans* ms or *Helichrysum oligochaetum*) are restricted to the island. *Helichrysum oligochaetum* has not been observed or recorded in surveys of the proposed development areas. Although the proposed development on Barrow Island may impact some of the populations of *Corchorus interstans* ms, this species is widely represented outside the proposed development areas. *Corchorus interstans* ms is abundant in a wide range of environments and is not threatened by the proposed development.

A number of species, though not listed as Rare or Priority, appear to be restricted in distribution on the island and consideration should be given to avoiding these species where possible within the proposed development areas. Of the 23 species considered to be restricted in distribution or poorly known on the island prior to recent post cyclonic rain surveys, 6 species were recorded in recent surveys of the proposed development areas;

Dichanthium sericuem subsp. *humilius*, *Erythrina vespertilio*, *Grevillea pyramidalis* subsp. ?*leucadendron*, *Hakea lorea* subsp. *lorea*, *Hybanthus aurantiacus* and *Whiteochloa airoides*.

Dichanthium sericuem subsp. *humilius* was located within the proposed gas processing facility area in recent post cylonic rain surveys and knowledge of this species on the island is limited.

Grevillea pyramidalis subsp. ?*leucadendron* occurs in communities L6a, L6b, L6c and L6d, of which three communities were recorded on the proposed North White's Beach pipeline route. *Erythrina vespertilio* was recorded within community F4a on the proposed CO_2 reinjection pipeline corridor.

Hakea lorea subsp. *lorea* was recorded in a variety of vegetation communities within the proposed development areas in the current survey, and appears to be more widespread than previously considered.

Hybanthus aurantiacus was recorded within the proposed gas processing facility area and in the wider study area. Although some populations are likely to be affected by the proposed gas processing facility, most populations of this species are not likely to be affected.

Whiteochloa airoides was recorded on the proposed feed gas pipeline corridor and has been found further inland in previous surveys. Further investigation of this species is required to determine its distribution on the island.

Species recorded during recent post cyclonic surveys of the proposed development areas that require further investigation to clarify their distribution on the island include *Tephrosia clementii, Eriachne flaccida* (Southern Pilbara — Carnarvon Coastal Form), *Isolepis* sp. , *Tribulus hirsutus* and *Corchorus congener*.

Eriachne flaccida (Southern Pilbara – Carnarvon Coastal Form) may be restricted to the clay pan community on the proposed CO_2 reinjection pipeline. Further investigation of other clay pan areas on the island are required to clarify the distribution of community S1a on the island.

Due to the limited number of specimens of *Tephrosia clementii* in the Western Australian Herbarium and limited knowledge of its wider distribution, the conservation significance of this species may be revised by CALM.

Seventeen species requiring further identification are potentially restricted on Barrow Island and further studies are required to determine whether these species are restricted to Barrow Island. Of these 17 species, *Isolepis* sp. and *Acacia bivenosa* (elongate phyllode variant) were recorded within the proposed development areas. The *Isolepis* specimen does not appear to match any known *Isolepis* specimen held in the Western Australian Herbarium, apart from a specimen recently collected in Perth. Further collections of *Isolepis* sp. are necessary to enable positive identification.

Two forms of *Acacia bivenosa* occur in the proposed development areas, a 'normal' variant and an 'elongate phyllode' variant. Further studies of *Acacia bivenosa* and variants of it on the island are required to clarify the taxonomic status of this species.

The collection of a new introduced species; *Setaria verticillata* on the island, near the proposed North White's Beach pipeline corridor warrants further investigation.

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C1a	Open Grassland of *Spinifex longifolius* with low scattered *Atriplex isatidea* , *Myoporum montanum* , *Euphorbia myrtoides* and *Salsola tragus* shrubs and herbs on seaward face of white sandy fore dunes.
C1d	Low Open Shrubland of *Scaevola cunninghamii* , *Corchorus* sp. and *Heliotropium glanduliferum* over Very Open Grassland of *Spinifex longifolius* over scattered *Cynanchum floribundum* creeper on lower slopes at the base of primary sand dunes.
C1e	Grassland of *Spinifex longifolius* over Low Open Shrubland of *Threlkeldia diffusa* with scattered *Rhagodia preissii* subsp. *obovata* and *Frankenia pauciflora* var. *pauciflora* on ridges and back slopes of white sandy foredunes.
C2a	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune swales, slopes and ridges.
C2b	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Acacia bivenosa* and *Pentalepis trichodesmoides* with scattered *Acanthocarpus verticillatus* over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on red/brown sandy flats.
C2c	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune slopes and ridges.
C2d	Low Open Shrubland of *Acacia coriacea* and *Myoporum montanum* over Grassland to Hummock Grassland of *Spinifex longifolius* with patches of *Triodia epactia* in swales between dunes.
C2e	Low Open Shrubland of *Myoporum montanum* with *Corchorus* sp. over Grassland to Hummock Grassland of *Spinifex longifolius* with *Triodia angusta* over scattered *Cynanchum floribundum* creeper on crest of primary dunes.
C2f	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* and *Acacia bivenosa* with occasional *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on sandy dune ridges (over scattered *Heliotropium glanduliferum* and *Diplopeltis eriocarpa* on back of red/brown sandy flats and dunes).
C2g	Shrubland of *Acacia coriacea* over Low Shrubland to Shrubland of *Olearia dampieri* subsp. *dampieri* , *Stylobasium spathulatum* and *Acacia bivenosa* over Hummock Grassland of *Triodia epactia* over low scattered *Threlkeldia diffusa* herbs in swales between dunes.
C2h	Low Shrubland of *Acacia coriacea* with *Rhagodia preissii* subsp. *obovata* over Very Open Herbland of *Threlkeldia diffusa* over Grassland to Hummock Grassland of *Triodia epactia* and *Spinifex longifolius* on secondary dune slopes and ridges.
C3a	Open Heath of *Acacia bivenosa* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* with low scattered *Myoporum montanum* and *Enchylaena tomentosa* var. *tomentosa* shrubs over Open Hummock Grassland of *Triodia epactia* on red/brown sandy flats behind dunes.
C4e	Open Shrubland of *Trichodesma zeylanicum* over Low Open Shrubland of *Corchorus* sp., *Olearia dampieri* subsp. *dampieri* , *Scaevola cunninghamii* and *Whiteochloa airoides* over Open Hummock Grassland of *Triodia angusta* over *Cynanchum floribundum* scattered creepers on upper slope to mid slopes of sandy dunes.
C5a	Low scattered *Frankenia pauciflora* var. *pauciflora* shrubs with scattered *Oldenlandia crouchiana* herbs and *Cyperus cunninghamii* subsp. *cunninghamii* sedges on coastal limestone cliffs and in major drainage lines in coastal areas.
C5b	Low scattered *Pentalepis trichodesmoides* , *Olearia dampieri* subsp. *dampieri* , *Corchorus* sp. and *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia angusta* over scattered *Cynanchum floribundum* creepers on limestone ridges and flats (plateaus).
C5c	Very Open Hummock Grassland of *Triodia angusta* over low scattered Scaevola *cunninghamii* , *Corchorus* sp., *Frankenia pauciflora* var. *pauciflora* and *Heliotropium glanduliferum* scattered herbs and shrubs on lower slopes on limestone.
C5d	Low Open Shrubland of *Myoporum montanum* over Very Open Grassland of *Spinifex longifolius* with scattered Hummocks of *Triodia epactia* over Low Open Shrubland of *Frankenia pauciflora* var. *pauciflora* with scattered *Heliotropium glanduliferum* on flat sandy swales with occasional limestone outcropping behind primary dunes.
D1a	Scattered tall *Acacia coriacea* shrubs over Low Shrubland to Shrubland of *Stylobasium spathulatum* and *Acacia bivenosa* over Very Open Herbland of *Acanthocarpus verticillatus* over Closed Hummock Grassland of *Triodia angusta* with scattered *Triodia wiseana* on valley floors and deep gullies. This unit contains occasional *Hakea lorea* subsp. *lorea* . Unit also contains areas of scoured drainage channel in areas of heavy seasonal flow.
D1c	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* at edges in major drainage lines.
D1d	Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with patchy *Triodia angusta* and *Triodia wiseana* on lower slopes and broad drainage flats.
D1e	Open Shrubland of *Stylobasium spathulatum* , *Pentalepis trichodesmoides* with *Trichodesma zeylanicum* over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over Low Open Shrubland of *Acacia bivenosa* and *Acacia gregorii* in some locations on lower slopes, drainage flats and wide drainage lines.
D1f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in major drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea* .
D1g	Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over low scattered *Tephrosia rosea* and *Indigofera monophylla* shrubs in wide drainage lines.
D2c	Scattered tall *Trichodesma zeylanicum* shrubs over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* in disturbed drainage lines.
D2d	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* over Low Shrubland of *Acacia gregorii* in minor creek and drainage lines.
D2f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides* , *Acacia gregorii* and *Acacia bivenosa* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in minor drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea* .

FIGURE 1-1

BARROW ISLAND

VEGETATION LEGEND

Sheet 1 of 4 sheets

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F4a Low Open Woodland of *Erythrina vespertilio* over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with occasionally emergent *Ficus brachypoda* on flats with shallow red/brown sands and emergent limestone.

F5a Low Open Shrubland of *Stylobasium spathulatum* with scattered *Pentalepis trichodesmoides* and *Senna glutinosa* over Hummock Grassland of *Triodia angusta* with *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on gentle low slopes and flats.

F5b Scattered low *Ficus brachypoda* trees over scattered low *Pentalepis trichodesmoides* , *Acacia bivenosa* , *Corchorus* sp. , *Tephrosia rosea* and *Streptoglossa decurrens* shrubs over Closed Hummock Grassland of *Triodia epactia* with *Triodia angusta* on flats.

F5c Low Open Shrubland of *Pentalepis trichodesmoides* over mixed Hummock Grassland of *Triodia epactia* with occasional *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Acacia gregorii* on limestone ridges, slopes and flats.

F5d Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* over scattered low *Corchorus* sp., *Scaevola cunninghamii* and *Heliotropium glanduliferum* herbs and shrubs on upper slopes and mid slopes of small limestone rises.

F5e Scattered low *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Open Hummock Grassland of *Triodia angusta* with *Triodia epactia* over low scattered *Scaevola cunninghamii* , *Diplopeltis eriocarpa* and *Acacia bivenosa* shrubs on limestone flats and rises with shallow pale pink sands.

F6a Low Open Shrubland of *Acacia bivenosa* and *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on red/brown sandy flats.

F6b Scattered low *Ficus brachypoda* trees over Low Open Shrubland *of Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with on sandy slopes and flats with occasional limestone outcropping.

F6c Tall Open Shrubland of *Acacia coriacea* over low scattered *Stylobasium spathulatum* shrubs over Open Hummock Grassland of *Triodia epactia* on light red/brown sandy flats.

F6d Open Shrubland of *Trichodesma zeylanicum* over low scattered *Pterocaulon sphacelatum* shrubs over Hummock Grassland of *Triodia epactia* on limestone flats with shallow sands.

F7a Low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.

F7b Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on sandy flats.

F7c Open Shrubland of *Senna glutinosa* over Low Open Shrubland of *Pentalepis trichodesmoides* and *Tephrosea rosea* over Closed Hummock Grassland of *Triodia angusta* on red/brown sandy flats.

F7d Scattered *Hakea lorea* subsp. *lorea* shrubs over Low Scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* on mid slopes and flats.

F7e Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Corchorus* sp. and *Sarcostemma viminale* subsp. *australe* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats (with pockets of *Eriachne mucronata* on valley floors).

F8a Low Open Shrubland to Open Shrubland of *Acacia bivenosa* , with occasional scattered *Pentalepis trichodesmoides* , *Stylobasium spathulatum* and *Acanthocarpus verticillatus* shrubs over Hummock Grassland to Closed Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* on flats and valley floors.

F8b Scattered tall *Hakea lorea* subsp. *lorea* shrubs over Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats.

L1a Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* with occasional *Cymbopogon ambiguus* , *Tephrosia rosea* and *Triodia angusta* on limestone ridges and upper slopes.

L1b Scattered low *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes and ridges.

L1c Scattered low *Ficus brachypoda* over Low Open Shrubland of *Acacia bivenosa* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* and occasional *Triodia wiseana* on limestone slopes and ridges.

L1d Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Heliotropium glanduliferum* on limestone flats (plateau).

L1e Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees (with *Mallotus nesophilus*) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Diploteplis eriocarpa* shrubs on limestone slopes and flats.

L1f Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over Hummock Grassland of *Triodia wiseana* and patchy *Triodia angusta* on limestone slopes and ridges.

L3a Low Open Shrubland of *Stylobasium spathulatum* with *Petalostylis labicheoides* over Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* over Low Open Shrubland of *Acacia gregorii* on limestone slopes and ridges.

L3b Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* with *Triodia epactia* over low scattered *Acacia gregorii* and *Diplopeltis eriocarpa* shrubs on limestone slopes and ridges.

L3c Low scattered *Diplopeltis eriocarpa* shrubs with scattered *Triodia epactia, Cymbopogon ambiguus* and *Cyperus cunninghamii* subsp. *cunninghamii* herbs and grasses on small exposed limestone flats.

L3d Low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Low Open Shrubland of *Diplopeltis eriocarpa* , *Acacia gregorii* and *Hannafordia quadrivalvis* subsp. *recurva* over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* on limestone ridges.

FIGURE 1-2

BARROW ISLAND

VEGETATION LEGEND

Sheet 2 of 4 sheets

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	L3e	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over mixed Hummock Grassland of *Triodia wiseana* , *Triodia angusta* and *Triodia epactia* over low scattered *Diplopeltis eriocarpa* shrubs on slopes and ridges.
	L3f	Low scattered *Petalostylis labicheoides* and *Indigofera monophylla* shrubs over Hummock Grassland of *Triodia wiseana* on limestone ridges and upper slopes.
	L3g	Low Open Shrubland of *Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* and *Cymbopogon ambiguus* over Low Open Shrubland of *Diplopeltis eriocarpa* on limestone hillslopes.
	L3h	Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* over low scattered *Diplopeltis eriocarpa* shrubs on limestone ridges and flats.
	L3i	Low Open Shrubland to Low Shrubland of *Acacia bivenosa* with occasional low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock grassland of *Triodia angusta* with occasional *Triodia wiseana* on limestone slopes, small rises and flats.
	L4a	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Acacia bivenosa* with scattered *Petalostylis labicheoides* and *Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* on limestone ridges and midslopes with patches of *Triodia angusta* . This unit contains occasional *Hakea lorea* subsp. *lorea* .
	L5a	Scattered tall *Hakea lorea* subsp. *lorea* shrubs over low scattered *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over low scattered *Acacia gregorii* and *Corchorus interstans* shrubs on limestone ridges.
	L5b	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy midslopes.
	L6a	Low Open Shrubland of *Grevillea pyramidalis* subsp. *?leucadendron* and *Acacia bivenosa* over Hummock Grassland of *Triodia angusta* low scattered *Acacia gregorii* , *Scaevola cunninghamii* and *Heliotropium glanduliferum* shrubs and herbs on limestone midslopes.
	L6b	Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Grevillea pyramidalis* ?subsp. *leucadendron* with occasional *Pentalepis trichodesmoides* , *Trichodesma zeylanicum* with scattered *Acacia gregorii* over Closed Hummock Grassland of *Triodia epactia* , *Triodia wiseana* and *Eriachne* sp. over Low Open Shrubland of *Acacia gregorii* on upper slopes and midslopes of small rises.
	L6c	Low Open Shrubland of *Pentalepis trichodesmoides* with *Grevillea pyramidalis* ?subsp. *leucadendron* (Grevillea only in eastern section of community) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on mid to upper slopes with red/brown sands and occasional limestone outcropping on rocky rises and slopes.
	L6d	Low Open Shrubland of *Pentalepis trichodesmoides* with *Indigofera monophylla* and scattered *Grevillea pyramidalis* ?subsp. *leucadendron* over Hummock Grassland of *Triodia epactia* in minor drainage lines.
	L7a	Low Shrubland of *Melaleuca cardiophylla* , *Stylobasium spathulatum* , *Pentalepis trichodesmoides* , *Trichodesma zeylanicum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* , *Acacia bivenosa* shrubs on rocky limestone ridges, slopes and minor gullies, with occasional pockets of *Gossypium robinsonii* .
	L7b	Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over low scattered shrubs to Low Open Shrubland of *Acacia gregorii* on limestone upper slopes and ridges.
	L9a	Low Open Woodland of *Ficus brachypoda* over low scattered *Pentalepis trichodesmoides* and *Sarcostemma viminale* subsp. *australe* shrubs over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on coastal limestone flats.
	S1a	Grassland of *?Eriachne flaccida* over scattered low *Pluchea dunlopii* and *Streptoglossa decurrens* herbs and shrubs on clay pans. (Community contains scattered emergent *Acacia bivenosa* and *Stylobasium spathulatum* shrubs and *Triodia angusta* at edges).
	V1a	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* shrubs on limestone midslopes and occasional small rises. This unit contains some areas of disturbance by fauna.
	V1b	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* and some *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* on red/brown sandy flats.
	V1c	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over scattered low *Petalostylis labicheoides* , *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* , *Triodia epactia* and *Cymbopogon ambiguus* on limestone slopes and ridges, with *Stylobasium spathulatum* at edges on red/brown sandy drainage flats.
	V1d	Low Open Shrubland of *Acacia bivenosa* with low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on limestone slopes and low ridges with occasional *Melaleuca cardiophylla* .
	V1f	Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* on red/brown sandy flats.
	V1g	Scattered tall *Acacia pyrifolia* shrubs over low scattered *Petalostylis labicheoides* , *Acacia bivenosa* and *Acacia gregorii* shrubs over Hummock Grassland of *Triodia wiseana* with some *Triodia angusta* and *Cymbopogon ambiguus* on red/brown sandy midslopes and in minor drainage lines with occasional outcropping.
	V1h	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* , *Petalostylis labicheoides* and *Acacia bivenosa* over Closed Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* on limestone slopes. This unit contains occasional *Hakea lorea* subsp. *lorea* .
	V1i	Hummock Grassland of *Triodia epactia* with occasional *Triodia wiseana* over Low Open Shrubland *Acacia gregorii* with *Diplopeltis eriocarpa* on gentle slopes and flats.
	V1j	Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.

FIGURE 1-3

BARROW ISLAND

VEGETATION LEGEND

Sheet 3 of 4 sheets

	V1k	Scattered *Hakea lorea* subsp. *lorea* shrubs over Low Open Shrubland to Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Acacia gregorii* shrubs on limestone hillslopes and minor drainage lines.
	V1m	Low Open Heath of *Melaleuca cardiophylla* with *Acacia bivenosa*, *Sarcostemma viminale* subsp. *australe* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* on limestone ridges and slopes.
	V1n	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered shrubs to Low Open Shrubland of *Melaleuca cardiophylla* with *Acacia bivenosa*, *Stylobasium spathulatum* and *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia angusta* on flats and edge of drainage lines.
	V3a	Scattered low *Ficus brachypoda* trees over scattered *Acacia pyrifolia* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes. This community contains minor drainage lines.
	V3b	Scattered *Acacia pyrifolia* shrubs with occasional *Hakea lorea* subsp. *lorea* over low scattered shrubs to Low Open Shrubland of *Petalostylis labicheoides* and *Stylobasium spathulatum*, occasional *Acacia bivenosa* and *Acacia gregorii* over Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on limestone slopes.
	R	Rocks
	Dist	Disturbed, cleared, roads.
	D1a Dist	Disturbed Community D1a drainage areas.
	Restricted Area	

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FIGURE 1-4

BARROW ISLAND

VEGETATION LEGEND

Sheet 4 of 4 sheets

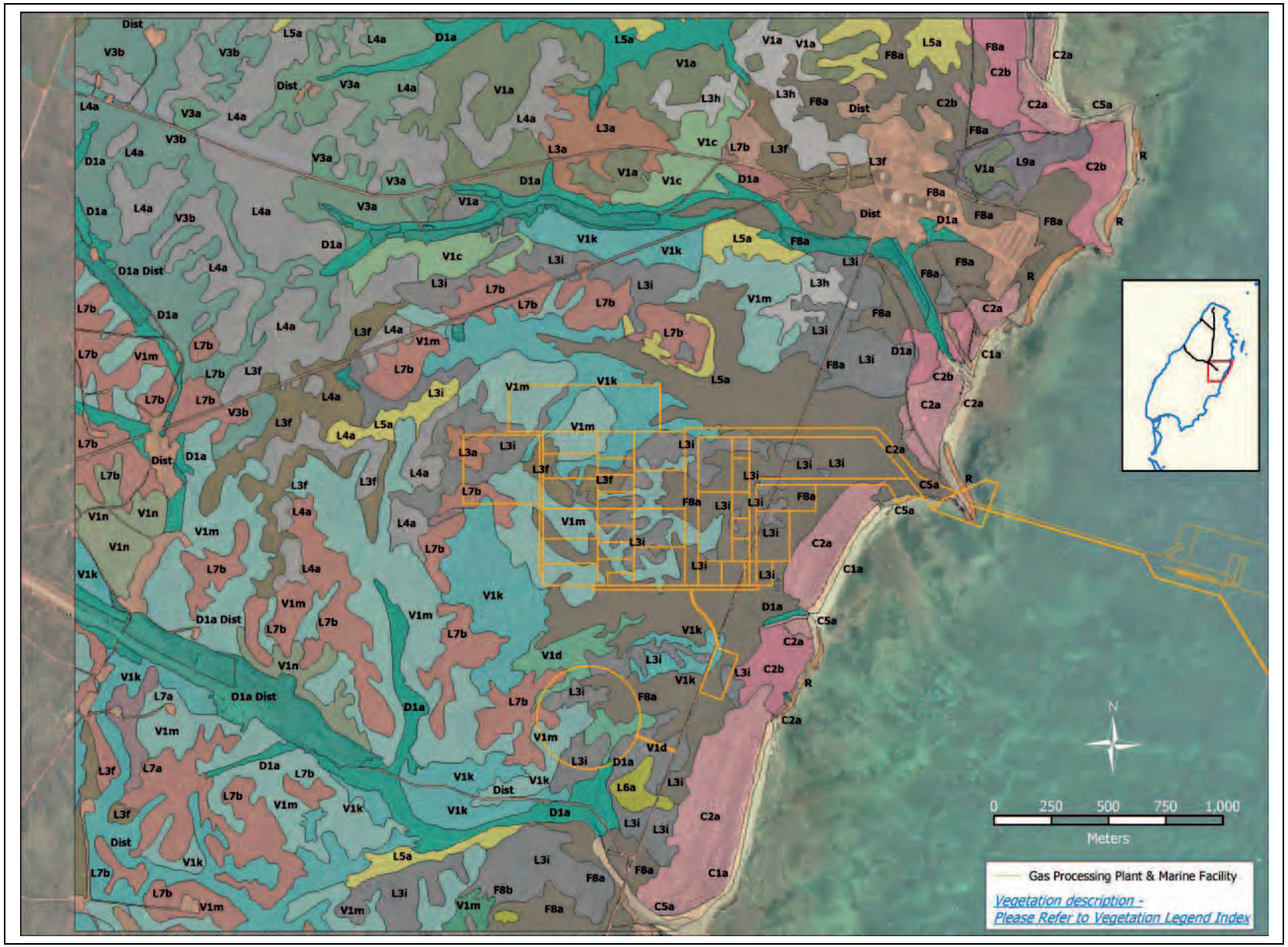
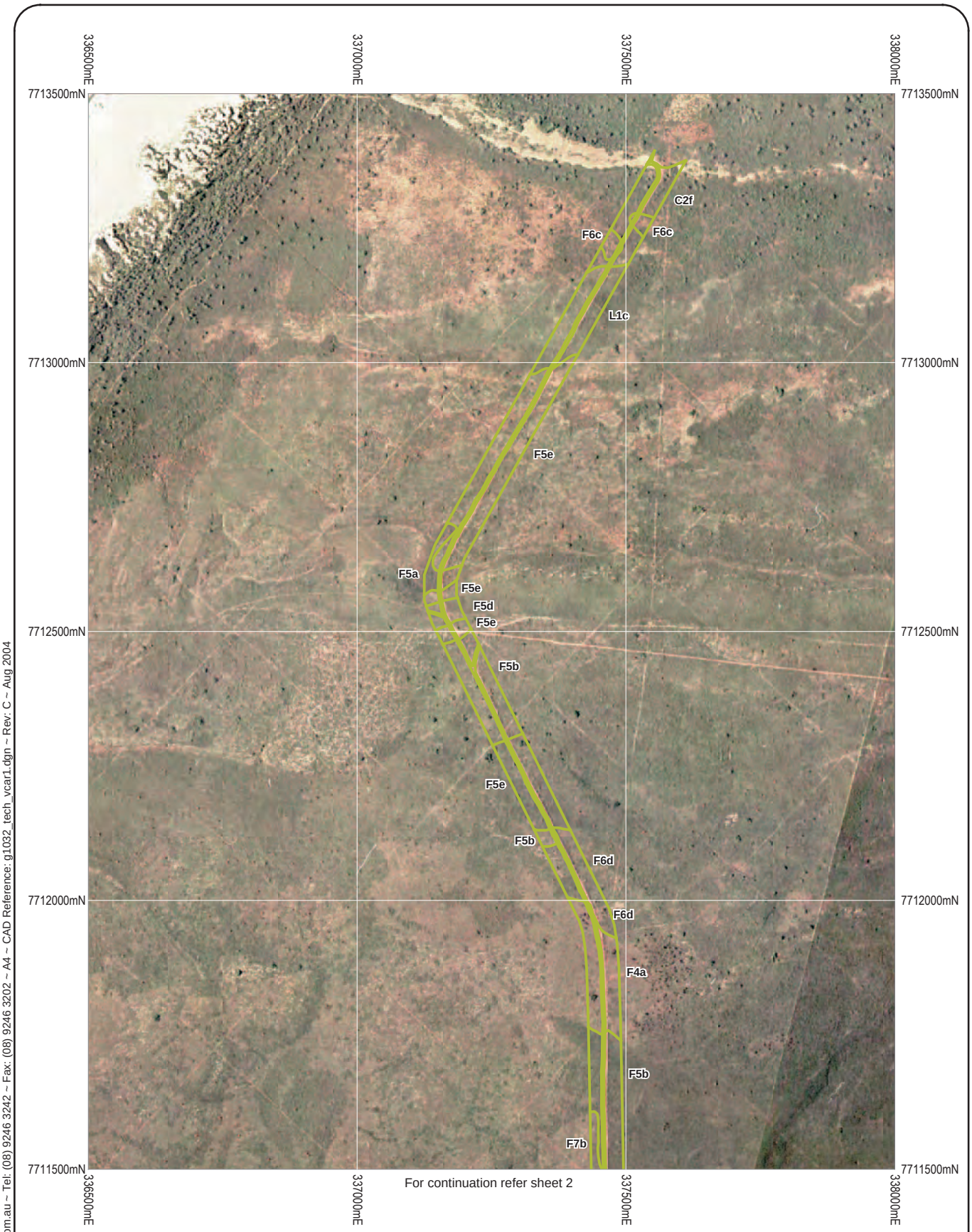


Figure 2-1 – Wider Study Area for Proposed Gas Processing Facility – Vegetation



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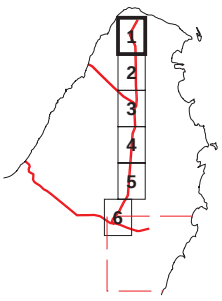


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

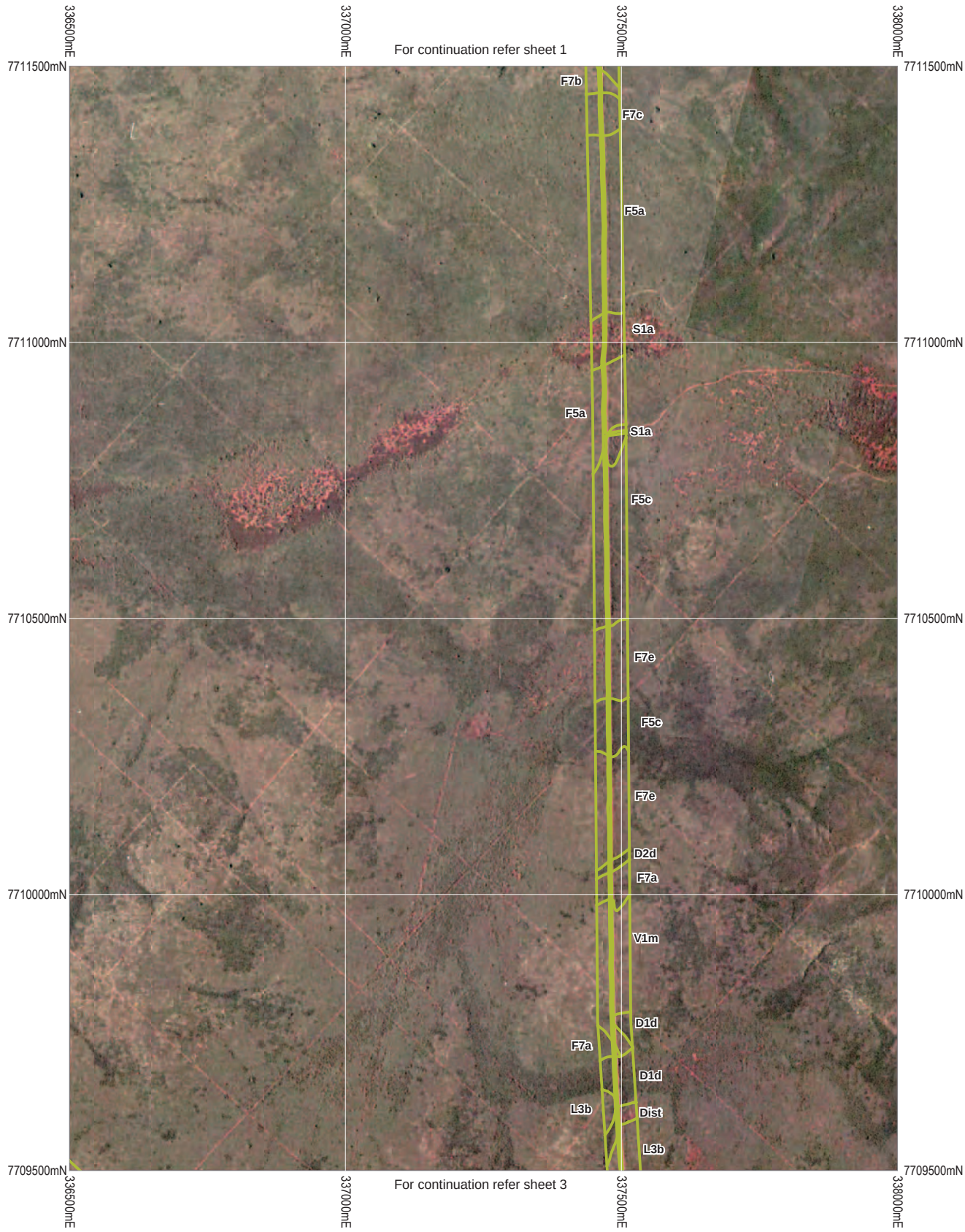
FIGURE 3-1

BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 1 of 6 sheets



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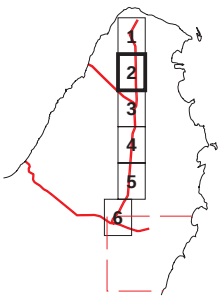


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

FIGURE 3-2

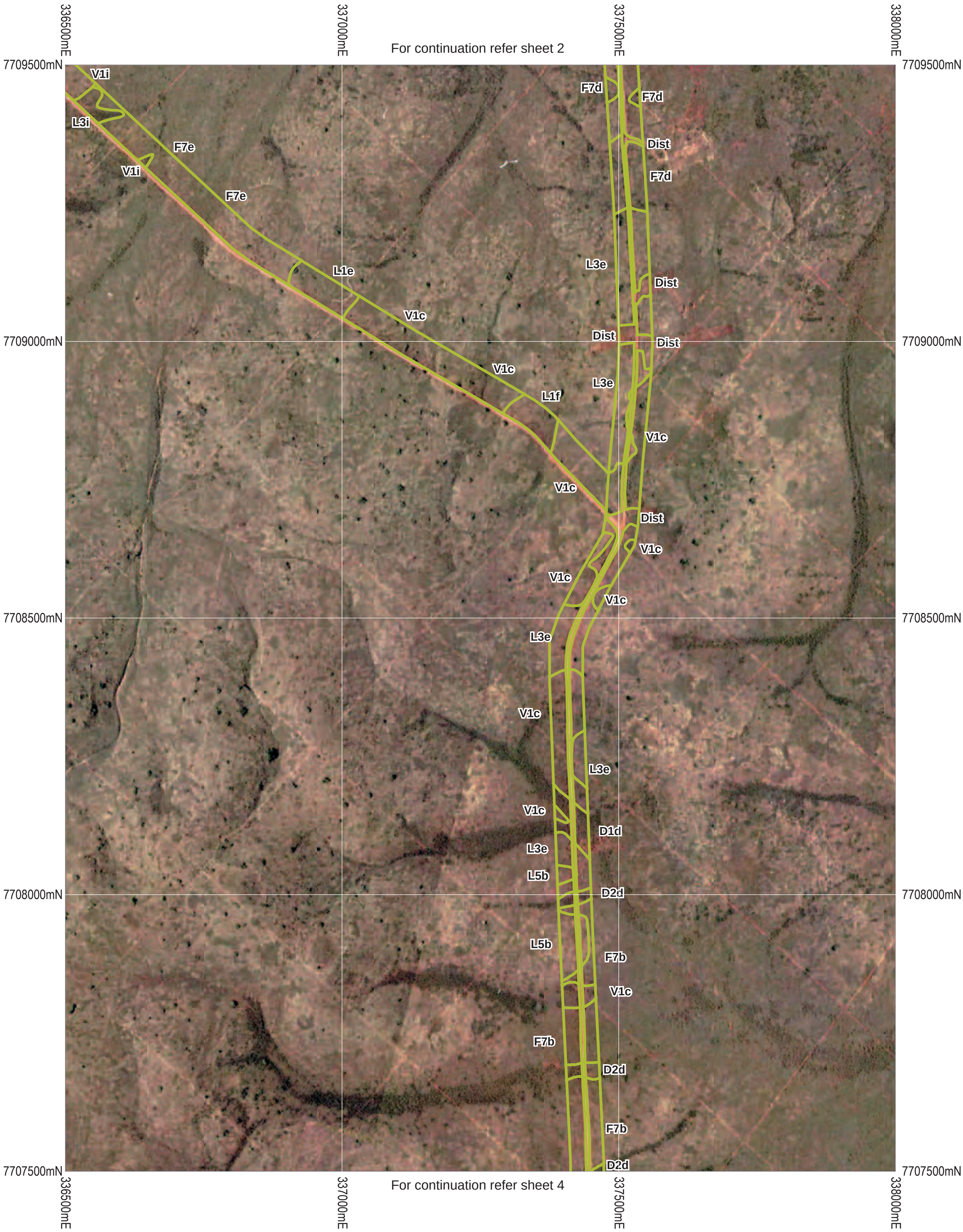
BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 2 of 6 sheets

For continuation refer sheet 2



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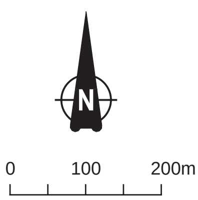

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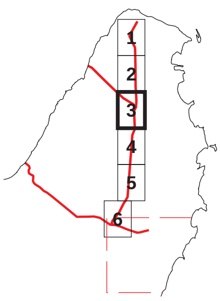

Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

FIGURE 3-3

BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 3 of 6 sheets

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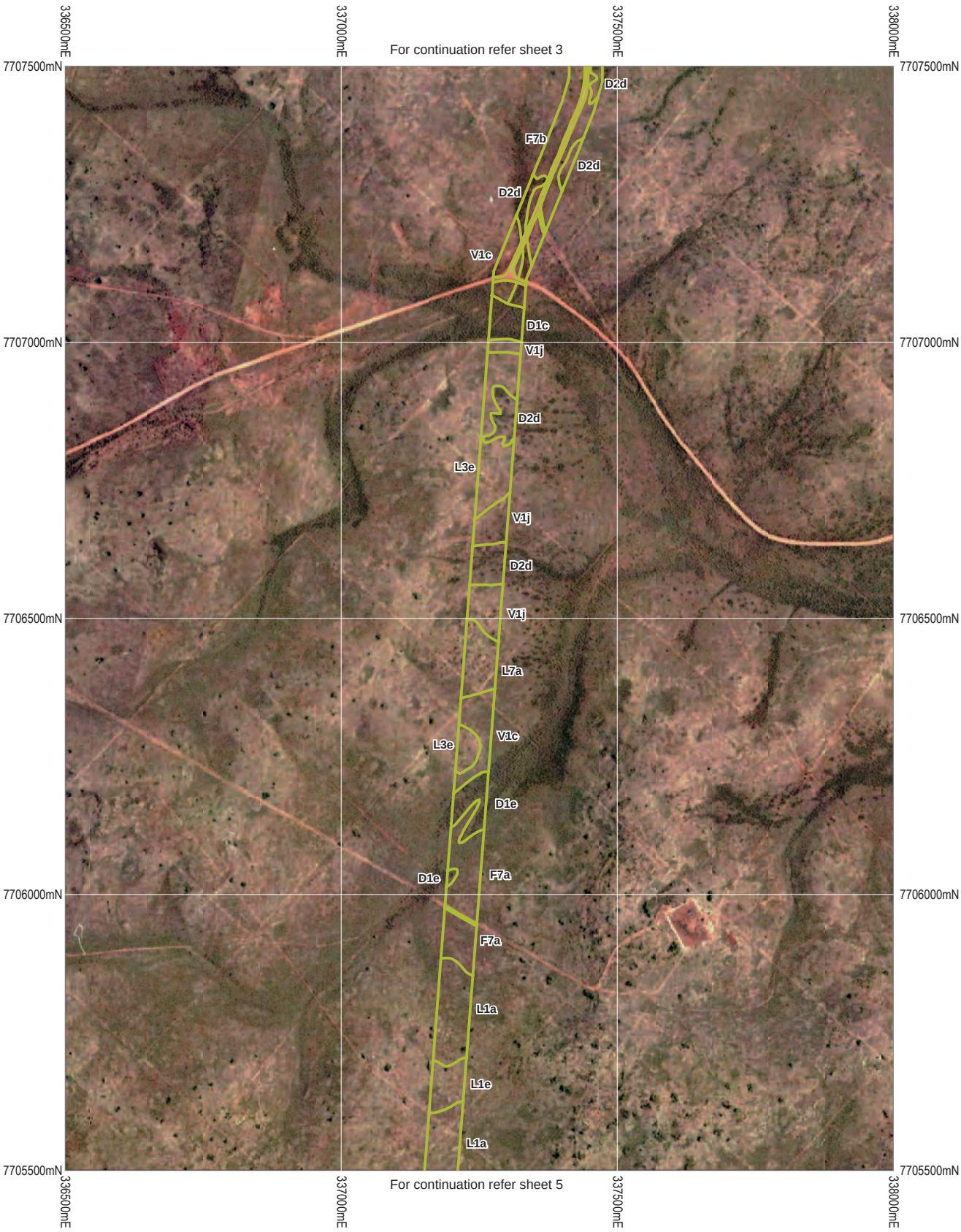

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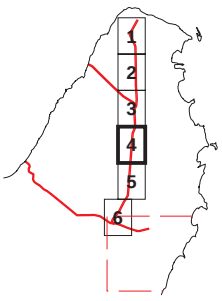

Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

FIGURE 3-4

BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 4 of 6 sheets

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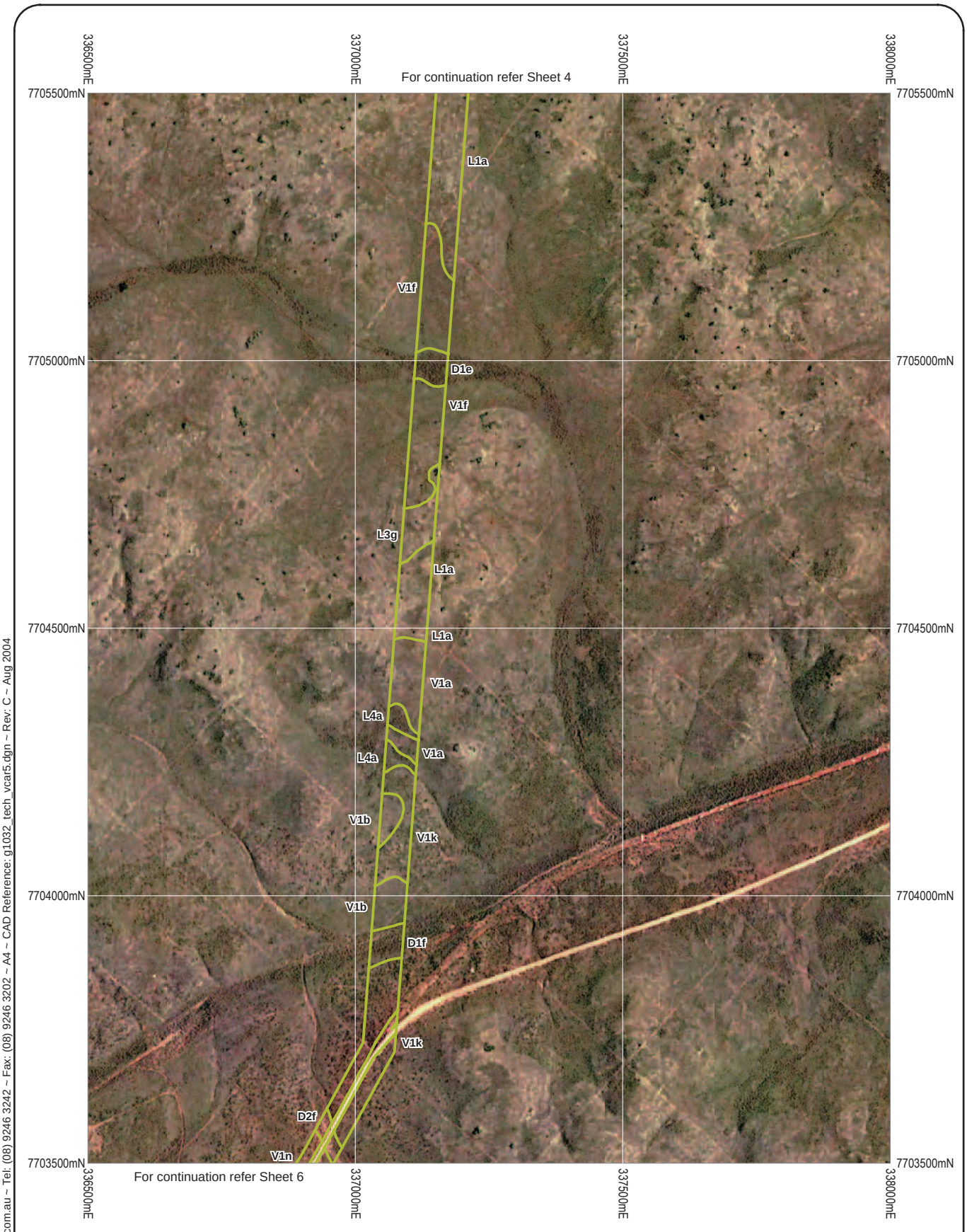

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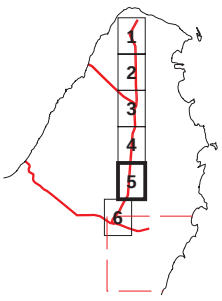


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

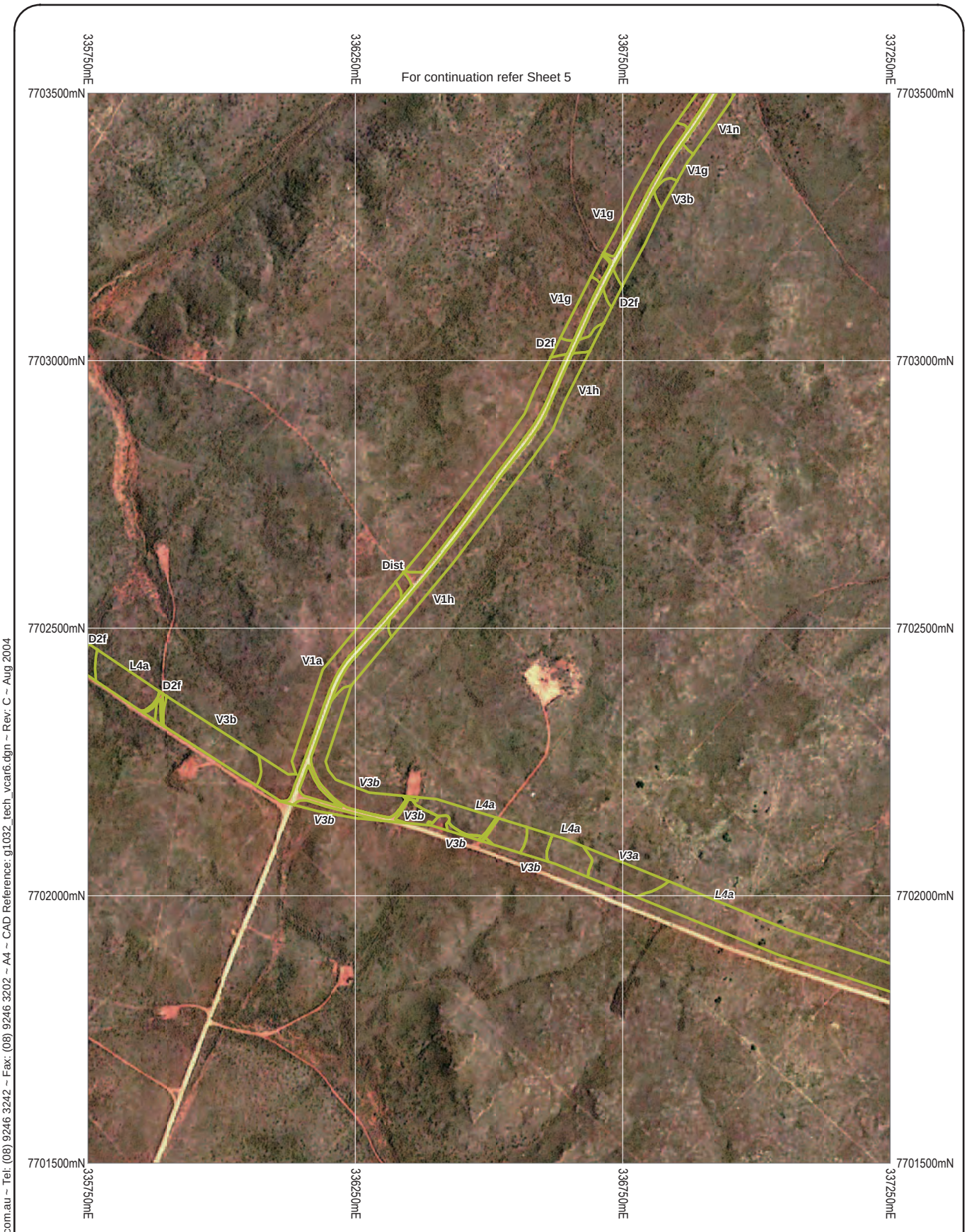
FIGURE 3-5

BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 5 of 6 sheets



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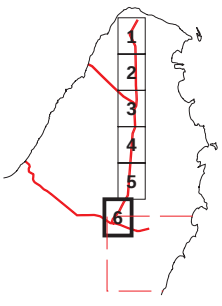

Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

FIGURE 3-6

BARROW ISLAND

PROPOSED CO_2 REINJECTION PIPELINE

VEGETATION BOUNDARIES

Sheet 6 of 6 sheets

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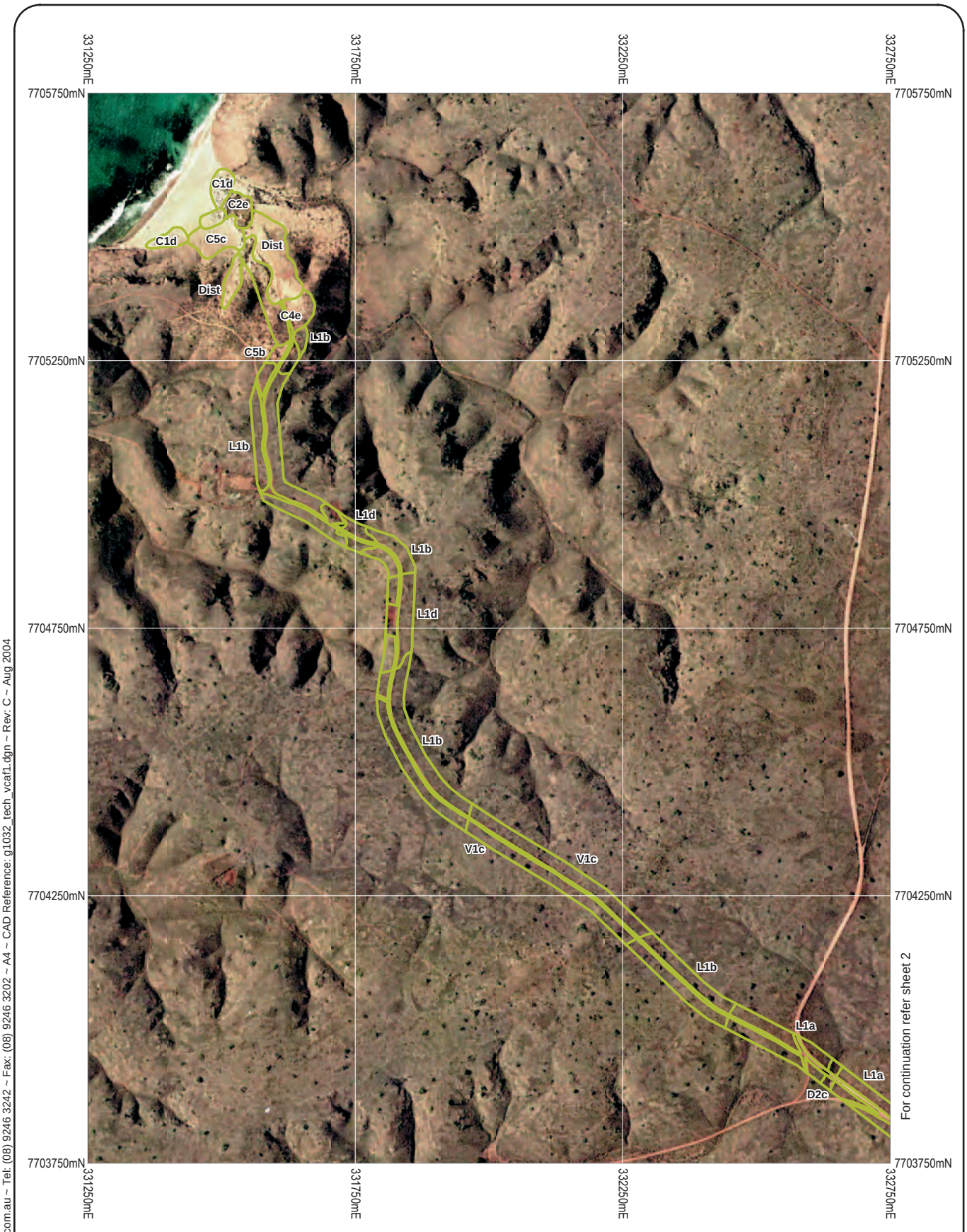

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Scale
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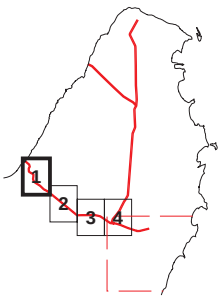


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

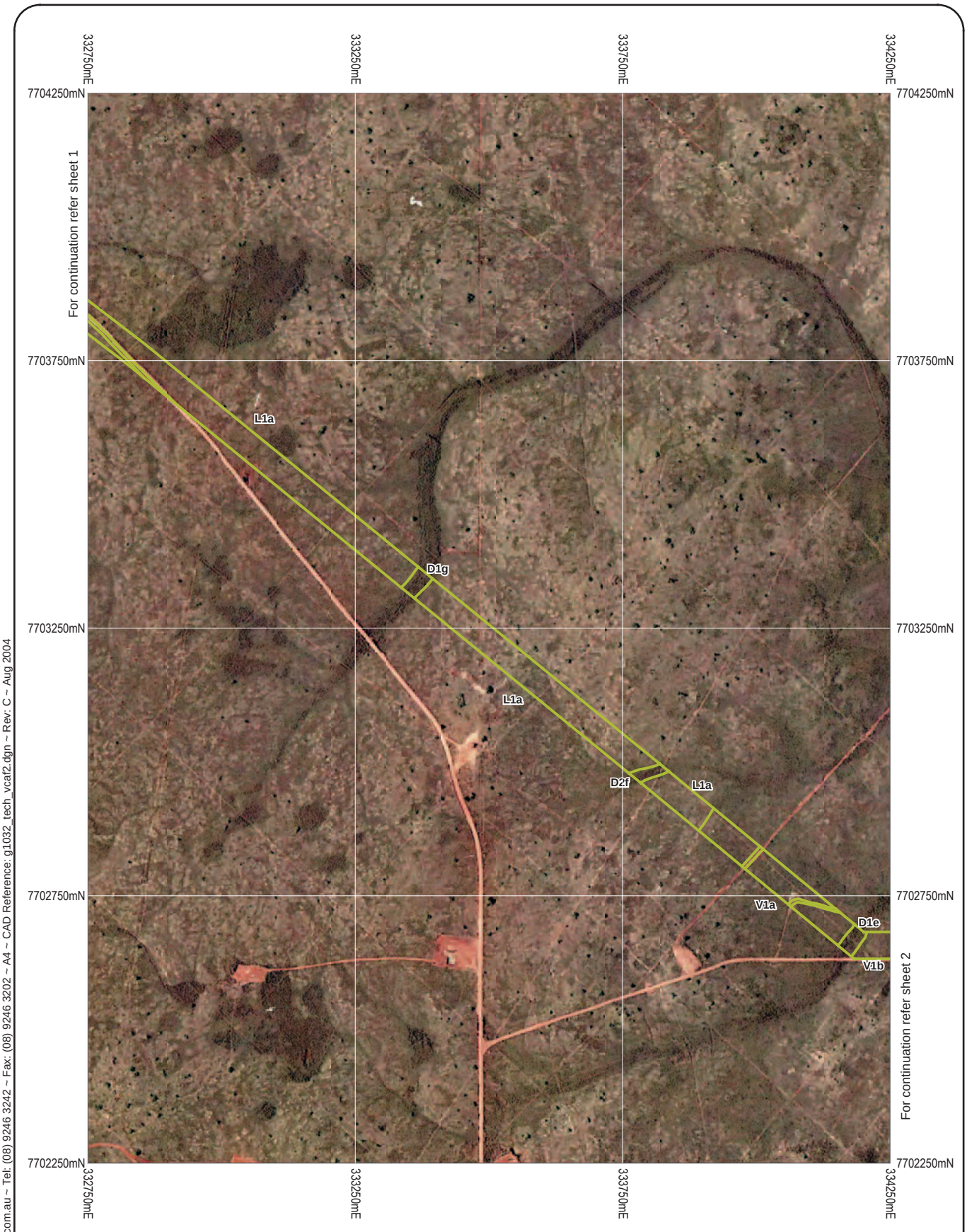
FIGURE 4-1

BARROW ISLAND

PROPOSED FEED GAS PIPELINE

VEGETATION BOUNDARIES

Sheet 1 of 4 sheets



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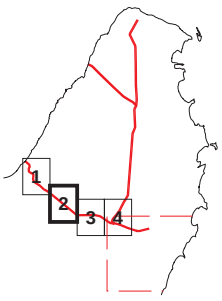


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

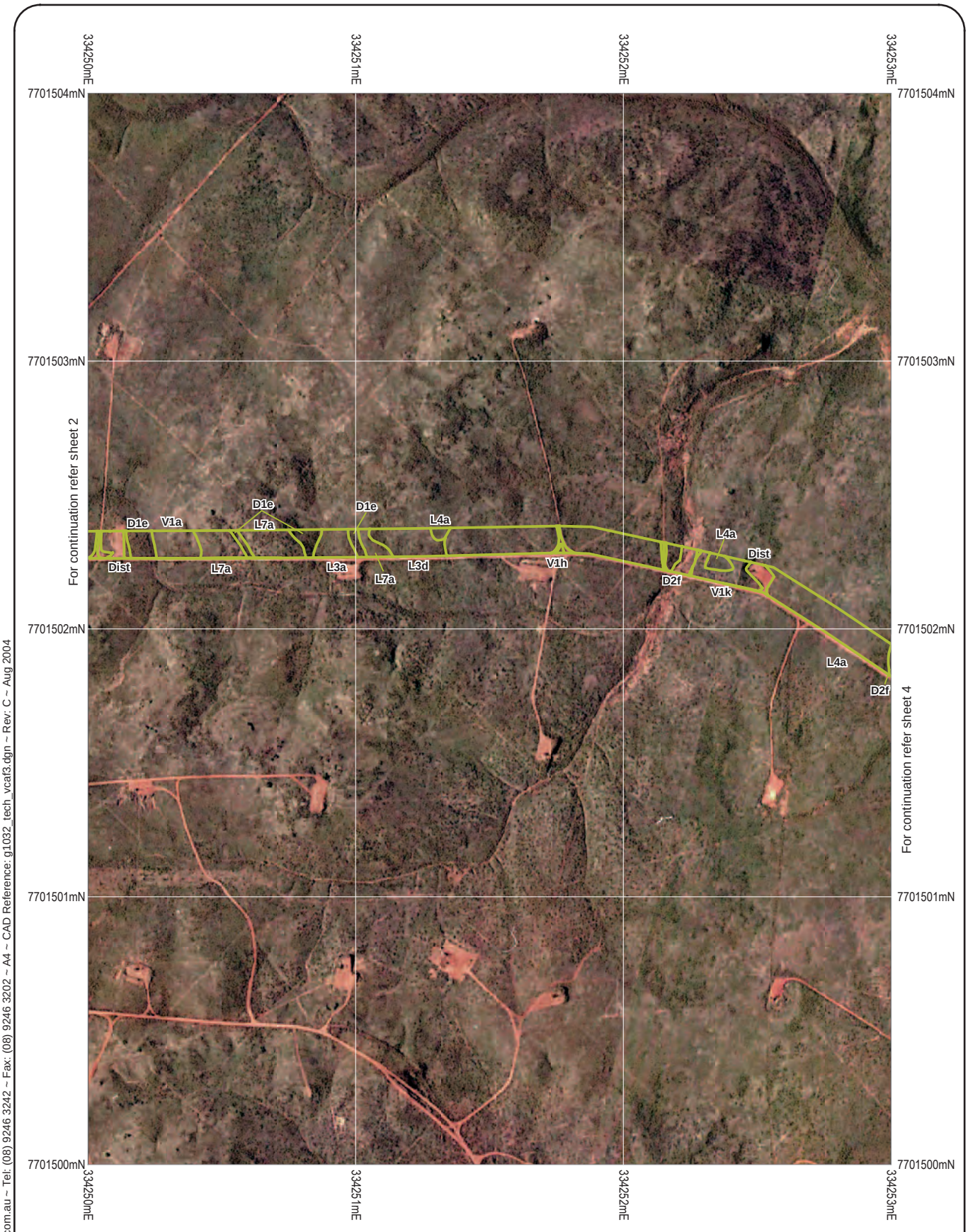
FIGURE 4-2

BARROW ISLAND

PROPOSED FEED GAS PIPELINE

VEGETATION BOUNDARIES

Sheet 2 of 4 sheets



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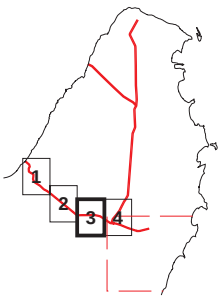


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

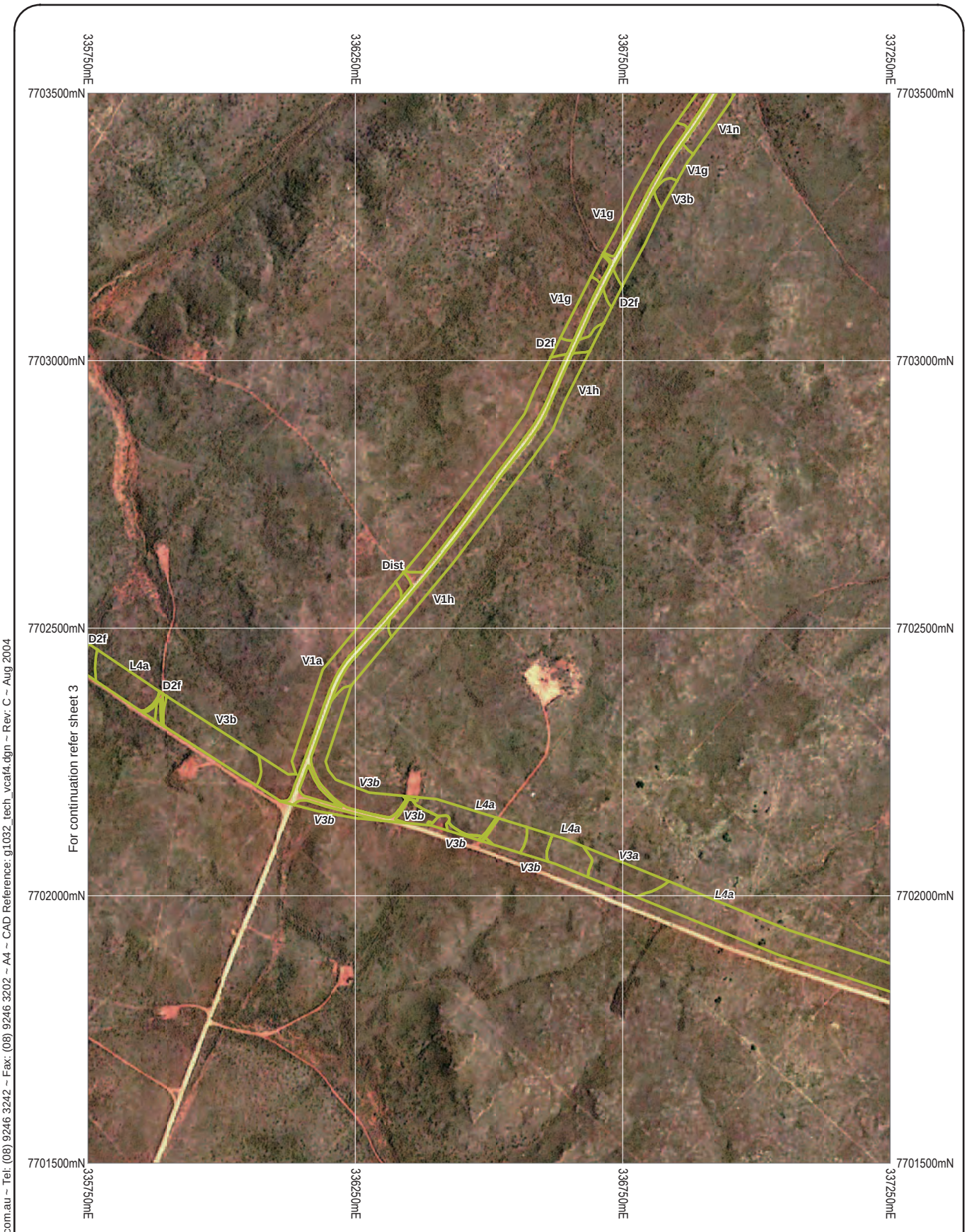
FIGURE 4-3

BARROW ISLAND

PROPOSED FEED GAS PIPELINE

VEGETATION BOUNDARIES

Sheet 3 of 4 sheets



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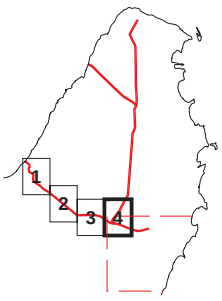


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

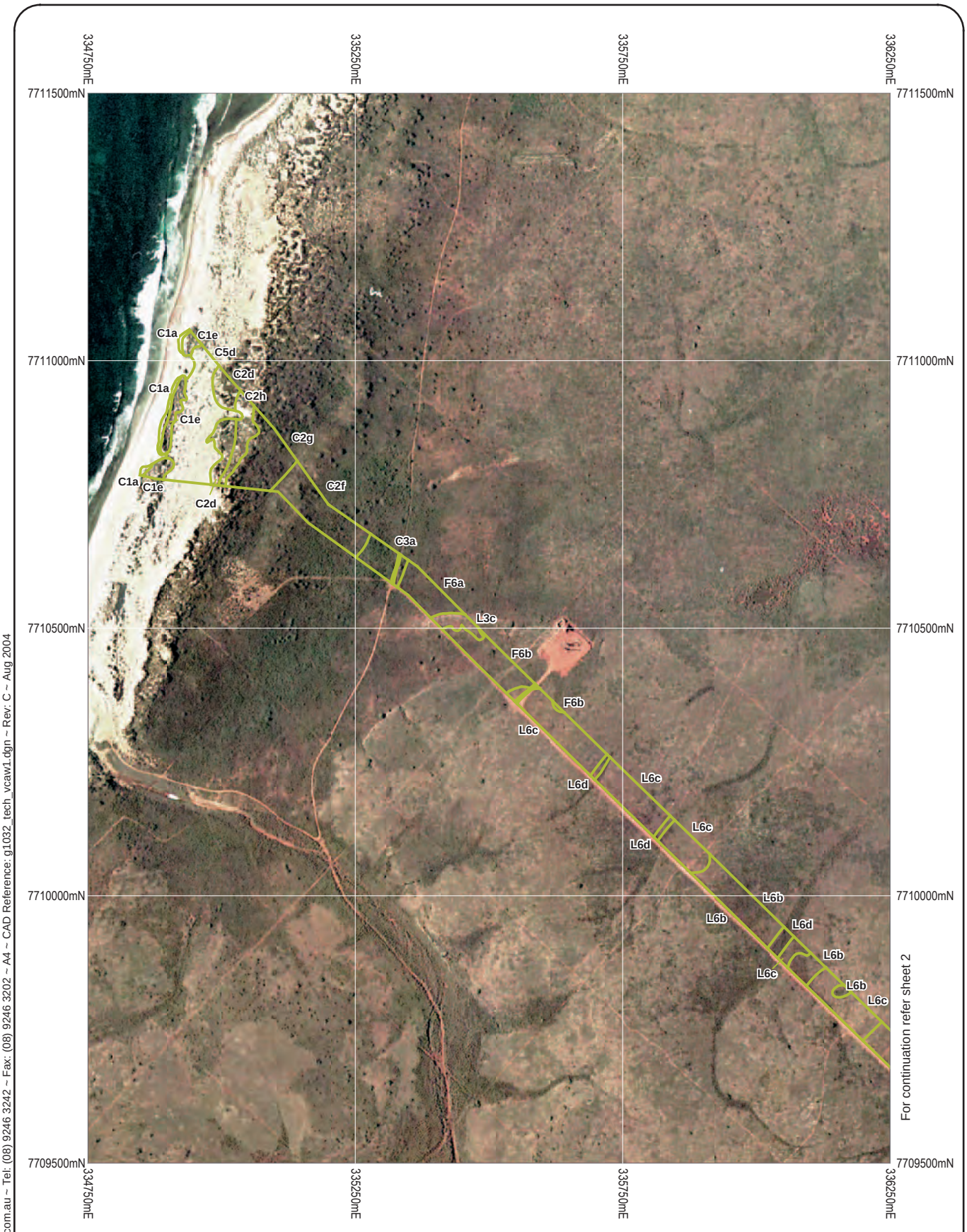
FIGURE 4-4

BARROW ISLAND

PROPOSED FEED GAS PIPELINE

VEGETATION

Sheet 4 of 4 sheets



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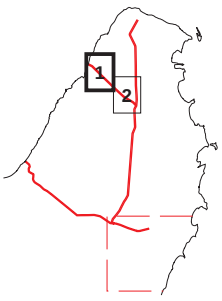


Sheet Layout

For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

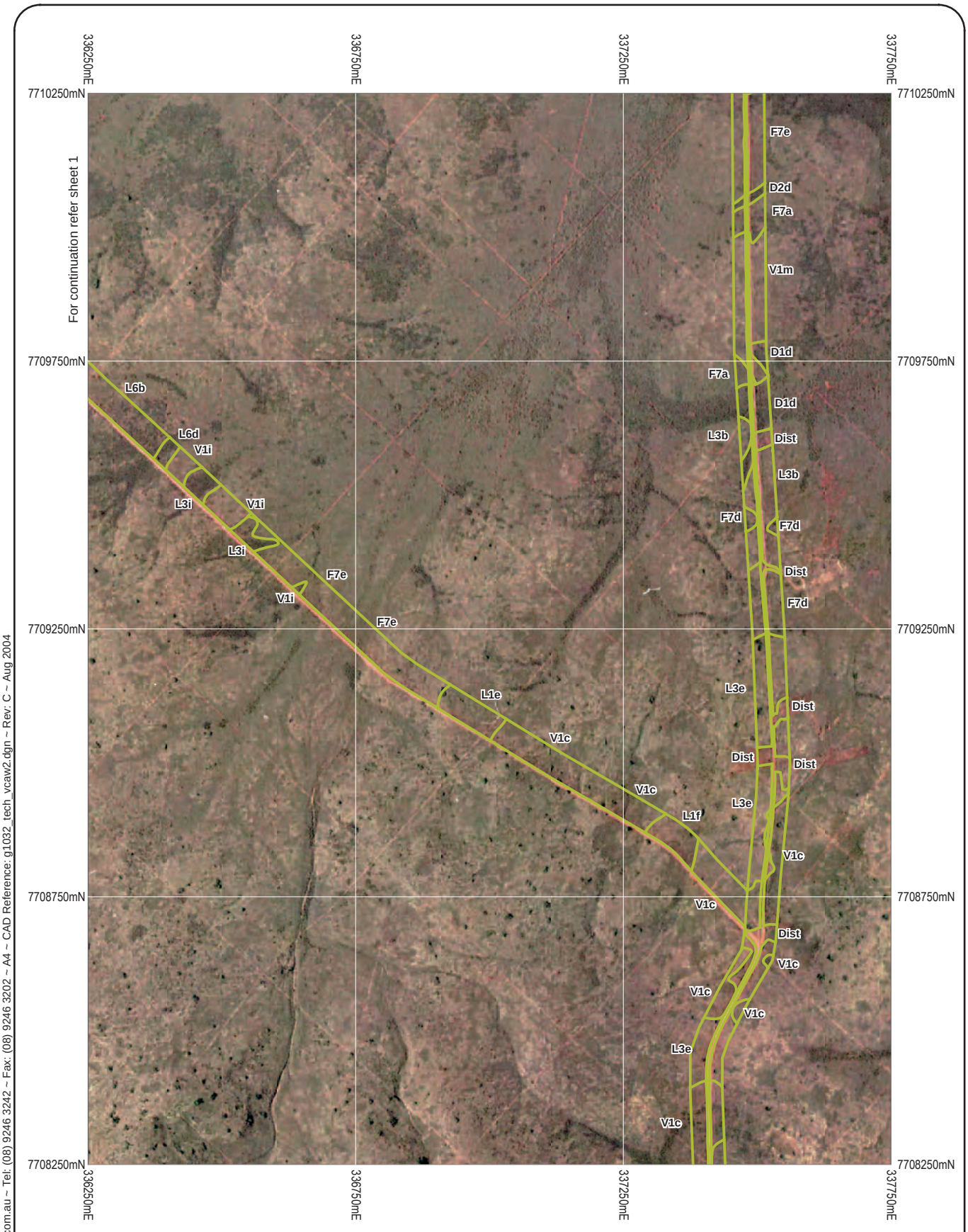
FIGURE 5-1

BARROW ISLAND

PROPOSED NORTH WHITES BEACH PIPELINE

VEGETATION BOUNDARIES

Sheet 1 of 2 sheets



For detailed vegetation legend refer to Vegetation Legend Sheets 1 to 4

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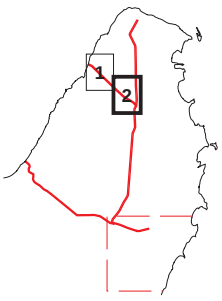

Sheet Layout

FIGURE 5-2

BARROW ISLAND

PROPOSED NORTH WHITES BEACH PIPELINE

VEGETATION BOUNDARIES

Sheet 2 of 2 sheets

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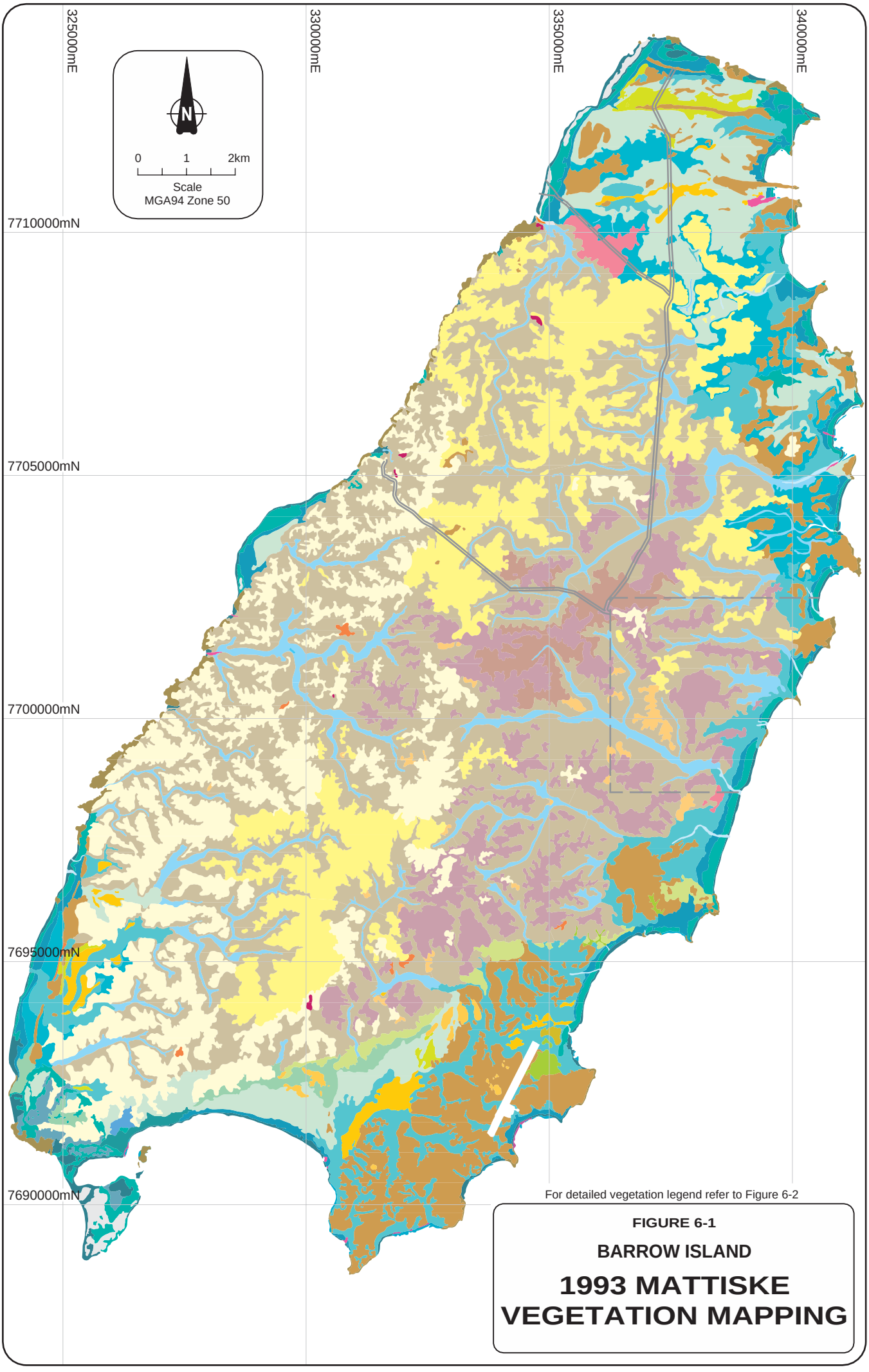

For detailed vegetation legend refer to Figure 6-2

FIGURE 6-1

BARROW ISLAND

1993 MATTISKE VEGETATION MAPPING

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Marine

M1 Aquatic Complex supporting stands of *Avicennia marina* and *Ruppia maritima* on the fringes of the Island.

Tidal

T1 Halophytic Complex dominated by *Halosarcia halocnemoides* and *Halosarcia indica* on tidal flats.

T2 Mixed Chenopod and Halophytic Complex with low *Frankenia pauciflora* shrubs on high tide areas usually associated with stands of *Avicennia marina.*

Creek or Seasonal Drainage Lines

D1 Mixed Hummock Grassland of *Triodia angusta* with pockets of dense shrubs along major creek-lines.

D2 Hummock Grassland of *Triodia angusta* along minor creek-lines and drainage lines.

D3 Hummock Grassland of *Triodia angusta* along minor creek-line with emrgent *Santalum murrayanum.*

Coastal Complex and Dune System

C1 Coastal Complex dominated by *Spinifex longifolius* on white fore-dunes; including Coastal Complex of *Ipomoea pes-caprae* ssp. *brasiliensis* and *Spinifex longifolius* on strand line foredunes.

C2 Open Scrub of *Acacia coriacea - Rhagodia preissii* ssp. *obovata - Olearia dampieri* ssp. *dampieri* on elevated dunes on fringes of Island.

C3 Hummock Grassland of *Triodia pungens* with dense shrubs including *Acacia bivenosa* on back-slopes of foredunes.

C4 Mixed Hummock Grassland of *Triodia angusta - Triodia pungens* with dense shrubs including *Acacia bivenosa* on back-slopes of foredunes.

C5 Low Mixed Shrubland of *Frankenia pauciflora* and *Hedyotis crouchiana* on exposed cliff faces around edge of Island.

C6 Hummock Grassland of *Triodia pungens* with dense pockets of *Melaleuca cardiophylla* on sandy valley systems in south-western corner of Island.

C7 Hummock Grassland of *Triodia pungens* with dense pockets of *Olearia dampieri* spp. *dampieri* on sandy soils behind fore-dune in south-western corner of Island.

Clay Pans

S1 Mixed Herbfield and Grassland of *Eragrostis xerophila, Eriachne flaccida* and *Sporobolus virginicus* on clay pans.

S2 Mixed Herbfields with *Streptoglossa bubakii* and *Pterocaulon sphacelatum* on fringes of tidal Halophytic areas and flood channels on clay soils near coast.

Miscellaneous

BS Bare sand

Flats

F1 Hummock Grassland of *Triodia angusta* on red earth flats and drainage lines.

F2 Hummock Grassland of *Triodia angusta* with emergent *Acacia synchronicia* on red earth flat.

F3 Hummock Grassland of *Triodia angusta* with emergent shrubs of *Gossypium robinsonii* on red earth flats.

F4 Hummock Grassland of *Triodia angusta - Triodia* spp. with emergent pockets of *Erythrina verspertilio* on flats.

F5 Mixed Hummock Grassland of *Triodia pungens - Triodia angusta* on fringes of main red earth flats and drainage lines.

F6 Hummock Grassland of *Triodia pungens* on slopes of escarpments on fringes of red earth flats.

F7 Hummock Grassland of *Triodia pungens - Triodia angusta - Triodia wiseana* on slopes of escarpments on fringes of red earth flats.

Limestone Ridges

L1 Hummock Grassland of *Triodia wiseana* with *Ficus platypoda* var. *platypoda* on central limestone ridges.

L2 Hummock Grassland of *Triodia wiseana* with *Ficus virens* var. *virens* on escarpments on west coast and southern edge of limestone ridges.

L3 Hummock Grassland of *Triodia wiseana* with low mixed shrubs, including *Acacia gregorii* on limestone ridges.

L4 Hummock Grassland of *Triodia wiseana* with dense emergent shrubs of *Acacia pyrifolia, Acacia gregorii* and *Petalostylis labicheoides* on limestone ridges.

L5 Hummock Grassland of *Triodia wiseana* with emergent *Hakea suberea* on limestone ridges.

L6 Hummock Grassland of *Triodia wiseana* with emergent *Grevillea pyramidalis* on limestone ridges.

L7 Hummock Grassland of *Triodia wiseana* with dense pockets of *Melaleuca cardiophylla* on limestone ridges.

L8 Hummock Grassland of *Triodia wiseana* with pockets of *Eucalyptus patellaris* on limestone ridges.

L9 Hummock Grassland of *Triodia wiseana - Triodia angusta* with emergent *Sarcostemma viminali* spp. *australe* and *Ficus platypoda* var. *platypoda* on coastal limestone flats and low ridges with localised pockets of *Frankenia pauciflora.*

L10 Hummock Grassland of *Triodia pungens - Triodia augusta* with emergent *Hakea suberea* on exposed small limestone hills on southern coastal area.

Valley Slopes and Escarpment Slopes

V1 Hummock Grassland of *Triodia wiseana* with mixed emergent shrub species on valley slopes.

V2 Hummock Grassland of *Triodia wiseana* with *Pentalepis trichodesmoides* on southern escarpment.

Merchant Site

Mattiske Seismic Site 1993A

Mattiske Vegetation Site 1993B

Trudgen Site

Astron Site

FIGURE 6-2

BARROW ISLAND

1993 MATTISKE VEGETATION LEGEND

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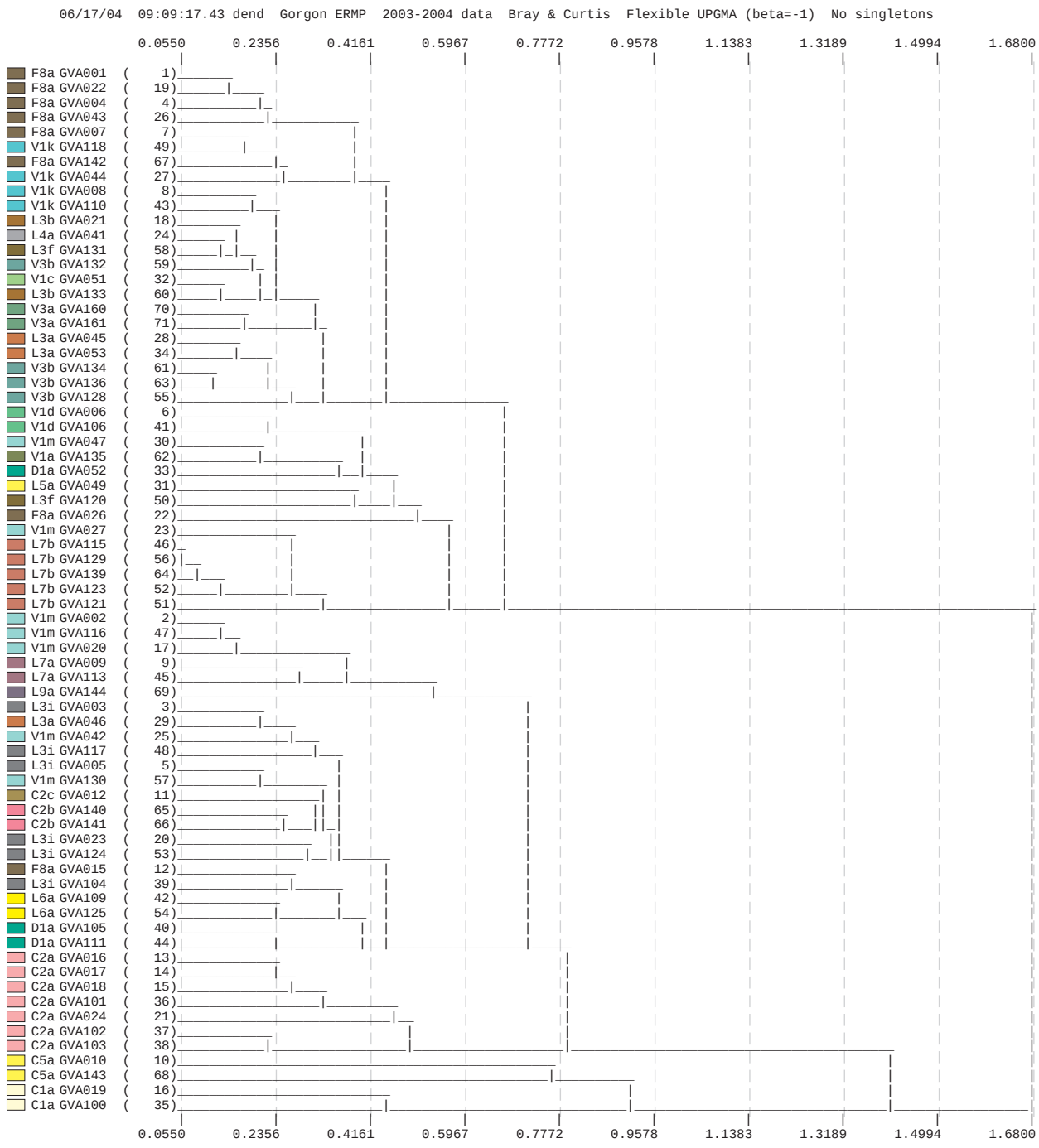


LEGEND

Vegetation Community	Vegetation Plot No.
F8a	GVA001
F8a	GVA022
F8a	GVA004

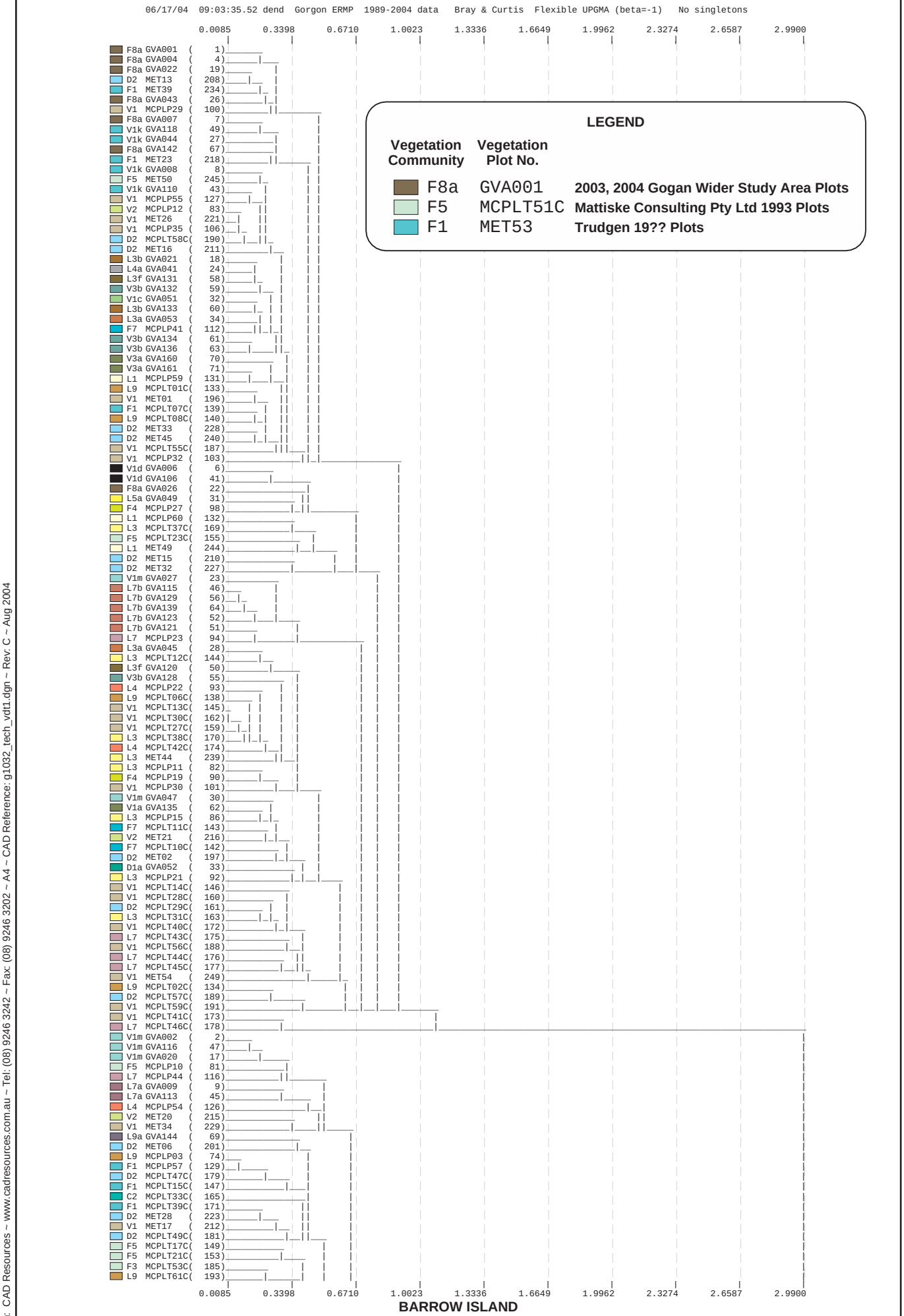
BARROW ISLAND

2003 & 2004 GORGON PROJECT AREA VEGETATION MAPPING

WIDER STUDY AREA FOR PROPOSED GAS PROCESSING FACILITY
BRAY CURTIS DENDROGRAM

Sheet 1 of 1 sheets

FIGURE 7-1



BARROW ISLAND

BRAY CURTIS DENDROGRAM
Historical and Recent Vegetation Plots

Sheet 1 of 2 sheets

FIGURE 7-2

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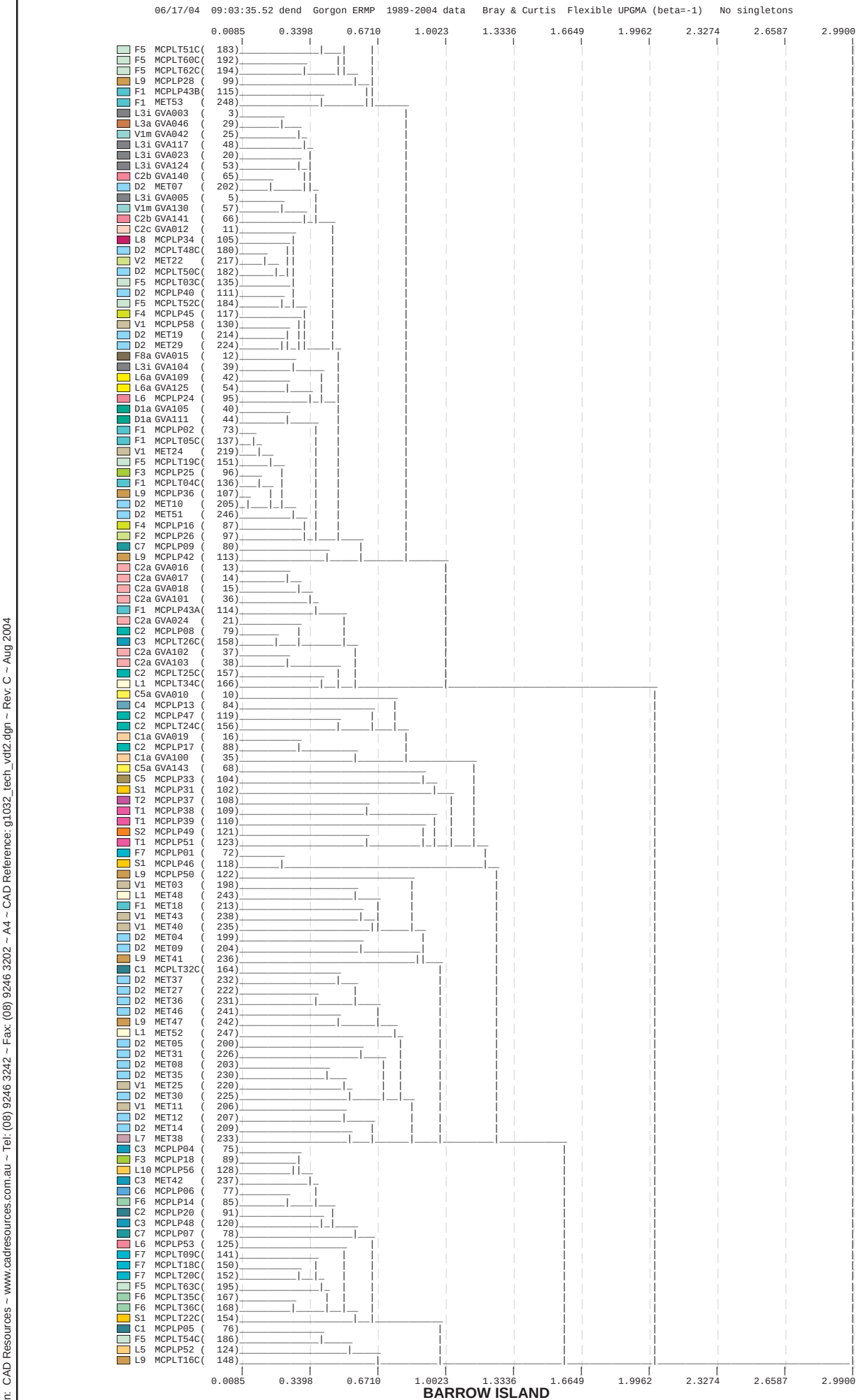

BARROW ISLAND

BRAY CURTIS DENDROGRAM
Historical and Recent Vegetation Plots
Sheet 2 of 2 sheets

FIGURE 7-3

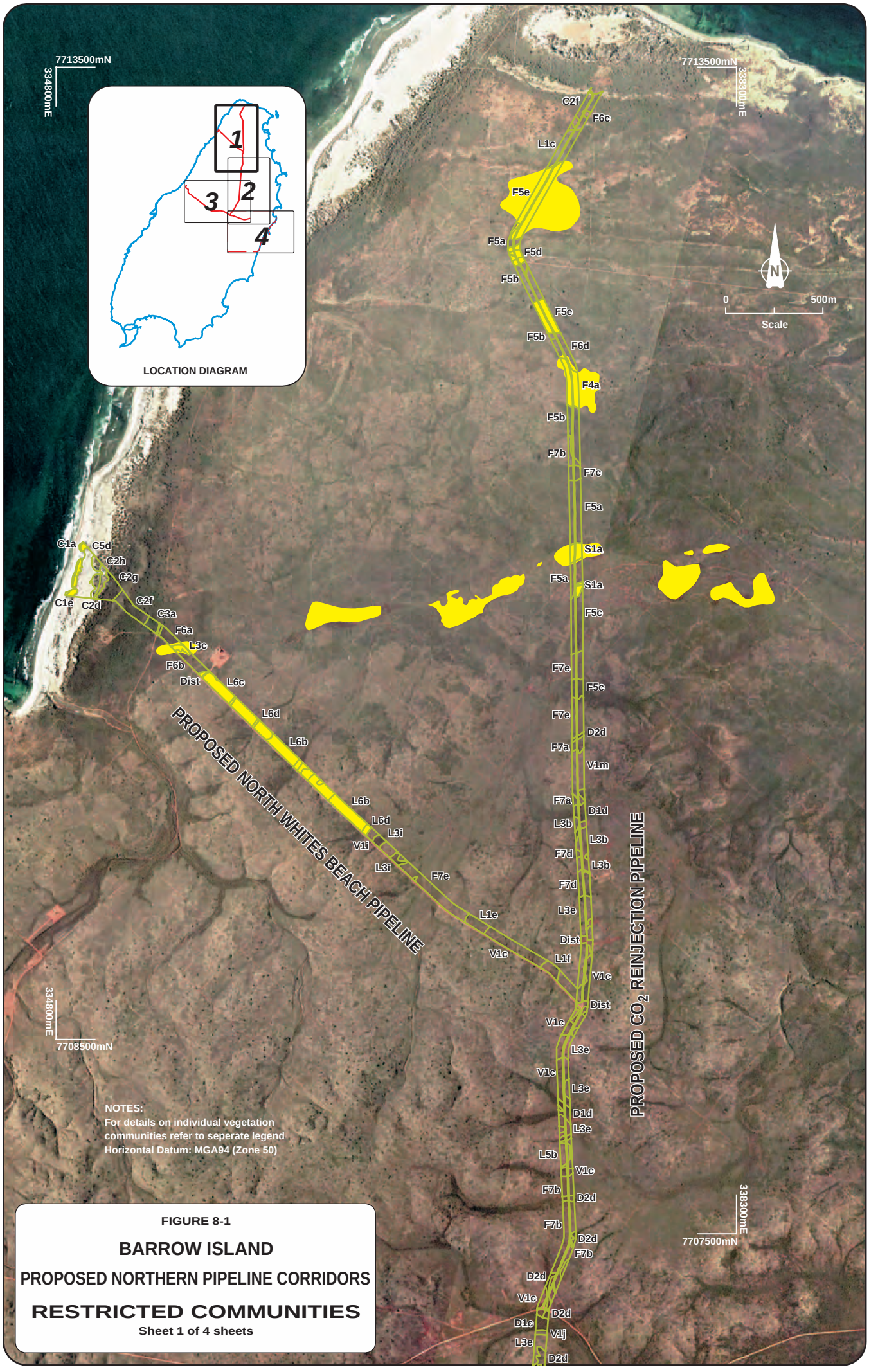

FIGURE 8-1

BARROW ISLAND

PROPOSED NORTHERN PIPELINE CORRIDORS

RESTRICTED COMMUNITIES

Sheet 1 of 4 sheets

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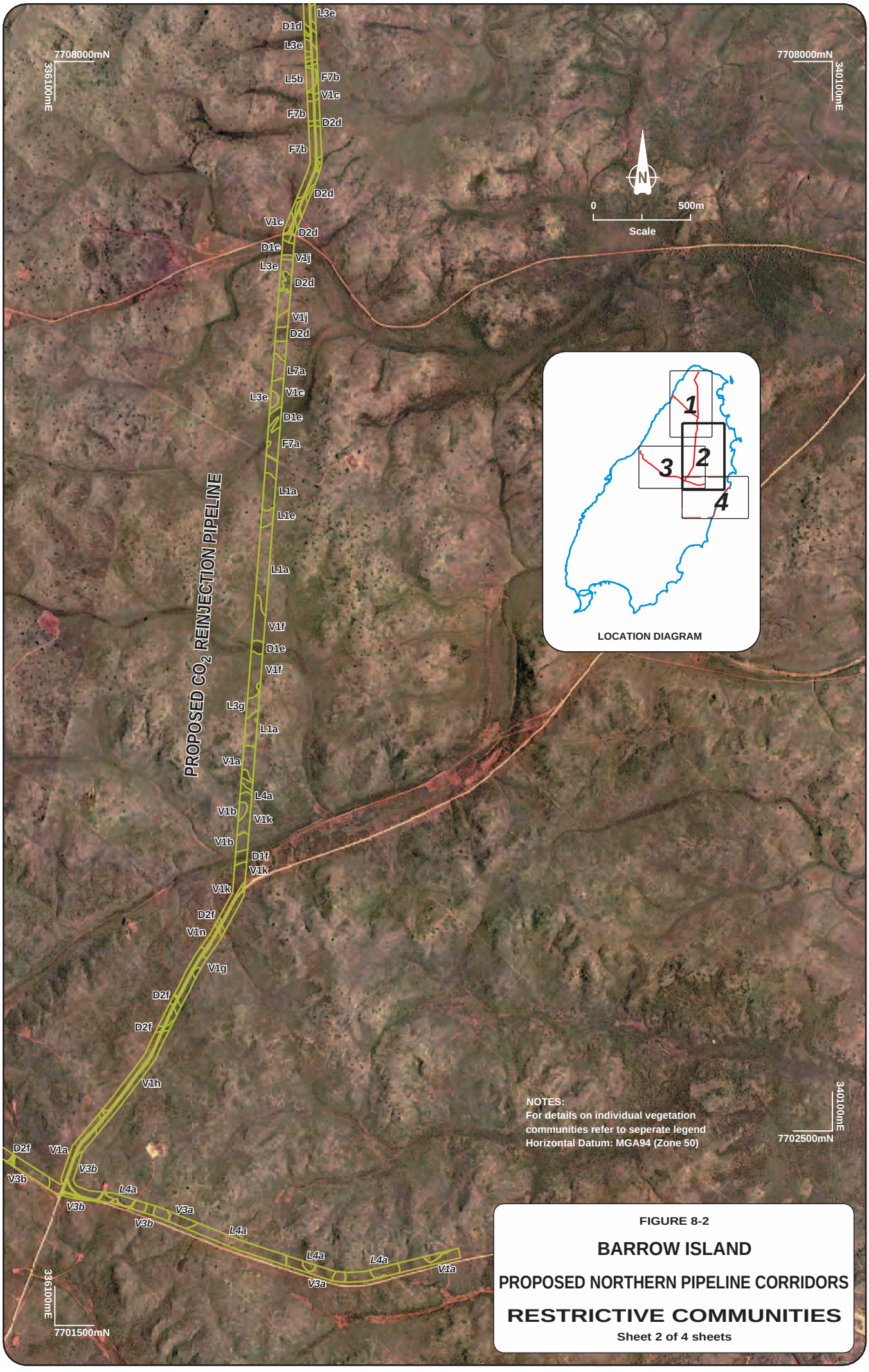

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FIGURE 8-2

BARROW ISLAND

PROPOSED NORTHERN PIPELINE CORRIDORS

RESTRICTIVE COMMUNITIES

Sheet 2 of 4 sheets

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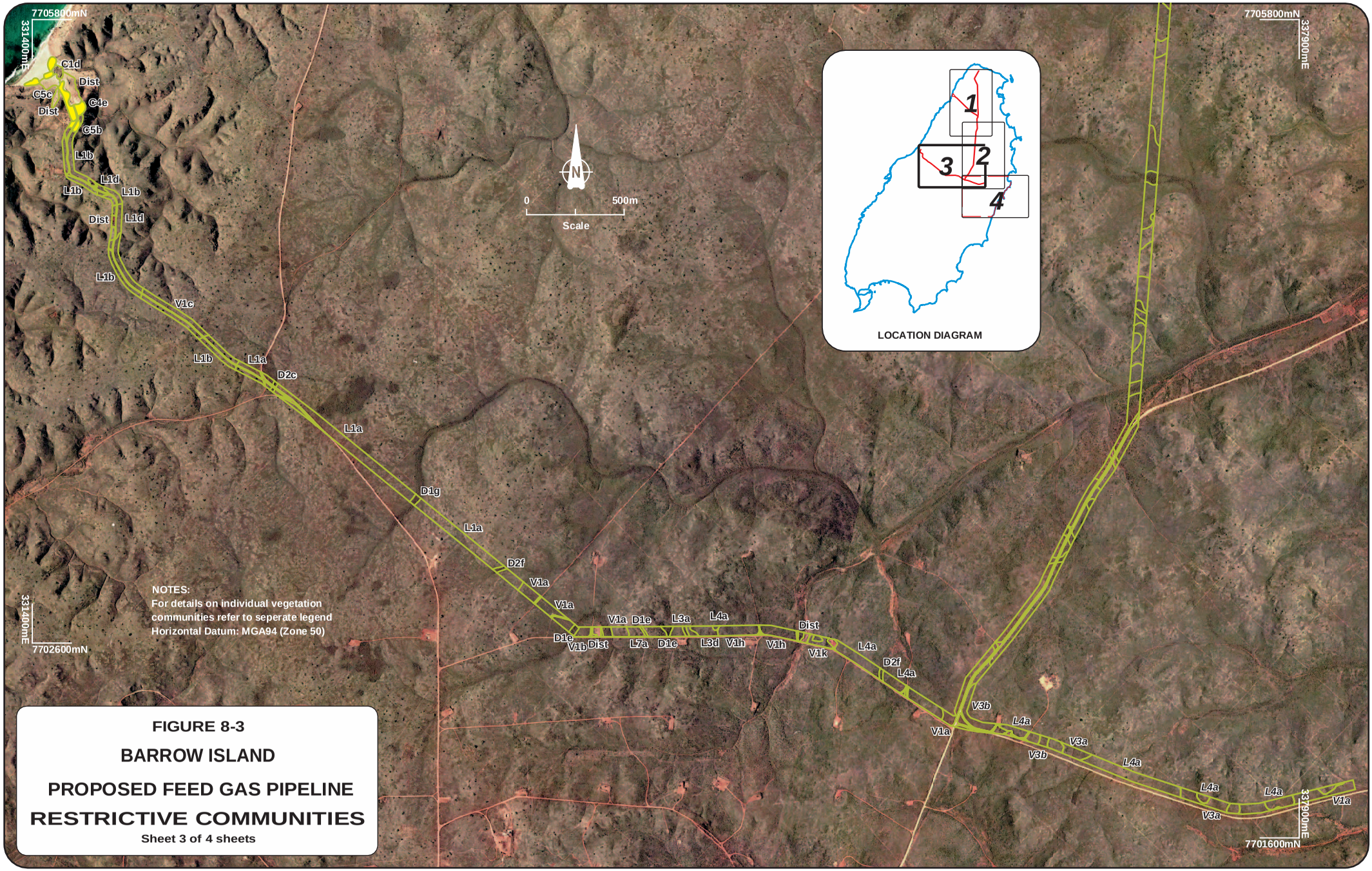

FIGURE 8-3

BARROW ISLAND

PROPOSED FEED GAS PIPELINE

RESTRICTIVE COMMUNITIES

Sheet 3 of 4 sheets

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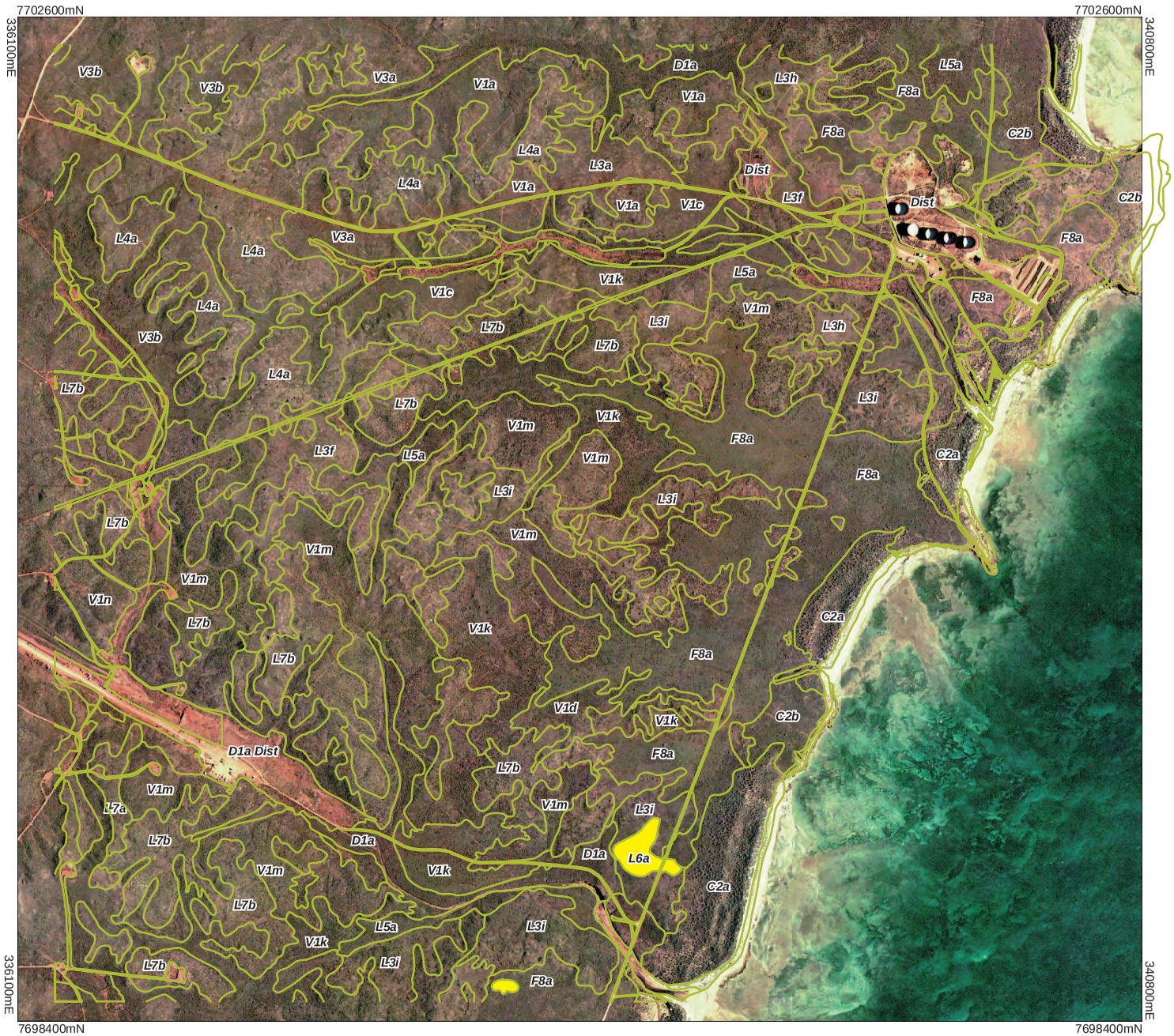

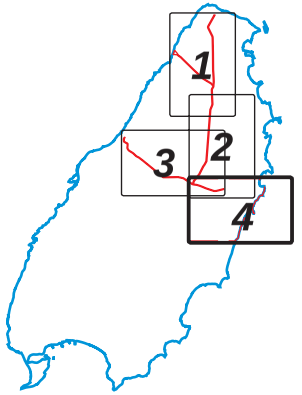

LOCATION DIAGRAM

Notes:
For detailed legend refer figure numbered 8.3.1.1:1 to 8.3.1.1:4
Horizontal Datum: MGA94 (Zone 50)

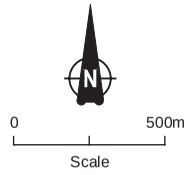

FIGURE 8-4

BARROW ISLAND

WIDER STUDY AREA FOR PROPOSED GAS PROCESSING FACILITY

RESTRICTIVE COMMUNITIES

Sheet 4 of 4 sheets

PLATES

Plate 1 - Non-vascular species observed on proposed CO_2 Reinjection Pipeline

Plate 2 - C1d Community

Community C1d – Low Open Shrubland of *Scaevola cunninghamii*, *Corchorus* sp. and *Heliotropium glanduliferum* over Very Open Grassland of *Spinifex longifolius* over scattered *Cynachum floribundum* creeper on lower slopes at the base of primary sand dunes. Recorded on the proposed feed gas pipeline route.

Plate 3 - C2a Community

Community C2a – Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampierii* subsp. *dampierii* over Open Hummock Grassland to Hummock Grassland of *Triodia angusta* on dune swales, slopes and ridges.

Plate 4 - C2f Community

Community C2f – Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Olearia dampierii* subsp. *dampierii* and *Acacia bivenosa* with occasional *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on sandy dune ridges (over scattered *Heliotropium glanduliferum* and *Diplopeltis eriocarpa* on the back of red/brown sandy flats and dunes).

Plate 5 - C2g Community

Community C2g – Shrubland of *Acacia coriacea* over Low Shrubland to Shrubland of *Olearia dampierii* subsp. *dampierii, Stylobasium spathulatum* and *Acacia bivenosa* over Hummock Grassland of *Triodia epactia* over low scattered *Threlkeldia diffusa* herbs in swales between dunes.

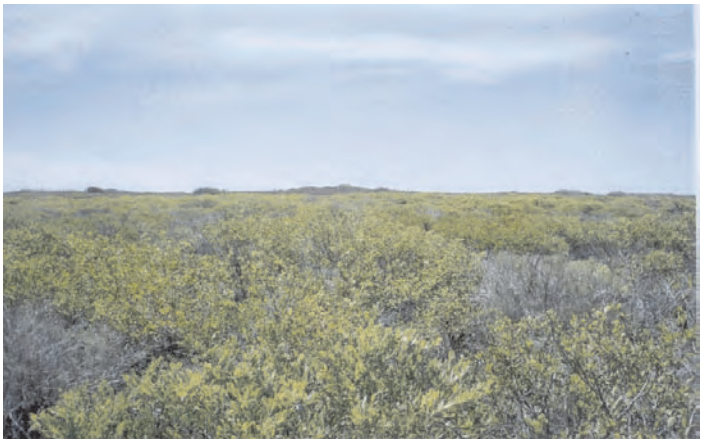

Plate 6 - C3a Community

Community C3a – Open Heath of *Acacia bivenosa* over Low Open Shrubland of *Olearia dampierii* subsp. *dampierii* with low scattered *Myoporum montanum* and *Enchylaena tomentosa* var. *tomentosa* over Open Hummock Grassland of *Triodia epactia* on red/brown sandy flats behind dunes

Plate 7 - C4e Community

Community C4e – Open Shrubland if *Trichodesma zeylanicum* over Low Open Shrubland of *Corchorus* sp., *Olearia dampieri* subsp. *dampieri*, *Scaevola cunninghamii* and *Whiteochloa airoides* over Open Hummock Grassland of *Triodia angusta* over *Cynanchum floribundum* scattered creepers on upper slopes to mid slopes of sandy dunes. Recorded on the proposed gas pipeline route.

Plate 8 - C5c Community

Plate 9 - C5c Community

Community C5c – Very Open Hummock Grassland of Triodia angusta over low scattered *Scaevola cunninghammi*, *Corchorus* sp., *Frankenia pauciflora* var. *pauciflora* and *Heliotropium glanduliferum* scattered herbs and shrubs on lower slopes on limestone. Recorded on the proposed feed gas pipeline route.

Plate 10 - D1a Community

Community D1a – Scattered tall *Acacia coriacea* over Low Shrubland to Shrubland of *Stylobasium spathulatum* and *Acacia bivenosa* over Very Open Herbland of *Acanthocarpus verticillatus* over Closed Hummock Grassland of *Triodia angusta* with scattered *Triodia wiseana* on valley floors and deep gullies. This unit contains occasional *Hakea lorea* subsp. *lorea*. It also contains areas of scoured drainage channel in areas of heavy seasonal flow.

Plate 11 - D1c Community

Community D1c – Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* with*Triodia epactia* at edges in major drainage lines.

Plate 12 - D1d Community

Community D1d – Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with patchy *Triodia angusta* and *Triodia wiseana* on lower edges of broad drainage flats.

Plate 13 - D1e Community

Community D1e – Open Shrubland of *Stylobasium spathulatum, Pentalepis trichodesmoides* with *Trichodesma zeylanicum* over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over Low Open Shrubland of *Acacia bivenosa* and *Acacia gregorii* in some locations on lower slopes, drainage flats and wide drainage lines.

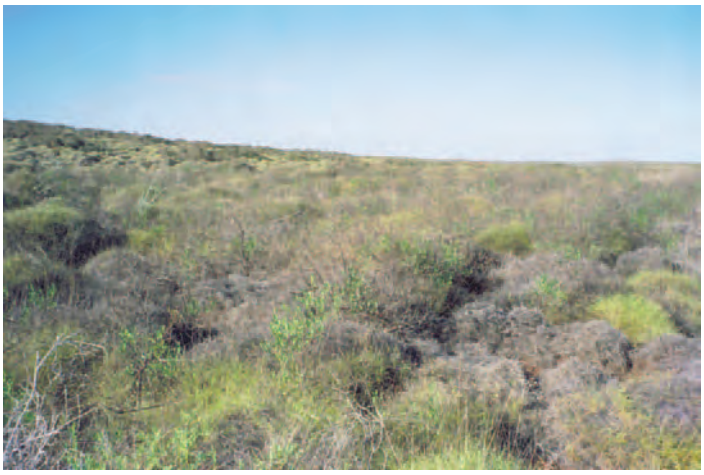

Plate 14 - D1f Community

Community D1f – Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathalatum* with patchy *Petalostylis labicheoides* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in major drainage lines. This community contains occasional *Hakea lorea* subsp. *lorea* and was recorded on the proposed $C0_2$ reinjection pipeline route.

Plate 15 - D1f Community

Hakea lorea subsp. *lorea* recorded within community D1f on proposed $C0_2$ reinjection pipeline route.

Plate 16 - D1g Community

Community D1g – Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over low scattered *Tephrosia* sp. and *Indigofera monophylla* shrubs in wide drainage lines. Recorded on the proposed feed gas pipeline route.

Plate 17 - D2c Community

Community D2c – Tall scattered *Trichodesma zeylanicum* over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* over low Open Shrubland of *Tephrosia rosea* in disturbed drainage lines.

Plate 18 - D2d Community

Community D2d – Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over low shrubland of *Acacia gregorii* in major creek and drainage lines.

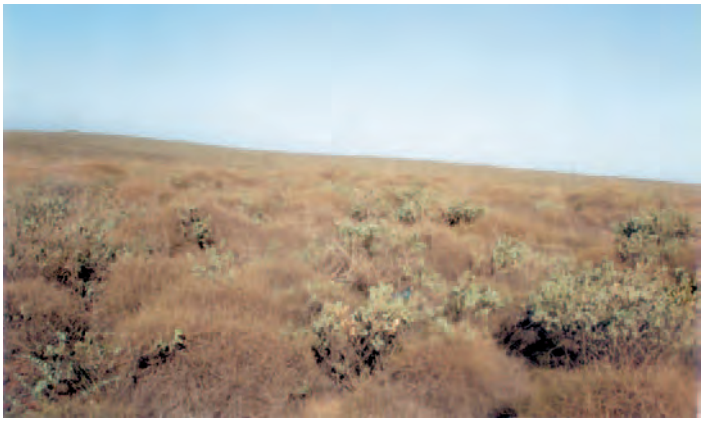

Plate 19 - D2f Community

Community D2f – Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patch *Petalostylis labichioides, Acacia gregorii* and *Acacia bivenosa* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in minor drainage lines. This unit occasionally holds *Hakea lorea* subsp. *lorea.*

Plate 20 - F4a Community

Community F4a – Low Open Woodland of *Erythrina vespertilio* over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with occasionally emergent *Ficus brachypoda* on flats with shallow red/brown sands and emergent limestone. Recorded on the proposed CO_2 reinjection pipeline route.

Plate 21 - F5a Community

Community F5a – Low Open Shrubland of *Stylobasium spathulatum* with scattered *Pentalepis trichodesmoides* and *Senna glutinosa* ovre Hummock Grassland of *Triodia angusta* with *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on gentle low slopes and flats.

Plate 22 - F5b Community

Community F5b – Scattered Low Trees of *Ficus brachypoda* over scattered low *Pentalepis trichodesmoides, Acacia bivenosa, Corchorus* sp. *Tephrosea rosea* and *Streptoglossa decurrens* over Closed Hummock Grassland of *Triodia epactia* with *Triodia angusta* on flats.

Plate 23 - F5c Community

Community F5c – Low Open Shrubland of *Pentalepis trichodesmoides* over mixed Hummock Grassland of *Triodia epactia* with occasional *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Acacia gregorii* on limestone ridges, slopes and flats.

Plate 24 - F5e Community

Community F5e – Scattered low trees of *Ficus brachypoda* over scattered low shrubs of *Pentalepis trichodesmoides, Scaevola cunninghamii, Acacia bivenosa* and *Diplopeltis eriocarpa* over Open Hummock Grassland of *Triodia angusta* with *Triodia epactia* on limestone flats with shallow pale pink sands.

Plate 25 - F6a Community

Community F6a – Low Open Shrubland of *Acacia bivenosa* and *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on red/brown sandy flats.

Plate 26 - F6b Community

Community F6b – Scattered low trees of *Ficus brachypoda* over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* on sandy slopes and flats with occasional limestone outcropping.

Plate 27 - F6d Community

Community F6d – Open Shrubland of *Trichodesma zeylanicum* over low scattered *Pterocaulon sphacelatum* shrubs over Hummock Grassland of *Triodia epactia* on limestone flats with shallow sands.

Plate 28 - F7a Community

Community F7a – Scattered low shrubs of *Pentalepis trichodesmoides* and *Trichodesmoides zeylanicum* over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.

Plate 29 - F7b Community

Community F7b - Scattered low trees of *Ficus brachypoda* over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on sandy flats.

Plate 30 - F7d Community

Community F7d – Scattered shrubs of *Hakea lorea* subsp. *lorea* over low scattered shrubs of *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* on mid-slopes and flats.

Plate 31 - F7e Community

Community F7e – Low Open Shrubland of *Pentalepis trichodesmoides* over scattered low shrubs of *Corchorus* sp. and *Sarcostemma viminale* subsp. *australe* over Himmock Grassland of *Triodia wiseana* on red/brown sandy flats (with pockets of *Eriachne mucronata* on valley floors).

Plate 32 - L1a Community

Community L1a – Scattered low trees of *Ficus brachypoda* and *Pittosporum phylliraeoides* over scattered low shrubs of *Stylobasium spathulatum* and *Petalostylis labichiodes* over Hummock Grassland of *Triodia wiseana* (*Triodia* angusta) with occasional *Cymbopogon ambiguus* and *Tephrosia rosea* on limestone ridges and upper slopes.

Plate 33 - L1b Community

Community L1b - Scattered low trees of *Ficus brachypoda* over scattered low shrubs of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* on limestone slopes and ridges.

Plate 34 - L1c Community

Community L1c Scattered low trees of *Ficus brachypoda* over Low Open Shrubland of *Acacia bivenosa* over Closed Hummock Grassland of *Triodia angusta* (*Triodia epactia, T.wiseana)* on limestone slopes and ridges.

Plate 35 - L1d Community

Community L1d – Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Heliotropium glanduliferum* on limestone flats (plateau).

Plate 36 - L1e Community

Community L1e – Scattered low trees of *Ficus brachypoda* and *Pittosporum phylliraeoides* (*Mallotus nesophilus)* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) over scattered low shrubs of *Diplopeltis eriocarpa* on limestone slopes and flats.

Plate 37 - L1f Community

Community L1f – Scattered low trees of *Ficus brachypoda* and *Pittosporum phylliraeoides* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta)* on limestone slopes and ridges.

Plate 38 - L3b Community

Community L3b – Scattered low shrubs of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* (*Triodia epactia*) over scattered low *Acacia gregorii, Diplopeltis eriocarpa* on limestone slopes and ridges.

Plate 39 - L3c Community

Community L3c – Low scattered *Diplopeltis eriocarpa* shrubs with scattered *Cymbopogan ambiguus*, *Triodia epactia* and *Cyperus cunninghamii* subsp. *cunninghamii* herbs and grasses on small exposed limestone flat. Recorded on the proposed alternate North White's Beach pipeline route.

Plate 40 - L3d Community

Community L3d – Scattered low shrubs of *Stylobasium spathulatum, Petalostylis labichioides* over Low Open Shrubland of *Diplopeltis eriocarpa, Acacia gregorii* and *Hannafordia quadrivalvis* subsp. *recurva* over Hummock Grassland of *Triodia angusta* (*Triodia wiseana*) on limestone ridges.

Plate 41 - L3e Community

Community L3e – Scattered low trees of *Ficus brachypoda, Pittosporum phylliraeoides* over scattered low shrubs of *Pentalepis trichodesmoides, Trichodesma zeylanicum* over mixed Hummock Grassland of *Triodia wiseana, T. angusta* and *T. epactia* over scattered low shrubs of *Diplopeltis eriocarpa* on slopes and ridges.

Plate 42 - L3f Community

Community L3f – Scattered low shrubs of *Petalostylis labichioides*, *Indigofera monophylla* over Hummock Grassland of *Triodia wiseana* on limestone ridges and upper slopes.

Plate 43 - L3g Community

Community L3g – Low Open Shrubland of *Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) and *Cymbopogon anbiguus* over Low Open Shrubland of *Diplopeltis eriocarpa* on limestone hillslopes.

Plate 44 - L3h Community

Community L3h – Scattered low shrubs of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* over scattered low shrubs of *Diplopeltis eriocarpa* on limestone ridges and flats.

Plate 45 - L3i Community

Community L3i – Low Open Shrubland to Low Shrubland of *Acacia bivenosa* with occasional scattered low shrubs of *Stylobasium spathulatum, Petalostylis labichioides* over Hummock Grassland of *Triodia angusta* (*Triodia wiseana*) on limestone slopes, small rises and flats.

Plate 46 - L4a Community

Community L4a – Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Acacia bivenosa* with scattered *Petalostylis labichioides, Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) on limestone ridges and mid-slopes. This unit also contains occasional *Hakea lorea* subsp. *lorea.*

Plate 47 - L5b Community

Plate 48 - L5b Community

Community L5b – Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy midslopes. Recorded on proposed $C0_2$ reinjection pipeline route.

Plate 49 - L6a Community

Community L6a – Low Open Shrubland of *Grevillea pyramidalis* subsp. *?leucadendron* and *Acacia bivenosa* over Hummock Grassland of *Triodia angusta* over low scattered *Acacia gregorii*, *Scaevola cunninghamii* and *Heliotropium glanduliferum* shrubs and herbs on limestone midslopes. Recorded south of proposed gas processing facility.

Plate 50 - L6b Community

Community L6b – Scattered low trees of *Ficus brachypoda* over Low Open Shrubland of *Grevillea pyramidalis* ?subsp. *leucadendron* with occasional *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* over closed Hummock Grasssland of *Triodia epactia*, *Triodia wiseana* and *Eriachne* sp. over Low Open Shrubland of *Acacia gregorii* on upper slopes and midslopes of small rises. Recorded on proposed North White's Beach pipeline route.

Plate 51 - L6c Community

Community L6c – Low Open Shrubland of *Pentalepis trichodesmoides* (with *Grevillea pyramidalis* subsp. *leucadendron* in eastern parts) over Hummock Grassland of *Triodia wiseana* (*T. epactia*) over Low Open Shrubland of *Diplopeltis eriocarpa* on rocky mid- to upper slopes with red/brown sands and occasional limestone outcropping.

Plate 52 - L6d Community

Community L6d – Low Open Shrubland of *Pentalepis trichodesmoides* with *Indigofera monophylla* and scattered *Grevillea pyramidalis* ?subsp. *leucadendron* over Hummock Grassland of *Triodia epactia* in minor drainage lines. Recorded on proposed North White's Beach pipeline route.

Plate 53 - L7a Community

Community L7a – Low shrubland of *Melaleuca cardiophylla, Stylobasium spathulatum, Pentalepis trichodesmoides, Trichodesma zeylanicum, Acacia bivenosa* (occasional pockets of *Gossypium robinsonii*) over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) over Low Open Shrubland of *Acacia gregorii* on rocky limestone ridges, slopes and minor gullies.

Plate 54 - L7b Community

Community L7b – Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over low scattered shrubs to Low Open Shrubland of *Acacia gregorii* on limestone upper slopes and ridges.

Plate 55 - S1a Community

Community S1a – Grassland of *Eriachne flaccida* (Southern Pilbara-Carnarvon Coastal Form) over Scattered Low *Pluchea dunlopii* and *Streptoglossa decurrens* herbs and shrubs on clay pans. (Community contains scattered emergent *Acacia bivenosa* and *Stylobasium spathulatum* shrubs and *Triodia angusta* at edges). Recorded on the proposed CO_2 reinjection pipeline route.

Plate 56 - V1a Community

Community V1a – Low Open Shrubland of *Acacia bivenosa, Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) over Low Open Shrubland of *Acacia gregorii* on limestone midslopes and occasional small rises.

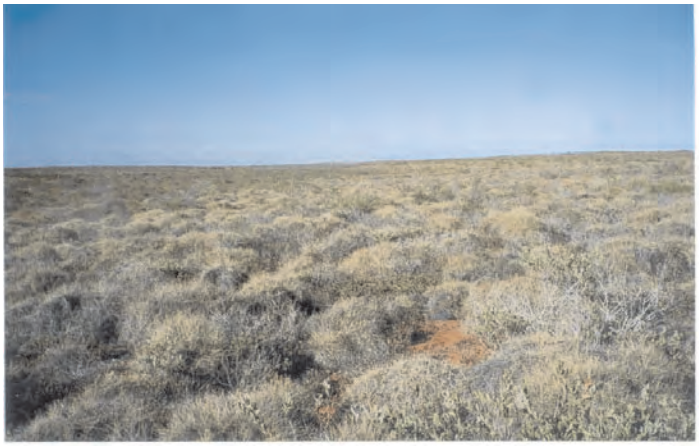

Plate 57 - V1b Community

Community V1b – Low Open Shrubland of *Acacia bivenosa, Petalostylis labichioides* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) over Low Open Shrubland of *Diplopeltis eriocarpa* on red/brown sandy flats.

Plate 58 - V1c Community

Community V1c – Scattered Low trees of *Ficus brachypoda, Pittosporum phylliraeoides* over scattered low shrubs of *Petalostylis labichioides, Pentalepis trichodesmoides* over Hummock Grassland of *Triodia angusta* (*Triodia wiseana, Triodia epactia*) with occasional *Cymbopogon ambiguus* tussocks, on limestone slopes and ridges or with *Stylobasium spathulatum* at edges on red/brown sandy drainage flats.

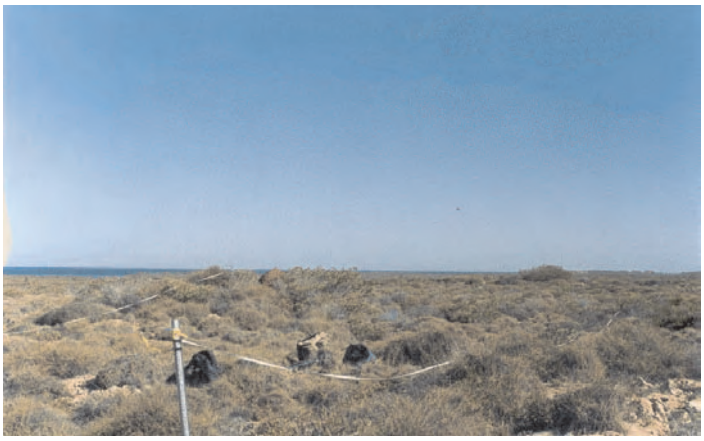

Plate 59 - V1d Community

Community V1d – Low Open Shrubland of *Acacia bivenosa* with scattered low shrubs of *Pentalepis trichodesmoides* and occasional *Melaleuca cardiophylla* over Hummock Grassland of *Triodia angusta, T. wiseana* on limestone slopes and low ridges.

Plate 60 - V1f Community

Community V1f – Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* on red/brown sandy flats.

Plate 61 - V1g Community

Community V1g – Scattered tall shrubs of *Acacia pyrifolia* over scattered low shrubs of *Petalostylis labichioides, Acacia bivenosa* and *Acacia gregorii* over Hummock Grassland of *Triodia wiseana* with some *Triodia angusta* and *Cymbopogon ambiguus* on red/brown sandy midslopes and in minor drainage lines with occasional outcropping.

Plate 62 - V1h Community

Community V1h – Open Shrubland of *Acacia pyrifolia* over low Open Shrubland of *Stylobasium spathulatum, petalostylis labichioides* and *Acacia bivenosa* over Closed Hummock Grassland of *Triodia wiseana, T. angusta* over low Open Shrubland of *Acacia gregorii* on limestone slopes. This unit may contain occasional *Hakes lorea* subsp. *lorea.*

Plate 63 - V1i Community

Community V1i – Hummock Grassland of *Triodia epactia* (*Triodia wiseana*) over low Open Shrubland of *Acacia gregorii* and *Diplopeltis eriocarpa* on gentle slopes and flats.

Plate 64 - V1j Community

Community V1j – Scattered low shrubs of *Pentalepis trichodesmoides* over Hummock Grassland *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.

Plate 65 - V1k Community

Community V1k – Scattered shrubs of *Acacia pyrifolia* and occasional *Hakea lorea* subsp. *lorea* over Low Open Shrubland to Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) over scattered low shrubs of *Acacia gregorii* on limestone hilltops and minor drainage lines.

Plate 66 - V1m Community

Community V1m – Low Open Heath of *Melaleuca cardiophylla* with *Sarcostemma viminale* subsp. *australe* over Hummock Grassland of *Triodia wiseana, T. angusta* on limestone ridges and slopes.

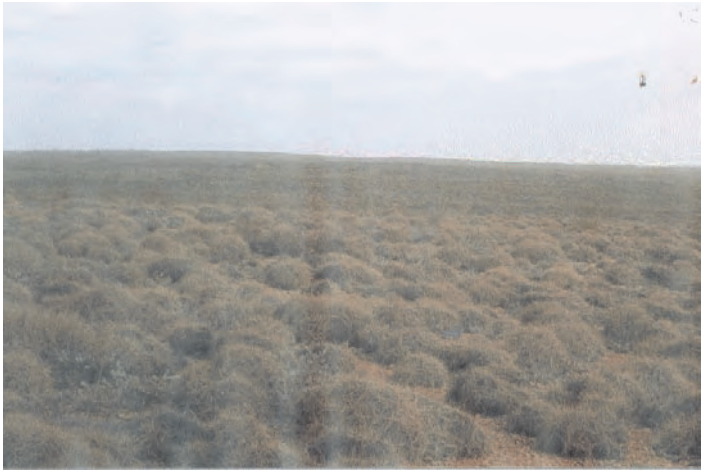

Plate 67 - V3a Community

Community V3a – Scattered low trees of *Ficus brachypoda* over scattered shrubs of *Acacia pyrifolia* over Hummock Grassland of *Triodia wiseana* on limestone slopes and minor drainage lines.

Plate 68 - V3b Community

Community V3b – Scattered shrubs of *Acacia pyrifolia* with occasional *Hakea lorea* subsp. *lorea* over scattered low shrubs to Low Open Shrubland of *Petalostylis labichiodes, Stylobasium spathulatum*, occasional *Acacia bivenosa* and *Acacia gregorii* over Hummock Grassland of *Triodia wiseana* (*Triodia angusta*) on limestone slopes.

Plate 69 - Intertidal Community

Intertidal mangrove vegetation consisting of *Avicennia marina* subsp. ?*eucalyptifolia*, *Bruguiera exaristata* and *Rhizophora stylosa*.

Plate 70 - Intertidal Community

Intertidal vegetation included areas of samphires consisting of a Low Shrubland of *Halosarcia halocnemoides* subsp. *tenuis, Halosarcia indica* and *Suaeda arbusculoides*.

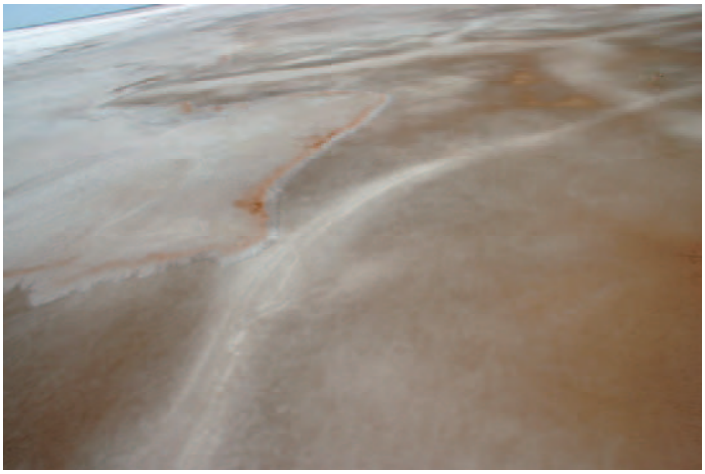

Plate 71 – Unvegetated Tidal Flats

Unvegetated tidal flats.

Plate 72 – Pipeline Vegetation

A Grassland of *Triodia epactia* and ?*Cenchrus* sp. with *Eragrostis dielsii* and *Eragrostis falcata* with occasionally emergent *Acacia farnesiana*, *Acacia trachycarpa, Lawrencia viridigrisea* and *Neobassia astrocarpa* shrubs on raised red earth mounds.

Plate 73 – Pipeline Vegetation

A Low Open Shrubland including *Acacia* sp. over Grassland including *Dicanthium sericeum* subsp. *humilius*, *Eriachne flaccida*, *Aristida holathera* var *holathera* and *Eriachne dimorpantha* over a Very Open Herbland including *Rhynchosia minima* and *Neptunia dimorpantha* on red earth flats.

Plate 74 – Pipeline Vegetation

An Open Shrubland to Tall Open Shrubland of *Acacia trachycarpa*, *Acacia ancistrocarpa*, *Acacia elachantha*, *Acacia victoriae* and *Acacia xiphophylla* over a Grassland of *Triodia epactia* and ?*Cenchrus* sp. over mixed herb species on red sandy flats. This community was recorded at the eastern end of the proposed mainland pipeline site, near the existing compressor station

ATTACHMENT A: LIST OF VASCULAR PLANT SPECIES RECORDED ON BARROW ISLAND

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
MARSILEACEAE		P	fern	#	*Marsilea ?hirsuta*			+				+
POTAMOGETONACEAE		P	herb	#	*Ruppia maritima*					+	+	
CYMODOCEACEAE		P	herb	#	*Halodule uninervis*							+
POACEAE		A/P	grass		*Aristida contorta*							+
		A/P	grass		*Aristida holathera*							+
		A/P	grass	#	*Aristida holathera* var. *holathera*							+
		P	grass	#	*Bothriochloa bladhii*				+	+		
		A/P	grass		*Brachyachne* sp.							
		P	grass		* *Cenchrus ciliaris*							+
		P	grass	#	*Chrysopogon fallax*				+	+		
	+	P	grass		*Cymbopogon ambiguus*							+
		P	grass	#	*Cymbopogon bombycinus*				+	+		
		P	grass	#	*Cymbopogon procerus*				+	+		
		P	grass		*Cymbopogon* sp.							
		P	grass	#	* *Cynodon dactylon*							+
		A	grass	#	*Dactyloctenium radulans*							+
		A	grass	#	*Dichanthium sericeum* subsp. *humilius*				+	+		
		A	grass	#	*Dichanthium sericeum* subsp. *sericeum*							+
		A/P	grass	#	*Digitaria ctenantha*				+	+		
		A/P	grass		*Enneapogon caerulescens*					+	+	

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
POACEAE		A/P	grass		*Enneapogon caerulescens* var. *caerulescens*					+	+	
		A/P	grass	#	*Enneapogon caerulescens* var. *occidentalis*					+		
		A/P	grass	#	*Enneapogon oblongus*				+	+		
		A/P	grass	#	*Enneapogon polyphyllus*							+
		A/P	grass		*Enneapogon* sp.							
		A	grass	#	*Eragrostis cumingii*				+	+		
	+	A/P	grass		*Eragrostis dielsii*							+
		P	grass	#	*Eragrostis falcata*							+
		P	grass	#	*Eragrostis xerophila*							+
		A/P	grass		*Eragrostis* sp.							
		P	grass	#	*Eriachne benthamii*							+
	+	P	grass	#	*Eriachne flaccida*					+	+	
	+	P	grass		*Eriachne flaccida* (Southern Pilbara - Carnarvon Coastal Form)					+		
	+	P	grass	#	*Eriachne mucronata*							+
		P	grass		*Eriachne* sp.							+
		P	grass		*Eulalia aurea*							
		A	grass	#	*Iseilema dolichotrichum*				+	+		
		A	grass		*Paspalidium clementii*					+	+	
	+	A	grass	#	*Paspalidium tabulatum*					+		
		A/P	grass		*Paspalidium* sp.							
		A	grass	#	*Setaria dielsii*							+
	+	A	grass	*	*Setaria verticillata*							+
		P	grass	#	*Sorghum plumosum*				+	+		

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Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
POACEAE	+	P	grass		*Spinifex longifolius*							+
		A	grass	#	*Sporobolus australasicus*				+	+		
		P	grass	#	*Sporobolus mitchellii*							+
		P	grass		*Sporobolus virginicus*							+
		P	grass	#	*Themeda triandra*							+
	+	P	grass	#	*Triodia angusta*					+		
		P	grass	#	*Triodia epactia*				+	+		
	+	P	grass	#	*Triodia wiseana*				+	+		
		P	grass	#	*Triraphis mollis*							+
		A/P	grass	#	*Whiteochloa airoides*				+	+		
	+	A/P	grass	#	*Yakirra australiensis*				+	+		
		A/P	grass		Poaceae sp.							
		A/P	grass		Poaceae sp. 1							
		A/P	grass		Poaceae sp. 2							
		A/P	grass		Poaceae sp. 3 (Tussock grass)							
CYPERACEAE	+	A	sedge	#	*Bulbostylis barbata*							+
		P	sedge	#	*Cyperus bifax*							+
	+	P	sedge	#	*Cyperus cunninghamii*							+
		P	sedge	#	*Cyperus cunninghamii* subsp. *cunninghamii*				+	+		
		A	sedge	#	*Cyperus iria*							+
		A	sedge	#	*Cyperus squarrosus*							+
		P	sedge	#	*Fimbristylis dichotoma*							+

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CYPERACEAE		A	sedge	#	*Fimbristylis schultzii*				+			
		A	sedge	# *	*Isolepis marginata*						+	
	+	A	sedge		*Isolepis* sp.			?+				
		A	sedge		*Lipocarpha microcephala*							
		A	sedge	#	*Schoenoplectus dissachanthus*							+
COMMELINACEAE		A/P	herb	#	*Commelina ciliata*				+			
		A/P	herb	#	*Commelina ensifolia*							+
DASYPOGONACEAE	+	P	herb	#	*Acanthocarpus verticillatus*					+		
ANTHERICAEAE		P	herb/shrub	#	*Corynotheca flexuosissima*					+		
MORACEAE		P	shrub/tree	#	*Ficus brachypoda*							+
		P	shrub/tree	#	*Ficus brachypoda* (hairy variant)			+				
		P	shrub/tree	#	*Ficus opposita* var. *aculeata*				+	+		
		P	tree	#	*Ficus virens* var. *virens*				+	+		
		P	shrub/tree		*Ficus* sp.							
PROTEACEAE		P	shrub/tree	#	*Grevillea pyramidalis*							+
	?	P	shrub/tree	#	*Grevillea pyramidalis* subsp. *leucadendron*				+	+		
	+	P	shrub/tree		*Hakea lorea* subsp. *lorea*							+

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
SANTALACEAE		P	shrub/tree	#	*Santalum murrayanum*						+	
LORANTHACEAE		P	shrub/tree		Loranthaceae sp.							
POLYGONACEAE		A	herb	*	*Emex australis*							+
CHENOPODIACEAE		P	shrub	#	*Atriplex isatidea*					+	+	
		P	herb	#	*Atriplex semilunaris*					+	+	
		A	herb		*Chenopodium* aff. *cristatum*							+
		A	herb		*Chenopodium melanocarpum* forma *leucocarpum*					+	+	
		A/P	herb	#	*Chenopodium pumilio*						+	
		A	herb	#	*Dysphania kalpari*					+	+	
		A	herb		*Dysphania plantaginella*							+
		A	herb	#	*Dysphania rhadinostachya*							+
		A	herb	#	*Dysphania rhadinostachya* subsp. *inflata*							+
	+	A	herb		*Dysphania rhadinostachya* subsp. *rhadinostachya*							+
		P	shrub		*Enchylaena tomentosa* var. *tomentosa*							+
		P	shrub	#	*Eremophea spinosa*					+	+	
		P	shrub		*Halosarcia halocnemoides*							+
		P	shrub	#	*Halosarcia halocnemoides* subsp. *tenuis*							+
		P	shrub		*Halosarcia indica*							+
		P	shrub	#	*Halosarcia indica* subsp. *leiostachya*							+
		P	herb/shrub		*Halosarcia* sp.							

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Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
CHENOPODIACEAE		P	shrub		*Neobassia astrocarpa*				+	+		
		P	shrub	#	*Rhagodia eremaea*							+
		P	shrub		*Rhagodia latifolia* subsp. *latifolia*						+	
		P	shrub	#	*Rhagodia latifolia* var. ?*recta*						+	
		P	shrub		*Rhagodia preissii* subsp. *obovata*					+	+	
	+	A	herb		*Salsola tragus*							+
		P	herb	#	*Sclerolaena convexula*					+	+	
		P	herb		*Sclerolaena uniflora*					+	+	
		P	herb	#	*Threlkeldia diffusa*							+
AMARANTHACEAE		A	herb	#	*Alternanthera nodiflora*							+
		A/P	herb/shrub		*Alternanthera* sp.							
		A	herb	#	*Amaranthus mitchellii*				+	+		
	+	A	herb		*Amaranthus pallidiflorus*				+	+		
		A/P	herb/shrub		*Amaranthus* sp. Barrow Island D200(R. Buckley 6884)							
		A	herb		*Amaranthus* sp.							
		A	herb	#	*Gomphrena sordida*					+		
		P	herb	#	*Hemichroa diandra*							+
	+	P	herb/shrub	#	*Ptilotus clementii*				+	+		
		A	herb	#	*Ptilotus exaltatus*							+
		A	herb	#	*Ptilotus exaltatus* var. *exaltatus*							+
		A/P	herb	#	*Ptilotus fusiformis*				+	+		
	+	A/P	herb		*Ptilotus fusiformis* var. *fusiformis*				+	+		

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
AMARANTHACEAE	+	A	herb		*Ptilotus gomphrenoides* var. *gomphrenoides*							+
		P	shrub		*Ptilotus obovatus* (adherent prostrate form on island)			+				+
	+	P	shrub		*Ptilotus obovatus* var. *obovatus*							+
		A/P	herb		*Ptilotus villosiflorus*					+	+	
NYCTAGINACEAE		P	herb/shrub	#	*Boerhavia burbidgeana*				+	+		
		A/P	herb	#	*Boerhavia coccinea*							+
	+	P	herb	#	*Boerhavia gardneri*				+	+		
		A/P	herb	#	*Boerhavia* aff. *repleta*					+		
		P	herb	#	*Boerhavia schomburgkiana*							+
		P	herb		*Boerhavia* sp.							+
		P	shrub		*Commicarpus australis*							+
GYROSTEMONACEAE	+	P	shrub/tree	#	*Codonocarpus cotinifolius*							+
AIZIOACEAE		P	herb		*Sesuvium portulacastrum*							+
PORTULACACEAE		A	herb		*Calandrinia balonensis*							+
	+	A	herb	#	*Calandrinia polyandra*					+	+	
		A	herb	#	*Calandrinia* aff. *polyandra*					+	+	
		A	herb		*Calandrinia* ?aff. *remota*			+				
		A	herb		*Calandrinia* sp.							
		A	herb	#	*Portulaca australis*							

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
PORTULACACEAE		A/P	herb		*Portulaca intraterranea*					+		
		A	herb	#	*Portulaca oleracea*							+
		A	herb	#	*Portulaca pilosa*							+
		A	herb		*Portulaca pilosa* (Boodie Island)					+		
CARYOPHYLLACEAE	+	P	herb	#	*Polycarpaea longiflora*				+	+		
MENISPERMACEAE		P	climber	#	*Tinospora smilacina*				+	+		
LAURACEAE		P	climber	#	*Cassytha capillaris*				+	+		
CAPPARACEAE		P	shrub/climber	#	*Capparis lasiantha*				+	+		
		P	shrub	#	*Capparis spinosa*							+
	+	P	shrub	#	*Capparis spinosa* var. *nummularia*							+
		P	shrub/tree	#	*Capparis umbonata*				+	+		
	+	A/P	herb	#	*Cleome viscosa*							+
BRASSICACEAE		P	shrub	#	*Lepidium platypetalum*					+	+	
PITTOSPORACEAE	+	P	shrub/tree		*Pittosporum phylliraeoides*					+	+	
SURIANACEAE	+	P	shrub		*Stylobasium spathulatum*							+

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
MIMOSACEAE	+	P	shrub		*Acacia bivenosa*				+			
		P	shrub		*Acacia bivenosa* (elongate phyllode form)			+				
		P	shrub		*Acacia bivenosa* (Airlie Island variant)			+				
		P	shrub		*Acacia bivenosa* (semiprostrate form)			+				
		P	shrub/tree		*Acacia coriacea*				+	+		
	+	P	shrub/tree		*Acacia coriacea* subsp. *coriacea*				+	+		
		P	shrub/tree	#	*Acacia coriacea* subsp. *pendens*				+			
		P	shrub/tree	#	*Acacia cowleana*				+			
		P	shrub/tree		*Acacia grasbyi*					+	+	
	+	P	shrub	#	*Acacia gregorii*				+			
		P	shrub/tree	#	*Acacia inaequilatera*				+			
	+	P	shrub	#	*Acacia pyrifolia*				+	+		
		P	shrub/tree	#	*Acacia synchronicia*							+
CAESALPINACEAE	+	P	shrub	#	*Petalostylis labicheoides*					+	+	
		P	shrub	#	*Senna artemisioides*							+
		P	shrub	#	*Senna artemisioides* subsp. *oligophylla*							+
		P	shrub	#	*Senna glutinosa* subsp. *glutinosa*				+	+		
	+	P	shrub	#	*Senna glutinosa* subsp. *pruinosa*				+	+		
	?	P	shrub	#	*Senna notabilis*				+	+		
		P	shrub	#	*Senna planitiicola*				+		+	
		P	shrub	#	*Senna venusta*				+	+		

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PAPILIONACEAE		P	climber	#	*Canavalia rosea*				+	+		
		P	shrub	#	*Crotalaria cunninghamii*				+	+		
		A/P	herb/shrub	#	*Crotalaria medicaginea*				+	+		
		P	shrub	#	*Crotalaria novae-hollandiae*				+	+		
		P	shrub	#	*Cullen lachnostachys*					+		
		P	shrub	#	*Cullen leucanthum*							+
		P	herb	#	*Cullen pallidum*					+		
		P	herb	#	*Cullen* aff. *pallidum*					+		
		A/P	herb	#	*Cullen patens*					+	+	
	+	P	herb/shrub	#	*Cullen pustulatum*				+	+		
		P	tree	#	*Erythrina vespertilio*							+
		P	herb/shrub	#	*Indigofera boviperda*					+	+	
		A/P	herb	#	*Indigofera colutea*							+
		A/P	herb	#	*Indigofera linifolia*				+	+		
		P	herb	#	*Indigofera linnaei*				+	+		
	+	P	shrub	#	*Indigofera monophylla*				+	+		
		A/P	herb	#	*Indigofera trita*				+	+		
		A/P	herb/shrub		*Indigofera* sp.							
		P	shrub	#	*Isotropis atropurpurea*				+	+		
		A/P	herb	#	*Lotus australis*							+
		A	herb		*Lotus cruentus*					+	+	
	+	P	climber	#	*Rhynchosia minima*				+	+		
		A/P	herb/shrub	#	*Sesbania cannabina*				+	+		

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PAPILIONACEAE		A	herb	#	*Swainsona formosa*					+	+	
		A/P	herb	#	*Swainsona kingii*							+
		P	herb	#	*Swainsona pterostylis*					+	+	
	+	A	herb		*Tephrosia clementii*					+		
		P	shrub	#	*Tephrosia rosea*				+	+		
	+	P	shrub	#	*Tephrosia rosea* var. *clementii*				+	+		
		P	shrub	#	*Tephrosia rosea* var. *glabrior* (ms)				+	+		
		A/P	herb/shrub		*Tephrosia* sp.							
		A/P	herb/shrub/tree		Papilionaceae sp.							
ZYGOPHYLLACEAE		P	herb	#	*Tribulus cistoides*				+	+		
		P	herb		*Tribulus hirsutus*				+	+		
		P	herb	#	*Tribulus occidentalis*							+
	+	A	herb	#	*Tribulus terrestris*							+
POLYGALACEAE		A	herb	#	*Polygala isingii*					+	+	
EUPHORBIACEAE	+	P	shrub	#	*Adriana tomentosa* var. *tomentosa*				+	+		
	+	A/P	herb	#	*Euphorbia australis*							+
	+	A/P	herb/shrub	#	*Euphorbia coghlanii*				+	+		
	+	P	herb		*Euphorbia drummondii* subsp. *drummondii*							+
		P	herb		*Euphorbia* aff. *drummondii* (Boodie Island)			+				
	+	A	herb	#	*Euphorbia myrtoides*							+

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EUPHORBIACEAE		A/P	herb/shrub		*Euphorbia tannensis* subsp. *eremophila*							+
		A/P	herb/shrub/tree		*Euphorbia* sp.							
		A/P	herb/shrub/tree		*Euphorbia* sp. A				+			
		P	shrub/tree	#	*Flueggea virosa* subsp. *melanthesiodes*				+	+		
		P	shrub/tree		*Mallotus dispersus*				+			
	+	P	shrub/tree	#	*Mallotus nesophilus*				+	+		
	+	A/P	herb/shrub	#	*Phyllanthus maderaspatensis*					+	+	
STACKHOUSIACEAE	?	A/P	herb		*Stackhousia muricata*					+	+	
SAPINDACEAE		P	shrub/tree		*Alectryon oleifolius* subsp. *oleifolius*					+		
	+	P	shrub	#	*Diplopeltis eriocarpa*					+		
		P	shrub	#	*Diplopeltis intermedia* var. *?intermedia*					+	+	
		P	shrub		*Diplopeltis* sp.							
	+	P	shrub	#	*Dodonaea lanceolata*							+
		P	shrub	#	*Dodonaea lanceolata* var. *lanceolata*				+	+		
RHAMNACEAE		P	tree	#	*Ventilago viminalis*				+	+		
TILIACEAE	+	P	shrub	#	*Corchorus congener*					+		
	+	P	shrub	#	*Corchorus ?congener*					+		
	+	P	shrub	#	*Corchorus interstans* (ms)	P3				+		
		A	herb	#	*Corchorus tridens*				+	+		
		P	shrub	#	*Corchorus walcottii*				+	+		
		P	shrub		*Corchorus ?walcottii*							+

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TILIACEAE		A/P	herb/shrub		*Corchorus* sp.			+				
		A/P	herb/shrub		*Corchorus* sp. Barrow 1			+				
		A/P	herb/shrub		*Corchorus* sp. Barrow 2			+				
	?	P	shrub	#	*Triumfetta appendiculata*					+		
		P	shrub		*Triumfetta* aff. *appendiculata*					+		
		P	shrub		*Triumfetta chaetocarpa*					+		
	+	P	shrub	#	*Triumfetta clementii*					+		
	?	P	shrub	#	*Triumfetta maconochieana*					+		
		P	shrub	#	*Triumfetta ramosa*					+		
		P	shrub	#	*Triumfetta* aff. *ramosa*					+		
		A/P	herb/shrub		*Triumfetta* sp.							
MALVACEAE	?	P	herb/shrub		*Abutilon cunninghamii*				+			
		P	shrub	#	*Abutilon indicum* var. *australiense*				+			
		P	shrub	#	*Abutilon leucopetalum*				+	+		
		P	shrub	#	*Abutilon otocarpum*				+	+		
		A/P	herb/shrub		*Abutilon* sp.(VL-2706-09)			+				
		A/P	herb/shrub		*Abutilon* sp.							
		P	shrub	#	*Gossypium australe*				+	+		
	+	P	shrub	#	*Gossypium robinsonii*				+	+		
		A/P	herb	#	*Herissantia crispa*				+			
		P	shrub	#	*Hibiscus burtonii*					+		
		P	herb/shrub	#	*Hibiscus coatesii*				+	+		

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MALVACEAE		P	shrub	#	*Hibiscus sturtii*							+
		P	shrub	#	*Hibiscus sturtii* var. *campylochlamys*				+	+		
		P	shrub	#	*Hibiscus sturtii* var. *platychlamys*					+		
		A/P	herb/shrub		*Hibiscus* sp. (EM12013)							
		A/P	herb/shrub		*Hibiscus* sp. (VL-2706-41)							
		P	shrub	#	*Lawrencia viridigrisea*							+
		P	herb/shrub	# *	*Malvastrum americanum*							+
		P	shrub	#	*Sida calyxhymenia*					+	+	
		P	shrub	#	*Sida clementii*					+		
		P	shrub	#	*Sida echinocarpa*					+		
		P	herb/shrub		*Sida fibulifera*							+
		P	herb	#	*Sida spodochroma*				+	+		
		A/P	herb/shrub		*Sida* sp. (VL-2709-14)			+				
		A/P	herb/shrub		*Sida* sp. EM12018							
		A/P	herb/shrub		*Sida* sp. EM20301B							
		A/P	herb/shrub		*Sida* sp.							
STERCULIACEAE	?	P	shrub		*Hannafordia quadrivalvis*					+	+	
	+	P	shrub		*Hannafordia quadrivalvis* subsp. *recurva*							
		P	shrub		*Keraudrenia* sp.							
		P	herb/shrub	#	*Melhania oblongifolia*				+	+		
		P	herb/shrub	#	*Waltheria indica*				+	+		

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ELATINACEAE		A	herb	#		*Bergia pedicellaris*				+	+		
FRANKENIACEAE		P	shrub	#		*Frankenia ambita*				+	+		
	+	P	shrub			*Frankenia pauciflora* var. *pauciflora*							
		P	shrub			*Frankenia* sp.							
VIOLACEAE	+	P	shrub	#		*Hybanthus aurantiacus*				+	+		
PASSIFLORACEAE		P	climber	#	*	*Passiflora foetida* var. *hispida*				+	+		
LYTHRACEAE		A	herb	#		*Ammannia multiflora*				+	+		
RHIZOPHORACEAE		P	tree/shrub	#		*Rhizophora stylosa*				+	+		
MYRTACEAE		P	tree	#		*Eucalyptus camaldulensis*							+
		P	mallee	#		*Eucalyptus gamophylla*					+		
		P	tree	#	*	*Eucalyptus gomphocephala*						+	
		P	tree	#		*Eucalyptus torquata*						+	
		P	tree	#		*Eucalyptus xerothermica* (ms)					+		
	+	P	shrub	#		*Melaleuca cardiophylla*					+	+	
HALORAGACEAE	+	A	herb			*Haloragis gossei*							+

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PRIMULACEAE		P	herb	#	*Samolus repens*							+
PLUMBAGINACEAE		P	herb	#	*Muellerolimon salicorniaceum*							+
		P	shrub	#	*Plumbago zeylanica*				+	+		
OLEACEAE	+	P	climber/shrub		*Jasminum calcarium*							+
		P	climber/shrub	#	*Jasminum didymum*				+	+		
		P	climber/shrub	#	*Jasminum didymum* subsp. *lineare*				+	+		
GENTIACEAE		A	herb		*Centaurium spicatum*							+
ASCLEPIADACEAE	+	P	shrub	#	*Cynanchum floribundum*							+
		P	climber/shrub		*Marsdenia* sp.							
	+	P	shrub		*Sarcostemma viminale* subsp. *australe*							+
		P	climber	#	*Tylophora cinerascens*				+	+		
		P	climber	#	*Tylophora flexuosa*				+	+		
CONVOLVULACEAE	+	P	herb		*Bonamia media* var. *villosa*							
		P	herb		*Convolvulus* sp. (RB7250)							
		P	herb	#	*Evolvulus alsinoides*							+
	?	P	herb	#	*Evolvulus alsinoides* var. *decumbens*							+
	+	P	herb		*Evolvulus alsinoides* var. *villosicalyx*				+	+		
		P	herb	#	*Ipomoea pes-caprae* subsp. *brasiliensis*				+	+		

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CONVOLVULACEAE	+	P	herb	#	*Polymeria ambigua*							+
		P	herb		*Polymeria* sp.							
CUSCUTACEAE		A	herb/climber	#	*Cuscuta australis*						+	
BORAGINACEAE		P	shrub/tree	#	*Cordia subcordata* (Boodie Island)				+	+		
		P	shrub/tree		*Ehretia saligna*							
		A	herb	#	*Heliotropium conocarpum*					+	+	
		A/P	herb	#	*Heliotropium crispatum*					+		
		A	herb	#	*Heliotropium cunninghamii*					+		
	+	P	herb/shrub	#	*Heliotropium glanduliferum*					+		
		A/P	herb	#	*Heliotropium inexplicitum*					+		
		A/P	herb	#	*Heliotropium ovalifolium*				+	+		
		A/P	herb/shrub		*Heliotropium* sp.							
		A/P	herb/shrub		*Heliotropium* sp. (perennial shrub) VL-2104-19, VL-2709-24			+				
		A/P	herb/shrub		*Heliotropium* sp. (RB6866)							
		A/P	herb/shrub		*Heliotropium* sp. (RB7037)							
	+	A/P	herb/shrub		*Trichodesma zeylanicum* var. *zeylanicum*							
AVICENNIACEAE		P	shrub/tree	#	*Avicennia marina* subsp. *marina*					+	+	
LAMIACEAE		P	shrub/tree	#	*Clerodendrum tomentosum* var. *lanceolatum*				+	+		

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SOLANACEAE		P	shrub	#	*Duboisia hopwoodii*							+
		A/P	herb	#	*Nicotiana benthamiana*				+	+		
	+	A/P	herb	#	*Nicotiana occidentalis* subsp. *occidentalis*					+		
		A/P	herb/shrub		*Nicotiania* sp.							
	+	A/P	herb	#	*Solanum cleistogamum*					+	+	
	+	P	shrub	#	*Solanum diversiflorum*				+	+		
		P	herb	#	*Solanum esuriale*							+
	+	P	shrub		*Solanum lasiophyllum*							+
		P	herb/shrub	*	*Solanum nigrum*							+
		A/P	herb/shrub		*Solanum* sp.							
SCROPHULARIACEAE		A	herb	#	*Mimulus gracilis*					+		
		P	herb	#	*Stemodia glabella*				+	+		
		P	herb	#	*Stemodia grossa*							+
BIGNONIACEAE		P	shrub/tree	#	*Dolichandrone heterophylla*				+	+		
PEDALIACEAE		A	herb	#	? *Josephinia eugeniae*							+
ACANTHACEAE		P	herb/shrub	#	*Dicladanthera forrestii*					+		
		P	herb/shrub		*Dicladanthera* sp. (RB6863)							
		P	herb/shrub	#	*Dipteracanthus australasicus*					+		
		P	herb/shrub	#	*Dipteracanthus australasicus* subsp. *corynothecus*					+		

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								Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
MYOPORACEAE		P	shrub	#	*Eremophila forrestii* subsp. *forrestii* (ms)					+	+	
		P	shrub		*Eremophila* sp.							
	+	P	shrub		*Myoporum montanum*							
RUBIACEAE	+	A	herb	#	*Oldenlandia crouchiana*				+	+		
		A	herb	#	*Oldenlandia galioides*				+	+		
		A/P	herb	#	*Synaptantha tillaeacea* var. *tillaeacea*							+
CUCURBITACEAE		P	herb/climber	#	*Mukia maderaspatana*							+
CAMPANULACEAE		A/P	herb		*Wahlenbergia* sp.							
GOODENIACEAE		A	herb	#	*Goodenia microptera*				+	+		
		A	herb		*Goodenia* sp.							
		P	shrub	#	*Lechenaultia* sp. VL-BW103-13			+				
		P	herb	#	*Scaevola* cf. *aemula*						+	
		P	shrub	#	*Scaevola amblyanthera* var. *amblyanthera*				+	+		
		P	shrub	#	*Scaevola amblyanthera* var. *centralis*							+
		P	shrub		*Scaevola* ?*anchusifolia*							
		P	shrub		*Scaevola crassifolia*							+
	+	P	herb/shrub	#	*Scaevola cunninghamii*					+		
		P	shrub	#	*Scaevola sericophylla*					+	+	
	+	P	shrub	#	*Scaevola spinescens*							+

ATTACHMENT A: LIST OF VASCULAR PLANT SPECIES RECORDED ON BARROW ISLAND

NB: A = Annual, P = Perennial, # = Western Australian Herbarium collections, * denotes introduced (weed) species, SCC = State Conservation Code, FCC = Federal Conservation Code, R = restricted taxon or taxon requiring more investigation on Barrow Island, B-K = Barrow Island to the Kimberly, B-P = Barrow Island to the Pilbara, B-S = Barrow Island to the south, W = widespread, 03/04 = recorded in current survey

									Distribution			
Family	**03/04**	**A/P**	**Life Form**			**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
GOODENIACEAE		P	herb/shrub			*Scaevola* sp.VL-2104-26			+				
		P	herb/shrub			*Scaevola* sp.							
ASTERACEAE		A	herb	#	*	*Arctotheca calendula*						+	
		A	herb	#		*Centipeda minima*				+	+		
		A	herb		*	*Conyza sumatrensis*							+
		A	herb	#		*Flaveria australasica*				+	+		
		A	herb	#		*Helichrysum oligochaetum*	P1				+		
		P	herb	#		*Launaea sarmentosa*				+	+		
	+	P	shrub	#		*Olearia dampieri* subsp. *dampieri* (ms)					+	+	
	+	P	herb/shrub	#		*Pentalepis trichodesmoides*				+	+		
	+	P	herb/shrub	#		*Pluchea dentex*					+	+	
		P	shrub			*Pluchea dunlopii*					+		
		P	shrub			*Pluchea ferdinandi-muelleri*				+	+		
	+	P	herb/shrub	#		*Pluchea rubelliflora*							+
		P	herb/shrub	#		*Pluchea tetranthera*				+	+		
		P	herb/shrub			*Pluchea* sp.							
		A	herb		*	*Pseudognaphalium luteoalbum*							+
	+	P	herb/shrub	#		*Pterocaulon sphacelatum*				+	+		
	+	P	herb/shrub	#		*Pterocaulon sphaeranthoides*				+	+		
		A	herb		*	*Sonchus oleraceus*							+
		A	herb	#		*Streptoglossa adscendens*					+		
	+	P	herb	#		*Streptoglossa bubakii*				+	+		

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NB: A = Annual, P = Perennial, # = Western Australian Herbarium collections, * denotes introduced (weed) species, SCC = State Conservation Code, FCC = Federal Conservation Code, R = restricted taxon or taxon requiring more investigation on Barrow Island, B-K = Barrow Island to the Kimberly, B-P = Barrow Island to the Pilbara, B-S = Barrow Island to the south, W = widespread, 03/04 = recorded in current survey

									Distribution			
Family	**03/04**	**A/P**	**Life Form**		**Species**	**SCC**	**FCC**	**R**	**B-K**	**B-P**	**B-S**	**W**
ASTERACEAE	+	P	herb/shrub	#	*Streptoglossa decurrens*				+	+		
		P	herb/shrub	#	*Streptoglossa macrocephala*				+	+		
		A	herb	#	*Vittadinia arida*					+		
	+	A	herb	#	*Vittadinia hispidula* var. *setosa*					+		
		A	herb	#	*Vittadinia obovata*				+	+		
		A/P	herb/shrub		*Vittadinia* sp.							
		A/P	herb/shrub		Asteraceae sp.							
		A/P	herb/shrub		Asteraceae sp. 2							

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ATTACHMENT B: VEGETATION COMMUNITY DESCRIPTIONS FOR PROPOSED PIPELINE ROUTES AND PROPOSED GAS PROCESSING FACILITY AND WIDER STUDY AREA 2003, 2004

Note: GPW - recorded in proposed gas processing facility area and wider study area
NW - recorded on North Whites Beach Pipeline route
GF - recorded on proposed feed gas pipeline
C0 - recorded on proposed $C0_2$ reinjection pipeline

Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
C1a	Open Grassland of *Spinifex longifolius* with low scattered *Atriplex isatidea, Myoporum montanum, Euphorbia myrtoides* and *Salsola tragus* shrubs and herbs on seaward face of white sandy foredunes.	NW/GPW
C1d	Low Open Shrubland of *Scaevola cunninghamii, Corchorus* sp. and *Heliotropium glanduliferum* over Very Open Grassland of *Spinifex longifolius* over scattered *Cynanchum floribundum* creeper on lower slopes at the base of primary sand dunes.	GF
C1e	Grassland of *Spinifex longifolius* over Low Open Shrubland of *Threlkeldia diffusa* with scattered *Rhagodia preissii* subsp. *obovata* and *Frankenia pauciflora* var. *pauciflora* on ridges and back slopes of white sandy foredunes.	NW
C2a	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune swales, slopes and ridges.	GPW
C2b	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Acacia bivenosa* and *Pentalepis trichodesmoides* with scattered *Acanthocarpus verticillatus* over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on red/brown sandy flats.	GPW
C2c	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune slopes and ridges.	GPW
C2d	Low Open Shrubland of *Acacia coriacea* and *Myoporum montanum* over Grassland to Hummock Grassland of *Spinifex longifolius* with patches of *Triodia epactia* in swales between dunes.	NW
C2e	Low Open Shrubland of *Myoporum montanum* with *Corchorus* sp. over Grassland to Hummock Grassland of *Spinifex longifolius* with *Triodia angusta* over scattered *Cynanchum floribundum* creeper on crest of primary dunes.	GF
C2f	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* and *Acacia bivenosa* with occasional *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on sandy dune ridges (over scattered *Heliotropium glanduliferum* and *Diplopeltis eriocarpa* on back of red/brown sandy flats and dunes).	NW/C0
C2g	Shrubland of *Acacia coriacea* over Low Shrubland to Shrubland of *Olearia dampieri* subsp. *dampieri, Stylobasium spathulatum* and *Acacia bivenosa* over Hummock Grassland of *Triodia epactia* over low scattered *Threlkeldia diffusa* herbs in swales between dunes.	NW
C2h	Low Shrubland of *Acacia coriacea* with *Rhagodia preissii* subsp. obovata over Very Open Herbland of *Threlkeldia diffusa* over Grassland to Hummock Grassland of *Triodia epactia* and *Spinifex longifolius* on secondary dune slopes and ridges.	NW
C3a	Open Heath of *Acacia bivenosa* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* with low scattered *Myoporum montanum* and *Enchylaena tomentosa* var. *tomentosa* shrubs over Open Hummock Grassland of *Triodia epactia* on red/brown sandy flats behind dunes.	NW

ATTACHMENT B: VEGETATION COMMUNITY DESCRIPTIONS FOR PROPOSED PIPELINE ROUTES AND PROPOSED GAS PROCESSING FACILITY AND WIDER STUDY AREA 2003, 2004

Note: GPW - recorded in proposed gas processing facility area and wider study area
NW - recorded on North Whites Beach Pipeline route
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C0 - recorded on proposed $C0_2$ reinjection pipeline

Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
C4e	Open Shrubland of *Trichodesma zeylanicum* over Low Open Shrubland of *Corchorus* sp., *Olearia dampieri* subsp. *dampieri, Scaevola cunninghamii* and *Whiteochloa airoides* over Open Hummock Grassland of *Triodia angusta* over *Cynanchum floribundum* scattered creepers on upper slope to mid slopes of sandy dunes.	GF
C5a	Low scattered *Frankenia pauciflora* var. *pauciflora* shrubs with scattered *Oldenlandia crouchiana* herbs and *Cyperus cunninghamii* subsp. *cunninghamii* sedges on coastal limestone cliffs and in major drainage lines in coastal areas.	GPW
C5b	Scattered low *Pentalepis trichodesmoides, Olearia dampieri* subsp. *dampieri, Corchorus* sp. and *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia angusta* over scattered *Cynanchum floribundum* creepers on limestone ridges and flats (plateaus).	GF
C5c	Very Open Hummock Grassland of *Triodia angusta* over low scattered *Scaevola cunninghamii, Corchorus* sp., *Frankenia pauciflora* var. *pauciflora* and *Heliotropium glanduliferum* scattered herbs and shrubs on lower slopes on limestone.	GF
C5d	Low Open Shrubland of *Myoporum montanum* over Very Open Grassland of *Spinifex longifolius* with scattered Hummocks of *Triodia epactia* over Low Open Shrubland of *Frankenia pauciflora* var. *pauciflora* with scattered *Heliotropium glanduliferum* on flat sandy swales with occasional limestone outcropping behind primary dunes.	NW
D1a	Scattered tall *Acacia coriacea* shrubs over Low Shrubland to Shrubland of *Stylobasium spathulatum* and *Acacia bivenosa* over Very Open Herbland of *Acanthocarpus verticillatus* over Closed Hummock Grassland of *Triodia angusta* with scattered *Triodia wiseana* on valley floors and deep gullies. This unit contains occasional *Hakea lorea* subsp. *lorea.* Unit also contains areas of scoured drainage channel in areas of heavy seasonal flow.	GPW
D1c	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* at edges in major drainage lines.	C0
D1d	Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with patchy *Triodia angusta* and *Triodia wiseana* on lower slopes and broad drainage flats.	C0
D1e	Open Shrubland of *Stylobasium spathulatum, Pentalepis trichodesmoides with Trichodesma zeylanicum* over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over Low Open Shrubland of *Acacia bivenosa* and *Acacia gregorii* in some locations on lower slopes, drainage flats and wide drainage lines.	GF/C0
D1f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in major drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea.*	C0
D1g	Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over low scattered *Tephrosia rosea* and *Indigofera monophylla* shrubs in wide drainage lines.	GF
D2c	Tall scattered *Trichodesma zeylanicum* shrubs over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* in disturbed drainage lines.	GF
D2d	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* over Low Shrubland of *Acacia gregorii* in minor creek and drainage lines.	C0
D2f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides, Acacia gregorii and Acacia bivenosa* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in minor drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea.*	C0/GF

ATTACHMENT B: VEGETATION COMMUNITY DESCRIPTIONS FOR PROPOSED PIPELINE ROUTES AND PROPOSED GAS PROCESSING FACILITY AND WIDER STUDY AREA 2003, 2004

Note: GPW - recorded in proposed gas processing facility area and wider study area
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Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
F4a	Low Open Woodland of *Erythrina vespertilio* over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with occasionally emergent *Ficus brachypoda* on flats with shallow red/brown sands and emergent limestone.	C0
F5a	Low Open Shrubland of *Stylobasium spathulatum* with scattered *Pentalepis trichodesmoides* and *Senna glutinosa* over Hummock Grassland of *Triodia angusta* with *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on gentle low slopes and flats.	C0
F5b	Scattered low *Ficus brachypoda* trees over scattered low *Pentalepis trichodesmoides, Acacia bivenosa*, *Corchorus* sp. , *Tephrosia rosea* and *Streptoglossa decurrens* shrubs over Closed Hummock Grassland of *Triodia epactia* with *Triodia angusta* on flats.	C0
F5c	Low Open Shrubland of *Pentalepis trichodesmoides* over mixed Hummock Grassland of *Triodia epactia* with occasional *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Acacia gregorii* on limestone ridges, slopes and flats.	C0
F5d	Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* over scattered low *Corchorus* sp., *Scaevola cunninghamii* and *Heliotropium glanduliferum* herbs and shrubs on upper slopes and mid slopes of small limestone rises.	C0
F5e	Low scattered *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Open Hummock Grassland of *Triodia angusta* with *Triodia epactia* over low scattered *Scaevola cunninghamii, Diplopeltis eriocarpa* and *Acacia bivenosa* shrubs on limestone flats and rises with shallow pale pink sands.	C0
F6a	Low Open Shrubland of *Acacia bivenosa* and *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on red/brown sandy flats.	NW
F6b	Low scattered *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with on sandy slopes and flats with occasional limestone outcropping.	NW
F6c	Tall Open Shrubland of *Acacia coriacea* over low scattered *Stylobasium spathulatum* shrubs over Open Hummock Grassland of *Triodia epactia* on light red/brown sandy flats.	C0
F6d	Open Shrubland of *Trichodesma zeylanicum* over low scattered *Pterocaulon sphacelatum* shrubs over Hummock Grassland of *Triodia epactia* on limestone flats with shallow sands.	C0
F7a	Low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum shrubs* over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.	C0
F7b	Scattered low Ficus brachypoda trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on sandy flats.	C0
F7c	Open Shrubland of *Senna glutinosa* over Low Open Shrubland of *Pentalepis trichodesmoides* and *Tephrosea rosea* over Closed Hummock Grassland of *Triodia angusta* on red/brown sandy flats.	C0
F7d	Scattered *Hakea lorea* subsp. *lorea* shrubs over Low Scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* on mid slopes and flats.	C0
F7e	Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Corchorus* sp. and *Sarcostemma viminale* subsp. *australe* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats (with pockets of *Ericahne mucronata* on valley floors).	NW/C0

ATTACHMENT B: VEGETATION COMMUNITY DESCRIPTIONS FOR PROPOSED PIPELINE ROUTES AND PROPOSED GAS PROCESSING FACILITY AND WIDER STUDY AREA 2003, 2004

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Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
F8a	Low Open Shrubland to Open Shrubland of *Acacia bivenosa,* with occasional scattered *Pentalepis trichodesmoides, Stylobasium spathulatum* and *Acanthocarpus verticillatus* shrubs over Hummock Grassland to Closed Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* on flats and valley floors.	GPW
F8b	Scattered *Hakea lorea* subsp. *lorea* tall shrubs over Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats.	GPW
L1a	Scattered low *Ficus brachypoda and Pittosporum phylliraeoides* trees over low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* with occasional *Cymbopogon ambiguus, Tephrosia rosea* and *Triodia angusta* on limestone ridges and upper slopes.	C0
L1b	Scattered low *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes and ridges.	GF
L1c	Low scattered *Ficus brachypoda* over Low Open Shrubland of *Acacia bivenosa* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* and occasional *Triodia wiseana* on limestone slopes and ridges.	C0
L1d	Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Heliotropium glanduliferum* on limestone flats (plateau).	GF
L1e	Low scattered *Ficus brachypoda* and *Pittosporum phylliraeoides* trees (with *Mallotus nesophilus*) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Diplotepltis eriocarpa* shrubs on limestone slopes and flats.	NW
L1f	Low scattered *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over Hummock Grassland of *Triodia wiseana* and patchy *Triodia angusta* on limestone slopes and ridges.	NW
L3a	Low Open Shrubland of *Stylobasium spathulatum* with *Petalostylis labicheoides* over Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* over Low Open Shrubland of *Acacia gregorii* on limestone slopes and ridges.	GF/GPW
L3b	Scattered low *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* with *Triodia epactia* over low scattered *Acacia gregorii* and *Diplopeltis eriocarpa* shrubs on limestone slopes and ridges.	C0/NW
L3c	Scattered low *Diplopeltis eriocarpa* shrubs with scattered *Triodia epactia*, *Cymbopogon ambiguus* and *Cyperus cunninghamii* subsp. *cunninghamii* herbs and grasses on small exposed limestone flats.	NW
L3d	Scattered low S*tylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Low Open Shrubland of *Diplopeltis eriocarpa*, *Acacia gregorii* and *Hannafordia quadrivalvis* subsp. *recurva* over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* on limestone ridges.	GF
L3e	Low scattered *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over mixed Hummock Grassland of *Triodia wiseana, Triodia angusta* and *Triodia epactia* over low scattered *Diplopeltis eriocarpa* shrubs on slopes and ridges.	C0
L3f	Low scattered *Petalostylis labicheoides* and *Indigofera monophylla* shrubs over Hummock Grassland of *Triodia wiseana* on limestone ridges and upper slopes.	GPW
L3g	Low Open Shrubland of *Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* and *Cymbopogon ambiguus* over Low Open Shrubland of *Diplopeltis eriocarpa* on limestone hillslopes.	C0
L3h	Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* over low scattered *Diplopeltis eriocarpa* shrubs on limestone ridges and flats.	GPW

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Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
L3i	Low Open Shrubland to Low Shrubland of *Acacia bivenosa* with occasional low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock grassland of *Triodia angusta* with occasional *Triodia wiseana* on limestone slopes, small rises and flats.	GPW
L4a	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Acacia bivenosa* with scattered *Petalostylis labicheoides and Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* on limestone ridges and midslopes with patches of *Triodia angusta* . This unit contains occasional *Hakea lorea* subsp. *lorea.*	C0/GF/GPW
L5a	Scattered *Hakea lorea* subsp. *lorea* tall shrubs over low scattered *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over low scattered *Acacia gregorii* and *Corchorus interstans* shrubs on limestone ridges.	GPW
L5b	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy midslopes.	C0
L6a	Low Open Shrubland of *Grevillea pyramidalis* subsp. ?*leucadendron* and *Acacia bivenosa* over Hummock Grassland of *Triodia angusta* low scattered *Acacia gregorii, Scaevola cunninghamii* and *Heliotropium glanduliferum* shrubs and herbs on limestone midslopes.	GPW
L6b	Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Grevillea pyramidalis* ?subsp. *leucadendron* with occasional *Pentalepis trichodesmoides, Trichodesma zeylanicum* with scattered *Acacia gregorii* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* and *Eriachne* sp. over Low Open Shrubland of *Acacia gregorii* on upper slopes and midslopes of small rises.	NW
L6c	Low Open Shrubland of *Pentalepis trichodesmoides* with *Grevillea pyramidalis* ?subsp. *leucadendron* (*Grevillea* only in eastern section of community) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on mid to upper slopes with red/brown sands and occasional limestone outcropping on rocky rises and slopes.	NW
L6d	Low Open Shrubland of *Pentalepis trichodesmoides* with *Indigofera monophylla* and scattered *Grevillea pyramidalis* ?subsp. *leucadendron* over Hummock Grassland of *Triodia epactia* in minor drainage lines.	NW
L7a	Low Shrubland of *Melaleuca cardiophylla, Stylobasium spathulatum, Pentalepis trichodesmoides, Trichodesma zeylanicum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* over Low Open Shrubland of *Acacia gregorii, Acacia bivenosa* shrubs on rocky limestone ridges, slopes and minor gullies, with occasional pockets of *Gossypium robinsonii.*	GF/C0/GPW
L7b	Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over low scattered shrubs to Low Open Shrubland of *Acacia gregorii* on limestone upper slopes and ridges.	GPW
L9a	Low Open Woodland of *Ficus brachypoda* over low scattered *Pentalepis trichodesmoides* and *Sarcostemma viminale* subsp. *australe* shrubs over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on coastal limestone flats.	GPW
S1a	Grassland of ?*Eriachne flaccida* over scattered low *Pluchea dunlopii* and *Streptoglossa decurrens* herbs and shrubs on clay pans. (Community contains scattered emergent *Acacia bivenosa* and *Stylobasium spathulatum* shrubs and *Triodia angusta* at edges).	C0
V1a	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* shrubs on limestone midslopes and occasional small rises. This unit contains some areas of disturbance by fauna.	GPW/GF

ATTACHMENT B: VEGETATION COMMUNITY DESCRIPTIONS FOR PROPOSED PIPELINE ROUTES AND PROPOSED GAS PROCESSING FACILITY AND WIDER STUDY AREA 2003, 2004

Note: GPW - recorded in proposed gas processing facility area and wider study area
NW - recorded on North Whites Beach Pipeline route
GF - recorded on proposed feed gas pipeline
C0 - recorded on proposed $C0_2$ reinjection pipeline

Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Pipeline
V1b	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* and some *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* on red/brown sandy flats.	C0/W
V1c	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over scattered low *Petalostylis labicheoides*, *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana, Triodia epactia* and *Cymbopogon ambiguus* on limestone slopes and ridges, with *Stylobasium spathulatum* at edges on red/brown sandy drainage flats.	NW/GF/C0/GPW
V1d	Low Open Shrubland of *Acacia bivenosa* with low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on limestone slopes and low ridges with occasional *Melaleuca cardiophylla.*	GPW
V1f	Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* on red/brown sandy flats.	C0
V1g	Scattered tall *Acacia pyrifolia* shrubs over low scattered *Petalostylis labicheoides, Acacia bivenosa* and *Acacia gregorii* shrubs over Hummock Grassland of *Triodia wiseana* with some *Triodia angusta* and *Cymbopogon ambiguus* on red/brown sandy midslopes and in minor drainage lines with occasional outcropping.	C0/GF
V1h	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum, Petalostylis labicheoides* and *Acacia bivenosa* over Closed Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* on limestone slopes. This unit contains occasional *Hakea lorea* subsp. *lorea.*	GF/C0
V1i	Hummock Grassland of *Triodia epactia* with occasional *Triodia wiseana* over Low Open Shrubland *Acacia gregorii* with *Diplopeltis eriocarpa* on gentle slopes and flats.	NW
V1j	Low scattered Pentalepis trichodesmoides shrubs over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.	C0
V1k	Scattered *Hakea lorea* subsp. *lorea* shrubs over Low Open Shrubland to Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Acacia gregorii* shrubs on limestone hillslopes and minor drainage lines.	C0/GF/GPW
V1m	Low Open Heath of *Melaleuca cardiophylla* with *Acacia bivenosa, Sarcostemma viminale* subsp. *australe* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* on limestone ridges and slopes.	GF/GPW
V1n	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered shrubs to Low Open Shrubland of *Melaleuca cardiophylla* with *Acacia bivenosa, Stylobasium spathulatum* and *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia angusta* on flats and edge of drainage lines.	GPW
V3a	Scattered low *Ficus brachypoda* trees over scattered *Acacia pyrifolia* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes. This community contains minor drainage lines.	GF/GPW
V3b	Scattered *Acacia pyrifolia* shrubs with occasional *Hakea lorea* subsp. *lorea* over low scattered shrubs to Low Open Shrubland of *Petalostylis labicheoides and Stylobasium spathulatum*, occasional *Acacia bivenosa* and *Acacia gregorii* over Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on limestone slopes.	GPW/GF/C0

Attachment C: Comparison of Vegetation Mapping Units and Area of Representation on Barrow Island

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
Marine	**M1**	Aquatic Complex supporting stands of *Avicennia marina* and *Ruppia maritima* on the fringes of the island.			Total of Mattiske mapping unit 24.67ha		-	-	-	-		
Tidal	**T1**	Halophytic Complex dominated by *Halosarcia halocnemoides* and *Halosarcia indica* on tidal flats.			Total of Mattiske mapping unit 12.21ha		-	-	-	-		
	T2	Mixed Chenopod and Halophytic Complex with low *Frankenia pauciflora* shrubs on high tide areas usually associated with stands of *Avicennia marina*			Total of Mattiske mapping unit 4.39ha		-	-	-	-		
Coastal Complex and Dune System	**C1**	Coastal Complex dominated by *Spinifex longifolius* on white foredunes; including Coastal Complex of *Ipomoea pes-caprae* subsp. *brasiliensis* and *Spinifex longifolius*.			Total of Mattiske mapping unit 253.78ha	Total of Subunits (below) = 5.61ha (2.2%)	-	-	-	Total of Subunits (below) = 0.58ha (0.23%)		
			C1a	Open Grassland of *Spinifex longifolius* with low scattered *Atriplex isatidea, Myoporum montanum, Euphorbia myrtoides* and *Salsola tragus* shrubs and herbs on seaward face of white sandy foredunes.		5.61	-	-	-	0.12	**AC1a**	Open Grassland of *Spinifex longifolius* (10-30%) on the seaward facing foredunes.

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C1d	Low Open Shrubland of *Scaevola cunninghamii, Corchorus* sp. and *Heliotropium glanduliferum* over Very Open Grassland of *Spinifex longifolius* over scattered *Cynanchum floribundum* creeper on lower slopes at the base of primary sand dunes.		-	-	Outside corridor	-	-		
			C1e	Grassland of *Spinifex longifolius* over Low Open Shrubland of *Threlkeldia diffusa* with scattered *Rhagodia preissii* subsp. *obovata* and *Frankenia pauciflora* var. *pauciflora* on ridges and back slopes of white sandy foredunes.		-	-	-	-	0.46		
	C2	Open Scrub of *Acacia coriacea - Rhagodia preissii* subsp. o*bovata - Olearia dampieri* subsp. *dampieri* on elevated dunes on fringes of island.			Total of Mattiske mapping unit 535.31ha	Total of Subunits (below) = 84.78ha (15.8%)	Total of Subunits (below) = 0.20ha (0.04%)	-	Total of Subunits (below) = 0.97ha (0.18%)	Total of Subunits (below) = 3.18ha (0.59%)		
			C2a	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune swales, slopes and ridges.		53.46	0.2	-	-	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C2b	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Acacia bivenosa* and *Pentalepis trichodesmoides* with scattered *Acanthocarpus verticillatus* over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on red/brown sandy flats.		31.04	0.00	-	-	-	**AC2b**	Tall Shrubland (10-30%; >2m) of *Acacia coriacea* over Shrubland (10-30%; 11.5m) of *Acacia bivenosa* with *Olearia damperi* subsp. *dampieri* over Low Shrubland (10-15%; <1m) of *Acanthocarpus verticillatus* over Hummock Grassland (30-70%) of *Triodia angusta* on hind dunes.
			C2c	Shrubland to Tall Shrubland of *Acacia coriacea* over Low Open Shrubland to Open Shrubland of *Acacia bivenosa* with low scattered *Olearia dampieri* subsp. *dampieri* shrubs over Open Hummock Grassland to Grassland of *Triodia angusta* on dune slopes and ridges.		0.28	-	-	-	-		
			C2d	Low Open Shrubland of *Acacia coriacea* and *Myoporum montanum* over Grassland to Hummock Grassland of *Spinifex longifolius* with patches of *Triodia epactia* in swales between dunes.		-	-	-	-	0.64		
			C2e	Low Open Shrubland of *Myoporum montanum* with *Corchorus* sp. over Grassland to Hummock Grassland of *Spinifex longifolius* with *Triodia angusta* over scattered *Cynanchum floribundum* creeper on crest of primary dunes.		-	-	Outside corridor	-	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C2f	Open Shrubland of *Acacia coriacea* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* and *Acacia bivenosa* with occasional *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on sandy dune ridges (over scattered *Heliotropium glanduliferum* and *Diplopeltis eriocarpa* on back of red/brown sandy flats and dunes).		-	-	-	0.97	1.09		
			C2g	Shrubland of *Acacia coriacea* over Low Shrubland to Shrubland of *Olearia dampieri* subsp. *dampieri, Stylobasium spathulatum* and *Acacia bivenosa* over Hummock Grassland of *Triodia epactia* over low scattered *Threlkeldia diffusa* herbs in swales between dunes.		-	-	-	-	1.02		
			C2h	Low Shrubland of *Acacia coriacea* with *Rhagodia preissii* subsp. *obovata* over Very Open Herbland of *Threlkeldia diffusa* over Grassland to Hummock Grassland of *Triodia epactia* and *Spinifex longifolius* on secondary dune slopes and ridges.		-	-	-	-	0.43	**AC2a**	Shrubland (30-40%; 12 m) of *Acacia coriacea* over Low Shrubland of *Rhagodia preissii* subsp. *obovata* over Grassland (30-50%) of mixed *Eulalia aurea, Spinifex longifolius* on landward side of foredunes.
	C3	Hummock Grassland of *Triodia epactia* with dense shrubs including *Acacia bivenosa* on back-slopes of foredunes.			Total of Mattiske mapping unit 413.87ha	-	-	-	-	Total of Subunits (below) = 0.44ha (0.11%)		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C3a	Open Heath of *Acacia bivenosa* over Low Open Shrubland of *Olearia dampieri* subsp. *dampieri* with low scattered *Myoporum montanum* and *Enchylaena tomentosa* var. *tomentosa* shrubs over Open Hummock Grassland of *Triodia epactia* on red/brown sandy flats behind dunes.		-	-	-	-	0.44		
	C4	Mixed Hummock Grassland of *Triodia angusta- Triodia epactia* with dense shrubs including *Acacia bivenosa* on back-slopes of foredunes.			Total of Mattiske mapping unit 73.73ha	-	-	Total of Subunits (below) = 0.025ha (0.03%)	-	-		
			C4e	Open Shrubland of *Trichodesma zeylanicum* over Low Open Shrubland of *Corchorus* sp., *Olearia dampieri* subsp. *dampieri, Scaevola cunninghamii* and *Whiteochloa airoides*over Open Hummock Grassland of *Triodia angusta* over *Cynanchum floribundum* scattered creepers on upper slope to mid slopes of sandy dunes.		-	-	0.025	-	-		
	C5	Low Mixed Shrubland of *Frankenia pauciflora* and *Hedyotis crouchiana* on exposed cliff faces around edge of island.			Total of Mattiske mapping unit 207.81ha	Total of Subunits (below) = 8.92ha (4.3%)	Total of Subunits (below) = 0.58ha (0.28%)	Total of Subunits (below) = 0.22ha (0.11%)	-	Total of Subunits (below) = 1.76ha (0.85%)		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C5a	Low scattered *Frankenia pauciflora* var. *pauciflora* shrubs with scattered *Oldenlandia crouchiana* herbs and *Cyperus cunninghamii* subsp. *cunninghamii* sedges on coastal limestone cliffs and in major drainage lines in coastal areas.		8.92	0.58	-	-	-		
			C5b	Scattered low *Pentalepis trichodesmoides, Olearia dampieri* subsp. *dampieri, Corchorus* sp. and *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia angusta* over scattered *Cynanchum floribundum* creepers on limestone ridges and flats (plateaus).		-	-	0.22	-	-		
			C5c	Very Open Hummock Grassland of *Triodia angusta* over low scattered *Scaevola cunninghamii, Corchorus* sp., *Frankenia pauciflora* var. *pauciflora* and *Heliotropium glanduliferum* scattered herbs and shrubs on lower slopes on limestone.		-	-	Outside corridor	-	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			C5d	Low Open Shrubland of *Myoporum montanum* over Very Open Grassland of *Spinifex longifolius* with scattered Hummocks of *Triodia epactia* over Low Open Shrubland of *Frankenia pauciflora* var. *pauciflora* with scattered *Heliotropium glanduliferum* on flat sandy swales with occasional limestone outcropping behind primary dunes.		-	-	-	-	1.76		
	C6	Hummock Grassland of *Triodia epactia* with dense pockets of *Melaleuca cardiophylla* on sandy valley systems in south-western corner of island.			Total of Mattiske mapping unit 14.18ha	-	-	-	-	-		
	C7	Hummock Grassland of *Triodia epactia* with dense pockets of *Olearia dampieri* subsp. *dampieri* on sandy soils behind fore dune in south-western corner of island.			Total of Mattiske mapping unit 38.16ha	-	-	-	-	-		
Major Creek or Wide Drainage Lines	**D1**	Mixed Hummock Grassland of *Triodia angusta* with pockets of dense shrubs along major creek-lines and wide drainage lines.			Total of Mattiske mapping unit 34.97ha	Total of Subunits (below) = 64.92ha (further 39.87ha disturbed)	Total of Subunits (below) = 0.09ha	Total of Subunits (below) = 0.92ha	Total of Subunits (below) = 2.74ha	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
	D1		**D1a**	Scattered tall *Acacia coriacea* shrubs over Low Shrubland to Shrubland of *Stylobasium spathulatum* and *Acacia bivenosa* over Very Open Herbland of *Acanthocarpus verticillatus* over Closed Hummock Grassland of *Triodia angusta* with scattered *Triodia wiseana* on valley floors and deep gullies. This unit contains occasional *Hakea lorea* subsp. *lorea*. Unit also contains areas of scoured drainage channel in areas of heavy seasonal flow.		64.92 (further 39.87ha disturbed)	0.09	-	-	-	**AD1g**	Scattered to Open (<22%)tall shrubs of *Hakea lorea* over tall Dense Hummock Grassland (70-100%) of *Triodia angusta* sometimes with scattered (<2%) *Pentalepis trichodesmoides, Acacia bivenosa.*
			D1c	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* at edges in major drainage lines.		-	-	-	0.41	-		
			D1d	Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with patchy *Triodia angusta* and *Triodia wiseana* on lower slopes and broad drainage flats.		-	-	-	1.04	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			D1e	Open Shrubland of *Stylobasium spathulatum, Pentalepis trichodesmoides with Trichodesma zeylanicum* over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over Low Open Shrubland of *Acacia bivenosa* and *Acacia gregorii* in some locations on lower slopes, drainage flats and wide drainage lines.		-	-	0.75	0.9	-		
			D1f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in major drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea.*		-	-	-	0.39	-		
			D1g	Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* over low scattered *Tephrosia rosea* and *Indigofera monophylla* shrubs in wide drainage lines.		-	-	0.17	-	-		
Minor Creeks or Narrow Drainage Lines	**D2**	Hummock Grassland of *Triodia angusta* along minor creek lines and narrow drainage lines.			Total of Mattiske mapping unit 1101.94ha	-	-	Total of Subunits (below) = 0.50ha (0.05%)	Total of Subunits (below) = 2.41ha (0.22%)	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			D2c	Tall scattered *Trichodesma zeylanicum* shrubs over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* in disturbed drainage lines.		-	-	0.09	-	-		
			D2d	Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* over Low Shrubland of *Acacia gregorii* in minor creek and drainage lines.		-	-	-	1.8	-		
			D2f	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum* with patchy *Petalostylis labicheoides, Acacia gregorii and Acacia bivenosa* over Hummock Grassland to Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* in minor drainage lines. This unit contains occasional *Hakea lorea* subsp. *lorea.*		-	-	0.41	0.61	-		
Minor Creekline	**D3**	Hummock Grassland of *Triodia angusta* along minor creek-line with emergent *Santalum murrayanum.*			Total of Mattiske mapping unit 0.65ha	-	-	-	-	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
Flats	**F1**	Hummock Grassland of *Triodia angusta* on red earth flats and drainage lines.			Total of Mattiske mapping unit 1558.85ha	-	-	-	-	-		
	F2	Hummock Grassland of *Triodia angusta* with emergent *Acacia synchronicia* on red earth flat.			Total of Mattiske mapping unit 9.02ha	-	-	-	-	-		
	F3	Hummock Grassland of *Triodia angusta* with emergent shrubs of *Gossypium robinsonii* on red earth flats.			Total of Mattiske mapping unit 36.85ha	-	-	-	-	-		
	F4	Hummock Grassland of *Triodia angusta - Triodia* spp. with emergent pockets of *Erythrina vespertilio* on flats.			Total of Mattiske mapping unit 127.6ha	-	-	-	Total of Subunit (below) = 1.2ha (0.94%)	-		
			F4a	Low Open Woodland of *Erythrina vespertilio* over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with occasionally emergent *Ficus brachypoda* on flats with shallow red/brown sands and emergent limestone.		-	-	-	1.2	-		
	F5	Mixed Hummock Grassland of *Triodia epactia - Triodia angusta* on fringes of main red earth flats and drainage lines.			Total of Mattiske mapping unit 1350.13ha	-	-	-	Total of Subunit (below) = 11.47ha (0.87%)	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			F5a	Low Open Shrubland of *Stylobasium spathulatum* with scattered *Pentalepis trichodesmoides* and *Senna glutinosa* over Hummock Grassland of *Triodia angusta* with *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on gentle low slopes and flats.		-	-	-	2.91	-		
			F5b	Scattered low *Ficus brachypoda* trees over scattered low *Pentalepis trichodesmoides, Acacia bivenosa*, *Corchorus* sp. , *Tephrosia rosea* and *Streptoglossa decurrens* shrubs over Closed Hummock Grassland of *Triodia epactia* with *Triodia angusta* on flats.		-	-	-	2.55	-		
			F5c	Low Open Shrubland of *Pentalepis trichodesmoides* over mixed Hummock Grassland of *Triodia epactia* with occasional *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Acacia gregorii* on limestone ridges, slopes and flats.		-	-	-	2.18	-		
			F5d	Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia angusta* over scattered low *Corchorus* sp., *Scaevola cunninghamii* and *Heliotropium glanduliferum* herbs and shrubs on upper slopes and mid slopes of small limestone rises.		-	-	-	0.24	-		

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			F5e	Low scattered *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Open Hummock Grassland of *Triodia angusta* with *Triodia epactia* over low scattered *Scaevola cunninghamii, Diplopeltis eriocarpa* and *Acacia bivenosa* shrubs on limestone flats and rises with shallow pale pink sands.		-	-	-	3.59	-		
	F6	Hummock Grassland of *Triodia epactia* on slopes of escarpments on fringes of red earth flats.			Total of Mattiske mapping unit 157.51ha	-	-	-	Total of Subunit (below) = 1.15ha (0.73%)	Total of Subunit (below) = 1.34ha (0.85%)		
			F6a	Low Open Shrubland of *Acacia bivenosa* and *Stylobasium spathulatum* over Hummock Grassland of *Triodia epactia* on red/brown sandy flats.		-	-	-	-	0.56		
			F6b	Low scattered *Ficus brachypoda* trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia epactia* with on sandy slopes and flats with occasional limestone outcropping.		-	-	-	-	0.78		
			F6c	Tall Open Shrubland of *Acacia coriacea* over low scattered *Stylobasium spathulatum* shrubs over Open Hummock Grassland of *Triodia epactia* on light red/brown sandy flats.		-	-	-	0.23	-		

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			F6d	Open Shrubland of *Trichodesma zeylanicum* over low scattered *Pterocaulon sphacelatum* shrubs over Hummock Grassland of *Triodia epactia* on limestone flats with shallow sands.		-	-	-	0.92	-		
	F7	Hummock Grassland of *Triodia epactia - Triodia angusta - Triodia wiseana* on slopes of escarpments on fringes of red earth flats.			Total of Mattiske mapping unit 786.02ha	-	-	-	Total of Subunit (below) = 8.44ha (1.07%)	Total of Subunit (below) = 2.21ha (0.28%)		
			F7a	Low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.		-	-	-	1.9	-		
			F7b	Scattered low Ficus brachypoda trees over Low Open Shrubland of *Pentalepis trichodesmoides* over Closed Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on sandy flats.		-	-	-	3.5	-		
			F7c	Open Shrubland of *Senna glutinosa* over Low Open Shrubland of *Pentalepis trichodesmoides* and *Tephrosea rosea* over Closed Hummock Grassland of *Triodia angusta* on red/brown sandy flats.		-	-	-	0.4	-		

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			F7d	Scattered *Hakea lorea* subsp. *lorea* shrubs over Low Scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* on mid slopes and flats.		-	-	-	0.81	-		
			F7e	Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Corchorus* sp. and *Sarcostemma viminale* subsp. *australe* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats (with pockets of *Eriachne mucronata* on valley floors).		-	-	-	1.83	2.21		
	F8	Not separated as distinct "F" community in Mattiske (1993) - differs in dominance of different *Triodia*			Total of Mattiske mapping unit 0ha	Total of Subunits (below) = 184.25ha	Total of Subunits (below) = 47.86	-	-	-		
			F8a	Low Open Shrubland to Open Shrubland of *Acacia bivenosa,* with occasional scattered *Pentalepis trichodesmoides, Stylobasium spathulatum* and *Acanthocarpus verticillatus* shrubs over Hummock Grassland to Closed Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* on flats and valley floors.		181.87	47.86	-	-	-		

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			F8b	Scattered *Hakea lorea* subsp. *lorea* tall shrubs over Low Open Shrubland of *Pentalepis trichodesmoides* over low scattered *Tephrosia rosea* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy flats.		2.38	-	-	-	-		
Limestone Ridges	**L1**	Hummock Grassland of *Triodia wiseana* with *Ficus brachypoda* on central limestone ridges.			Total of Mattiske mapping unit 2728.29ha	-	-	Total of Subunits (below) = 14.04ha (0.51%)	Total of Subunits (below) = 6.13ha (0.22%)	Total of Subunits (below) = 1.10ha (0.04%)		
			L1a	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* with occasional *Cymbopogon ambiguus, Tephrosia rosea* and *Triodia angusta* on limestone ridges and upper slopes.		-	-	8.41	4.47	-	**AL1a**	Low Open Woodland (10-20% <5m) of *Ficus brachypoda* over Mixed Shrubland of *Acacia bivenosa, Stylobasium spathulatum* over Dwarf Shrubland (10-20%: 0.5m) of *Solanum lasiophyllum, Corchorus interstans* over mixed Hummock Grassland (30-70%) of *Triodia angusta* and *Triodia wiseana* on limestone ridges.
			L1b	Scattered low *Ficus brachypoda* trees over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes and ridges.		-	-	4.71	0.0002	-		

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			L1c	Scattered low *Ficus brachypoda* over Low Open Shrubland of *Acacia bivenosa* over Closed Hummock Grassland of *Triodia angusta* with *Triodia epactia* and occasional *Triodia wiseana* on limestone slopes and ridges.		-	-	-	1.16	-		
			L1d	Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and *Heliotropium glanduliferum* on limestone flats (plateau).		-	-	0.92	-	-		
			L1e	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees (with *Mallotus nesophilus*) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Diplotepltis eriocarpa* shrubs on limestone slopes and flats.		-	-	-	0.5	0.61	**AL1b**	Dwarf Shrubland (10-30%; 0.5m) of *Diplopeltis eriocarpa* over Hummock Grassland (30-70%) of *Triodia wiseana*. Very scattered *Ficus brachypoda* on limestone hillslopes.
			L1f	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over Hummock Grassland of *Triodia wiseana* and patchy *Triodia angusta* on limestone slopes and ridges.		-	-	-	-	0.49		
	L2	Hummock Grassland of *Triodia wiseana* with *Ficus virens* var. *virens* on escarpments on west coast and southern edge of limestone ridges.			Total of Mattiske mapping unit 19.64ha	-	-	-	-	-		

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	L3	Hummock Grassland of *Triodia wiseana* with low mixed shrubs, including *Acacia gregorii* on limestone ridges.			Total of Mattiske mapping unit 2782.99ha	Total of Subunits (below) = 198.67ha (7.14%)	Total of Subunits (below) = 35.64ha (1.24%)	Total of Subunits (below) = 0.92ha (0.03%)	Total of Subunits (below) = 6.91ha (0.25%)	Total of Subunits (below) = 0.72ha (0.03%)		
			L3a	Low Open Shrubland of *Stylobasium spathulatum* with *Petalostylis labicheoides* over Closed Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana* over Low Open Shrubland of *Acacia gregorii* on limestone slopes and ridges.		15.73	1.34	0.33	-	-	**AL3a**	Open Shrubland (2-10%; 1m) of *Petalostylis labicheoides, Stylobasium spathulatum* over Dwarf Shrubland (10-20% <0.5m) of *Acacia gregorii* over Hummock Grassland (30-70%) of mixed *Triodia wiseana* and *Triodia angusta*. There are scattered (<2%) *Hakea lorea* on limestone hillslopes.
			L3b	Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* with *Triodia epactia* over low scattered *Acacia gregorii* and *Diplopeltis eriocarpa* shrubs on limestone slopes and ridges.		-	-	-	1.12	-		
			L3c	Low scattered *Diplopeltis eriocarpa* shrubs with scattered *Cymbopogon ambiguus* and *Cyperus cunninghamii* subsp. *cunninghamii* herbs and grasses on small exposed limestone flats.		-	-	-	-	0.22		

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			L3d	Low scattered S*tylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Low Open Shrubland of *Diplopeltis eriocarpa*, *Acacia gregorii* and *Hannafordia quadrivalvis* subsp. *recurva* over Hummock Grassland of *Triodia angusta* with *Triodia wiseana* on limestone ridges.		-	-	0.59	-	-		
			L3e	Low scattered *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over low scattered *Pentalepis trichodesmoides* and *Trichodesma zeylanicum* shrubs over mixed Hummock Grassland of *Triodia wiseana, Triodia angusta* and *Triodia epactia* over low scattered *Diplopeltis eriocarpa* shrubs on slopes and ridges.		-	-	-	5.17	-		
			L3f	Low scattered *Petalostylis labicheoides* and *Indigofera monophylla* shrubs over Hummock Grassland of *Triodia wiseana* on limestone ridges and upper slopes.		42.9	6.24	-	-	-		
			L3g	Low Open Shrubland of *Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* and *Cymbopogon ambiguus* over Low Open Shrubland of *Diplopeltis eriocarpa* on limestone hillslopes.		-	-	-	0.62	-		

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			L3h	Low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* over low scattered *Diplopeltis eriocarpa* shrubs on limestone ridges and flats.		23.54	-	-	-	-		
			L3i	Low Open Shrubland to Low Shrubland of *Acacia bivenosa* with occasional low scattered *Stylobasium spathulatum* and *Petalostylis labicheoides* shrubs over Hummock grassland of *Triodia angusta* with occasional *Triodia wiseana* on limestone slopes, small rises and flats.		116.5	28.06	-	-	0.5		
	L4	Hummock Grassland of *Triodia wiseana* with dense emergent shrubs of *Acacia pyrifolia, Acacia gregorii* and *Petalostylis labicheoides* on limestone ridges.			Total of Mattiske mapping unit 322.73ha	Total of Subunit (below) = 127.11ha (39.39%)	-	Total of Subunit (below) = 7.47ha (2.31%)	Total of Subunit (below) = 0.38ha (0.12%)	-		
			L4a	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Acacia bivenosa* with scattered *Petalostylis labicheoides and Stylobasium spathulatum* over Hummock Grassland of *Triodia wiseana* on limestone ridges and midslopes with patches of *Triodia angusta.* This unit contains occasional *Hakea lorea* subsp. *lorea.*		127.11	-	7.47	0.38	-		
	L5	Hummock Grassland of *Triodia wiseana* with emergent *Hakea lorea* subsp. *lorea* on limestone ridges.			Total of Mattiske mapping unit 106.54ha	Total of Subunit (below) = 29.12ha (27.33%)	-	-	Total of Subunit (below) = 0.56ha (1.92%)	-		

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			L5a	Scattered tall *Hakea lorea* subsp. *lorea* tall shrubs over low scattered *Petalostylis labicheoides* shrubs over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over low scattered *Acacia gregorii* and *Corchorus interstans* shrubs on limestone ridges.		29.12	-	-	-	-	**AL5a**	Low shrubland (10-30%; 1m) of *Acacia bivenosa* over Hummock Grassland (30-70%) of *Triodia wiseana*. There are scattered Hakea lorea on limestone hillslopes.
			L5b	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia wiseana* on red/brown sandy midslopes.		-	-	-	0.56	-		
	L6	Hummock Grassland of *Triodia wiseana* with emergent *Grevillea pyramidalis* on limestone ridges.			Total of Mattiske mapping unit 93.67ha	Total of Subunit (below) = 2.68ha (2.86%)	-	-	-	Total of Subunit (below) = 5.85ha (6.25%)		
			L6a	Low Open Shrubland of *Grevillea pyramidalis* subsp. ?*leucadendron* and *Acacia bivenosa* over Hummock Grassland of *Triodia angusta* low scattered *Acacia gregorii, Scaevola cunninghamii* and *Heliotropium glanduliferum* shrubs and herbs on limestone midslopes.		2.68	-	-	-	-		

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			L6b	Scattered low *Ficus brachypoda* trees over Low Open Shrubland of *Grevillea pyramidalis* ?subsp. *leucadendron* with occasional *Pentalepis trichodesmoides, Trichodesma zeylanicum* with scattered *Acacia gregorii* over Closed Hummock Grassland of *Triodia epactia* and *Triodia wiseana* and *Eriachne* sp. over Low Open Shrubland of *Acacia gregorii* on upper slopes and midslopes of small rises.		-	-	-	-	2.4		
			L6c	Low Open Shrubland of *Pentalepis trichodesmoides* with *Grevillea pyramidalis* ?subsp. *leucadendron* (*Grevillea* only in eastern section of community) over Hummock Grassland of *Triodia wiseana* with patchy *Triodia epactia* over Low Open Shrubland of *Diplopeltis eriocarpa* on mid to upper slopes with red/brown sands and occasional limestone outcropping on rocky rises and slopes.		-	-	-	-	3.07		
			L6d	Low Open Shrubland of *Pentalepis trichodesmoides* with *Indigofera monophylla* and scattered *Grevillea pyramidalis* ?subsp. *leucadendron* over Hummock Grassland of *Triodia epactia* in minor drainage lines.		-	-	-	-	0.38		

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	L7	Hummock Grassland of *Triodia wiseana* with dense pockets of *Melaleuca cardiophylla* on limestone ridges.			Total of Mattiske mapping unit 1583.84ha	Total of Subunit (below) = 143.97ha (9.09%)	Total of Subunit (below) = 2.20ha (0.14%)	Total of Subunit (below) = 1.06ha (0.07%)	Total of Subunit (below) = 0.70ha (0.04%)	-		
			L7a	Low Shrubland of *Melaleuca cardiophylla, Stylobasium spathulatum, Pentalepis trichodesmoides, Trichodesma zeylanicum* over Hummock Grassland of *Triodia wiseana* with *Triodia angusta* over Low Open Shrubland of *Acacia gregorii, Acacia bivenosa* shrubs on rocky limestone ridges, slopes and minor gullies, with occasional pockets of *Gossypium robinsonii.*		4.92	-	1.06	0.7	-	**AL7a**	Low Shrubland (10-30%; 0.51m) of *Melaleuca cardiophylla* with *Acacia gregorii* (occasional prostrate *Acacia bivenosa)* over Hummock Grassland (30-70%) of *Triodia wiseana* on limestone hillslopes.
			L7b	Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over low scattered shrubs to Low Open Shrubland of *Acacia gregorii* on limestone upper slopes and ridges.		139.05	2.20	-	-	-	**AL7c**	Shrubland (10-30%; 12m) of *Melaleuca cardiophylla, Petalostylis labicheoides* over Dwarf Shrubland (10-30%, 00.5m) of *Acacia gregorii* with *Diplopeltis eriocarpa* over Hummock Grassland (30-70%) of *Triodia wiseana* on limestone hillslopes.
	L8	Hummock Grassland of *Triodia wiseana* with pockets of *Eucalyptus xerothermica* on limestone ridges.			Total of Mattiske mapping unit 8.85ha	-	-	-	-	-		

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	L9	Hummock Grassland of *Triodia wiseana - Triodia angusta* with emergent *Sarcostemma viminale* subsp. *australe* and *Ficus brachypoda* on coastal limestone flats and low ridges with localised pockets of *Frankenia pauciflora*.			Total of Mattiske mapping unit 1749.96ha	Total of Subunit (below) = 8.37ha (0.48%)	-	-	-	-		
			L9a	Low Open Woodland of *Ficus brachypoda* over low scattered *Pentalepis trichodesmoides* and *Sarcostemma viminale* subsp. *australe* shrubs over Closed Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on coastal limestone flats.		8.37	-	-	-	-	**AL9a**	Low Woodland (10-30% <5m) *Ficus brachypoda* over Very Open (2-10%; <1m) of Low Shrubland of *Sarcostemma viminale* subsp. *australe* over Hummock Grassland (30-40%) of *Triodia wiseana* on coastal limestone hillslopes and plateaus.
	L10	Hummock Grassland of *Triodia epactia - Triodia angusta* with emergent *Hakea lorea* subsp. *lorea* on exposed small limestone hills on southern coastal area.			Total of Mattiske mapping unit 47.57ha	-	-	-	-	-		
Rocky Headlands	**R**	No equivalent mapped by Mattiske (1993)			Total of Mattiske mapping unit 0ha							
			R			Total of Subunit = 4.7ha	Total of Subunit = 0.5ha	-	-	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
Clay Pans	**S1**	Mixed Herbfield and Grassland of *Eragrostis xerophila, Eriachne flaccida* and *Sporobolus virginicus* on clay pans.			Total of Mattiske mapping unit 192.3ha	-	-	-	Total of Subunit (below) = 0.66ha (0.34%)	-		
			S1a	Grassland of ?*Eriachne flaccida* over scattered low *Pluchea dunlopii* and *Streptoglossa decurrens* herbs and shrubs on clay pans. (Community contains scattered emergent *Acacia bivenosa* and *Stylobasium spathulatum* shrubs and *Triodia angusta* at edges).		-	-	-	0.66	-		
	S2	Mixed Herbfields with *Streptoglossa bubakii* and *Pterocaulon sphacelatum* on fringes of tidal Halophytic areas and flood channels on clay soils near coast.			Total of Mattiske mapping unit 0.91ha	-	-	-	-	-		
Valley Slopes and Escarpment Slopes	**V1**	Hummock Grassland of *Triodia wiseana* with mixed emergent shrub species on valley slopes.			Total of Mattiske mapping unit 6805.74ha	Total of Subunit (below) = 410.83ha (6.04%)	Total of Subunit (below) = 46.61ha (0.68%)	Total of Subunit (below) = 8.73ha (0.13%)	Total of Subunit (below) = 19.70ha (0.29%)	Total of Subunit (below) = 3.04ha (0.04%)		
			V1a	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* with occasional *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* shrubs on limestone midslopes and occasional small rises. This unit contains some areas of disturbance by fauna.		54.4	-	3.88	2.43	-	**AV1a**	Open Low Shrubland (2-10% <1m) of mixed *Petalostylis labicheoides, Acacia bivenosa* over Hummock Grassland (30-70%) of *Triodia wiseana* on valley slopes.

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			V1b	Low Open Shrubland of *Acacia bivenosa* with *Petalostylis labicheoides* over Hummock Grassland of *Triodia wiseana* and some *Triodia angusta* over Low Open Shrubland of *Diplopeltis eriocarpa* on red/brown sandy flats.		-	-	0.44	0.83	-		
			V1c	Scattered low *Ficus brachypoda* and *Pittosporum phylliraeoides* trees over scattered low *Petalostylis labicheoides*, *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* with patchy *Triodia wiseana, Triodia epactia* and *Cymbopogon ambiguus* on limestone slopes and ridges, with *Stylobasium spathulatum* at edges on red/brown sandy drainage flats.		21.42	-	1.79	3.63	2.39		
			V1d	Low Open Shrubland of *Acacia bivenosa* with low scattered *Pentalepis trichodesmoides* shrubs over Hummock Grassland of *Triodia angusta* and *Triodia wiseana* on limestone slopes and low ridges with occasional *Melaleuca cardiophylla.*		9.4	3.15	-	-	-		
			V1f	Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Tephrosia rosea* on red/brown sandy flats.		-	-	-	2.43	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			V1g	Scattered tall *Acacia pyrifolia* shrubs over low scattered *Petalostylis labicheoides, Acacia bivenosa* and *Acacia gregorii* shrubs over Hummock Grassland of *Triodia wiseana* with some *Triodia angusta* and *Cymbopogon ambiguus* on red/brown sandy midslopes and in minor drainage lines with occasional outcropping.		-	-	-	1.79	-		
			V1h	Open Shrubland of *Acacia pyrifolia* over Low Open Shrubland of *Stylobasium spathulatum, Petalostylis labicheoides* and *Acacia bivenosa* over Closed Hummock Grassland of *Triodia wiseana* and *Triodia angusta* over Low Open Shrubland of *Acacia gregorii* on limestone slopes. This unit contains occasional *Hakea lorea* subsp. *lorea.*		-	-	2.02	2.91	-		
			V1i	Hummock Grassland of *Triodia epactia* with occasional *Triodia wiseana* over Low Open Shrubland *Acacia gregorii* with *Diplopeltis eriocarpa* on gentle slopes and flats.		-	-	-	-	0.65		
			V1j	Low scattered Pentalepis trichodesmoides shrubs over Hummock Grassland of *Triodia wiseana* over Low Open Shrubland of *Diplopeltis eriocarpa* and scattered *Acacia gregorii* on limestone slopes.		-	-	-	1.05	-		

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
			V1k	Occasional *Hakea lorea* subsp. *lorea* shrubs over Low Open Shrubland to Low Shrubland of *Melaleuca cardiophylla* over Hummock Grassland of *Triodia wiseana* with patchy *Triodia angusta* over low scattered *Acacia gregorii* shrubs on limestone hillslopes and minor drainage lines.		115.04	10.70	0.6	2.66	-		
			V1m	Low Open Heath of *Melaleuca cardiophylla* with *Acacia bivenosa, Sarcostemma viminale* subsp. *australe* over Hummock Grassland of *Triodia wiseana* and *Triodia angusta* on limestone ridges and slopes.		190.71	32.77	-	1.28	-		
			V1n	Scattered *Hakea lorea* subsp. *lorea* shrubs over low scattered shrubs to Low Open Shrubland of *Melaleuca cardiophylla* with *Acacia bivenosa, Stylobasium spathulatum* and *Pentalepis trichodesmoides* over Hummock Grassland of *Triodia angusta* on flats and edge of drainage lines.		19.86	-	-	0.69	-	**AL7d**	Scattered (<2%) to Open (25%) Tall Shrubland of *Hakea lorea* over Low Shrubland (10-30% ; 1m) of *Melaleuca cardiophylla, Acacia bivenosa* over Mixed Hummock Grassland (30-70%) sometimes Dense (90%) of *Triodia wiseana, Triodia angusta* on limestone hillslopes but frequently also on red earth flats.

	Mattiske Unit	Community Description for Barrow Island (Mattiske 1993)	Mapping Code	Community Description for Proposed Plant Area and Pipeline Corridors (2003, 2004)	Area (ha) on Barrow Island (Mattiske 1993)	Area (ha) on Proposed GPF Wider Study Area	Area (ha) on Proposed GPF Area	Area (ha) on Feed Gas Pipeline	Area (ha) on CO_2 Injection Pipeline	Area on North White's Beach Pipeline	Astron (2002) code - 'A' prefix added to original code	Community Description for Barrow Island (Astron 2002) (units presented are closest match to 2003/2004 communities)
	V2	Hummock Grassland of *Triodia wiseana* with *Pentalepis trichodesmoides* on southern escarpment.			Total of Mattiske mapping unit 144.6ha	-	-	-	-	-		
	V3				Total of Mattiske mapping unit 0ha	Total of Subunits (below) = 105.54ha	-	Total of Subunits (below) = 4.71ha	Total of Subunits (below) = 0.59ha	-		
			V3a	Scattered low *Ficus brachypoda* trees over scattered *Acacia pyrifolia* shrubs over Hummock Grassland of *Triodia wiseana* on limestone slopes. This community contains minor drainage lines.		37.19	-	2.44	-	-		
			V3b	Scattered *Acacia pyrifolia* shrubs with occasional *Hakea lorea* subsp. *lorea* over low scattered shrubs to Low Open Shrubland of *Petalostylis labicheoides and Stylobasium spathulatum*, occasional *Acacia bivenosa* and *Acacia gregorii* over Hummock Grassland of *Triodia wiseana* with patches of *Triodia angusta* on limestone slopes.		68.35	-	2.27	0.59	-		
	Dist	Disturbed Areas	**Dist**	Disturbed or cleared areas.	Not Available	39.87	0.65	2.68	5.87	0.05		

GPF: Gas Processing Facility

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ATTACHMENT D: FIELD DATA COLLECTION SHEETS

Gorgon Gas Development on Barrow Island
VEGETATION SURVEY-2003/2004

Site:			**Date:**		**Initials:**	
Plot No:			**Film:**		**Photo:**	
GPS Datum:			**Accuracy:**		**Topo:** RI BR US MS	**Litter cover:** %
Peg #:	1	2	3	4	F LS VF MIC MAC	**Litter type:** Logs
mE:					**Outcrop:** Few Mod Num	Twigs Lvs
mN:					Lmst Lat Gran Dol Sndst	**Bare ground:** %
Soil Type: SLG SL SG CL G C L P S					**Aspect:** N NW W SW	**Age since fire:** yrs
Soil colour:					S SE E NE N/A	**Disturbance:** Hi Med Lo

Observations: ……

Community Type:

Vegetation Condition:

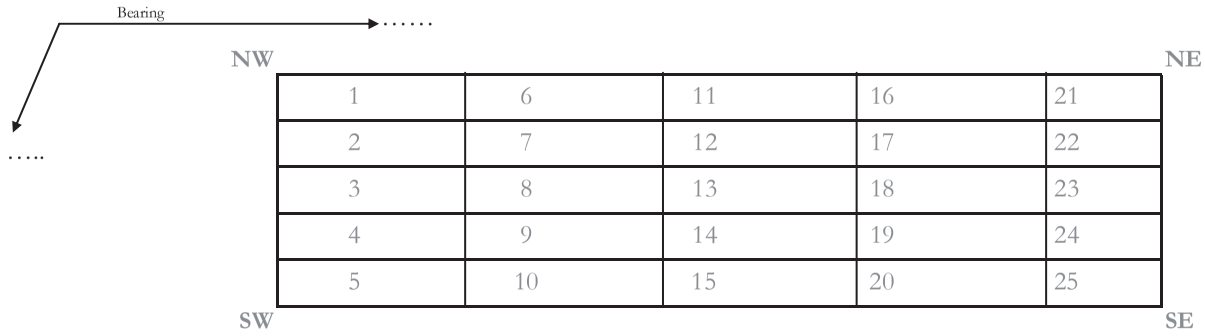
Vegetation Description: ……

……

……

Plot Location:…… ……

Sketch of Quadrat Layout:



ATTACHMENT D: FIELD DATA COLLECTION SHEETS

Gorgon Gas Development on Barrow Island - Vegetation Survey

Key: **Habit: C** = climber, **P** = prostrate, **T** = tufted, **R** = rhizomatous, other - specify
RS = Reproductive stage: B = bud, **Fl** = flower, **Fr** = fruit, **N** = nut, **N/A** = none of the above

Form: DH = dwarf herb, **WH** = woody herb, **S** = shrub, **T** = single trunk tree, **M** = mallee tree
Col = Reproductive stage colour eg. flower colour

Site:		Plot No:				Quadrat __		Quadrat __		Quadrat __		Quadrat __		Quadrat __	
Date:		Initials:	Ht (cm)	Habit	Form	RS / Co	%A	%D	%A	%D	%A	%D	%A	%D	%A	%D
Coll No.	Species															

Attachment E: Aplin's (1979) modification of Specht's (1970) vegetation classification by Trudgen (2002)

Life Form and Height	Projective Foliage Cover of tallest stratum as %	Description of tallest stratum
Trees over 30 metres	70-100 30-70 10-30 2-10 under 2	High closed forest High open Forest High woodland High open woodland Scattered tall trees
Trees 10-30 metres	70-100 30-70 10-30 2-10 under 2	Closed forest Open forest Woodland Open Woodland Scattered trees
Trees under 10 metres	70-100 30-70 10-30 2-10 under 2	Low closed forest Low open forest Low woodland Low open woodland Scattered low trees
Shrubs over 2 metres	70-100 30-70 10-30 2-10 under 2	Closed scrub Open scrub High shrubland High open shrubland Scattered tall shrubs
Shrubs 1-2 metres	70-100 30-70 10-30 2-10 under 2	Closed heath Open heath Shrubland Open shrubland Scattered shrubs
Shrubs under 1 metre	70-100 30-70 10-30 2-10 under 2	Low closed heath Low open heath Low shrubland Low open shrubland Low scattered shrubs
Herbs/Sedges/Grasses	70-100 30-70 10-30 2-10 under 2	Closed herb, sedge, grassland Herb, sedge, grassland Open herb, sedge, grassland Very open herb, sedge, grassland Scattered herb, sedges, grasses

Note: 'Tall' substituted for 'High' in vegetation descriptions used for the proposed Gorgon development areas survey 2003, 2004

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ATTACHMENT F: AMALGAMATED VASCULAR PLANT SPECIES LIST, BARROW ISLAND

# indicates species updated after post cyclonic rain surveys, + indicates species located in initial vegetation surveys

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Fam			Barrow	PGPF	PFG	PCO	PNW					New				2004					Buckley	Aust.	Lewis			Mattiske			BARROW
No	FAMILY	Species	Island					F	G	S	T	I	Taxa	PL	P1	P3	Astron	Astron	Barrow	Perth	Karratha	Butler	Herb.No.	Grierson	rudge	1993a	1993b	1994	1995	1996	1999	ield Herbarium
13	MARSILEACEAE	*Marsilea ?hirsuta.*	+					1	1	1	1						+	+	HB53			+									
13		*(= Marsilea sp.)*																													
23	POTAMOGETONACEA	*Ruppia maritima*	+					1	1	1	1							+	HB152				RB6869,RB6972								
23C	CYMODOCEACEAE	*Halodule uninervis*	+					1	1	1	1							+													
31	POACEAE	*Aristida contorta*	+					1	1	1	1						+	+	12/75x2	RB6910		RB6910	RB6910								
31		*Aristida holathera*	+							1	1							+	+			+			+					+	
31		*Aristida holathera* var. *holathera*	+		#						1						+	+		DWG1554											
31		*Bothriochloa bladhii*	+						1	1	1							+	RB6895	RB6895		RB6895	RB6895								
31		*Brachyachne* sp.	+						1	1	1							+												+	
31	*	*Cenchrus ciliaris*	+						1	1	1	1					+	+	MRW122	MRW122	RW122, 047	+									+
31		*Chrysopogon fallax*	+						1	1	1						+	+	HB202	DWG1559		+									
31																			BI175												
31		*Cymbopogon ambiguus*	+	+	+	+	+		1	1	1						+	+	+	HB27			RB6760,RB6947		EM1200	EM20227					+
31		*(=Cymbopogon ?ambiguus)*																													
31		*Cymbopogon bombycinus*	+							1	1						+	+	+			+				EM20313					
31		*Cymbopogon procerus*	+							1	1						+	+	MRW092	MRW092	RW092, 047	RB6947	46,RB6947,RB6760								
31		*Cymbopogon* sp.	+							1	1							+	+					+							
31	*	*Cynodon dactylon*	+						1	1	1	1					+	+	6798, MRW	MRW123	RW123, 047	B6740,RB679	40,RB6741,RB6749								+
31																							RB6798,RB6848								
31		*Dactyloctenium radulans*	+						1	1	1						+	+	RB7217	B199,RB7128		RB7128	RB7128					NEC20575			
31		*Dichanthium sericeum* subsp. *humilius*	+	#					1	1	1						+	+	MRW192	MRW192	MRW192					EM20403				+	+
31		*Dichanthium sericeum* subsp. *sericeum*	+								1																			+	
31		*(=Dichanthium affine)*																	HB110	36705,RB6714		RB6714	3B6705,RB6714		+	DET11034		NEC20563			
31																												NEC20532			
31																															
31		*Digitaria ctenantha*	+						1	1	1						+	+	RB7040									NEC20576			
31		*Enneapogon caerulescens*	+						1	1	1						+		+			+				EM20366		NEC205	+		
31		*Enneapogon caerulescens* var. *caerulescens*	+								1							+	+	RB6891	RB6891	RB6891									
31																															
31		*Enneapogon caerulescens* var. *occidentalis*	+								1							+	+	RB6801			RB6801								
31		*Enneapogon oblongus*	+							1	1						+	+	RB7226	HB, RB6968		RB7226	RB6800			EM20225					
31																				RB6801,RB6800			RB6968			EM20300					
31																				RB7225,DWG1555			RB7225								
31		*Enneapogon polyphyllus*	+							1	1							+	RB7242	RB7230		RB7242	3B7230,RB7242								
31		*Enneapogon* sp.	+							1	1							+	+						+						
31																														+	
31		*Eragrostis cumingii*	+	#					1	1	1						+	+	RB7244	RB7269		+	RB6725			EM20375		NEC20528			
31		*(= Eragrostis basedowii)*																		DWG1528						EM20397		NEC20615			
31																										EM20413					
31		*Eragrostis dielsii*	+	+						1	1						+	+								EM20404					
31																												NEC20530			
31																												NEC20505			
31																														+	
31		*Eragrostis falcata*	+							1	1						+	+	HB187	MRW193	MRW193	RB7058	3B7056,RB7057								+
31																			RB7262	IB44,RB7261		RB7261	3B7031,RB7261								
31																			MRW193	RB7056			RB7262		+						
31																				RB7057											
31		*Eragrostis xerophila*	+							1	1							+	MRW090	MRW090	MRW090					DET11000		NEC20561			+
31																					04777										
31																														+	
31		*Eragrostis* sp.	+							1	1							+	+					+							
31		*Eriachne benthamii*	+						1	1	1							+									NEC20571				
31		*Eriachne flaccida*	+	+		+				1	1						+	+	MRW152	RB6737	MRW199	RB6737	3B6737,RB6810			DET11039		NEC20535		+	+
31																			HB54	MRW199						EM20426					

ATTACHMENT F: AMALGAMATED VASCULAR PLANT SPECIES LIST, BARROW ISLAND

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Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW	F	G	S	T	I	New Taxa	PL	P1	P3	2004 Astron	Astron	Barrow	Perth	Karratha	Buckley Butler	Aust. Herb.No.	Lewis Grierson	rudge	1993a	1993b	Mattiske 1994	1995	1996	1999	BARROW ield Herbarium
31																			MRW199	RB6810												
31		*(=Eriachne ?flaccida)*																														
31		*Eriachne flaccida* (Southern Pilbara - Carnarvon Co	#			#				1	1									DWG1552												
31		*Eriachne mucronata*	+	+	+	#	+			1	1	1					+	+	B6925,HB1			+			+	+	EM20316 DET11016 EM20319 EM20371 EM20464	NEC20508		+		
31		*Eriachne* sp.	+		+		+			1	1																					
31		*Eulalia aurea*	+			#			1	1	1						+	+	RB6674	HB76	MRW091	+					EM20380				+	
31		*(= Eulalia fulva)*																	MRW091	MRW091	04826						EM20415					
31		*Iseilema dolichotrichum*	+						1	1	1						+	+	+	DWG1515						+		NEC20577				
31		*(= Iseilema eremaeum)*																														
31		*Paspalidium clementii*	+			#			1	1	1						+	+	+			+										
31		*(= Paspalidium gracile)*																														
31		*Paspalidium tabulatum*	+	+	#		#			1	1						+	+	RB6912	RB6768	MRW115	RB6737	B6677,RB6764			+	EM20249	NEC20506		+	+	
31																			RB6788	MRW115	04478	RB6768	R6912,RB7028				EM20314	NEC20569				
31																			MRW115	RB6764		RB6788					EM20374					
31																				RB6912		RB6912					EM20378					
31																											EM20385					
31		*Paspalidium sp.*	+							1	1																			+	
31		*Setaria dielsii*	+						1	1	1						+	+	RB6963	B186,RB6963		RB6963	B6963,RB6964									
31		*(= Setaria carnei)*																	HB186	36964,RB7019		RB7753	B7019,RB7020									
31		*(=*Setaria verticillata)*																		RB7021,RB7023			RB7021,RB7023									
31																				RB7024,RB7113			RB7024,RB7113									
31																				RB7020												
31	*	*Setaria verticillata*	#				#		1	1	1																					
31		*Sorghum plumosum*	+						1	1	1						+	+	HB77	36716,RB6808		RB6716	92,RB6808,RB7149									
31		*Spinifex longifolius*	+	+	+		+		1	1	1						+	+	HB23	RB6822	IRW088, 047	RB6822	B6822,RB682	+		+	+			+	+	
31																			MRW088	MRW088	IRW089,04780											
31																			MRW089	MRW089												
31																				RB6823												
31																				DWG1560												
31		*Sporobolus australasicus*	+	#					1	1	1						+	+	HB182	B6704,HB182		RB6704	B6794,RB6699			+	EM20405	NEC20524				
31																				DWG1527												
31		*Sporobolus mitchellii*	+							1	1							+	+								EM20424	NEC20536				
31		*Sporobolus virginicus*	+		#		+			1	1						+	+	6693, MRW	B69,RB711	IRW100, 047	RB6648	6667,RB6708	+			EM20220			+	+	
31																			HB	MRW100		RB6693	RB7115									
31		*Themeda triandra*	+						1	1	1							+	+			+										
		(=Themeda australis)	+														+															
31		*Triodia angusta*	+	+	+	+	+		1	1	1						+	+	HB145	IB23,RB674	MRW070	RB6838	B6708,RB674	+	+	EM5006	EM20265					+
31																			RB6838	MRW070	MRW101		RB6791			EM12045						
31																			RB6839	MRW101						EM12044						
31																			MRW070	DWG1561						DET5000						
31																			MRW101	RB6971												
31																														+		
31		*Triodia epactia*	+		+	+	+			1	1						+	+	HB25	HB167		+		+	+	43	EM20266	NEC20522			+	
31		*(= Triodia pungens)*																	HB167							EM1204	EM20290					
31																																
31		*Triodia wiseana*	+	+	+	+	+			1	1						+	+	HB168	RB6909	MRW079	RB6909	RB6757	+	+	+	+	+		+	+	
31																			MRW079	MRW079						EM12041		NEC20522				
31																				DWG1563						DET5001						
31																				HB168												
31																				HB171												
31		*Triraphis mollis*	+						1	1	1						+	+	RB7082	RB6892		RB6892	92,RB7067,RB7089					NEC20581				
31																			HB185	RB7067		RB7082	RB7254									

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Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW	F	G	S	T	I	New Taxa	PL	P1	P3	2004 Astron	Astron	Barrow	Perth	Karratha	Buckley Butler	Aust. Herb.No.	Lewis Grierson	rudge	1993a	1993b	Mattiske 1994	1995	1996	1999	BARROW ield Herbariur
31																				HB72												
31		*Whiteochloa airoides*	+		+				1	1	1						+	+	+								DET11008				+	
31																											EM20419					
31		*Yakirra australiensis*	+	+					1	1	1						+	+	HB154	HB154								NEC20518				
31		*(= Panicum decompositum)*																	RB7158			RB7158						NEC20570				
31		*(= Panicum australiense)*																										NEC20501				
31		Poaceae sp.	+	+					1	1	1							+	MRW139							+						
31																			MRW145													
31																															+	
31		Poaceae sp. 1	+						1	1	1							+	+						+							
31		Poaceae sp. 2	+						1	1	1							+	+						+							
31		Poaceae sp. 3 (Tussock grass)	+						1	1	1							+	+						+							
32	CYPERACEAE	*Bulbostylis barbata*	+	+				1	1	1	1						+	+	RB7203	HB147		RB7203	RB7203				EM20228	NEC20580				
32																				DWG1530								NEC20572				
32																												NEC20526				
32																												NEC20605				
32																												NEC20534				
32		*Cyperus bifax*	+						1	1	1							+										NEC20604				
32		*Cyperus cunninghamii*	+							1	1																				+	+
32		*Cyperus cunninghamii* subsp. *cunninghamii*	+	+		+	+				1						+	+	RB6627	HB122	MRW078	B6605,RB662	27,RB6651,RB6858		+	+	)ET11022	+		+		
32		*(= Mariscus sp.)*																	RB6767	DWG1513	04783		RB6943				EM20226					
32																			RB6651	MRW078							EM20302					
32																			MRW078	RB6858							EM20328					
32																				HB6/64							EM20376					
32																											EM20468					
32		*Cyperus iria*	+							1	1							+										NEC20595				
32		*Cyperus squarrosus*	+							1	1						+	+				RB6737	RB6737					NEC20586				
32																												NEC20602				
32																												NEC20609				
32																												NEC20537				
32		*Fimbristylis dichotoma*	+						1	1	1						+	+										NEC20573				
32		*Fimbristylis schultzii*	+							1	1						+	+	+	HB43		+		+		+					+	
32	*	*Isolepis marginata*	+						1	1	1	1						+	+			+										
32		*Isolepis* sp.	#	#						1	1																					
32		*(= Scirpus marginatus)*																														
32		*Lipocarpha microcephala*	+	+					1	1	1																					
32		*Schoenoplectus dissachanthus*	+						1	1	1							+	HB55			+										
32		*(= Scirpus dissachanthus)*																														
47	COMMELINACEAE	*Commelina ciliata*	+						1	1	1							+	+			+										
47		*Commelina ensifolia*	+							1	1							+	HB197	DWG1214		+										
47																			B1202													
54C	DASYPOGONACEAE	*Acanthocarpus verticillatus*	+	+					1	1	1							+	+	HB169	B136,RB67	B6784, 0478	RB6784	RB6784		+	+	EM20256				+	
54C		*(+ Acanthocarpus preissii)*																		MRW163								EM20361					
54C		*(= Acanthocarpus robustus)*																			MRW163	SVL1083										
54C		*(= Acanthocarpus sp.)*																			MRW119	MRW163										
54C																						MRW119										
54C																																
54F	ANTHERICACEAE	*Corynotheca flexuosissima*	+						1	1	1							+	+	RB7202	RB7222		RB7202	:B7202,RB7222									
54F		*(+ Corynotheca micrantha)*																			RB7202											
87	MORACEAE	*Ficus brachypoda*	+	+	+	+	+	1	1	1	1						+															
87		*(= Ficus platypoda)*																+	RB6776	RB6621	04785	RB6621	RB7022		+		EM20202				+	+

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Fam			Barrow	PGPF	PFG	PCO	PNW						New				2004					Buckley	Aust.	Lewis		Mattiske				BARROW
No	FAMILY	Species	Island					F	G	S	T	I	Taxa	PL	P1	P3	Astron	Astron	Barrow	Perth	Karratha	Butler	Herb.No.	Grierson	rudge	1993a	1993b	1994	1995	1996	1999	ield Herbariur
87		*(= Ficus leucophea)*																	HB	HB							EM20337					
87		*(= Ficus platypoda* var. *minor)*																	MRW072	MRW072	MRW072						EM20373					
		Ficus brachypoda hairy variant (ex *Ficus platypoda* va	+								1						+															
87		*Ficus opposita* var. *aculeata*	+							1	1						+	+	RB6802			RB6802	RB6802					DET1101	EC207(	+		
87		*Ficus virens* var. *virens*	+							1	1						+	+	MRW200	MRW200	MRW200	RB6776	RB6776				EM2042	+				+
87		*Ficus* sp.	+							1	1							+	+				RB6616									
90	PROTEACEAE	*Grevillea pyramidalis*	+					1	1	1	1						+	+	+			+					+				+	
90		*Grevillea pyramidalis* subsp. *?leucadendron*	+	+			+				1							+														
90		*Hakea lorea* subsp. *lorea*	+	+	+	+			1	1	1						+															
90		*(= Hakea lorea)*																+	MRW111	MRW111	RW111, 047	+			+		EM20255				+	+
92	SANTALACEAE	*Santalum murrayanum*	+					1	1	1	1						+	+	RB6864	RB6864		RB6864	RB6864				EM2048	+				+
92		*(= Santalum lanceolatum)*																	MRW204													
97	LORANTHACEAE	Loranthaceae sp.	+					1	1	1	1						+	+	+			+										
103	POLYGONACEAE *	*Emex australis*	+					1	1	1	1	1					+															
105	CHENOPODIACEAE	*Atriplex isatidea*	+				+	1	1	1	1						+	+	MRW146	RB6686	6862,RB6742		RB6742				DET1102	+				+
105		*Atriplex semilunaris*	+							1	1						+	+	HB193	B7044,HB1	RB7077	77 RB7044,RB7078,RB7080										
105																				RB7078,RB7080											
105		*Chenopodium* aff. *cristatum*	+	+					1	1	1		1																			
105		*Chenopodium melanocarpum* forma *leucocarpum*	+							1	1						+	+	HB100,HB4	G1283,RB6840		RB6769	24,RB6752,RB6827,							+	+	
105		*(= Chenopodium carinatum)*																		RB6827,RB6752			RB6840									
105		*Chenopodium pumilio*	+							1	1							+	RB6624	MRW057	MRW057											
105		*Dysphania kalpari*	+						1	1	1						+	+	MRW178								EM20275				+	+
105																											EM20377					
105																											EM20412					
105																											EM20474					
105		*Dysphania plantaginella*	+							1	1						+	+	RB6706	RB6706		RB6706	B6706,RB6685				EM20206	NEC20558				
105																				DWG1285							EM20473					
105																											EM20479					
105		*Dysphania rhadinostachya*	+							1	1						+		RB6721	HB59		RB6721	RB6753		+		EM20406			+	+	
105		*(= Chenopodium rhadinostachyum)*																									EM20418					
105		*(= Dysphania inflata)*																		DWG1549												
105		*Dysphania rhadinostachya* subsp. *inflata*	+								1							+														
105		*Dysphania rhadinostachya* subsp. *rhadinostachya*	+	+	+						1		1																			
105		*Enchylaena tomentosa* var. *tomentosa*	+				+		1	1	1						+	+														
105		*(= Enchylaena tomentosa)*																	RB7234	RB6960	MRW188	RB6960	B6960,RB7042				EM20299					+
105		*(= Enchylaena micrantha)*																	MRW188	RB7042		RB7234										
105																				MRW188												
105		*Eremophea spinosa*	+				+		1	1	1						+	+	HB142	B1, MRW1	MRW164	RB6783	11,RB6750,RB6770				DET1104	+			+	
105		*(= Sclerolaena spinosa)*																		HB142,RB6770			RB6775,RB6777,RB6779				EM20218b					
105																				RB6775,RB6779			RB6871,RB7224,RB7268									
105																				RB6871,RB7224												
105																				RB7224,RB7268												
105																				DWG1274,DWG1275												
105	CHENOPODIACEAE	*Halosarcia halocnemoides*	+					1	1	1	1																				+	
105		*Halosarcia halocnemoides* subsp. *tenuis*	+				+				1						+	+	MRW160	HB70,HB26	RB6780	RB6780	RB6772				EM20219				+	+
105		*(= Arthrocnemum halocnemoides)*																		RB6772	MRW160						EM20230					
105																				MRW160							EM20394					
105																											DET11046					
105		*Halosarcia indica*	+				+			1	1							+	HB								DET11048				+	+
105		*(= Arthrocnemum leiostachyum)*																														

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105		*(=Halosarcia indica* subsp. *julacea)*	+															+	MRW165	MRW165	MRW165						EM20231				+		
105																											EM20243						
105																											EM20393						
105		*(=Halosarcia ?indica)*	+																MRW158														
105		*Halosarcia indica* subsp. *leiostachya*	+								1						+	+	20	RB6773		RB6781	RB6773										
105																			21														
105		*Halosarcia* sp.	+							1	1							+						+									
105		*Neobassia astrocarpa*	+				+		1	1	1						+	+	RB6740	26/7	HB71/22	RB6740	:B6722,RB674	+			DET11047				+	+	
105		*(= Bassia astrocarpa)*																	BI161	DWG1234	MRW099		RB6873				EM20232						
105		*(= Neobassia sp.)*																	MRW099	MRW099	04787						EM20392						
105																				RB6722													
105																				RB6873													
105		*Rhagodia eremaea*	+						1	1	1							+	HB14														
105		*Rhagodia latifolia* subsp. *latifolia*	+							1	1						+	+	+							EM12025					+		
105		*Rhagodia latifolia* subsp. *?recta*	+								1							+	+							EM5002							
105																										EM12026							
105		*Rhagodia preissii* subsp. *obovata*	+				+			1	1						+	+	RB7104	IB18,RB681	MRW142	RB7104	:B6819,RB683	+			DET11020				+	+	
105		*(= Rhagodia obovata)*																	BI60	326/2,RB6830			RB7037,RB7091				EM20207						
105		*(= Rhagodia baccata)*																	MRW142	B3285,RB7091			RB7096,RB7097										
105		*(= Rhagodia dioica)*																		DWG1284,RB7096			RB7103,RB7104										
105																				MRW142,RB7097													
105																				RB7103,RB7104													
105		*Salsola tragus*	+	+			+		1	1	1						+	+	HB32	MRW054	MRW054	+				+	+	NEC20613			+	+	
105																			MRW054	SVL1075	VL1075, 03876												
105		*Sclerolaena convexula*	+						1	1	1						+	+	MRW164			+										+	
105		*(= Bassia convexula)*																															
105		*Sclerolaena uniflora*	+							1	1						+	+	MRW159	MRW159	MRW159	+										+	
105		*Threlkeldia diffusa*	+				+		1	1	1						+	+	RB6954	HB,RB6743	HB65	RB6954	:B6743,RB687	+		EM1202	ET11021				+	+	
105																			MRW143	MRW143	MRW143		RB7018,RB6954				DET11045						
105																				RB6954													
105																				RB7018													
106	AMARANTHACEAE	*Alternanthera nodiflora*	+					1	1	1	1						+	+															
106		*Alternanthera* sp.	+							1	1								+			+											
106																				RB6836,RB6961		RB6836,RB6961											
106		*Amaranthus mitchellii*	+	#					1	1	1							+														+	
106		*Amaranthus pallidiflorus*	+	+			#			1	1						+	+	+	RB6821	RB6821	RB6683					EM20277		NEC20541				
106		*(= Amaranthus viridis)*																											NEC20549				
106		*Amaranthus* sp. Barrow Island D200(R. Buckley 6	+							1	1							+															
106		*Amaranthus* sp.	+							1	1								RB6961	36962,RB6884		RB6962,RB6884											
106		*Gomphrena sordida*	+						1	1	1						+	+	RB7029	RB7030		RB7029	RB7030	+									
106																						RB7030	RB7125									
106		*Hemichroa diandra*	+						1	1	1						+	+	HB	BI,HB158		+											
106																				DWG1236(1964)													
106		*Ptilotus clementii*	+	+		#			1	1	1						+	+	MRW108	MRW185	MRW108	RB6682	:B6861,RB6945				DET11043					+	
106																			MRW185	MRW108	MRW185						EM20264						
106																					04788						EM20266						
106		*Ptilotus exaltatus*	+							1	1								RB7006	HB188	MRW009	RB7006	:B7004,RB7032									+	
106																			MRW009	MRW009													
106		*Ptilotus exaltatus* var. *exaltatus*	+								1						+	+															
106		*Ptilotus fusiformis*	+							1	1						+	+															
106		*Ptilotus fusiformis* var. *fusiformis*	#	#		?#					1																						
106		*(Ptilotus fusiformis ?* var.)																	HB105			+											
106		*Ptilotus gomphrenoides* subsp. *gomphrenoides*	+	+						1	1						+																
106		*Ptilotus obovatus^^*	+							1	1						+	+	RB6715	RB6804	MRW007	RB6804	:B6606,RB663	+		+	EM20286			+	+	+	
106		(^^abherent prostrate form on island)																	HB85	RB6876	MRW201	RB6715	:B6697,RB6715				EM20430						

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106																			MRW007	MRW007	03877		RB6876,RB6890				EM20431					
106																			MRW201	MRW201			RB6876,RB6890									
106		*Ptilotus obovatus* subsp. *obovatus*	+	+	+	+	+				1																					
106		*Ptilotus villosiflorus*	+							1	1						+	+	RB6735	HB67		RB6735	RB6735				EM20260				+	+
106																			MRW130								EM20291					
107	NYCTAGINACEAE	*Boerhavia burbidgeana*	+		#			1	1	1	1							+	+													
107		*(= Boerhavia diffusa)*																														
107		*(=?Boerhavia repleta)*																		RB7059		RB6601	:25,RB6880,RB7059									
107		*Boerhavia coccinea*	+							1	1							+	HB90	HB90												
107		*Boerhavia gardneri*	+	+	#	#				1	1						+	+	MRW189	MRW189	MRW189				+		DET11007	NEC20603			+	+
107																											EM20306					
107																											EM20333					
107																											EM20410					
107																											EM20486					
107		*Boerhavia* aff. *repleta*	+							1	1																				+	
107		*(=Boerhavia ?repleta)*	+															+	+	RB7251						+	EM20295					
		Boerhavia schomburgkiana	+							1	1						+	+														
107		*(Boerhavia ?schomburgkiana)*																	+	RB6601								NEC20525				
107																												NEC20557				
107		*Boerhavia* sp.	+							1	1							+	HB10					+							+	
107		*Commicarpus australis*	+				#		1	1	1						+	+	HB31	MRW172	MRW172	+	:45,RB6650,RB7011		+		DET11026				+	
107		*(= Boerhavia chinensis)*																		HB31							EM20209					
107		*(= Boerhavia repandra)*																		RB6880,RB7011							EM20267					
108	GYROSTEMONACEAE	*Codonocarpus cotinifolius*	+	+		+		1	1	1	1						+	+	HB132	RB6941	MRW140	RB6941	RB6941				EM20315					+
108																			MRW140	MRW140												
110	AIZOACEAE	*Sesuvium portulacastrum*	+					1	1	1	1						+	+	HB170	B170,RB69	MRW157	RB6965	RB6965				EM20351					
110																			MRW157	MRW157												
111	PORTULACACEAE	*Calandrinia balonensis*	+					1	1	1	1							+	+			+										
111		*Calandrinia polyandra*	+	+						1	1						+	+	+										96/42 TF		+	
111		*(= Calandrinia ?polyandra)*																	RB6815	RB6746	RB6746,RB6815	RB6746,RB6815				+	EM20233					
111																			HB86								EM20390					
111		*Calandrinia* sp. aff. *polyandra*	+								1																				+	
111		*Calandrinia ?*aff. *remota*	+	+						1	1		1																			
111		*Calandrinia* sp.	+							1	1							+	MRW011		05404											
111		*Portulaca australis*	+						1	1	1							+	+			+										
111		*Portulaca intraterranea*	+							1	1						+	+	RB7207	RB7107		RB7107	:B7095,RB7106									
111																						RB7207	:B7107,RB7208									
111		*Portulaca oleracea*	+							1	1							+	+			+										
111		*Portulaca pilosa*	+							1	1							+	RB7053	RB7255		RB7053	:B7052,RB7088									
111		*Portulaca pilosa (Boodie Island)*	+							1	1						+					RB7255	:B7112,RB7225									
113	CARYOPHYLLACEAE	*Polycarpaea longiflora*	+	+	#	+	+	1	1	1	1							+	HB108	MRW085	MRW085		RB6631,RB6663				EM20293		NEC20578		+	+
113																			MRW085	DWG1253	04789											
113																																
122	MENISPERMACEAE	*Tinospora smilacina*	+				+	1	1	1	1						+	+	RB6859	HB91			RB6859				DET1101	DET1100			+	
122																											EM20326					
122																											EM20483					
131	LAURACEAE	*Cassytha capillaris*	+					1	1	1	1						+	+	MRW180								EM20241					+

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137A	CAPPARACEAE	*Capparis lasiantha*	+					1	1	1	1						+	+	RB7155	RB7155		RB7155	RB7155								
137A		*(= Capparis sp.(RB7155))*																													
137A		*Capparis spinosa*	+							1	1																			+	
137A		*Capparis spinosa* var. *nummularia*	+	+	+						1						+	+	HB11	HB20	IRW015, 03878		RB6798				DET11017				+	+
137A		*(= Capparis spinosa)*																	MRW015	MRW015	SVL1069						EM20467					
137A		*Capparis umbonata*	+							1	1						+	+	IRW202A+B									DET1101				
137A		*Cleome viscosa*	+	+		#			1	1	1						+	+	RB6700	HB140	MRW109	RB6700	RB6700	+	+	+	EM20274				+	+
137A																			MRW109	MRW109	04790						EM20398					
137A																				DWG1286,RB6700							EM20476					
138	BRASSICACEAE	*Lepidium platypetalum*	+					1	1	1	1						+	+	RB7141			RB7139	39,RB7140,RB7141									
152	PITTOSPORACEAE	*Pittosporum phylliraeoides*	+	+	+	+	+	1	1	1	1						+	+	HB17	RB6860	MRW073	RB6860	B6865,RB688	+			EM20257				+	+
152																			HB58	W073,RB6	04791		RB6894,RB7154				EM20331					
152																			MRW073	7154,DWG1227												
152																				CLAY & YARDAV												
160	SURIANACEAE	*Stylobasium spathulatum*	+	+	+	+	+	1	1	1	1							+	RB6703	IB,SVL108	MRW116	RB6703	RB6753	+	+	+	EM20265				+	+
160																			MRW116	MRW116	SVL1081											
163	MIMOSACEAE	*Acacia bivenosa*	+	+	+	+	+	1	1	1	1						+	+	RB7210	HB50	MRW055	RB7210	B6790,RB721	+	+	+	EM2028	+				+
163		*Acacia bivenosa* (elongate phyllode form)	+	+							1																					
163		*Acacia bivenosa* (intermediate form)	+	+							1																					
		Acacia bivenosa (Airlie Island variant)	+								1						+															
		Acacia bivenosa (semiprostrate form)	+								1						+															
163		*Acacia coriacea*	+							1	1								HB21	HB8	MRW102		RB6680	+	+	+	EM20208					+
163		*Acacia coriacea* subsp. *coriacea*	+	+		+	+				1						+	+		HB												
163		*Acacia coriacea* subsp. *pendens*	+								1						+	+		RB7246			RB7246									
163		*Acacia cowleana*	+							1	1						+	+	MRW195								EM20411					+
163		*Acacia grasbyi*	+							1	1							+	RB6696	HB	HB	RB6696	RB6696									
163		*Acacia gregorii*	+	+	+	+	+			1	1						+	+	MRW084	MRW084	MRW084		RB6655	+		+	EM20312					+
163		*Acacia inaequilatera*	+							1	1						+	+									EM20240		NEC20700			
163		*Acacia pyrifolia*	+	+	+	+				1	1						+	+	HB	SMITH131	MRW058		RB6939	+	+	+	EM20349			+		+
163		*Acacia synchronicia*	+							1	1						+	+	HB	MRW127	MRW127	RB6952	B6951,RB6952				EM20400					+
164	CAESALPINIACEAE	*Petalostylis labicheoides*	+	+	+	+		1	1	1	1						+	+	RB6791	B119,RB67	MRW016	RB6791	RB6759	+	+	+	EM20311				+	+
164																			MRW016	MRW016	03882											
164																				JSB3275												
164		*Senna artemisioides*	+						1	1	1																				+	
164		*(= Bassia uniflora)*																														
164		*Senna artemisioides* subsp. *oligophylla*	+								1						+	+	6635,MRW	MRW053	IRW053, 047	+					+				+	+
164		*(= Cassia oligophylla)*																	MRW094	MRW094	IRW094, 03883											
164		*Senna glutinosa* subsp. *glutinosa*	+		+	+				1	1						+	+	MRW162	MRW162	MRW162				+	+	DET11051				+	+
164		*(= Cassia glutinosa)*																									EM20318					
164		*Senna glutinosa* subsp. *pruinosa*	+	+							1						+	+	MRW161	RB6937		RB6635	35,RB6640,RB6661				DET11031					
164		*(= Cassia pruinosa)*																	HB159			RB6937					EM20317					
164																											DET11050					
164		*Senna notabilis*	+	+		+				1	1						+	+	RB6658	IB63,RB693	MRW056	RB6658	B6658,RB6931		+	+	EM20307				+	
164		*(= Cassia notabilis)*																	MRW056	MRW056	03881						EM20365					+
164		*(= ? Senna notabilis)*																														
164		*Senna planitiicola*	+							1	1						+	+	MRW138							+	DET11003		+			+
164																			MRW182								EM20245					
164																											EM20414					
164		*Senna venusta*	+							1	1						+	+	+			+										
164		*(= Cassia venusta)*																														

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No	FAMILY	Species	Island					F	G	S	T	I	Taxa	PL	P1	P3	Astron	Astron	Barrow	Perth	Karratha	Butler	Herb.No.	Grierson	rudge	1993a	1993b	1994	1995	1996	1999	ield Herbarium
165	PAPILIONACEAE	*Canavalia rosea*	+					1	1	1	1						+	+	HB149	RB6879			RB6879									
165		*(= Canavalia maritima)*																														
165		*Crotalaria cunninghamii*	+						1	1	1						+	+												+		
165		*Crotalaria medicaginea*	+							1	1						+	+	RB7258	RB7258		RB7258	RB7258				EM20298					
165		*(= Crotalaria trifoliastrum)*																									EM20402					
165		*Crotalaria novae-hollandiae*	+							1	1						+	+	MRW126	MRW126	MRW126	+										+
165		*Cullen lachnostachys*	+						1	1	1						+	+	HB127	RB6970	HB, 048802	RB6760	:B6754,RB6762				EM20292					+
165		*(= Psoralea lachnostachys)*																	MRW124	MRW124	MRW124											
165		*Cullen leucanthum*	+		+					1	1						+	+													+	+
165		*(= Psoralea leucantha)*																	RB6736	HB117	03884	RB6736	:B6642,RB673	+	+	+	EM20384		+			
165																			HB6/12	MRW005	SVL1070											
165																			MRW005	SVL1070	MRW005											
165		*Cullen pallidum*	+							1	1														+		EM20381					
165		*(= Psoralea sp.(aff. patens Carr 4603/Beauglehole 4838))*																														
165		*(= Psoralea patens)*																														
165		*Cullen* aff. *pallidum*	+								1							+	+											+		
165		*Cullen patens*	+							1	1						+	+														
165		*Cullen pustulatum*	+	+		+	+			1	1						+	+													+	
165		*Erythrina vespertilio*	+			+	+		1	1	1						+	+	HB161	HB161		+		+		+	+			+	+	
165																			HB27													
165		*Indigofera boviperda*	+			+			1	1	1						+	+	HB121	MRW105	MRW105	+					DET11015				+	+
165		*(?= Indigofera georgei)*																	MRW105	MRW177	MRW177						EM20236					
165																			MRW177		04801						EM20262A					
165																											EM20370					
165																											EM20389					
165		*(= Indigofera ?boviperda)*																														
165		*Indigofera colutea*	+							1	1						+	+	6814, MRW	36814,RB7256		RB6814	:86,RB6814,RB7256				EM20238	NEC20616				+
165		*(= Indigofera viscosa)*																									EM20285	NEC20579				
165		*Indigofera linifolia*	+							1	1						+	+	RB7013	IB75,RB7233		RB7013	:B7014,RB7233									
165																				RB7014												
165		*Indigofera linnaei*	+							1	1						+	+	+			+			+		EM20262B	NEC20592			+	
165		*(= Indigofera enneaphylla)*																														
165		*Indigofera monophylla*	+	+	+	+	+			1	1						+	+	RB118	RB6877	MRW125	RB6877	:02,RB6612,RB6629		+	EM1201	EM20248				+	+
165																			HB10	HB203	MRW183		RB6639,RB6787				EM20342					
165																			MRW125	RB6787	04800											
165																			MRW183	MRW183												
165																				MRW125												
165		*Indigofera trita*	+							1	1						+	+	HB198	37036,RB7060		RB7036	:36,RB7060,RB6914				EM20253					
165		*Indigofera* sp.	+							1	1							+	+							+						
165		*(Indigofera sp. (RB6723) (not received))*																+	+	RB6914			RB6723									
165		*Isotropis atropurpurea*	+							1	1						+	+	MRW150								DET11037					+
165																											EM20252					
165																											EM20334					
165		*Lotus australis*	+						1	1	1							+	RB6881	RB6881		RB6881	RB6881									
165		*Lotus cruentus*	+							1	1							+														
165		*Rhynchosia minima*	+	+	#		#		1	1	1						+															
165		*(= Rhynchosia ?minima)*																														
165		*(= Rhynchosia cf. minima)*																+	RB7151	RB6825	MRW144	RB6889	:B6660,RB6825		+	+	EM20270		+			+
165		*Sesbania cannabina*	+	+					1	1	1						+	+	+	DWG1325		+										
165		*Swainsona formosa*	+						1	1	1						+	+	HB172		04792	+										
165		*(= Clianthus formosus)*																														
165		*Swainsona kingii*	+							1	1						+	+	RB7086	HB155		RB7086	:85,RB7086,RB7087									
165		*Swainsona pterostylis*	+							1	1							+	HB1	RB6656		RB6656	:49,RB6665,RB6671									
165		*Tephrosia clementii*	#			#			1	1	1																					
165		*Tephrosia rosea*	+	#	+	+				1	1								MRW097	MRW097	MRW097										+	+

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No	FAMILY	Species	Island					F	G	S	T	I	Taxa	PL	P1	P3	Astron	Astron	Barrow	Perth	Karratha	Butler	Herb.No.	Grierson	rudge	1993a	1993b	1994	1995	1996	1999	ield Herbarium
165																			MRW186		04808											
165		*Tephrosia rosea* var. *dementii*	+	+	+		+				1						+	+	RB6818	JFC352		RB6818	5818,RB6721	+	+	+	EM20341				+	
165																				JSB3274			RB6789				EM20347					
165																				CLAY & YADAV							EM20484					
165																				RB6789							DET11030					
165		*Tephrosia rosea* var. *glabrior* ms	+								1						+	+	HB62	HB	MRW148	RB6668	B6668,RB6955				DET11033					+
165																			RB6668	DWG1288							EM20201					
165																				MRW148							EM20269					
165																				RB6955							EM20458					
165		*Tephrosia* sp.	+							1	1							+	+							+				+		
165		Papilionaceae sp.	+	+					1	1	1																			+		
173	ZYGOPHYLLACEAE	*Tribulus cistoides*	+					1	1	1	1							+														
173		*Tribulus hirsutus*	#	#		#				1	1																					
173		*Tribulus occidentalis*	+							1	1						+	+	+			+										
173		*Tribulus terrestris*	+							1	1							+	MRW117	MRW117	RW117, 04804		RB7064,RB7065,RB7066									+	
183	POLYGALACEAE	*Polygala isingii*	+					1	1	1	1						+															
		(Polygala aff. *isingii)*																+										NEC20567				
183																												NEC20608				
183																												NEC20520				
185	EUPHORBIACEAE	*Adriana tomentosa* var. *tomentosa*	+	+	+	+	+	1	1	1	1						+	+															
185		*(= Adriana tomentosa)*																	RB6763	HB8	MRW076	RB6763	RB6763	+		+	EM20321				+	+
185																			MRW076	MRW076	SVL1078						EM20364					
185																					04805						EM20460					
185		*Euphorbia australis*	+	+		+			1	1	1						+	+	RB6756	HB42	HB30/L4	RB6756	31,RB6831,RB6833				EM20237	NEC20503			+	
185		*(= Euphorbia australis* var. *vaccaria)*									1							+									EM20269	NEC20559				
185		*(= Chamaesyce australis)*																									EM20272					
185																											EM20360					
185																											EM20363					
185																											EM20368					
185																																
185		*Euphorbia coghlanii*	+	+		#				1	1						+	+	RB7092	RB7083	RB6794	RB6688	B6688,RB6826		+		DET11019	NEC20500			+	
185		*(= Chamaesyce atoto)*																	RB6688	RB6688	RB6903	RB6903	B7092,RB7094				EM20239	NEC20514				
185																				DWG1330		RB7092	RB7116					NEC20562				
185		*Euphorbia drummondii* subsp. *drummondii*	+	+	+		+			1	1						+	+	HB16	RB6923	HB		RB6923,RB7159,RB6956									
185		*(= Chamaesyce atoto)*																		RB6956												
185		*(= ? Euphorbia drummondii* subsp. *drummondii)*																		RB7148												
185																				RB7159												
		Euphorbia aff. drummondii (Boodie Island)	+							1	1						+															
185		*Euphorbia myrtoides*	+	+						1	1							+	+	RB6901		RB6688	32,RB6690,RB7062		+						+	
185		*(= Chamaesyce myrtoides)*																		RB6902		RB7083	B7081,RB7083									
185		*(= Euphorbia alsinifiora)*																		RB6904		RB7093	01,RB6902,RB6904									
185		*Euphorbia tannensis* subsp. *eremophila*	+	#						1	1						+	+	RB7002	RB7001	MRW045	RB7001	5837,RB7001	+	+	+	DET11013	NEC20512				
185		*(+ Euphorbia boophona)*																	HB	MRW045		RB7002	B7002,RB7003				EM20267					
185		*(= Euphorbia eremophila)*																					RB7005,RB7012				EM20276					
185																							RB7098,RB7099				EM20472					
185		*Euphorbia* sp.	+							1	1							+														
185		*Euphorbia* sp.A.	+							1	1							+	+				RB7111				EM20482	NEC20548			+	
185																												NEC20510				
185																												NEC20516				
185		*Flueggea virosa* subsp. *melanthesiodes*	+						1	1	1						+	+	+						+					+	+	
185		*(= Flueggea virosa)*																														
185		*Mallotus dispersus*	+						1	1	1						+	+	+								EM20261					
185		*(=Mallotus didmochryseus)*																									EM20327					

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185		*Mallotus nesophilus*	+	+	+		+			1	1						+	+	HB?	B80, RB682	B6897, 0540	RB6897	B6857,RB6897				EM20200				+	
185																			MRW082	MRW082	MRW082						EM20429					
185		*Phyllanthus maderaspatensis*	+	+					1	1	1						+	+	RB6899	201,DWG1524		RB6899	99,RB6900,RB6905		+	+	EM2046		IEC20554			
185																			RB7241	36898,RB6900		RB7241	06,RB6935,RB7241						IEC20511			
185																				RB6935,RB7241											
185		*(=Phyllanthus* sp.)																+													
202	STACKHOUSIACEAE	*Stackhousia muricata*	+	+				1	1	1	1						+	+	HB28	RB6659	MRW107	RB6659	RB6730				EM20284				+	+
202		*(= Stackhousia elata)*																	MRW107	MRW107	04806						EM20462					
202		*(= Stackhousia ?muricata)*																														
207	SAPINDACEAE	*Alectryon oleifolius* subsp. *oleifolius*	+					1	1	1	1						+	+	HB28	RB6866	RB6862	RB6862	B6862,RB6866				EM2047	+				
207		*(= Heterodendrum oleaefolium)*																														
207		*(= Atalaya hemiglauca)*																														
207		*Diplopeltis eriocarpa*	+	+	+	+	+		1	1	1						+	+	HB19	MRW003	MRW003		RB6744		+	+	EM1200	EM20218				+	
207		*(= Diplopeltis ?eriocarpa)*																	MRW003	HB19	03885						EM20325					
207																				RB6744												
207																				DWG1293												
207																																
207		*Diplopeltis intermedia* var. *?intermedia*	+							1	1							+	+							+	EM20217				+	
207		*Diplopeltis* sp.	+	+						1	1																				+	
207		*Dodonaea lanceolata*	+						1	1	1							+													+	
207		*Dodonaea lanceolata* var. *lanceolata*	+	+							1						+	+	RB6613	MRW075	MRW075	RB6613	RB6613		+	+	EM1203	EM20330				+	+
207																			HB82	JSB3278	04807											
207																			MRW075	DWG1237												
215	RHAMNACEAE	*Ventilago viminalis*	+					1	1	1	1						+	+														
220	TILIACEAE	*Corchorus congener*	#	#																												
220		*Corchorus ?congener*	#	#			#																									
220		*Corchorus interstans* ms (P3)	+	+			+	1	1	1	1					1	+	+	RB6938			RB6938										
220		*(= Corchorus sidoides)*																					RB6732									
220		*(=Corchorus* aff. sp. Barrow 2)																	MRW149							EM1201	DET11032				+	
220		*(=Corchorus aff. sidoides)*																									DET11055					
220		*(= Corchorus ?interstans)*																														
220		*Corchorus tridens*	+							1	1						+	+											NEC20539			
220		*Corchorus walcottii*	+		#	#	#			1	1						+	+	HB116	HB	MRW081	RB6638	B6647,RB6734			+	EM20459				+	
220																				JSB3279											+	
220																				DWG1520												
220																				CLAY & YARDAV												
220		*(= Corchorus walcottii)*																	L-3	MRW081	05406						EM20475					
220																			MRW081								EM20281					
220		*(= Corchorus ?walcottii)*	+	+																												
220		*(=Corchorus walcottii* s.l.)	+	+																												
220		*(=Corchorus* sp. Barrow)	+															+	+									NEC205	+			
220		*Corchorus* sp.	+	+		+				1	1								+	36732,RB6751			RB6870		+	+						
220		*Corchorus* aff. sp. Barrow 1	+							1	1								RB6638	HB11	HB37	RB7132	RB7132				EM20224			+		+
220		*(= Corchorus parviflorus)*															+	+		MRW187	MRW187						EM20271					
220																				RB6623			RB6623				EM20279				+	
220																				RB6793			RB6793				EM20296					
220																											EM20362					
220		*Corchorus* sp. Barrow 2	+							1	1							+														
220		*Triumfetta appendiculata*	+						1	1	1						+														+	
220		*Triumfetta* aff. *appendiculata*	+	+							1		1																			
220		*Triumfetta chaetocarpa*	+				+			1	1																					

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220		*Triumfetta clementii*	+	+		#	+			1	1						+	+	RB6672	RB6807	MRW133	RB6807	RB6672		+		EM20263		NEC20533		+	+
220		*(= Triumfetta leptacantha)*																	MRW133	MRW133							EM20353					
220																				DWG1564							EM11006					
220		*(= Triumfetta ?clementii)*																														
220		*Triumfetta maconochieana*	+	+	+					1	1						+		MRW151	MRW151	MRW151	RB6882	'97,RB6868,RB6882				EM2025	ET1103	EC20555			
220																			HB31													
220																											EM20336				+	
220		*(= Triumfetta ?maconochieana)*																														
220		*(= Triumfetta* sp. Rudall subsp. Woodstock)	+															+														
220		*Triumfetta ramosa*	+			+				1	1						+	+	HB46	HB46			RB6669				DET11023				+	+
220		*(= Triumfetta appendiculata)*																	MRW147	DWG1538							EM20309					
220		*Triumfetta* aff. *ramosa*	+								1								+	MRW147	MRW147					EM12019						
220		*(= Triumfetta* aff. *appendiculata)*																													+	
220		*Triumfetta* sp.	+	+	+					1	1																					
221	MALVACEAE	*Abutilon cunninghamii*	+	#			#	1	1	1	1						+	+	RB7033	HB45	RB6813	RB6681	:B6681,RB6686				DET11014		NEC20509		+	
221		*(+ Abutilon fraseri?)*																	RB6681	MRW096	MRW096	RB6813	:B6813,RB6817				EM20112					
221		*(= Abutilon exonemum)*																	MRW096			RB7033	:B6924,RB7009				EM20114					
221																							RB7033				EM20268					
221																											EM20289					
221																											EM20301					
221																											EM20352					
221		*Abutilon indicum* var. *australiense*	+							1	1							+														
221		*Abutilon leucopetalum*	+							1	1						+	+	7232,MRW	MRW128	MRW128	RB7232	RB7231			+						+
221		*Abutilon otocarpum*	+	+						1	1						+	+	+								EM20454					
		Abutilon sp. (VL-2706-09)	+							1	1						+															
221		*Abutilon* sp.	+			+				1	1							+	+						+	+	+				+	
221																			MRW055	MRW055	03879						EM20372				+	
221																				JSB3276												
221																				JSB3284												
221																				DWG1321												
221																			MRW102	MRW102	SVL1084						EM20451				+	
221																				SVL1084	04793											
221																				AAB053	04795										+	
221																				DWG1311												
221																			RB6939	MRW058	MRW176										+	
221																			MRW058	MRW176	03880											
221																				DWG1297												
221																				JSB3272												
221																			MRW127	RB6952	04798										+	
221																				RB6951												
221		*Gossypium australe*	+						1	1	1						+	+	+						+						+	
221		*(= Notoxylinon australe)*																													+	
221		*Gossypium robinsonii*	+	+						1	1						+	+	HB97	RB6940	MRW012	6940	6940	+	+		EM20357					+
221																			MRW012	MRW012	03886						EM20452					
221																				HB97												
221																				CLAY & YARDAV												
221		*Herissantia crispa*	+						1	1	1							+	+			+									+	
221		*(= Abutilon crispum)*																														
221		*(= Abutilon herissantia)*																														
221		*Hibiscus burtonii*	+						1	1	1							+	+							+						
221		*Hibiscus coatesii*	+			#				1	1						+	+	+							47	EM20322					
221		*Hibiscus sturtii*	+			+				1	1																				+	
221		*Hibiscus sturtii* var. *campylochlamys*	+								1						+	+	HB165			+			+	+					+	
221		*Hibiscus sturtii* var. *platychlamys*	+								1						+	+	+							EM1204	EM20288		NEC20513			
221																											EM20303					

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221																												EM20355					
221																												EM20368					
221			*Hibiscus* sp. (VL-2706-41)	+							1	1						+															
221			*Hibiscus* sp. (EM12013)	+							1	1							+	+								EM12013						
221			*Lawrencia viridigrisea*	+						1	1	1						+	+	RB7137	RB7147		RB7137	:B7135,RB7136										
221																						RB1747	:B7137,RB7147									
221																																	
221		*	*Malvastrum americanum*	+						1	1	1	1					+	+	RB6709	HB61	MRW120	RB6709	:07,RB6609,RB6610		+		DET11002	+		+	+	
221			(=*Malvastrum spicatum)																	MRW120	MRW120	04808		RB6709,RB6959				EM20367					
221																												EM20455					
221			*Sida calyxhymenia*	+						1	1	1							+	RB7236			RB7236	RB7235									
221			*Sida clementii*	+							1	1							+	+													
221			*Sida echinocarpa*	+							1	1						+	+	RB6853	HB194		RB6853	RB6853				EM20281					+
221																				MRW187								EM20461					
221			*Sida fibulifera*	+				#			1	1						+	+	RB6701	HB7	MRW110	RB6701	RB6710	+	+	+	EM20310	NEC20523				
221			(= *Sida* aff. *fibulifera)*																	HB101	HB166							EM20350	NEC20566		+		
221																				MRW110	MRW110							EM20369					
221																												EM20386					
221																												EM20407					
221																												EM20422					
221			*Sida spodochroma*	+							1	1								HB	RB6875		RB6875	:B7245,RB7143							+	
221			(= *Hibiscus spodochroma)*																+													
221			(= *Sida corrugata)*															+	+													
221			*Sida* sp. (VL-2709-14)	+							1	1						+															
221			*Sida* sp. EM12018	+							1	1							+	+							EM12018						
221			*Sida* sp. EM20301B	+							1	1							+	+								EM20301B					
221			*Sida* sp.	+			+				1	1																					
223	STERCULIACEAE		*Hannafordia quadrivalvis*	+	+	+	+		1	1	1	1						+	+	RB6619	B6626,HB1	MRW141	RB6619	:B6619,RB662	+	+	EM1201	DET11019					+
223			(= *Hannafordia ?quadrivalvis)*																	MRW141	MRW141		RB6626	RB6632				EM20234					
223																												EM20323					
223																												EM20469					
223			*Hannafordia quadrivalvis* subsp. *recurva*	+	+			+				1																					
223			*Keraudrenia* sp.	+						1	1	1						+	+	+			+								+	
223			*Melhania oblongifolia*	+						1	1	1						+	+	RB7133	IB92,RB66(	HB146K	RB7133	:04,RB7073,RB7074									
223			(= *Melhania incana)*																	RB7134	B195,RB7075		RB7134	:75,RB7114,RB7120									
223																					RB7121,RB7126		RB7157	21,RB7126,RB7133									
223																					RB7157,RB7263			RB7134,RB7157,RB7263									
223			*Waltheria indica*	+						1	1	1						+	+	HB34	HB34	HB75	+		+		EM1201	DET11028					
223																																	
223																					RB6882,RB6868							EM20387				+	
235	ELATINACEAE		*Bergia pedicellaris*	+					1	1	1	1																	NEC20614				
236	FRANKENIACEAE		*Frankenia ambita*	+					1	1	1	1							+	MRW013	MRW013	MRW013											
236			*Frankenia pauciflora* var. *pauciflora*	+	+	+		+			1	1						+															
236			(= *Frankenia pauciflora)*																+	RB6733	HB6	HB	RB6733	:B6729,RB673	+	+	+	EM20379					+
236																				HB			RB7060	:B6949,RB6950									
236																								RB7069									
236																																	
236			*Frankenia* sp.								1	1																				+	
243	VIOLACEAE		*Hybanthus aurantiacus*	+	+	+			1	1	1	1						+	+	+								DET11032	NEC20574			+	
248	PASSIFLORACEAE	*	*Passiflora foetida* var. *hispida*	+					1	1	1	1							+														
248			(=*Passiflora foetida)*																+	HB			+										

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265	LYRTHRACEAE		*Ammannia multiflora*	+					1	1	1	1						+	+		RB6742	RB6742							NEC20538		+	
265																					MRW146	MRW146							NEC20593			
265			*(= Cryptostemma calendula)*																														
269	RHIZOPHORACEAE		*Rhizophora stylosa*	+					1	1	1	1							+	L-6			+										
273	MYRTACEAE	^	*Eucalyptus camaldulensis*	+					1	1	1	1			1			+	+	+			+										
273		^	*Eucalyptus gamophylla*	+							1	1			1			+	+														
273		*	*Eucalyptus gomphocephala*	+							1	1			1			+	+	+			+					EM20434						
273		^	*Eucalyptus torquata*	+							1	1			1			+	+	+			+										
273			*Eucalyptus xerothermica* (ms)	+							1	1						+	+	HB79	MRW093	MRW093	+					EM20255	DET110			+	
273			*(^=Eucalyptus patellaris)*																	MRW093	MRW156	MRW156											
273																				MRW156	SVL1068	04809										
273			*Melaleuca cardiophylla*	+	+	+	+			1	1	1						+	+	HB133	HB139	B6922, 0388	RB6922	RB6922			+	+	EM12035	+				+
273																				MRW018	MRW018	MRW018										
276	HALORAGACEAE		*Haloragis gossei*	+	+		+		1	1	1	1						+	+	MRW113	MRW113	MRW113	6712	67126749		+		EM20273			+	+	+
276																						04810						EM20282					
276																												EM20383					
276																																	
293	PRIMULACEAE		*Samolus repens*	+					1	1	1	1						+	+	RB7259			RB6933	B6913,RB6933								+	
293																				RB6933			RB7259	B7259,RB7260								
294	PLUMBAGINACEAE		*Muellerolimon salicorniaceum*	+				+	1	1	1	1						+	+	HB	RB7035	HB	RB6778	B6676,6778,70	+			EM20229					
294			*(= Limonium salicorniaceum)*																				RB7035	RB7035								+	
294			*Plumbago zeylanica*	+						1	1	1						+	+	RB6620	HB	MRW083	RB6620	B6620,RB6644				EM20259		+			+
294																				MRW083	MRW083	04811						EM20409				
294																				HB200												
301	OLEACEAE		*Jasminum calcarium*	+	+		+		1	1	1	1						+	+	RB6739	HB141	MRW008	RB6739	39,RB6828,RI	+	+		DET11012					
301			*(=Jasminum ?calcarium)*																	MRW008	MRW008	03889						DET11042					
301			*(Not Jasminum calcareum -MAX)*																									EM20329					
301																												EM20354					
301			*Jasminum didymum*	+							1	1							+	RB7145	HB		RB7145	B7144,RB7146									
301			*(= Jasminum* sp.*)*																														
301			*Jasminum didymum* subsp. *lineare*	+								1																					
303	GENTIANACEAE		*Centaurium spicatum*	+					1	1	1	1						+	+	RB6695	RB6719	MRW196	B6695,RB671	B6695,RB6719				EM20417				+	
303			*(= *Centaurium erythraea)*																	MRW196	MRW196							EM20423					
305	ASCLEPIADACEAE		*Cynanchum floribundum*	+	+	+	+	+	1	1	1	1						+	+	HB24	HB24	RB6654	RB6654	RB6662	+			EM20205					
305			*(= Gymnema* sp.*)*																	7-12	RB6654	MRW010						EM20268				+	
305																				MRW010	DWG1243	03390						EM20339				
305																					MRW010												
305			*Marsdenia* sp.	+							1	1							+														
305			*Sarcostemma viminale* subsp. *australe*	+	+	+	+	+		1	1	1						+	+	MRW095	138,DWG1	04812											
305			*(= Sarcostemma australe)*																	HB138	MRW095	MRW095		RB6782	+	+		+			+		
305			*Tylophora cinerascens*	+						1	1	1								RB6969			RB6969	B6967,RB6969								+	+
305			*(= Marsdenia cinerascens)*																														
305			*Tylophora flexuosa*	+							1	1							+														
307	CONVOLVULACEAE		*Bonamia media* var. *villosa*	+	+				1	1	1	1		1				+														
307			*Convolvulus* sp. (RB7250)	+						1	1	1							+	+				RB7250									
307			*Evolvulus alsinoides*	+						1	1	1																					

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307		*Evolvulus alsinoides* var. *decumbens*	+	+							1						+	+														
307		*(= Evolvulus alsinoides ?*var. *decumbens)*																	RB7237			RB7237	RB7238		+		EM20433		NEC20583		+	
307																											DET11024					
307		*(= Evolvulus ?alsinoides* var. *decumbens)*																														
307		*Evolvulus alsinoides* var. *villosicalyx*	#			#					1																					
307		*Ipomoea pes-caprae* subsp. *brasiliensis*	+						1	1	1						+	+	HB148								EM20701					
307		*Polymeria ambigua*	+	+	+	+			1	1	1						+	+	HB83	HB83		+					EM20242					+
307		*(+ Bonamia media)*																	MRW134						+	+	EM20308				+	
307		*(+ Bonamia pannosa)*																	RB6916,RB6932			RB6916	B6603,RB6664				EM20348					
307		*(+ Bonamia rosea)*																				RB6917	RB6673				EM20421					
307		*(+ Polymeria calycina)*																				RB6932										
307																						RB6936										
307		*(=Polymeria ?ambigua)*																+	+								DET11024					
307		*Polymeria* sp.	+							1	1							+	+						+							
307A	CUSCUTACEAE	*Cuscuta australis*	+					1	1	1	1						+	+	RB7102	RB7050	MRW155	B7050,RB710	50,RB7051,RB7102									
307A		*(= Cassytha australis)*																		MRW155												
307A		*(+ Cassytha filiformis)*																														
307A		*(= Cuscuta* sp.*)*																														
310	BORAGINACEAE	*Cordia subcordata* (Boodie Island)	+					1	1	1	1						+	+					RB7221								+	
310		*Ehretia saligna*	+						1	1	1						+															
310		*Heliotropium conocarpum*	+						1	1	1							+	+			+										
310		*Heliotropium crispatum*	+				#			1	1						+	+	MRW1004	MRW004	MRW004	+					EM20271		NEC20542			+
310		*(= Heliotropium ramosissimum)*																			03391								NEC20560		+	
310		*(= Heliotropium undulatum)*																	RB6850	HBL5	RB6867	RB6850	B6637,RB6689						NEC20515			
310																						RB6867	RB6755		+							
310		*Heliotropium cunninghamii*	+							1	1						+	+	+	HB		+									+	
310		*Heliotropium glanduliferum*	+	+	+	+	+			1	1							+														
310		*Heliotropium inexplicitum*	+							1	1							+														
310		*Heliotropium ovalifolium*	+							1	1						+	+	RB6792	RB6611	HB3, 04813	RB6611	B6618,RB667	+		EM12010	ET20204					+
310																			MRW077	MRW077	MRW077	RB6792	B6771,RB6792									
310		*Heliotropium* sp.	+							1	1																				+	
310		*Heliotropium* sp. (perennial shrub) VL-2104-19, V	+							1	1						+	+	+						+						+	
310		*Heliotropium* sp. (RB6866)	+							1	1							+	+				RB6866									
310		*Heliotropium* sp. (RB7037)	+							1	1							+	+			RB7037	B7037,RB7090									
310		*Trichodesma zeylanicum* var. *zeylanicum*	+	+	+	+	+		1	1	1						+															
310		*(=Trichodesma zeylanicum)*																+	HB48	L-7	RW001, 03892		RB6774	+	+	+	EM20382					+
310																			MRW001	MRW001	SVL1087											
310		*(=?Trichodesma zeylanicum)*																														
312	AVICENNIACEAE	*Avicennia marina* subsp. *marina*	+				+	1	1	1	1						+	+	MRW098	MRW098	RW098, 048	+					EM20391				+	+
313	LAMIACEAE	*Clerodendrum tomentosum* var. *lanceolatum*	+	#				1	1	1	1						+	+	RB6928	HB98	MRW086	RB6928	15,RB6628,RB6643				EM2033	+				+
313																			MRW086	MRW086	04814		RB6928,RB7220				EM20450					
313																											EM20261					
315	SOLANACEAE	*Duboisia hopwoodii*	+					1	1	1	1						+	+	+			+									+	
315		*Nicotiana benthamiana*	+						1	1	1						+	+	RB6856	HB88		RB6856	56,RB6942,RB7267				EM20465					+
315																			HB22, MRW207													
315		*Nicotiana occidentalis* subsp. *occidentalis*	+	+						1	1						+	+	RB6696	MRW104	MRW104	RB6696	14,RB6691,RB6702				EM20264				+	+
315																			MRW104		04816		RB6812,RB6915				EM20278					
315		*Nicotiana* sp.	+							1	1																					
315		*Solanum cleistogamum*	+	+			+		1	1	1						+	+	HB126	RB6687		RB6687	6720,RB7227	+	+	+	EM20115				+	+
315		*(= Solanum horridum)*																	HB12-1966	DWG1544		RB7228	B7239,RB7243								+	
315		*(= Solanum quadriloculatum)*																	MRW137				RB7228									

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315			*Solanum diversiflorum*	+	+		+				1	1						+	+	HB4	HB99	:B6633, 0481	RB6633	:33,RB6636,RB6713		+	EM1200	EM20203					+
315																				MRW114	MRW114	MRW114		RB6718				EM20280					
315			*Solanum esuriale*	+							1	1						+	+	RB7156			RB7156	:B7138,RB7160								+	
315			*Solanum lasiophyllum*	+	+	+	+	+			1	1						+	+	HB39	RB6738	VL1071, 048	RB6738	RB6738	+	+	+	EM2028	)ET110	+		+	+
315			*(= Solanum phlomoides)*																	HB6-1964	MRW074	MRW074						EM20408				+	
315																				MRW074		SVL1072											
315		*	*Solanum nigrum*	+							1	1	1					+	+	MRW112	MRW112	05407	+										+
315			*Solanum* sp.	+							1	1							+	RB7228													
316	SCROPHULARIACEAE		*Mimulus gracilis*	+					1	1	1	1							+	MRW197			+					EM20416	NEC20599				+
316			*Stemodia glabella*	+						1	1	1						+	+	MRW181								DET11005					
316			*(= Morgania glabra)*																	RB6727	HB177		RB6727	:B6727,RB6809				EM20247				+	
316																												EM20480					
316			*Stemodia grossa*	+							1	1						+	+	+			+										
317	BIGNONIACEAE		*Dolichandrone heterophylla*	+					1	1	1	1						+	+	+			+						KK20703				
318	PEDALIACEAE	?	*Josephinia eugeniae*	+					1	1	1	1							+	+							EM12028					
325	ACANTHACEAE		*Dicladanthera forrestii*	+					1	1	1	1						+	+	RB7130	RB7142		RB7129,RB713	:B7129,RB7130									
325																							RB7142	RB7131								
325			*Dicladanthera* sp. (RB6863)	+							1	1							+	RB6863			RB6863	RB6863									
325			*Dipteracanthus australasicus*	+						1	1	1							+														
325			*Dipteracanthus australasicus* subsp. *corynotheca*	+								1						+	+	6885, MRW	HB84	RB6907	B6885,RB690	:85,RB7007,RB7008		+	+	EM20228	NEC20550				+
325			*(= Ruellia primulacea)*																	HB125	HB6/1964	MRW103	RB7045,RB7046,RB7047									+	
325			*(= Brunoniella australis)*																		MRW103	MRW174		RB7072,RB7048									
325																					MRW174											
326	MYOPORACEAE		*Eremophila forrestii* subsp. *forrestii* ms	+					1	1	1	1						+	+														
326			*(= Eremophila leucophylla)*																	MRW080	MRW080	MRW080				+		EM20356				+	
326			*(= Eremophila forrestii)*																			04819											+
326			*Eremophila* sp.	+							1	1																				+	
326			*Myoporum montanum*	+	+	+		+		1	1	1						+	+	RB6929	HB	MRW071	RB6929	RB6641	+	+	+	)ET11004					
326			*(= Myoporum acuminatum)*																	MRW071	HB13	SVL1077											+
326																					MRW071	04820										
326			*(= Myoporum* sp.)																														
331	RUBIACEAE		*Oldenlandia crouchiana*	+	+		#		1	1	1	1						+	+	MRW103	DWG1302	04795	+			+		DET11040	NEC20545		+	+	
331																				HB66, MRW154		05408						EM20453					
331																				HB174													
331			*Oldenlandia galioides*	+			+				1	1							+										NEC20607				
331			*(=Oldenlandia ?galioides)*	+																													
331																																	
331			*Synaptantha tillaeacea* var. *tillaeacea*	+						1	1	1						+	+														
331			*(= Synaptantha tillaeacea)*																	HB192	RB7229		RB6874	:74,RB7027,RB7061				DET11010	NEC20543			+	
331																				HB112	HB192		RB7229	:B7079,RB7229				EM20471	NEC20587				
337	CUCURBITACEAE		*Mukia maderaspatana*	+					1	1	1	1						+	+	HB179	HB157	MRW087		RB6918			+	+	NEC20529			+	+
337																				MRW087	MRW136	MRW136											
337																				MRW136	MRW087	04821											
339	CAMPANULACEAE		*Wahlenbergia* sp.	+					1	1	1	1							+	RB6766			RB6766	:B6766,RB6816									
341	GOODENIACEAE		*Goodenia microptera*	+		#	+		1	1	1	1						+	+	RB7054	86785,RB6896		RB6896	'85,RB6896,RB6921				EM20481					

ATTACHMENT F: AMALGAMATED VASCULAR PLANT SPECIES LIST, BARROW ISLAND

# indicates species updated after post cyclonic rain surveys, + indicates species located in initial vegetation surveys

PGPF: proposed Gas Processing Facility and Wider Study Area, PNW: proposed North Whites Beach Pipeline

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Fam No	FAMILY		Species	Barrow Island	PGPF	PFG	PCO	PNW	F	G	S	T	I	New Taxa	PL	P1	P3	2004 Astron	Astron	Barrow	Perth	Karratha	Buckley Butler	Aust. Herb.No.	Lewis Grierson	rudge	1993a	1993b	Mattiske 1994	1995	1996	1999	BARROW ield Herbarium
341																					RB7055			RB7054								
341			*Goodenia* sp.	+							1	1							+	HB164												
341			*Lechenaultia* sp. VL-BWI03-13	+						1	1	1						+														
341			(= Goodeniaceae sp.)																														
341			(=?*Lechenaultia divaricata* - not current name)																	MRW131			+									
341			*Scaevola* cf. *aemula*	+						1	1	1							+	+	RB6888			RB6888									
341			*Scaevola amblyanthera* var. *amblyanthera*	+		+					1	1							+														
341			*Scaevola amblyanthera* var. *centralis*	+		#						1						+	+	HB120	HB163,HB12	RB6617	RB6622	B6617,RB6622				EM20244		NEC20556			+
341			(= *Scaevola decipiens)*																	HB6	DWG1240	MRW121						EM20340					
341																				MRW121	MRW121	04822						EM20420					
341			*Scaevola ?anchusifolia*	+			+				1	1																					
341			*Scaevola crassifolia*	+							1	1						+	+	RB7107	HB144		RB7100	B7100,RB7101									
341			(= *Scaevola nitida)*																	RB7101	RB7100												
341																					RB7101											
341			*Scaevola cunninghamii*	+	+	+	+	+			1	1							+	HB8-12	RB6785	MRW106	RB6608	B6646,RB665	+		+	ET11009					+
341			(= *Scaevola ?collaris)*																	HB13	HB3	04823	RB6653	66,RB6785,RB6842				EM20210				+	
341			(= *Scaevola glandulifera)*																	RB6921	RB6653		RB6666					EM20294					
341			(= *Scaevola globulifera)*																	RB6842	DWG1511							EM20470					
341																				HB14	MRW106												
341																				MRW106	DWG1268											
341																					RB6646											
341																					RB6666											
341																					HB13,HB14											
341			*Scaevola sericophylla*	+	+						1	1							+												+	+	
341			*Scaevola spinescens*	+	+						1	1							+	+	RB6678	RB7026	MRW175	RB6675	6675,RB6678	+			DET11029					+
341																				HB74	RB6675		RB7015	B7063,RB7223				EM20235					
341																				MRW175	MRW175			RB7026				EM20320					
341																					RB7063											
341																					RB7223											
341			*Scaevola* sp.VL-2104-26	+							1	1							+														
341			*Scaevola* sp.	+	+						1	1								+							+		NEC20596				
345	ASTERACEAE	*	*Arctotheca calendula*	+					1	1	1	1	1						+	+				+									
345			*Centipeda minima*	+						1	1	1							+	+	HB57	36805,RB6726		RB6805	05,RB6726,RB6765				EM20396		+			+
345																				MRW194								EM20425					
345		*	*Conyza sumatrensis*	+						1	1	1	1					+															
			(= * *Conyza albida)*																														
345			*Flaveria australasica*	+						1	1	1						+	+	RB7068	HB190		RB7068	RB6657	+			+					
345			*Helichrysum oligochaetum* (P1)	+						1	1	1				1			+												+	+	
345			*Launaea sarmentosa*	+						1	1	1							+	RB7117			RB7117	B7118,RB7123								+	
345			*Olearia dampieri* subsp. *dampieri* ms	+	+	+		+		1	1	1						+	+	HB6	MRW014	MRW014	RB6843	B6820,RB685	+		+	EM20263					+
345			(= *Olearia axillaris)*																	MRW014	26/1	SVL1082											
345			(= *Olearia revoluta)*																		MRW032	MRW032											
345																					HB6	03894										
345																					SVL1082											
345																					DWG1277											
345																					RB6820,RB6855											
345			*Pentalepis trichodesmoides*	+	+	+	+	+		1	1	1						+	+	RB6745	HB2,RB674	MRW017	RB6745	RB6745	+	+	EM1200	EM20305				+	+
345			(= *Chrysogonum trichodesmoides)*																	MRW017	Y & YARD	03893											
345																				HB12	DWG1255											
345																					MRW017											
345			*Pluchea dentex*	+	+						1	1							+	+	RB6854	HB123		RB6911	RB6911			+	EM20332				+	
345																					RB6911							EM20478					
345			*Pluchea dunlopii*	+			+				1	1																					
345			*Pluchea ferdinandi-muelleri*	+		+					1	1																					
345			*Pluchea rubelliflora*	+	+			+		1	1	1							+	+	RB6953	B2/12,HB272		RB6854	B6854,RB7206				DET110	K20704			+	+

ATTACHMENT F: AMALGAMATED VASCULAR PLANT SPECIES LIST, BARROW ISLAND

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Fam No	FAMILY		Species	Barrow Island	PGPF	PFG	PCO	PNW	F	G	S	T	I	New Taxa	PL	P1	P3	2004 Astron	Astron	Barrow	Perth	Karratha	Buckley Butler	Aust. Herb.No.	Lewis Grierson	rudge	1993a	1993b	Mattiske 1994	1995	1996	1999	BARROW ield Herbarium
345																				HB26	36854,RB6958							EM20223				
345																				MRW153								EM20456				
345			*Pluchea tetranthera*	+						1	1							+	+	RB6852	IB25,RB6852		RB6852	RB6852		EM1202	EM2022	+				
345																					HB885		RB6953	RB6953			EM20358					
345																							RB6958	RB6958			EM20399					
345																											EM20457					
345			*(= Pluchea tetranthera var. ?tetranthera)*																												+	
345			*Pluchea* sp.	+						1	1								+	MRW057	MRW057	MRW057									+	
345																				MRW135		03875										
345		*	*Pseudognaphalium luteoalbum*	+						1	1	1	1						+	HB175			+				EM20427					
345			*(= Gnaphalium luteo-album)*																	HB			RB6652									
345			*(= Gnaphalium* sp.*)*																	RB6652												
345			*(= Gnaphalium pseudognaphalium)*																	MRW198												
345			*Pterocaulon sphacelatum*	+	+	+	+			1	1	1						+	+	HB124	HB124			HB6796		+	+	DET11053					+
345																				HB5/12	RB6796						EM20222				
345																				MRW173							EM20246				
345			*Pterocaulon sphaeranthoides*	+	+			+			1	1						+		MRW002	HB47	SVL1086	+				DET11052				+	+
345			*(=Pterocaulon ?sphaeranthoides)*																		HB12-1966	MRW002					EM20113					
345																					SVL1086	03895					EM20270				
345																					CLAY & YARDAV										
345																					MRW002										
345																					DWG1251										
345		*	*Sonchus oleraceus*	+	+					1	1	1	1					+	+	MRW205							EM20463				+	+
345			*Streptoglossa adscendens*	+				+		1	1	1						+	+	RB7205	RB7205		RB7205	B7204,RB7205			DET11001					
345			*(= Pterigeron adscendens)*																								EM20359					
345			*Streptoglossa bubakii*	+	+			+			1	1						+	+	HB94	IB4-12,HB9	MRW006	RB6698	B6684,RB669	+	+	+				+	+
345			*(= Pterigeron bubakii)*																	MRW006	W006,RB6	03896		RB6717								
345			*(= Streptoglossa ?liatroides)*																		RB6717										+	
345			*(=Streptoglossa ?bubakii)*																	RB6698	HB9-74			RB6957								
345			*Streptoglossa decurrens*	+	+	+	+				1	1						+	+	HB64	RB7257	SVL1088	+	7257		+		DET11035					+
345			*(= Pterigeron decurrens)*																	MRW191	AY & YADAV							EM20388				
345																					SVL1088						EM20432				
345			*Streptoglossa macrocephala*	+				#			1	1						+	+	HB115	HB115							DET11030				+	
345			*(= Pterigeron macrocephala)*																													
345			*Vittadinia arida*	+		#				1	1	1						+	+		HB87											
345			*Vittadinia hispidula* var. *setosa*	+	+						1	1							+	RB6786	MRW118	MRW118	RB6786	RB6786				DET11018					+
345			*(=Vittadinia hispidula)*															+		MRW118	RB6786							EM20258				
345					+															MRW190								EM20401				
345			*Vittadinia obovata*	+							1	1						+	+	HB114	HB114											
345																					Site L29-RB1974										
345			*Vittadinia* sp.	+							1	1							+	MRW208			+									
345			Asteraceae sp.	+						1	1	1							+							+						
345			Asteraceae sp. 2	+						1	1	1							+							+						

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ATTACHMENT G: VASCULAR PLANT SPECIES IN VEGETATION COMMUNITIES WITHIN PROPOSED GAS PROCESSING FACILITY SURVEY AREA

(Presence/absence data based on Alive Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Abutilon ?cunninghamii			x								x													
Acacia bivenosa	x	x	x	x		x	x	x		x	x	x	x	x	x			x		x	x	x		x
Acacia bivenosa (elongate phyllode form)		x	x	x			x	x			x	x		x				x		x	x	x		
Acacia coriacea subsp. *coriacea*	x	x	x	x		x	x				x						x			x	x	x		
Acacia gregorii						x	x	x	x		x		x	x	x	x		x	x	x	x	x		x
Acacia pyrifolia												x				x					x		x	x
Acanthocarpus verticillatus		x	x	x		x	x				x			x										
Adriana tomentosa	x	x																						
Adriana tomentosa var. *tomentosa*		x		x			x							x						x		x		
Amaranthus pallidiflorus		x			x						x													
Boerhavia gardneri													x											
Bonamia media var. *villosa*											x								x					
Bulbostylis barbata																	x				x	x		
Calandrinia ?aff. *remota*											x									x	x			
Calandrinia polyandra																	x							
Capparis spinosa var. *nummularia*					x												x							
Chenopodium aff. *cristatum*		x																						
Chenopodium sp.		x																						
Cleome ?viscosa		x															x							
Codonocarpus cotinifolius											x			x						x				
Corchorus ?walcottii																						x		
Corchorus interstans			x	x	x	x	x	x	x	x	x	x	x	x	x		x		x	x	x	x	x	
Corchorus sp.		x	x			x	x			x	x		x	x	x				x	x	x	x		x
Corchorus sp. (seedling)													x											
Corchorus walcottii																						x		
Corchorus walcottii s.l.						x	x													x	x			
Cullen pustulatum						x	x																	
Cymbopogon ambiguus					x				x				x				x						x	x

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(Presence/absence data based on Alive Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Cynanchum floribundum						x	x	x					x	x			x					x		
Cyperus cunninghamii subsp. *cunninghamii*					x												x							
Diplopeltis eriocarpa			x	x		x	x		x	x	x					x		x		x	x	x		
Diplopeltis sp.		x									x													
Dodonaea lanceolata var. *lanceolata*						x					x													
Dysphania rhadinostachya subsp. *rhadinostachya*																					x			
Eragrostis dielsii					x																	x		
Eriachne flaccida																				x				
Eriachne mucronata								x			x		x					x						
Euphorbia australis		x																			x			
Euphorbia coghlanii														x										
Euphorbia drummondii subsp. *drummondii*					x						x			x		x						x		
Euphorbia myrtoides	x	x																						
Evolvulus ?alsinoides var. *decumbens*																x								
Ficus brachypoda											x						x						x	
Frankenia pauciflora var. *pauciflora*					x																			
Gossypium robinsonii															x									
Grevillea pyramidalis ?subsp. *leucadendron*														x										
Hakea lorea subsp. *lorea*						x					x		x	x								x		x
Haloragis gossei			x			x	x				x		x	x		x					x	x		
Hannafordia quadrivalvis subsp. *recurva*						x	x	x			x		x	x		x		x		x	x	x		
Heliotropium glanduliferum		x		x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x
Hybanthus aurantiacus								x					x									x		
Indigofera monophylla			x		x	x	x	x	x	x	x		x	x	x		x		x	x	x	x	x	x
Jasminum calcarium						x				x														
Lipocarpha microcephala																					x			
Mallotus nesophilus																							x	
Melaleuca cardiophylla						x	x			x					x	x				x	x	x		

ATTACHMENT G: VASCULAR PLANT SPECIES IN VEGETATION COMMUNITIES WITHIN PROPOSED GAS PROCESSING FACILITY SURVEY AREA

(Presence/absence data based on Alive Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Myoporum montanum	x	x			x	x	x				x			x			x			x				
Nicotiana occidentalis subsp. *occidentalis*		x					x				x													
Oldenlandia crouchiana					x											x	x					x		
Olearia dampieri subsp. *dampieri*	x	x	x	x	x		x																	
Paspalidium tabulatum					x								x			x				x		x	x	
Pentalepis trichodesmoides			x			x	x	x	x	x		x		x			x		x	x	x	x	x	
Petalostylis labicheoides						x		x	x	x	x	x	x		x			x	x		x	x	x	x
Phyllanthus maderaspatensis													x	x			x						x	
Pittosporum phylliraeoides						x											x						x	x
Pluchea dentex					x								x		x									
Pluchea rubelliflora					x																			
Poaceae sp.											x		x				x				x			
Polycarpaea longiflora			x		x						x						x					x		
Polymeria ambigua			x					x		x												x		x
Pterocaulon sp.	x	x									x		x											
Pterocaulon sphacelatum		x	x		x		x			x	x		x		x		x				x	x		
Pterocaulon sphaeranthoides	x	x									x		x	x			x						x	x
Ptilotus clementii											x													
Ptilotus gomphrenoides var. *gomphrenoides*	x																							
Ptilotus obovatus var. *obovatus*											x													
Rhynchosia minima			x			x	x														x			
Salsola tragus	x																							
Sarcostemma viminale subsp. *australe*		x	x		x		x				x						x						x	
Scaevola cunninghamii					x	x					x			x						x				
Scaevola sp.											x													
Scaevola spinescens		x									x													
Senna glutinosa subsp. *pruinosa*									x															
Senna notabilis																				x		x		

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(Presence/absence data based on Alive Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Solanum cleistogamum			x		x												x						x	
Solanum diversiflorum							x				x			x										
Solanum lasiophyllum	x	x	x	x	x	x	x	x	x	x	x			x	x	x	x	x			x	x		x
Spinifex longifolius	x	x																						
Stackhousia ?muricata										x														
Streptoglossa bubakii						x			x	x	x				x									
Streptoglossa decurrens			x		x		x	x		x				x		x	x			x		x	x	
Streptoglossa sp.										x												x		
Stylobasium spathulatum	x	x	x	x		x	x	x			x				x						x	x		x
Tephrosia rosea var. *clementii*							x	x	x			x			x						x	x		x
Tephrosia sp.																					x			
Trichodesma zeylanicum var. *zeylanicum*		x	x	x		x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x	x
Triodia angusta	x	x	x	x	x	x	x	x		x	x			x	x	x	x	x	x	x	x	x		x
Triodia wiseana		x	x			x	x	x	x	x	x	x			x	x	x	x	x	x	x	x	x	x
Triumfetta ?maconochieana								x																
Triumfetta aff. appendiculata						x														x	x			
Triumfetta clementii			x														x							
Triumfetta sp.																x								
Vittadinia hispidula var. *setosa*											x													
Yakirra australiensis																	x				x			

ATTACHMENT H: VASCULAR PLANT SPECIES IN VEGETATION COMMUNITIES WITHIN PROPOSED GAS PROCESSING FACILITY SURVEY AREA

(Presence/absence data based on Alive and Dead Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25Q	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Abutilon ?cunninghamii			x								x	x												
Acacia bivenosa	x	x	x	x		x	x	x		x	x	x	x	x	x			x		x	x	x		x
Acacia bivenosa (elongate phyllode form)		x	x	x			x	x			x			x				x		x	x	x		
Acacia coriacea subsp. *coriacea*	x	x	x	x		x	x				x						x			x	x	x		
Acacia gregorii						x	x	x	x		x	x	x	x	x	x		x	x	x	x	x		x
Acacia pyrifolia											x					x					x		x	x
Acanthocarpus verticillatus		x	x	x		x	x				x			x										
Adriana tomentosa	x	x																						
Adriana tomentosa var. *tomentosa*		x		x			x							x						x		x		
Amaranthus pallidiflorus		x			x						x													
Boerhavia gardneri													x											
Bonamia media var. *villosa*											x								x					
Bulbostylis barbata																	x				x	x		
Calandrinia ?aff. *remota*											x									x	x			
Calandrinia polyandra																	x							
Capparis spinosa var. *nummularia*					x												x							
Chenopodium aff. *cristatum*		x																						
Chenopodium sp.		x																						
Cleome ?viscosa		x															x							
Codonocarpus cotinifolius											x			x						x				
Corchorus ?walcottii												x										x		
Corchorus interstans			x	x	x	x	x	x	x	x	x		x	x	x		x		x	x	x	x	x	
Corchorus sp.		x	x			x	x			x	x		x	x	x				x	x	x	x		x
Corchorus sp. (seedling)													x											
Corchorus walcottii																						x		
Corchorus walcottii s.l.						x	x													x	x			
Cullen pustulatum						x	x																	
Cymbopogon ambiguus					x				x				x				x						x	x
Cynanchum floribundum						x	x	x					x	x			x					x		
Cyperus cunninghamii subsp. *cunninghamii*					x												x							
Diplopeltis eriocarpa			x	x		x	x		x	x	x					x		x		x	x	x		
Diplopeltis sp.		x									x													

ATTACHMENT H: VASCULAR PLANT SPECIES IN VEGETATION COMMUNITIES WITHIN PROPOSED GAS PROCESSING FACILITY SURVEY AREA

(Presence/absence data based on Alive and Dead Percentage Foliage Cover data)

No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25Q	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Dodonaea lanceolata var. *lanceolata*						x					x													
Dysphania rhadinostachya subsp. *rhadinostachya*																					x			
Eragrostis dielsii					x																	x		
Eriachne flaccida																				x				
Eriachne mucronata								x			x		x					x						
Euphorbia australis		x																			x			
Euphorbia coghlanii														x										
Euphorbia drummondii subsp. *drummondii*					x						x			x		x						x		
Euphorbia myrtoides	x	x																						
Evolvulus ?alsinoides var. *decumbens*																x								
Ficus brachypoda											x						x						x	
Frankenia pauciflora var. *pauciflora*					x																			
Gossypium robinsonii															x									
Grevillea pyramidalis ?subsp. *leucadendron*														x										
Hakea lorea subsp. *lorea*						x					x		x	x								x		x
Haloragis gossei			x			x	x				x		x	x		x					x	x		
Hannafordia quadrivalvis subsp. *recurva*						x	x	x			x		x	x		x		x		x	x	x		
Heliotropium glanduliferum		x		x	x	x	x	x	x	x	x		x	x	x	x		x	x	x	x	x		x
Hybanthus aurantiacus								x					x									x		
Indigofera monophylla			x		x	x	x	x	x	x	x		x	x	x		x		x	x	x	x	x	x
Jasminum calcarium						x				x														
Lipocarpha microcephala																					x			
Mallotus nesophilus																							x	
Melaleuca cardiophylla						x	x			x					x	x				x	x	x		
Myoporum montanum	x	x			x	x	x				x			x			x			x				
Nicotiana occidentalis subsp. *occidentalis*		x					x				x													
Oldenlandia crouchiana					x											x	x					x		
Olearia dampieri subsp. *dampieri*	x	x	x	x	x		x							x										
Paspalidium tabulatum					x							x	x			x				x		x	x	
Pentalepis trichodesmoides			x			x	x	x	x	x	x	x		x			x		x	x	x	x	x	
Petalostylis labicheoides						x		x	x	x	x		x		x			x	x		x	x	x	x
Phyllanthus maderaspatensis													x	x			x						x	

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No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25Q	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Pittosporum phylliraeoides						x											x						x	x
Pluchea dentex					x								x		x									
Pluchea rubelliflora					x																			
Poaceae sp.											x		x				x				x			
Polycarpaea longiflora			x		x						x						x					x		
Polymeria ambigua			x					x		x												x		x
Pterocaulon sp.	x	x									x		x											
Pterocaulon sphacelatum		x	x		x		x			x	x		x		x		x				x	x		
Pterocaulon sphaeranthoides	x	x									x		x	x			x						x	x
Ptilotus clementii											x													
Ptilotus gomphrenoides var. *gomphrenoides*	x																							
Ptilotus obovatus var. *obovatus*											x													
Rhynchosia minima			x			x	x														x			
Salsola tragus	x																							
Sarcostemma viminale subsp. *australe*		x	x		x		x				x						x						x	
Scaevola cunninghamii					x	x					x			x						x				
Scaevola sp.											x			x										
Scaevola spinescens		x									x													
Senna glutinosa subsp. *pruinosa*									x															
Senna notabilis																				x		x		
Solanum cleistogamum		x	x		x								x				x						x	
Solanum diversiflorum							x				x			x										
Solanum lasiophyllum	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x			x	x		x
Spinifex longifolius	x	x																						
Stackhousia ?muricata										x														
Streptoglossa bubakii						x			x	x	x				x									
Streptoglossa decurrens			x		x		x	x		x			x	x		x	x			x		x	x	
Streptoglossa sp.										x												x		
Stylobasium spathulatum	x	x	x	x		x	x	x			x	x	x		x						x	x		x
Tephrosia rosea var. *clementii*							x	x	x		x				x						x	x		x
Tephrosia sp.												x									x			
Trichodesma zeylanicum var. *zeylanicum*		x	x	x		x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x

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No. Quadrats	50	175	50	14	35	70	200	75	50	50	150	25	25	50	40	116	25	25	25Q	50	95	160	50	100
Species **Vegetation Community**	**C1a**	**C2a**	**C2b**	**C2c**	**C5a**	**D1a**	**F8a**	**L3a**	**L3f**	**L3h**	**L3i**	**L4a**	**L5a**	**L6a**	**L7a**	**L7b**	**L9a**	**V1a**	**V1c**	**V1d**	**V1k**	**V1m**	**V3a**	**V3b**
Triodia angusta	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x
Triodia wiseana		x	x			x	x	x	x	x	x		x		x	x	x	x	x	x	x	x	x	x
Triumfetta ?maconochieana								x					x											
Triumfetta aff. appendiculata						x														x	x			
Triumfetta clementii			x														x							
Triumfetta sp.																x								
Vittadinia hispidula var. *setosa*											x													
Yakirra australiensis										x							x				x			

ATTACHMENT I: VASCULAR PLANT SPECIES RECORDED IN PROPOSED GORGON DEVELOPMENT AREAS, BARROW ISLAND 2003, 2004

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Fam No	FAMILY		Species	Barrow Island	PGPF	PFG	PCO	PNW
31	POACEAE		*Aristida holathera* var. *holathera*	+		#		
31			*Cymbopogon ambiguus*	+	+	+	+	+
31			*Dichanthium sericeum* subsp. *humilius*	+	#			
31			*Eragrostis cumingii*	+	#			
31			*Eragrostis dielsii*	+	+			
31			*Eriachne flaccida*	+	+		+	
31			*Eriachne flaccida* (Southern Pilbara - Carr	#			#	
31			*Eriachne mucronata*	+	+	+	#	+
31			*Eriachne* sp.	+		+		+
31			*Eulalia aurea*	+			#	
31			*Paspalidium clementii*	+			#	
31			*Paspalidium tabulatum*	+	+	#		
31			Poaceae sp.	+	+			
31		*	*Setaria verticillata*	#		#		
31			*Spinifex longifolius*	+	+	+		+
31			*Sporobolus australasicus*	+	#			
31			*Sporobolus virginicus*	+		#		+
31			*Triodia epactia*	+		+	+	+
31			*Triodia angusta*	+	+	+	+	+
31			*Triodia wiseana*	+	+	+	+	+
31			*Whiteochloa airoides*	+		+		
31			*Yakirra australiensis*	+	+			
32	CYPERACEAE		*Bulbostylis barbata*	+	+			
32			*Cyperus cunninghamii* subsp. *cunninghamii*	+	+		+	+
32			*Isolepis* sp.	+	#			
32			*Lipocarpha microcephala*	+	+			
54C	DASYPOGONACEAE		*Acanthocarpus verticillatus*	+	+			
87	MORACEAE		*Ficus brachypoda*	+	+	+	+	+
90	PROTEACEAE		*Grevillea pyramidalis*	+				
90			*Grevillea pyramidalis* subsp. ?*leucadendron*	+	+			+
90			*Hakea lorea* subsp. *lorea*	+	+	+	+	
105	CHENOPODIACEAE		*Atriplex isatidea*	+				+
105			*Chenopodium* aff. *cristatum*	+	+			
105			*Dysphania rhadinostachya* subsp. *rhadinosta*	+	+	+		
105			*Enchylaena tomentosa* var. *tomentosa*	+				+
105			*Eremophea spinosa*	+				+
105			*Halosarcia halocnemoides* subsp. *tenuis*	+				+
105			*Halosarcia indica*	+				+

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Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW
105	CHENOPODIACEAE	*Neobassia astrocarpa*	+				+
105		*Rhagodia preissii* subsp. *obovata*	+				+
105		*Salsola tragus*	+	+			+
105		*Threlkeldia diffusa*	+				+
106	AMARANTHACEAE	*Amaranthus mitchellii*	+	#			
106		*Amaranthus pallidiflorus*	+	+			#
106		*Ptilotus clementii*	+	+			
106		*Ptilotus fusiformis* var. *fusiformis*	#			?#	
106		*Ptilotus gomphrenoides* subsp. *gomphrenoides*	+	+			
106		*Ptilotus obovatus* subsp. *obovatus*	+	+	+	+	+
107	NYCTAGINACEAE	*Boerhavia burbidgeana*	+		#		
107		*Boerhavia gardneri*	+	+		#	
107		*Commicarpus australis*	+				#
108	GYROSTEMONACEAE	*Codonocarpus cotinifolius*	+	+		+	
111	PORTULACACEAE	*Calandrinia* ?aff. *remota*	+	+			
111		*Calandrinia polyandra*	+	+			
113	CARYOPHYLLACEAE	*Polycarpaea longiflora*	+	+		+	+
122	MENISPERMACEAE	*Tinospora smilacina*	+				+
137A	CAPPARACEAE	*Capparis spinosa* var. *nummularia*	+	+	+		
137A		*Cleome viscosa*	+	+		#	
152	PITTOSPORACEAE	*Pittosporum phylliraeoides*	+	+	+	+	+
160	SURIANACEAE	*Stylobasium spathulatum*	+	+	+	+	+
163	MIMOSACEAE	*Acacia bivenosa*	+	+	+	+	+
163		*Acacia bivenosa* (elongate phyllode form)	+	+			
163		*Acacia bivenosa* (intermediate form)	+	+			
163		*Acacia coriacea* subsp. *coriacea*	+	+		+	+
163		*Acacia gregorii*	+	+	+	+	+
163		*Acacia pyrifolia*	+	+	+	+	

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Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW
164	CAESALPINIACEAE	*Petalostylis labicheoides*	+	+	+	+	
164		*Senna glutinosa* subsp. *glutinosa*	+		+	+	
164		*Senna glutinosa* subsp. *pruinosa*	+	+			
164		*Senna notabilis*	+	+		+	
165	PAPILIONACEAE	*Cullen leucanthum*	+		+		
165		*Cullen pustulatum*	+	+		+	+
165		*Erythrina vespertilio*	+			+	+
165		*Indigofera boviperda*	+			+	
165		*Indigofera monophylla*	+	+	+	+	+
165		Papilionaceae sp.	+	+			
165		*Rhynchosia minima*	+	+	#		#
165		*Sesbania cannabina*	+	+			
165		*Tephrosia clementii*	#			#	
165		*Tephrosia rosea*	+	#	+	+	
165		*Tephrosia rosea* var. *clementii*	+	+	+		+
173	ZYGOPHYLLACEAE	*Tribulus hirsutus*	#	#		#	
185	EUPHORBIACEAE	*Adriana tomentosa* var. *tomentosa*	+	+	+	+	+
185		*Euphorbia australis*	+	+		+	
185		*Euphorbia coghlanii*	+	+		#	
185		*Euphorbia drummondii* subsp. *drummondii*	+	+	+		+
185		*Euphorbia myrtoides*	+	+			
185		*Euphorbia tannensis* subsp. *eremophila*	+	#			
185		*Mallotus nesophilus*	+	+	+		+
185		*Phyllanthus maderaspatensis*	+	+			
202	STACKHOUSIACEAE	*Stackhousia muricata*	+	+			
207	SAPINDACEAE	*Diplopeltis eriocarpa*	+	+	+	+	+
207		*Diplopeltis* sp.	+	+			
207		*Dodonaea lanceolata* var. *lanceolata*	+	+			
220	TILIACEAE	*Corhorus congener*	+				
220		*Corchorus interstans* ms (P3)	+	+			+
220		*Corchorus* sp.	+	+		+	
220		*Corchorus walcottii* s.l.	+	+			
220		*Corchorus ?walcottii*	+	+			
220		*Triumfetta* aff. *appendiculata*	+	+			
220		*Triumfetta chaetocarpa*	+				+
220		*Triumfetta clementii*	+	+		#	+
220		*Triumfetta maconochieana*	+	+	+		
220		*Triumfetta ramosa*	+			+	
220		*Triumfetta* sp.	+	+	+		

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Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW
221	MALVACEAE	*Abutilon cunninghamii*	+	#			#
221		*Abutilon otocarpum*	+	+			
221		*Abutilon* sp.	+			+	
221		*Gossypium robinsonii*	+	+			
221		*Hibiscus coatesii*	+			#	
221		*Hibiscus sturtii*	+			+	
221		*Sida fibulifera*	+				#
221		*Sida* sp.	+			+	
223	STERCULIACEAE	*Hannafordia quadrivalvis*	+	+	+	+	
223		*Hannafordia quadrivalvis* subsp. *recurva*	+	+			+
236		*Frankenia pauciflora* var. *pauciflora*	+	+	+		+
243	VIOLACEAE	*Hybanthus aurantiacus*	+	+	+		
273	MYRTACEAE	*Melaleuca cardiophylla*	+	+	+	+	
276	HALORAGACEAE	*Haloragis gossei*	+	+		+	
294	PLUMBAGINACEAE	*Muellerolimon salicorniaceum*	+				+
301	OLEACEAE	*Jasminum calcarium*	+	+		+	
305	ASCLEPIADACEAE	*Cynanchum floribundum*	+	+	+	+	+
305		*Sarcostemma viminale* subsp. *australe*	+	+	+	+	+
307	CONVOLVULACEAE	*Bonamia media* var. *villosa*	+	+			
307		*Evolvulus alsinoides* var. *decumbens*	+	+			
307		*Evolvulus alsinoides* var. *villosicalyx*	#			#	
307		*Polymeria ambigua*	+	+	+	+	
310		*Heliotropium crispatum*	+				#
310		*Heliotropium glanduliferum*	+	+	+	+	+
310		*Trichodesma zeylanicum* var. *zeylanicum*	+	+	+	+	+
312	AVICENNIACEAE	*Avicennia marina* subsp. *marina*	+				+
313	LAMIACEAE	*Clerodendrum tomentosum* var. *lanceolatum*	+	#			
315	SOLANACEAE	*Nicotiana occidentalis* subsp. *occidentalis*	+	+			
315		*Solanum cleistogamum*	+	+			+
315		*Solanum diversiflorum*	+	+		+	
315		*Solanum lasiophyllum*	+	+	+	+	+

ATTACHMENT I: VASCULAR PLANT SPECIES RECORDED IN PROPOSED GORGON DEVELOPMENT AREAS, BARROW ISLAND 2003, 2004

+ indicates species recorded in initial surveys of proposed Gorgon development area
# indicates species updated after post cyclonic rain surveys
PGPF: Proposed Gas Processing Facility and Wider Study Area, PNW: Proposed North Whites Beach Pipeline
PFG: Proposed Feed Gas Pipeline, PCO: Proposed $C0_2$ Reinjection Pipeline

Fam No	FAMILY	Species	Barrow Island	PGPF	PFG	PCO	PNW
326	MYOPORACEAE	*Myoporum montanum*	+	+	+		+
331	RUBIACEAE	*Oldenlandia crouchiana*	+	+		#	
331		*Oldenlandia galioides*	+			+	
341	GOODENIACEAE	*Goodenia microptera*	+		#	+	
341		*Scaevola ?anchusifolia*	+			+	
341		*Scaevola amblyanthera* var. *amblyanthera*	+		+		
341		*Scaevola amblyanthera* var. *centralis*	+		#		
341		*Scaevola cunninghamii*	+	+	+	+	+
341		*Scaevola sericophylla*	+	+			
341		*Scaevola* sp.	+	+			
341		*Scaevola spinescens*	+	+			
345	ASTERACEAE	*Olearia dampieri* subsp. *dampieri* ms	+	+	+		+
345		*Pentalepis trichodesmoides*	+	+	+	+	+
345		*Pluchea dentex*	+	+			
345		*Pluchea dunlopii*	+			+	
345		*Pluchea ferdinandi-muelleri*	+		+		
345		*Pluchea rubelliflora*	+	+			+
345		*Pterocaulon sphacelatum*	+	+	+	+	
345		*Pterocaulon sphaeranthoides*	+	+			+
345		* *Sonchus oleraceus*	+	+			
345		*Streptoglossa adscendens*	+				+
345		*Streptoglossa bubakii*	+	+			+
345		*Streptoglossa decurrens*	+	+	+	+	
345		*Streptoglossa macrocephala*	+				#
345		*Vittadinia arida*	+		#		
345		*Vittadinia hispidula* var. *setosa*	+	+			

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Technical Appendix C2

Mammals and Reptiles

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

MAMMALS AND REPTILES

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Report No. R03202
April 2005

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1 Introduction

The Gorgon Venture proposes to develop a gas processing facility at Town Point on the east coast of Barrow Island with associated gas feed pipelines running across the Island from a shore crossing at either North White's Beach or Flacourt Bay. The proposed Development area includes vegetated and unvegetated habitats used by mammals and reptiles. Direct loss of some of these habitats during construction of the gas processing facility and pipelines is likely to affect local fauna.

Formal assessment of the impacts of the proposed Development requires information on the significance of the impacted areas to terrestrial fauna. Forty three reptile species, one frog species, thirteen resident land mammal species and two vagrant mammal species are known from Barrow Island (Attachment 1 and 2). The Barrow Island populations of some of these species are of regional significance because they are secure populations of species that are under threat on the mainland. Long isolation from the mainland has also led to genetic divergence of the Island populations from the mainland populations giving the Island taxa higher conservation significance. While specially protected mammal and reptile species are known to occur on Barrow Island and there is a good species inventory for the Island, quantitative data on the distribution and abundance of the fauna around the Island are scarce.

Harry Butler conducted early surveys to establish an understanding of the vertebrate fauna on Barrow Island, for example Butler (1970). The Department of Conservation and Land Management (CALM) has studied terrestrial vertebrates on the Island during annual trapping and spotlighting surveys for at least the last six years. CALM established a mammal monitoring program for Barrow Island that involves five grids of traps in representative areas around the Island. Population estimates for the key mammal species on the Island have been derived from the work by CALM and by Short et al. (1988). The Western Australian Museum (WAM) has collected on the Island and has been provided with specimens from the Island from other studies.

Literature reviews and further field surveys were conducted on behalf of the Gorgon Venture for the earlier Environmental, Social and Economic (ESE) Review of the Gorgon Development proposal (Bamford 2002). The ESE Review process identified gaps in existing knowledge concerning the distribution and diversity of terrestrial fauna, especially reptiles, in potential impact areas in relation to other areas.

Bamford Consulting Ecologists and Biota Environmental Sciences were engaged to redress this lack of information by surveying mammals and herpetofauna in the proposed Development area in 2003/2004.

The main aims of the current study of the vertebrate fauna of Barrow Island were taxonomic and ecological as described below:

- To assess the reptile and mammal species diversity in the vicinity of the proposed Development area and to augment existing WAM collections for the area (taxonomic).
- To determine the abundance of vertebrates in different landforms/vegetated habitats within the potential impact area (ecological).

Seasonal variation in catchability, detectability and population size necessitate sampling over several seasons to gain a representative sample of the biodiversity of the area. This report presents the findings of trapping surveys in November-December 2003, October

2004 and targeted herpetofauna sampling in August–September 2004. This report assesses the importance of the proposed Development sites in relation to other areas of Barrow Island for terrestrial vertebrate fauna, based on the results of these surveys and previous work by CALM.

2 Methods

The two aims of the study demanded different survey techniques. Trapping grids were set up to survey the abundance of vertebrate fauna in different vegetation and landform habitats. Targeted sampling of habitats known to be important for herpetofauna in other areas was employed to gain an inventory for the area.

2.1 Survey Methodology and Limitations

Survey methodology was consistent with the Guidance for the Assessment of Environmental Factors No. 56 - Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA, 2004).

The survey teams were led by Dr Mike Bamford, Dr Mike Craig, Dr Roy Teale and Greg Harold; professionals experienced in small vertebrate surveys and ecology in the Pilbara.

While the survey design and methodology closely matched CALM's trapping program on Barrow Island, there are limitations in these methods for censusing larger reptiles. Pitfall traps were augmented with opportunistic hand foraging and targeted trapping techniques for reptiles. Funnel trapping was not employed to catch larger reptiles, such as pygopodid lizards and snakes, due to concerns that captured animals would be more vulnerable to predation by mammals and perenties prior to traps being cleared.

Trapping grid surveys were conducted in spring of 2003 and 2004 to match the annual sampling periodicity followed by CALM. Surveying at other times of the year may detect other species, especially of reptiles, not recorded during the spring surveys. Changes in abundance and population recruitment rates may also be estimated by sampling at different times of the year.

2.2 Ecological Surveys

Trapping grids replicating the grid layout established by CALM during annual sampling carried out on Barrow Island since 1998 (Burbidge et al. 1998, 2003) were established in the proposed gas processing facility area. CALM currently monitors Barrow Island's mammal and reptile fauna from five grids set out around the Island. Bamford Consulting and RPS Bowman Bishaw Gorham established a further six grids in the vicinity of the proposed Development area. This allowed results collected in the proposed Development area to be compared with CALM data from similar habitats elsewhere on the Island and to determine the importance of different vegetation and landform types in the area for fauna.

Boodie (*Bettongia lesueur*) warrens are of special conservation significance as they persist for many years and boodies rely upon warrens for daytime shelter. An area of approximately 658 ha of the area surrounding proposed infrastructure locations near Town Point was surveyed in an attempt to locate all warrens in the vicinity of the proposed gas processing facility (Figure 2-1). The route of the gas pipeline from North White's Beach to the Gorgon gas processing facility area was also surveyed

(approximately 550 ha) for boodie warrens in sectors where this did not follow existing roads. The Flacourt Bay alternative pipeline route was surveyed and found to be clear of boodie warrens during the ESE Review studies (Bamford 2002).

2.2.1 Trapping Grids

Reptiles and mammals were trapped from 25 November to 2 December 2003, and from 16–25 October 2004. The trapping grid layout replicated that used by CALM as part of its long-term monitoring on the Island, with each trapping site containing 25 pitfalls (40 cm deep by 15 cm diameter PVC pipe, assisted with a six metre drift fence), 25 Elliott traps and 25 cage traps. These were deployed at 20 m spacing in a five by five regular grid. Six such layouts were established in the six main vegetation types within the proposed Development area. Some of these vegetation types were also represented in CALM's monitoring program and therefore the sampling in these sites was replicated. Each trapping grid was opened over four consecutive nights for sampling. CALM sampled its trap grids over four nights during 21–29 October 2003 and CALM's trap grids were sampled concurrently with the grids in the Gorgon Development area in October 2004.

Table 2-1 describes each trapping site in the Gorgon Development area and lists the CALM site in similar vegetation where applicable. The trapping grids are shown in Figure 2-1.

Table 2-1 - Locations and Vegetation Descriptions of Reptile and Mammal Trapping Sites in the Proposed Development Area

Trapping Grid	Location (WGS84)	Vegetated habitat	CALM grid analogue
Site 1	339285E 7700715N	Acacia bivenosa shrubland over *Triodia wiseana* on red loam	Similar to CALM Site Landing at 340765E, 7706890N
Site 2	339257E 7700980N	*Melaleuca* shrubland over *Triodia wiseana* on limestone slopes	Similar to CALM Site M21 at 334140E, 698560N
Site 3	339010E 7699320N	*Acacia coriacea* shrubland over *Triodia angusta* on red sandy-loam behind secondary dune	Similar to CALM Site John Wayne Country
Site 4	339885E 7700545N	*Triodia angusta* with scattered *Acacia coriacea* on shallow pale red sand over limestone near coast	No similar CALM site
Site 5	339555E 7700225N	Coastal dune complex, from *Spinifex longifolius* on white sand foredunes to *Acacia coriacea* shrubland over *Triodia angusta* on red sand of secondary dunes and swales	Some similarities to CALM Site John Wayne Country and CALM site Bandicoot Bay. Bandicoot Bay used for comparisons
Site 6	338415E 7701855N	*Triodia wiseana* on hilltop; soil consisting of fragmented limestone and red loam	Similar to CALM Site S62 at 329490E, 7703402N

The location given is for the north-west corner of each grid. Also indicated are CALM trapping sites in similar vegetation types

All specimens caught in the trapping survey were measured, weighed and marked. Reptile snout to vent and total lengths were measured. Reptiles were marked by toe-clipping, with a single clip being taken in most cases so that specimens could be recognised as recaptures during the survey. For mammals, crown, pes and external gonad dimensions were measured, while notes were made on reproductive condition and the presence of pouch young for females. Small mammals were individually marked with an ear punch and larger mammals (boodie, brush-tailed possum, golden bandicoot and spectacled hare-wallaby) had a Passive Identification Tag (PIT) inserted under the skin between the shoulder blades by F. Donaldson or M. Bamford under licence from CALM. Marking allowed assessment of recapture rates.

2.2.2 Boodie Warren Transect Surveys

Boodie warrens have been recorded in the Development area during previous surveys (Bamford 2002). Observations made during operation of the existing oil facilities have also been made available. Nevertheless, a systematic approach of intensive walked transects was required to confirm the status of known warrens and to locate other boodie warrens within the proposed Development area.

Boodie warren transects were spaced 50 m apart and aligned east to west. The area covered by the boodie transects is the Mammal Survey Outline shown in Figure 2-1. Details of the boodie transects, including coordinates of the ends of each transect, are presented in Attachment 3. Hand-held GPS units were used to ensure that surveyors stayed on track and observers moved away from their transect only to investigate interesting features such as possible warrens or dense vegetation. Boodie warren transects were progressively surveyed from October to December 2003 until the entire survey area had been covered. The total length of boodie warren transects was 131 km.

When warrens were located, their position (WGS84; zone 50) was recorded and the approximate number of entrances and significant features such as vegetation and soil type were noted. In addition to warrens, areas of limestone solution pipes that were clearly being used for shelter by mammals or reptiles were noted, with the number of holes also being recorded, as were locations of active foraging by mammals (indicated by concentrations of diggings). The locations of hare-wallabies and incidental observations of landbirds were also recorded. Landbirds are described in Technical Appendix C3.

The pipeline route from North White's Beach to the proposed gas processing facility was surveyed for boodie warrens during 9-10 February 2004. Sections surveyed were from North White's Beach at 334871E, 7710932N to 337503E, 7708662N, with emphasis on the westernmost portion of this section where the route passes through undisturbed vegetation and from 337306E, 7707122N to 337044E, 7703717N. This latter section passes entirely through undisturbed vegetation and is also a potential route for the CO_2 reinjection pipeline.

2.3 Taxonomic Inventory Surveys

To supplement the systematic herpetofauna trapping in the grids described above, in November 2003 and August-September 2004 Biota Environmental Sciences used opportunistic hand foraging and other targeted techniques throughout the Development area to augment the inventory of herpetofauna from the area. The survey methods included visual searches, raking leaf litter, excavating burrows, lifting rocks and head-torching. In addition, three transects of up to 50 medium sized Elliott traps were

installed. The aim of the survey was to collect species that do not readily enter pit traps and to search for previously unrecorded species.

Discussions with WAM indicated that whilst previous collecting had been thorough, there was little tissue to support molecular studies examining the taxonomic status of the Barrow Island populations. It was therefore decided that five specimens of each sex for each species should be collected. All specimens were curated in the field under ethics approval granted under the WAM application to the CALM Animal Ethics Committee, which covers Mr Roy Teale as a Research Associate with WAM. Collecting was undertaken under licences granted to Mr Roy Teale and Mr Greg Harold.

The herpetofauna survey was conducted between the 18 and 25 November 2003. Hand foraging and raking was completed during the morning between 6:30 am and 11:30 am and again late in the afternoon through to dusk. This was supplemented by road-spotting and head-torching activities at night.

Specimens were euthanased using Nembutal® which was injected into the heart region or for small reptiles by placing a few drops into the mouth of the animal. Liver samples were taken from a small incision made just below the rib cage. Liver samples were placed into labelled cryovials and deposited into a Dewar flask containing liquid nitrogen. The animal was subsequently labelled with the voucher number provided by WAM and placed into the freezer. Prior to removing a liver sample the animal was weighed, sexed and the snout-vent and tail-vent were measured. Upon completion of the survey all specimens and associated tissue samples were lodged with WAM.

For those specimens where the total species capture had exceeded 10 individuals or five from any one sex (where this could be accurately determined), a small (1–1.5 cm) length of tail was removed and placed in 100% ethanol. These samples were also lodged with WAM for future DNA analysis.

All data for specimens from which tissue was collected were provided to WAM for inclusion in FaunaBase.

For those species where the above program did not yield sufficient numbers for molecular studies, additional specimens were obtained from the ecological trapping grids. This document summarises data associated with the specimens vouchered with WAM as well as additional records from animals captured and subsequently released.

Further to sampling in November 2003, additional opportunistic sampling was conducted at the end of winter between 25 August and 1 September 2004. The work involved hand foraging and raking during the day as the cooler temperatures enabled the reptiles to remain active throughout the daylight hours. Little nocturnal work was completed because cool temperatures and strong winds precluded any significant reptile activity at night time.

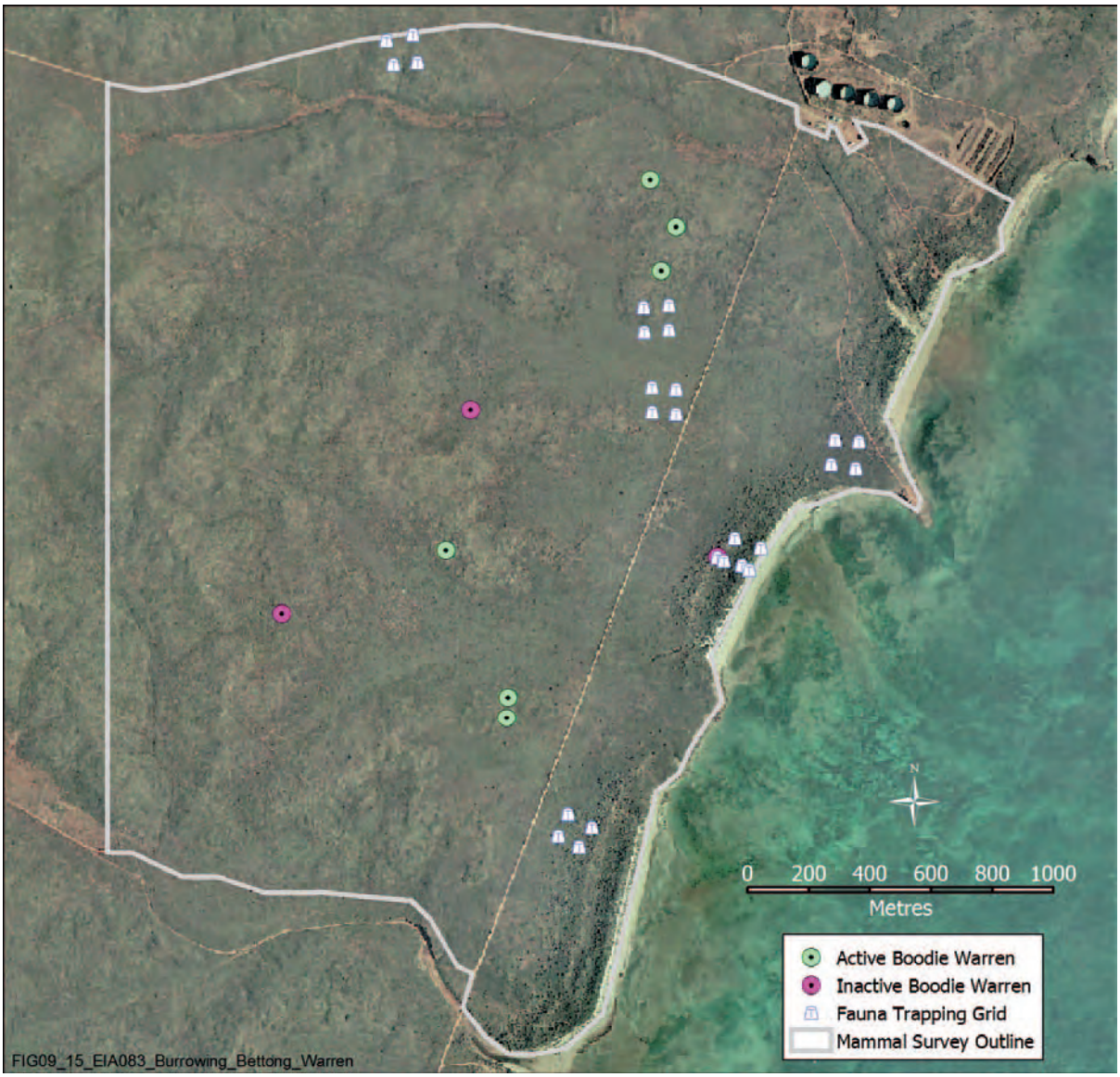

Figure 2-1 - Fauna Trapping Grids, Boodie Warrens and Boodie Transect Survey Area

3 Results

3.1 Trapping Survey and Opportunistic Observations

3.1.1 Reptiles

The number of each species of reptile caught in the six trapping grids in 2003 and 2004 is presented in Table 3-1 and Table 3-2 respectively. Trapping results are presented in Attachment 4. The species list for terrestrial reptiles known from Barrow Island is presented in Attachment 2.

In November-December 2003, a total of 295 individual reptiles representing six families and 18 species were caught in the traps. A further seven species were observed in the trapping area, but were not captured in the pitfalls. In October 2004, a total of 248 individual reptiles representing five families and 17 species were caught in the traps. These numbers are similar to those recorded in the 2003 survey.

In the 2003 and 2004 surveys combined, a total of six families and 22 species were caught in traps. This tally represents slightly more than half the reptile species known from Barrow Island. In addition to the species trapped, the Perentie (*Varanus giganteus*) was observed on major tracks and beaches throughout the study area and on rocks and in open grassland at Town Point, while three snake species (the Mulga Snake *Pseudechis australis*, Stimson's Python *Antaresia stimsoni* and a blind snake *Ramphotyphlops grypus*), were observed within or close to the Development area. The blind snake represented an addition to the reptile fauna known from Barrow Island.

Table 3-1 - Reptiles Caught in Six Trapping Grids on the Proposed Development Area, November-December 2003

Species	Grid						Total
	1	2	3	4	5	6	
Gekkonidae							
Heteronotia binoei	1	3	0	0	2	2	8
Pygopodidae							
Delma borea	0	0	0	1	0	0	1
Delma nasuta	2	0	0	0	0	1	3
Lialis burtonis	0	0	0	0	2	0	2
Agamidae							
Pogona minor	0	0	0	0	3	0	3
Varanidae							
Varanus acanthurus	0	1	0	0	0	0	1
Scincidae							
Carlia triacantha	0	1	0	0	0	0	1
Ctenotus grandis	5	4	5	1	1	0	16
Ctenotus pantherinus	1	0	1	0	1	0	3
Ctenotus saxatilis	1	2	0	1	1	1	6
Cyclodomorphus melanops	1	0	1	1	0	0	3
Lerista bipes	3	17	70	37	51	0	178
Lerista muelleri	6	5	8	9	7	5	40
Menetia greyii	8	5	0	0	2	6	21
Morethia ruficauda	0	0	1	0	0	0	1
Notoscincus ornatus	1	6	0	0	0	0	7
Proablepharus reginae	0	0	0	0	1	0	1
Typhlopidae							
Ramphotyphlops ammodytes	0	1	0	0	0	0	1
Number of species	10	10	6	6	10	5	18
Number of specimens	29	45	86	50	71	15	295

Table 3-2 - Reptiles Caught in Six Trapping Grids on the Proposed Development Area, October 2004

Species	Grid						Total
	1	2	3	4	5	6	
Gekkonidae							
Heteronotia binoei	2					5	7
Strophurus jeanae			1	1			2
Pygopodidae							
Delma borea	1						1
Agamidae							
Ctenophorus caudicinctus						1	1
Pogona minor					1		1
Varanidae							
Varanus acanthurus		2					2
Scincidae							
Ctenotus grandis	6	12	7	7	2		34
Ctenotus pantherinus	1	2			1	1	5
Ctenotus saxatilis	2	7			1	2	12
Cyclodomorphus melanops	2		1	3		2	8
Glaphyromorphus isolepis					1		1
Lerista bipes	3	14	33	26	43		119
Lerista muelleri	2	4	2	4	3	1	16
Menetia greyii	3	4	2		1	1	11
Morethia ruficauda		3	1	2			6
Notoscincus ornatus	2	4	2		1		9
Proablepharus reginae		2		1		2	5
Number of species	10	10	8	7	9	8	17
Number of specimens	24	54	49	44	54	15	240

The abundances of most of the reptile species were so low within each habitat type that little can be concluded regarding their habitat associations. However, for the more abundant skinks, the following patterns were evident:

- *Lerista bipes* - very abundant in coastal or near-coastal sites with sandy or sandy-loam soils.
- *Lerista muelleri* - widespread across all sites.
- *Menetia greyii* - absent from the coastal sites with sandy soils.
- *Notoscincus ornatus* - practically restricted to *Melaleuca* shrubland and spinifex on shallow soil with a lot of exposed limestone.

Burbidge et al. (2003) indicate the sites at which they trapped each of the 14 reptile species collected from the CALM grids. Two of these species were not recorded in the Gorgon trapping grids, but are expected to occur in the area. The skink *Lerista elegans* was caught only at CALM's Bandicoot Bay site and the gecko *Strophurus jeanae* was caught at the Bandicoot Bay, John Wayne and M21 sites. The habitats surrounding these CALM trapping sites are also represented in the Gorgon trapping sites, although the Bandicoot Bay site has more extensive white sands than are present at the most similar site in the proposed Development area (Site 5 - Table 2-1).

3.1.2 Mammals

The abundances of mammals caught in the six trapping grids in November-December 2003 and October 2004 are presented in Table 3-3 and Table 3-4 respectively. A complete list of mammals known from Barrow Island is presented in Attachment 1. Mammal trapping results are presented in Attachment 5.

A total of 202 individual mammals representing six families and eight species were caught in November-December 2003. In October 2004, 288 individual mammals of six families and six species were caught. Overall, all of the terrestrial mammals of Barrow Island were caught in the Town Point grids with the exception of the bats, the euro (*Macropus robustus isabellinus*), the black-flanked rock-wallaby (*Petrogale lateralis*) and the rakali or water-rat (*Hydromys chrysogaster*).

The euro was present at all sites and was seen most regularly along the coast where rocks and gorges provide shade. It appeared that about 10 animals occurred across the proposed Development area.

The rock-wallaby was absent from the Town Point area as the habitat was not suitable and all previous records of the species are from the west coast. Rock wallabies were observed in the cliffs at Flacourt Bay on the west coast of the Island.

The rakali was recorded along the coast near Town Point where tracks were seen and one specimen was trapped in an opportunistically placed cage trap. Rakali were observed foraging at night along the high tide line on the beach between Town Point and the ChevronTexaco camp (Fitzpatrick, J. and Vitenbergs, A. 2004. Personal communications). Tracks on beaches indicate that the rakali occurs right around Barrow Island, particularly where rocky and sandy shorelines alternate.

Table 3-3 - Mammals Caught in Six Trapping Grids on the Proposed Development Area, November-December 2003

Species	Grid						Total
	1	2	3	4	5	6	
Dasyuridae							
Pseudantechinus sp.	0	0	1	0	0	1	2
Planigale sp.	0	1	0	1	1	0	3
Peramelidae							
Isoodon auratus barrowensis	27	20	18	29	21	21	136
Phalangeridae							
Trichosurus vulpecula	2	9	8	8	8	2	37
Potoroidae							
Bettongia lesueur	2	2	3	3	0	0	10
Macropodidae							
Lagorchestes conspicillatus	1	5	1	0	1	1	9
Muridae							
Pseudomys nanus ferculinus	1	1	0	0	1	0	3
Zyzomys argurus	0	0	1	1	0	0	2
Number of species	5	6	6	5	5	4	8
Number of specimens	33	38	32	42	32	25	202

Table 3-4 - Mammals Caught in Six Trapping Grids on the Proposed Development Area, October 2004

Species	Grid						Total
	1	2	3	4	5	6	
Dasyuridae							
Planigale sp.	0	0	0	0	1	0	1
Peramelidae							
Isoodon auratus barrowensis	30	32	44	20	35	29	190
Phalangeridae							
Trichosurus vulpecula	9	5	4	6	10	5	39
Potoroidae							
Bettongia lesueur	1	0	9	2	5	1	18
Macropodidae							
Lagorchestes conspicillatus	1	5	3	0	9	8	26
Muridae							
Pseudomys nanus ferculinus	1	0	0	7	6	0	14
Number of species	5	3	4	4	6	4	6
Number of specimens	42	42	60	35	66	43	288

Pseudantechinus sp., *Planigale* sp., *Pseudomys nanus ferculinus* and *Zyzomys argurus* were caught too infrequently for any conclusions to be drawn as to their habitat associations. *Zyzomys argurus* (the common rock-rat) is commonly associated with rocky substrates, but the two captures of this species were in sandy areas, although at one site there was coastal limestone nearby. These four species are also infrequently caught in CALM's trapping program, with trap success of <10 per cent each year (1998–2004). In 2003, only eight *Pseudomys nanus ferculinus*, six *Planigale* sp., one *Pseudantechinus* sp. and one *Zyzomys argurus* were caught from four sites in the CALM program (Burbidge et al. 2003). In 2004, only five *P. nanus ferculinus* and two *Planigale* sp. were caught from two sites in the CALM programme (Table 3-7).

Golden bandicoots and northern brushtailed possums were well represented throughout the Gorgon Development area. The golden bandicoot was abundant at all sites and there was no significant difference in the number of individuals between the six sites in 2003 ($\chi^2 = 4.105$, df = 5). However, in 2004 there was a significant difference in the number of individual golden bandicoots between the six sites ($\chi^2 = 12.303$, df = 5), and the abundance of golden bandicoots across the sites was significantly different between the 2003 and the 2004 surveys ($\chi^2 = 11.638$, df = 5). The brush-tailed possum was evenly distributed across all sites in both 2003 ($\chi^2 = 8.53$, df = 5) and 2004 ($\chi^2 = 4.537$, df = 5), and their abundance did not vary significantly between 2003 and 2004 ($\chi^2 = 8.678$, df = 5).

In 2003, boodies were absent from grids five and six and only two or three specimens were caught at each of the remaining sites. In 2004, boodies were recorded in slightly higher numbers, across all sites except grid two. Captures of the spectacled hare-wallabies in 2003 were generally low; the highest catch was five individuals in grid two, but in 2004, catches were generally higher, with the highest catch of nine individuals in grid five.

Opportunistic observations of hare-wallabies during landbird transects over the 2003/2004 summer indicated that these animals favour areas of tall *Triodia* grassland.

3.1.3 Comparison with CALM Trapping Data

The abundances of mammals caught in the CALM monitoring program are compared with their abundances in the proposed Gorgon Development in Table 3-5, Table 3-6 and Table 3-7.

In 2003, the abundances of all species tended to be lower in the six Gorgon grids than in the five CALM grids, despite the sampling effort being 20 % higher in the Gorgon grids (Table 3-5). However, in 2004 the abundances of spectacled hare-wallabies and *P. nanus ferculinus* were higher in the Gorgon grids than in the CALM grids.

Table 3-5 - Total Mammal Abundances from Annual Trapping by CALM (Five grids, 1998-2004) and Sampling in the Proposed Development Area (Six grids, 2003-2004)

Species	CALM 1998	CALM 2000	CALM 2003	Gorgon 2003	CALM 2004	Gorgon 2004
Pseudantechinus sp.	4	2	1	2	0	0
Planigale sp.	6	9	6	3	2	1
Isoodon auratus barrowensis	163	147	166	136	191	190
Trichosurus vulpecula	41	48	60	37	73	39
Bettongia lesueur	30	26	22	10	21	18
Lagorchestes conspicillatus	13	8	11	9	18	26
Pseudomys nanus ferculinus	14	15	8	3	5	14
Zyzomys argurus	1	4	1	2	0	0

The numbers of each mammal species caught in five (of the six) Gorgon trapping grids that most closely resemble the five CALM trapping grids, are presented with the numbers caught in the analogous CALM trapping grids in Table 3-6 (2003) and Table 3-7 (2004).

In 2003 catches of golden bandicoots on Gorgon trapping grids one and two (G1, G2) were very similar to catches in the analogous CALM sites (CALM Landing, CALM M21) and catches in Gorgon grids three, five and six were about half those of CALM sites in similar habitats (Table 3-6). In 2004, catches of golden bandicoots were similar between each of the Gorgon sites and their analogous CALM sites (Table 3-7). However, the differences between the catches of golden bandicoots on the Gorgon sites and the analogous CALM sites were not statistically different in either 2003 ($\chi^2 = 5.792$, df = 4) or 2004 ($\chi^2 = 2.793$, df = 4).

Catches of brushtailed possums and boodies were inconsistent between most pairs of grids (Table 3-6 and Table 3-7). The most extreme differences were between the low numbers of brushtailed possums on Gorgon grid six (2 in 2003 and 5 in 2004) compared with the high numbers caught on CALM grid S62 (21 in 2003 and 25 in 2004). These two grids were established in low *Triodia* on limestone ridges, but S62 was close to a cliff line,

which probably provided shelter for possums, with no such shelter available near grid six. The differences in the abundance of brushtailed possums between the Gorgon grids and the analogous CALM grids were significant in both 2003 ($\chi^2 = 19.374$, df = 4) and 2004 ($\chi^2 = 16.475$, df = 4).

Table 3-6 - Comparison of Numbers of Individuals Caught on Grids in the Proposed Development Area with Numbers Caught on Analogous CALM grids in 2003

Species	Gorgon G1	CALM Landing	Gorgon G2	CALM M21	Gorgon G3	CALM JW	Gorgon G5	CALM BB	Gorgon G6	CALM S62
Pseudantechinus sp.	0	0	0	0	1	0	0	0	1	1
Planigale sp.	0	1	1	4	0	0	1	0	0	1
Golden bandicoot *Isoodon auratus barrowensis*	27	28	20	22	18	40	21	39	21	37
Brushtailed possum *Trichosurus vulpecula*	2	14	9	10	8	12	8	3	2	21
Boodie *Bettongia lesueur*	2	10	2	2	3	0	0	7	0	3
Spectacled hare-wallaby *Lagorchestes conspicillatus*	1	2	5	2	1	2	1	5	1	0
Djoori (common rock-rat) *Zyzomys argurus*	0	0	0	9	1	0	0	0	0	1
Barrow Island chestnut mouse *Pseudomys nanus ferculinus*	0	1	0	1		0	0	6	0	0

Table 3-7 - Comparison of Numbers of Individuals Caught on Grids in the Proposed Development Area with Numbers Caught on Analogous CALM grids in 2004

Species	Gorgon G1	CALM Landing	Gorgon G2	CALM M21	Gorgon G3	CALM JW	Gorgon G5	CALM BB	Gorgon G6	CALM S62
Planigale sp.	0	0	0	0	0	1	1	1	0	0
Golden bandicoot *Isoodon auratus barrowensis*	30	44	32	30	44	41	35	39	29	37
Brushtailed possum *Trichosurus vulpecula*	9	16	5	8	4	20	10	4	5	25
Boodie *Bettongia lesueur*	1	6	0	3	9	4	5	6	1	2
Spectacled hare-wallaby *Lagorchestes conspicillatus*	1	1	5	2	3	4	9	11	8	0
Barrow Island chestnut mouse *Pseudomys nanus ferculinus*	1	0	0	0	0	2	6	3	0	0

3.2 Boodie Warrens within the Study Area

There are nine boodie warrens in the proposed Development area, of which six were being actively used (Table 3-8), probably by boodies. Three additional locations where boodie warrens had been reported previously were visited, but no warrens could be found in the general area. Raw data from boodie transects, including coordinates of each transect, are presented in Attachment 3.

In addition, there were 11 locations where solution pipes in limestone provided shelter for animals and appeared to be in use (Table 3-9).

Table 3-8 - Locations, Sizes and Status of Boodie Warrens in the Proposed Development Area (between Terminal Tanks and Airport Road)

Easting	Northing	Number of entrances	Status
339279	7701400	6	Active
338813	7699703	5	Active
338809	7699637	10-20	Active
339314	7701103	11	Active
339364	7701247	3	Active
338611	7700187	20-30	Active
339499	7700165	4	Inactive
338691	7700645	9	Inactive
338072	7699979	0	Inactive

Table 3-9 - Locations, Sizes and Status of Solution Pipe Habitats Being Used for Shelter by Mammals or Reptiles in the Gorgon Wider Study Area

Easting	Northing	Number of entrances	Status
339490	7701210	3	Active
339571	7701211	4	Active
339792	7701034	2	Active
339717	7701037	10	Active
339717	7701037	10	Active
339731	7700866	4	Active
339539	7701064	TBD	unknown
339268	7701002	2	Active
378064	7700814	3	Active
338366	7700553	TBD	unknown
338768	7699202	TBD	unknown

No boodie warrens were found along the alternative pipeline route from Flacourt Bay or along the pipeline route from North White's Beach (Bamford 2002).

During surveys of boodie transects, 33 spectacled hare-wallabies were observed. If a transect width of ten metres along the 131 km of boodie transects is assumed, a search area of 131 ha is indicated, giving a population density of 0.25 hare-wallabies/ha.

3.3 Taxonomic Herpetofauna Survey

An annotated list of the reptile species collected from the proposed Development area and from other parts of Barrow Island during the 2003 taxonomic survey is presented in Attachment 6. The list also describes the voucher specimens collected, their curation and the taxonomic significance of the collections. The annotated list of the species collected during the 2004 survey is presented in Attachment 7. Attachment 8 contains a list of reptile specimens donated to WAM. Figure 3-1 displays the distribution of reptile species caught during the 2004 taxonomic study.

In total, the targeted herpetofauna surveys yielded 24 species of reptile. This compares to the 43 species known from Barrow Island (excluding sea-snakes and marine turtles) (Attachment 2). Additions to the Island's known species list are *Varanus brevicauda* trapped near Surf Point in the late 1990s (Bamford, M. 2004. Personal communication) and observed at Obe's Beach in January 2004 (Pendoley, K. & Vitenbergs, A. 2004. Personal communication) and *Ramphotyphlops grypus* collected from Latitude Point in September 2004.

Some of the species collected are poorly represented in the WAM collection and specimens were collected and curated for donation to WAM. The paucity of specimens is largely due to lack of collecting on Barrow Island, however, some species may be uncommon. For example, *Carla triacantha* was represented by only from three specimens in the WAM Barrow Island collection, from Flacourt Bay and Town Point. They are known from the inter-dunal vegetation near Town Point (Smith 1976).

Four *Ctenotus pantherinus acripes* individuals were caught or observed during the 2003 survey, and seven were caught over a wide area in the 2004 survey (Figure 3-1). This species is of conservation significance on Barrow Island because it is believed to be an endemic race, genetically and geographically separated from the nearest mainland populations in Northern Territory and Queensland. Butler (1970) caught the species on the west coast of Barrow Island. Additionally, seven *Ctenotus pantherinus acripes* were trapped over the two surveys in five of the six trapping grids (G1, G2, G3, G5, G6), suggesting a wide distribution on Barrow Island.

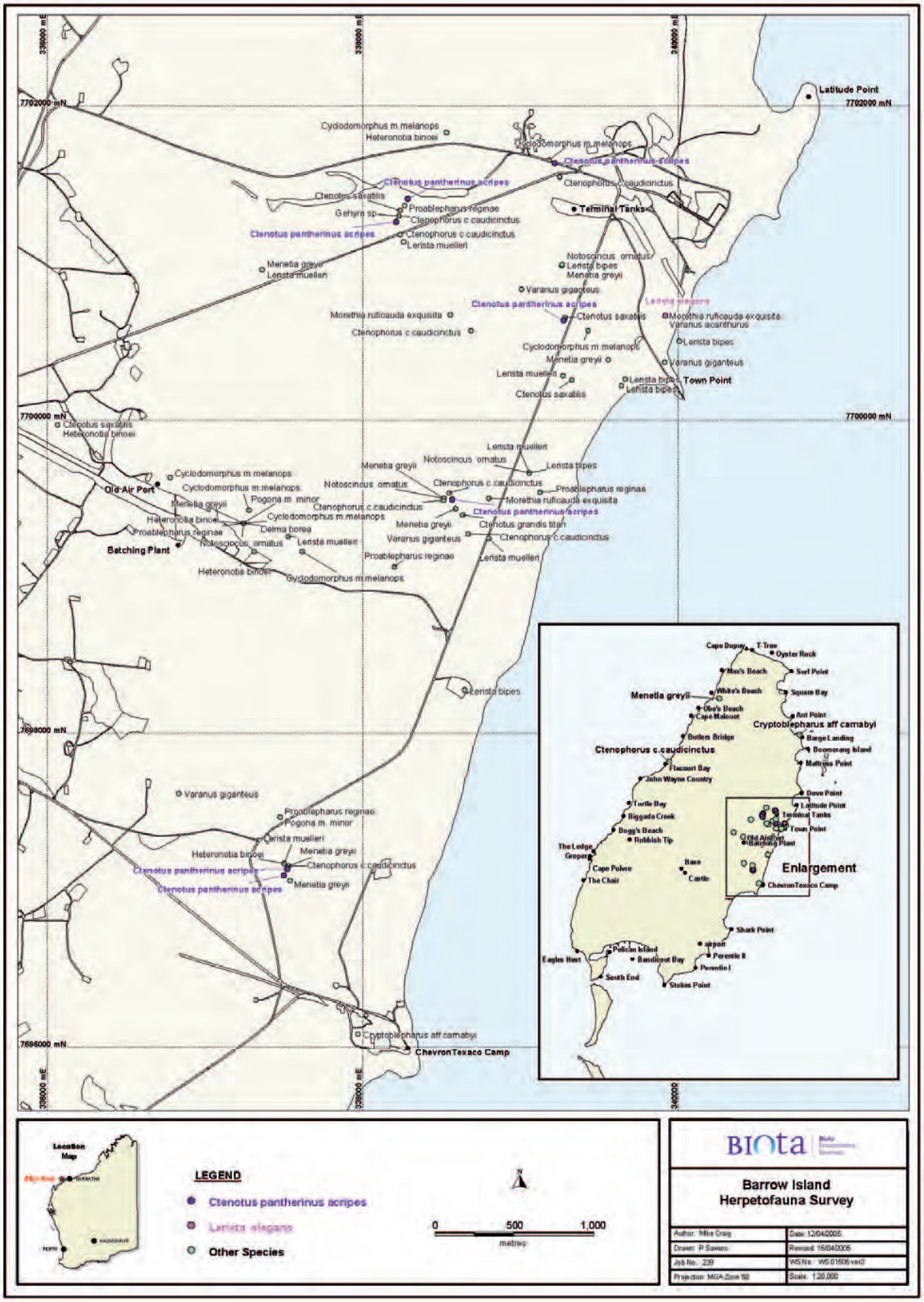

Figure 3-1 - Species Distribution of Herpetofauna Surveyed in August-September 2004

4 Discussion

4.1 Reptiles

Reptile activity on Barrow Island appeared to be low compared with some mainland sites at which the authors have worked (Teale, R. & Harold, G. 2004. Personal observations). Of the 43 reptile species known to occur on Barrow Island, 27 of these species have been identified in vicinity of the proposed Gorgon Development area through trapping, observation and opportunistic surveying.

None of the herpetofauna are geographically restricted to the proposed Development area, with all species occurring in other parts of Barrow Island. The reptile assemblage in the Gorgon trapping grids was similar to the CALM trapping grids in similar parts of the island. The existing information indicates that there are no habitats within the proposed Development area that could sustain higher than usual concentrations of any reptile species and no reptile species are restricted to the proposed Development area.

Some strong patterns in habitat association emerged for the more abundant species in the proposed Development area. Burrowing skinks such as *Lerista bipes* were closely associated with sandy soils and at Town Point and adjacent areas are probably restricted to the coastal dune system. Other skinks were associated with hard substrates. For example, *Menetia greyii*, appeared absent from sandy soils and *Notoscincus ornatus* was associated with *Melaleuca* over *Triodia* on limestone. All of these habitats are widespread within and outside the study area.

The most species-rich areas were on grid five, where the habitat was a complex of shrubs and *Triodia* on coastal primary and secondary dunes, grid one, where the vegetation was largely low *Triodia* in loam soil and grid two, which supported *Melaleuca* and *Triodia* on limestone. The most species-poor site and the site where fewest specimens were caught (grid six) was low *Triodia* in rocky soil, high in the landscape. In contrast, grids three and four, with only six species each, had high numbers of captures.

With the exception of *Ramphotyphlops longissimus*, none of the recorded herpetofauna is confined to Barrow Island. All other taxa are represented elsewhere in Western Australia or, in the case of *Ctenotus pantherinus acripes*, the Northern Territory and Queensland (Horner 1991; Wilson & Swan 2003). However, the taxonomic status of *Ctenotus pantherinus acripes* and many other reptiles on Barrow Island is uncertain. Genetic studies are required to elucidate patterns of relationship and genetic divergence of the isolated Island populations from the mainland populations. *Ctenotus pantherinus acripes* was recorded to the north and south of the proposed gas processing facility which, combined with Butler's records from the west coast, indicate that the species is widespread outside of the proposed Development area.

A number of reptile taxa are confined to Western Australian islands, including *Ramphotyphlops longissimus*, *Ramphotyphlops yampiensis*, *Aprasia rostrata*, *Ctenotus lancelini*, *Egernia pulchra longicauda*, *Lerista praefrontalis*. Island populations are recognised as important repositories for biodiversity, harbouring endemic taxa and genetic novelties, such as dwarfism. Molecular studies based on existing tissue collections have been crucial in resolving taxonomic anomalies within Western Australian taxa (e.g. the *Lerista muelleri* complex, *Delma borea* complex, *Egernia stokesii* complex). Reptile populations on Barrow Island are likely to show unique genetic characteristics as a result of their relatively long isolation.

No molecular (DNA) studies have been undertaken for Barrow Island populations due to the paucity of suitable material for genetic analysis. The current study is critical in improving the collection of tissue in WAM for future genetic studies. Prior to this work, tissue samples were available from only 23 of the 923 specimens and from just 10 of the 43 species lodged with WAM (source Western Australian Museum Fauna Database).

The implications of this lack of knowledge on the true biodiversity of the Island's herpetofauna are that all Island populations must be assumed to be unique genetic races and their conservation significance assessed accordingly.

4.2 Mammals

All of the resident mammal species known from Barrow Island, except the bats and the black-flanked rock-wallaby, occur in the vicinity of the proposed gas processing facility. All of these species are expected to occur in the vicinity of the proposed feed gas pipeline also, but no boodie warrens occur along the pipeline route. Unidentified bats have been observed along Airport Creek to the south of Town Point.

Mammal species richness and abundance on the Gorgon trapping grids varied between November-December 2003 and October 2004. This probably reflects the inter-annual variation in mammal distribution and catchability. For example, grid four showed the highest mammal abundances of the six grids in 2003 and the lowest in 2004. The high limestone with low *Triodia* grassland (grid 6) had the lowest mammal species richness and abundances in 2003, but not in 2004. The presence and abundance of mammals across the remaining sites were similar in 2003, but grid two (*Melaleuca* over *Triodia* on limestone) was species rich and had high captures of the spectacled hare-wallaby. This was not expected as the hare-wallaby was usually observed in dense *Triodia* near the coast and in valleys, but may indicate that the species forages in more open *Melaleuca* and *Triodia* habitats at night. In 2004, however, grid two had the lowest species richness, and the highest captures of hare-wallabies were on grids five and six.

Abundance of mammals tended to be lower in the Gorgon trapping sites than in the CALM sites within similar vegetated habitats even though the two surveys took place only a few weeks or days apart. Read et al. (1988) noted this sort of variability in the results of trapping based on grid layouts, probably because the grids are influenced by the surrounding habitats for animals with large home-ranges. Mammals may have been attracted to the baited traps from other habitats. For example, Gorgon grid 6 was in similar vegetation to CALM's grid S62, but the CALM site was close to a low cliff line that probably provided shelter for brushtailed possums and other mammals that were more abundant on S62 than on Gorgon grid six.

The greatest proportional difference between the CALM survey results and the current survey results was for boodies. This probably reflects the proximity of some of the CALM grids to active boodie warrens and the low abundances of boodies in the vicinity of the proposed gas processing facility.

The surveys suggest similar levels of abundance in the proposed Development area to other parts of Barrow Island. There are no unusual features within the proposed Development area that suggest unusual concentrations of any mammal species may be present. The only areas within the proposed Development area with a relatively depauperate mammal fauna were the highest points in the landscape where there was low, sparse *Triodia* and rocky ground.

The significance of the mammal populations with respect to the rest of Barrow Island can be assessed by comparison of the proportion of Barrow Island population that occurs in the proposed Development area. Burbidge et al. (2003) reviewed population estimates for mammals on Barrow Island and present a range of estimates based on different calculation methods or data sources. Other recent estimates, for example McKenzie et al. (1995) and those based on spotlighting, vary greatly.

The golden bandicoot population on Barrow Island probably ranges from 60 000–80 000 (McKenzie et al. 1995). Population estimates based on spotlighting data fall within the range 1679–3679 (Burbidge et al. 2003), but the authors stress these values should be treated with caution and suggest that the Island population is in the tens of thousands. This species is widespread and abundant throughout its range on Barrow Island.

Available estimates of the Island population of the brushtailed possum are based only on spotlighting data (Burbidge et al. 2003) and range from 650–1468. Thirty seven and thirty-nine were caught within the Gorgon Development area in 2003 and 2004 respectively. Island population estimates for the spectacled hare-wallaby are 8600 (Short et al. 1988.) and estimates based on spotlighting range from 828 to 1661 (Burbidge et al. 2003). Density estimates from the current study suggest a population of 75 individuals in the 300 ha Gorgon Development area. This equates to an Island population of approximately 5800 if the density in the Gorgon Development area is representative of densities across the whole Island.

Euros were not trapped or systematically recorded, but were regularly seen within the proposed Development area. Island population estimates for euros range from 1500 (Short et al. 1988) to 528-914 (Burbidge et al. 2003). Most euro sightings in the proposed Development area were along the coastline where cliffs and gorges provided shelter. It was estimated that ten euros were present across the Gorgon Development area. Euros are widespread across the Island in areas where there is sufficient shade.

The size of the boodie population on Barrow Island, based on spotlighting surveys, is 2884 (Burbidge et al. 2003). However, Burbidge et al. (2003) consider that such estimates should be treated with caution. The distribution of boodies is clumped because of their dependence upon warrens, and boodie numbers in the proposed Gorgon Development area can be estimated from a count of the number of warrens and warren entrances. There are six active warrens with a combined total of about 60 entrances (the number of entrances in some warrens is uncertain) within the mammal survey area (Figure 2-1). There are generally about half as many boodies present as entrances (Donaldson, F. 2004. Personal communication), suggesting approximately 30 boodies in the 658 ha sampling area at the Gorgon Development location. In trapping carried out in March 2004, 14 boodies were trapped on warrens in the Gorgon Development area. The single active warren in the gas facility footprint has 20–30 entrances, suggesting 10–15 boodie inhabitants. However, trapping at this warren (20 traps over 4 nights) caught only three boodies over two years (Donaldson, F. 2004. Personal communication).

Unlike the more mobile mammal fauna, boodies are dependent on their warrens and are expected to have limited ability to disperse into surrounding areas. Their use of surrounding areas for foraging is unknown however they appear to have home ranges of several kilometres (Donaldson, F. 2004 Personal communication). F. Donaldson is currently completing a PhD study to investigate habitat usage by boodies; however, the results of this study will not be available for several years.

Although three of the boodie warrens located were inactive, it is possible that usage of warrens by boodies varies seasonally and annually and that any existing warren may be used at some time in the future. For example, the warrens at 339499 E, 7700165 N and 338691 E, 7700645 N were active in spring 2003 but had been inactive for some weeks or months when examined in March 2004. Unlike other warrens, both were in loam soil rather than excavated beneath limestone.

5 Conclusion

The study area encompassing the proposed gas processing facility and associated infrastructure does not appear to have any intrinsic value to mammals or herpetofauna above that of adjacent and surrounding habitats.

Surveys for the proposed Gorgon Development have revealed a high diversity of mammal and reptile fauna within the proposed Development area. The initial survey in November-December 2003 indicated that all of the mammals on the Island, except the bats and the black-flanked rock-wallaby, occur near Town Point. Over half of Barrow Island's herpetofauna are known to occur in the proposed Development area. More are expected to be found in ongoing surveys.

Comparison of the capture rates within the proposed Development area with those in CALM's trapping grids distributed around the Island, suggest that mammal densities are lower in the study area than in other parts of the Island.

The habitats in which the mammals and reptiles were found are widespread across Barrow Island and well-represented in places unlikely to be affected by Development. The populations of most mammals are believed to be stable, although there is concern that the rock-wallaby population, while probably stable, may be suffering from genetic depression. Rock wallabies occur in the vicinity of the alternative shore crossing at Flacourt Bay, but not at any other proposed Development site. Reptile population sizes could not be assessed but their known distribution and habitat associations indicate that they are well represented in areas outside the Development area.

Ongoing sampling of herpetofauna populations in and around the proposed Development area will yield a valuable scientific resource for genetic determination of the true levels of endemism of Barrow Island's fauna.

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Attachment 1 - Mammal Species Recorded from Barrow Island, Based Upon Western Australian Museum Records and WAPET (1991), Excluding Marine Species

Species recorded within the proposed Development area in August 2002 or during the 2003/2004 field surveys are indicated (+). The conservation status of species under the WA Wildlife Conservation Act, Federal EPBC Act and CALM priority list is indicated. Introduced species considered to be absent from the main Island have been excluded.

Species	Observed	Conservation status
Dasyuridae		
Planigale sp.	+	
Pseudantechinus sp.	+	
Phalangeridae (possums)		
Northern brush-tailed possum *Trichosurus vulpecula arnhemensis*	+	
Peramelidae (bandicoots)		
Barrow Island golden bandicoot *Isoodon auratus barrowensis*	+	Vulnerable
Potoroidae (potoroos and bettongs)		
Barrow Island boodie *Bettongia lesueur* (Barrow Island race)	+	Vulnerable
Macropodidae (kangaroos and wallabies)		
Barrow Island spectacled hare-wallaby *Lagorchestes conspicillatus conspicillatus*	+	Vulnerable
Barrow Island euro *Macropus robustus isabellinus*	+	Vulnerable
Black-flanked rock-wallaby *Petrogale lateralis*	+	Vulnerable
Pteropodidae (fruit bats or flying-foxes)		
Black flying-fox *Pteropus alecto*		(vagrant)
Emballonuridae (sheathtail bats)		
Common sheathtail bat *Taphozous georgianus*	+	
Mollosidae (mastiff bats)		
White-striped bat *Tadarida (Nyctinomus) australis*		(vagrant)
Vespertilionidae (vesper bats)		
Vespadelus (Eptesicus) finlaysoni	+	
Muridae (rats and mice)		
Rakali or water-rat *Hydromys chrysogaster*	+	Priority 4
Barrow Island chestnut mouse or moolboo *Pseudomys nanus ferculinus*	+	Vulnerable
Djoorri or common rock-rat *Zyzomys argurus*	+	

Attachment 2 - Reptile Species Recorded from Barrow Island (Source: Butler 1970, Smith 1976; Western Australian Museum FaunaBase)(Maryan, B. 2004. Personal communication.)

Family Agamidae
*Ctenophorus c. caudicinctus**
Lophognathus gilberti
*Pogona minor**
Family Pygopodidae
*Delma borea**
*Delma nasuta**
Delma tincta
*Lialis burtonis**
*Pygopus nigriceps**
Family Gekkonidae
Diplodactylus stenodactylus
Gehyra Pilbara
*Gehyra variegata**
*Heteronotia binoei**
*Strophurus jeanae**
Family Scincidae
*Carlia triacantha**
*Cryptoblepharus carnabyi**
Ctenotus duricola
*Ctenotus grandis**
Ctenotus hanloni
*Ctenotus pantherinus acripes**
*Ctenotus saxatilis**
Ctenotus serventyi
*Cyclodomorphus melanops**
Eremiascincus richardsonii
Glaphyromorphus isolepis
*Lerista bipes**
*Lerista elegans**
*Lerista muelleri**
*Menetia greyii**
Morethia lineoocellata
*Morethia ruficauda**
*Notoscincus ornatus**
*Proablepharus reginae**
Family Typhlopidae
*Ramphotyphlops ammodytes**
Ramphotyphlops longissimus
Ramphotyphlops grypus
Family Varanidae
*Varanus acanthurus**
Varanus brevicauda
*Varanus giganteus**
Family Boidae
*Antaresia stimsoni**
Family Elapidae
Brachyurophis approximans
Demansia rufescens
Furina ornata
*Pseudechis australis**

* known to occur in the Gorgon Development area

Attachment 3 - Location of Boodie Warrens, Hare Wallaby Sightings and Solution Pipes on the East-West Transects on the Proposed Development Area.

Note: Most transects were divided into three sections, and each section was not necessarily completed on the same day

A: West of about 338000E B: Between 338000E and road C: East of road

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
1	338297E 7701850N	339124E 7701850	-	14/12	-	-	1040-1100	-							
2	338066E 7701800	339316E 7701800N	-	14/12	-	-	1010-1035	-							
3	337864E 7701750N	339467E 7701750N	16/12	14/12	-	0815-0820	0930-1005	-							
4	337500E 7701700N	339600E 7701700N	16/12	14/12	-	0755-0810	0820-0920	-							
5	337500E 7701650N	339736E 7701650N	16/12	14/12	-	0745-0755	0720-0810	-				338707E 7701645N	1		
6	337500E 7701600N	339752E 7701599N	16/12	14/12	-	0730-0740	0630-0715	-				339031E 7701607N	1		
7	337500E 7701550N	340100E 7701550N	16/12	01/10	04/10	0720-0730	1015-1120	0630-0650							
8	337500E 7701500N	340151E 7701500N	16/12	02/03	04/03	0705-0720	0630-0730	0625 0640							
9	337500E 7701450N	340233E 7701450N	16/12	02/10	04/10	0655-0705	0620-0725	0650-0705	339279E 7701400N	6	active				
10	337500E 7701400N	340307E 7701400N	16/12	02/10	04/10	0645-0655	0730-0815	0645-0700							
11	337500E	340453E	16/12	02/10	04/10	0630-	0725-	0710-							

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
	7701350N	7701350N				0640	0815	0730							
12	337500E 7701300N	339649E 7701300N	16/12	02/10	04/10	0620-0630	0820-0920					337499E 7701312N	1		
13	337500E 7701250N	340416E 7701250N	16/12	02/10	02/10	0610-0615	0820-0920	1055-1120	339364E 7701247	3	unknown	340395E 7701249N	1		
14	337500E 7701200N	340392E 7701200N	16/12	02/10	02/10	0550-0605	0925- 1030					339985E 7701115N	2	339490E 7701210N	3
														339571E 7701211N	4
15	337500E 7701150N	340299E 7701150N	15/12	02/10	02/10	1035-1045	0925- 1055								
16	337471E 7701100N	340243E 7701100N	15/12	05/10	04/10	1035-1050	1320-1430	0705-0725							
17	337500E 7701050N	340226E 7701050N	15/12	05/10	04/10	1035-1045		0740-0805						339792E 7701034N	2
														339717E 7701037N	10
														339717E 7701037N	10
														339539E 7701064N	?
18	337500E 7701000N	340227E 7701000N	15/12	05/10	04/10	1015-1025	1325-1425	0735-0800						339268E 7701002N	2
19	337495E 7700950N	340145E 7700950N	15/12	05/10	04/10	1020-1030	1435-1525	0815-0840							
20	337500E	340145E	15/12	05/10	04/10	1015-	1435-	0805-							

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
	7700900N	7700900N				1030	1525	0835							
21	337500E 7700850N	340136E 7700850N	15/12	05/10	04/10	1000-1011		0845-0915				337809E 7700852N	1		
												339983E 7700855N	1		
22	337495E 7700800N	340118E 7700800N	15/12	05/10	04/10	1005-1015	1535-1620	0840-0915				339829E 7700801N	1	378064E 7700814N	3
23	337500E 7700750N	340050E 7700750N	15/12	05/10	04/10	1000-1010	1535-1620	0920-0940				339817E 7700743N	1		
24	337500E 7700700N	340057E 7700700N	15/12	05/10	04/10	0950-0955		0920-0940							
25	337495E 7700650N	340032E 7700650N	15/12	05/10	04/10	0955-1000	1635-1730	0950-1015	338691E 7700645N	9	unknown	338706E 7700652N	1		
26	337500E 7700600N	340056E 7700600N	15/12	05/10	04/10	0945-0955	1630-1725	0945-1010							
27	337500E 7700550N	340040E 7700550	15/12	05/10	04/10	0935-0945		1025-1045						338366E7700553N	?
28	337496E 7700500N	340076E 7700500N	15/12	12/12	04/10	0940-0950	1000-1045	1020-1045				339442E 7700497N	1		
29	337500E 7700450N	340082E 7700450N	15/12	12/12	04/10	09350-0945	1050-1135	1050-1115							
30	337500E 7700400N	340137E 7700400N	15/12	12/12	04/10	0920-0930	1350-1435	1050-1120				339621E 7700401N	1		
												337732E 7700402N	1		
31	337482E	339775E	15/12	12/12	05/10	0925-	1435-	0925-				337741E	1		

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
	7700350N	7700350N				0935	1505	0940				7700332N			
32	337500E 7700300N	339715E 7700300N	15/12	12/12	05/10	0920-0930	1505-1550	0920-0940							
33	337500E 7700250N	339677E 7700250N	15/12	12/12	05/12	0905-0915	1530-1605		338611E 7700187N	20-30	unknown				
34	337484E 7700200N	339628E 7700200N	15/12	12/12	05/10	0910-0920	1615-1640	0950-1005				339402E 7700203N	1		
35	337500E 7700150N	339625E 7700150N	15/12	12/12	05/10	0905-0915	1645-1520	0945-1000							
36	337490E 7700100N	339576E 7700100N	15/12	13/12	05/10	0850-0905	0630-0710					339145E 7700094N	1		
												339348E 7700110N	1		
37	337500E 7700050N	339541E 7700050N	15/12	13/12	05/10	0850-0900	0630-0715	1020-1040				338978E 7700055N	1		
38	337500E 7700000N	339535E 7700000N	15/12	13/12	05/10	0845-0855	0630-0715		338072E 7699979N		unknown	338969E 7700000N	1		
												339323E 7700046N	1		
												339331E 7700044N	1		
39	337500E 7699950N	339506E 7699950N	15/12	13/12	05/10	0825-0840	0720-0750					338648E 7699946N	1		
												339329E 7699964N	1		

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
40	337500E 7699900N	339485E 7699900N	15/12	13/12	05/10	0815-0825	0720-0755	1045-1110							
41	337500E 7699850N	339483E 7699850N	15/12	13/12	05/10	0750-0800	0720-0755	1110-1125							
42	337500E 7699800N	339479E 7699800N	15/12	13/12	05/10	07350 0750	0800-0830	1110-1125							
43	337500E 7699750N	339500E 7699750N	15/12	13/12	14/12	0720-0730	0800-0835	0625-0640				339373E 7699744N	1		
44	337500E 7699700N	339500E 7699700N	15/12	13/12	14/12	0710-0720	0800-0835	0625-0640	338813E 7699703N	5	not active	338614E 7699702N	1		
45	337500E 7699650N	339447E 7699650N	15/12	13/12	14/12	0655-0705	0840-0900	0645-0700	338809E 7699637N	10-20	unknown	338075E 7699448N	1		
46	337500E 7699600N	339425E 7699600N	15/12	13/12	14/12	0640-0650	0840-0905	0645-0700							
47	337500E 7699550N	339410E 7699550N	15/12	13/12	14/12	0625-0640	0840-0905	0705-0720							
48	337500E 7699500N	339393E 7699500N	14/12	13/12	14/12	1655-1710	0915-0945	0705-0720							
49	337494E 7699450N	339366E 7699450N	14/12	13/12	14/12	1700-1715	0950-1015	0730-0745							
50	337500E 7699400N	339282E 7699400N	14/12	13/12	14/12	1655-1710	1020-1045	0730-0745				338904E 7699397N	1		
												338507E 7699411N	1		
51	337500E 7699350N	339283E 7699350N	14/12	13/12	14/12	1640-1655	1050-1115	0750-0805							

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
52	337498E 7699300N	339246E 7699300N	14/12	13/12	14/12	1640-1655	1415-1435	0750-0805							
53	337500E 7699250N	339258E 7699250N	14/12	13/12	14/12	1635-1650	1435-1455	0805-0820							
54	337500E 7699200N	339241E 7699200N	14/12	13/13	14/12	1620-1635	1500-1520	0805-0820						338768E 7699202N	?
55	337685E 7699150N	339238E 7699150N	14/12	13/12	14/12	1620-1630	1525-1555	0825-0840				338544E 7699152N	1		
56	337925E 7699100N	339228E 7699100N	14/12	13/12	14/12	1620-1625	1555-1635	0825-0840							
57	338000E 7699050N	339218E 7699050N	-	13/12	14/12	-	1640-1700	0845-0900							
58	338557E 7699000N	339189E 7699000N	-	16/12	14/12	-	0800-0810	0845-0900							
59	338575E 7698950N	339201E 7698950N	-	16/12	16/12	-	0810-0815	0800-0810							
60	338604E 7698900N	339168E 7698900N	-	16/12	16/12	-	0815-0820	0810-0825							
61	338625E 7698850N	339160E 7698850N	-	16/12	16/12	-	0820-0825	0830-0845							
62	338698E 7698800N	339139E 7698800N	-	-	16/12	-	-	0828-0840							
63	338680E 7698750N	339134E 7698750N	-	-	16/12	-	-	0845-0900				338745E 7698749N	1		
64	338671E 7698700N	339117E 7698700N	-	-	16/12	-	-	0843-0855							

	Transect Coordinates		Survey Date			Survey Time			Boodie warrens			Hare Wallaby sightings		Solution pipes	
	Start	Finish	A	B	C	A	B	C	Coordinates	# entrances	Active/ Inactive	Coordinates	#	Coordinates	#
65	338698E 7698650N	339045E 7698650N	-	-	16/12	-	-	0850-0857				338796E 7698632N	1		
66	338725E 7698600N	338998E 7698609N	-	-	16/12	-	-	0900-0905				338774E 7698607N	1		

Attachment 4 - Details of Reptile Captures on the Six Grids in the Gorgon Development Area, November-December 2003 and October 2004

Number is the individual mark (toe-clipping) given to some species. Cryo number and Museum number are for specimens collected and preserved for taxonomic studies.

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
01/12/03	AM	1	E13	*Ctenotus grandis*	7		115	272	32.1	Y	F	BIMB043	
01/12/03	AM	1	P18	*Ctenotus saxatilis*	3		100	239	20.2	Y	F	BIMB033	
01/12/03	AM	1	P25	*Lerista bipes*			50	93		N			R154171
01/12/03	AM	2	P25	*Ctenotus grandis*	6		117	265	33.3	Y		BIMB042	
01/12/03	AM	2	P18	*Heteronotia binoei*	4		37	85		Y			
01/12/03	AM	2	P11	*Lerista bipes*			51	90		N			R154172
01/12/03	AM	2	P12	*Lerista bipes*			53	104		N			
01/12/03	AM	2	P18	*Lerista bipes*			46	86		N			
01/12/03	AM	2	P23	*Lerista bipes*			49	95		N			
01/12/03	AM	2	P25	*Menetia greyii*			23	61		N	M		
01/12/03	AM	2	P13	*Notoscincus ornatus*	3		39	84		N			
01/12/03	PM	6	P16	*Lerista muelleri*			35	76		N			
02/12/03	AM	6	E09	*Ctenotus saxatilis*	1		98	226	15.4	Y	F	BIMB045	
02/12/03	AM	6	P08	*Delma nasuta*			80	294	5.0	N	F		
25/11/03	PM	4	P10	*Lerista bipes*			50	55		Y			
25/11/03	PM	4	P24	*Lerista bipes*			30	49		N			
25/11/03	PM	4	P25	*Lerista muelleri*			32	52		B			R154167
25/11/03	PM	5	P01	*Lerista muelleri*			33	80		N			
25/11/03	PM	5	P21	*Pogona minor*	1		39	103				BIMB001	
25/11/03	PM	5	P23	*Pogona minor*			105	288	33.0				

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
26/11/03	AM	4	P13	*Delma borea*			79	325		N			R154148
26/11/03	AM	4	P02	*Lerista bipes*			51	95	0.7	N			
26/11/03	AM	4	P02	*Lerista bipes*			54	90	0.9	Y			
26/11/03	PM	4	P04	*Lerista bipes*			56	92	0.9	Y			
26/11/03	PM	4	P10	*Lerista bipes*			42	76	0.4	N			
26/11/03	AM	4	P14	*Lerista bipes*			54	85	0.8	Y			
26/11/03	PM	4	P16	*Lerista bipes*			52	98		N		BIMB007	
26/11/03	AM	4	P17	*Lerista bipes*			54	100	0.9	N			
26/11/03	AM	4	P21	*Lerista bipes*			50	77	0.6	Y			
26/11/03	AM	4	P21	*Lerista bipes*			57	101	0.6	N			
26/11/03	PM	4	P24	*Lerista bipes*			54	87	0.8	N			
26/11/03	AM	4	P25	*Lerista bipes*			53	82	0.6	Y			
26/11/03	AM	4	P02	*Lerista muelleri*			22	45	0.1	N			
26/11/03	PM	4	P02	*Lerista muelleri*			35	70	0.3	N		BIMB009	
26/11/03	PM	4	P14	*Lerista muelleri*			35	86	0.5	B		BIMB008	
26/11/03	PM	4	P14	*Lerista muelleri*			20	40		N			
26/11/03	PM	4	P23	*Lerista muelleri*			33	66	0.4	Y		BIMB006	
26/11/03	AM	5	P25	*Heteronotia binoei*	1		40	98	1.7	N		BIMB002	
26/11/03	AM	5	P01	*Lerista bipes*			51	96	0.7	N			
26/11/03	AM	5	P01	*Lerista bipes*			55	96	0.8	N			
26/11/03	AM	5	P01	*Lerista bipes*			51	96	0.7	N			
26/11/03	AM	5	P04	*Lerista bipes*			52	82	0.7	Y			
26/11/03	AM	5	P04	*Lerista bipes*			51	93	0.6	N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
26/11/03	AM	5	P05	*Lerista bipes*			49	90	0.7	N			
26/11/03	AM	5	P06	*Lerista bipes*			52	95	0.7	N			
26/11/03	AM	5	P06	*Lerista bipes*			52	85	0.7	Y			
26/11/03	AM	5	P07	*Lerista bipes*			55	89	1.0	Y			
26/11/03	AM	5	P13	*Lerista bipes*			55	98	0.8	N			
26/11/03	AM	5	P13	*Lerista bipes*			49	95	0.6	N			
26/11/03	AM	5	P14	*Lerista bipes*			53	101	0.7	N			
26/11/03	AM	5	P14	*Lerista bipes*			53	95	0.7	N			
26/11/03	AM	5	P15	*Lerista bipes*			55	92	0.8	N			
26/11/03	AM	5	P15	*Lerista bipes*			57	96	0.9	Y			
26/11/03	AM	5	P18	*Lerista bipes*			54	99	0.7	N			
26/11/03	PM	5	P04	*Lerista muelleri*			35	65				BIMB003	
26/11/03	PM	5	P08	*Lerista muelleri*			32	67	0.4	N		BIMB004	
26/11/03	AM	5	P03	*Lialis burtonis*			165	320	12.5	N			
26/11/03	PM	5	P20	*Lialis burtonis*			170	380	9.0	N			
26/11/03	AM	5	P09	*Menetia greyii*			?	?					
26/11/03	PM	5	P18	*Proablepharus reginae*	1		32	96				BIMB005	
27/11/03	PM	1	P13	*Delma nasuta*			96	335		N		BIMB030	
27/11/03	PM	1	P11	*Lerista muelleri*			37	78		N			
27/11/03	PM	1	P21	*Lerista muelleri*			34	77		Y			
27/11/03	PM	1	P24	*Lerista muelleri*			36	88		N			
27/11/03	PM	1	P24	*Lerista muelleri*			37	47		B			R154162
27/11/03	PM	1	P01	*Menetia greyii*	2		25	59		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
27/11/03	PM	1	P16	*Menetia greyii*	1		24	43		Y			
27/11/03	PM	1	P21	*Menetia greyii*	12		27	55		N			
27/11/03	PM	2	P02	*Carlia triacantha*			?	?					
27/11/03	PM	2	P03	*Lerista muelleri*			36	83		N			
27/11/03	PM	2	P09	*Lerista muelleri*			36	64		Y		BIMB029	
27/11/03	PM	2	P17	*Lerista muelleri*			37	85		N			
27/11/03	PM	2	P03	*Ramphotyphlops ammodytes*			?	?					
27/11/03	PM	2	P12	*Varanus acanthurus*	1		127	322	27.0		F	BIMB013	
27/11/03	AM	3	P01	*Lerista bipes*			55	105	1.0	N			
27/11/03	AM	3	P02	*Lerista bipes*			53	91	0.7	Y			
27/11/03	AM	3	P04	*Lerista bipes*			52	97	0.8	N			
27/11/03	AM	3	P05	*Lerista bipes*			52	91	0.8	Y			
27/11/03	AM	3	P05	*Lerista bipes*			56	98	1.0	Y			
27/11/03	AM	3	P05	*Lerista bipes*			48	90	0.5	N			
27/11/03	AM	3	P08	*Lerista bipes*			52	95	0.8	N			
27/11/03	AM	3	P08	*Lerista bipes*			56	95	0.7	N			
27/11/03	AM	3	P08	*Lerista bipes*			55	101	0.8	N			
27/11/03	AM	3	P11	*Lerista bipes*			52	82	0.6	Y			
27/11/03	AM	3	P11	*Lerista bipes*			54	81	0.7	Y			
27/11/03	AM	3	P12	*Lerista bipes*			50	84	0.5	N			
27/11/03	AM	3	P13	*Lerista bipes*			55	100	0.9	N			
27/11/03	AM	3	P14	*Lerista bipes*			47	85	0.5	N			
27/11/03	AM	3	P15	*Lerista bipes*			53	85	0.8	Y			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
27/11/03	AM	3	P15	*Lerista bipes*			45	80	0.4	N			
27/11/03	AM	3	P20	*Lerista bipes*			55	91	0.9	Y			
27/11/03	AM	3	P21	*Lerista bipes*			55	100	0.7	N			
27/11/03	AM	3	P23	*Lerista bipes*			52	86	0.7	N			
27/11/03	AM	3	P24	*Lerista bipes*			57	107	0.9	N			
27/11/03	AM	3	P24	*Lerista bipes*			47	80	0.6	N			
27/11/03	PM	3	P12	*Lerista muelleri*			35	88		N			R154166
27/11/03	PM	3	P17	*Lerista muelleri*			37	85		N			
27/11/03	AM	4	E03	*Ctenotus grandis*	1		80	228	11.0	N			
27/11/03	PM	4	P12	*Cyclodomorphus melanops*			143	239	22.0	Y			R154152
27/11/03	AM	4	P02	*Lerista bipes*			53	77	0.8	Y			
27/11/03	AM	4	P03	*Lerista bipes*			42	51	0.7	B		BIMB011	
27/11/03	AM	4	P06	*Lerista bipes*			50	96	0.7	N			
27/11/03	AM	4	P12	*Lerista bipes*			56	92	0.9	Y			
27/11/03	AM	4	P13	*Lerista bipes*			56	100	0.8	N			
27/11/03	AM	4	P15	*Lerista bipes*			53	96	0.8	N			
27/11/03	AM	4	P20	*Lerista bipes*			52	98	0.8	N			
27/11/03	AM	4	P21	*Lerista bipes*			50	88	0.6	N		BIMB010	
27/11/03	AM	4	P24	*Lerista bipes*			57	100	1.0	N			
27/11/03	AM	4	P25	*Lerista bipes*			57	91	0.8	Y			
27/11/03	AM	4	P03	*Lerista muelleri*			35	84	0.6	N			
27/11/03	AM	5	P02	*Lerista bipes*			55	86	0.6	Y			
27/11/03	AM	5	P03	*Lerista bipes*			55	100	0.8	N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
27/11/03	AM	5	P06	*Lerista bipes*			55	95		B			
27/11/03	AM	5	P06	*Lerista bipes*			50	87	0.7	N			
27/11/03	AM	5	P07	*Lerista bipes*			52	82	0.7	Y			
27/11/03	AM	5	P07	*Lerista bipes*			53	88	0.7	Y			
27/11/03	AM	5	P08	*Lerista bipes*			57	75	0.6	Y			
27/11/03	AM	5	P08	*Lerista bipes*			53	80	0.5	Y			
27/11/03	AM	5	P08	*Lerista bipes*			50	86	0.8	N			
27/11/03	AM	5	P12	*Lerista bipes*			55	90	0.8	Y			
27/11/03	AM	5	P13	*Lerista bipes*			55	95	0.7	Y			
27/11/03	AM	5	P14	*Lerista bipes*			58	102	1.0	Y			
27/11/03	AM	5	P14	*Lerista bipes*			51	95	0.7	N			
27/11/03	AM	5	P16	*Lerista bipes*			53	96	0.8	N			
27/11/03	PM	5	P04	*Lerista muelleri*			34	68		Y			R154164
27/11/03	PM	5	P05	*Lerista muelleri*			35	84		N			R154165
27/11/03	AM	5	P15	*Pogona minor*	2		80	240	15.0			BIMB012	
28/11/03	PM	1	P03	*Ctenotus grandis*			110	221	26.7	Y		BIMB031	
28/11/03	AM	1	P15	*Ctenotus grandis*			109	296	28.9	N	F	BIMB017	
28/11/03	AM	1	P18	*Ctenotus grandis*			114	235	22.2	Y		BIMB016	
28/11/03	PM	1	P07	*Cyclodomorphus melanops*			113	223	16.0	N			R154160
28/11/03	PM	1	P15	*Delma nasuta*			110	288	9.5	Y			R154170
28/11/03	AM	1	P11	*Heteronotia binoei*			40	87		N			
28/11/03	PM	1	P10	*Lerista muelleri*			32	69		N	F		R154163
28/11/03	PM	1	P10	*Menetia greyii*			23	53		N			R154169

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
28/11/03	PM	1	P21	*Menetia greyii*			23	27		B			R154161
28/11/03	AM	1	P22	*Menetia greyii*	3		26	54		N			
28/11/03	AM	2	P02	*Ctenotus grandis*	3		116	252	27.1	Y	F	BIMB018	
28/11/03	AM	2	P25	*Ctenotus grandis*	4		91	212	12.7	Y		BIMB019	
28/11/03	AM	2	P03	*Ctenotus saxatilis*			88	238		Y	F		R154150
28/11/03	AM	2	P12	*Heteronotia binoei*	2		39	99		Y			
28/11/03	AM	2	P20	*Lerista bipes*			44	84		N			
28/11/03	AM	2	P22	*Lerista bipes*			59	97		Y			
28/11/03	PM	2	P25	*Lerista muelleri*			32	76		N		BIMB028	
28/11/03	AM	2	P13	*Menetia greyii*			23	47		N			R154153
28/11/03	PM	2	P13	*Menetia greyii*	8		21	43		Y			
28/11/03	AM	2	P20	*Menetia greyii*	3.4		28	62		N			
28/11/03	PM	2	P20	*Menetia greyii*	9		24	39		Y			
28/11/03	AM	2	P22	*Notoscincus ornatus*			35	83		Y	F		R154147
28/11/03	AM	2	P22	*Notoscincus ornatus*	1		35	94		N			
28/11/03	PM	2	P24	*Notoscincus ornatus*			33	64		Y			R154159
28/11/03	PM	2	P24	*Notoscincus ornatus*			?	?					
28/11/03	PM	3	P02	*Ctenotus grandis*	2		126	307	32.3	N	F	BIMB035	
28/11/03	PM	3	P16	*Ctenotus grandis*			113	311	39.9	N		BIMB034	
28/11/03	AM	3	P23	*Ctenotus grandis*	1		112	262		N	F	BIMB015	
28/11/03	AM	3	P06	*Lerista bipes*		R	53	93		N			
28/11/03	AM	3	P25	*Lerista bipes*		R	55	96		Y			
28/11/03	AM	3	P03	*Lerista bipes*			58	94		Y			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
28/11/03	AM	3	P03	*Lerista bipes*			52	100		N			
28/11/03	AM	3	P03	*Lerista bipes*			55	88		Y			
28/11/03	AM	3	P04	*Lerista bipes*			52	60		B		BIMB014	
28/11/03	AM	3	P04	*Lerista bipes*			55	101		N			
28/11/03	AM	3	P05	*Lerista bipes*			42	76		N			
28/11/03	AM	3	P09	*Lerista bipes*			53	100		N			
28/11/03	AM	3	P09	*Lerista bipes*			36	60		N			
28/11/03	AM	3	P10	*Lerista bipes*			56	95		Y			
28/11/03	AM	3	P10	*Lerista bipes*			52	89		Y			
28/11/03	AM	3	P11	*Lerista bipes*			55	90		N			
28/11/03	AM	3	P12	*Lerista bipes*			54	99		N			
28/11/03	AM	3	P13	*Lerista bipes*			54	99		N			
28/11/03	AM	3	P13	*Lerista bipes*			49	97		N			
28/11/03	AM	3	P14	*Lerista bipes*			47	86		Y			
28/11/03	AM	3	P16	*Lerista bipes*			54	105		N			
28/11/03	AM	3	P17	*Lerista bipes*			57	102		N			
28/11/03	AM	3	P17	*Lerista bipes*			50	92		N			
28/11/03	AM	3	P19	*Lerista bipes*			57	104		N			
28/11/03	AM	3	P19	*Lerista bipes*			54	101		N			
28/11/03	AM	3	P19	*Lerista bipes*			47	79		N			
28/11/03	AM	3	P20	*Lerista bipes*			54	103		N			
28/11/03	AM	3	P20	*Lerista bipes*			?	?					
28/11/03	AM	3	P21	*Lerista bipes*			54	101		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
28/11/03	AM	3	P21	*Lerista bipes*			55	94		Y			
28/11/03	AM	3	P21	*Lerista bipes*			53	97		N			
28/11/03	AM	3	P25	*Lerista bipes*			56	94		Y			
28/11/03	PM	3	P06	*Lerista muelleri*			38	69		N			
28/11/03	AM	4	E19	*Ctenotus saxatilis*	1		110	250	31.3	Y		BIMB022	
28/11/03	AM	4	P09	*Lerista bipes*			55	103					
28/11/03	AM	4	P09	*Lerista bipes*			42	76					
28/11/03	AM	4	P10	*Lerista bipes*			55	92					
28/11/03	AM	4	P17	*Lerista bipes*			50	92		Y			
28/11/03	AM	4	P17	*Lerista bipes*			54	97		Y			
28/11/03	AM	4	P19	*Lerista bipes*			54	89		Y			
28/11/03	AM	4	P20	*Lerista bipes*			55	84		Y			
28/11/03	AM	4	P21	*Lerista bipes*			57	64		B		BIMB021	
28/11/03	AM	4	P21	*Lerista bipes*			56	99		N			
28/11/03	AM	4	P23	*Lerista bipes*			55	64		B		BIMB020	
28/11/03	PM	4	P03	*Lerista muelleri*			38	82		N			
28/11/03	AM	4	P08	*Lerista muelleri*			35	85					
28/11/03	AM	5	P06	*Ctenotus pantherinus*			45	75		N			R154151
28/11/03	AM	5	P02	*Ctenotus saxatilis*			120	340		N	F		R154149
28/11/03	AM	5	P15	*Heteronotia binoei*	2		38	92		N			
28/11/03	AM	5	P01	*Lerista bipes*			53	88		Y			
28/11/03	AM	5	P03	*Lerista bipes*			52	58		B			
28/11/03	AM	5	P05	*Lerista bipes*			42	75		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
28/11/03	AM	5	P07	*Lerista bipes*			51	61		B		BIMB024	
28/11/03	AM	5	P07	*Lerista bipes*			51	95					
28/11/03	AM	5	P08	*Lerista bipes*			58	109		N			
28/11/03	AM	5	P10	*Lerista bipes*			53	100		N			
28/11/03	AM	5	P10	*Lerista bipes*			51	96		N			
28/11/03	AM	5	P14	*Lerista bipes*			53	97		N			
28/11/03	AM	5	P15	*Lerista bipes*			48	53		B		BIMB023	
28/11/03	PM	5	P17	*Lerista bipes*			56	94		Y			
28/11/03	AM	5	P18	*Lerista bipes*			52	99		N			
28/11/03	AM	5	P19	*Lerista bipes*			55	97		N			
28/11/03	AM	5	P20	*Lerista bipes*			51	99		N			
28/11/03	AM	5	P20	*Lerista bipes*			58	107		N			
28/11/03	AM	5	P25	*Lerista bipes*			53	96		N			
28/11/03	AM	5	P25	*Lerista bipes*			53	88		N			
28/11/03	PM	5	P14	*Lerista muelleri*			19	43		N			
28/11/03	PM	5	P20	*Lerista muelleri*			36	92		N			
28/11/03	PM	6	P14	*Lerista muelleri*			35	81		N			
28/11/03	PM	6	P17	*Lerista muelleri*			36	45		Y			
29/11/03	PM	1	P22	*Ctenotus grandis*	3		81	216	10.4	N	F	BIMB040	
29/11/03	PM	1	P04	*Ctenotus pantherinus*			98	234	21.9	N	F		
29/11/03	AM	1	P24	*Lerista bipes*			52	96		N			
29/11/03	AM	1	P20	*Menetia greyii*	10		23	39		Y			
29/11/03	AM	1	P05	*Notoscincus ornatus*			35	88		N			R154155

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
29/11/03	AM	2	P25	*Ctenotus grandis*	5		95	215	24.0	Y		BIMB027	
29/11/03	AM	2	P08	*Ctenotus saxatilis*	2		92	244	26.0	Y	F	BIMB025	
29/11/03	AM	2	P07	*Lerista bipes*			49	93					
29/11/03	AM	2	P14	*Lerista bipes*			50	82		Y			
29/11/03	AM	2	P16	*Lerista bipes*			?	?					
29/11/03	AM	2	P20	*Lerista bipes*			50	99		N			
29/11/03	AM	2	P24	*Lerista bipes*			55	96		N			
29/11/03	AM	2	P14	*Lerista muelleri*		R	?	?					
29/11/03	AM	3	P12	*Ctenotus grandis*	3		127	321	32.8	N	F	BIMB038	
29/11/03	AM	3	P20	*Ctenotus grandis*	4		121	234	32.9	Y	F	BIMB039	
29/11/03	AM	3	P19	*Cyclodomorphus melanops*			104	186	22.0	Y			R154154
29/11/03	AM	3	P01	*Lerista bipes*		R	57	109		N			
29/11/03	AM	3	P02	*Lerista bipes*			52	86		N			
29/11/03	AM	3	P04	*Lerista bipes*			54	72		Y		BIMB037	
29/11/03	AM	3	P04	*Lerista bipes*			52	88		N			
29/11/03	AM	3	P04	*Lerista bipes*			39	70		N			
29/11/03	AM	3	P06	*Lerista bipes*			35	59		N			
29/11/03	AM	3	P08	*Lerista bipes*			60	109		N			
29/11/03	AM	3	P10	*Lerista bipes*			58	94		N			
29/11/03	AM	3	P10	*Lerista bipes*			46	72		Y			
29/11/03	AM	3	P15	*Lerista bipes*			53	100		N			
29/11/03	AM	3	P15	*Lerista bipes*			45	87		N			
29/11/03	AM	3	P16	*Lerista bipes*			51	97		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
29/11/03	AM	3	P16	*Lerista bipes*			58	110		N			
29/11/03	AM	3	P17	*Lerista bipes*			54	85		Y			
29/11/03	PM	3	P01	*Lerista muelleri*			32	79		N			
29/11/03	PM	3	P08	*Lerista muelleri*			34	64		Y			
29/11/03	PM	3	P20	*Lerista muelleri*			40	72		Y			
29/11/03	AM	4	P12	*Lerista bipes*			57	104		N			
29/11/03	AM	4	P14	*Lerista bipes*			54	99		N			
29/11/03	AM	4	P16	*Lerista bipes*			55	102		N			
29/11/03	AM	4	P24	*Lerista bipes*			53	97		N			
29/11/03	AM	5	P03	*Lerista bipes*			52	98		N		BIMB036	
29/11/03	AM	5	P13	*Lerista bipes*			53	96		N			
29/11/03	AM	5	P14	*Lerista bipes*			57	107		N			
29/11/03	AM	5	P20	*Lerista bipes*			44	80		N			
29/11/03	AM	5	P03	*Menetia greyii*			25	52			M		R154158
29/11/03	AM	6	P15	*Heteronotia binoei*	2		43	108		N		BIMB044	
29/11/03	AM	6	P23	*Heteronotia binoei*	1		42	76		Y	M		
29/11/03	AM	6	P03	*Menetia greyii*			19	39		N			R154156
29/11/03	AM	6	P09	*Menetia greyii*			24	54		N			R154157
29/11/03	AM	6	P15	*Menetia greyii*			20	39		Y			
29/11/03	AM	6	P23	*Menetia greyii*	1		24	52		N			
30/11/03	AM	1	P24	*Lerista bipes*			52	82		Y			
30/11/03	PM	1	P05	*Lerista muelleri*			20	43		N			
30/11/03	AM	1	P22	*Menetia greyii*	11		24	57		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
30/11/03	PM	2	P07	*Heteronotia binoei*	3		44	100		N			
30/11/03	PM	2	P09	*Lerista bipes*			54	80		Y			
30/11/03	AM	2	P12	*Lerista bipes*			53	81		Y			
30/11/03	AM	2	P14	*Lerista bipes*			54	94		Y			
30/11/03	AM	2	P16	*Lerista bipes*			51	88		N			
30/11/03	PM	2	P19	*Lerista bipes*			54	92		Y			
30/11/03	PM	2	P21	*Lerista bipes*			56	71		B			
30/11/03	PM	2	P07	*Lerista muelleri*			39	74		Y			
30/11/03	AM	2	P17	*Notoscincus ornatus*	2		36	91		N			
30/11/03	AM	3	P05	*Ctenotus pantherinus*			31	77					R154168
30/11/03	AM	3	P02	*Lerista bipes*			52	84		Y			
30/11/03	AM	3	P02	*Lerista bipes*			55	90		Y			
30/11/03	AM	3	P03	*Lerista bipes*			57	103		N			
30/11/03	AM	3	P04	*Lerista bipes*			53	97		N			
30/11/03	AM	3	P05	*Lerista bipes*			52	99		N			
30/11/03	AM	3	P06	*Lerista bipes*			56	79		B		BIMB041	
30/11/03	AM	3	P07	*Lerista bipes*			57	83		Y			
30/11/03	AM	3	P08	*Lerista bipes*			59	92		N			
30/11/03	AM	3	P17	*Lerista bipes*			54	96		Y			
30/11/03	PM	3	P10	*Lerista muelleri*			34	81		N			
30/11/03	PM	3	P21	*Lerista muelleri*			?	?					
30/11/03	PM	3	P15	*Morethia ruficauda*			36	43		B		BIMB032	R154174
30/11/03	PM	6	P16	*Lerista muelleri*			21	46		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
30/11/03	PM	6	P17	*Lerista muelleri*			35	78		N			
30/11/03	AM	6	P11	*Menetia greyii*	3		25	56		N			
30/11/03	PM	6	P19	*Menetia greyii*			22	55		N			
01/12/03	AM	1	E13	*Ctenotus grandis*	7		115	272	32.1	Y	F	BIMB043	
01/12/03	AM	1	P18	*Ctenotus saxatilis*	3		100	239	20.2	Y	F	BIMB033	
01/12/03	AM	1	P25	*Lerista bipes*			50	93		N			R154171
01/12/03	AM	2	P25	*Ctenotus grandis*	6		117	265	33.3	Y		BIMB042	
01/12/03	AM	2	P18	*Heteronotia binoei*	4		37	85		Y			
01/12/03	AM	2	P11	*Lerista bipes*			51	90		N			R154172
01/12/03	AM	2	P12	*Lerista bipes*			53	104		N			
01/12/03	AM	2	P18	*Lerista bipes*			46	86		N			
01/12/03	AM	2	P23	*Lerista bipes*			49	95		N			
01/12/03	AM	2	P25	*Menetia greyii*			23	61		N	M		
01/12/03	AM	2	P13	*Notoscincus ornatus*	3		39	84		N			
01/12/03	PM	6	P16	*Lerista muelleri*			35	76		N			
02/12/03	AM	6	E09	*Ctenotus saxatilis*	1		98	226	15.4	Y	F	BIMB045	
02/12/03	AM	6	P08	*Delma nasuta*			80	294	5.0	N	F		
25/11/03	PM	4	P10	*Lerista bipes*			50	55		Y			
25/11/03	PM	4	P24	*Lerista bipes*			30	49		N			
25/11/03	PM	4	P25	*Lerista muelleri*			32	52		B			R154167
25/11/03	PM	5	P01	*Lerista muelleri*			33	80		N			
25/11/03	PM	5	P21	*Pogona minor*	1		39	103				BIMB001	
25/11/03	PM	5	P23	*Pogona minor*			105	288	33.0				

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
26/11/03	AM	4	P13	*Delma borea*			79	325		N			R154148
26/11/03	AM	4	P02	*Lerista bipes*			51	95	0.7	N			
26/11/03	AM	4	P02	*Lerista bipes*			54	90	0.9	Y			
26/11/03	PM	4	P04	*Lerista bipes*			56	92	0.9	Y			
26/11/03	PM	4	P10	*Lerista bipes*			42	76	0.4	N			
26/11/03	AM	4	P14	*Lerista bipes*			54	85	0.8	Y			
26/11/03	PM	4	P16	*Lerista bipes*			52	98		N		BIMB007	
26/11/03	AM	4	P17	*Lerista bipes*			54	100	0.9	N			
26/11/03	AM	4	P21	*Lerista bipes*			50	77	0.6	Y			
26/11/03	AM	4	P21	*Lerista bipes*			57	101	0.6	N			
26/11/03	PM	4	P24	*Lerista bipes*			54	87	0.8	N			
26/11/03	AM	4	P25	*Lerista bipes*			53	82	0.6	Y			
26/11/03	AM	4	P02	*Lerista muelleri*			22	45	0.1	N			
26/11/03	PM	4	P02	*Lerista muelleri*			35	70	0.3	N		BIMB009	
26/11/03	PM	4	P14	*Lerista muelleri*			35	86	0.5	B		BIMB008	
26/11/03	PM	4	P14	*Lerista muelleri*			20	40		N			
26/11/03	PM	4	P23	*Lerista muelleri*			33	66	0.4	Y		BIMB006	
26/11/03	AM	5	P25	*Heteronotia binoei*	1		40	98	1.7	N		BIMB002	
26/11/03	AM	5	P01	*Lerista bipes*			51	96	0.7	N			
26/11/03	AM	5	P01	*Lerista bipes*			55	96	0.8	N			
26/11/03	AM	5	P01	*Lerista bipes*			51	96	0.7	N			
26/11/03	AM	5	P04	*Lerista bipes*			52	82	0.7	Y			
26/11/03	AM	5	P04	*Lerista bipes*			51	93	0.6	N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
26/11/03	AM	5	P05	*Lerista bipes*			49	90	0.7	N			
26/11/03	AM	5	P06	*Lerista bipes*			52	95	0.7	N			
26/11/03	AM	5	P06	*Lerista bipes*			52	85	0.7	Y			
26/11/03	AM	5	P07	*Lerista bipes*			55	89	1.0	Y			
26/11/03	AM	5	P13	*Lerista bipes*			55	98	0.8	N			
26/11/03	AM	5	P13	*Lerista bipes*			49	95	0.6	N			
26/11/03	AM	5	P14	*Lerista bipes*			53	101	0.7	N			
26/11/03	AM	5	P14	*Lerista bipes*			53	95	0.7	N			
26/11/03	AM	5	P15	*Lerista bipes*			55	92	0.8	N			
26/11/03	AM	5	P15	*Lerista bipes*			57	96	0.9	Y			
26/11/03	AM	5	P18	*Lerista bipes*			54	99	0.7	N			
26/11/03	PM	5	P04	*Lerista muelleri*			35	65				BIMB003	
30/11/03	AM	3	P04	*Lerista bipes*			53	97		N			
30/11/03	AM	3	P05	*Lerista bipes*			52	99		N			
30/11/03	AM	3	P06	*Lerista bipes*			56	79		B		BIMB041	
30/11/03	AM	3	P07	*Lerista bipes*			57	83		Y			
30/11/03	AM	3	P08	*Lerista bipes*			59	92		N			
30/11/03	AM	3	P17	*Lerista bipes*			54	96		Y			
30/11/03	PM	3	P10	*Lerista muelleri*			34	81		N			
30/11/03	PM	3	P21	*Lerista muelleri*			?	?					
30/11/03	PM	3	P15	*Morethia ruficauda*			36	43		B		BIMB032	R154174
30/11/03	PM	6	P16	*Lerista muelleri*			21	46		N			
30/11/03	PM	6	P17	*Lerista muelleri*			35	78		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
30/11/03	AM	6	P11	*Menetia greyii*	3		25	56		N			
30/11/03	PM	6	P19	*Menetia greyii*			22	55		N			
16/10/04	AM	3	P6	*Ctenotus grandis*	6		115	285	37	?			
16/10/04	PM	3	P9	*Ctenotus grandis*	7		125	325		N			
16/10/04	AM	3	P15	*Cyclodomorphus melanops*	6		78	158		N			
16/10/04	AM	3	P22	*Diplodactylus jeanae*	NA								
16/10/04	AM	3	P14	*Lerista bipes*	tc		56	100		N			
16/10/04	AM	3	P18	*Lerista bipes*	tc		56	101		N			
16/10/04	AM	3	P18	*Lerista bipes*	tc		NA						
16/10/04	AM	3	P20	*Lerista bipes*	tc		53	100		N			
16/10/04	AM	3	P22	*Lerista bipes*	tc		53	92		N			
16/10/04	AM	4	E4	*Ctenotus grandis*	1	Y							
16/10/04	PM	4	P12	*Ctenotus grandis*	6		75	220		N			
16/10/04	PM	4	P9	*Cyclodomorphus melanops*	6		89	152		Y			
16/10/04	PM	4	P7	*Cyclodomorphus melanops*	7		106	192		N			
16/10/04	PM	4	P21	*Lerista bipes*	tc		51			D			
16/10/04	PM	4	P1	*Lerista muelleri*	tc		32	71		N			
16/10/04	AM	5	P11	*Lerista bipes*	tc		52	85		Y			
16/10/04	AM	5	P3	*Lerista bipes*	tc		54	95		N			
16/10/04	AM	5	P10	*Lerista bipes*	tc		56	95		N			
16/10/04	AM	5	P6	*Lerista bipes*	tc		54	102		N			
16/10/04	AM	5	P12	*Lerista bipes*	tc		52	100		N			
16/10/04	AM	5	P14	*Lerista bipes*	tc		52	92		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
16/10/04	AM	5	P15	*Lerista bipes*	tc		54	100		N			
16/10/04	AM	5	P10	*Lerista bipes*	tc		53	100		N			
16/10/04	AM	5	P16	*Lerista bipes*	tc		55	80		Y			
16/10/04	AM	5	P16	*Lerista bipes*	tc		55	88		Y			
16/10/04	AM	5	P16	*Lerista bipes*	tc		53	92		Y			
16/10/04	AM	5	P17	*Lerista bipes*	tc		52	95		N			
16/10/04	AM	5	P20	*Lerista bipes*	tc		50			D			
16/10/04	AM	5	P9	*Pogona minor*	5		78	228		N			
17/10/04	PM	1	P2	*Menetia greyii*	NA	NA							
17/10/04	PM	1	P7	*Notoscincus ornatus*	-		31	87		N			
17/10/04	PM	3	P21	*Ctenotus grandis*	NA		116	335		N			
17/10/04	PM	3	P7	*Ctenotus grandis*	10		110	260		Y			
17/10/04	AM	3	P23	*Ctenotus grandis*	7		85	239	13.5	N			
17/10/04	PM	3	P8	*Lerista bipes*	tc		36	66		N			
17/10/04	PM	3	P19	*Lerista bipes*	tc	Y - 04	52	86		N			
17/10/04	PM	3	P6	*Lerista bipes*	tc	Y - 04	53	90		N			
17/10/04	AM	3	P14	*Lerista bipes*	tc	Y?	53	98		N			
17/10/04	AM	3	P14	*Lerista bipes*	tc		48	91		Y			
17/10/04	AM	3	P17	*Lerista bipes*	tc		54	91		N			
17/10/04	PM	3	P3	*Lerista bipes*	tc		54	92		N			
17/10/04	PM	3	P5	*Lerista bipes*	tc		53	95		N			
17/10/04	PM	3	P6	*Menetia sp.*	NA		24			D			
17/10/04	PM	3	P12	*Morethia ruficauda*	6		32	76		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
17/10/04	AM	3	P14	*Notoscincus ornatus*	1		31	84		N			
17/10/04	AM	4	E4	*Ctenotus grandis*	40		115	310		N			
17/10/04	PM	4	P9	*Ctenotus grandis*	7		114	275		N			
17/10/04	PM	4	P20	*Ctenotus grandis*	8		113	320		N			
17/10/04	AM	4	P18	*Diplodactylus jeanae*	NA		41	81					
17/10/04	AM	4	P1	*Lerista bipes*	tc								
17/10/04	AM	4	P9	*Lerista bipes*	tc		55	98		N			
17/10/04	AM	4	P16	*Lerista bipes*	tc		46	80		N			
17/10/04	PM	4	P21	*Lerista bipes*	tc		41	90		N			
17/10/04	AM	4	P11	*Morethia ruficauda*	10		33	60		Y			
17/10/04	PM	4	P6	*Proablepharus reginae*	6		38	100		N			
17/10/04	AM	5	P8	*Lerista bipes*	tc		52	95		N			
17/10/04	AM	5	P14	*Lerista bipes*	tc		55	100		N			
17/10/04	AM	5	P21	*Lerista bipes*	tc		51	95		N			
17/10/04	AM	5	P22	*Lerista bipes*	tc		52	80		D			
17/10/04	AM	5	P25	*Lerista bipes*	tc		50	70		D			
17/10/04	AM	5	P25	*Lerista bipes*	tc		55	85		Y			
17/10/04	AM	5	P25	*Lerista bipes*	tc		52	95					
17/10/04	PM	5	P25	*Lerista muelleri*	tc		33	70		N			
17/10/04	AM	6	P15	*Ctenotus saxatilis*	-		86	241	20	N			
17/10/04	PM	6	P24	*Cyclodomorphus melanops*	21		95	195		N			
17/10/04	AM	6	E1	*Cyclodomorphus melanops*	20		95	152	17.5	Y			
17/10/04	AM	6	P20	*Heteronotia binoei*	NA	NA	40			D			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
17/10/04	AM	6	P16	*Heteronotia binoei*	NA	NA	35	90		N			
17/10/04	PM	6	P22	*Proablepharus reginae*	6		24	75		N			
18/10/04	AM	1	E15	*Ctenotus grandis*	-	-							
18/10/04	PM	1	C1	*Ctenotus grandis*	6		118	336		N			
18/10/04	PM	1	P7	*Cyclodomorphus melanops*	6		91	196		N			
18/10/04	AM	1	P23	*Heteronotia binoei*	NA	NA	44	105		N			
18/10/04	AM	2	P2	*Ctenotus grandis*	6		102	246	31	Y			
18/10/04	AM	2	E2	*Ctenotus grandis*	7		113	305	40	N			
18/10/04	AM	2	E8	*Ctenotus grandis*	8		80	226		N			
18/10/04	AM	2	E19	*Ctenotus grandis*	9		109	274	33	N			
18/10/04	AM	2	P23	*Ctenotus grandis*	-	-							
18/10/04	AM	2	E23	*Ctenotus grandis*	10		110	283	31	N			
18/10/04	AM	2	P21	*Ctenotus grandis*	11		110	269	36	Y			
18/10/04	AM	2	E6	*Ctenotus saxatilis*	6		95	258	19	N			
18/10/04	AM	2	E13	*Ctenotus saxatilis*	7		19	267	19	N			
18/10/04	AM	2	P8	*Lerista bipes*	tc		58	94		N			
18/10/04	AM	2	P15	*Lerista bipes*	tc		51	93		N			
18/10/04	AM	2	P9	*Menetia greyii*	NA	NA	24	65		N			
18/10/04	AM	2	P16	*Menetia greyii*	NA	NA	30	65		N			
18/10/04	AM	2	P12	*Morethia ruficauda*	-	-							
18/10/04	PM	2	P10	*Morethia ruficauda*	-	-							
18/10/04	PM	2	P24	*Morethia ruficauda*	1								
18/10/04	AM	2	P14	*Notoscincus ornatus*	NA	NA	31	78		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
18/10/04	AM	3	E9	*Ctenotus grandis*	7	Y	125	325		N			
18/10/04	AM	3	P10	*Lerista bipes*	tc		54	90		N			
18/10/04	AM	3	P8	*Lerista bipes*	tc		52	98		N			
18/10/04	AM	3	P13	*Lerista bipes*	tc		54	95		N			
18/10/04	AM	3	P15	*Lerista bipes*	tc								
18/10/04	AM	3	P19	*Lerista bipes*	tc		54	94		N			
18/10/04	AM	3	P17	*Lerista bipes*	tc		58	90		Y			
18/10/04	AM	3	P17	*Lerista bipes*	tc		53	90		N			
18/10/04	AM	3	P17	*Lerista bipes*	tc		50	95		N			
18/10/04	AM	3	P16	*Lerista bipes*	tc		53	95		N			
18/10/04	AM	3	P16	*Lerista bipes*	tc	Y - 04	50	65		D			
18/10/04	AM	3	P23	*Lerista bipes*	tc		55	89		N			
18/10/04	PM	4	P14	*Ctenotus grandis*	8		110	250		N			
18/10/04	AM	4	P7	*Cyclodomorphus melanops*	8		85	125		D			
18/10/04	AM	4	P1	*Lerista bipes*	tc		55	90		N			
18/10/04	PM	5	P18	*Ctenotus grandis*	-		113	295		N			
18/10/04	AM	5	P17	*Ctenotus pantherinus*	6		98	245		N			
18/10/04	AM	5	P12	*Lerista bipes*	tc		55	90		N			
18/10/04	AM	5	P24	*Lerista bipes*	tc		50	92		N			
18/10/04	AM	6	P24	*Heteronotia binoei*	NA	NA							
18/10/04	PM	6	P13	*Lerista muelleri*	-	-							
19/10/04	AM	1	P8	*Ctenotus grandis*	7	R							
19/10/04	AM	1	P22	*Ctenotus grandis*	8		104	240		Y			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
19/10/04	PM	1	P4	*Delma orea*	-								
19/10/04	PM	1	P1	*Lerista bipes*	-								
19/10/04	AM	1	P23	*Menetia greyii*	-		24	65		N			
19/10/04	AM	2	P10	*Ctenotus grandis*	-		82	199	14	Y			
19/10/04	AM	2	P21	*Ctenotus grandis*	80		113	330	42	N			
19/10/04	PM	2	P3	*Ctenotus grandis*	9		112	305		N			
19/10/04	AM	2	E6	*Ctenotus saxatilis*	8		89	248	19	Y			
19/10/04	AM	2	E23	*Ctenotus saxatilis*	9		90	254	21	N			
19/10/04	AM	2	P6	*Lerista bipes*									
19/10/04	AM	2	P6	*Lerista bipes*	tc		52	92		N			
19/10/04	AM	2	P6	*Lerista bipes*	tc		53	77		Y			
19/10/04	AM	2	P6	*Lerista bipes*	tc		55	92		Y			
19/10/04	AM	2	P23	*Lerista bipes*									
19/10/04	AM	2	P23	*Lerista bipes*	tc		51	68		Y			
19/10/04	AM	2	P22	*Lerista bipes*	tc		54	60		Y			
19/10/04	AM	2	P22	*Lerista bipes*	tc		54	82		N			
19/10/04	PM	2	P25	*Lerista muelleri*	tc		34	75		Y			
19/10/04	AM	2	P6	*Menetia greyii*	NA	NA	23	62		N			
19/10/04	AM	2	P9	*Notoscincus ornatus*	-		32	39		Y			
19/10/04	AM	2	P24	*Notoscincus ornatus*	-		32	60		Y			
19/10/04	PM	2	P13	*Notoscincus ornatus*	-		33	90		N			
19/10/04	AM	3	P13	*Ctenotus grandis*	10	Y - 04	115	265		N			
19/10/04	AM	3	P16	*Ctenotus grandis*	16		78	225		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
19/10/04	AM	3	E21	*Ctenotus grandis*	17		120	280		N			
19/10/04	AM	3	P1	*Lerista bipes*	tc		54	95		N			
19/10/04	AM	3	P8	*Lerista bipes*	tc		56	65		D			
19/10/04	AM	3	P7	*Lerista bipes*	tc		43	73		N			
19/10/04	AM	3	P7	*Lerista bipes*	tc		57	90		Y			
19/10/04	AM	3	P7	*Lerista bipes*	tc		52	98		N			
19/10/04	AM	3	P7	*Lerista bipes*	tc		52	80		Y			
19/10/04	AM	3	P7	*Lerista bipes*	tc		54	72		D			
19/10/04	AM	3	P6	*Lerista bipes*	-								
19/10/04	AM	3	P14	*Lerista bipes*	tc		52	95		N			
19/10/04	AM	3	P15	*Lerista bipes*	tc		52	92		N			
19/10/04	AM	3	P23	*Lerista bipes*	tc		52	95		N			
19/10/04	AM	3	P23	*Lerista bipes*	tc		52	90		N			
19/10/04	AM	3	P23	*Lerista bipes*	tc		56	90		Y			
19/10/04	AM	3	P4	*Lerista muelleri*	tc		33	40		D			
19/10/04	AM	3	P7	*Lerista muelleri*	-								
19/10/04	AM	3	P7	*Menetia sp.*	tc		26	60		N			
19/10/04	AM	3	P17	*Notoscincus ornatus*	6		32	41		D			
19/10/04	PM	4	P1	*Ctenotus grandis*	-								
19/10/04	AM	4	P1	*Lerista bipes*	tc		52	65		D			
19/10/04	AM	4	P9	*Lerista bipes*	tc		53	96		N			
19/10/04	AM	4	P8	*Lerista bipes*	tc		52	87		Y			
19/10/04	AM	4	P6	*Lerista bipes*	tc		53	90		N			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
19/10/04	AM	4	P11	*Lerista bipes*	tc		32	60		N			
19/10/04	AM	4	P11	*Lerista bipes*	tc	Y - 03	52	90		N			
19/10/04	AM	4	P17	*Lerista bipes*	tc		54	80		D			
19/10/04	AM	4	P12	*Lerista bipes*	tc								
19/10/04	AM	4	P16	*Lerista bipes*	tc								
19/10/04	AM	4	P21	*Lerista bipes*	tc		52	80		Y			
19/10/04	AM	4	P21	*Lerista bipes*	tc		58	90		Y			
19/10/04	AM	4	P21	*Lerista bipes*	tc		56	99		Y			
19/10/04	AM	4	P21	*Lerista bipes*	tc		55	90		Y			
19/10/04	AM	4	P22	*Lerista bipes*	tc		48	92		N			
19/10/04	AM	4	P22	*Lerista bipes*	tc		38	60		N			
19/10/04	AM	4	P24	*Lerista bipes*	tc		57	95		N			
19/10/04	AM	4	P25	*Lerista bipes*	tc		55	90		N			
19/10/04	PM	4	P6	*Lerista bipes*	tc		56	72		D			
19/10/04	PM	4	P7	*Lerista bipes*	tc		56	105		N			
19/10/04	PM	4	P8	*Lerista bipes*	tc		58	82		Y			
19/10/04	AM	4	P25	*Lerista muelleri*	tc		33	75		N			
19/10/04	PM	4	P4	*Lerista muelleri*	-								
19/10/04	PM	4	P20	*Lerista muelleri*	-								
19/10/04	AM	4	P7	*Morethia ruficauda*	-								
19/10/04	AM	5	E16	*Ctenotus grandis*	1	R - 03	115	330		N			
19/10/04	AM	5	P25	*Ctenotus saxatilis*	2 & 3		102	240		Y			
19/10/04	AM	5	P1	*Glaphyromorphus isolepis*	1		46	90		D			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
19/10/04	AM	5	P7	*Lerista bipes*	tc		56	90		Y			
19/10/04	AM	5	P11	*Lerista bipes*	tc		35	50		D			
19/10/04	AM	5	P11	*Lerista bipes*	tc		57	90		N			
19/10/04	AM	5	P11	*Lerista bipes*	tc		55	104		N			
19/10/04	AM	5	P11	*Lerista bipes*	tc		38	55		Y			
19/10/04	AM	5	P12	*Lerista bipes*	tc		55	100		N			
19/10/04	AM	5	P13	*Lerista bipes*	tc	R - 04	50	75		N			
19/10/04	AM	5	P15	*Lerista bipes*	tc	R - 03	54	70		D			
19/10/04	AM	5	P16	*Lerista bipes*	tc		53	95		N			
19/10/04	AM	5	P17	*Lerista bipes*	tc		33	58		N			
19/10/04	AM	5	P19	*Lerista bipes*	tc		55	95		N			
19/10/04	AM	5	P19	*Lerista bipes*	tc		39	75		N			
19/10/04	AM	5	P20	*Lerista bipes*	tc		52	93		N			
19/10/04	AM	5	P23	*Lerista bipes*	tc		32	57		N			
19/10/04	AM	5	P21	*Lerista bipes*	tc		50	92		N			
19/10/04	PM	5	P6	*Lerista bipes*	tc		52	80		Y			
19/10/04	PM	5	P6	*Lerista bipes*	tc		54	96		N			
19/10/04	PM	5	P4	*Lerista bipes*	tc		52	80		Y			
19/10/04	PM	5	P4	*Lerista bipes*	tc		56	101		N			
19/10/04	PM	5	P4	*Lerista bipes*	tc		51	70		Y			
19/10/04	PM	5	P4	*Lerista bipes*	tc		55	100		N			
19/10/04	PM	5	P15	*Lerista bipes*	tc		54	60		D			
19/10/04	PM	5	P3	*Lerista muelleri*	-								

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
19/10/04	PM	5	P4	*Lerista muelleri*	-								
19/10/04	PM	5	P4	*Menetia sp.*	-								
19/10/04	PM	5	P4	*Notoscincus ornatus*	1		32	90		N			
19/10/04	AM	6	P13	*Ctenotus saxatilis*	3		53	152		N			
19/10/04	AM	6	P10	*Heteronotia binoei*	NA	NA	35	84		N			
19/10/04	AM	6	P20	*Heteronotia binoei*	NA	NA	38	99		N			
19/10/04	PM	6	P18	*Menetia sp.*	10		35	60		N			
19/10/04	PM	6	P11	*Proablepharus reginae*	10		30	55		D			
20/10/04	AM	1	E18	*Ctenotus grandis*	9		106	269	35	N			
20/10/04	AM	1	P21	*Ctenotus pantherinus*	6		87	231	19	N			
20/10/04	AM	1	P4	*Ctenotus saxatilis*									
20/10/04	AM	1	E15	*Ctenotus saxatilis*	6		95	239	21.5	N			
20/10/04	PM	1	P17	*Heteronotia binoei*	-								
20/10/04	AM	1	P1	*Lerista bipes*	tc	R	50	54		Y			
20/10/04	AM	1	P1	*Lerista bipes*	tc		52	81		N			
20/10/04	AM	1	P2	*Lerista bipes*	tc		54	82		N			
20/10/04	AM	1	P6	*Menetia greyii*									
20/10/04	AM	2	E22	*Ctenotus grandis*	-								
20/10/04	AM	2	E4	*Ctenotus grandis*	12		110	250		Y			
20/10/04	AM	2	P15	*Ctenotus pantherinus*	6		90	235		N			
20/10/04	AM	2	P5	*Ctenotus pantherinus*	-		93	248		N			
20/10/04	AM	2	E3	*Ctenotus saxatilis*	7		95	240		Y			
20/10/04	AM	2	E5	*Ctenotus saxatilis*	90		95	245		Y			

Date	Time	Grid	Trap	Species	Number	Rec	SVL	Total	Weight	Regrown tail	Sex	Cryo Number	Museum number
20/10/04	AM	2	P17	*Lerista bipes*	tc		58	87		Y			
20/10/04	AM	2	P17	*Lerista bipes*	tc		45	63		N			
20/10/04	AM	2	P17	*Lerista bipes*	tc		55	97		N			
20/10/04	AM	2	P7	*Lerista bipes*	tc		52	92		N			
20/10/04	AM	2	P21	*Lerista muelleri*	-		37	88		N			
20/10/04	AM	2	P7	*Lerista muelleri*	tc		35	75		N			
20/10/04	AM	2	P21	*Proablepharus reginae*	-		27	41		D			
20/10/04	AM	2	P17	*Proablepharus reginae*	-								
20/10/04	AM	2	P2	*Varanus acanthurus*	-		140	360		N			
20/10/04	AM	2	P2	*Varanus acanthurus*	-		130	355		N			
20/10/04	AM	6	P18	*Ctenophorus caudicinctus*	6		53	141		N			
20/10/04	AM	6	P22	*Ctenotus pantherinus*	1		80	176		N			
21/10/04	PM	1	P6	*Ctenotus grandis*	9		115	288		N			
21/10/04	PM	1	P4	*Cyclodomorphus melanops*	-								
21/10/04	PM	1	P11	*Lerista muelleri*	tc		32	68		N			
21/10/04	PM	1	P23	*Lerista muelleri*	-								
21/10/04	PM	1	P11	*Notoscincus ornatus*	1		32	94		N			
21/10/04	AM	2	E2	*Ctenotus saxatilis*	10		89	248		N			
21/10/04	AM	2	P16	*Lerista muelleri*	tc		32	78		N			
21/10/04	AM	2	P22	*Menetia sp.*	-		24	55		N			

Attachment 5 - Details of Mammal Captures on the Six Grids in the Proposed Development Area, November-December 2003 and October 2004

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
01/12/03	AM	1	C17	*Bettongia lesueur*	630	982009101139931	AS1417	R						
01/12/03	AM	1	C16	*Isoodon auratus barrowensis*	210	240213		C	60.3				F	Virginal
01/12/03	AM	1	E17	*Isoodon auratus barrowensis*	230	258738		C						
01/12/03	AM	1	E09	*Isoodon auratus barrowensis*	220	982009100613438		R						
01/12/03	AM	1	C04	*Isoodon auratus barrowensis*	250	982009100621275		R						
01/12/03	AM	1	C24	*Isoodon auratus barrowensis*	220	982009100664874		R						
01/12/03	AM	1	C13	*Isoodon auratus barrowensis*	300	982009100671145		R						
01/12/03	AM	1	C02	*Isoodon auratus barrowensis*	225	982009100681581		R						regressed
01/12/03	AM	1	C21	*Isoodon auratus barrowensis*	260	982009100690840		R						
01/12/03	AM	1	E14	*Isoodon auratus barrowensis*	290	982009100713545		R						with young
01/12/03	AM	1	E15	*Isoodon auratus barrowensis*	220	982009101221296			61.5	15.2	20.8		M	
01/12/03	AM	1	C14	*Isoodon auratus barrowensis*	270	982009101238585		R						young still present
01/12/03	AM	1	C05	*Isoodon auratus barrowensis*	220	982009101241806		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
01/12/03	AM	1	C22	*Isoodon auratus barrowensis*	300	982009101242881		N						
01/12/03	AM	1	E10	*Isoodon auratus barrowensis*	240	982009101244635		R						
01/12/03	AM	1	E22	*Isoodon auratus barrowensis*	285	982009101261108			65.1				F	Regressed
01/12/03	AM	1	C18	*Isoodon auratus barrowensis*	220	982009101359509			62.7				F	1x20mm
01/12/03	AM	1	E03	*Isoodon auratus barrowensis*		982009101453040		R						with young
01/12/03	AM	1	C15	*Lagorchestes conspicillatus*		No PIT			94.2				F	1x150mm
01/12/03	AM	1	C20	*Trichosurus vulpecula*	1075	982009101216118	AS1311		76.8				F	216118
01/12/03	AM	2	C25	*Isoodon auratus barrowensis*	250	982009100618982		R						
01/12/03	AM	2	E15	*Isoodon auratus barrowensis*	255	982009100660088		R						
01/12/03	AM	2	E12	*Isoodon auratus barrowensis*	225	982009100677956		R						
01/12/03	AM	2	C17	*Isoodon auratus barrowensis*	315	982009100683037		R						
01/12/03	AM	2	E21	*Isoodon auratus barrowensis*	170	982009100702357		R						
01/12/03	AM	2	E3	*Isoodon auratus barrowensis*		982009100708906		R						
01/12/03	AM	2	C23	*Isoodon auratus barrowensis*	250	982009101224743		R						
01/12/03	AM	2	E16	*Isoodon auratus barrowensis*	270	982009101351583		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
01/12/03	AM	2	E2	*Isoodon auratus barrowensis*	245	982009101351996		R						
01/12/03	AM	2	C5	*Isoodon auratus barrowensis*	270	982009101445505		R						
01/12/03	AM	2	C10	*Isoodon auratus barrowensis*	250	982009101455058		R						
01/12/03	AM	2	C10	*Lagorchestes conspicillatus*	4500	982009101244427			99	20.7	24.7		M	
01/12/03	AM	2	E20	*Pseudomys nanus ferculinus*										
01/12/03	AM	2	C12	*Trichosurus vulpecula*	550	239680	AS1305	C						
01/12/03	AM	2	E22	*Trichosurus vulpecula*	525	982009101220124	AS1312		71				F	Virginal
01/12/03	AM	2	C21	*Trichosurus vulpecula*	1000	982009101446496		R						
01/12/03	AM	2	C13	*Trichosurus vulpecula*	1200	No PIT	AS1313		80.1				F	1x40mm
01/12/03	AM	2	C11	*Trichosurus vulpecula*	1300	No PIT	AS1314		85.3	25.1	28.6		M	
01/12/03	AM	6	C21	*Isoodon auratus barrowensis*	140	451740		C						
01/12/03	AM	6	C5	*Isoodon auratus barrowensis*	200	982009101236881		R						
01/12/03	AM	6	E2	*Isoodon auratus barrowensis*	180	982009101241467		R						
01/12/03	AM	6	E21	*Isoodon auratus barrowensis*	160	982009101244207		R						
01/12/03	AM	6	E4	*Isoodon auratus barrowensis*	200	982009101263830			62.3	13.7	19.8		M	
01/12/03	AM	6	C11	*Isoodon auratus barrowensis*	270	982009101357885		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
01/12/03	AM	6	E11	*Isoodon auratus barrowensis*	240	982009101447290		R						
01/12/03	AM	6	C17	*Isoodon auratus barrowensis*	200	982009101448585			65.3	15.8	21.2		M	
01/12/03	AM	6	C12	*Isoodon auratus barrowensis*	170	982009101450647		R						
01/12/03	AM	6	E7	*Isoodon auratus barrowensis*	230	982009101453358		R						
02/12/03	AM	6	C11	*Isoodon auratus barrowensis*	235	982009101447290		R						
02/12/03	AM	6	C5	*Isoodon auratus barrowensis*	175	982009101451260		R						
02/12/03	AM	6	E4	*Isoodon auratus barrowensis*	230	982009101453358		R						
02/12/03	AM	6	C12	*Isoodon auratus barrowensis*	260	No PIT			67.4	15.3	22.1		M	
02/12/03	AM	6	C16	*Isoodon auratus barrowensis*	210	No PIT			62.6	13.7	18.3		M	
02/12/03	AM	6	E2	*Isoodon auratus barrowensis*	260	No PIT			65.7	15.6	21.3		M	
02/12/03	AM	6	C21	*Trichosurus vulpecula*	1150	No PIT			76.1	24.4	29.4		M	
02/12/03	AM	6	C6	*Trichosurus vulpecula*	900	No PIT			69.9	15.2	15.8		M	
26/11/03	AM	4	C07	*Bettongia lesueur*	850	982009101221058			71.9			82	F	reg
26/11/03	AM	4	C22	*Bettongia lesueur*	770	982009101245090			65.6	18.1	21.7	85	M	
26/11/03	AM	4	C01	*Isoodon auratus barrowensis*	270	982009101217247			62.75			40.28	F	2x15mm
26/11/03	AM	4	C21	*Isoodon auratus barrowensis*	300	982009101223852			65.93			43.45	F	1x35mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
26/11/03	AM	4	C06	*Isoodon auratus barrowensis*	290	982009101242467			63.81			42.68	F	regressed
26/11/03	AM	4	E07	*Isoodon auratus barrowensis*	230	982009101245369			61.44	12.44	19.73	40.78	M	
26/11/03	AM	4	E16	*Isoodon auratus barrowensis*	300	982009101259441			64.57			41.99	F	1x64.2mm F
26/11/03	AM	4	E15	*Isoodon auratus barrowensis*	280	982009101261450			67.26			42.75	F	1xlac
26/11/03	AM	4	C06	*Isoodon auratus barrowensis*	330	982009101262267			66.71	13.56	21.18	43.18	M	
26/11/03	AM	4	E06	*Isoodon auratus barrowensis*	290	982009101264699			62.5			39.7	F	2x35mm
26/11/03	AM	4	E20	*Isoodon auratus barrowensis*	270	982009101356742			67.22			37.85	F	1x40mm
26/11/03	AM	4	C05	*Isoodon auratus barrowensis*	210	982009101360729			59.5			35.7	F	v
26/11/03	AM	4	E01	*Isoodon auratus barrowensis*	240	982009101446012			62.41	17.89	19.64	41.02	M	
26/11/03	AM	4	E24	*Isoodon auratus barrowensis*	210	982009101451826			39.09			41.67	F	virginal
26/11/03	AM	4	C02	*Trichosurus vulpecula*	1100	982009101222180			75.62			50.15	F	reg
26/11/03	AM	4	C19	*Trichosurus vulpecula*	1350	982009101239433			82.83	26.01	31.16	46.85	M	
26/11/03	AM	4	C11	*Trichosurus vulpecula*	1250	982009101357271			78.2	24.7	33.6	49	M	
26/11/03	AM	4	E21	*Zyzomys argurus*	52		1		37.2		13.5	21	M	
26/11/03	AM	5	E11	*Isoodon auratus barrowensis*	295	982009101222158			66.95			41.88	F	Yng 2x20mm
26/11/03	AM	5	E04	*Isoodon auratus barrowensis*	300	982009101241642			66.63			42.75	F	10mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
26/11/03	AM	5	S01	*Isoodon auratus barrowensis*	300	982009101246696			74.52	13.64	20.37	43.1	M	
26/11/03	AM	5	C25	*Isoodon auratus barrowensis*	260	982009101261583			64.44			42.18	F	Yng x2 20x20mm
26/11/03	AM	5	C15	*Isoodon auratus barrowensis*	200	982009101264875			61.26	14.08	19.35	41	M	
26/11/03	AM	5	E10	*Isoodon auratus barrowensis*	250	982009101267637			63.55	13.43	20.72	41.74	M	
26/11/03	AM	5	E03	*Isoodon auratus barrowensis*	200	982009101352703			65.27			37.34	FV	
26/11/03	AM	5	E05	*Isoodon auratus barrowensis*	270	982009101354739			68.98			39.76	F	Young 30mm
26/11/03	AM	5	C11	*Isoodon auratus barrowensis*	270	982009101355888			66.25			39.63	F	Yng 50mm M
26/11/03	AM	5	E25	*Isoodon auratus barrowensis*	310	982009101454810			70.48	12.2	18.85	46.44	M	
26/11/03	AM	5	C22	*Isoodon auratus barrowensis*		No PIT								
26/11/03	AM	5	P20	*Planigale* sp.	11		1		21.20			9.50	F	lactating
26/11/03	AM	5	C21	*Trichosurus vulpecula*	850	982009101220200			76.01			48.05	F	lactating
26/11/03	AM	5	C21	*Trichosurus vulpecula*	950	982009101244679			74.10			44.83	F	
26/11/03	AM	5	C16	*Trichosurus vulpecula*	340	982009101245301			66.72			42.57	M	
26/11/03	AM	5	C21	*Trichosurus vulpecula*	410	982009101262197			66.70	12.91		42.24	M	
26/11/03	AM	5	C19	*Trichosurus vulpecula*	450	982009101449263			64.76	9.85	15.25	34.58	M	
27/11/03	AM	3	E04	*Isoodon auratus barrowensis*	290	982009101220313			70.35				F	Young 30mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
27/11/03	AM	3	C16	*Isoodon auratus barrowensis*	270	982009101222352			73.70	13.80	18.40		M	
27/11/03	AM	3	C01	*Isoodon auratus barrowensis*	210	982009101243662			63.46	13.40	19.50		M	
27/11/03	AM	3	C23	*Isoodon auratus barrowensis*	265	982009101257730			67.90				F	Young 60mm
27/11/03	AM	3	C25	*Isoodon auratus barrowensis*	200	982009101355127			64.20				FV	
27/11/03	AM	3	E21	*Isoodon auratus barrowensis*	275	982009101356856			73.20	16.60	22.80		M	
27/11/03	AM	3	C18	*Isoodon auratus barrowensis*	235	982009101452045			69.70				FV	
27/11/03	AM	3	E19	*Pseudantechinus* sp.	17		1		32.80				F	
27/11/03	AM	3	C17	*Trichosurus vulpecula*	1300	982009101453702			82.00	19.40	28.80		M	
27/11/03	AM	4	E02	*Isoodon auratus barrowensis*	280	982009101242467		R					F	
27/11/03	AM	4	E22	*Isoodon auratus barrowensis*	190	982009101261225			60.20	6.30	7.90		M	
27/11/03	AM	4	E23	*Isoodon auratus barrowensis*	300	982009101261450		R					F	
27/11/03	AM	4	E01	*Isoodon auratus barrowensis*	220	982009101262623			67.10	15.90	22.60		M	
27/11/03	AM	4	E16	*Isoodon auratus barrowensis*	275	982009101264699		R						
27/11/03	AM	4	C01	*Isoodon auratus barrowensis*	300	982009101357113			64.80				F	Young 50mm x1
27/11/03	AM	4	E25	*Isoodon auratus barrowensis*	220	982009101360729		R					FV	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
27/11/03	AM	4	E21	*Isoodon auratus barrowensis*	190	982009101451826		R						
27/11/03	AM	4	C14	*Trichosurus vulpecula*	1300	982009101239433		R					M	
27/11/03	AM	4	C16	*Trichosurus vulpecula*	950	982009101262018			73.60				F	Furred young 90mm
27/11/03	AM	4	C21	*Trichosurus vulpecula*	1400	982009101357271		R					M	
27/11/03	AM	5	E04	*Isoodon auratus barrowensis*	240	982009100609711			66.50				F	
27/11/03	AM	5	E03	*Isoodon auratus barrowensis*	230	982009101244635			65.80				F	
27/11/03	AM	5	E21	*Isoodon auratus barrowensis*	270	982009101246696		R					M	
27/11/03	AM	5	E05	*Isoodon auratus barrowensis*	235	982009101257692			63.80				F	
27/11/03	AM	5	C18	*Isoodon auratus barrowensis*	250	982009101258127			65.10				F	Yng 2x 15mm
27/11/03	AM	5	E23	*Isoodon auratus barrowensis*	250	982009101261583		R					F	
27/11/03	AM	5	C15	*Isoodon auratus barrowensis*	170	982009101264875		R					M	
27/11/03	AM	5	E17	*Isoodon auratus barrowensis*	210	982009101264928			61.50				FV	
27/11/03	AM	5	E16	*Isoodon auratus barrowensis*	260	982009101355888		R					F	
27/11/03	AM	5	C24	*Lagorchestes conspicillatus*	4000	982009101224936			96.00				F	Yng 70mmx10mm
27/11/03	AM	5	C12	*Trichosurus vulpecula*	1000	982009101244679		R					F	
27/11/03	AM	5	C20	*Trichosurus vulpecula*	1150	982009101265419			79.60	21.60	29.30		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
27/11/03	AM	5	C23	*Trichosurus vulpecula*	1050	No PIT			75.10				F	
28/11/03	AM	1	C02	*Isoodon auratus barrowensis*	240	982009100613438			63.70	15.20	22.90		M	
28/11/03	AM	1	C05	*Isoodon auratus barrowensis*	260	982009100621275			68.20	15.00	22.20		M	
28/11/03	AM	1	C20	*Isoodon auratus barrowensis*	240	982009100664874			66.00				F	
28/11/03	AM	1	E20	*Isoodon auratus barrowensis*	240	982009100671145			65.80				F	Yng 65mm x 1
28/11/03	AM	1	C04	*Isoodon auratus barrowensis*	240	982009100681581			66.90				F	
28/11/03	AM	1	E21	*Isoodon auratus barrowensis*	255	982009100690840			66.30	14.90	18.00		M	
28/11/03	AM	1	E22	*Isoodon auratus barrowensis*	280	982009100713545			68.10				F	Yng 65mmx1 female
28/11/03	AM	2	C21	*Bettongia lesueur*	800	982009100985920	AS1973	C	75.40	16.20	19.90	83.9	M	
28/11/03	AM	2	C14	*Isoodon auratus barrowensis*	240	982009100613872			68.60				F	
28/11/03	AM	2	E17	*Isoodon auratus barrowensis*	265	982009100618982			65.50	16.50	22.10		M	
28/11/03	AM	2	C22	*Isoodon auratus barrowensis*	250	982009100660088			65.10				F	
28/11/03	AM	2	C09	*Isoodon auratus barrowensis*	230	982009100677956			67.60	14.10	21.30		M	
28/11/03	AM	2	C10	*Isoodon auratus barrowensis*	300	982009100683037			66.60				F	Young 60mm
28/11/03	AM	2	E03	*Isoodon auratus barrowensis*	250	982009100689973			65.10				F	Young 2x15mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
28/11/03	AM	2	C23	*Isoodon auratus barrowensis*	235	982009100693687			63.20				F	
28/11/03	AM	2	E11	*Isoodon auratus barrowensis*	210	982009100702357			60.90				FV	
28/11/03	AM	2	C04	*Isoodon auratus barrowensis*	280	982009100708906			65.60				F	Young 60mm
28/11/03	AM	2	E21	*Isoodon auratus barrowensis*	330	982009100819380			70.50	16.40	23.40		M	
28/11/03	AM	2	E23	*Isoodon auratus barrowensis*	240	982009101455058			63.60				F	2x 20mm
28/11/03	AM	2	C03	*Lagorchestes conspicillatus*	4500	982009101245091			96.10	19.20	24.30		M	
28/11/03	AM	2	C25	*Trichosurus vulpecula*	1450	982009101265683			79.90	26.30	29.70		M	
28/11/03	AM	2	C12	*Trichosurus vulpecula*	1050	982009101446496			78.50				F	90mm
28/11/03	AM	3	C07	*Isoodon auratus barrowensis*	320	982009100699086			70.40	15.50	23.30		M	
28/11/03	AM	3	E11	*Isoodon auratus barrowensis*	295	982009100701643			65.70				F	2 x15mm
28/11/03	AM	3	C13	*Isoodon auratus barrowensis*	180	982009100817306			64.8	11.7	16.2		M	
28/11/03	AM	3	E08	*Isoodon auratus barrowensis*	290	982009101220313		R					F	present
28/11/03	AM	3	E20	*Isoodon auratus barrowensis*	210	982009101243662		R					M	
28/11/03	AM	3	E07	*Isoodon auratus barrowensis*	180	982009101355127		R						
28/11/03	AM	3	C12	*Isoodon auratus barrowensis*	275	982009101356856		R					M	
28/11/03	AM	3	C16	*Trichosurus vulpecula*	1300	982009100692633			78.70	23.20			M	1x15mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
28/11/03	AM	3	C06	*Trichosurus vulpecula*	1250	982009100813198			85.10				M	
28/11/03	AM	3	C20	*Trichosurus vulpecula*	1300	982009101453702		R					M	1x15mm
28/11/03	AM	4	C11	*Bettongia lesueur*		982009101221058		R					F	
28/11/03	AM	4	C21	*Isoodon auratus barrowensis*	250	982009101217247		R					F	
28/11/03	AM	4	E05	*Isoodon auratus barrowensis*	190	982009101245369		R					M	
28/11/03	AM	4	C25	*Isoodon auratus barrowensis*	280	982009101259441		R					F	
28/11/03	AM	4	E03	*Isoodon auratus barrowensis*	330	982009101262267		R					M	
28/11/03	AM	4	E21	*Isoodon auratus barrowensis*	280	982009101264699		R					F	
28/11/03	AM	4	C16	*Isoodon auratus barrowensis*	290	982009101357113		R					F	
28/11/03	AM	4	C23	*Isoodon auratus barrowensis*	200	982009101360729		R					F	
28/11/03	AM	4	C06	*Isoodon auratus barrowensis*	180	982009101361694			61.40				FV	
28/11/03	AM	4	C03	*Isoodon auratus barrowensis*	220	982009101446012		R					M	
28/11/03	AM	4	P05	*Planigale sp.*	5.8		4		21.7			13.9	F	
28/11/03	AM	4	C12	*Trichosurus vulpecula*	1300	982009101239433		R					M	
28/11/03	AM	4	C01	*Trichosurus vulpecula*	1450	982009101357271		R					M	
28/11/03	AM	5	E10	*Isoodon auratus barrowensis*	230	982009101221505			58.40				FV	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
28/11/03	AM	5	E03	*Isoodon auratus barrowensis*	250	982009101222158		R					F	
28/11/03	AM	5	E12	*Isoodon auratus barrowensis*	240	982009101244635		R						
28/11/03	AM	5	C10	*Isoodon auratus barrowensis*	225	982009101257692		R						
28/11/03	AM	5	C01	*Isoodon auratus barrowensis*	250	982009101258127		R					F	
28/11/03	AM	5	E20	*Isoodon auratus barrowensis*	190	982009101264875		R					M	
28/11/03	AM	5	C22	*Isoodon auratus barrowensis*	190	982009101264928		R						
28/11/03	AM	5	C15	*Isoodon auratus barrowensis*	230	982009101267637		R					M	
28/11/03	AM	5	C02	*Isoodon auratus barrowensis*		982009101355888		R						
28/11/03	AM	5	E13	*Isoodon auratus barrowensis*	315	982009101454810		R					M	
28/11/03	AM	5	C25	*Pseudomys nanus ferculinus*	55								M	
28/11/03	AM	5	C16	*Trichosurus vulpecula*	900	982009101244679		R					F	
28/11/03	AM	5	E11	*Trichosurus vulpecula*	320	982009101245301		R					M	
28/11/03	AM	5	C18	*Trichosurus vulpecula*	1150	982009101265419		R					M	
29/11/03	AM	1	C21	*Bettongia lesueur*	650	982009101139931	AS1417		72.30					
29/11/03	AM	1	E11	*Isoodon auratus barrowensis*	250	982009100621275		R						
29/11/03	AM	1	E19	*Isoodon auratus barrowensis*	240	982009100664874		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
29/11/03	AM	1	C17	*Isoodon auratus barrowensis*	245	982009100681581		R						
29/11/03	AM	1	E22	*Isoodon auratus barrowensis*	260	982009100690840		R						
29/11/03	AM	1	E18	*Isoodon auratus barrowensis*	300	982009100713545		R						
29/11/03	AM	1	E21	*Isoodon auratus barrowensis*	230	982009101241806			64.9				F	regressed
29/11/03	AM	1	E23	*Isoodon auratus barrowensis*	260	982009101258734			65.6	12.5	22.8		M	
29/11/03	AM	1	E16	*Isoodon auratus barrowensis*	305	982009101266038			70				F	1x60mm young
29/11/03	AM	1	C25	*Isoodon auratus barrowensis*	320	982009101267297			71.9	15.3	21			
29/11/03	AM	2	C06	*Bettongia lesueur*	700	982009101168071	AS1416		66.3	16.9	18.3		M	
29/11/03	AM	2	E10	*Isoodon auratus barrowensis*	210	982009100613872		R						
29/11/03	AM	2	C23	*Isoodon auratus barrowensis*	270	982009100618982		R						
29/11/03	AM	2	C21	*Isoodon auratus barrowensis*	250	982009100660088		R						
29/11/03	AM	2	E21	*Isoodon auratus barrowensis*	220	982009100677956		R						
29/11/03	AM	2	E16	*Isoodon auratus barrowensis*	260	982009100689973		R						
29/11/03	AM	2	E09	*Isoodon auratus barrowensis*	340	982009100819380		R						
29/11/03	AM	2	C10	*Isoodon auratus barrowensis*	260	982009101258412			65.1				F	1x50mm young

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
29/11/03	AM	2	C05	*Isoodon auratus barrowensis*	240	982009101351996			64.8	15.1	21.7		M	
29/11/03	AM	2	E04	*Isoodon auratus barrowensis*	280	982009101445505			66.4				F	1X lactating
29/11/03	AM	2	E14	*Isoodon auratus barrowensis*	110	982009101447147			53				F	virginal
29/11/03	AM	2	E20	*Isoodon auratus barrowensis*	260	982009101455058		R						
29/11/03	AM	2	C12	*Lagorchestes conspicillatus*	4500	982009101225961			103.6				F	1X100mm young
29/11/03	AM	2	C03	*Lagorchestes conspicillatus*	5500	982009101452816								
29/11/03	AM	2	P16	*Planigale* sp.	9		1						M	
29/11/03	AM	2	C21	*Trichosurus vulpecula*	500	982009101239680	AS1305	R	62.7				F	Virginal
29/11/03	AM	2	C08	*Trichosurus vulpecula*	1200	982009101260761	AS1306		80.5	22.7	31		M	
29/11/03	AM	2	C19	*Trichosurus vulpecula*	1000	982009101446496		R						
29/11/03	AM	3	C09	*Bettongia lesueur*	750	982009101353434	AS1440		69.3				F	regressed
29/11/03	AM	3	C02	*Isoodon auratus barrowensis*	295	982009100699086		R					M	
29/11/03	AM	3	E09	*Isoodon auratus barrowensis*	280	982009101219142			66				F	regressed
29/11/03	AM	3	C02	*Isoodon auratus barrowensis*	275	982009101220313		R					F	
29/11/03	AM	3	C06	*Isoodon auratus barrowensis*	280	982009101222352		R						
29/11/03	AM	3	C18	*Isoodon auratus barrowensis*	255	982009101241645			64.7				F	regressed

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
29/11/03	AM	3	C08	*Isoodon auratus barrowensis*	230	982009101243662		R						
29/11/03	AM	3	E25	*Isoodon auratus barrowensis*	320	982009101261312			64.2				F	1x10mm
29/11/03	AM	3	C03	*Isoodon auratus barrowensis*	170	982009101355127		R						
29/11/03	AM	3	E07	*Isoodon auratus barrowensis*	255	982009101357653			63.4				F	2x15mm
29/11/03	AM	3	C13	*Lagorchestes conspicillatus*		982009101449376			99.5				F	1x110mm
29/11/03	AM	3	C16	*Trichosurus vulpecula*	1250	982009100692633		R						
29/11/03	AM	3	C20	*Trichosurus vulpecula*	1000	982009101361303	AS1307		78	22.8	26.1		M	
29/11/03	AM	4	C01	*Isoodon auratus barrowensis*	280	982009101221870			70				M	
29/11/03	AM	4	C06	*Isoodon auratus barrowensis*	270	982009101222068			67.6				F	1x10mm
29/11/03	AM	4	C16	*Isoodon auratus barrowensis*	310	982009101223852		R						
29/11/03	AM	4	C11	*Isoodon auratus barrowensis*	320	982009101242881			68.2				F	
29/11/03	AM	4	E04	*Isoodon auratus barrowensis*	225	982009101245369		R						
29/11/03	AM	4	E23	*Isoodon auratus barrowensis*	290	982009101259441		R						
29/11/03	AM	4	E12	*Isoodon auratus barrowensis*	300	982009101261450		R						
29/11/03	AM	4	C08	*Isoodon auratus barrowensis*	270	982009101263196			66.8				F	1x60mm

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
29/11/03	AM	4	C21	*Isoodon auratus barrowensis*	285	982009101357113		R						
29/11/03	AM	4	E20	*Isoodon auratus barrowensis*	200	982009101360729		R						
29/11/03	AM	4	C09	*Trichosurus vulpecula*	1450	982009101239443		C						
29/11/03	AM	4	C23	*Trichosurus vulpecula*	1050	982009101222180		R						
29/11/03	AM	4	C17	*Trichosurus vulpecula*	1000	982009101262018		R						
29/11/03	AM	5	C04	*Isoodon auratus barrowensis*	300	982009101241642		R						
29/11/03	AM	5	C01	*Isoodon auratus barrowensis*	285	982009101246696		R						
29/11/03	AM	5	E05	*Isoodon auratus barrowensis*	230	982009101257692		R						
29/11/03	AM	5	E02	*Isoodon auratus barrowensis*	250	982009101258127		R						
29/11/03	AM	5	C10	*Isoodon auratus barrowensis*	260	982009101261087			70.6				F	2x25mm
29/11/03	AM	5	E03	*Isoodon auratus barrowensis*	240	982009101266837			66				F	1x70mm
29/11/03	AM	5	E09	*Isoodon auratus barrowensis*	225	982009101267637		R						
29/11/03	AM	5	C14	*Isoodon auratus barrowensis*	250	982009101354739		R						
29/11/03	AM	5	E10	*Isoodon auratus barrowensis*	250	982009101355080			64.6				F	
29/11/03	AM	5	E18	*Isoodon auratus barrowensis*	325	982009101454810		R	69.9					

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
29/11/03	AM	5	C15	*Isoodon auratus barrowensis*	310	No PIT			69				F	
29/11/03	AM	5	C08	*Lagorchestes conspicillatus*		982009101224936		R						
29/11/03	AM	5	C03	*Trichosurus vulpecula*	950	982009101244679		R						
29/11/03	AM	5	C12	*Trichosurus vulpecula*	320	982009101245301		R						
29/11/03	AM	5	C20	*Trichosurus vulpecula*	1100	982009101265419		R						
29/11/03	AM	6	C02	*Isoodon auratus barrowensis*	200	982009101236881			66.1	16.3	21.7		M	
29/11/03	AM	6	E23	*Isoodon auratus barrowensis*	210	982009101237480			65.1	15.6	22.3		M	
29/11/03	AM	6	E06	*Isoodon auratus barrowensis*	180	982009101244207			61				F	2x10mm
29/11/03	AM	6	E24	*Isoodon auratus barrowensis*	280	982009101261234			63.5				F	1x70mm
29/11/03	AM	6	C12	*Isoodon auratus barrowensis*	260	982009101357885			66.6	18.3	22.7		M	
29/11/03	AM	6	C11	*Isoodon auratus barrowensis*	250	982009101447290			64.3	13.9	19.9		M	
29/11/03	AM	6	E02	*Isoodon auratus barrowensis*	180	982009101450647			62.2				F	1x20mm
29/11/03	AM	6	E07	*Isoodon auratus barrowensis*	160	982009101450647		R	62.5				FV	
29/11/03	AM	6	E05	*Isoodon auratus barrowensis*	240	982009101453358			69.9	16.1	20.9		M	
29/11/03	AM	6	P24	*Pseudantechinus roryi*	26		10		33.5				F	6x
30/11/03	AM	1	C19	*Bettongia lesueur*		982009101139931	AS1417	R						
30/11/03	AM	1	C20	*Bettongia lesueur*	850	982009100985920	AS1973	N					M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
30/11/03	AM	1	E19	*Isoodon auratus barrowensis*	240	982009100613438		R						
30/11/03	AM	1	C21	*Isoodon auratus barrowensis*	230	982009100664874		R						
30/11/03	AM	1	E24	*Isoodon auratus barrowensis*	305	982009100713545		R						
30/11/03	AM	1	C17	*Isoodon auratus barrowensis*	220	982009101218191			60.8				F	1x10mm
30/11/03	AM	1	C24	*Isoodon auratus barrowensis*	260	982009101237149			68.6				F	1x20mm
30/11/03	AM	1	C02	*Isoodon auratus barrowensis*	250	982009101238585			60				F	1x60mm
30/11/03	AM	1	C15	*Isoodon auratus barrowensis*	340	982009101243648			66.8				F	1x70mm
30/11/03	AM	1	E20	*Isoodon auratus barrowensis*	245	982009101244635		N						
30/11/03	AM	1	E11	*Isoodon auratus barrowensis*	270	982009101258412		N						
30/11/03	AM	1	E17	*Isoodon auratus barrowensis*	300	982009101259959			67.6				F	1x75mm
30/11/03	AM	1	E21	*Isoodon auratus barrowensis*	290	982009101266038		R					F	x1
30/11/03	AM	1	C25	*Isoodon auratus barrowensis*	325	982009101267297		R					M	
30/11/03	AM	1	E05	*Isoodon auratus barrowensis*	280	982009101357359			66.1				F	1x70mm
30/11/03	AM	1	E18	*Isoodon auratus barrowensis*	280	982009101359995			64.5				F	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
30/11/03	AM	1	E15	*Isoodon auratus barrowensis*	270	982009101453040			65.8				F	2x50mm
30/11/03	AM	1	C22	*Pseudomys nanus*	53		1		34.1				F	
30/11/03	AM	1	C05	*Trichosurus vulpecula*	1000	982009101237580	AS1309		75.4				F	
30/11/03	AM	2	E20	*Isoodon auratus barrowensis*	225	982009100613872		R						
30/11/03	AM	2	C21	*Isoodon auratus barrowensis*	255	982009100618982		R						
30/11/03	AM	2	E24	*Isoodon auratus barrowensis*	245	982009100660088		R						
30/11/03	AM	2	C18	*Isoodon auratus barrowensis*	225	982009100677956		R						
30/11/03	AM	2	E12	*Isoodon auratus barrowensis*	265	982009100689973		R						
30/11/03	AM	2	E21	*Isoodon auratus barrowensis*	240	982009100693687		R						
30/11/03	AM	2	E03	*Isoodon auratus barrowensis*	180	982009100702357		R						
30/11/03	AM	2	E02	*Isoodon auratus barrowensis*	290	982009100708906		R					F	
30/11/03	AM	2	E17	*Isoodon auratus barrowensis*	315	982009100819380		R						
30/11/03	AM	2	C12	*Isoodon auratus barrowensis*	270	982009101224743			67				F	
30/11/03	AM	2	C01	*Isoodon auratus barrowensis*	210	982009101245501			61.7	14.9	21.9		M	
30/11/03	AM	2	E05	*Isoodon auratus barrowensis*	290	982009101351583			67.5	16.6	23.2		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
30/11/03	AM	2	C25	*Isoodon auratus barrowensis*	245	982009101455058		R						
30/11/03	AM	2	C06	*Lagorchestes conspicillatus*	4500	982009101355704			99.2				F	1x70mm
30/11/03	AM	2	C16	*Trichosurus vulpecula*	1150	982009101260761	AS1306	R						
30/11/03	AM	2	C11	*Trichosurus vulpecula*	1200	982009101354895	AS1310		74.1				F	
30/11/03	AM	2	C20	*Trichosurus vulpecula*	1100	982009101446496		R						
30/11/03	AM	3	C23	*Bettongia lesueur*	875	982009101237492			76.6	18.6	19.6		M	
30/11/03	AM	3	C05	*Bettongia lesueur*	950	982009101354867	AS1441		74.6				F	1x20mm
30/11/03	AM	3	C01	*Isoodon auratus barrowensis*	280	982009100699086		R						
30/11/03	AM	3	E17	*Isoodon auratus barrowensis*	280	982009101218854			65.3	14.2	22.1		M	
30/11/03	AM	3	C07	*Isoodon auratus barrowensis*	260	982009101220313		R						
30/11/03	AM	3	C06	*Isoodon auratus barrowensis*	195	982009101238985			61.3	12.4	21.1		M	
30/11/03	AM	3	E10	*Isoodon auratus barrowensis*	235	982009101243662		R					M	
30/11/03	AM	3	E20	*Isoodon auratus barrowensis*	195	982009101245099			66				F	2x20mm
30/11/03	AM	3	E21	*Isoodon auratus barrowensis*	280	982009101257730		R						
30/11/03	AM	3	C12	*Isoodon auratus barrowensis*	215	982009101352830			59.7				F	
30/11/03	AM	3	C16	*Isoodon auratus barrowensis*	260	982009101356856		R					M	
30/11/03	AM	3	C25	*Trichosurus vulpecula*	1200	982009101261220	AS1308		83.4	28.2	29.8		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
30/11/03	AM	3	C02	*Trichosurus vulpecula*	1050	982009101361303	AS1307	R						
30/11/03	AM	3	C20	*Trichosurus vulpecula*	1300	No PIT	Ear punch						M	
30/11/03	AM	3	C08	*Zyzomys argurus*	53.1				37				F	
30/11/03	AM	6	C13	*Isoodon auratus barrowensis*	160	451740		R						
30/11/03	AM	6	E07	*Isoodon auratus barrowensis*	190	982009101236881		R						
30/11/03	AM	6	E18	*Isoodon auratus barrowensis*	215	982009101241467			64.1	16.7	23.8		M	
30/11/03	AM	6	E16	*Isoodon auratus barrowensis*	180	982009101244207		R						
30/11/03	AM	6	E11	*Isoodon auratus barrowensis*	250	982009101261234		R					F	Expelled 1x70mm M
30/11/03	AM	6	E23	*Isoodon auratus barrowensis*	200	982009101352288			62.3	13.5	21.8		M	
30/11/03	AM	6	C12	*Isoodon auratus barrowensis*	240	982009101355689			67.6				F	
30/11/03	AM	6	C05	*Isoodon auratus barrowensis*	180	982009101450647		R						
30/11/03	AM	6	C07	*Isoodon auratus barrowensis*	185	982009101451260			62.9				FV	
30/11/03	AM	6	C02	*Isoodon auratus barrowensis*	225	982009101453358		R						
30/11/03	AM	6	C10	*Lagorchestes conspicillatus*		982009101259860			96.8	21.2	23.2		M	
16/10/04	AM	3	C5	*Bettongia lesueur*	820	982F0091 - 01549647			73.8		19		M	
16/10/04	AM	3	C16	*Isoodon auratus barrowensis*	220	982F0091 - 01326492			56.5		20		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
16/10/04	AM	3	E19	*Isoodon auratus barrowensis*	320	982F0091 - 01352830		R					F	PY
16/10/04	AM	3	C4	*Isoodon auratus barrowensis*	250	982F0091 - 01357653		R	64.5				F	NPY
16/10/04	AM	3	C12	*Isoodon auratus barrowensis*	440	982F0091 - 01373856			67		20		M	
16/10/04	AM	3	C15	*Isoodon auratus barrowensis*	245	982F0091 - 01452045		R	65				F	NPY
16/10/04	AM	3	E24	*Isoodon auratus barrowensis*	255	982F0091 - 01547921			63				F	NPY
16/10/04	AM	3	E5	*Isoodon auratus barrowensis*	220	982F0091 - 01658924			64				F	NPY
16/10/04	AM	3	C25	*Isoodon auratus barrowensis*	320	982F0091 - 01659656			72		24		M	
16/10/04	AM	3	E25	*Isoodon auratus barrowensis*	340	982F0091 - 01667298			65		22		M	
16/10/04	AM	3	C19	*Lagorchestes conspicillatus*	2500	982F0091 - 01547863			84		22		M	
16/10/04	AM	3	C24	*Trichosurus vulpecula*	1400	982F0091 - 01670060			77		36		M	
16/10/04	AM	4	C13	*Bettongia lesueur*	690	982F0091 - 01166621		R	64		18		M	
16/10/04	AM	4	E12	*Isoodon auratus barrowensis*	350	982F0091 - 01259441		R					F	PY
16/10/04	AM	4	E8	*Isoodon auratus barrowensis*	345	982F0091 - 01261225		R	70		23		M	
16/10/04	AM	4	E17	*Isoodon auratus barrowensis*	354	982F0091 - 01261450		R	65				F	NPY
16/10/04	AM	4	E25	*Isoodon auratus barrowensis*	365	982F0091 - 01360729		R						2+ PY dropped

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
16/10/04	AM	4	C17	*Isoodon auratus barrowensis*	425	982F0091 - 01446012		R	68		20		M	
16/10/04	AM	4	C9	*Isoodon auratus barrowensis*	305	982F0091 - 01451826		R					F	Large PY
16/10/04	AM	4	E5	*Pseudomys nanus ferculinus*	65		#16		36.1		11		M	Scrotal testes
16/10/04	AM	4	P20	*Pseudomys nanus ferculinus*	12.5		#17		29.7					Juv
16/10/04	AM	4	P23	*Pseudomys nanus ferculinus*	10		#18		24.4				M	Juv
16/10/04	AM	4	E23	*Pseudomys nanus ferculinus*	53	no data								
16/10/04	AM	4	C7	*Trichosurus vulpecula*	1150	982F0091 - 01222180		R	69.4				F	PY
16/10/04	AM	4	C22	*Trichosurus vulpecula*	1370	982F0091 - 01357271	ear tag 304	R	78		28		M	
16/10/04	AM	4	C5	*Trichosurus vulpecula*	1005	982F0091 - 01598396		R	73		21		M	
16/10/04	AM	5	E9	*Isoodon auratus barrowensis*	165		#16		59				F	NPY
16/10/04	AM	5	E22	*Isoodon auratus barrowensis*	95		#17		47		6		M	
16/10/04	AM	5	E12	*Isoodon auratus barrowensis*	280	982F0091 - 01222158		R	65				F	NPY - pouch active
16/10/04	AM	5	E6	*Isoodon auratus barrowensis*	290	982F0091 - 01243648		R	67				F	NPY
16/10/04	AM	5	E22	*Isoodon auratus barrowensis*	365	982F0091 - 01245369		R	66		23		M	
16/10/04	AM	5	E21	*Isoodon auratus barrowensis*	405	982F0091 - 01246696		R	72		22		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
16/10/04	AM	5	C8	*Isoodon auratus barrowensis*	400	982F0091 - 01264875		R	70		24		M	
16/10/04	AM	5	E24	*Isoodon auratus barrowensis*	342	982F0091 - 01381631			60		21		M	
16/10/04	AM	5	E10	*Isoodon auratus barrowensis*	198	982F0091 - 01521525			61		16		M	
16/10/04	AM	5	E11	*Isoodon auratus barrowensis*	310	982F0091 - 01657561			66		23		M	
16/10/04	AM	5	C4	*Lagorchestes conspicillatus*		982F0091 - 01483584			84				F	NPY
16/10/04	AM	5	C20	*Lagorchestes conspicillatus*	2900	982F0091 - 01524714							F	PY
16/10/04	AM	5	E3	*Pseudomys nanus ferculinus*	12.5		#16		26				F	Juv
16/10/04	AM	5	E13	*Pseudomys nanus ferculinus*	53	not marked								
16/10/04	AM	5	C22	*Trichosurus vulpecula*	1400	982F0091 - 01480090			69		27		M	
16/10/04	AM	5	C2	*Trichosurus vulpecula*		982F0091 - 01541399			82.5		26		M	
16/10/04	AM	5	C5	*Trichosurus vulpecula*	1185	982F0091 - 01546680			83		26		M	
17/10/04	AM	3	C19	*Bettongia lesueur*	665	982F0091 - 01060164	AS 1449	R	63		16		M	
17/10/04	AM	3	C15	*Bettongia lesueur*	440	982F0091 - 01166229			58		9		M	
17/10/04	AM	3	C25	*Bettongia lesueur*	790	982F0091 - 01243943		R	65		20		M	
17/10/04	AM	3	C17	*Bettongia lesueur*	761	982F0091 - 01319916			64		21		M	
17/10/04	AM	3	C4	*Isoodon auratus barrowensis*	144		#16		59		6		M	
17/10/04	AM	3	E24	*Isoodon auratus barrowensis*	160		#17		56.5		8		M	
17/10/04	AM	3	E12	*Isoodon auratus barrowensis*	170		#18		57				F	virgin pouch

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
17/10/04	AM	3	C11	*Isoodon auratus barrowensis*	415	982F0091 - 00699086		R	73		22		M	
17/10/04	AM	3	E22	*Isoodon auratus barrowensis*	270	982F0091 - 00701643		R	63				F	lactating
17/10/04	AM	3	E23	*Isoodon auratus barrowensis*	270	982F0091 - 01061756			63		21		M	
17/10/04	AM	3	C9	*Isoodon auratus barrowensis*	250	982F0091 - 01066534			60		20		M	
17/10/04	AM	3	E10	*Isoodon auratus barrowensis*	375	982F0091 - 01193845			69		24		M	
17/10/04	AM	3	E15	*Isoodon auratus barrowensis*	230	982F0091 - 01357653		R	61				F	post-lactating
17/10/04	AM	3	C8	*Isoodon auratus barrowensis*	235	982F0091 - 01452045		R	58				F	post-lactating
17/10/04	AM	3	C5	*Isoodon auratus barrowensis*	253	982F0091 - 01522376			59				F	
17/10/04	AM	3	C23	*Isoodon auratus barrowensis*	310	982F0091 - 01659656		R	65.5		21		M	
17/10/04	AM	3	E25	*Isoodon auratus barrowensis*	350	982F0091 - 01667298		R	68		21		M	
17/10/04	AM	3	E3	*Isoodon auratus barrowensis*	274	982F0091 - 01671400			57				F	Post lactating
17/10/04	AM	3	C7	*Lagorchestes conspicillatus*		not marked - escaped								
17/10/04	AM	4	E21	*Isoodon auratus barrowensis*	200		#18		63				M	
17/10/04	AM	4	E10	*Isoodon auratus barrowensis*	265	982F0091 - 01162211			64		24		M	
17/10/04	AM	4	C11	*Isoodon auratus barrowensis*	335	982F0091 - 01173374			66		21		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
17/10/04	AM	4	C5	*Isoodon auratus barrowensis*	340	982F0091 - 01259441		R	64				F	PY
17/10/04	AM	4	E14	*Isoodon auratus barrowensis*	340	982F0091 - 01261450		R	63				F	NPY - recently used
17/10/04	AM	4	C20	*Isoodon auratus barrowensis*	265	982F0091 - 01264928		R	59				F	PY
17/10/04	AM	4	E15	*Isoodon auratus barrowensis*	355	982F0091 - 01360729		R	64				F	PY
17/10/04	AM	4	E13	*Isoodon auratus barrowensis*	300	982F0091 - 01451826		R	63				F	PY
17/10/04	AM	4	E7	*Pseudomys nanus ferculinus*	40		#20		32				F	NPY - lactating
17/10/04	AM	4	C7	*Trichosurus vulpecula*	635	982F0091 - 01024279			64		15		M	
17/10/04	AM	4	C17	*Trichosurus vulpecula*	1040	982F0091 - 01180577			73				F	PY
17/10/04	AM	4	C10	*Trichosurus vulpecula*	1300	982F0091 - 01357271	ear tag 304	R	79		35		M	
17/10/04	AM	5	C13	*Bettongia lesueur*	865	982F0091 - 01358581		R	67		19		M	
17/10/04	AM	5	E22	*Isoodon auratus barrowensis*	95		#16	R	49		5.5		M	
17/10/04	AM	5	E18	*Isoodon auratus barrowensis*	170		#18		57				F	virgin pouch
17/10/04	AM	5	E12	*Isoodon auratus barrowensis*	195	982F0091 - 01018809			57		15		M	
17/10/04	AM	5	E21	*Isoodon auratus barrowensis*	210	982F0091 - 01154506			59				F	virgin pouch
17/10/04	AM	5	E16	*Isoodon auratus barrowensis*	225	982F0091 - 01175495			65		18		M	
17/10/04	AM	5	E6	*Isoodon auratus barrowensis*	275	982F0091 - 01243648		R	68				F	NPY

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
17/10/04	AM	5	C4	*Isoodon auratus barrowensis*	380	982F0091 - 01246696		R	73		24		M	
17/10/04	AM	5	E24	*Isoodon auratus barrowensis*	315	982F0091 - 01258127		R	66				F	PY
17/10/04	AM	5	C5	*Isoodon auratus barrowensis*	385	982F0091 - 01264875		R	69		22		M	
17/10/04	AM	5	E19	*Isoodon auratus barrowensis*	450	982F0091 - 01267297		R	76		23		M	
17/10/04	AM	5	E1	*Isoodon auratus barrowensis*	395	982F0091 - 01267637		R	70		18		M	
17/10/04	AM	5	E3	*Isoodon auratus barrowensis*	270	982F0091 - 01337805			62.5		37		F	recently used pouch
17/10/04	AM	5	E25	*Isoodon auratus barrowensis*	245	982F0091 - 01352703		R	63				F	NPY - lactating
17/10/04	AM	5	C25	*Isoodon auratus barrowensis*	290	982F0091 - 01354739		R	62.5				F	PY
17/10/04	AM	5	E11	*Isoodon auratus barrowensis*	220	982F0091 - 01355080		R	64				F	NPY
17/10/04	AM	5	E23	*Isoodon auratus barrowensis*	340	982F0091 - 01381631		R	65		23		M	
17/10/04	AM	5	C7	*Lagorchestes conspicillatus*	2400		#1		82				F	NPY - lactating
17/10/04	AM	5	C11	*Lagorchestes conspicillatus*	3100		#3		99				F	Small PY
17/10/04	AM	5	C12	*Lagorchestes conspicillatus*	3000		#5		97		24		M	
17/10/04	AM	5	C14	*Lagorchestes conspicillatus*	3000		#7		94					Small PY
17/10/04	AM	5	C21	*Lagorchestes conspicillatus*	2650		#9		94				F	30mm PY
17/10/04	AM	5	C22	*Lagorchestes conspicillatus*	unmarked									

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
17/10/04	AM	5	E4	*Pseudomys nanus ferculinus*	70		#17		36.2		10		M	
17/10/04	AM	5	C1	*Trichosurus vulpecula*	1320	982F0091 - 01480090		R	72		22		M	
17/10/04	AM	5	C2	*Trichosurus vulpecula*	995	982F0091 - 01541399		R	75		33		M	
17/10/04	AM	5	C15	*Trichosurus vulpecula*		not marked							F	1xhalf grown young
17/10/04	AM	6	C21	*Isoodon auratus barrowensis*	450	982F0091 - 01236881		R	62		25		M	
17/10/04	AM	6	C1	*Isoodon auratus barrowensis*	182	982F0091 - 01327188			97				F	Not lactating
17/10/04	AM	6	C16	*Isoodon auratus barrowensis*	260	982F0091 - 01451260		R	68				F	PY
17/10/04	AM	6	E25	*Isoodon auratus barrowensis*	140?	982F0091 - 01451740		R					F	
17/10/04	AM	6	C24	*Isoodon auratus barrowensis*	320	982F0091 - 01453358		R	63		21		M	Post lactating
17/10/04	AM	6	E21	*Isoodon auratus barrowensis*	296	982F0091 - 01543154			68		23		M	
17/10/04	AM	6	C2	*Lagorchestes conspicillatus*	2500		#16		79		28		M	
17/10/04	AM	6	C10	*Lagorchestes conspicillatus*	2250		#18		91		26		M	
17/10/04	AM	6	C20	*Lagorchestes conspicillatus*	2300		#20		36				F	Large PY
17/10/04	AM	6	C20	*Lagorchestes conspicillatus*	45	N/A - pouch young of #20 - dec.						F		
17/10/04	AM	6	C4	*Trichosurus vulpecula*	1025	982F0091 - 01377159			98		32		M	
18/10/04	AM	1	E3	*Isoodon auratus barrowensis*	275	982F0091 - 00664874		R	65				F	inactive pouch

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	1	E2	*Isoodon auratus barrowensis*	245	982F0091 - 00671145		R	65				F	no pouch young
18/10/04	AM	1	E19	*Isoodon auratus barrowensis*	280	982F0091 - 00681581		R	56.5				F	inactive pouch
18/10/04	AM	1	C8	*Isoodon auratus barrowensis*	380	982F0091 - 00690840		R	71		22		M	
18/10/04	AM	1	C20	*Isoodon auratus barrowensis*	330	982F0091 - 00713545		R	68				F	post lactating
18/10/04	AM	1	C3	*Isoodon auratus barrowensis*	320	982F0091 - 01164936			64.5		21		M	
18/10/04	AM	1	C5	*Isoodon auratus barrowensis*	380	982F0091 - 01221296		R	71		23		M	
18/10/04	AM	1	C13	*Isoodon auratus barrowensis*	260	982F0091 - 01243648		R	65				F	inactive pouch
18/10/04	AM	1	E6	*Isoodon auratus barrowensis*	300	982F0091 - 01244635		R	67				F	inactive pouch
18/10/04	AM	1	E7	*Isoodon auratus barrowensis*	265	982F0091 - 01338730			61		20		M	
18/10/04	AM	1	E5	*Isoodon auratus barrowensis*	310	982F0091 - 01453040		R	59				F	post lactating
18/10/04	AM	1	E8	*Isoodon auratus barrowensis*		not marked								
18/10/04	AM	1	C6	*Lagorchestes conspicillatus*	2950		#24		94		28		M	
18/10/04	AM	1	C17	*Trichosurus vulpecula*	335		#16		59				F	
18/10/04	AM	1	C16	*Trichosurus vulpecula*	1080	982F0091 - 01062845			73				F	pouch young
18/10/04	AM	1	C18	*Trichosurus vulpecula*	1090	982F0091 - 01067100			81				F	lactating
18/10/04	AM	1	C1	*Trichosurus vulpecula*	860	982F0091 - 01237580		R					F	pouch young

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	1	C9	*Trichosurus vulpecula*		not marked								
18/10/04	AM	2	C2	*Isoodon auratus barrowensis*		982F0091 - 00613872		R					F	pouch young
18/10/04	AM	2	C21	*Isoodon auratus barrowensis*	390	982F0091 - 00618982		R	73		25		M	
18/10/04	AM	2	E17	*Isoodon auratus barrowensis*	315	982F0091 - 00660088		R	66				F	post lactating
18/10/04	AM	2	C16	*Isoodon auratus barrowensis*	405	982F0091 - 00677956		R	71		22		M	
18/10/04	AM	2	C23	*Isoodon auratus barrowensis*	350	982F0091 - 00689973		R	60				F	no pouch young
18/10/04	AM	2	E16	*Isoodon auratus barrowensis*	305	982F0091 - 00693687		R	65				F	post lactating
18/10/04	AM	2	C18	*Isoodon auratus barrowensis*	395	982F0091 - 00819380		R	69		24		M	
18/10/04	AM	2	E9	*Isoodon auratus barrowensis*	285	982F0091 - 01034150			66		21		M	
18/10/04	AM	2	E25	*Isoodon auratus barrowensis*	210	982F0091 - 01169022			67		21		M	
18/10/04	AM	2	C17	*Isoodon auratus barrowensis*	480	982F0091 - 01258734		R	75		25		M	
18/10/04	AM	2	C5	*Isoodon auratus barrowensis*	470	982F0091 - 01351996		R	74		24		M	
18/10/04	AM	2	E20	*Isoodon auratus barrowensis*		982F0091 - 01445505		R						large pouch young
18/10/04	AM	2	C3	*Lagorchestes conspicillatus*	2880		#26		98		21		M	
18/10/04	AM	3	C12	*Bettongia lesueur*	900	982F0091 - 01261952		R	66				F	small pouch young

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	3	C5	*Bettongia lesueur*		not marked							F	
18/10/04	AM	3	C25	*Isoodon auratus barrowensis*	300		#32	R	68		20		M	
18/10/04	AM	3	C15	*Isoodon auratus barrowensis*	135		#64		54				F	virgin pouch
18/10/04	AM	3	C8	*Isoodon auratus barrowensis*	420	982F0091 - 00699086		R					M	
18/10/04	AM	3	C11	*Isoodon auratus barrowensis*	325	982F0091 - 01021009			64		22		M	
18/10/04	AM	3	E16	*Isoodon auratus barrowensis*	235	982F0091 - 01038424			61				F	post lactating
18/10/04	AM	3	C9	*Isoodon auratus barrowensis*	275	982F0091 - 01154140			58		21		M	
18/10/04	AM	3	C4	*Isoodon auratus barrowensis*	285	982F0091 - 01219142		R	64.5				F	post lactating
18/10/04	AM	3	E10	*Isoodon auratus barrowensis*	230	982F0091 - 01241645		R	63.5				F	post lactating
18/10/04	AM	3	C19	*Isoodon auratus barrowensis*	300	982F0091 - 01261312		R	62.5				F	post lactating
18/10/04	AM	3	E18	*Isoodon auratus barrowensis*	320	982F0091 - 01352830		R						
18/10/04	AM	3	C7	*Isoodon auratus barrowensis*	320	982F0091 - 01373856		R						
18/10/04	AM	3	C24	*Isoodon auratus barrowensis*	310	982F0091 - 01659656		R					M	
18/10/04	AM	3	C23	*Isoodon auratus barrowensis*	295	not marked			60				F	large pouch young
18/10/04	AM	3	C6	*Trichosurus vulpecula*	1000	982F0091 - 01192067			67				M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	3	C16	*Trichosurus vulpecula*	1320	982F0091 - 01261220		R	74		32		M	
18/10/04	AM	4	C13	*Bettongia lesueur*	700	982F0091 - 01178882			68		15		M	
18/10/04	AM	4	E22	*Isoodon auratus barrowensis*	115		#16		52				F	virgin pouch
18/10/04	AM	4	E25	*Isoodon auratus barrowensis*	205		#18	R						
18/10/04	AM	4	E2	*Isoodon auratus barrowensis*	168		#19		54		7		M	
18/10/04	AM	4	E8	*Isoodon auratus barrowensis*	260	982F0091 - 01162211		R					M	
18/10/04	AM	4	E21	*Isoodon auratus barrowensis*	265	982F0091 - 01162442			56				F	post lactating
18/10/04	AM	4	E18	*Isoodon auratus barrowensis*	345	982F0091 - 01173374							M	
18/10/04	AM	4	E4	*Isoodon auratus barrowensis*	343	982F0091 - 01261450		R					F	
18/10/04	AM	4	E23	*Isoodon auratus barrowensis*	260	982F0091 - 01263196			63				F	post lactating
18/10/04	AM	4	E20	*Isoodon auratus barrowensis*	260	982F0091 - 01264928		R					F	
18/10/04	AM	4	C11	*Isoodon auratus barrowensis*	260	982F0091 - 01337600			65				F	virgin pouch
18/10/04	AM	4	C10	*Isoodon auratus barrowensis*	355	982F0091 - 01360729		R					F	
18/10/04	AM	4	E12	*Isoodon auratus barrowensis*	430	982F0091 - 01446012		R					M	
18/10/04	AM	4	C5	*Isoodon auratus barrowensis*	295	982F0091 - 01451826		R					F	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	4	P17	*Pseudomys nanus ferculinus*			#18	R	24				F	
18/10/04	AM	4	E19	*Pseudomys nanus ferculinus*	55		#3		33.5		12		M	
18/10/04	AM	4	E3	*Pseudomys nanus ferculinus*	35		torn between #2 and #3	28.7				M		
18/10/04	AM	4	C6	*Trichosurus vulpecula*	650	982F0091 - 01024279		R					M	
18/10/04	AM	4	C17	*Trichosurus vulpecula*	1200	982F0091 - 01222180		R					F	
18/10/04	AM	4	C1	*Trichosurus vulpecula*	960	982F0091 - 01262018		R	68.5				F	pouch young
18/10/04	AM	4	C9	*Trichosurus vulpecula*	1400	982F0091 - 01357271		R						
18/10/04	AM	4	C19	*Trichosurus vulpecula*	1100	982F0091 - 01598396		R	67		28		M	
18/10/04	AM	5	C14	*Bettongia lesueur*	860	982F0091 - 01033357			66				M	
18/10/04	AM	5	C8	*Bettongia lesueur*	920	982F0091 - 01358581		R						
18/10/04	AM	5	E4	*Isoodon auratus barrowensis*	165		#20 (could be #18)	R	53.5				F	no pouch young
18/10/04	AM	5	C7	*Isoodon auratus barrowensis*	210		#64		61				F	pouch young
18/10/04	AM	5	E25	*Isoodon auratus barrowensis*	145		#64		53				F	virgin pouch
18/10/04	AM	5	E22	*Isoodon auratus barrowensis*	235	982F0091 - 01222158		R					F	
18/10/04	AM	5	E11	*Isoodon auratus barrowensis*	360	982F0091 - 01245369		R						
18/10/04	AM	5	E8	*Isoodon auratus barrowensis*	425	982F0091 - 01246696		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	5	E3	*Isoodon auratus barrowensis*	380	982F0091 - 01264875		R						
18/10/04	AM	5	C12	*Isoodon auratus barrowensis*	270	982F0091 - 01266837		R	67				F	post lactating
18/10/04	AM	5	C19	*Isoodon auratus barrowensis*	420	982F0091 - 01267297		R	72		20		M	
18/10/04	AM	5	E2	*Isoodon auratus barrowensis*	380	982F0091 - 01267637		R						
18/10/04	AM	5	E12	*Isoodon auratus barrowensis*	270	982F0091 - 01337805		R						
18/10/04	AM	5	E24	*Isoodon auratus barrowensis*	325	982F0091 - 01381631		R					M	
18/10/04	AM	5	C25	*Isoodon auratus barrowensis*	355	982F0091 - 01454810		R	64		20		M	
18/10/04	AM	5	P21	*Planigale* sp.	11.5		#16		24.1		8		M	
18/10/04	AM	5	E7	*Pseudomys nanus ferculinus*	52		#18		32.4				F	post lactating
18/10/04	AM	5	E13	*Pseudomys nanus ferculinus*	50		#19		32.8				M	
18/10/04	AM	5	C15	*Trichosurus vulpecula*	1100	982F0091 - 01060146			75		24		M	
18/10/04	AM	5	C20	*Trichosurus vulpecula*	1200	982F0091 - 01069349			77		31		M	
18/10/04	AM	5	P14	*Trichosurus vulpecula*	260	982F0091 - 01069611			59					
18/10/04	AM	5	C16	*Trichosurus vulpecula*	1280	982F0091 - 01480090		R	77				M	
18/10/04	AM	5	C11	*Trichosurus vulpecula*	1000	982F0091 - 01541399		R						
18/10/04	AM	6	C11	*Bettongia lesueur*	840	982F0091 - 01237987		R	66		22		M	
18/10/04	AM	6	C1	*Isoodon auratus barrowensis*	235		#17		64				F	pouch young

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	6	C16	*Isoodon auratus barrowensis*	190		#18		63		20		M	
18/10/04	AM	6	E11	*Isoodon auratus barrowensis*	330	982F0091 - 01035190			64		21		M	
18/10/04	AM	6	C6	*Isoodon auratus barrowensis*	355	982F0091 - 01059827			70		23		M	
18/10/04	AM	6	C12	*Isoodon auratus barrowensis*	210	982F0091 - 01191384		R	60		21		M	
18/10/04	AM	6	E25	*Isoodon auratus barrowensis*	420	982F0091 - 01236881		R						
18/10/04	AM	6	C5	*Isoodon auratus barrowensis*	350	982F0091 - 01237480		R	69.5		23		M	
18/10/04	AM	6	C19	*Isoodon auratus barrowensis*	395	982F0091 - 01241467		R	66		23		M	
18/10/04	AM	6	E4	*Isoodon auratus barrowensis*	285	982F0091 - 01261234		R					F	pouch young
18/10/04	AM	6	E16	*Isoodon auratus barrowensis*	232	982F0091 - 01327188		R	61				F	no pouch young
18/10/04	AM	6	E6	*Isoodon auratus barrowensis*	310	982F0091 - 01448585		R	69		22		M	
18/10/04	AM	6	E22	*Isoodon auratus barrowensis*	260	982F0091 - 01451260		R						
18/10/04	AM	6	E19	*Isoodon auratus barrowensis*	298	982F0091 - 01451740		R	60					
18/10/04	AM	6	E21	*Isoodon auratus barrowensis*	330	982F0091 - 01453358		R						
18/10/04	AM	6	E23	*Isoodon auratus barrowensis*	315	982F0091 - 01543154		R						
18/10/04	AM	6	C25	*Lagorchestes conspicillatus*	2450		#16	R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
18/10/04	AM	6	C13	*Lagorchestes conspicillatus*	2350		#20	R					F	no pouch young
18/10/04	AM	6	C24	*Lagorchestes conspicillatus*	2150		#22		88				F	small pouch young
18/10/04	AM	6	C4	*Trichosurus vulpecula*	1150	982F0091 - 01332594			81				F	post lactating
18/10/04	AM	6	C21	*Trichosurus vulpecula*	980	982F0091 - 01377159		R						
19/10/04	AM	1	E11	*Isoodon auratus barrowensis*	310		#16						F	pouch young
19/10/04	AM	1	E7	*Isoodon auratus barrowensis*		982F0091 - 00664874		R						
19/10/04	AM	1	C15	*Isoodon auratus barrowensis*		982F0091 - 00681581		R						
19/10/04	AM	1	E6	*Isoodon auratus barrowensis*		982F0091 - 00690840		R						
19/10/04	AM	1	E14	*Isoodon auratus barrowensis*		982F0091 - 00713545		R						
19/10/04	AM	1	C8	*Isoodon auratus barrowensis*	225	982F0091 - 01059617			64				F	post lactating
19/10/04	AM	1	E2	*Isoodon auratus barrowensis*		982F0091 - 01164936		R						
19/10/04	AM	1	C13	*Isoodon auratus barrowensis*	225	982F0091 - 01180492			62		21		M	
19/10/04	AM	1	E5	*Isoodon auratus barrowensis*		982F0091 - 01221296		R						
19/10/04	AM	1	E9	*Isoodon auratus barrowensis*	382	982F0091 - 01241806		R	65				F	
19/10/04	AM	1	C5	*Isoodon auratus barrowensis*		982F0091 - 01244635		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	1	C3	*Isoodon auratus barrowensis*	310	982F0091 - 01333353			70		22		M	
19/10/04	AM	1	E4	*Isoodon auratus barrowensis*		982F0091 - 01453040		R						
19/10/04	AM	1	C21	*Isoodon auratus barrowensis*										
19/10/04	AM	1	C7	*Trichosurus vulpecula*		982F0091 - 01237580		R						
19/10/04	AM	1	C2	*Trichosurus vulpecula*	1040	982F0091 - 01340125			67		21		M	
19/10/04	AM	2	E24	*Isoodon auratus barrowensis*	105		#16		50				F	
19/10/04	AM	2	C21	*Isoodon auratus barrowensis*	325		#16		67.5		21		M	
19/10/04	AM	2	C1	*Isoodon auratus barrowensis*		982F0091 - 00613872		R						
19/10/04	AM	2	E7	*Isoodon auratus barrowensis*		982F0091 - 00660088		R						
19/10/04	AM	2	C3	*Isoodon auratus barrowensis*	228	982F0091 - 01066536			66		21		M	
19/10/04	AM	2	E1	*Isoodon auratus barrowensis*	320	982F0091 - 01266038		R	71.5				F	inactive pouch
19/10/04	AM	2	E4	*Isoodon auratus barrowensis*		982F0091 - 01351996		R						
19/10/04	AM	2	C4	*Isoodon auratus barrowensis*		982F0091 - 01445505		R						
19/10/04	AM	2	C5	*Isoodon auratus barrowensis*		982F0091 - 11034150		R						
19/10/04	AM	2	C11	*Isoodon auratus barrowensis*		982F0091- 00618982		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	2	C16	*Isoodon auratus barrowensis*		982F0091- 00677956		R						
19/10/04	AM	2	C12	*Isoodon auratus barrowensis*		982F0091- 00689973		R						
19/10/04	AM	2	E16	*Isoodon auratus barrowensis*		982F0091- 00693687		R						
19/10/04	AM	2	E15	*Isoodon auratus barrowensis*	335	982F0091- 00702357		R	60				F	2 x PY
19/10/04	AM	2	C23	*Isoodon auratus barrowensis*		982F0091- 00819380		R						
19/10/04	AM	2	E21	*Isoodon auratus barrowensis*	485	982F0091- 01033775			71		23		M	
19/10/04	AM	2	E22	*Isoodon auratus barrowensis*		982F0091- 01037246			70		20		M	
19/10/04	AM	2	E19	*Isoodon auratus barrowensis*	250	982F0091- 01062890			62				F	Pre-lactating
19/10/04	AM	2	E13	*Isoodon auratus barrowensis*		982F0091- 01169022		R						
19/10/04	AM	2	E17	*Isoodon auratus barrowensis*		982F0091- 01258734		R						
19/10/04	AM	2	C15	*Lagorchestes conspicillatus*	2650		#32							lactating
19/10/04	AM	2	C15	*Lagorchestes conspicillatus*	480		#34		66.5				F	
19/10/04	AM	2	C24	*Trichosurus vulpecula*	1340	982F0091- 01220124		R	72				F	>1 PY
19/10/04	AM	2	C25	*Trichosurus vulpecula*	1190	982F0091- 01260761		R	74		26		M	
19/10/04	AM	3	E18	*Bettongia lesueur*	400	982F0091- 01166229		R						
19/10/04	AM	3	C18	*Bettongia lesueur*	750	982F0091- 01319916		R						
19/10/04	AM	3	C17	*Bettongia lesueur*		982F0091- 01353434		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	3	C12	*Bettongia lesueur*	790	982F0091- 01549647		R						
19/10/04	AM	3	C9	*Bettongia lesueur*	940	982F0091- 01668970			69		27		M	
19/10/04	AM	3	C23	*Isoodon auratus barrowensis*			#18	R					F	virgin pouch
19/10/04	AM	3	E3	*Isoodon auratus barrowensis*	185		#65		57.5		8		M	
19/10/04	AM	3	E24	*Isoodon auratus barrowensis*	165		#66		57		8		M	
19/10/04	AM	3	E17	*Isoodon auratus barrowensis*	150		#68							
19/10/04	AM	3	E8	*Isoodon auratus barrowensis*	410	982F0091- 00699086		R						
19/10/04	AM	3	E25	*Isoodon auratus barrowensis*	215	982F0091- 01026853			60				F	small PY
19/10/04	AM	3	E2	*Isoodon auratus barrowensis*	335	982F0091- 01066534		R						
19/10/04	AM	3	C15	*Isoodon auratus barrowensis*	240	982F0091- 01154140		R						
19/10/04	AM	3	E22	*Isoodon auratus barrowensis*	315	982F0091- 01171557			71		20		M	
19/10/04	AM	3	C25	*Isoodon auratus barrowensis*	260	982F0091- 01190500			53.5				F	PY
19/10/04	AM	3	E9	*Isoodon auratus barrowensis*	360	982F0091- 01218854		R	64		25		M	
19/10/04	AM	3	E4	*Isoodon auratus barrowensis*	33	982F0091- 01219142		R					F	NPY
19/10/04	AM	3	C6	*Isoodon auratus barrowensis*	355	982F0091- 01243662		R	60.5		21		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	3	C13	*Isoodon auratus barrowensis*	290	982F0091- 01261312		R						
19/10/04	AM	3	E11	*Isoodon auratus barrowensis*	220	982F0091- 01326492		R						
19/10/04	AM	3	C2	*Isoodon auratus barrowensis*	260	982F0091- 01327437			40.5				F	PY
19/10/04	AM	3	C1	*Isoodon auratus barrowensis*	265	982F0091- 01328303			59.5				F	NPY
19/10/04	AM	3	E6	*Isoodon auratus barrowensis*	255	982F0091- 01355127		R						
19/10/04	AM	3	E15	*Isoodon auratus barrowensis*	240	982F0091- 01357653		R						
19/10/04	AM	3	E7	*Isoodon auratus barrowensis*	295	982F0091- 01373856		R						
19/10/04	AM	3	C19	*Isoodon auratus barrowensis*		982F0091- 01452045		R						
19/10/04	AM	3	E10	*Isoodon auratus barrowensis*	270	982F0091- 01522376		R						
19/10/04	AM	3	E5	*Isoodon auratus barrowensis*	245	982F0091- 01525412			59				F	Post-lactational
19/10/04	AM	3	E20	*Isoodon auratus barrowensis*	285	982F0091- 01547921		R						
19/10/04	AM	3	E1	*Isoodon auratus barrowensis*	225	982F0091- 01656232			61		19		M	
19/10/04	AM	3	E16	*Isoodon auratus barrowensis*	280	982F0091- 01657326			65				F	Post-lactational
19/10/04	AM	3	E12	*Isoodon auratus barrowensis*	230	982F0091- 01657750			56		17		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	3	E19	*Isoodon auratus barrowensis*		982F0091- 01659656		R						
19/10/04	AM	3	E13	*Isoodon auratus barrowensis*	205	982F0091- 01666093			60		22		M	
19/10/04	AM	3	C21	*Lagorchestes conspicillatus*	3200		#1 (big chunk - natural mark)	97					M	
19/10/04	AM	3	C11	*Trichosurus vulpecula*	1170	982F0091- 01261220		R					M	
19/10/04	AM	3	C5	*Trichosurus vulpecula*	990	982F0091- 01540851			74				M	
19/10/04	AM	4	E18	*Isoodon auratus barrowensis*	200		#18	R					M	
19/10/04	AM	4	E8	*Isoodon auratus barrowensis*	250	982F0091- 01162211		R					M	
19/10/04	AM	4	C17	*Isoodon auratus barrowensis*	260	982F0091- 01162442		R					F	
19/10/04	AM	4	E11	*Isoodon auratus barrowensis*	330	982F0091- 01173374		R					M	
19/10/04	AM	4	E3	*Isoodon auratus barrowensis*	360	982F0091- 01259441		R						
19/10/04	AM	4	C9	*Isoodon auratus barrowensis*	355	982F0091- 01261225		R						
19/10/04	AM	4	C20	*Isoodon auratus barrowensis*	325	982F0091- 01261450		R						
19/10/04	AM	4	E24	*Isoodon auratus barrowensis*	230	982F0091- 01263196		R						
19/10/04	AM	4	C24	*Isoodon auratus barrowensis*	260	982F0091- 01264928		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	4	E7	*Isoodon auratus barrowensis*	265	982F0091- 01337600		R					F	
19/10/04	AM	4	E1	*Isoodon auratus barrowensis*	315	982F0091- 01357113		R	64				F	post-lactating
19/10/04	AM	4	C5	*Isoodon auratus barrowensis*	345	982F0091- 01360729		R					F	
19/10/04	AM	4	E6	*Isoodon auratus barrowensis*	260	982F0091- 01361694		R	65				F	2 x very small PY
19/10/04	AM	4	E21	*Isoodon auratus barrowensis*	425	982F0091- 01446012		R					M	
19/10/04	AM	4	E4	*Isoodon auratus barrowensis*	305	982F0091- 01451826		R						
19/10/04	AM	4	C7	*Isoodon auratus barrowensis*	225	982F0091- 01655481			59		9.5		M	
19/10/04	AM	4	E2	*Isoodon auratus barrowensis*	225	982F0091- 01661132			56				F	virgin pouch
19/10/04	AM	4	E24	*Isoodon auratus barrowensis*	285	982F0091- 01662579			60		19		M	
19/10/04	AM	4	C1	*Trichosurus vulpecula*	600	982F0091- 01024279		R						
19/10/04	AM	4	C13	*Trichosurus vulpecula*	920	982F0091- 01180577		R					F	
19/10/04	AM	4	E22	*Trichosurus vulpecula*	1170	982F0091- 01222180		R					F	
19/10/04	AM	4	C11	*Trichosurus vulpecula*	1290	982F0091- 01357271		R					M	
19/10/04	AM	5	C5	*Bettongia lesueur*	630	982F0091- 01060164		R						
19/10/04	AM	5	C4	*Bettongia lesueur*	380	982F0091- 01166621		R						
19/10/04	AM	5	C9	*Bettongia lesueur*	870	982F0091- 01654682			70		24		M	
19/10/04	AM	5	E4	*Isoodon auratus barrowensis*	195		#19		58		9		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	5	E10	*Isoodon auratus barrowensis*	135		#65		49		10		M	
19/10/04	AM	5	C8	*Isoodon auratus barrowensis*	195		#66		54		9		M	
19/10/04	AM	5	E15	*Isoodon auratus barrowensis*	200		#67		56		8		M	
19/10/04	AM	5	E19	*Isoodon auratus barrowensis*	195		#68		59				F	virgin pouch
19/10/04	AM	5	E17	*Isoodon auratus barrowensis*	165		#69		55				F	virgin pouch
19/10/04	AM	5	E7	*Isoodon auratus barrowensis*	210	982F0091- 01018809		R						
19/10/04	AM	5	E8	*Isoodon auratus barrowensis*	220	982F0091- 01175495		R	60		22		M	
19/10/04	AM	5	E25	*Isoodon auratus barrowensis*	280	982F0091- 01221505		R	60				F	small PY
19/10/04	AM	5	E22	*Isoodon auratus barrowensis*	270	982F0091- 01222158		R						
19/10/04	AM	5	C20	*Isoodon auratus barrowensis*	410	982F0091- 01246696		R					M	
19/10/04	AM	5	E23	*Isoodon auratus barrowensis*	310	982F0091- 01258127		R						
19/10/04	AM	5	E11	*Isoodon auratus barrowensis*	265	982F0091- 01266837		R						
19/10/04	AM	5	C22	*Isoodon auratus barrowensis*	430	982F0091- 01267297		R						
19/10/04	AM	5	E3	*Isoodon auratus barrowensis*	370	982F0091- 01267637		R					M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	5	C12	*Isoodon auratus barrowensis*	270	982F0091- 01337805		R						
19/10/04	AM	5	C24	*Isoodon auratus barrowensis*	290	982F0091- 01354739		R						
19/10/04	AM	5	C25	*Isoodon auratus barrowensis*	315	982F0091- 01381631		R						
19/10/04	AM	5	E13	*Isoodon auratus barrowensis*		982F0091- 01541775			63.5				F	Large PY CR=20mm
19/10/04	AM	5	E18	*Isoodon auratus barrowensis*	245	982F0091- 01670154			59		21		M	
19/10/04	AM	5	C7	*Lagorchestes conspicillatus*	2900		#3	R						
19/10/04	AM	5	C6	*Lagorchestes conspicillatus*	2950		#4 (natural mark)	96		25		M		
19/10/04	AM	5	P14	*Pseudomys nanus ferculinus*	35		#16	R					M	
19/10/04	AM	5	E1	*Pseudomys nanus ferculinus*	10.5		#20		26				M	
19/10/04	AM	5	C10	*Trichosurus vulpecula*	1170	982F0091- 01069349		R						
19/10/04	AM	5	C2	*Trichosurus vulpecula*	890	982F0091- 01244679		R	78.5				F	NPY
19/10/04	AM	5	C15	*Trichosurus vulpecula*	990	982F0091- 01380569			79				F	
19/10/04	AM	5	C14	*Trichosurus vulpecula*	1210	982F0091- 01453702		R	75		30		M	
19/10/04	AM	5	C11	*Trichosurus vulpecula*	1250	982F0091- 01480090		R						
19/10/04	AM	6	C1	*Isoodon auratus barrowensis*	255		#16	R						
19/10/04	AM	6	E22	*Isoodon auratus barrowensis*	170		#20		54.5				F	virgin pouch

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	6	E1	*Isoodon auratus barrowensis*		982F0091 - 01035190		R						
19/10/04	AM	6	E19	*Isoodon auratus barrowensis*	345	982F0091 - 01061173			66		17		M	
19/10/04	AM	6	C11	*Isoodon auratus barrowensis*	360	982F0091 - 01164926			69		21		M	
19/10/04	AM	6	C21	*Isoodon auratus barrowensis*	200	982F0091 - 01165279 and #18	R	65						
19/10/04	AM	6	E16	*Isoodon auratus barrowensis*	260	982F0091 - 01188434			70		24		M	
19/10/04	AM	6	C20	*Isoodon auratus barrowensis*		982F0091 - 01191384		R						
19/10/04	AM	6	E21	*Isoodon auratus barrowensis*		982F0091 - 01236881		R						
19/10/04	AM	6	C15	*Isoodon auratus barrowensis*		982F0091 - 01241467		R						
19/10/04	AM	6	E8	*Isoodon auratus barrowensis*		982F0091 - 01261234		R	62					
19/10/04	AM	6	C16	*Isoodon auratus barrowensis*	340	982F0091 - 01341030			70		23		M	
19/10/04	AM	6	E4	*Isoodon auratus barrowensis*	407	982F0091 - 01352288		R	70		23		M	
19/10/04	AM	6	E11	*Isoodon auratus barrowensis*		982F0091 - 01451260		R						
19/10/04	AM	6	E10	*Isoodon auratus barrowensis*		982F0091 - 01453358		R						
19/10/04	AM	6	E23	*Isoodon auratus barrowensis*		982F0091 - 01543154		R						
19/10/04	AM	6	C3	*Lagorchestes conspicillatus*	3050		#28		92		21		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
19/10/04	AM	6	C7	*Trichosurus vulpecula*	1040	982F0091 - 01036036			76		24		M	
19/10/04	AM	6	C6	*Trichosurus vulpecula*	1150	982F0091 - 01332594		R						
20/10/04	AM	1	C7	*Bettongia lesueur*	1870	982F0091- 00985920			10		21		M	
20/10/04	AM	1	C13	*Isoodon auratus barrowensis*	160		#18		58				F	virgin pouch
20/10/04	AM	1	C24	*Isoodon auratus barrowensis*	95		#24		52				F	virgin pouch
20/10/04	AM	1	E7	*Isoodon auratus barrowensis*	280		#32 (natural)	68				F	small pouch young	
20/10/04	AM	1	E1	*Isoodon auratus barrowensis*		982F0091- 00664874		R						
20/10/04	AM	1	C22	*Isoodon auratus barrowensis*		982F0091- 00690840		R						
20/10/04	AM	1	E4	*Isoodon auratus barrowensis*		982F0091- 00713545		R						
20/10/04	AM	1	C25	*Isoodon auratus barrowensis*		982F0091- 01164936		R						
20/10/04	AM	1	C6	*Isoodon auratus barrowensis*	235	982F0091- 01218191			67				F	Post-lactational
20/10/04	AM	1	E3	*Isoodon auratus barrowensis*		982F0091- 01241806		R						
20/10/04	AM	1	C2	*Isoodon auratus barrowensis*		982F0091- 01243648		R						
20/10/04	AM	1	C9	*Isoodon auratus barrowensis*		982F0091- 01333353		R						
20/10/04	AM	1	C8	*Isoodon auratus barrowensis*		982F0091- 01338730		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
20/10/04	AM	1	C14	*Isoodon auratus barrowensis*	315	982F0091- 01357359			71				F	small pouch young
20/10/04	AM	1	C11	*Isoodon auratus barrowensis*	375	982F0091- 01359995			64				F	small pouch young
20/10/04	AM	1	C15	*Isoodon auratus barrowensis*		982F0091- 01453040		R						
20/10/04	AM	1	C5	*Isoodon auratus barrowensis*		982F0091- 01509617		R						
20/10/04	AM	1	C1	*Trichosurus vulpecula*		982F0091- 01062845		R						
20/10/04	AM	1	C3	*Trichosurus vulpecula*		982F0091- 01237580		R						
20/10/04	AM	1	C16	*Trichosurus vulpecula*	1470	982F0091- 01265683			79		31		M	
20/10/04	AM	2	C21	*Isoodon auratus barrowensis*	320		#16	R	63.5				M	
20/10/04	AM	2	E1	*Isoodon auratus barrowensis*		982F0091- 00613872		R						
20/10/04	AM	2	E11	*Isoodon auratus barrowensis*		982F0091- 00618982		R			26		M	
20/10/04	AM	2	C16	*Isoodon auratus barrowensis*	390	982F0091- 00677956		R						
20/10/04	AM	2	E12	*Isoodon auratus barrowensis*	335	982F0091- 00689973		R						
20/10/04	AM	2	E9	*Isoodon auratus barrowensis*		982F0091- 00702357		R						
20/10/04	AM	2	E23	*Isoodon auratus barrowensis*	365	982F0091- 00819380		R						
20/10/04	AM	2	C22	*Isoodon auratus barrowensis*	460	982F0091- 01033775		R						

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
20/10/04	AM	2	E14	*Isoodon auratus barrowensis*	290	982F0091- 01034150		R						
20/10/04	AM	2	C5	*Isoodon auratus barrowensis*	215	982F0091- 01066536		R						
20/10/04	AM	2	E13	*Isoodon auratus barrowensis*	310	982F0091- 01169022		R						
20/10/04	AM	2	C25	*Isoodon auratus barrowensis*	400	982F0091- 01245501		R	62		24		M	
20/10/04	AM	2	C18	*Isoodon auratus barrowensis*	435	982F0091- 01258734		R					M	
20/10/04	AM	2	C1	*Isoodon auratus barrowensis*		982F0091- 01266038		R						
20/10/04	AM	2	C4	*Isoodon auratus barrowensis*	405	982F0091- 01445505		R						large PY
20/10/04	AM	2	C7	*Isoodon auratus barrowensis*	320	982F0091- 01447147		R	67				F	Post-lactational
20/10/04	AM	2	E20	*Isoodon auratus barrowensis*	340	982F0091- 01481092			65.6				F	PY
20/10/04	AM	2	C9	*Lagorchestes conspicillatus*		#18	R							
20/10/04	AM	2	C20	*Lagorchestes conspicillatus*	2250		#32	R						
20/10/04	AM	2	C17	*Trichosurus vulpecula*	250	982F0091- 01220124		R						
20/10/04	AM	2	C24	*Trichosurus vulpecula*	1170	982F0091- 01260761		R						
20/10/04	AM	2	C23	*Trichosurus vulpecula*	1190	982F0091- 01667601			71		27		M	
20/10/04	AM	6	E21	*Isoodon auratus barrowensis*	185		#22		60		17		M	
20/10/04	AM	6	C16	*Isoodon auratus barrowensis*	145		#26		59		13		M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
20/10/04	AM	6	E20	*Isoodon auratus barrowensis*	220	982F0091- 00957324			60		20		M	
20/10/04	AM	6	E22	*Isoodon auratus barrowensis*		982F0091- 01164926		R						
20/10/04	AM	6	E6	*Isoodon auratus barrowensis*	365	982F0091- 01188434		R						
20/10/04	AM	6	C21	*Isoodon auratus barrowensis*		982F0091- 01191384		R						
20/10/04	AM	6	E16	*Isoodon auratus barrowensis*		982F0091- 01236881		R?						
20/10/04	AM	6	C14	*Isoodon auratus barrowensis*	320	982F0091- 01237480		R						
20/10/04	AM	6	C18	*Isoodon auratus barrowensis*		982F0091- 01241467		R?						
20/10/04	AM	6	E8	*Isoodon auratus barrowensis*		982F0091- 01244207		R	64				F	Post-lactational
20/10/04	AM	6	E10	*Isoodon auratus barrowensis*	250	982F0091- 01261234		R						
20/10/04	AM	6	C25	*Isoodon auratus barrowensis*		982F0091- 01327188		R						
20/10/04	AM	6	C5	*Isoodon auratus barrowensis*	390	982F0091- 01352288		R					M	
20/10/04	AM	6	E13	*Isoodon auratus barrowensis*	265	982F0091- 01374608			58				F	Post-lactational
20/10/04	AM	6	C6	*Isoodon auratus barrowensis*	250	982F0091- 01375356			60.5				F	PY
20/10/04	AM	6	E1	*Isoodon auratus barrowensis*	315	982F0091- 01448585		R					M	

Date	Time	Grid	Trap	Species	Wt	PIT#	Ear Clip #	Rec	Crown	GL	GW	Pes	Sex	Young
20/10/04	AM	6	E11	*Isoodon auratus barrowensis*	205	982F0091- 01451260		R						
20/10/04	AM	6	E25	*Isoodon auratus barrowensis*		982F0091- 01451740		R						
20/10/04	AM	6	C19	*Isoodon auratus barrowensis*		982F0091- 01453358		R?						
20/10/04	AM	6	C23	*Isoodon auratus barrowensis*		982F0091- 01543154		R						
20/10/04	AM	6	C20	*Lagorchestes conspicillatus*	3050		#18							
20/10/04	AM	6	C24	*Lagorchestes conspicillatus*	2470		#64 (?? natural)	86		25			M	
20/10/04	AM	6	C4	*Lagorchestes conspicillatus*	2300	unmarked			80		26		M	
20/10/04	AM	6	C1	*Trichosurus vulpecula*			#1		56		10		M	young of 01546382
20/10/04	AM	6	C9	*Trichosurus vulpecula*	1070	982F0091- 01332594		R						
20/10/04	AM	6	C15	*Trichosurus vulpecula*	930	982F0091- 01377159		R						
20/10/04	AM	6	C1	*Trichosurus vulpecula*		982F0091- 01546382			75				F	mother of #1

Attachment 6 - Annotated List of Reptiles Collected From the Proposed Development Area in November 2003

Ctenophorus c. caudicinctus

This species was observed on more occasions than the five vouchered specimens suggest (R154125 – 29) and from most areas visited. Most observations were of individuals amongst *Triodia* on exposed limestone and were typically observed basking on large rocks in the windrows along the major roads or on termitaria. There was variation with respect to colour patterns of the males.

This species is represented in the Western Australian Museum's collection by 75 specimens, including three with associated tissue samples. Collection localities are given as Barrow Island, Double Island, Town Point, Flacourt Bay, Turtle Bay, Surf Point, Cape Malouet. Smith (1976) notes that this species was widespread across the Island whilst Butler (1970) noted it as the 'most prevalent and obvious reptile on the Island.'

Delma borea

Recorded from just two specimens (R154143 and R154148) including a gravid female. A juvenile (R154143, SVL of 36 mm) was raked from beneath spoil on G1 (20° 47.402' 115° 27.364') whilst the gravid female (R154148, SVL of 79mm) was collected from pit trap 13 on G4. The species is represented in the Western Australian Museum's collection by just two specimens, one collected in 1973, with a locality listed as Shark Point and the other collected in 1967, listed as Barrow Island.

The '*borea'* species complex has recently been reviewed by Brad Maryan (Western Australian Museum) using both morphological and molecular analysis, though no tissue from Barrow Island individuals was available at the time of the study. The study suggests that the Barrow Island population is the same species as that from the mainland Pilbara at Mandora.

Delma nasuta

A single gravid female (SVL 100 mm, R154170) was collected from trapping grid 1. This species is represented in the Western Australian Museum's collection by 63 specimens, most of which (n=53) were collected by Smith (1976) during his visit in late October/early November 1973. The remaining individuals were collected prior to 1989, with the majority being collected in the 1970s. Smith also collected gravid females during his October/November survey and noted that specimens predominantly came from '*T. angusta o*n red sands and loams.' Locality records from the Western Australian Museum's collection comprise Barrow Island and Flacourt Bay.

Lialis burtonis

Recorded on two occasions, the first record was of a female collected from the cliff in Airport Creek (R154133) a second female (R154134) was collected from pale dunes vegetated with *Triodia* sp. adjacent to trap point T1.11.

The Western Australian Museum's collection includes 21 specimens, all collected during, or prior to 1977, with the locality given as either Barrow Island or Cape Malouet. Smith (1976) collected 17 specimens from '*T. angusta* whilst Butler (1970) notes that he collected specimens from '*Triodia* tussocks, mostly in dune habitats.'

Gehyra variegata

A single specimen (R154142) was collected from the accommodation block at the main camp. The form collected appears to differ from another specimen collected earlier in the year, that also appears to occur on Cape Range and on Varanus Island.

The taxon is represented by 14 specimens in the Western Australian Museum's collection with localities listed as Barrow Island, Town Point, Boodie Island, Whitlock Cove and Flacourt Bay. Smith (1976) collected his specimens from 'under debris such as timber, iron and old tyres.'

Heteronotia binoei

Eleven specimens that were vouchered (R154100 – R154108, R154114, R154141) were collected during the survey. Most were collected whilst raking beneath leaf litter, but specimens were also collected from the main track through the proposed Development area whilst road-spotting, and from termitaria.

Represented by 51 specimens in the collection from localities including Barrow Island, Town Point and Boodie Island. With the exception of one specimen collected in 1990, the remaining collections were made prior to 1977. Smith (1976) notes that this species was 'particularly common under man-made debris' whilst Butler (1970) recorded this species from 'termitaria, caves, *Triodia* clumps and under old camp rubbish.'

Strophurus jeanae

Single specimen (R154145) collected from under a live *Triodia* hummock. Represented by 15 specimens in the collection with localities given as Town Point and Barrow Island. With the exception of one specimen collected in 1990, all others were collected prior to 1977. Smith (1976) recorded all specimens from '*T. angusta* on siliceous sands and loams.'

Carlia triacantha

Several specimens were observed actively foraging on exposed limestone cap, but none were captured. Known from three specimens in the collection, with localities given as Town Point and Flacourt Bay. This species may be genuinely uncommon on Barrow Island. Smith (1976) only recorded a single individual from a 'well vegetated inter-dune near Town Point.'

Cryptoblepharus carnabyi

Five records including one from dead *Acacia coriacea* on the primary dunes within the proposed gas processing facility footprint area (R154112) and four specimens (R154109 – 11 and R154113) collected from low walls within the main camp. Known from 12 specimens within the Western Australian Museum's collection from localities given as Barrow Island and Town Point. Butler (1970) collected this species from mangrove trunks, rock faces, termitaria and caves, whilst Smith (1976) collected his specimens from similar habitat and the trunk of a eucalypt.

Ctenotus grandis

This species was represented by 18 captures including ten specimens vouchered with the Western Australian Museum (R154081 – 90). All individuals recorded by the authors were captured using medium size Elliott traps. A small section of tail was taken from the remaining eight individuals and stored in 100 % ethanol for future molecular studies.

This species is represented by 11 specimens in the collection, including two from 2001 from which tissue was taken. Locations are given as Barrow Island and Town Point. Both Butler (1970) and Smith (1976) record this species as being collected from sand areas.

Ctenotus pantherinus acripes

Only two specimens were collected, though an additional two were seen actively moving through *Triodia* hummock grass. This taxon is represented by 40 specimens in the collections of the Western Australian Museum, but just one from which tissue was taken. Butler (1970) recorded his specimens from *'Triodia* and *Frankenia* on barren salt eroded limestone outcrops on the west coast.' Smith (1976) noted the primary habitat as 'rocky areas with *Triodia wiseana.'*

According to current taxonomy this sub-species does not occur elsewhere in Western Australia, but is recorded from Northern Territory and Queensland (Horner 1991). There is some question over the validity of the sub-species described for Western Australia (Aplin and Smith, 2001) and genetic studies are required.

Ctenotus saxatilis

This species was recorded on nine occasions with an additional two specimens collected from the trapping grids; all eleven specimens were eventually vouchered (R154091 – 99 and R154149 – 50). The majority of the individuals (n=9) were collected using medium size Elliott traps established along the three transects and came from *Triodia* hummock grassland.

The species is well represented in the Western Australian Museum's collection with 96 specimens, though none are complemented with tissue samples. Localities are given as Barrow Island, South Double Island, South Pascoe Island, Town Point, Flacourt Bay, Surf Point, Cape Dupuy, Double Island, Pelican Point, Ant Point and Bandicoot Bay. Smith (1976) notes that this species is the 'dominant skink on the Island ... found in all habitats'. Butler (1970) indicates that this species occurs in '*Triodia* and coastal *Spinifex* thickets'.

The closely related taxa *Ctenotus saxatilis*, *C. fallens* and *C. ornatus* are currently the subject of a detailed phylogenetic study which will also attempt to resolve species distributions in these very similar looking species. Additional collections from Barrow Island and its close neighbours would provide valuable tissue to help resolve these phylogenies as well as place the Barrow Island population in a regional context.

Cyclodomorphus melanops

Recorded from three specimens during opportunistic collections (R154130 – 32) including one gravid female, supplemented by an additional three specimens (R154152, R154154 and R154160) collected from pit-traps in the trapping grids. The former three were recorded from beneath dead *Triodia* in spoil piles and, in one case, from under *Triodia* on limestone.

Represented by 60 specimens in the Western Australian Museum's collection, including one specimen with tissue. Localities are given as Barrow Island, Cape Dupuy, Town Point and Surf Point. Smith (1976) gives the habitat of this species as '*T. angusta* on consolidated dunes and loamy flats'. He also recorded females with enlarged follicles during October and November.

Lerista bipes

A total of ten individuals were lodged with the Western Australian Museum, comprising eight specimens (R154114 – 22) raked from beneath debris and vegetation and a further two collected

from pit traps (R154171 – 72). The collection included three individuals collected from Cape Dupuy. Specimens were raked from white siliceous sand on the primary dunes as well as loamy areas.

Represented by 89 specimens in the Western Australian Museum, including just two with associated tissue samples. Localities are given as Barrow Island, Town Point, Flacourt Bay, Surf Point, WAPET Camp, Bandicoot Bay, Pelican Point and Ant Point. Smith (1976) notes that this species was recorded from 'consolidated dunes and loamy flats'.

Lerista muelleri

Two opportunistic collections (R154139 – 40) were supplemented by six pit-trapped specimens (R154162 – 67). Those collected opportunistically were raked from beneath spoil in Airport Creek and from beneath *Triodia* at Cape Dupuy.

Represented by 42 specimens within the Western Australian Museum's collection with locations given as Barrow Island, Town Point, Flacourt Bay, Bandicoot Bay, Pelican Point and Ant Point. Smith (1976) notes that this species was found from 'consolidated dunes'. He recorded one female with an enlarged follicle during October/November.

A recent review of this species complex yielded in excess of 15 new species and it is appears that the Barrow Island taxon is similar to that on the adjacent Pilbara coast.

Menetia greyii

Nine specimens vouchered with the Western Australian Museum, including seven collected from pit-traps (R154153, R154156 – 58, R154161, R154169, R154173) and two collected opportunistically, including one raked from beneath *Triodia* on a primary dune (R154123) and another from under *Triodia* on limestone (R154144). The collection included one gravid female.

Poorly collected on Barrow Island, with just four specimens in the Western Australian Museum collection, with localities given as Barrow Island and Flacourt Bay. The sparsity of this species on Barrow Island was noted by Smith (1976).

This taxa is known to be a complex of species that displays polyploidy, probable parthenogenesis, sympatry and hybridisation (Aplin and Smith 2001).

Morethia ruficauda exquisita

Just the one specimen vouchered with the Western Australian Museum (R154174) collected from a pit-trap.

Represented by 26 specimens in the Western Australian Museum collection with localities given as Barrow Island, Town Point, Flacourt Bay, Pelican Point and Ant Point. Smith (1976) found this species in all habitats but noted it 'mostly in siliceous foredunes and consolidated dunes.'

Notoscincus ornatus ornatus

Five specimens vouchered with the Western Australian Museum, including three from pit traps (R154147, R154155, R154159), one raked from beneath spoil in Airport Creek (R154137) and another from *Triodia* on exposed limestone near Town Point (R154138).

Represented by 25 specimens in the collection including two specimens with associated tissue samples. Localities include Barrow Island, Town Point, Surf Point and Flacourt Bay. Smith (1976) notes that this species 'can be found in all habitats but is most common in consolidated dunes and loamy flats.'

Proablepharus reginae

Just two specimens vouchered with the Western Australian Museum, both collected opportunistically. The first was raked from beneath spoil in Airport Creek (R154135) and the second was collected near T1.21 in sparse *Acacia coriacea* on red loam.

Thirty-one specimens in the Western Australian Museum's collection with localities given as Barrow Island, Flacourt Bay and Surf Point.

Varanus giganteus

No specimens vouchered but often encountered on the major tracks and at Town Point.

Represented in the Western Australian Museum's collection by eight specimens, all collected prior to 1985. There are no supporting tissue samples. It is envisaged that any road kill specimens will be collected and stored in the chest freezer on site. Any such specimens will provide valuable tissue for any future molecular studies.

Pseudechis australis

A single individual collected whilst road-spotting through the proposed Development area (R154124).

This species is represented by just six specimens in the Western Australian Museum collection, with localities given as Barrow Island and Town Point.

Smith (1976) suggests that the Barrow Island form of this species may exhibit dwarfism given the shorter SVL in these individuals.

Attachment 7 - Annotated List of Reptiles Collected From the Proposed Development Area in August-September 2004

AGAMIDAE

Ctenophorus caudicinctus caudicinctus

This species was recorded on nine occasions at Flacourt Bay, alternative campsites and the Gorgon footprint area. Most records were in Acacia over Triodia on limestone (seven observations) with the remaining two records being in Melaleuca cardiophylla and Triodia on limestone. Smith (1976) notes that this species was "seen all over the island" whilst Butler (1970) noted is as the "most prevalent and obvious reptile on the island."

Pogona minor minor

Recorded from two individuals captured in the alternative campsites and old airport area. One individual was from Triodia angusta valleys and the other was from Triodia on loam. Smith (1976) collected most specimens from "2-3 m up in dead Hakea lorea, or Acacia shrubs". Butler (1970) recorded most specimens from Acacia coriacea along the coast and this was the habitat where most individuals were captured during the trapping program in 2003.

PYGOPODIDAE

Delma borea

Recorded on just one occasion from east of the old airport. The individual was captured in Triodia on loam. Smith (1976) states that the one specimen he obtained was "out of Triodia".

The 'borea' species complex has recently been reviewed by Brad Maryan (Western Australian Museum), using both morphological and molecular anlaysis. His study suggests that the Barrow Island population is the same species as that from the mainland Pilbara at Mandora.

GEKKONIDAE

Gehyra variegata

A single individual was recorded in the Gorgon project area near the pipeline in Melaleuca cardiophylla and Triodia on limestone. This individual apparently belong to a species found on Barrow Island and adjacent parts of the Pilbara mainland, which is different from true variegata (G. Harold, pers. comm.). Smith (1976) collected his specimens from "under debris such as timber, iron and old tyres" and Butler (1970) obtained his specimens from "dead Acacia coriacea, caves and termitaria" although it seems likely that his records include other Gehyra species.

Heteronotia binoei

Five records from the alternative campsites, Gorgon project area and old airport area. Most records from Melaleuca cardiophylla and Triodia on limestone (three records) with one record from Triodia angusta valleys and one record from cleared areas at the old airport. Smith (1976) notes that this species was "particularly common under man-made debris" whilst Butler (1970) recorded this species from "termitaria, caves, Triodia clumps and under old camp rubbish".

SCINCIDAE

Cryptoblepharus carnabyi

Recorded from two individuals. One was collected from a stone wall at the main camp and the other was collected from bare sandstone below a limestone cliff at Barge Landing. Butler (1970) collected this species from "rock faces, mangrove trunks, termitaria and caves", whilst Smith (1976) collected his specimens from "mangroves, a eucalypt trunk, the wall of a building and the face of a sink hole".

This species, as currently recognised, is a species complex containing over a dozen true species. It is not clear how widely distributed the form on Barrow Island is.

Ctenotus grandis titan

Only one capture from Triodia on loam in the alternative campsites. Both Butler (1970) and Smith (1976) record this species as being collected from sand areas.

Ctenotus pantherinus acripes

Seven records from the Gorgon project area and alternative campsites. Most records were from Triodia on loam (five records) with the remaining two records being from Melaleuca cardiophylla and Triodia on limestone. This species was recorded from north of the Gorgon footprint during this survey and Butler (1970) recorded his specimens from "Triodia and Frankenia on barren salt eroded limestone outcrops on the west coast". Smith (1976) noted the primary habitat as "rocky areas with Triodia wiseana". This species is clearly widespread across the island.

According to current taxonomy this sub-species does not occur elsewhere in Western Australia, but is recorded from Northern Territory and Queensland (Horner 1991). There is some question over the validity of the sub-species described for Western Australia (Smith and Aplin 2001) and genetic studies are required.

Ctenotus saxatilis

Five records from White's Beach, old airport area and Gorgon project area. It was recorded in a range of habitats with single records in each of Acacia over Triodia on limestone, Melaleuca cardiophylla and Triodia on limestone, Triodia on loam, disturbed ground and Triodia angusta valleys. Smith (1976) notes that this species is the "dominant skink on the island ….found in all habitats." Butler (1970) indicates that this species occurs in "Triodia and coastal Spinifex thickets."

Cyclodomorphus melanops melanops

Eight records from the old airport and Gorgon project areas. Two records from each of Triodia angusta valleys and regrowth Triodia in rehabilitated areas with single records from each of Melaleuca cardiophylla and Triodia on limestone, Acacia over Triodia on limestone and Triodia on loam. Butler (1970) obtained all his specimens "from Triodia except one found under a limestone slab". Smith (1976) gives the habitat o this species as "T. angusta on consolidated dunes and loamy flats". He also recorded females with enlarged follicles during October and November.

Lerista bipes

Seven records from the Gorgon project area and Airport Creek. Most records were from Acacia coriacea over Triodia on coastal sand (three records) and Triodia on loam (two records) with single records from each of Melaleuca cardiophylla and Triodia on limestone and Acacia over Triodia on limestone. Butler (1970) said that "their tracks are extremely common throughout the island in sandy areas" and Smith (1976) notes that this species was recorded from "consolidated dunes and loamy flats".

Lerista elegans

One record from just north of Town Point, in Acacia coriacea on white beach sand. Not previously recorded in the Gorgon project area. During the 2004 trapping survey, the species was recorded in large numbers from Triodia on white sand in the Bandicoot Bay area and Butler (1970) reports it as being common "on Triodia in sand". Not collected by Smith (1976).

Lerista muelleri

Seven records from the alternative campsites, old airport area and Gorgon project area. Most records from Acacia over Triodia on limestone (five observations), with the remaining two records from Melaleuca cardiophylla and Triodia on limestone. Smith (1976) notes that this species was found "among consolidated dunes" and Butler (1970) recorded one from a "sand dune…..among Acacia and Spinifex".

A recent review of this species complex by Laurie Smith at the WA Museum yielded in excess of 15 new species and it is appears that the Barrow Island taxon is similar to that on the adjacent Pilbara coast.

Menetia greyii

Nine records from White's Beach, alternative campsites, old airport area and Gorgon project area. Most records from Melaleuca cardiophylla and Triodia on limestone (four records), with further records from Triodia on loam (three records), Triodia angusta valleys (one record) and Triodia on the edge of a rehabilitated area (one record). Not recorded by either Butler (1970), or Smith (1976).

This taxa is know to be a complex of species that displays polyploidy, probable parthenogenesis, sympatry and hybridisation (Aplin and Smith 2001).

Morethia ruficauda exquisita

Three records from the Gorgon project area in Melaleuca cardiophylla and Triodia on limestone (two records) and Acacia coriacea on white sand (one record). Smith (1976) found this species in all habitats but noted it "mostly in siliceous foredunes and consolidated dunes" and Butler (1970) found it "on limestone edges of sand dunes".

Notoscincus ornatus ornatus

Four records from the old airport and Gorgon project areas. Two records from Acacia over Triodia on limestone, with single records from each of Triodia angusta valleys and Melaleuca cardiophylla and Triodia on limestone. Not recorded by Butler (1970) but Smith (1976) notes that this species "can be found in all habitats but is most common in consolidated dunes and loamy flats".

Proablepharus reginae

Five records from the alternative campsites, old airport area and Gorgon project area. Three records from Triodia on loam, with single records from each of Triodia angusta valleys and Melaleuca cardiophylla and Triodia on limestone. Butler (1970) recorded the species from "Triodia on sand" whilst Smith (1976) recorded it only from "Triodia angusta on sandy soil" but noted that it was one of the most common lizards on the island.

VARANIDAE

Varanus acanthurus

One record from Acacia coriacea on white sand just north of Town Point. Not recorded by Butler (1970) and Smith (1976) collected three specimens, "two under rubbish, the other out of Triodia".

Varanus giganteus

Four observations from the alternative campsites and Gorgon project area. Two observations in Acacia over Triodia on limestone with one observation from Triodia on loam. Butler (1970) described the species as "wide-ranging over all habitats" and Smith (1976) had 27 sightings "in all habitats".

Attachment 8 - List of Reptile Specimens from Barrow Island Donated to the Western Australian Museum

Reg No.	Genus	Species	Subspecies	Latitude	Longitude	Date
154363	*Antaresia*	*stimsoni*	*stimsoni*	20°49`36"S	115°26`41"E	29/11/2003
154109	*Cryptoblepharus*	*carnabyi*		20°49`36"S	115°26`41"E	22/11/2003
154110	*Cryptoblepharus*	*carnabyi*		20°49`36"S	115°26`41"E	20/11/2003
154111	*Cryptoblepharus*	*carnabyi*		20°49`36"S	115°26`41"E	20/11/2003
154112	*Cryptoblepharus*	*carnabyi*		20°47`18"S	115°27`46"E	20/11/2003
154113	*Cryptoblepharus*	*carnabyi*		20°49`36"S	115°26`41"E	23/11/2003
154125	*Ctenophorus*	*caudicinctus*	*caudicinctus*	20°40`16"S	115°26`13"E	24/11/2003
154126	*Ctenophorus*	*caudicinctus*	*caudicinctus*	20°48`09"S	115°26`53"E	23/11/2003
154127	*Ctenophorus*	*caudicinctus*	*caudicinctus*	20°47`32"S	115°26`18"E	22/11/2003
154128	*Ctenophorus*	*caudicinctus*	*caudicinctus*	20°47`32"S	115°26`18"E	23/11/2003
154129	*Ctenophorus*	*caudicinctus*	*caudicinctus*	20°47`06"S	115°27`42"E	23/11/2003
154081	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	20/11/2003
154082	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	20/11/2003
154083	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	22/11/2003
154084	*Ctenotus*	*grandis*	*titan*	20°47`12"S	115°27`22"E	22/11/2003
154085	*Ctenotus*	*grandis*	*titan*	20°47`12"S	115°27`22"E	21/11/2003
154086	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	20/11/2003
154087	*Ctenotus*	*grandis*	*titan*	20°47`12"S	115°27`22"E	21/11/2003
154088	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	21/11/2003
154089	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	22/11/2003
154090	*Ctenotus*	*grandis*	*titan*	20°47`58"S	115°27`12"E	22/11/2003
154151	*Ctenotus*	*pantherinus*	*acripes*	20°47`29"S	115°27`31"E	28/11/2003
154168	*Ctenotus*	*pantherinus*	*acripes*	20°47`58"S	115°27`12"E	30/11/2003
154389	*Ctenotus*	*pantherinus*	*acripes*	20°47`12"S	115°27`22"E	29/11/2003
154091	*Ctenotus*	*saxatilis*		20°47`58"S	115°27`12"E	22/11/2003
154092	*Ctenotus*	*saxatilis*		20°47`58"S	115°27`12"E	22/11/2003
154093	*Ctenotus*	*saxatilis*		20°47`03"S	115°27`21"E	24/11/2003
154094	*Ctenotus*	*saxatilis*		20°47`03"S	115°27`21"E	24/11/2003
154095	*Ctenotus*	*saxatilis*		20°47`12"S	115°27`22"E	21/11/2003
154096	*Ctenotus*	*saxatilis*		20°47`03"S	115°27`21"E	24/11/2003
154097	*Ctenotus*	*saxatilis*		20°47`58"S	115°27`12"E	20/11/2003
154098	*Ctenotus*	*saxatilis*		20°47`58"S	115°27`12"E	24/11/2003
154099	*Ctenotus*	*saxatilis*		20°47`58"S	115°27`12"E	24/11/2003
154149	*Ctenotus*	*saxatilis*		20°47`29"S	115°27`31"E	28/11/2003

Reg No.	Genus	Species	Subspecies	Latitude	Longitude	Date
154150	*Ctenotus*	*saxatilis*		20°47`03"S	115°27`21"E	28/11/2003
154130	*Cyclodomorphus*	*melanops*	*melanops*	20°48`08"S	115°26`52"E	21/11/2003
154131	*Cyclodomorphus*	*melanops*	*melanops*	20°48`08"S	115°26`52"E	21/11/2003
154132	*Cyclodomorphus*	*melanops*	*melanops*	20°47`06"S	115°27`42"E	19/11/2003
154152	*Cyclodomorphus*	*melanops*	*melanops*	20°47`18"S	115°27`43"E	27/11/2003
154154	*Cyclodomorphus*	*melanops*	*melanops*	20°47`58"S	115°27`12"E	29/11/2003
154160	*Cyclodomorphus*	*melanops*	*melanops*	20°47`12"S	115°27`22"E	28/11/2003
154143	*Delma*	*borea*		20°47`24"S	115°27`21"E	21/11/2003
154148	*Delma*	*borea*		20°47`18"S	115°27`43"E	26/11/2003
154170	*Delma*	*nasuta*		20°47`12"S	115°27`22"E	28/11/2003
154362	*Delma*	*nasuta*		20°46`35"S	115°26`53"E	02/12/2003
154142	*Gehyra*	*variegata*		20°47`06"S	115°27`42"E	22/11/2003
154100	*Heteronotia*	*binoei*		20°49`55"S	115°26`06"E	22/11/2003
154101	*Heteronotia*	*binoei*		20°48`06"S	115°26`54"E	22/11/2003
154102	*Heteronotia*	*binoei*		20°48`08"S	115°26`53"E	21/11/2003
154103	*Heteronotia*	*binoei*		20°47`18"S	115°27`46"E	20/11/2003
154104	*Heteronotia*	*binoei*		20°47`28"S	115°27`12"E	21/11/2003
154105	*Heteronotia*	*binoei*		20°47`16"S	115°27`09"E	22/11/2003
154106	*Heteronotia*	*binoei*		20°47`16"S	115°27`09"E	22/11/2003
154107	*Heteronotia*	*binoei*		20°48`08"S	115°26`53"E	21/11/2003
154108	*Heteronotia*	*binoei*		20°48`08"S	115°26`53"E	21/11/2003
154114	*Heteronotia*	*binoei*		20°48`48"S	115°26`31"E	22/11/2003
154141	*Heteronotia*	*binoei*		20°49`24"S	115°27`18"E	24/11/2003
154115	*Lerista*	*bipes*		20°40`16"S	115°26`13"E	23/11/2003
154116	*Lerista*	*bipes*		20°40`16"S	115°26`13"E	23/11/2003
154117	*Lerista*	*bipes*		20°47`18"S	115°27`47"E	20/11/2003
154118	*Lerista*	*bipes*		20°40`16"S	115°26`13"E	23/11/2003
154119	*Lerista*	*bipes*		20°47`18"S	115°27`46"E	20/11/2003
154120	*Lerista*	*bipes*		20°48`20"S	115°27`03"E	21/11/2003
154121	*Lerista*	*bipes*		20°48`24"S	115°27`01"E	22/11/2003
154122	*Lerista*	*bipes*		20°48`24"S	115°27`01"E	22/11/2003
154171	*Lerista*	*bipes*		20°47`12"S	115°27`22"E	01/12/2003
154172	*Lerista*	*bipes*		20°47`03"S	115°27`21"E	01/12/2003
154139	*Lerista*	*muelleri*		20°48`16"S	115°26`57"E	18/11/2003
154140	*Lerista*	*muelleri*		20°40`15"S	115°26`13"E	23/11/2003
154162	*Lerista*	*muelleri*		20°47`12"S	115°27`22"E	27/11/2003
154163	*Lerista*	*muelleri*		20°47`12"S	115°27`22"E	28/11/2003

Reg No.	Genus	Species	Subspecies	Latitude	Longitude	Date
154164	*Lerista*	*muelleri*		20°47`29"S	115°27`31"E	27/11/2003
154165	*Lerista*	*muelleri*		20°47`29"S	115°27`31"E	27/11/2003
154166	*Lerista*	*muelleri*		20°47`58"S	115°27`12"E	27/11/2003
154167	*Lerista*	*muelleri*		20°47`18"S	115°27`43"E	25/11/2003
154133	*Lialis*	*burtonis*		20°48`08"S	115°26`53"E	20/11/2003
154134	*Lialis*	*burtonis*		20°47`28"S	115°27`27"E	21/11/2003
154123	*Menetia*	*greyii*		20°48`24"S	115°27`01"E	22/11/2003
154144	*Menetia*	*greyii*		20°47`32"S	115°26`18"E	23/11/2003
154153	*Menetia*	*greyii*		20°47`03"S	115°27`21"E	28/11/2003
154156	*Menetia*	*greyii*		20°46`35"S	115°26`53"E	29/11/2003
154157	*Menetia*	*greyii*		20°46`35"S	115°26`53"E	29/11/2003
154158	*Menetia*	*greyii*		20°47`29"S	115°27`31"E	29/11/2003
154161	*Menetia*	*greyii*		20°47`12"S	115°27`22"E	28/11/2003
154169	*Menetia*	*greyii*		20°47`12"S	115°27`22"E	28/11/2003
154173	*Menetia*	*greyii*		20°47`03"S	115°27`21"E	01/12/2003
154174	*Morethia*	*ruficauda*	*exquisita*	20°47`58"S	115°27`12"E	30/11/2003
154137	*Notoscincus*	*ornatus*	*ornatus*	20°48`16"S	115°26`57"E	18/11/2003
154138	*Notoscincus*	*ornatus*	*ornatus*	20°48`00"S	115°28`00"E	22/11/2003
154147	*Notoscincus*	*ornatus*	*ornatus*	20°47`03"S	115°27`21"E	28/11/2003
154155	*Notoscincus*	*ornatus*	*ornatus*	20°47`12"S	115°27`22"E	29/11/2003
154159	*Notoscincus*	*ornatus*	*ornatus*	20°47`03"S	115°27`21"E	28/11/2003
154135	*Proablepharus*	*reginae*		20°48`16"S	115°26`57"E	18/11/2003
154136	*Proablepharus*	*reginae*		20°47`28"S	115°27`27"E	24/11/2003
154124	*Pseudechis*	*australis*		20°48`32"S	115°27`18"E	24/11/2003
154145	*Strophurus*	*jeanae*		20°47`20"S	115°27`17"E	22/11/2003

Attachment 9 - Report on the Findings of the Hepetofauna Survey of the Gorgon Project Area 2004. Report to RPS Bowman Bishaw Gorham by Biota Environmental Sciences, April 2005.

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Report on the findings of the herpetofauna survey of the Gorgon project area 2004

Introduction

The purpose of the herpetofauna work was to sample the Gorgon project area at a different season and, specifically, to search for additional herpetofauna species that may have been present in the Gorgon project area. The aim of the survey was to collect species that do not readily enter pit traps and to search for previously unrecorded species, in particular *Aprasia rostrata* (see below). That new species are still to be recorded for Barrow Island is suggested by the recent (Jan 2004) recording of *Varanus brevicauda* on Obe's Beach.

Methodology

The herpetofauna survey was conducted between the 25th August and 1st September 2004 in comparison to the 18th and 25th November 2003. For the 2004 survey, hand foraging and raking was conducted throughout the day as the cooler temperatures enabled reptiles to remain active throughout the daylight hours. However, little nocturnal work was completed because the low temperatures and strong winds after dark precluded any significant reptile activity at night time (Table 1). A total of 33.4mm of rain had fallen on Barrow between 1st April 2004 and the end of the survey compared to an average from April to August inclusive of 162.7mm. This indicates that the survey was conducted during a very dry period.

Table 1: Climatic variables for Barrow Island for the duration of the 2004 herpetofauna survey (data from Bureau of Meteorology website http://www.bom.gov.au/climate/dwo/IDCJDW6008.shtml)

Date	25/8/04	26/8/04	27/8/04	28/8/04	29/8/04	30/8/04	31/8/04	1/9/04	Average
Maximum	23.8	23.9	23.9	23.5	22.4	22.0	21.3	23.1	23.0
Minimum	19.1	18.6	17.7	18.1	17.7	17.7	13.4	14.7	17.1
Rainfall	0	0	0	0	0	0	0	0	0

For all reptiles hand captured or identified in the field, we recorded (1) date, (2) species, (3) number of individuals, (4) location (northings and eastings in WGS 84) and (5) a habitat description. All collecting was undertaken under licences granted to Mr Greg Harold by the Department of Conservation and Land Management (DCLM).

Results

The targeted herpetofauna survey yielded 19 species of reptile (Table 2). This compares with 18 species captured in the 2003 survey and a total of 42 species known from the island (excluding sea-snakes and marine turtles). All of the 19 species were previously

known from the Gorgon project area, except *Lerista elegans*. The location of all individuals captured during the herpetological survey are shown in Figure 1.

Table 2: Reptile species recorded from Barrow Island (Source: Butler 1970, Smith 1976; WA Museum Faunabase, Brad Maryan pers comm.)

Family Agamidae	*Cyclodomorphus melanops melanops**
*Ctenophorus caudicinctus caudicinctus**	*Eremiascincus richardsonii*
Lophognathus gilberti	*Glaphyromorphus isolepis*
*Pogona minor**	*Lerista bipes**
Family Pygopodidae	*Lerista elegans**
*Delma borea**	*Lerista muelleri**
Delma nasuta	*Menetia greyii**
Delma tincta	*Morethia lineoocellata*
Lialis burtonis	*Morethia ruficauda exquisita**
Pygopus nigriceps	*Notoscincus ornatus ornatus**
Family Gekkonidae	*Proablepharus reginae**
Diplodactylus stenodactylus	**Family Typhlopidae**
Gehyra pilbara	*Ramphotyphlops ammodytes*
*Gehyra variegata**	*Ramphotyphlops longissimus*
*Heteronotia binoei**	**Family Varanidae**
Strophurus jeanae	*Varanus acanthurus**
Family Scincidae	*Varanus brevicauda*
Carlia triacantha	*Varanus giganteus**
*Cryptoblepharus carnabyi**	*Family Boidae*
Ctenotus duricola	*Antaresia stimsoni*
*Ctenotus grandis titan**	Family Elapidae
Ctenotus hanloni	*Brachyurophis approximans*
*Ctenotus pantherinus acripes**	*Demansia psammophis reticulata*
*Ctenotus saxatilis**	*Furina ornata*
Ctenotus serventyi	*Pseudechis australis*

* recorded during the 2004 survey

Annotated List

AGAMIDAE

Ctenophorus caudicinctus caudicinctus

This species was recorded on nine occasions at Flacourt Bay, alternative campsites and the Gorgon footprint area. Most records were in *Acacia* over *Triodia* on limestone (seven observations) with the remaining two records being in *Melaleuca cardiophylla* and *Triodia* on limestone. Smith (1976) notes that this species was "*seen all over the island*" whilst Butler (1970) noted is as the "*most prevalent and obvious reptile on the island*."

Pogona minor minor
Recorded from two individuals captured in the alternative campsites and old airport area. One individual was from *Triodia angusta* valleys and the other was from *Triodia* on loam. Smith (1976) collected most specimens from "*2-3 m up in dead Hakea lorea, or Acacia shrubs*". Butler (1970) recorded most specimens from *Acacia coriacea* along the coast and this was the habitat where most individuals were captured during the trapping program in 2003.

PYGOPODIDAE
Delma borea
Recorded on just one occasion from east of the old airport. The individual was captured in *Triodia* on loam. Smith (1976) states that the one specimen he obtained was "out of *Triodia*".
The '*borea'* species complex has recently been reviewed by Brad Maryan (Western Australian Museum), using both morphological and molecular anlaysis. His study suggests that the Barrow Island population is the same species as that from the mainland Pilbara at Mandora.

GEKKONIDAE
Gehyra variegata
A single individual was recorded in the Gorgon project area near the pipeline in *Melaleuca cardiophylla* and *Triodia* on limestone. This individual apparently belong to a species found on Barrow Island and adjacent parts of the Pilbara mainland, which is different from true *variegata* (G. Harold, pers. comm.). Smith (1976) collected his specimens from "*under debris such as timber, iron and old tyres*" and Butler (1970) obtained his specimens from "*dead Acacia coriacea, caves and termitaria*" although it seems likely that his records include other *Gehyra* species.

Heteronotia binoei
Five records from the alternative campsites, Gorgon project area and old airport area. Most records from *Melaleuca cardiophylla* and *Triodia* on limestone (three records) with one record from *Triodia angusta* valleys and one record from cleared areas at the old airport. Smith (1976) notes that this species was "*particularly common under man-made debris*" whilst Butler (1970) recorded this species from "*termitaria, caves, Triodia clumps and under old camp rubbish*".

SCINCIDAE
Cryptoblepharus carnabyi
Recorded from two individuals. One was collected from a stone wall at the main camp and the other was collected from bare sandstone below a limestone cliff at Barge Landing. Butler (1970) collected this species from "*rock faces, mangrove trunks, termitaria and caves*", whilst Smith (1976) collected his specimens from "*mangroves, a eucalypt trunk, the wall of a building and the face of a sink hole*".
This species, as currently recognised, is a species complex containing over a dozen true species. It is not clear how widely distributed the form on Barrow Island is.

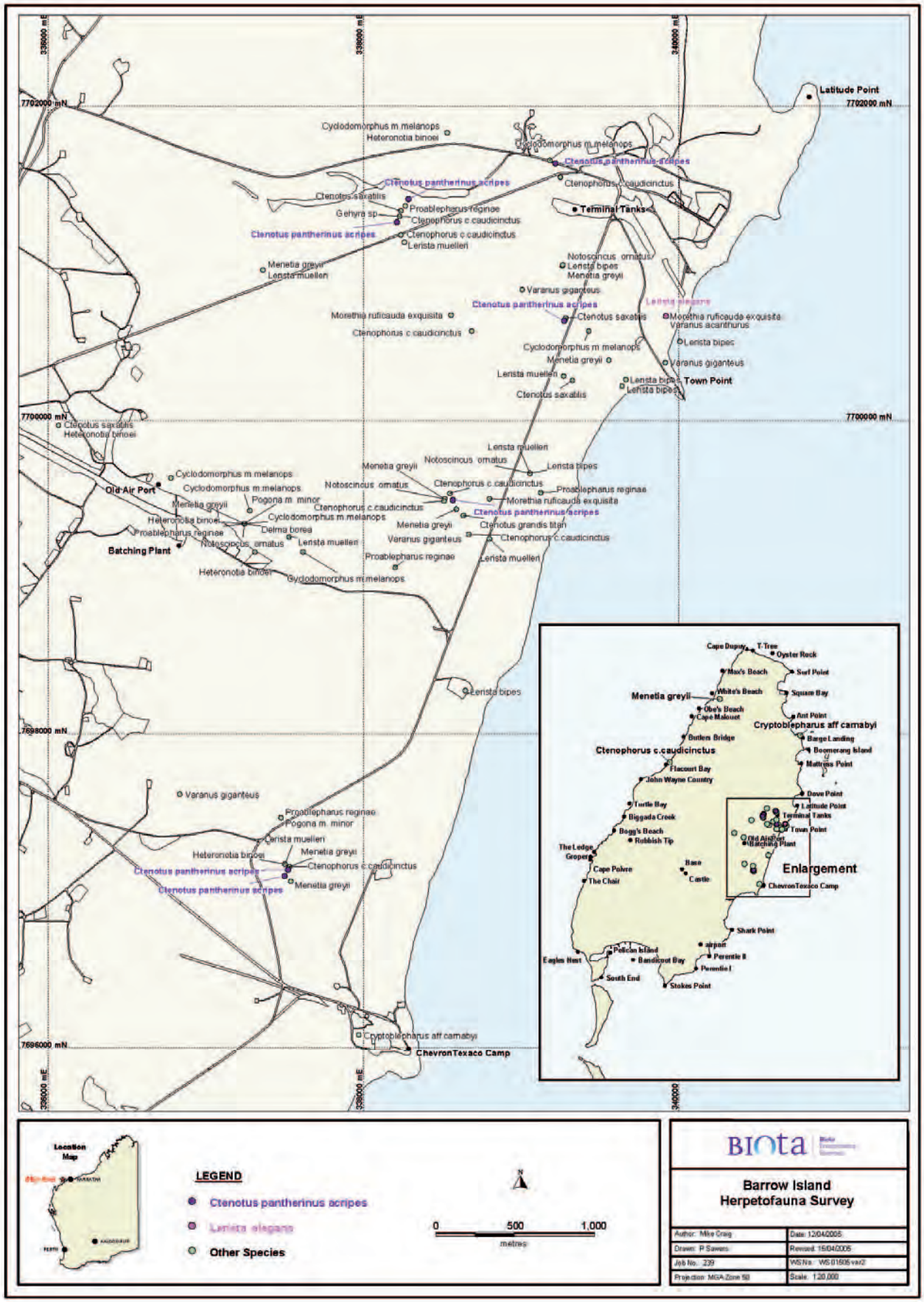

Figure 1. Location of all reptiles captured during the herpetological survey.

Ctenotus grandis titan
Only one capture from *Triodia* on loam in the alternative campsites. Both Butler (1970) and Smith (1976) record this species as being collected from sand areas.

Ctenotus pantherinus acripes
Seven records from the Gorgon project area and alternative campsites. Most records were from *Triodia* on loam (five records) with the remaining two records being from *Melaleuca cardiophylla* and *Triodia* on limestone. This species was recorded from north of the Gorgon footprint during this survey and Butler (1970) recorded his specimens from "*Triodia and Frankenia on barren salt eroded limestone outcrops on the west coast*". Smith (1976) noted the primary habitat as "*rocky areas with Triodia wiseana*". This species is clearly widespread across the island.
According to current taxonomy this sub-species does not occur elsewhere in Western Australia, but is recorded from Northern Territory and Queensland (Horner 1991). There is some question over the validity of the sub-species described for Western Australia (Smith and Aplin 2001) and genetic studies are required.

Ctenotus saxatilis
Five records from White's Beach, old airport area and Gorgon project area. It was recorded in a range of habitats with single records in each of *Acacia* over *Triodia* on limestone, *Melaleuca cardiophylla* and *Triodia* on limestone, *Triodia* on loam, disturbed ground and *Triodia angusta* valleys. Smith (1976) notes that this species is the "*dominant skink on the island ….found in all habitats*." Butler (1970) indicates that this species occurs in "*Triodia and coastal Spinifex thickets*."

Cyclodomorphus melanops melanops
Eight records from the old airport and Gorgon project areas. Two records from each of *Triodia angusta* valleys and regrowth *Triodia* in rehabilitated areas with single records from each of *Melaleuca cardiophylla* and *Triodia* on limestone, *Acacia* over *Triodia* on limestone and *Triodia* on loam. Butler (1970) obtained all his specimens "*from Triodia except one found under a limestone slab*". Smith (1976) gives the habitat o this species as "*T. angusta on consolidated dunes and loamy flats*". He also recorded females with enlarged follicles during October and November.

Lerista bipes
Seven records from the Gorgon project area and Airport Creek. Most records were from *Acacia coriacea* over *Triodia* on coastal sand (three records) and *Triodia* on loam (two records) with single records from each of *Melaleuca cardiophylla* and *Triodia* on limestone and *Acacia* over *Triodia* on limestone. Butler (1970) said that "*their tracks are extremely common throughout the island in sandy areas*" and Smith (1976) notes that this species was recorded from "*consolidated dunes and loamy flats*".

Lerista elegans
One record from just north of Town Point, in *Acacia coriacea* on white beach sand. Not previously recorded in the Gorgon project area. During the 2004 trapping survey, the species was recorded in large numbers from *Triodia* on white sand in the Bandicoot Bay

area and Butler (1970) reports it as being common "*on Triodia in sand*". Not collected by Smith (1976).

Lerista muelleri
Seven records from the alternative campsites, old airport area and Gorgon project area. Most records from *Acacia* over *Triodia* on limestone (five observations), with the remaining two records from *Melaleuca cardiophylla* and *Triodia* on limestone. Smith (1976) notes that this species was found "*among consolidated dunes*" and Butler (1970) recorded one from a "*sand dune…..among Acacia and Spinifex*".
A recent review of this species complex by Laurie Smith at the WA Museum yielded in excess of 15 new species and it is appears that the Barrow Island taxon is similar to that on the adjacent Pilbara coast.

Menetia greyii
Nine records from White's Beach, alternative campsites, old airport area and Gorgon project area. Most records from *Melaleuca cardiophylla* and *Triodia* on limestone (four records), with further records from *Triodia* on loam (three records), *Triodia angusta* valleys (one record) and *Triodia* on the edge of a rehabilitated area (one record). Not recorded by either Butler (1970), or Smith (1976).
This taxa is know to be a complex of species that displays polyploidy, probable parthenogenesis, sympatry and hybridisation (Aplin and Smith 2001).

Morethia ruficauda exquisita
Three records from the Gorgon project area in *Melaleuca cardiophylla* and *Triodia* on limestone (two records) and *Acacia coriacea* on white sand (one record). Smith (1976) found this species in all habitats but noted it "*mostly in siliceous foredunes and consolidated dunes*" and Butler (1970) found it "*on limestone edges of sand dunes*".

Notoscincus ornatus ornatus
Four records from the old airport and Gorgon project areas. Two records from *Acacia* over *Triodia* on limestone, with single records from each of *Triodia* angusta valleys and *Melaleuca cardiophylla* and *Triodia* on limestone. Not recorded by Butler (1970) but Smith (1976) notes that this species "*can be found in all habitats but is most common in consolidated dunes and loamy flats*".

Proablepharus reginae
Five records from the alternative campsites, old airport area and Gorgon project area. Three records from *Triodia* on loam, with single records from each of *Triodia angusta* valleys and *Melaleuca cardiophylla* and *Triodia* on limestone. Butler (1970) recorded the species from "*Triodia on sand*" whilst Smith (1976) recorded it only from "*Triodia angusta on sandy soil*" but noted that it was one of the most common lizards on the island.

VARANIDAE

Varanus acanthurus

One record from *Acacia coriacea* on white sand just north of Town Point. Not recorded by Butler (1970) and Smith (1976) collected three specimens, "*two under rubbish, the other out of Triodia*".

Varanus giganteus

Four observations from the alternative campsites and Gorgon project area. Two observations in *Acacia* over *Triodia* on limestone with one observation from *Triodia* on loam. Butler (1970) described the species as "*wide-ranging over all habitats*" and Smith (1976) had 27 sightings "*in all habitats*".

Discussion

The 2004 herpetofauna survey recorded only one additional species for the Gorgon project area, the skink *Lerista elegans*. This species was recorded north of Town Point on the edge of the Gorgon footprint. However, the species is widespread elsewhere on the island and appears to be particularly common in white sand areas around Bandicoot Bay. In addition, *Ctentous pantherinus acripes* was also recorded to the north of the Gorgon footprint which, combined with Butler's records from the west coast, indicate that the species is widespread outside the Gorgon footprint. None of the species recorded in he Gorgon project area are restricted to that part of the island.

One species that was not recorded during the 2004 survey was the pygopodid *Aprasia rostrata*, even though it was specifically targeted. This species is found on the Montbello Islands and on the Pilbara mainland at Cape Range, so its absence from Barrow Island is surprising. Its apparent absence from the Gorgon project area suggests that searches in the northern part of Barrow Island around Cape Dupuy may be more fruitful. The northern part of the island was separated from the much larger southern part when sea levels were higher a few thousand years ago (W.H. Butler, pers. comm.). As this area is geographically closer to the Montebello Islands, it seems the most likely place for the species to occur, assuming that it is present on Barrow Island.

Another species not recorded by this survey, *Ramphotyphlops longissimus*, is the only reptile species endemic to Barrow Island. However, this species is known from only one pair hauled up from below ground with some well casings (Storr et al. 2002). Based on its morphology, this species appears to spend its entire life in subterranean limestone caves. Thus, there is almost no chance of detecting one during a terrestrial survey such as this one. It is hoped that further stygofauna and troglobitic surveys will reveal more specimens.

A total of 27 reptile species are now known from the Gorgon project area (Table 3). As reptile assemblages can change markedly over time, particularly in arid areas in response to rainfall events, it is unlikely that the reptile list for the Gorgon project area is complete. However, it is likely that any additional species are rare or temporally highly variable in

abundance in the project area. Based on the species recorded so far, none are restricted to the Gorgon project area.

Table 2: Reptile species recorded from the Gorgon Project Area

Family Agamidae	*Cyclodomorphus melanops melanops*
Ctenophorus caudicinctus caudicinctus	*Lerista bipes*
Pogona minor	*Lerista elegans*
Family Pygopodidae	*Lerista muelleri*
Delma borea	*Menetia greyii*
Delma nasuta	*Morethia ruficauda exquisita*
Lialis burtonis	*Notoscincus ornatus ornatus*
Pygopus nigriceps	*Proablepharus reginae*
Family Gekkonidae	**Family Typhlopidae**
Gehyra variegata	*Ramphotyphlops ammodytes*
Heteronotia binoei	**Family Varanidae**
Strophurus jeanae	*Varanus acanthurus*
Family Scincidae	*Varanus giganteus*
Carlia triacantha	**Family Boidae**
Cryptoblepharus carnabyi	*Antaresia stimsoni*
Ctenotus grandis titan	**Family Elapidae**
Ctenotus pantherinus acripes	*Pseudechis australis*
Ctenotus saxatilis	

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Horner, P. (1991). Skinks of the Northern Territory. Northern Territory Government Printing Office, Darwin.

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Appendix 1: A list of the all the reptiles seen or captured during the 2004 herpetofauna survey including location and habitat information.

Family	Species	Number	Northing	Easting	Habitat	Comments
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	338238	7701179	*Acacia* over *Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	331192	7705341	*Triodia* on limestone	Limestone headland
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	2	338229	7701297	*Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	338511	7699486	*Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	338549	7699533	*Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	338668	7699272	*Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	3	339249	7701547	*Triodia* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	337532	7697155	*Triodia*/*Melaleuca* on limestone	
AGAMIDAE	*Ctenophorus caudicinctus caudicinctus*	1	338687	7700567	*Triodia*/*Melaleuca* on limestone	
AGAMIDAE	*Pogona minor minor*	1	337246	7699341	*Triodia angusta*	In rehab pit
AGAMIDAE	*Pogona minor minor*	1	337478	7697468	*Triodia* on red loamy sand	
PYGOPODIDAE	*Delma borea*	2	337246	7699341	*Triodia* on red loamy sand	
GEKKONIDAE	*Gehyra variegata*	1	338229	7701297	*Triodia*/*Melaleuca* on limestone	
GEKKONIDAE	*Heteronotia binoei*	9	337246	7699341	*Triodia angusta*	On edge of rehab
GEKKONIDAE	*Heteronotia binoei*	1	338532	7701830	*Triodia* on limestone	
GEKKONIDAE	*Heteronotia binoei*	1	337312	7699160	*Triodia*/*Melaleuca* on limestone	
GEKKONIDAE	*Heteronotia binoei*	1	337503	7697172	*Triodia*/*Melaleuca* on limestone	Dead in pit
GEKKONIDAE	*Heteronotia binoei*	1	336068	7699966	?	Dead in pit trap
SCINCIDAE	*Cryptoblepharus carnabyi*	1	341044	7707397	On bare sandstone below limestone cliff	Dead in pit
SCINCIDAE	*Cryptoblepharus carnabyi*	3	337971	7696084	Stone walls at camp	
SCINCIDAE	*Ctenotus grandis titan*	1	338634	7699393	*Triodia* on red loamy sand	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	337501	7697096	*Acacia* over *Triodia* on limestone	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	337522	7697137	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	339273	7700632	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	338567	7699491	*Triodia* on red loamy sand	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	339217	7701636	*Triodia* on red loamy sand	
SCINCIDAE	*Ctenotus pantherinus acripes*	1	338213	7701261	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Ctenotus pantherinus acripes*	3	338286	7701408	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Ctenotus saxatilis*	1	339325	7700252	*Acacia* over *Triodia* on limestone	

SCINCIDAE	*Ctenotus saxatilis*	1	334970	7710149	Dead *Triodia* along creek	
SCINCIDAE	*Ctenotus saxatilis*	1	336068	7699966	Scattered herbs on bare hard loam	Dead in pit trap
SCINCIDAE	*Ctenotus saxatilis*	1	339283	7700651	*Triodia* on red loamy sand	
SCINCIDAE	*Ctenotus saxatilis*	1	338238	7701333	*Triodia*/*Melaleuca* on limestone	Dead in pit trap
SCINCIDAE	*Cyclodomorphus melanops melanops*	2	337280	7699424	Sparse *Acacia* over *Triodia* on rehab	
SCINCIDAE	*Cyclodomorphus melanops melanops*	1	337618	7699160	*Triodia angusta*	
SCINCIDAE	*Cyclodomorphus melanops melanops*	1	?	?	*Triodia angusta*	
SCINCIDAE	*Cyclodomorphus melanops melanops*	1	336780	7699632	*Triodia* on edge of rehab	
SCINCIDAE	*Cyclodomorphus melanops melanops*	1	338532	7701830	*Triodia* on limestone	
SCINCIDAE	*Cyclodomorphus melanops melanops*	2	339182	7701655	*Triodia* on red loamy sand	
SCINCIDAE	*Cyclodomorphus melanops melanops*	1	339429	7700567	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Cyclodomorphus melanops melanops*	4	337246	7699341	?	
SCINCIDAE	*Lerista bipes*	1	339640	7700217	*Acacia* coriacea on wet sand dune	
SCINCIDAE	*Lerista bipes*	1	339664	7700258	*Acacia* coriacea on wet sand dune	
SCINCIDAE	*Lerista bipes*	1	338646	7698278	*Acacia* coriacea over *Triodia* on sand	
SCINCIDAE	*Lerista bipes*	1	339056	7699662	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Lerista bipes*	1	340007	7700502	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Lerista bipes*	2	339056	7699662	*Triodia* on limestone	Dead in pit trap
SCINCIDAE	*Lerista bipes*	2	339262	7700983	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Lerista elegans*	1	339918	7700662	*Acacia* coriacea on white beach sand	
SCINCIDAE	*Lerista muelleri*	1	338260	7701133	*Acacia* over *Triodia* on limestone	
SCINCIDAE	*Lerista muelleri*	1	338800	7699243	*Acacia* over *Triodia* on limestone	
SCINCIDAE	*Lerista muelleri*	1	337363	7700956	*Triodia* on limestone	
SCINCIDAE	*Lerista muelleri*	1	339056	7699662	*Triodia* on limestone	Dead in pit trap
SCINCIDAE	*Lerista muelleri*	1	339270	7700280	*Triodia* on limestone	Dead in pit trap
SCINCIDAE	*Lerista muelleri*	2	337503	7697172	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Lerista muelleri*	1	337529	7699257	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Menetia greyii*	1	334970	7710149	Dead *Triodia* along creek	
SCINCIDAE	*Menetia greyii*	1	337541	7697063	*Melaleuca* & *Acacia* over *Triodia* on sandy loam	
SCINCIDAE	*Menetia greyii*	7	337246	7699341	*Triodia* on edge of rehab	
SCINCIDAE	*Menetia greyii*	2	338589	7699433	*Triodia* on red loamy sand	
SCINCIDAE	*Menetia greyii*	1	339556	7700383	*Triodia* on red loamy sand	
SCINCIDAE	*Menetia greyii*	2	337363	7700956	*Triodia*/*Melaleuca* on limestone	

SCINCIDAE	*Menetia greyii*	1	337532	7697155	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Menetia greyii*	1	338516	7699499	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Menetia greyii*	1	339262	7700983	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Morethia ruficauda exquisita*	1	339918	7700662	*Acacia coriacea* on white beach sand	
SCINCIDAE	*Morethia ruficauda exquisita*	1	338556	7700668	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Morethia ruficauda exquisita*	1	338800	7699499	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Notoscincus ornatus ornatus*	1	337246	7699341	*Triodia angusta*	On edge of rehab
SCINCIDAE	*Notoscincus ornatus ornatus*	1	338516	7699499	*Triodia* on limestone	
SCINCIDAE	*Notoscincus ornatus ornatus*	1	339056	7699662	*Triodia* on limestone	Dead in pit
SCINCIDAE	*Notoscincus ornatus ornatus*	1	339264	7700988	*Triodia*/*Melaleuca* on limestone	
SCINCIDAE	*Proablepharus reginae*	1	337478	7697468	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Proablepharus reginae*	1	339124	7699538	*Acacia* over *Triodia* on loamy sand	
SCINCIDAE	*Proablepharus reginae*	1	338202	7699061	*Melaleuca* over *Triodia* on loamy sand	
SCINCIDAE	*Proablepharus reginae*	1	337246	7699341	*Triodia angusta*	On edge of rehab
SCINCIDAE	*Proablepharus reginae*	1	338266	7701364	*Triodia*/*Melaleuca* on limestone	
VARANIDAE	*Varanus acanthurus*	1	339918	7700662	*Acacia coriacea* on white beach sand	Dead
VARANIDAE	*Varanus giganteus*	1	338668	7699272	*Triodia* on limestone	
VARANIDAE	*Varanus giganteus*	1	339914	7700365	*Triodia* on limestone	Town point
VARANIDAE	*Varanus giganteus*	1	336836	7697617	*Triodia* on red loamy sand	
VARANIDAE	*Varanus giganteus*	1	339007	7700831	?	

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Technical Appendix C3

Avifauna

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

AVIFAUNA

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April 2005

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1 Introduction

The Gorgon Venture proposes to develop a terrestrial gas processing facility and associated marine infrastructure at Town Point on the east coast of Barrow Island. The proposed development area near Town Point includes littoral and terrestrial habitats used by shorebirds, seabirds and landbirds. Direct loss of some of these habitats and disturbance to surrounding areas is likely to affect local avifauna.

Formal assessment of the impacts of the proposed development requires information on the significance of the impacted areas to avifauna. Protected and migratory species are known to occur on Barrow Island, however, quantitative data on the distribution and abundance of avifauna around the Island are scarce.

Field surveys and literature reviews were conducted on behalf of the Gorgon Venture for the earlier Environmental, Social and Economic (ESE) Review of the proposal (Bamford 2002, Astron Environmental 2002). The ESE Review process identified gaps in existing knowledge concerning the distribution and seasonality of birds in potential impact areas.

Most shorebirds and some other species are listed as migratory and are known to be abundant on the Island (Sedgwick 1978), but it is not clear for which species the Island is of particular importance, nor how the species vary in abundance during the year or across the Island. Previous studies indicated that the Bandicoot Bay area in the south of Barrow Island is the main area of importance for migratory shorebirds (Sedgwick 1978), but little was known of the importance of beaches near Town Point in relation to the rest of the Island.

Bamford Consulting Ecologists were engaged to redress this lack of information, by surveying avifauna in the development area in 2003/2004 and assessing the significance of this area to regional and local populations. This report presents the findings of the current study and provides assessment of the importance of the proposed development area in relation to other areas of Barrow Island for avifauna.

The current study addresses three aspects of the avifauna of Barrow Island:

- littoral avifauna (waterbirds that utilise coastal environments)
- landbirds
- Double Island seabirds

The littoral avifauna surveys aimed to identify the importance of the Town Point area for avifauna and to contribute to an understanding of the importance of Barrow Island for these species.

Landbird surveys were designed to compare the abundance of landbirds in the vicinity of the proposed gas processing facility with abundances in surrounding areas and with data from other studies on Barrow Island. The importance of different habitat and landform types for landbirds was investigated to facilitate estimates of the wider distribution of these birds on the Island.

Double Island, about four kilometres north-east of the project area, is known to support breeding populations of the wedge-tailed shearwater and bridled tern (Astron Environmental 2002). Although some distance from the proposed development area, it was suggested that lights might affect the breeding colony of shearwaters, particularly

through mortality of young birds attracted to the proposed development's lights. Preliminary surveys of this colony were carried out in October and November 2003.

2 Methods

2.1 Field Program

Field surveys were undertaken monthly between September 2003 and September 2004. Dates of surveys and activities undertaken during each survey are presented in Table 2-1. Most survey work was undertaken by Dr Mike Bamford and Dr Mike Craig (Bamford Consulting Ecologists). This report presents the results of all surveys, September 2003 to September 2004.

Table 2-1 – Barrow Island Sampling Program, September 2003 to September 2004

Sampling period	Littoral birds	Landbirds	Double Island seabirds
8-12 Sept 2003	*	*	
1-7 Oct 2003	*	*	*
22 Nov – 2 Dec 2003	*	*	*
11-16 Dec 2003	*	*	
9-14 Jan 2004	*	*	
6-11 Feb 2004	*	*	
11-17 March 2004	*	*	
21 – 28 April 2004	*	*	
21 – 24 May 2004	*	*	
18-21 June 2004	*	*	
16-19 July 2004	*	*	
18 –22 August 2004	*	*	
15-19 September 2004	*	*	

2.2 Littoral Avifauna Surveys

Surveys of littoral avifauna involved monthly counts around as much of the Island as possible and detailed observations on the coastline north and south of Town Point. Monthly counts were carried out during high tide periods, usually within two hours of the high tide, when most littoral avifauna were concentrated on beaches and headlands. Surveys were conducted at times when the maximum tide was at least 2.7 m (WAPET Landing datum). Surveys were carried out on foot by experienced observers, who identified birds with binoculars (10 x) and spotting telescopes (20 x to 60 x). Birds were counted individually, where possible, but when large flocks were encountered, standard approaches of estimation were used, such as block counting and using the proportion of each species determined from a detailed count to estimate the number of that species present in a mixed flock.

For the purposes of littoral avifauna counts, Barrow Island was divided into regions and sites, the sites consisting of individual bays, beaches and headlands (Figure 2-1). Within each site, birds were recorded as being either located at a roost, where ten or more birds

were concentrated, or outside of roosts. The co-ordinates of each roost (WGS84 datum) were recorded using a hand-held GPS unit. Survey coverage was not the same on each field trip and is summarised in Attachment 1.

Nearly the whole coastline of Barrow Island was surveyed from January to September 2004, most of the coast was surveyed from October to December 2003 and over half the coastline was surveyed in September 2003 (Attachment 1). To facilitate comparison of island-wide abundance between months, abundances at sites that were not surveyed were estimated for September to December 2003.

Population estimates for the whole island for September to December 2003 were derived by adding the abundances of birds at surveyed sites to the estimated abundance of birds at unsurveyed sites. Abundances of birds at unsurveyed sites was estimated from the proportional distribution of birds around the island in surveys from January to March 2004, when numbers were high and virtually all the island was counted.

The proportion of the island-wide total abundance of birds that was present at each of the beaches surveyed in January to March 2004 was used to scale up island-wide abundances for September to December 2003. This assumes that the proportion of birds using various sites was constant between September and December 2003 and between January and March 2004.

Littoral avifauna foraging in intertidal habitats in the vicinity of Town Point were counted at low tide. Waterbirds were counted on Terminal Beach (between Town Point and the pipeline to the north) and on Bivalve Beach (between Town Point and the first rocky point to the south). All birds within this area were counted using a spotting scope and classified as either within 200 m of Town Point or 200 m to 400 m from Town Point.

2.2.1 Double Island Seabird Surveys

Double Island is known to support breeding colonies of the wedge-tailed shearwater and bridled tern, and was visited in October and November 2003. Both islands were surveyed in October, but only the South Island was revisited in November because it supported the most accessible breeding areas for shearwaters. During the visits, observations were made on activity in some burrows and estimates were made of numbers of burrows present in the main breeding areas.

2.2.2 Landbird Surveys

Landbirds were surveyed along six transects in the vicinity of the proposed gas processing facility (Figure 2-2). Each transect was one kilometre long and sampled twice (once by each observer) during each monthly survey. All surveys occurred between 0600 and 0800 hours, when landbirds are most active and their densities can be most accurately estimated. The start and finish coordinates of each transect are shown in Table 2-2.

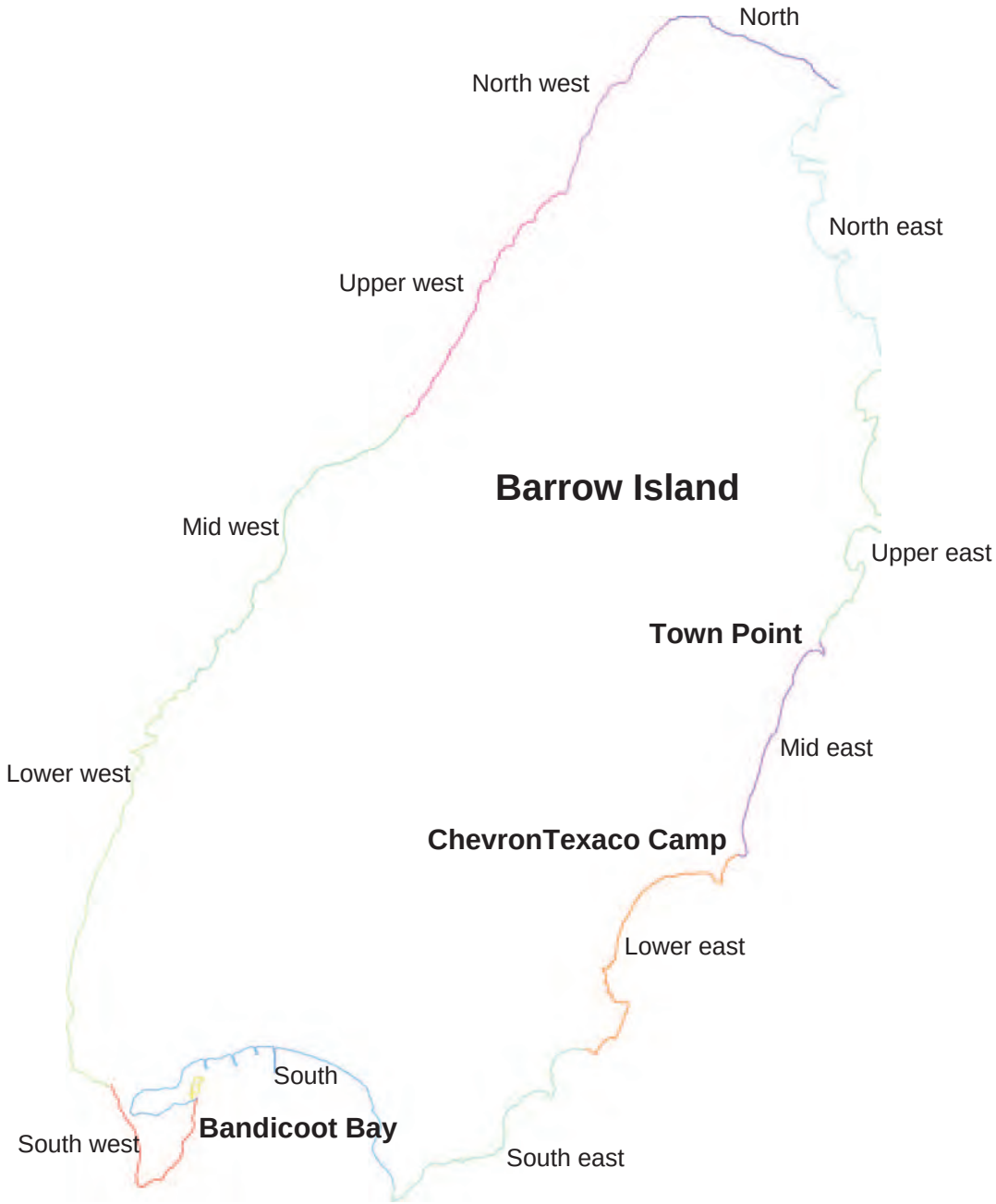

Figure 2-1 - Littoral Avifauna Survey Regions Around Barrow Island

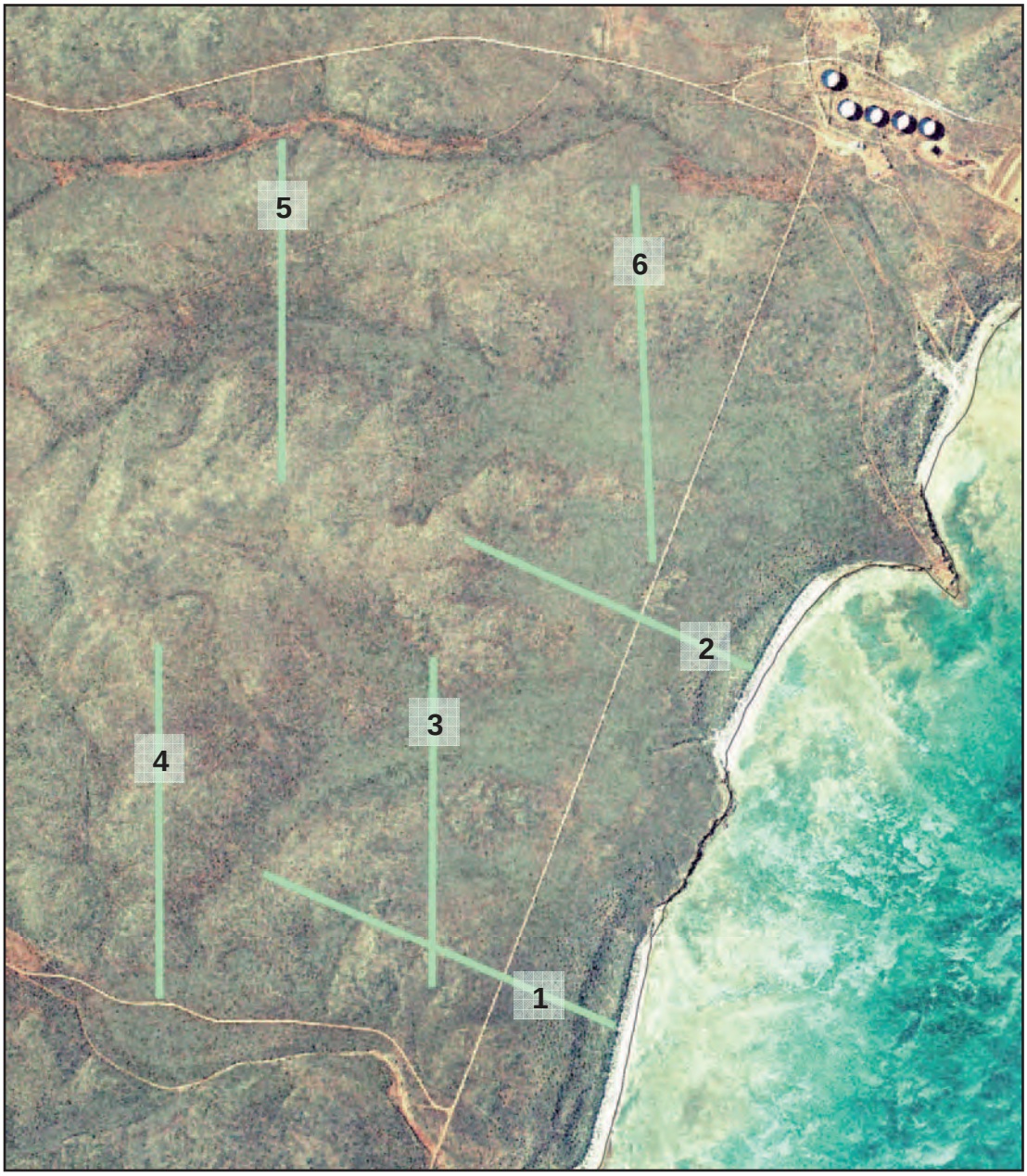

Figure 2-2 - Landbird Survey Transects

Table 2-2 - Landbird Transects within the Proposed Development Area - Co-ordinates: WGS84 (GDA94) Datum, Zone 50

Transect No.	Start	Finish
1	339170E, 7699045N	338156E, 7699495N
2	339527E, 7700100N	338748E, 7700460N
3	338645E, 7700115N	338645E, 7699155N
4	337855E, 7699146N	337850E, 7700149N
5	338210E, 7700618N	338210E, 7701615N
6	339234E, 7701482N	339283E, 7700387N

Surveys along the landbird transects involved walking slowly along each transect, recording landbirds within 25 m either side and beyond 25 m of each transect. Only records from within 25 m of each transect were used for the calculation of density estimates. The locations where birds within 25 m were first observed were recorded with a handheld GPS unit. Birds were identified and counted and some observations were made, such as the presence of male white-winged fairy- wrens in breeding plumage.

Each transect was 50 m wide and one kilometre long and therefore covered an area of five hectares. Within each transect, bird counts were related to vegetation type by recording the principle type of vegetation in 100 m units along each transect. The number of 100 m units in which each of the six main vegetation types was represented is presented in Table 2-3.

Details of landbird surveys conducted in October 2004 can be found in Attachment 5.

Table 2-3 - Vegetation Types on the Landbird Transects. F = Number of 100 m Units in Total Dominated by Each Vegetation Type

Vegetation code	Vegetation type	F
1	*Acacia coriacea* over *Triodia angusta* on coastal red, sandy dunes	4
2	*Acacia bivenosa* over mixed *Triodia* spp. on red sandy-loam plain	17
3	*Melaleuca* over mixed *Triodia* spp. on shallow soils of limestone rises and ridges	26
4	*Triodia angusta* forming dense stands with or without emergent shrubs in red sandy-loam valleys	2
5	*Triodia wiseana* occasionally with shrubs <1 percent cover on shallow soils of limestone ridges	3
6	Low *Acacia bivenosa* over mixed *Triodia* spp. on shallow soils of limestone slopes	8

3 Results

3.1 Littoral Avifauna

3.1.1 Barrow Island Total Counts

Monthly and maximum counts of each littoral avifauna species on Barrow Island are presented in Attachment 2.

A minimum of 32 119 littoral avifauna were counted on Barrow Island during the period September 2003 to September 2004. The highest monthly count of all birds was 20 428 in September 2004. Monthly counts of some species qualify Barrow Island as an internationally-significant migratory shorebird site, under the Ramsar Convention for supporting >1 % of a species' population in the East Asian-Australasian Flyway. Population estimates for migratory shorebirds in the East Asian-Australasia Flyway have been calculated by Bamford *et al.* (in press) and have been calculated for non-migratory shorebirds and terns by Wetlands International (2002).

Barrow Island is a regionally significant site for grey-tailed tattlers (6.6 % of known population), ruddy turnstones (5.5 % of known population), red-necked stints (2.4 % of known population) and fairy terns (8.3 % of known population).

In addition, counts of sanderlings, greater sand plovers and lesser sand plovers during southward migration period (September to November), met the staging criterion (0.25 % of a species' population) of the Ramsar Convention. Counts of roseate terns over adjacent waters in August 2002 (Astron Environmental 2002) and of bridled terns around Double Island in November 2003, may also be significant for these species. Population estimates for common terns in the north-west of Australia are uncertain and therefore the significance of over 1708 common terns in November 2003 is unknown. The maximum count of the sooty oystercatchers (83) represents 1.1 % of the known population of the distinctive northern race (*ophthalmicus*) of the species (Wetlands International 2002).

The total counts from January to March are based on surveys covering nearly all of the shoreline of Barrow Island, whereas coverage varied from September to December (see Attachment 1). Total Island-wide estimates based on the subset of sites surveyed in September, based on the sites surveyed between January and March and extrapolated to all sites (total) are presented in Figure 3-1. Total littoral avifauna abundances around Barrow Island increased during the southward migration in September to November 2003, dropped slightly in December and then peaked again in January to March 2004. Total island-wide abundances decreased following the northward migration and remained low between April and August 2004. The southward migration in 2005 appeared to start earlier than previously, with the highest total abundances counted in September 2004.

Monthly counts of the most abundant species are presented in Figure 3-2, Figure 3-3 and Figure 3-4 , to examine monthly patterns for the main species. Several of the most abundant species are migrants that showed a peak during southward migration and during the non-breeding season. These included the red-necked stint (Figure 3-3), and greater and lesser sand plovers (Figure 3-4). The common tern (Figure 3-3) contributed significantly to the overall spring peak while the silver gull and fairy tern (Figure 3-2) contributed to the summer non-breeding season peak. In contrast, grey-tailed tattler and ruddy turnstone abundances (Figure 3-3) displayed little variation during the spring-

summer period (September 2003 to March 2004). Numbers of the bar-tailed godwit were constant over the non-breeding period but peaked slightly during the northward migration in March 2004 (Figure 3-2).

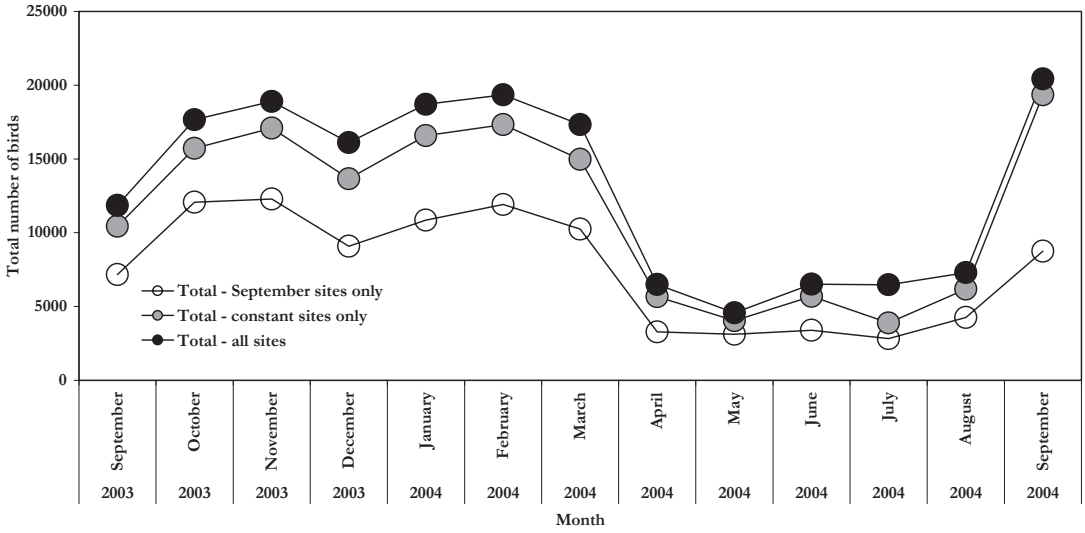

Figure 3-1 - Total Numbers of Waterbirds from September 2003 to September 2004. September 2003 to December 2003 Counts are Estimates

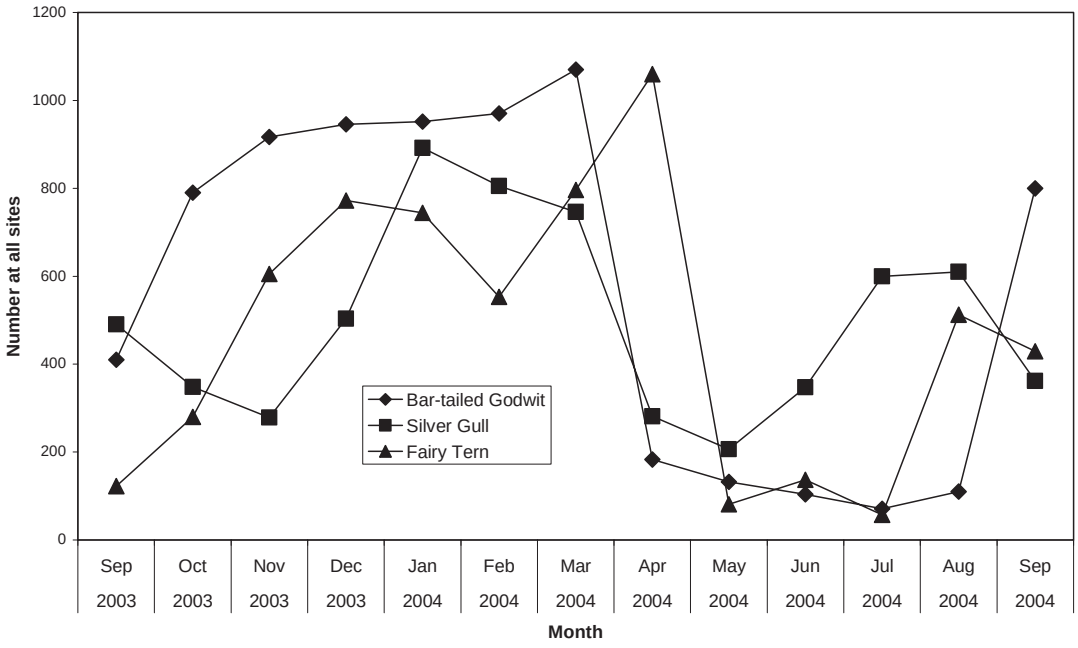

Figure 3-2 - Total Numbers of Bar-tailed Godwits, Silver Gulls and Fairy Terns from September 2003 to September 2004. September 2003 to December 2003 Counts are Estimates

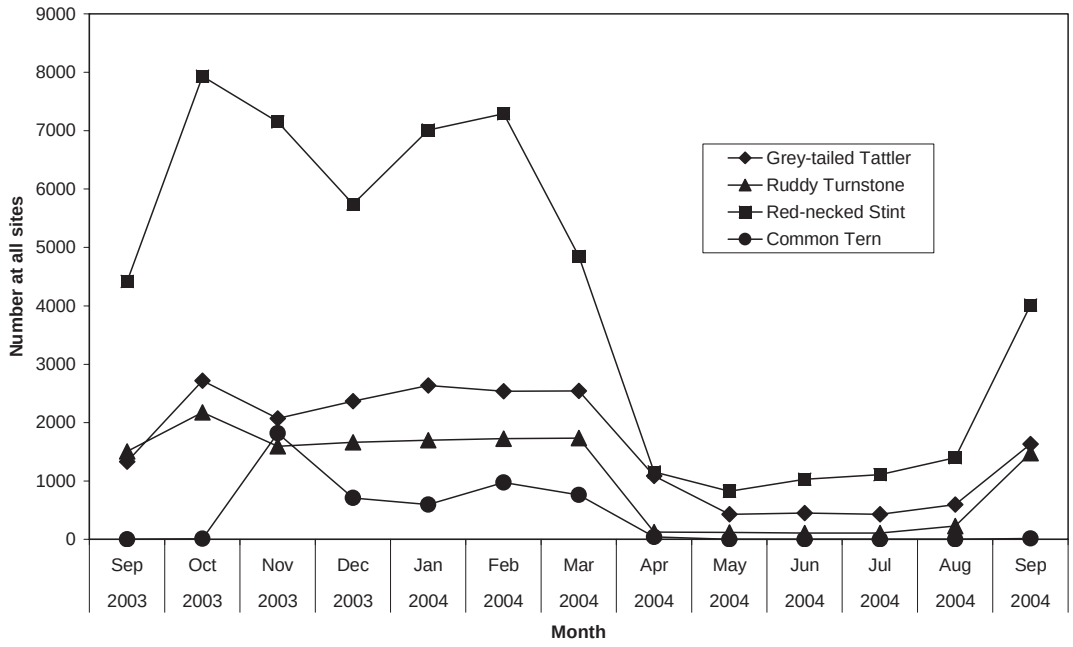

Figure 3-3 - Total Numbers of Grey-tailed Tattlers, Ruddy Turnstones, Red-necked Stints and Common Terns from September 2003 to September 2004. September 2003 to December 2003 Counts are Estimates

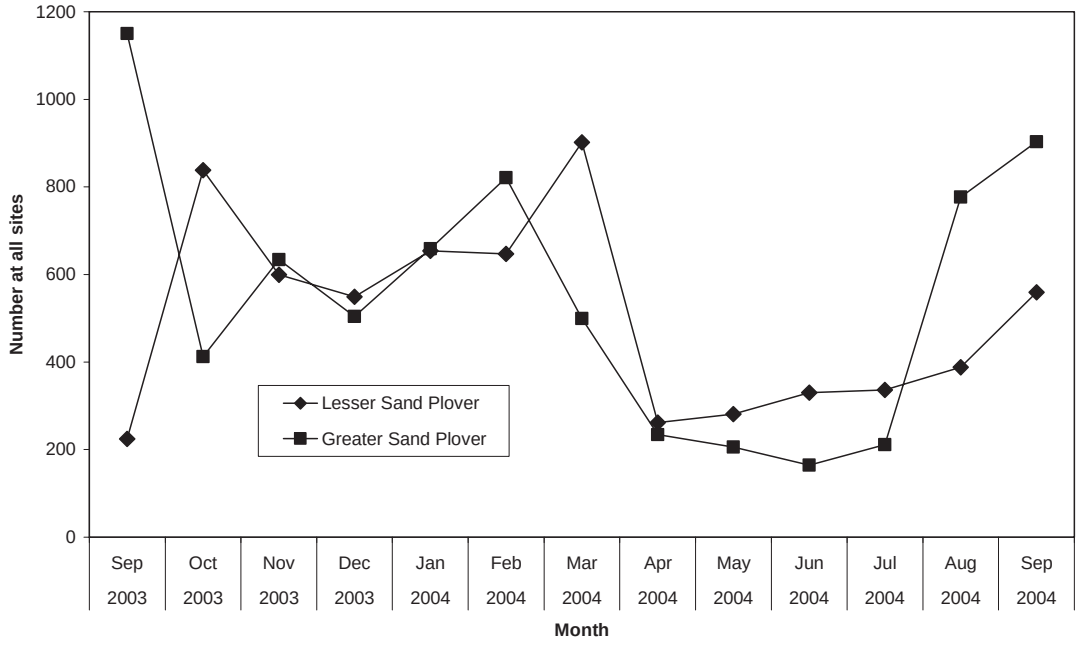

Figure 3-4 - Total Numbers of Lesser Sand Plovers and Greater Sand Plovers from September 2003 to September 2004. September 2003 to December 2003 Counts are Estimates

3.1.2 Distribution of Littoral Avifauna on Barrow Island

The abundances of all littoral avifauna pooled, and of the most abundant species in different sections of the shoreline around Barrow Island, are presented in Figure 3-5 to Figure 3-14. All of the monthly count data for various sections of the Barrow Island shoreline (regions) for all species pooled and for the most abundant species are presented in Attachment 3.

Littoral avifauna in general were concentrated in the south-east and south of Barrow Island (Figure 3-5) along beaches from the existing camp to the Bandicoot Bay area. This pattern was common to the majority of the most abundant species (Figure 3-6 to Figure 3-12). Silver gulls were more evenly distributed around the Island (Figure 3-13). Grey-tailed tattlers were also abundant in the North-East (Figure 3-7). Among less commonly observed species, the sanderling was recorded mainly in the South-West region but most other species were concentrated in the Lower East, South-East and/or South. There was little evidence of seasonal variation in distribution amongst regions of the Barrow Island shoreline.

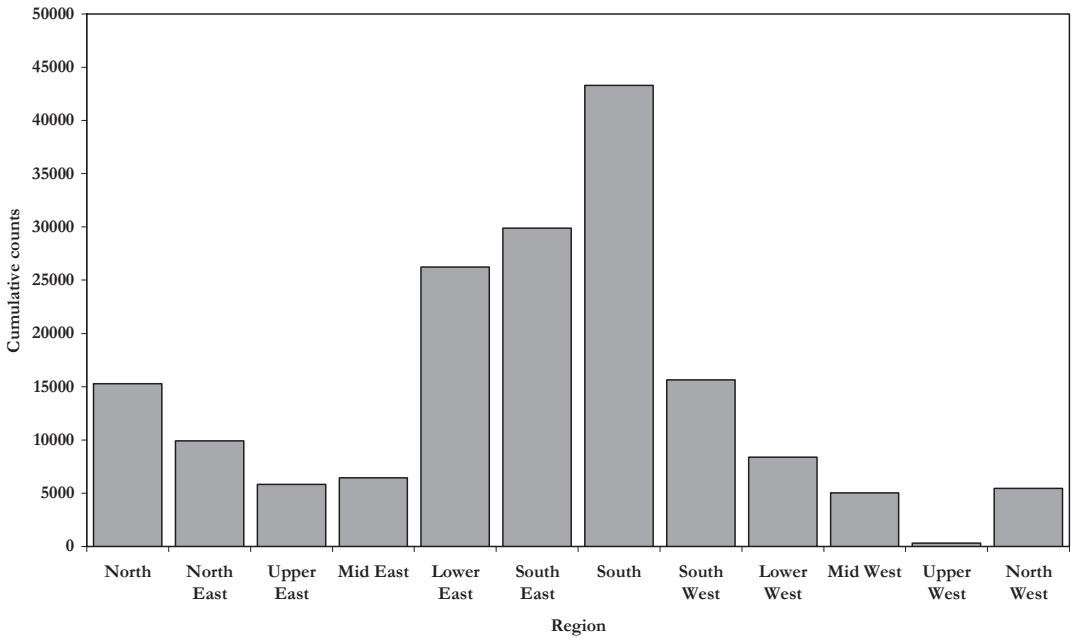

Figure 3-5 - Regional Distribution of all Waterbird Species Pooled from all Surveys, September 2003 to September 2004. Counts include Estimated Values for September to December 2003

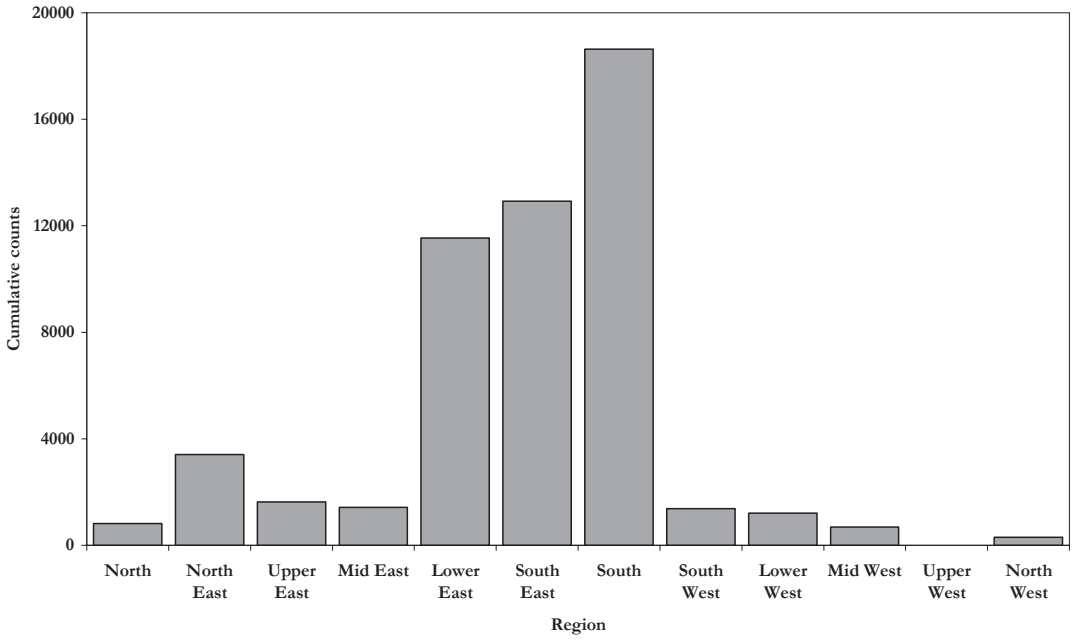

Figure 3-6 - The Regional Distribution of Red-Necked Stints on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

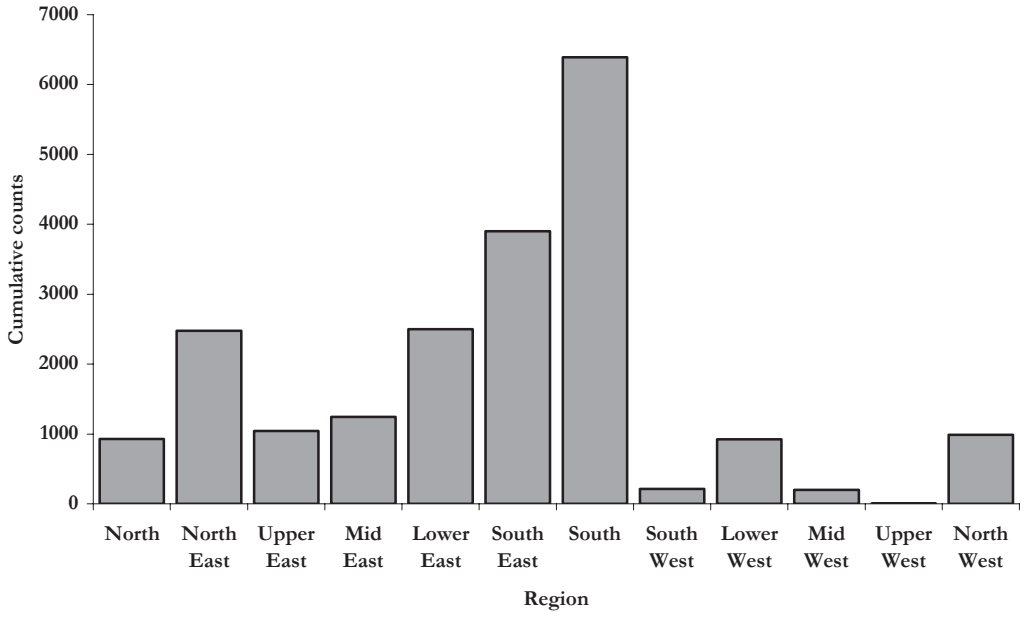

Figure 3-7 - The Regional Distribution of Grey-Tailed Tattlers on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

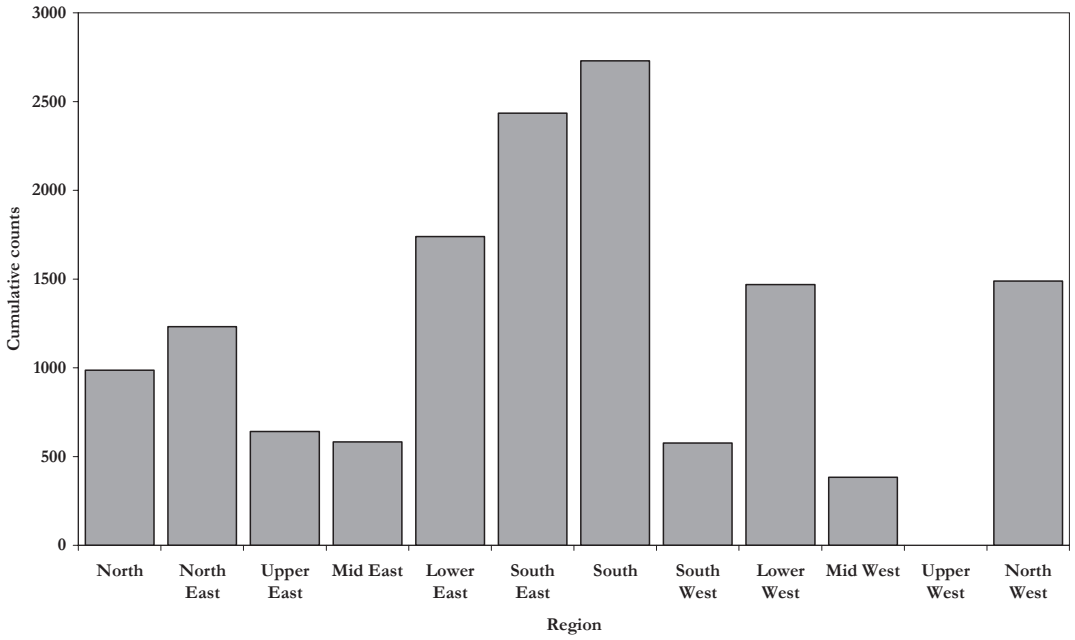

Figure 3-8 - The Regional Distribution of Ruddy Turnstones on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

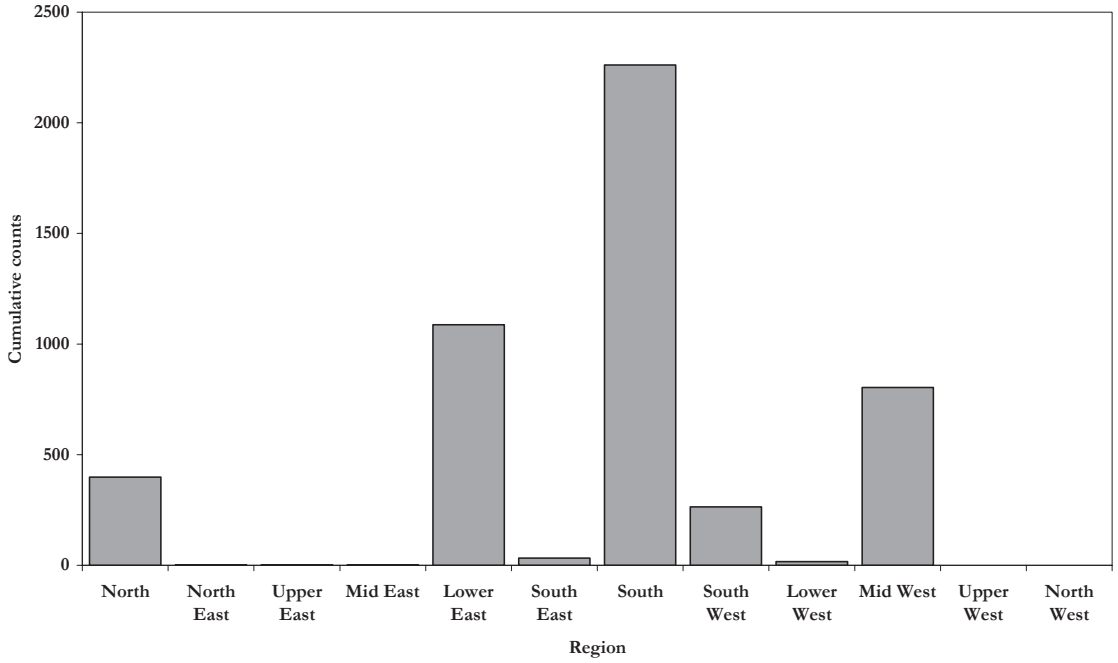

Figure 3-9 - The Regional Distribution of Common Terns on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

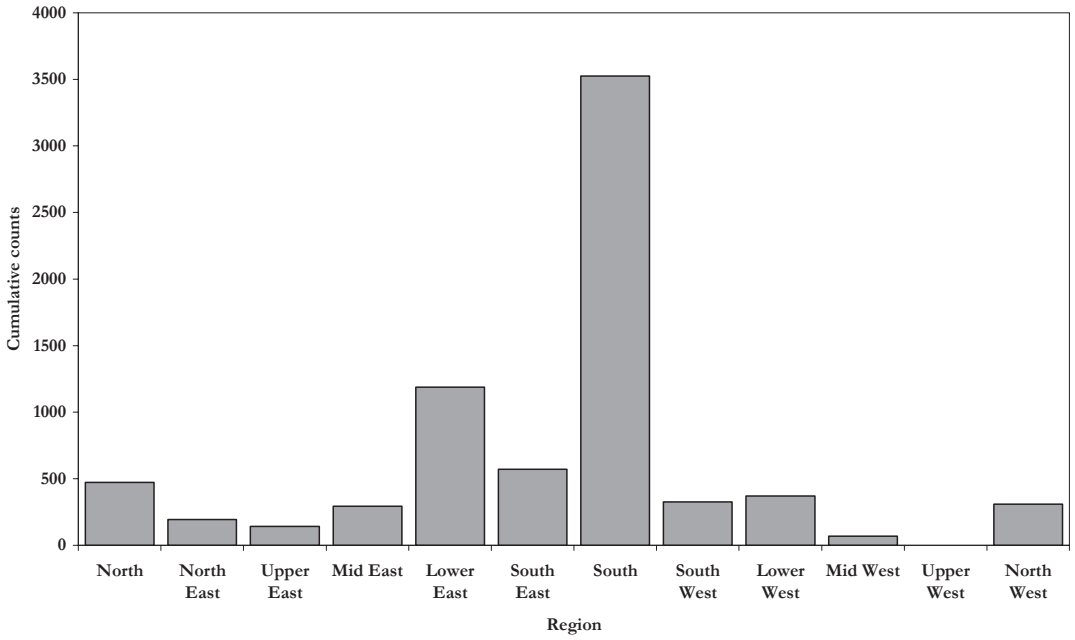

Figure 3-10 - The Regional Distribution of Bar-Tailed Godwits on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

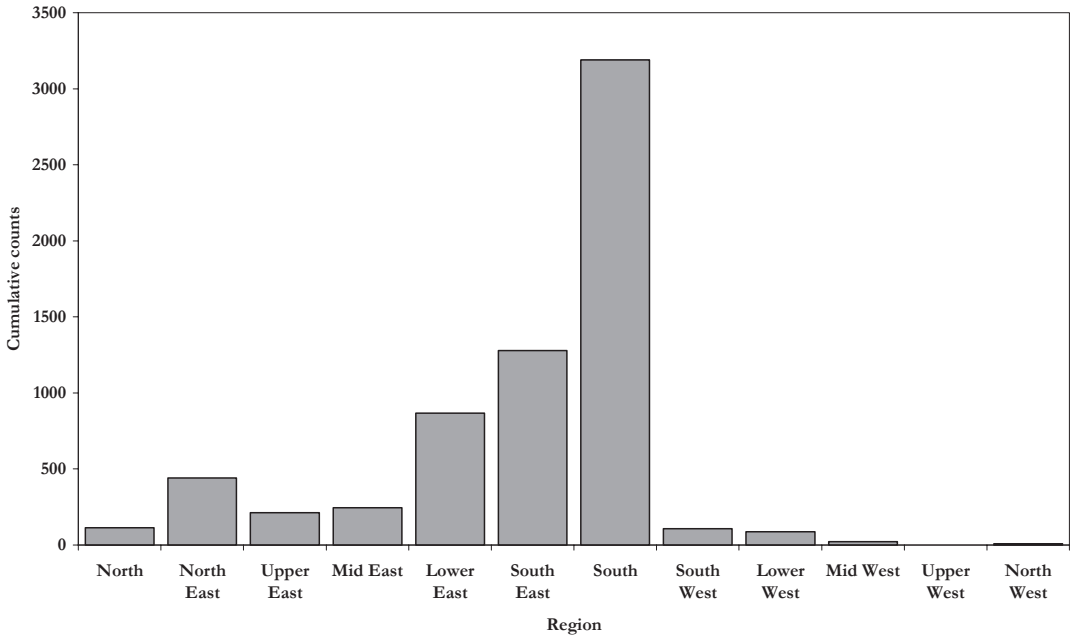

Figure 3-11 - The Regional Distribution of Lesser Sand Plovers on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

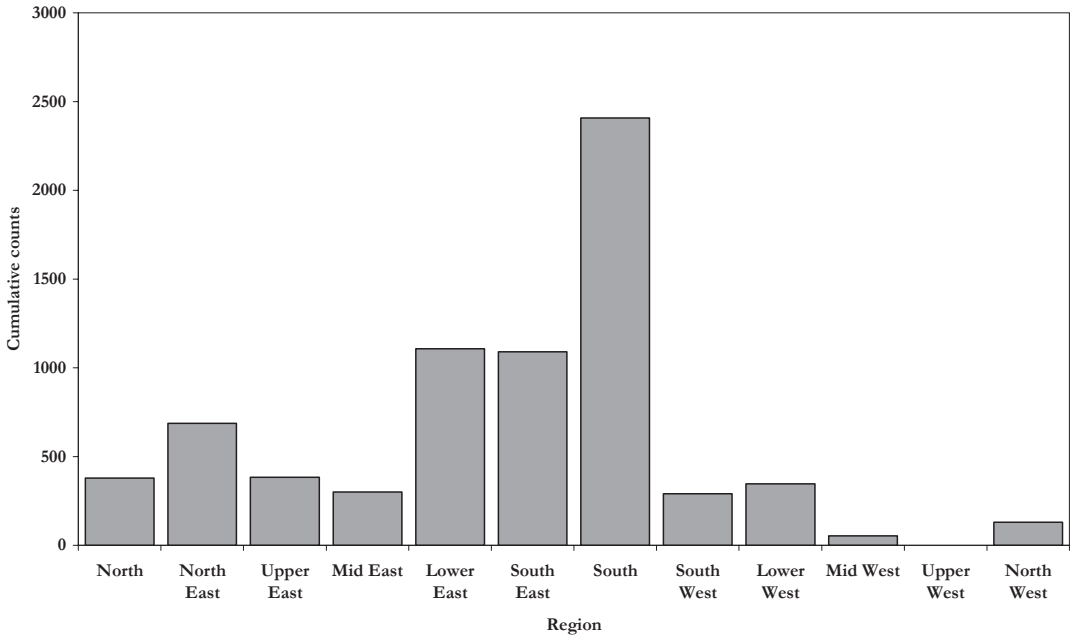

Figure 3-12 -The Regional Distribution of Greater Sand Plovers on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

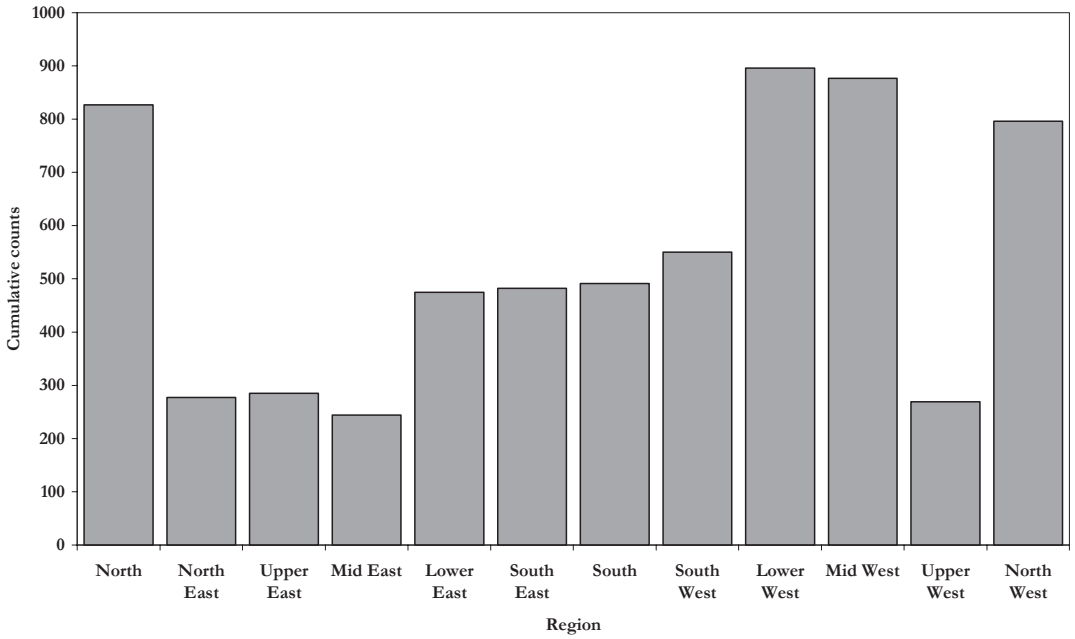

Figure 3-13 - The Regional Distribution of Silver Gulls on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

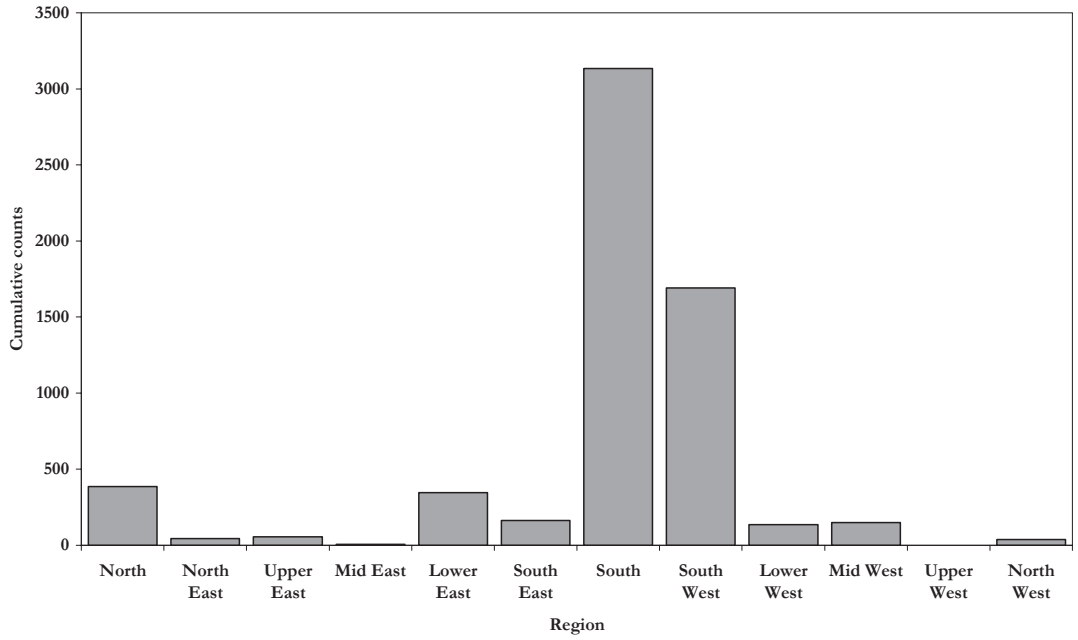

Figure 3-14 - The Regional Distribution of Fairy Terns on Barrow Island for all Months Combined. Counts include Estimated Values for September to December 2003

3.1.3 Littoral Avifauna of the Town Point Area

The distribution of littoral avifauna roost sites along the east coast shoreline adjacent to the proposed development at Town Point is presented in Figure 3-15.

At high tide, small numbers of cormorants, eastern reef egrets, silver gulls and oystercatchers roost on the rocks at Town Point. Favoured roost sites on the adjacent shoreline were consistently used between months. Data collected between April and September 2004 further supported these observations. Sooty oystercatchers successfully nested on the rocky cliff top at Town Point during spring 2003 and 2004. Other nests of this species were observed at Cape Dupuy on the north coast of Barrow Island.

The proposed Development at Town Point lies between the upper east and mid east regions that span approximately 11 km of the shoreline that was visited by 7.1 % of all littoral avifauna during the surveys. For the most abundant species, the percentage of island-wide records from the Town Point area (upper east and mid east regions) is presented in Table 3-1.

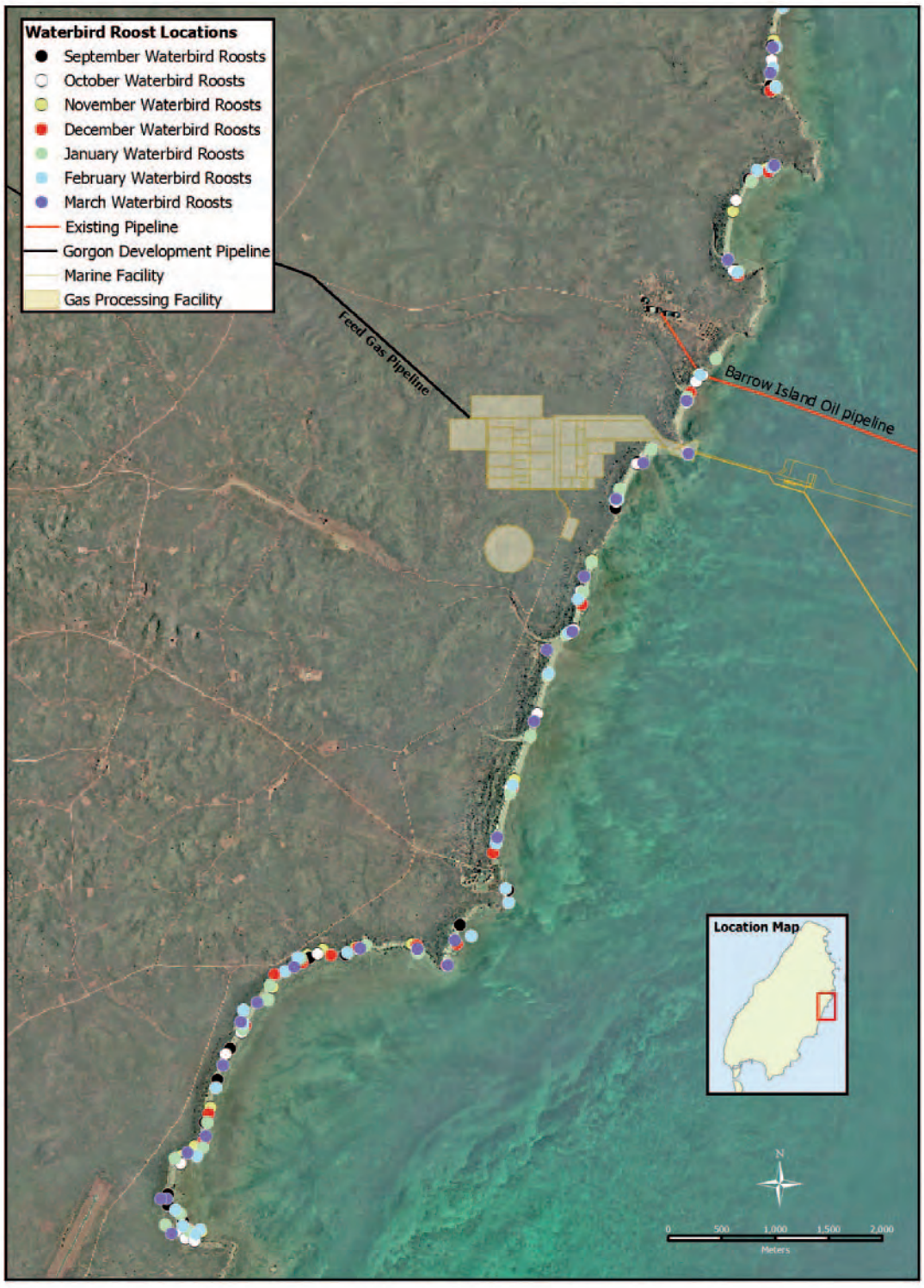

Figure 3-15 -East Coast of Barrow Island, Indicating Locations of all Roost Sites Recorded during Surveys from September 2003 to March 2004

Table 3-1 - Percentage of Waterbird records on Barrow Island in the Upper East and Mid East Regions, North and South of Town Point, between September 2003 and September 2004. Values are for abundant species only

Species	Total N records on Island (all months pooled)	Percentage present at Town Point
Red-necked stint	53 930	5.7
Grey-tailed tattler	20 818	11.0
Ruddy turnstone	14 261	8.6
Bar-tailed godwit	7 454	5.8
Lesser sand plover	6 569	6.9
Greater sand plover	7 175	9.5
Silver gull	6 469	8.2
Common tern	4 919	<0.1
Fairy tern	6 149	1.0
Caspian tern	1 031	27.8
Crested tern	8 620	13.5

The crested and Caspian terns are not abundant on Barrow Island, but have been included because they are the only regularly observed species with a distribution that is biased in favour of the north-east and mid-east regions.

Foraging

Only a small proportion of the littoral avifauna on Barrow Island forage on the reef platforms around Town Point. Twenty-two species and a maximum abundance of 249 waterbirds were observed foraging at Town Point between October 2003 and September 2004. Approximately one percent of the littoral avifauna on Barrow Island foraged on the surveyed section of shoreline up to 400 m north and south of Town Point (Table 3-2).

Table 3-2 - Total Number of Birds Foraging on Reef Platforms Adjacent to Town Point at low tide and the Percentage of the Total Number Present on the Island Observed at Town Point

Month	Northern reef platform	Southern reef platform	Total	Percentage of Island total
October 2003	77	90	167	1.06
November 2003	21	47	68	0.39
December 2003	74	104	178	1.24
January 2004	78	129	207	1.11
February 2004	75	132	207	1.07
March 2004	75	174	249	1.44
April 2004	28	32	60	0.92
May 2004	23	10	33	0.72
June 2004	26	35	61	0.94
July 2004	21	15	36	0.56
August 2004	19	35	54	0.74
September 2004	33	57	90	0.44

While approximately one percent of the waterbirds on the Island foraged at Town Point, the proportion was higher for some species (Table 3-3). These tended to be the less abundant species. The Town Point area was important for eastern reef egrets in January 2004, Australian pelicans in February 2004 and for Caspian and crested terns in March 2004. For all other species, less than seven percent of the individuals present on Barrow Island foraged at Town Point (Table 3-3).

Table 3-3 - The Maximum Number, Including Month Recorded, of Each Species Foraging on the Reef Platforms Around Town Point. Maxima are Presented as a Percent of the Total Island Population in that Month

Species	Maximum count	Month of count	Percentage of Monthly Total for Barrow Island
Australian pelican	3	February	15.0
Eastern reef egret	11	January	20.4
Osprey	1	October/December	4.8
Bar-tailed godwit	4	January	0.4
Whimbrel	3	January	3.2
Common greenshank	5	December	2.0
Common sandpiper	1	October/December	4.5
Grey-tailed tattler	32	October	1.4
Ruddy turnstone	30	October/March	2.0
Red-necked stint	62	October	0.8
Pied oystercatcher	9	February/April	3.1
Sooty oystercatcher	5	April	5.3
Grey plover	3	February	2.3
Red-capped plover	10	December/June	3.7
Greater sand plover	23	September	2.5
Lesser sand plover	1	March	0.1
Silver gull	45	January/February	5.6
Caspian tern	57	March	24.6
Crested tern	73	March	9.0
Lesser crested tern	3	March	22.8

Between 16 % and 65 % of the waterbirds on the reef platforms adjacent to Town Point were foraging within 200 m of the point (Table 3-4). These data indicate that the area immediately adjacent to Town Point is not of high significance to foraging waterbirds.

Table 3-4 - Abundance of Waterbirds Foraging in Intertidal Habitats within 200m of Town Point and the Proportion of All Waterbirds Foraging in this Area

Month of survey	Waterbird count <200 m	Waterbird count >200 m	Percentage waterbirds <200 m
October	57	110	34.0
November	14	54	20.6
December	53	125	29.8
January	56	151	27.1
February	52	155	25.1
March	40	249	16.1
April	18	42	42.8
May	13	20	65.0
June	12	49	24.5
July	9	27	33.3
August	13	41	31.7
September	27	63	42.9

3.1.4 Shearwaters and other Waterbirds on Double Island

Active shearwater burrows were found on both islets of Double Island in October 2003, with most activity across the top of the islands where the limestone is so deeply weathered by solution pipes that it resembles giant honeycomb. Burrows in this landscape are hard to examine because they start in small caverns that the birds access through solution pipes. These caverns lie approximately one metre below the surface of the ground. The solution pipes act as a common entrance to several burrows and make it very difficult to estimate the number of burrows present in this landscape.

Wedge-tailed shearwaters and eggs were present in the burrows on South Double Island in November 2003. North Double Island was not surveyed in November 2003. On the western side of South Double Island, there were approximately 500 burrows within an area of less than two hectares of sandy soil. Although these burrows were accessible and discrete, the sandy soil meant that there was a high risk of the burrows collapsing under the weight of the observers and the survey was curtailed. On the basis of this number of burrows in a small area and the area of limestone in which nests were located, the colony is probably used by 5000 to 10 000 pairs.

In November 2003, an estimated 4000 bridled terns were circling the islands and inspecting crevices in the limestone, presumably preparing to nest in these areas. Bridled terns were also observed in, or leaving, the caverns under the solution pipes. The islands are also important sites for other waterbirds. A pair of white-bellied sea-eagles with a recently-fledged chick was observed on South Double Island in November 2003. Approximately 165 pied cormorants and 24 eastern reef egrets were roosting on North Double Island in October 2003. The reef egret count was the highest single count for this species on Barrow Island. A reef egret nest with two eggs was found in October. Small numbers (<10 of each species) of ruddy turnstones, grey-tailed tattlers and greater sand-plovers were observed during both visits to Double Island.

3.2 Landbirds of the Gorgon Development Study Area

Abundances of landbirds in the proposed development area from September 2003 to August 2004 are presented in Table 3-5, 3-6 and 3-7. Results from landbird transects from October 2004 can be found in Attachment 5.

The abundance of landbirds in the study area appears to vary seasonally. The main bird species (white-winged fairy wren, singing honeyeater and spinifexbird) were recorded more often in late winter and early spring than in hotter months, with a slight increase in March, April and May 2004 in some species following cyclone Monty (Table 3-5). This almost certainly relates to changes in detectability due to the behaviour of the birds. Birds are more cryptic when sheltering from the sun and this behaviour is more critical in summer. Spinifexbirds also called more frequently in spring than in summer and were therefore easier to detect. In addition, there was some evidence to suggest that the fairy wren and honeyeater particularly may have been attracted to the observer in spring. These effects may have biased results in all months.

Table 3-5 - Total Abundance of Each Bird Species from September 2003 to August 2004. Data Pooled Across the Six Transects in Each Month

Species	Sep	Oc	No	De	Jan	Fe	Ma	Ap	My	Jn	Jl	Au	Total
Bar-shouldered dove	0	0	7	0	0	3	0	0	0	0	0	0	10
White-winged fairy wren	50	27	17	21	23	6	28	15	26	19	18	31	281
Singing honeyeater	7	3	0	0	0	0	1	7	9	2	2	3	34
Welcome swallow	0	1	0	0	0	0	1	0	2	1	1	0	6
Spinifexbird	10	13	5	4	8	5	8	14	14	5	7	28	121
Spotted harrier	0	0	0	0	0	0	0	1	0	0	0	0	1
Nankeen kestrel	0	0	0	0	0	0	0	0	0	0	0	1	1
White-breasted woodswallow	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	67	44	29	25	31	14	38	37	51	27	28	64	455

Densities of each landbird species were calculated for each transect (Table 3-6) and for each of the vegetation types (Table 3-7), as defined in Table 2-3.

There were trends in landbird densities between transects for most species (Table 3-6). For example, the bar-shouldered dove was confined to Transect Two and the white-winged fairy wren tended to be more abundant on Transect Five. The spinifexbird densities tended to be lower on Transect Four. The singing honeyeater was not recorded on Transect Five and was recorded at low densities on the other transects.

Table 3-6 - Mean Densities (per hectare) for Bird Species along Six Transects in the Vicinity of the Development Area, September 2003 to August 2004. There were 24 surveys in each transect

Species	Landbird Transect						
		1	2	3	4	5	6
Bar-shouldered dove	Mean	0.00	0.10	0.00	0.00	0.00	0.00
	SE	-	0.07	-	-	-	-
White-winged fairy wren	Mean	0.42	0.22	0.30	0.48	0.84	0.27
	SE	0.09	0.07	0.06	0.09	0.16	0.07
Spinifexbird	Mean	0.24	0.13	0.23	0.13	0.18	0.13
	SE	0.05	0.04	0.05	0.03	0.05	0.03
Singing honeyeater	Mean	0.16	0.06	0.03	0.01	0.01	0.04
	SE	0.06	0.02	0.02	0.01	0.01	0.02

Landbird distributions showed close affinities to vegetation types (Table 3-7) as described below:

- Bar-shouldered doves were confined to vegetation type one (coastal *Acacia coriacea*).
- White-winged fairy wrens were least abundant in coastal vegetation types one and two, but particularly abundant in vegetation type five (low *Triodia* over limestone). Vegetation type five was poorly represented, however, so in general the fairy wren was associated with *Triodia* with or without shrubs but growing in shallow soil on limestone rises.
- Singing honeyeaters were largely confined to coastal vegetation types one and two (*A. coriacea* and *A. bivenosa* over *Triodia* on red sandy-loam).
- Spinifexbirds were found across all vegetation types, but were most abundant in types one, two and six. These were near-coastal and inland sites, but consisted of *Acacia* over *Triodia*.

Table 3-7 - Mean Densities (per hectare) of Landbirds in Each Vegetation Type. Data Pooled over the Six Transects, September 2003 to August 2004 2004. (n = 24)

Species	Vegetation Type (see Table 2-3)						
		1	2	3	4	5	6
Bar-shouldered dove	Mean	0.15	0	0	0	0	0
	SE	0.15	-	-	-	-	-
White-winged fairy wren	Mean	0.02	0.23	0.52	0.29	0.81	0.38
	SE	0.02	0.06	0.07	0.22	0.31	0.11
Spinifexbird	Mean	0.10	0.19	0.15	0.12	0.16	0.25
	SE	0.05	0.04	0.03	0.09	0.09	0.06
Singing honeyeater	Mean	0.29	0.03	0.03	0	0	0.04
	SE	0.12	0.01	0.01	-	-	0.02

4 Discussion

4.1 Littoral avifauna

Between September 2003 and September 2004, Barrow Island supported large numbers of littoral avifauna, with migratory shorebirds and terns being the most abundant. While the migratory species had the expected peaks in abundance in spring, most remained abundant throughout the survey period, indicating that Barrow Island is not only a staging post during southward migration, but is used through the summer non-breeding season by migrant species and during the winter by at least some birds. Sedgwick (1978) also noted migratory shorebirds in August 1978, before most species would have returned from migration, suggesting that many birds 'over-winter' on the Island. High counts of migratory shorebirds during the breeding season (winter in the southern hemisphere) have been recorded for a number of other sites in northern Australia (Bamford *et al.* in press).

The monthly patterns of variation in the abundance of migratory shorebirds on Barrow Island in 2003/2004 were unexpected, as sites on the north-west coast of Australia tend to be most important for such species during southward migration (Bamford *et al.* in press). Southward migration was evident for some species, for example greater sand plovers in September and red-necked stints, sanderlings and lesser sand plovers in October. However, the abundance of other species, for example the grey-tailed tattler and ruddy turnstone, varied little from September 2003 to February 2004. This suggests that many birds stayed upon the Island following their arrival on southward migration in September. Migrating bar-tailed godwit appear to arrive and simply stay on the Island. Even among those species with the expected southward migration peak, there was an increase in abundance in January and February. This may have been due to local movements of birds from the mainland to Barrow Island. The slightly lower numbers in December may reflect a gap between the southward migration period and this possible phase due to local movements. Barrow Island is unusual compared with other sites in the north-west of Australia in effectively acting as a terminus for migratory species.

Sites in the north-west of Australia tend to be less important during northward than southward migration, and on the basis of March data (early northward migration), this also seems to be the case for Barrow Island. The two sand plover species and the bar-tailed godwit increased slightly in abundance in March, but most species declined in numbers; some sharply. This decline may have been influenced by the passage of Cyclone Monty prior to the March survey.

The November peak in the abundance of common terns, also a migratory species, is consistent with southward movement through Barrow Island, whereas the fairy tern (subject to local movements but not an international migrant) seemed to congregate on the Island during its breeding season. However, fairy terns were not observed to breed on Barrow Island and a substantial proportion of the birds were immature or in non-breeding plumage. Numbers of silver gulls increased steadily from November to January and then remained at a high level up to March, possibly in response to the emergence of turtle hatchlings.

Barrow Island is an internationally significant littoral avifauna site because it meets the Ramsar criterion of supporting >1 % of a species population for the ruddy turnstone, red-necked stint, grey-tailed tattler, sanderling, greater sand-plover, lesser sand-plover, fairy tern and for the *ophthalmicus* race of the sooty oystercatcher. All these species are

trans-equatorial migrants, except for the fairy tern, which undergoes only local movements and the sooty oystercatcher, which is a resident.

On the basis of the importance of the Island for six migratory waders (grey-tailed tattler, ruddy turnstone, red-necked stint, sanderling, greater sand-plover and lesser sand-plover), Barrow Island is equal tenth among the 147 important sites for migratory waders in Australia (Bamford *et al.* in press). For the grey-tailed tattler and ruddy turnstone, it is the fifth and fourth-most important site in Australia, respectively.

Ruddy turnstones, grey-tailed tattlers and red-necked stints were present on Barrow Island in August 1978 (Sedgwick 1978) at similar proportions to the current study. It is not clear how comprehensive the 1978 surveys were, but counts of most migratory shorebirds were much lower even than those recorded in September 2003. However, 36 black-tailed godwits, a species not seen during the current study, were recorded. Among non-migratory shorebirds and other littoral species, counts were broadly similar to those obtained in the present study.

The highest abundances of littoral avifauna on Barrow Island (over two-thirds of records of most species) are associated with the extensive tidal mudflats in the south and south-east of the Island, from Bandicoot Bay to the existing ChevronTexaco Camp. These areas are important for roosting and foraging and the birds appear to roost close to their foraging sites. The littoral avifauna habitats in Bandicoot Bay are recognised as being a key area for shorebirds and are proposed as a nature conservation area (CALM 2004). However, the current study has shown that the area of importance is greater than previously suggested.

Littoral avifauna were widely distributed around Barrow Island, usually associated with tidal mudflats or rocky intertidal pavements. However, littoral avifauna numbers were generally low in the vicinity of Town Point and the proposed development area, despite the extensive pavement reef and sand flats in this region. The grey-tailed tattler and the greater sand plover were the most abundant birds in the Town Point area. While the 12 km stretch of shoreline between Mattress Point and the ChevronTexaco Camp represents about 20 % of Barrow Island's coastline, less than nine percent of all littoral avifauna occurred in this area.

Town Point is a nesting site for the *ophthalmicus* race of sooty oystercatchers. Other nests were observed at Cape Dupuy on the northern coast and pairs of birds demonstrated mating behaviour at a number of other sites.

The reef platform around Town Point is not a major feeding site on Barrow Island. The number of birds that utilised the area was always less than 1.5 % of the Island total and was remarkably consistent between months, except for November 2003. Both the abundance of littoral avifauna and the proportion of the Island total in the Town Point area were much lower in November than in other months. This is probably due to the fact that the tide was much lower in November than in the other months. This would have resulted in more reef platform being exposed and, as a consequence, the birds being more widely dispersed and at lower density than at other times. It is also possible that the low tide meant that many foraging birds were feeding in depressions in the reef platform and, therefore, were missed by the count. It is recommended that all future counts be conducted at a standard low tide of 0.45 m (above chart datum) to remove any confounding effect of tide height.

When individual species were examined, the proportion of the Barrow Island total that foraged or roosted at low tide within 400 m of Town Point was generally low, but in March 2004 it was moderately high for two species common on the Island: Caspian terns (24.6 %) and crested terns (9.0 %). It is not clear why so many terns were present on the reef platform at Town Point in March.

Of all the littoral avifauna on Barrow Island, approximately one percent foraged within 400 m of Town Point, and less than 0.35 % foraged within the immediate vicinity of the Point (< 200 m). Habitat loss associated with construction of the landing and causeway will therefore directly affect approximately 0.35 % of littoral avifauna foraging habitat on Barrow Island.

4.2 Wedge-tailed Shearwaters on Double Island

The visits to Double Island confirmed the presence of a breeding colony of wedge-tailed shearwater with at least 500 nests in one small area on the South Island and a total colony size of 5000–10 000 pairs. There are hundreds of thousands of pairs of wedge-tailed shearwaters nesting on islands off the north-west and western coasts of Western Australia (Johnstone & Storr 1999).

Long-term monitoring of wedge-tailed shearwater breeding colonies elsewhere in the region has shown that breeding success varies from year-to-year amongst colonies, due to prevailing oceanographic conditions, even in years when breeding success is generally poor (Dunlop *et al.* 2002). Wedge-tailed shearwaters are reported to be tolerant of disturbance and human activities close to their breeding colonies (Marchant & Higgins 1990), but juvenile birds are sometimes attracted to lights and are injured or killed by flying into buildings and structures (Lane 1991). From a colony of 6000 pairs on Muttonbird Island (New South Wales), 176 juveniles were collected on the nearby mainland in the 1987 breeding season, some injured but most simply confused by the land and unable to find their way back to sea. Some of these birds came from resorts seven kilometres north of the breeding colony. Note that the Muttonbird Island colony itself appears unaffected by nearby commercial activities and low levels of human visitation.

4.3 Landbirds

The present investigations focussed on determining the density of the main landbird species in relation to different vegetation types within the proposed Development area. These data were used to calculate the importance of the Development area to landbirds by comparison with existing information, such as whole-of-island population estimates and densities of particular species, including relationships with vegetation type (Sedgwick 1978, Pruett-Jones & O'Donnell unpubl. and Pruett-Jones & Tarvin 2001).

Across the proposed Development area, the coastal *Acacia* shrublands supported the highest species richness and high densities of singing honeyeaters and spinifexbirds, but the inland habitats including *Melaleuca* shrublands over *Triodia* are important for the white-winged fairy wren, with inland *Acacia* shrublands over *Triodia* being important for the white-winged fairy-wren and spinifexbird.

The landbird assemblage of Barrow Island is depauperate. Of the 128 birds recorded on Barrow Island, 51 are landbirds and only 16 of these species are residents or regular migrants (Attachment 4). In an intensive study during September and October 2001,

Pruett-Jones & O'Donnel (unpubl.) found five landbird species to be common. These were the spinifexbird, white-winged fairy-wren, singing honeyeater, white-breasted woodswallow and welcome swallow. Of these, the spinifexbird, white-winged fairy-wren and singing honeyeater were the only species recorded regularly in the present study, with the addition of the bar-shouldered dove in near-coastal *Acacia* shrubland. There was a suggestion by Pruett-Jones & O'Donnel (unpubl.) that white-breasted woodswallows may have declined in abundance since the surveys of Sedgwick (1978).

The spinifexbird has an estimated Island population of 17 800 (Sedgwick 1978) to 24 623 (Pruett-Jones & O'Donnel unpubl.), with the latter value based on density estimates in excess of one bird/ha; much greater than the 0.13 to 0.24 birds/ha determined in the present study and the 0.33 birds/ha from the October 2004 transects. The low values obtained in 2003/2004 are probably due to poor detectability of the species outside the breeding season, when most surveys took place. Numbers of spinifexbirds recorded in transects in September and October 2003 and August 2004 were up to three times the numbers seen at other times of the year and therefore suggest densities at least broadly similar to those obtained by Pruett-Jones & O'Donnel (unpubl.). Despite this, the proportional abundance of spinifexbirds in different vegetation types can be expected to be reasonably accurate. Pruett-Jones & O'Donnel (unpubl.) found densities of the spinifexbird to be highest where there was a shrub stratum emergent through the *Triodia,* and this trend also emerged in the proposed development area, with high numbers in *Acacia coriacea* over *Triodia* in coastal areas and in *Acacia bivenosa* over *Triodia* in inland areas. There was an exception to this trend, however, as spinifexbirds were recorded at only low densities in vegetation type three, *Melaleuca* over *Triodia* on limestone rises and ridges. This is a widespread habitat in the proposed development area and was well-sampled, so it would appear that it is of low suitability for spinifexbirds. Spinifexbirds may favour more openly branched shrubs such as *Acacia*.

The white-winged fairy wren has an estimated Island population of 8150 (Sedgwick 1978) to 7519 (Pruett-Jones & O'Donnel unpubl.), with densities found by the latter authors in the range 0.25 to 1.75 birds/ha. In the proposed development area, densities fell within this range in vegetation types three to six, but densities were much lower in coastal *Acacia* shublands. Estimates from the October 2004 transect data (1.05 birds/ha) also fell within the above range of values (Attachment 5). Pruett-Jones & O'Donnel (unpubl.) found that the white-winged fairy-wren was associated with complex vegetation structure. In the proposed development area it appeared to be associated with inland vegetation types in general, with a tendency to favour formations with complex vegetation structure. Unlike the spinifexbird, it was notably abundant in areas of *Melaleuca* over *Triodia*. The very high density in vegetation type five (*Triodia* with very low shrub densities on limestone ridges) may have been an artefact of small sample size.

Population estimates of singing honeyeaters on Barrow Island range from 3050 (Sedgwick 1978) to 3920 (Pruett-Jones & O'Donnel unpubl.). This species is generally associated with coastal *Acacia* shrublands. This was clear in the proposed development area but the mean density of 0.16 and 0.11 birds/ha in the September 2003 – August 2004 and October 2004 studies, respectively, is much lower than the 2.5 birds/ha reported by Pruett-Jones & O'Donnel (unpubl.) in coastal *Acacia* shrublands. The low values in the proposed development area are partly related to seasonal variations in detectability, as very few singing honeyeaters were detected within transects from November to March. Despite this, a density of 2.5 birds/ha appears higher than any observed even in September and October.

Population densities of singing honeyeaters on Barrow Island may be suppressed due to several years of below-average rainfall. Alternatively, singing honeyeaters are sometimes attracted to the observer, so the use of two observers by Pruett-Jones & O'Donnel (unpubl.) may have led to an over-estimation of the species' density.

The population densities and approximate extent of vegetation types in the proposed development area can be used to estimate population sizes of the three most abundant bird species. Populations in the proposed development area compared with Island estimates from Pruett-Jones & O'Donnel (unpubl.) or Sedgwick (1978) are outlined in Table 4-1.

Table 4-1 - Landbird Populations in the Proposed Development Area.

Species	Population in Gorgon study area (300 ha)	Current Barrow Island total population estimate	Percentage of total Island population
Bar-shouldered dove	6	180	3
Spinifexbird	48	24 623	0.2
White-winged fairy wren	141	7 519	1.9
Singing honeyeater	10	3 920	0.3

The results from the October 2004 survey (Attachment 5) suggest that the numbers of white-winged fairy-wrens on Barrow Island may be slightly greater than those listed in the table above. The density of white-winged fairy-wrens in October 2004 was approximately 1.05 birds/ha. Their preferred shrubland habitat covers about 8926 ha or approximately 40% of the island. Assuming that the density of wrens is consistent in their preferred habitat across the island, the total population is approximately 9336.

As the area of the proposed Gorgon Development is 300 ha, the number of white-winged fairy-wrens in the entire development area is probably about 315 birds, or 3.3 % of the total population.

For both the white-winged fairy-wren and bar-shouldered dove, the proposed Development area probably has good representation of their preferred habitat. The area does not appear to be as favourable for the spinifexbird and the singing honeyeater.

The white-winged fairy-wren on Barrow Island is an endemic race that has recently been identified as the most genetically-distinct of the white-winged fairy wren races (Driskell *et* al. 2002). These birds are abundant on Barrow Island. Other non-migratory avifauna on Barrow Island, although not recognised as distinct taxa, are assumed to be genetically distinct from mainland populations, as a result of their long period of isolation.

5 Conclusions

5.1 Littoral Avifauna

A minimum of 32 119 littoral avifauna of 50 species used the Barrow Island shoreline during the period September 2003 to September 2004, with the highest monthly count of all birds being 20 428 (September 2004). Barrow Island is of international significance for six migratory species: grey-tailed tattler, ruddy turnstone, red-necked stint, sanderling, greater sand plover and lesser sand plover. It is also significant for two non-migratory birds: fairy tern and the northern race of the sooty oystercatcher.

The littoral avifauna was dominated by migratory species that were expected to use Barrow Island mainly during their southward migration (October-November), as is the case elsewhere in the north-west of Australia. However, some species were more abundant in January and February, contributing to overall higher counts in summer than in spring. For most migratory species, Barrow Island appears to act as a destination rather than as a staging site.

Littoral avifauna in general were concentrated in the south-east and south of Barrow Island, from the existing ChevronTexaco Camp to the Bandicoot Bay area. Over half of the littoral avifauna each month were found in these parts of the Island.

The coastline in the vicinity of Town Point and the proposed Development area is of relatively low importance for littoral avifauna compared with other parts of Barrow Island. Town Point was not generally an important waterbird foraging or roosting site during the 2003/2004 summer, reflected by the low abundances in this area in relation to other parts of the Barrow Island shoreline. The only waterbird breeding observed near Town Point was a pair of sooty oystercatchers that nested on Town Point in September 2003 and 2004 and a pair of ospreys with a nest (not used in 2003) on Latitude Point.

5.2 Shearwater Rookeries on Double Island

Wedge-tailed shearwaters nest on both islets of Double Island, beneath limestone slabs and in sandy soil. The sandy rookery on the north-western corner of the southern island comprises about 500 burrows across an area of approximately two hectares. The total colony may contain 5000–10 000 pairs.

The Double Island rookery is of regional significance as these migratory birds are protected under international conventions.

5.3 Landbirds

The proposed Development area is not locally or regionally significant for landbirds. The abundance of landbirds in the Town Point hinterland is similar to the abundance in other parts of Barrow Island as reported in earlier studies. The proposed Development area has no unique features that might constitute critical habitat.

The landbird fauna of Barrow Island is depauperate but is notable for the presence of an endemic race of the white-winged fairy-wren listed under the EPBC Act and as Schedule One (Vulnerable) under the Wildlife Conservation Act. The Barrow Island white-winged fairy wren generally inhabits low shrubland (*Acacia*, *Melaleuca*) over *Triodia* on limestone hill slopes away from the coast within the proposed Development area. About 3.4

percent of Barrow Island's total population of white-winged fairy wren occurs within the 300 ha of the proposed development area.

White-winged fairy-wrens are the second most abundant landbird on Barrow Island (Pruett-Jones & Tarvin 2001) and their population status is unlikely to be affected by small changes in available habitat.

Bar-shouldered doves, singing honeyeaters and spinifexbirds also inhabit the proposed Development area. The Island populations of these birds are probably genetically distinct from populations on the nearby mainland, due to the long period of isolation and should be treated as endemic taxa.

The bar-shouldered dove and singing honeyeater were largely confined to *Acacia* over *Triodia*, particularly near the coast. Spinifexbirds were widespread, with some bias in favour of areas of emergent *Acacia* amongst *Triodia*.

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Attachment 1 - Regions, Sites and Months for Littoral Bird Surveys. Constant sites are those surveyed in every month from October 2003 to February 2004.

Region	Site	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Constant site
North East	Surf Point		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Sponge Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Pungens Head		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Oystercatcher Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Square Head North		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Square Bay		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Square Head South		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Pillow Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Pillow Head		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Ant Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Ant Point		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Bed Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Lucky's Head		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Lucky's Bay		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Barge Landing		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Bob's Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
North East	Boomerang Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Mattress Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Mattress Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Dove Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Region	Site	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Constant site
Upper East	Dove Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Mushroom Rock Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Latitude Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Upper East	Pipeline Beach	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mid East	Town Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mid East	Yacht Club Beach	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Mid East	Camp Point		x	x	x	x	x	x	x	x	x	x	x	x	x
Lower East	Camp Beach	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lower East	Unnamed Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lower East	Shark Beach	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Lower East	Shark Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Perentie Two Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Perentie Two Point		x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Perentie One Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Perentie One Point		x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Stokes Bay		x	x	x	x	x	x	x	x	x	x	x	x	x
South East	Stokes Point	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South	Bandicoot Bay	x	x	x	x	x	x	x	x	x	x	x	x	x	x
South	Bandicoot Lagoon		x	x	x	x	x	x	x	x	x	x	x	x	x
South West	South East Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
South West	Sanderling Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
Lower West	Eagle's Nest Beach South					x	x	x	x	x	x	x	x	x	

Region	Site	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Constant site
Lower West	Eagle's Nest Beach North					x	x	x	x	x	x	x	x	x	
Lower West	Eagle's Nest Beach Point					x	x	x	x	x	x	x	x	x	
Lower West	West Point					x	x	x	x	x	x	x	x	x	
Lower West	Satellite Beach					x	x	x	x	x	x	x	x	x	
Lower West	Whale Beach					x	x	x	x	x	x	x	x	x	
Lower West	Whale Point					x	x	x	x	x	x	x	x	x	
Lower West	Groper Beach			x	x	x	x	x	x	x	x	x	x	x	
Lower West	Groper Point					x	x	x	x	x	x	x	x	x	
Lower West	The Ledge					x	x	x	x	x	x	x	x	x	
Mid West	Bogg's Beach			x	x	x	x	x	x	x	x	x	x	x	
Mid West	Bogg's Point					x									
Mid West	Biggada Creek			x	x	x	x	x	x	x	x	x	x	x	
Mid West	Turtle Bay		x	x	x	x	x	x	x	x	x	x	x	x	x
Mid West	John Wayne Beach			x	x	x	x	x	x	x	x	x	x	x	
Mid West	Petal Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
Upper West	Flacourt Bay		x	x	x	x	x	x	x	x	x	x	x	x	x
Upper West	Butler's Bridge					x	x	x	x	x	x	x	x	x	
Upper West	Y Beach					x	x	x	x	x	x	x	x	x	
Upper West	Cape Malouet								x	x	x	x	x	x	
Upper West	Obe's Beach					x	x	x	x	x	x	x	x	x	
North West	White's Beach					x	x	x	x	x	x	x	x	x	
North West	White's Point					x	x	x	x	x	x	x	x	x	

Region	Site	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Constant site
North West	Max's Beach					x	x	x	x	x	x	x	x	x	
North West	Max's Point					x	x	x	x	x	x	x	x	x	
North West	Tortuga Beach					x	x	x	x	x	x	x	x	x	
North	Tortuga Point					x	x	x	x	x	x	x	x	x	
North	Perched Beach					x	x	x	x	x	x	x	x	x	
North	Cape Dupuy		x			x	x	x	x	x	x	x	x	x	
North	Dupuy Beach		x			x	x	x	x	x	x	x	x	x	
North	First Beach		x			x	x	x	x	x	x	x	x	x	
North	Second Beach		x			x	x	x	x	x	x	x	x	x	
North	Oyster Rock		x			x	x	x	x	x	x	x	x	x	
North	Lighthouse Beaches		x			x	x	x	x	x	x	x	x	x	
North	Surf Point Beach		x	x	x	x	x	x	x	x	x	x	x	x	x
Number of sites:		18	52	50	50	76	75								46

Attachment 2 - Monthly Total Counts of Littoral Avifauna on Barrow Island. Species marked with an asterisk are recognised as migratory under state and federal legislation.

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Max
Little pied cormorant	0	0	0	0	2	0	11	1	2	2	2	2	0	11
Pied cormorant	306	19	135	60	81	135	398	146	280	518	250	659	332	659
Little black cormorant	0	0	0	0	0	11	0	0	0	0	0	0	0	11
Australian pelican	0	14	14	12	24	24	18	0	1	20	20	19	16	24
White-faced heron	0	8	5	0	7	5	1	0	3	2	2	0	0	8
Little egret*	0	0	0	0	0	0	0	0	0	0	0	0	10	10
Eastern reef egret*	42	30	17	21	54	40	73	63	45	40	56	48	46	73
Great egret*	0	0	0	0	1	0	0	0	1	0	0	0	0	1
Striated heron	7	5	5	2	5	2	7	6	7	9	6	4	12	12
Nankeen night heron	1	4	5	17	30	20	8	14	33	33	23	20	8	33
Osprey*	12	21	22	22	33	29	33	35	28	41	32	32	25	41
Brahminy kite	9	6	1	7	6	2	8	10	6	6	8	6	11	11
White-bellied sea-eagle*	4	7	2	5	3	4	3	9	5	11	6	1	6	11
Bar-tailed godwit*	251	660	766	790	952	970	1070	183	132	104	71	110	800	1070
Little curlew*	0	0	1	1	0	0	0	0	0	0	0	0	0	1
Whimbrel*	20	52	64	30	93	77	97	55	37	44	26	27	84	97
Eastern curlew*	3	8	3	3	6	2	5	2	1	1	0	1	3	8
Marsh sandpiper*	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Common greenshank*	54	188	203	255	224	227	108	49	33	20	34	59	188	255
Terek sandpiper*	1	8	15	2	16	13	9	8	3	0	1	1	7	16

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Max
Common sandpiper*	20	30	26	22	36	41	20	3	0	0	8	30	36	41
Grey-tailed tattler*	830	2368	1805	2060	2634	2535	2543	1090	428	448	429	594	1631	2634
Ruddy turnstone*	681	1531	1125	1171	1701	1725	1733	125	117	110	108	227	1476	1733
Great knot*	176	301	432	364	410	323	395	18	5	10	20	91	346	432
Red knot*	0	23	12	7	5	6	15	0	0	0	0	0	7	23
Sanderling*	0	177	36	96	56	75	96	24	0	1	4	29	93	177
Red-necked stint*	3005	7611	6860	5512	7011	7291	4845	1157	822	1033	1109	1400	4015	7611
Sharp-tailed sandpiper*	0	4	4	9	2	1	0	0	0	0	0	0	7	9
Curlew sandpiper*	128	102	133	168	145	128	85	7	4	5	4	54	105	168
Beach stone-curlew	0	0	0	0	4	3	5	2	5	4	3	3	5	5
Pied oystercatcher	112	261	256	269	321	341	345	352	362	334	344	333	348	362
Sooty oystercatcher	21	34	53	61	81	83	69	95	82	58	48	62	66	95
Pacific golden plover*	0	24	14	11	22	27	30	0	0	0	0	2	4	30
Grey plover*	58	141	114	162	188	142	178	12	5	20	9	9	159	188
Red-capped plover	171	208	182	271	243	355	133	266	226	262	250	200	323	355

Species	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Max.
Lesser sand plover*	158	811	580	531	654	647	902	262	281	330	336	388	559	811
Greater sand plover*	729	372	572	455	659	821	499	234	206	164	211	777	903	903
Oriental plover*	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Oriental pratincole*	0	0	0	0	0	0	5	0	0	0	0	0	0	5
Silver gull	125	190	152	275	892	805	746	281	206	347	600	610	362	892
Gull-billed tern	0	12	1	5	3	4	0	1	1	4	8	10	0	12
Caspian tern*	29	43	56	73	116	161	232	78	59	62	35	36	41	232
Lesser crested tern*	78	63	83	69	150	107	40	37	98	175	137	113	318	318
Crested tern	83	76	627	78	337	610	815	749	957	2098	1605	109	334	2098
Roseate tern	0	0	46	8	0	0	1	0	0	55	606	721	7300	7300
Common tern*	0	7	1708	109	595	972	763	40	0	0	0	0	13	1708
Little tern*	0	28	37	19	0	2	31	12	3	0	0	0	0	37
Fairy tern	41	278	601	622	744	553	796	1060	81	137	57	512	429	1060
Bridled tern*	0	0	0	0	0	1	0	0	0	0	0	0	0	1
White-winged black tern*	0	0	314	0	151	35	140	1	0	0	0	0	0	314
Total Waterbirds	7155	15726	17087	13654	18697	19356	17319	6487	4565	6508	6468	7299	20428	32119

Attachment 3 - Number of Littoral Avifauna Counted in Each Region in Each Monthly Survey. These include numbers that are estimates for September to December 2003 based on proportions in complete counts. The percentage of waterbirds counted or estimated in that month in each region is also indicated.

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
North	(3.7 %) 444	(2.1 %) 377	(5.4 %) 1028	(4.7 %) 763	(4.1 %) 766	(4.4 %) 852
North East	(4.3 %) 505	(6.6 %) 1165	(7.0 %) 1325	(5.1 %) 819	(7.9 %) 1473	(6.0 %) 1169
Upper East	(5.6 %) 662	(3.8 %) 676	(2.7 %) 514	(3.0 %) 479	(3.1 %) 580	(4.2 %) 807
Mid East	(4.6 %) 542	(5.6 %) 993	(4.4 %) 826	(2.5 %) 464	(3.8 %) 714	(4.6 %) 893
Lower East	(18.3 %) 2168	(13.5 %) 2380	(14.0 %) 2636	(16.2 %) 2610	(15.1 %) 2815	(17.7 %) 3420
South East	(24.5 %) 2902	(18.5 %) 3272	(16.6 %) 3132	(22.9 %) 3683	(20.3 %) 3790	(20.0 %) 3867
South	(27.6 %) 3270	(37.6 %) 6645	(41.0 %) 7743	(30.6 %) 4934	(34.4 %) 6423	(29.8 %) 5459
South West	(2.0 %) 235	(1.9 %) 329	(0.3 %) 65	(0.9 %) 151	(1.0 %) 192	(5.7 %) 1104
Lower West	(4.4 %) 519	(5.0 %) 883	(4.3 %) 803	(4.6 %) 742	(5.4 %) 1004	(3.4 %) 655
Mid West	(2.1 %) 248	(1.7 %) 304	(1.4 %) 261	(5.8 %) 940	(1.3 %) 240	(2.9 %) 562
Upper West	(<0.1 %) 4	(<0.1 %) 3	(<0.1 %) 3	(0.2 %) 27	(0.2 %) 43	(0.4 %) 69
North West	(3.0 %) 361	(3.6 %) 638	(2.9 %) 553	(3.1 %) 506	(3.5 %) 657	(2.6 %) 499
Total	11860	17665	18889	16118	18697	19356
Red-necked stint						
North	(1.3 %) 59	(1.2 %) 96	(1.3 %) 95	(1.5 %) 87	(0.8 %) 55	(1.9 %) 137
North East	(6.0 %) 265	(4.9 %) 392	(9.0 %) 642	(4.9 %) 282	(8.8 %) 614	(5.1 %) 374
Upper East	(4.3 %) 188	(2.8 %) 219	(3.1 %) 219	(2.6 %) 150	(2.2 %) 154	(4.2 %) 304
Mid East	(4.2 %) 185	(4.7 %) 370	(2.7 %) 190	(1.2 %) 70	(1.8 %) 125	(3.3 %) 237
Lower East	(26.5 %) 1169	(17.3 %) 1370	(18.2 %) 1298	(23.0 %) 1321	(16.4 %) 1152	(21.1 %)1538
South East	(26.2 %) 1156	(22.2 %) 1760	(19.7 %) 1408	(35.1 %) 2015	(30.0 %) 2104	(27.2 %) 1985
South	(25.4 %) 1123	(42.8 %) 3393	(42.1 %) 3013	(27.2 %) 1564	(35.2 %) 2470	(26.6 %) 1941

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
South West	(0.5 %) 21	(0.4 %) 31	(0.6 %) 43	(0.4 %) 22	(0.1 %) 4	(7.6 %) 555
Lower West	(2.4 %) 104	(1.7 %) 135	(2.3 %) 167	(2.3 %) 135	(3.6 %) 255	(1.1 %) 77
Mid West	(2.9 %) 128	(1.8 %) 142	(0.6 %) 43	(1.3 %) 74	(0.6 %) 44	(1.6 %) 114
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(0.5 %) 20	(0.3 %) 25	(0.4 %) 32	(0.4 %) 25	(0.5 %) 34	(0.4 %) 29
Total	(100.0 %) 4418	(100.0 %)7933	(100.0 %)7150	(100.0 %)5745	(100.0 %)7011	(100.0 %)7291
Grey-tailed tattler						
North	(5.3 %) 70	(2.8 %) 77	(7.2 %) 149	(4.4 %) 104	(2.9 %) 77	(5.3 %) 134
North East	(5.9 %) 79	(10.4 %) 283	(12.7 %) 263	(11.9 %) 281	(14.2 %) 374	(12.5 %) 317
Upper East	(11.8 %) 157	(6.4 %) 175	(2.3 %) 48	(3.2 %) 75	(4.1 %) 109	(3.6 %) 91
Mid East	(5.6 %) 75	(8.4 %) 228	(9.3 %) 192	(3.0 %) 70	(5.4 %) 143	(6.2 %) 156
Lower East	(9.8 %) 130	(7.6 %) 208	(11.4 %) 236	(12.9 %) 304	(11.0 %) 289	(11.5 %) 294
South East	(20.2 %) 269	(18.8 %) 512	(19.3 %) 400	(19.3 %) 456	(18.1 %) 478	(22.1 %) 561
South	(28.5 %) 379	(33.5 %) 910	(26.4 %) 547	(33.8 %) 800	(28.8 %) 759	(29.7 %) 753
South West	(0.2 %) 2	(<0.1 %) 1	(0 %) 0	(0 %) 0	(0.1 %) 2	(2.5 %) 63
Lower West	(5.1 %) 68	(5.8 %) 159	(5.9 %) 122	(6.4 %) 152	(9.2 %) 243	(1.0 %) 25
Mid West	(1.7 %) 22	(1.0 %) 26	(0.3 %) 6	(0 %) 0	(0.2 %) 4	(1.9 %) 47
Upper West	(0.2 %) 2	(0 %) 0	(0 %) 0	(0 %) 0	(0.1 %) 2	(0 %) 0
North West	(5.8. %) 77	(5.1 %) 140	(5.3 %) 109	(5.2 %) 123	(5.8 %) 154	(3.7 %) 94
Total	(100.0 %) 1330	(100.0 %)2719	(100.0 %)2072	(100.0 %)2365	(100.0 %)2634	(100.0 %)2535
Ruddy turnstone						
North	(5.5 %) 83	(6.1 %) 132	(7.5 %) 119	(7.7 %) 128	(7.0 %) 119	(6.6 %) 114
North East	(6.4 %) 97	(8.6 %) 187	(9.0 %) 143	(4.6 %) 76	(10.3 %) 175	(9.9 %) 170
Upper East	(6.1 %) 92	(3.7 %) 81	2.8(%) 44	(4.2 %) 70	(4.9 %) 84	(5.3 %) 92

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
Mid East	(3.1 %) 47	(3.5 %) 77	(3.1 %) 50	(6.4 %) 107	(1.8 %) 31	(5.4 %) 94
Lower East	(13.3 %) 201	(9.2 %) 199	(10.2 %) 163	(13.6 %) 226	(12.5 %) 213	(12.3 %) 212
South East	(15.0 %) 226	(12.0 %) 260	(19.6 %) 313	(22.4 %) 372	(14.6 %) 249	(18.4 %) 318
South	(21.4 %) 323	(28.4 %) 617	(22.1 %) 352	(12.8 %) 212	(22.2 %) 378	(15.0 %) 259
South West	(3.7 %) 56	(3.7 %) 81	(0.4 %) 6	(3.0 %) 50	(0.7 %) 12	(4.1 %) 70
Lower West	(12.2 %) 184	(11.6 %) 251	(12.2 %) 194	(11.6 %) 192	(12.0 %) 204	(11.1 %) 192
Mid West	(3.0 %) 45	(3.0 %) 66	(2.8 %) 44	(1.8 %) 30	(0.8 %) 41	(2.8 %) 49
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(10.2 %) 154	(10.2 %) 222	(10.5 %) 168	(12.0 %) 199	(11.5 %) 195	(9.0 %) 155
Total	(100.0 %) 1508	(100.0 %)2173	(100.0 %)1596	(100.0 %)1662	(100.0 %)1701	(100.0 %)1725
Common tern						
North	(0 %) 0	(22.2 %) 2	(19.3 %) 350	(3.9 %) 28	(2.9 %) 17	(0 %) 0
North East	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0.1 %) 1
Upper East	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0.1 %) 1
Mid East	(0 %) 0	(11.1 %) 1	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
Lower East	(0 %) 0	(22.2 %) 2	(4.9 %) 89	(8.6 %) 61	(55.3 %) 329	(42.5 %) 413
South East	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0.3 %) 2	(0 %) 0
South	(0 %) 0	(44.4 %) 4	(69.8 %) 1269	(1.1 %) 8	(41.0 %) 244	(47.1 %) 458
South West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(2.8 %) 27
Lower West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0.5 %) 5
Mid West	(0 %) 0	(0 %) 0	(6.1 %) 110	(86.3 %) 612	(0.5 %) 3	(6.9 %) 67
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
Total	0	(100.0 %) 9	(100.0 %)1818	(100.0 %) 709	(100.0 %) 595	(100.0 %) 972

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
Bar-tailed godwit						
North	(6.3 %) 26	(4.8 %) 38	(7.4 %) 68	(6.6 %) 62	(9.3 %) 89	(6.4 %) 62
North East	(3.9 %) 16	(3.8 %) 30	(1.6 %) 15	(3.6 %) 34	(1.8 %) 17	(2.6 %) 25
Upper East	(1.5 %) 6	(2.5 %) 20	(1.2 %) 11	(1.3 %) 12	(1.2 %) 11	(2.0 %) 19
Mid East	(1.5 %) 6	(9.4 %) 74	(0.7 %) 6	(2.6 %) 25	(5.6 %) 53	(4.0 %) 39
Lower East	(25.6 %) 105	(15.4 %) 122	(15.3 %) 140	(11.2 %) 106	(11.0 %) 105	(12.6 %) 122
South East	(8.0 %) 33	(10.8 %) 85	(9.6 %) 88	(5.1 %) 48	(9.0 %) 86	(7.9 %) 77
South	(37.8 %) 155	(40.9 %) 323	(52.3 %) 480	(57.6 %) 545	(53.4 %) 508	(44.0 %) 427
South West	(0.5 %) 2	(0.1 %) 1	(0.4 %) 4	(0 %) 0	(0.3 %) 3	(6.9 %) 67
Lower West	(5.4 %) 22	(5.3 %) 42	(5.9 %) 54	(6.0 %) 57	(1.6 %) 15	(9.0 %) 87
Mid West	(4.6 %) 19	(2.0 %) 16	(0 %) 0	(0.4 %) 4	(0.4 %) 4	(1.2 %) 12
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(4.9 %) 20	(4.9 %) 39	(5.6 %) 51	(5.6 %) 53	(6.4 %) 61	(3.4 %) 33
Total	(100.0 %) 410	(100.0 %) 790	(100.0 %) 917	(100.0 %) 946	(100.0 %) 952	(100.0 %) 970
Lesser Sand Plover						
North	(1.3 %) 3	(2.1 %) 18	(2.2 %) 13	(2.0 %) 11	(1.5 %) 10	(1.5 %) 10
North East	(6.7 %) 15	(10.0 %) 84	(14.0 %) 84	(1.6 %) 9	(6.0 %) 39	(2.6 %) 17
Upper East	(11.2 %) 25	(2.7 %) 23	(7.5 %) 45	(2.2 %) 12	(0.3 %) 2	(2.6 %) 17
Mid East	(1.3 %) 3	(10.1 %) 85	(1.5 %) 9	(3.3 %) 18	(9.6 %) 63	(1.7 %) 11
Lower East	(29.5 %) 66	(12.9 %) 108	(7.5 %) 45	(16.4 %) 90	(9.0 %) 59	(17.9 %) 116
South East	(22.8 %) 51	(22.0 %) 184	(28.4 %) 170	(23.9 %) 131	(25.8 %) 169	(30.4 %) 197
South	(25.0 %) 56	(36.3 %) 304	(36.4 %) 218	(48.3 %) 265	(43.6 %) 285	(35.2 %) 228
South West	(0 %) 0	(0.2 %) 2	(0 %) 0	(0 %) 0	(0 %) 0	(5.7 %) 37
Lower West	(2.2 %) 5	(2.6 %) 22	(2.5 %) 15	(2.4 %) 13	(3.8 %) 25	(0.3 %) 2

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
Mid West	(0 %) 0	(0.8 %) 7	(0 %) 0	(0 %) 0	(0 %) 0	(1.9 %) 12
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(0 %) 0	(0.1 %) 1	(0 %) 0	(0 %) 0	(0.3 %) 2	(0 %) 0
Total	(100.0 %) 224	(100.0 %) 838	(100.0 %) 599	(100.0 %) 549	(100.0 %) 654	(100.0 %) 647
Great sand plover						
North	(4.8 %) 55	(5.3 %) 22	(7.3 %) 46	(4.4 %) 22	(3.2 %) 21	(3.7 %) 30
North East	(8.3 %) 95	(12.4 %) 51	(6.0 %) 38	(3.6 %) 18	(16.1 %) 106	(8.5 %) 70
Upper East	(3.7 %) 43	(7.5 %) 31	(1.6 %) 10	(3.6 %) 18	(8.0 %) 53	(9.1 %) 75
Mid East	(4.3 %) 50	(3.2 %) 13	(10.1 %) 64	(0.8 %) 4	(1.7 %) 11	(5.5 %) 45
Lower East	(14.8 %) 170	(18.9 %) 78	(15.8%) 100	(20.4 %) 103	(12.7 %) 84	(11.6 %) 95
South East	(15.3 %) 176	(15.5 %) 64	(22.7 %) 144	(32.9 %) 166	(16.8 %) 111	(19.6 %) 161
South	(39.4 %) 453	(27.2 %) 112	(27.8 %) 176	(25.8 %) 130	(32.6 %) 215	(24.8 %) 204
South West	(0 %) 0	(1.2 %) 5	(0 %) 0	(0 %) 0	(0.3 %) 2	(7.2 %) 59
Lower West	(7.0 %) 80	(7.0 %) 29	(6.9 %) 44	(6.9 %) 35	(4.7 %) 31	(9.3 %) 76
Mid West	(0 %) 0	(0 %) 0	(0.2 %) 1	(0 %) 0	(0.5 %) 3	(0.7 %) 6
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(2.5 %) 29	(1.7 %) 7	(1.7 %) 11	(1.6 %) 8	(3.3 %) 22	(0 %) 0
Total	(100.0 %) 1151	(100.0 %) 412	(100.0 %) 634	(100.0 %) 504	(100.0 %) 659	(100.0 %) 821
Silver gull						
North	(12.0 %) 59	(11.2 %) 39	(9.0 %) 25	(10.1 %) 51	(12.1 %) 109	(13.4 %) 108
North East	(15.3 %) 75	(3.4 %) 12	(5.4 %) 15	(3.8 %) 19	(6.4 %) 57	(4.5 %) 36
Upper East	(4.7 %) 23	(2.3 %) 8	(9.4 %) 26	(2.0 %) 10	(3.8 %) 34	(7.5 %) 60
Mid East	(2.9 %) 14	(6.6 %) 23	(1.4 %) 4	(1.2 %) 6	(5.8 %) 52	(4.8 %) 39
Lower East	(7.3 %) 36	(10.1 %) 35	(7.9 %) 22	(6.0 %) 30	(10.1 %) 90	(6.2 %) 50

Region	September 2003	October 2003	November 2003	December 2003	January 2004	February 2004
South East	(7.3 %) 36	(17.5 %) 61	(12.9 %) 36	(7.7 %) 39	(4.7 %) 42	(5.2 %) 42
South	(14.7 %) 72	(11.5 %) 40	(13.3 %) 37	(26.2 %) 132	(5.4 %) 48	(3.9 %) 31
South West	(4.9 %) 24	(1.1 %) 4	(0 %) 0	(2.8 %) 14	(14.6 %) 130	(6.3 %) 51
Lower West	(10.8 %) 53	(11.8 %) 41	(7.2 %) 20	(11.5 %) 58	(10.9 %) 97	(6.8 %) 55
Mid West	(2.4 %) 12	(4.0 %) 14	(17.6 %) 49	(8.5 %) 43	(10.0 %) 89	(22.4 %) 180
Upper West	(5.7 %) 28	(5.7 %) 20	(5.8 %) 16	(5.8 %) 29	(4.3 %) 38	(7.3 %) 59
North West	(11.8 %) 58	(14.7 %) 51	(10.1 %) 28	(14.5 %) 73	(11.9 %) 106	(11.7 %) 94
Total	(100.0 %) 490	(100.0 %) 348	(100.0 %) 278	(100.0 %) 504	(100.0 %) 892	(100.0 %) 805
Fairy tern						
North	(0 %) 0	(0 %) 0	(5.5 %) 33	(15.0 %) 116	(18.3 %) 136	(6.7 %) 37
North East	(0 %) 0	(0 %) 0	(0.7 %) 4	(0 %) 0	(0 %) 0	(1.6 %) 9
Upper East	(27.9 %) 34	(0 %) 0	(0 %) 0	(0.3 %) 2	(0 %) 0	(0 %) 0
Mid East	(1.6 %) 2	(0 %) 0	(0.2 %) 1	(0 %) 0	(0 %) 0	(0 %) 0
Lower East	(0 %) 0	(0.4 %) 1	(2.1 %) 13	(0.9 %) 7	(8.3 %) 62	(19.9 %) 110
South East	(0 %) 0	(0 %) 0	(0 %) 0	(1.7 %) 13	(2.7 %) 20	(4.0 %) 22
South	(64.8 %) 79	(98.9 %) 277	(90.9 %) 550	(62.7 %) 484	(69.6 %) 518	(66.5 %) 368
South West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0.9 %) 5
Lower West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
Mid West	(0 %) 0	(0 %) 0	(0 %) 0	(19.4 %) 150	(0 %) 0	(0 %) 0
Upper West	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0	(0 %) 0
North West	(5.7 %) 7	(0.7 %) 2	(0.7 %) 4	(0 %) 0	(1.1 %) 8	(0.4 %) 2
Total	(100.0 %) 122	(100.0 %) 280	(100.0 %) 605	(100.0 %) 772	(100.0 %) 744	(100.0 %) 553

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
North	(4.5)%	785	(5.1%)	334	(8.3%)	379	(4.9%)	321	(4.4%)	283	(12.5%)	912	(39.4%)	8040
North East	(6.5%)	1122	(6.5%)	424	(3.4%)	153	(3.0%)	198	(3.4%)	222	(3.7%)	269	(5.2%)	1058
Upper East	(3.6%)	625	(3.6%)	232	(4.5%)	204	(2.2%)	141	(1.9%)	120	(2.4%)	177	(3.0%)	606
Mid East	(3.7%)	649	(3.5%)	225	(3.3%)	149	(1.2%)	77	(1.3%)	86	(2.6%)	193	(3.1%)	626
Lower East	(18.6%)	3226	(12.7%)	827	(26.0%)	1186	(16.9%)	1101	(11.6%)	749	(12.0%)	876	(10.9%)	2236
South East	(14.1%)	2440	(16.2%)	1053	(13.8%)	628	(12.1%)	785	(10.7%)	692	(18.1%)	1320	(11.4%)	2323
South	(21.4%)	3707	(21.0%)	1362	(24.9%)	1138	(23.2%)	1510	(20.9%)	1349	(27.8%)	2030	(16.8%)	3424
South West	(14.8%)	2555	(20.6%)	1336	(4.7%)	215	(24.4%)	1587	(5.7%)	369	(7.5%)	546	(6.2%)	1258
Lower West	(3.6%)	618	(3.5%)	227	(4.3%)	198	(6.9%)	451	(23.2%)	1501	(6.5%)	475	(1.4%)	289
Mid West	(4.7%)	806	(3.9%)	252	(4.8%)	218	(3.6%)	237	(10.8%)	701	(1.4%)	101	(0.8%)	165
Upper West	(0.2%)	31	(0.1%)	5	(>0.1%)	1	(0.2%)	14	(1.3%)	85	(0.3%)	24	(>0.1%)	5
North West	(4.4%)	755	(3.2%)	210	(2.1%)	96	(1.3%)	86	(4.8%)	311	(5.2%)	376	(1.9%)	398
Total	(100%)	17319	(100%)	6487	(100%)	4565	(100%)	6508	(100%)	6468	(100%)	7299	(100%)	20428
Red-necked stint														
North	(1.2%)	57	(6.2%)	72	(1.8%)	15	(1.0%)	10	(1.3%)	14	(3.4%)	47	(1.9%)	75
North East	(6.3%)	306	(8.6%)	99	(2.8%)	23	(1.4%)	14	(2.2%)	24	(2.7%)	38	(8.3%)	332
Upper East	(1.9%)	92	(4.2%)	49	(3.9%)	32	(1.8%)	19	(2.8%)	31	(2.0%)	28	(3.5%)	141
Mid East	(1.6%)	76	(1.7%)	20	(0.5%)	4	(0%)	0	(1.1%)	12	(1.1%)	16	(2.9%)	117
Lower East	(25.3%)	1228	(15.2%)	176	(38.2%)	314	(34.5%)	356	(35.8%)	397	(25.0%)	350	(21.5%)	865
South East	(17.5%)	846	(29.9%)	346	(4.4%)	36	(6.3%)	65	(9.2%)	102	(15.4%)	216	(22.1%)	889
South	(28.5%)	1379	(31.9%)	369	(47.6%)	391	(50.8%)	525	(40.2%)	446	(48.8%)	683	(33.5%)	1344
South West	(9.7%)	468	(2.0%)	23	(0%)	0	(0%)	0	(0.1%)	1	(0.1%)	1	(5.1%)	204
Lower West	(4.8%)	232	(0.3%)	3	(0.6%)	5	(2.0%)	21	(5.0%)	56	(0.7%)	10	(0%)	0
Mid West	(2.4%)	116	(0%)	0	(0.2%)	2	(0.1%)	1	(0%)	0	(0.3%)	4	(0.4%)	16

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(0.9%)	45	(0%)	0	(0%)	0	(2.1%)	22	(2.3%)	26	(0.5%)	7	(0.8%)	32
Total	(100%)	4845	(100%)	1157	(100%)	822	(100%)	1033	(100%)	1109	(100%)	1400	(100%)	4015
Grey-tailed tattler														
North	(5.0%)	127	(2.1%)	23	(0%)	0	(0%)	0	(11.7%)	50	(3.7%)	22	(6.0%)	98
North East	(12.1%)	307	(14.7%)	160	(10,7%)	46	(12.5%)	56	(12.8%)	55	(8.8%)	52	(12.4%)	203
Upper East	(5.7%)	144	(6.2%)	68	(8.4%)	36	(5.6%)	25	(2.8%)	12	(3.9%)	23	(4.8%)	79
Mid East	(7.7%)	195	(6.7%)	73	(3.7%)	16	(1.6%)	7	(0.5)	2	(1.5%)	9	(4.8%)	79
Lower East	(12.2%)	309	(11.7%)	127	(25.2%)	108	(22.5%)	101	(15.2%)	65	(20.5%)	122	(12.8%)	208
South East	(17.5%)	446	(17.7%)	193	(13.6%)	58	(10.5%)	47	(23.5%)	101	(16.2%)	96	(17.4%)	283
South	(29.5%)	751	(30.6%)	333	(38.3%)	164	(44.9%)	201	(28.7%)	123	(35.0%)	208	(28.3%)	462
South West	(0.7%)	17	(6.1%)	66	(0%)	0	(0%)	0	(0.5%)	2	(0.7%)	4	(3.6%)	58
Lower West	(0.8%)	21	(3.5%)	38	(0%)	0	(1.3%)	6	(3.7%)	16	(5.9%)	35	(2.5%)	40
Mid West	(1.4%)	36	(0.6%)	7	(0%)	0	(0%)	0	(0%)	0	(2.0%)	12	(2.5%)	41
Upper West	(>0.1%)	1	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(7.4%)	189	(0.2%)	2	(0%)	0	(1.1%)	5	(0.7%)	3	(1.9%)	11	(4.9%)	80
Total	(100%)	2543	(100%)	1090	(100%)	428	(100%)	448	(100%)	429	(100%)	594	(100%)	1631
Ruddy turnstone														
North	(6.4%)	111	(12.0%)	15	(10.3%)	12	(11.8%)	13	(7.4%)	8	(4.0%)	9	(8.4%)	124
North East	(10.8%)	188	(4.0%)	5	(0%)	0	(6.4%)	7	(7.4%)	8	(9.7%)	22	(10.4%)	154
Upper East	(5.2%)	90	(3.2%)	4	(3.4%)	4	(4.5%)	5	(0.9%)	1	(2.2%)	5	(4.6%)	68
Mid East	(4.8%)	84	(6.4%)	8	(0.9%)	1	(0%)	0	(1.9%)	2	(2.6%)	6	(5.1%)	75
Lower East	(15.7%)	272	(8.0%)	10	(11.1%)	13	(10.9%)	12	(3.7%)	4	(7.9%)	18	(13.3%)	197
South East	(17.0%)	294	(13.6%)	17	(21.4%)	25	(27.3%)	30	(29.6%)	32	(26.4%)	60	(16.2%)	239

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
South	(12.7%)	220	(15.2%)	19	(17.1%)	20	(14.5%)	16	(13.9%)	15	(29.5%)	67	(15.7%)	231
South West	(6.5%)	113	(32.0%)	40	(7.7%)	9	(6.4%)	7	(2.8%)	3	(3.1%)	7	(8.2%)	121
Lower West	(7.8%)	136	(0%)	0	(7.7%)	9	(6.4%)	7	(13.0%)	14	(5.3%)	12	(5.0%)	74
Mid West	(3.8%)	65	(4.8%)	6	(0%)	0	(0%)	0	(0%)	0	(0.9%)	2	(2.4%)	35
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(9.2%)	160	(0.8%)	1	(20.5%)	24	(11.8%)	13	(19.4%)	21	(8.4%)	19	(10.7%)	158
Total	(100%)	1733	(100%)	125	(100%)	117	(100%)	110	(100%)	108	(100%)	227	(100%)	1476
Common tern														
North	(0.3%)	2	(2.5%)	1	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(15.4%)	2
North East	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Upper East	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Mid East	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Lower East	(25.3%)	193	(95.0%)	38	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(30.8%)	4
South East	(3.9%)	30	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
South	(36.4%)	278	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
South West	(31.1%)	237	(2.5%)	1	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(53.8%)	7
Lower West	(1.6%)	12	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Mid West	(1.4%	11	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Total	(100%)	763	(100%)	40	(100%)	0	(100%)	0	(100%)	0	(100%)	0	(100%)	13
Bar-tailed godwit														
North	(4.0%)	43	(7.7%)	14	(9.8%)	13	(7.7%)	8	(0%)	0	(7.3%)	8	(5.3%)	42
North East	(2.6%)	28	(5.5%)	10	(0%)	0	(1.9%)	2	(0%)	0	(0.9%)	1	(1.8%)	14

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
Upper East	(2.1%)	22	(2.7%)	5	(4.5%)	6	(2.9%)	3	(5.6%)	4	(1.8%)	2	(2.4%)	19
Mid East	(3.4%)	36	(1.1%)	2	(0%)	0	(0%)	0	(0%)	0	(10.0%)	11	(5.0%)	40
Lower East	(24.7%)	264	(8.2%)	15	(12.1%)	16	(15.4%)	16	(9.9%)	7	(5.5%)	6	(20.5%)	164
South East	(5.3%)	57	(3.3%)	6	(0%)	0	(3.8%)	4	(23.9%)	17	(0%)	0	(8.8%)	70
South	(41.0%)	439	(32.8%)	60	(65.9%)	87	(61.5%)	64	(54.9%)	39	(73.6%)	81	(39.6%)	317
South West	(4.0%)	43	(38.8%)	71	(5.8%)	10	(5.8%)	6	(5.6%)	4	(0.9%)	1	(14.1%)	113
Lower West	(7.1%)	76	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(2.3%)	18
Mid West	(1.0%)	11	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0.3%)	2
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(4.8%)	51	(0%)	0	(0%)	0	(1.0%)	1	(0%)	0	(0%)	0	(0.1%)	1
Total	(100%)	1070	(100%)	183	(100%)	132	(100%)	104	(100%)	71	(100%)	110	100%	800
Lesser Sand Plover														
North	(4.0%)	36	(0.4%)	1	(0.4%)	1	(0.3%)	1	(0.3%)	1	(0.8%)	3	(1.1%)	6
North East	(11.1%)	100	(6.9%)	18	(1.1%)	3	(0%)	0	(0.3%)	1	(0.5%)	2	(12.5%)	70
Upper East	(2.1%)	19	(3.8%)	10	(7.5%)	21	(1.8%)	6	(0/9%)	3	(1.3%)	5	(4.3%)	24
Mid East	(4.1%)	37	(0.4%)	1	(1.4%)	4	(0%)	0	(0%)	0	(0.3%)	1	(2.1%)	12
Lower East	(15.6%)	141	(11.1%)	29	(27.4%)	77	(1.2%)	4	(3.0%)	10	(13.9%)	54	(12.0%)	67
South East	(22.5%)	203	(6.5%)	17	(2.5%)	7	(0.6%)	2	(0.6%)	2	(9.5%)	37	(19.3%)	108
South	(39.4%)	355	(58.8%)	154	(59.8%)	168	(94.5%)	312	(93.2%)	313	(73.7%)	286	(43.8%)	245
South West	(0.8%)	7	(12.2%)	32	(0%)	0	(1.5%)	5	(1.5%)	5	(0%)	0	(3.6%)	20
Lower West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0.3%)	1	(0%)	0	(0.9%)	5
Mid West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0.4%)	2
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(0.4%)	4	(0%)	0	(0%)	0	(0%)	00	(0%)	0	(0%)	0	(0%)	0

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
Total	(100%)	902	(100%)	262	(100%)	281	(100%)	330	(100%)	336	(100%)	388	(100%)	559
Great sand plover														
North	(5.0%)	25	(3.0%)	7	(13.1%)	27	(5.5%)	9	(0.9%)	2	(7.1%)	55	(6.4%)	58
North East	(5.2%)	26	(15.0%)	35	(9.2%)	19	(10.4%)	17	(4.7%)	10	(10.4%)	81	(13.4%)	121
Upper East	(1.0%)	5	(4.3%)	10	(14.6%)	30	(9.8%)	16	(2.8%)	6	(5.0%)	39	(5.3%)	48
Mid East	(1.8%)	9	(6.0%)	14	(3.4%)	7	(0%)	0	(0%)	0	(5.4%)	42	(4.5%)	41
Lower East	(21.4%)	107	(16.7%)	39	(22.3%)	46	(1.2%)	2	(9.0%)	19	(15.1%)	117	(16.4%)	148
South East	(10.6%)	53	(7.7%)	18	(0.5%)	1	(2.4%)	4	(0%)	0	(8.1%)	63	(14.4%)	130
South	(49.5%)	247	(36.8%)	86	(35.0%)	72	(65.9%)	108	(75.8%)	160	(27.5%)	214	(25.6%)	231
South West	(1.2%)	6	(8.5%)	20	(0%)	0	(4.3%)	7	(2.4%)	5	(14.8%)	115	(7.9%)	71
Lower West	(0%)	0	(0.9%)	2	(0%)	0	(0%)	0	(0.5%)	1	(4.2%)	33	(1.6%)	14
Mid West	(1.8%)	9	(0%)	0	(1.9%)	4	(0%)	0	(1.4%)	3	(1.7%)	13	(1.6%)	14
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(2.4%)	12	(1.3%)	3	(0%)	0	(0/6%)	1	(2.4%)	5	(0.6%)	5	(3.0%)	27
Total	(100%)	499	(100%)	234	(100%)	206	(100%)	164	(100%)	211	(100%)	777	(100%)	903
Silver gull														
North	(7.8%)	58	(7.8%)	22	(19.4%)	40	(3.2%)	11	(1.8%)	11	(17.7%)	108	(51.4%)	186
North East	(2.3%)	17	(5.0%)	14	(4.4%)	9	(0.9%)	3	(1.3%)	8	(1.3%)	8	(1.1%)	4
Upper East	(8.0%)	60	(7.5%)	21	(3.4%)	7	(4.0%)	14	(1.8%)	11	(1.3%)	8	(0.8%)	3
Mid East	(1.2%)	9	(16.0%)	45	(2.9%)	6	(2.3%)	8	(2.2%)	13	(1.8%)	11	(3.9%)	14
Lower East	(5.8%)	43	(8.2%)	23	(4.4%)	9	(10.4%)	36	(8.2%)	49	(4.4%)	27	(6.9%)	25
South East	(1.7%)	13	(3.2%)	9	(3.9%)	8	(15.6%)	54	(8.0%)	48	(9.5%)	58	(9.9%)	36
South	(3.2%)	24	(2.8%)	8	(3.9%)	8	(5.2%)	18	(1.7%)	10	(5.4%)	33	(8.3%)	30
South West	(6.6%)	49	(13.2%)	37	(30.6%)	63	(25.1%)	87	(9.8%)	59	(4.3%)	26	(1.7%)	6

Region	March 2004		April 2004		May 2004		June 2004		July 2004		August 2004		September 2004	
Lower West	(3.8%)	28	(8.2%)	23	(6.8%)	14	(21.9%)	76	(37.8%)	227	(30.3%)	185	(5.2%)	19
Mid West	(35.7%)	266	(4.3%)	12	(8.7%)	18	(7.2%)	25	(20.5%)	123	(4.6%)	28	(5.0%)	18
Upper West	(2.9%)	22	(0.4%)	1	(0%)	0	(2.9%)	10	(5.0%)	30	(2.6%)	16	(0%)	0
North West	(21.0%)	157	(23.5%)	66	(11.7%)	24	(1.4%)	5	(1.8%)	11	(16.7%)	102	(5.8%)	21
Total	(100%)	746	(100%)	281	(100%)	206	(100%)	347	(100%)	600	(100%)	610	(100%)	362
Fairy tern														
North	(5.4%)	43	(0.8%)	9	(1.2%)	1	(2.2%)	3	(0%)	0	(1.2%)	6	(0.2%)	1
North East	(3.4%)	27	(0.2%)	2	(0%)	0	(0%)	0	(1.8%)	1	(0%)	0	(0%)	0
Upper East	(0.1%)	1	(0.1%)	1	(0%)	0	(8.0%)	11	(0%)	0	(0.4%)	2	(1.2%)	5
Mid East	(0.4%)	3	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0.5%)	2
Lower East	(7.2%)	57	(1.4%)	15	(93.8%)	76	(3.6%)	5	(0%)	0	(0%)	0	(0%)	0
South East	(0.4%)	3	(8.5%)	90	(0%)	0	(7.3%)	10	(7.0%)	4	(0%)	0	(0%)	0
South	(75.4%)	600	(7.1%)	75	(4.9%)	4	(32.8%)	45	(15.8%)	9	(18.2%)	93	(7.5%)	32
South West	(7.8%)	62	(81.9%)	868	(0%)	0	(43.1%)	59	(71.9%)	41	(61.3%)	314	(80.0%)	343
Lower West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(18.2%)	93	(9.8%)	42
Mid West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
Upper West	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0	(0%)	0
North West	(0%)	0	(0%)	0	(0%)	0	(2.9%)	4	(3.5%)	2	(0.8%)	4	(0.9%)	4
Total	(100%)	796	(100%)	1060	(100%)	81	(100%)	137	(100%)	57	(100%)	512	(100%)	429

Attachment 4 - Bird Species Recorded from Barrow Island. Based on Sedgewick (1978) and WAPET (1991), with species apparently recorded for the first time on the Island during the 2003/2004 surveys marked with an asterisk. Under Status, species are classified as either: R = resident; M = regular migrant or V = vagrant. Under Habitat, species are classified as either: T = terrestrial; L = littoral (shoreline, shallows and inshore waters, including ephemeral wetlands); O = oceanic (marine) or OI = oceanic but breeding on offshore islets. The conservation status of species under the WA Wildlife Conservation Act, Federal EPBC Act and CALM priority list is indicated.

Species	Status	Habitat	Conservation status
Phasianidae (pheasants and quails)			
Brown quail *Coturnix ypsilophora*	R	T	
Anatidae (ducks, geese and swans)			
Black swan *Cygnus atratus*	V	L	
Australian wood duck *Chenonetta jubata*	V	L	
Grey teal *Anas gibberifrons*	V	L	
Podicepididae (grebes)			
Australasian grebe *Tachybaptus novaehollandiae*	V	L	
Procellariidae (shearwaters)			
Wedge-tailed shearwater *Puffinus pacificus*	M	OI	migratory
Diomedeidae (albatrosses)			
Yellow-nosed albatross *Diomedea chlororhynchos*	V	O	migratory
Hydrobatidae (storm-petrels)			
Wilson's storm-petrel *Oceanites oceanicus*	V	O	migratory
Sulidae (gannets and boobies)			
Masked booby *Sula dactylatra*	V	O	migratory
Brown booby *Sula leucogaster*	V	O	migratory
Anhingidae (darters)			
Darter *Anhinga melanogaster*	V	L	
Phalacrocoracidae (cormorants)			
Little pied cormorant *Phalacrocorax melanoleucos*	R*	L	
Pied cormorant *Phalacrocorax varius*	R	L	
Little black cormorant *Phalacrocorax sulcirostris*	R*	L	
Great cormorant *Phalacrocorax carbo*	R	L	
Pelecanoididae (pelicans)			
Australian pelican *Pelecanus conspicillatus*	R	L	
Fregatidae			
Lesser frigatebird *Fregata ariel*	V	O	migratory
Ardeidae (herons and egrets)			
White-faced heron *Ardea (Egretta) novaehollandiae*	R	L	
Little egret *Ardea (Egretta) garzetta*	V	L	

Species	Status	Habitat	Conservation status
Eastern reef egret *Ardea (Egretta) sacra*	R	L	migratory
Great egret *Ardea (Egretta) alba*	V*	L	migratory
Striated heron *Butorides striatus*	R	L	
Nankeen night heron *Nycticorax caledonicus*	R	L	
Accipitridae (kites, hawks and eagles)			
Osprey *Pandion haliaetus*	R	L	migratory
Black-shouldered kite *Elanus notatus*	R	T	
Square-tailed kite *Lophoictinia isura*	V	T	
Black-breasted buzzard *Hamirostra melanosternon*	V	T	
Whistling kite *Haliastur sphenurus*	V	T	
Brahminy kite *Haliastur indus*	R	L	
White-bellied sea-eagle *Haliaeetus leucogaster*	R	T	migratory
Spotted harrier *Circus assimilis*	R	T	
Wedge-tailed eagle *Aquila audax*	V	T	
Falconidae (falcons)			
Brown falcon *Falco berigora*	V	T	
Australian hobby *Falco longipennis*	V	T	
Nankeen kestrel *Falco cenchroides*	R	T	
Otidae (bustards)			
Australian bustard *Ardeotis australis*	V	T	Priority 4
Scolopacidae (sandpipers)			
Black-tailed godwit *Limosa limosa*	M	L	migratory
Bar-tailed godwit *Limosa lapponica*	M	L	migratory
Little curlew *Numenius minutes*	V	L	migratory
Whimbrel *Numenius phaeopus*	M	L	migratory
Eastern curlew *Numenius madagascariensis*	M	L	migratory
Marsh sandpiper Tringa stagnatalis	V	L	migratory
Common greenshank *Tringa nebularia*	M	L	migratory
Wood sandpiper *Tringa glareola*	V	L	migratory
Terek sandpiper *Tringa (Xenus) terek*	M	L	migratory
Common sandpiper *Tringa hypoleucos*	M	L	migratory
Grey-tailed tattler *Tringa brevipes*	M	L	migratory
Ruddy turnstone *Arenaria interpres*	M	L	migratory
Great knot *Calidris tenuirostris*	M	L	migratory
Red knot *Calidris canutus*	M	L	migratory
Sanderling *Calidris alba*	M	L	migratory
Red-necked stint *Calidris ruficolli*s	M	L	migratory
Sharp-tailed Sandpiper *Calidris acuminata*	M	L	migratory
Curlew Sandpiper *Calidris ferrugine*a	M	L	migratory

Species	Status	Habitat	Conservation status
Burhinidae (stone-curlews)			
Beach stone-curlew *Esacus neglectus*	R	L	
Haematopodidae (oystercatchers)			
Pied oystercatcher *Haematopus longirostris*	R	L	
Sooty oystercatcher *Haematopus fuliginosus*	R	L	
Recurvirostridae (stilts and avocets)			
Black-winged stilt *Himantopus himantopus*	V	L	
Banded stilt *Cladorhynchus leucocephalus*	V	L	
Charadriidae (lapwings and plovers)			
Pacific golden plover *Pluvialis fulva*	M	L	migratory
Grey plover *Pluvialis squatarola*	M	L	migratory
Red-capped plover *Charadrius ruficapillus*	R	L	
Lesser sand plover *Charadrius mongolus*	M	L	migratory
Greater sand plover *Charadrius leschenaultii*	M	L	migratory
Oriental plover *Charadrius veredus*	V	L	migratory
Glareolidae (pratincoles)			
Australian pratincole *Stiltia isabella*	V	L	migratory
Laridae (gulls and terns)			
Silver gull *Larus novaehollandiae*	R	L	
Gull-billed tern *Sterna (Gelochelidon) nilotica*	R	L	
Caspian tern *Sterna (Hydroprogne) caspia*	R	L	
Lesser crested tern *Sterna bengalensis*	R	L	
Crested tern *Sterna bergii*	R	L	
Roseate tern *Sterna dougallii*	M	L/O	
Common tern *Sterna hirundo*	M	L/O	migratory
Little tern *Sterna albifrons*	M	L	migratory
Fairy tern *Sterna nereis*	?	L	
Bridled tern *Sterna anaethet*us	M	OI	migratory
White-winged black tern *Chlidonias leucoptera*	M	L	migratory
Lesser noddy *Anous tenuirostris*	?	O	
Columbidae (pigeons and doves)			
Crested pigeon *Ocyphaps lophotes*	V	T	
Peaceful dove *Geopelia placida*	V	T	
Bar-shouldered dove *Geopelia humeralis*	R	T	
Cacatuidae (cockatoos)			
Galah *Cacatua roseicapilla*	V	T	
Little corella *Cacatua sanguinea*	V	T	
Cockatiel *Nymphicus hollandicus*	V	T	
Psittacidae (lorikeets and parrots)			

Species	Status	Habitat	Conservation status
Budgerigar *Melopsittacus undulatus*	V	T	
Cuculidae (cuckoos)			
Oriental cuckoo *Cuculus saturatus*	*V	T	migratory
Pallid cuckoo *Cuculus pallidus*	R	T	
Horsfield's bronze-cuckoo *Chrysococcyx basalis*	R	T	
Black-eared cuckoo *Chrysococcyx osculans*	R	T	
Strigidae (hawk-owls)			
Southern boobook owl *Ninox novaeseelandiae*	V	T	
Tytonidae (barn owls)			
Barn owl *Tyto alba*	V	T	
Apodidae (swifts)			
Swiftlet species *Collocalia* sp.	V	T	
Fork-tailed swift *Apus pacificus*	?M	T	
White-throated needletail *Hirundapus caudacutus*	?M	T	
Halcyonidae (forest kingfishers)			
Red-backed kingfisher *Todiramphus pyrrhopygia*	V	T	
Sacred kingfisher *Todiramphus sanctus*	R	L	
Maluridae (fairy wrens)			
Barrow Island white-winged fairy wren *Malurus leucopterus edouardi*	R	T	Sched. 1, Vulnerable
Meliphagidae (honeyeaters)			
Spiny-cheeked honeyeater *Acanthagenys rufogularis*	V	T	
Singing honeyeater *Lichenostomus virescens*	R	T	
Brown honeyeater *Lichmera indistincta*	V	T	
Crimson chat *Epthianura tricolor*	V	T	
Dicruridae (flycatchers)			
Magpie-lark *Grallina cyanoleuca*	V	T	
Willie wagtail *Rhipidura leucophrys*	V	T	
Campephagidae (cuckoo-shrikes)			
Black-faced cuckoo-shrike *Coracina novaehollandiae*	V	T	
White-winged triller *Lalage sueurii*	V	T	
Artamidae (woodswallows)			
White-breasted woodswallow *Artamus leucorhynchus*	R	T	
Masked woodswallow *Artamus personatus*	V	T	
Black-faced woodswallow *Artamus cinereus*	V	T	
Corvidae (ravens and crows)			
Little crow Corvus bennetti	V	T	
Motacillidae (pipits and true wagtails)			
Richard's pipit *Anthus novaeseelandiae*	R	T	
Passeridae (finches and allies)			

Species	Status	Habitat	Conservation status
Painted firetail *Emblema picta*	V	T	
Zebra finch *Taeniopygia guttata*	R	T	
Hirundinidae (swallows)			
Welcome swallow *Hirundo neoxena*	R	T	
Tree Martin *Hirundo nigricans*	V	T	
Fairy Martin *Hirundo ariel*	V	T	
Sylviidae (Old World warblers)			
Spinifexbird *Eremiornis carteri*	R	T	
Brown songlark *Cincloramphus cruralis*	V	T	
Zosteropidae (silvereyes)			
Yellow white-eye *Zosterops luteus*	R	T	

Attachment 5 - Gorgon Development on Barrow Island. Technical Report on the White-winged Fairy-wren *Malurus leucopterus edouardi.*

Gorgon development on Barrow Island

Technical report

White-winged Fairy-wren *Malurus leucopterus edouardi*

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1 Introduction

The Gorgon Venture proposes to develop a gas processing facility on Barrow Island. The facility is proposed for Town Point on the east coast of the Island, with the associated gas feed pipelines running across the Island from a shore crossing at either North White's Beach or Flacourt Bay . The proposed development will result in the loss of some habitat for the endemic White-winged Fairy-wren *Malurus leucopterus edouardi*. The Barrow Island sub-species of the White-winged Fairy-wren is listed as Vulnerable under the *Wildlife Conservation Act 1950 (WA)* (Wildlife Conservation Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The aim of this study was to determine the number of White-winged Fairy-wrens inhabiting the proposed development area, and relate this to the estimated number of wrens in similar habitat on Barrow Island.

2 Methods

Surveys for the White-winged Fairy-wren were carried out in the late afternoon on the 22nd – 24th October 2004. The eight search areas surveyed are listed in Table 1. Each search area was approximately 100m wide and of variable length. The search areas were side-by-side and approximately 0.81 km^2 of the proposed 3 km^2 Development area was surveyed. The vegetation in the search areas generally consisted of mixed *Triodia* species with scattered clumps of *Acacia bivenosa* and scattered clumps of a *Melaleuca cardiophylla*.

Table 1. Location of each White-winged Fairy-wren search area. Each search area is a rectangular transect and all searches were carried out between 1500 and 1830hr.

Search Area	Date Searched	Eastern Edge	Western Edge	Northern Edge	Southern Edge	Area (m^2)
1	22-Oct-04	339450 E	337970 E	7700700 N	7700600 N	148000
2	22-Oct-04	339450 E	337970 E	7700600 N	7700500 N	148000
3	23-Oct-04	339160 E	338290 E	7700100 N	7700000 N	87000
4	23-Oct-04	339160 E	338290 E	7700200 N	7700100 N	87000
5	24-Oct-04	339236 E	337970 E	7700300 N	7700200 N	126600
6	24-Oct-04	339236 E	337970 E	7700300 N	7700400 N	126600
7	24-Oct-04	339800 E	339310 E	7700500 N	7700400 N	49000
8	24-Oct-04	339800 E	339395 E	7700650 N	7700550 N	40500

The search areas were surveyed by six people standing in a line, 20m apart, on one 100m wide front. The search area was swept by the six people moving forward into the search area at a walking pace, maintaining the straight line. Hand-held Global Positioning System (GPS) units were used to maintain the correct bearing at each boundary of the search line. If a bird was observed, the survey team paused while the observation was recorded. This ensured that a straight line was maintained.

As terrestrial birds are relatively uncommon on Barrow Island, all birds (in addition to White-winged Fairy-wrens) that were seen were recorded. Spectacled Hare-Wallabies (*Lagorchestes conspicillatus*) were also recorded. For each observation, notes were made on the species, the number of birds in the group, the habitat the birds were observed in, the soil type and the location in eastings and northings.

3 Results

The size of each search area ranged from 40500 to 148000m^2 (Table 1). The total area searched was 812700m^2, or 0.81km^2.

Three species of birds were recorded during the surveys: the White-winged Fairy-wren, Singing Honeyeater and Spinifex-bird (Table 2). The survey data for each species are presented in Appendix 1, and each species is discussed separately below.

Table 2. The number, the mean group size and density of the three bird species recorded during surveys 22nd – 24th October 2004.

Species	Number of records	Number of birds	Mean group size ± SD	Density (birds/km^2)
White-winged Fairy-wren *Malurus leucopterus edouardi*	23	85	3.7 ± 1.6	104.6
Singing Honeyeater *Lichenostomus virescens*	6	9	1.5 ± 0.8	11.1
Spinifex-bird *Eremiornis carteri*	26	27	1.0 ± 0.2	33.2

3.1 White-winged Fairy-wren

The White-winged Fairy-wren was observed on 23 occasions during the searches, with a total of 85 individual birds counted (Table 2). As the area of the proposed Gorgon development is 3 km^2, the number of White-winged Fairy-wrens in the entire development area is probably about 315 birds.

The density of White-winged Fairy-wrens was the highest of the three bird species observed; almost three times greater than the density of Spinifex-birds and almost 10 times greater than the density of Singing Honeyeaters. The mean group size of White-winged Fairy-wrens was 3.6 birds per group, which was larger than both the Singing Honeyeater and Spinifex-bird. The maximum number of White-winged Fairy-wrens recorded in a group was eight (Appendix 1).

The vegetation in the survey areas generally consisted of mixed *Triodia* species with scattered clumps of *Acacia bivenosa* and scattered clumps of *M. cardiophylla*. In 87% of White-winged Fairy-wren records, the habitat contained myrtaceous shrubs, and in 44% of records the habitat contained *A. bivenosa*. In 30% of records both *Melaleuca* shrubs and *A. bivenosa* were present.

White-winged Fairy-wren habitat is found over about 89.26 km^2 or approximately 40% of the island. The density of birds found in this study (Table 2) can be used to estimate the number of birds found in this habitat across the whole island, giving a figure of about 9336 birds.

3.2 Singing Honeyeater

The Singing Honeyeater, *Lichenostomus virescens*, was the least common bird observed, with a total of only nine birds recorded during surveys (Table 2). Consequently, the density of the Singing Honeyeater was very low compared with the other species observed. The Singing Honeyeater was usually recorded in association with *A. bivenosa* when habitat type was recorded (Appendix 1).

3.3 Spinifex-bird

The Spinifex-bird, *Eremiornis carteri*, was usually observed as single birds rather than in groups (Table 2). This species was three times more abundant than the Singing Honeyeater, but only about a third as abundant as the White-winged Fairy-wren. Of the 18 records where habitat was recorded, 39% of records were in habitats containing *M. cardiophylla* and 44% of records were in habitats containing *A. bivenosa*.

4 Discussion

Johnstone and Storr (2004) state that the White-winged Fairy-wren is moderately common to common on Barrow Island, and is one of the most abundant birds on the island. This bird has an estimated Island population of 8 150 (Sedgwick 1978) to 7 519 (Pruett-Jones & O'Donnel unpubl.). The results of this study suggest that the White-winged Fairy-wren is also the most abundant bird in the proposed development area. Development of the proposed area will result in the loss of about 315 White-winged Fairy-wrens or approximately 3-4% of the islands population.

Groups of White-winged Fairy-wrens appeared to be associated with clumps of *M. cardiophylla* or *A. bivenosa*. These shrubs may provide favoured areas of dense shelter

for roosting and nesting. *Acacia bivenosa* may also provide higher perches from which to scan the surrounding landscape for danger. When re-vegetation is carried out in the future, it will be important to include *M. cardiophylla* and *A. bivenosa* as these are important elements of White-winged Fairy-wren habitat.

5 References

Johnstone, R.E. & Storr, G.M. (2004). *Handbook of Western Australian Birds. Volume 2: Passerines (Blue-winged Pitta to Goldfinch)*. Western Australian Museum, Perth.

Appendix 1. Observations of the (a.) White-winged Fairy-wren, (b.) Singing Honeyeater and (c.) Spinifex-bird in search areas 22nd – 24th October 2004.

a. White-winged Fairy-wren

Search area	Number of birds	Easting	Northing	Vegetation description	Soil
1	3	338669 E	7700673 N	Mixed *Triodia* with *M. cardiophylla* & *A. bivenosa*	Loam no exposed limestone
1	4	339008 E	7700578 N	*M. cardiophylla*	Rise with exposed limestone
2	1	339366 E	7700575 N	*Acacia coriacea* in *Triodia wiseana* with *M. cardiophylla* & *A. bivenosa*	-
2	3	338565 E	7700496 N	*Triodia wiseana* & myrtaceous shrub (20% cover)	Red loam, exposed limestone on lower slope
2	3	339300 E	7700520 N	Mixed *Triodia* with 15% mixed *A. bivenosa* & *M. cardiophylla*	Loam, no exposed limestone
2	4	338382 E	7700596 N	*M. cardiophylla*	Limestone ridge
2	6	338274 E	7700576 N	*M. cardiophylla* with mixed *Triodia*	Limestone ridge
3	2	338408 E	7700085 N	Mixed *Triodia* with *M. cardiophylla* & *A. bivenosa*	Red loam over limestone lower slopes
3	8	338308 E	7700085 N	Mixed *Triodia* with myrtaceous shrub & *A. bivenosa*	Red loam over limestone lower slopes
4	4	339152 E	7700180 N	*A. bivenosa* over *Triodia* sp.	Loam, no exposed limestone
4	4	338868 E	7700152 N	Mixed *Triodia* with *A. bivenosa*	-
4	5	338496 E	7700222 N	Myrtaceous shrub over *Triodia*	Loam no exposed limestone
5	2	338219 E	7700210 N	*M. cardiophylla* with *Triodia* sp.	Loam no exposed limestone

5	3	339129 E	7700197 N	*Acacia bivenosa* and *M. cardiophylla* over *Triodia* sp.	Loam no exposed limestone
5	3	339006 E	7700175 N	*M. cardiophylla* with *Triodia* sp.	Loam no exposed limestone
5	3	338123 E	7700165 N	*M. cardiophylla* with *Triodia* sp.	Exposed Limestone
5	3	337962 E	7700170 N	*M. cardiophylla* with *Triodia* sp.	Exposed Limestone
5	3	338756 E	7700285 N	*Triodia angusta* with *M. cardiophylla* (15% cover	Red loam
5	3	338756 E	7700285 N	Mixed *Triodia* with 15% *M. cardiophylla.*	Red loam
5	6	338676 E	7700298 N	Mixed *Triodia* with *M. cardiophylla* (15%)	Loam with some exposed limestone
5	6	338676 E	7700298 N	Mixed *Triodia* with 15% *M. cardiophylla.*	Low limestone rise
6	3	338957 E	7700270 N	Mixed *Triodia* with mixed *M. cardiophylla* & *Acacia* sp. (15%)	Sandy Loam plain
7	3	339812 E	7700398 N	*Acacia coriacea*	sand

b. Singing Honeyeater

Search area	Number of birds	Easting	Northing	Vegetation description	Soil
1	1	339104 E	7700601 N	-	-
1	2	338762 E	7700689 N	Mixed *triodia* with *A. bivenosa* (10%cover)	Red loam, no exposed limestone
1	3	339242 E	7700595 N	*A. coriacea*	-
2	1	338703 E	7700610 N	*M. cardiophylla* with *A. bivenosa*	-
3	1	338938 E	7699997 N	*A. bivenosa* over *Triodia* sp.	-
4	1	339024 E	7700211 N	*A. bivenosa* over *Triodia sp.*	Exposed Limestone

c. Spinifex-bird

Searcharea	Number of birds	Easting	Northing	Vegetation description	Soil
1	1	339056 E	7700700 N	Mixed *Triodia* with 5% *A. bivenosa*	Red loam
1	1	338834 E	7700684 N	Mixed *Triodia* with *A. bivenosa* & *M. cardiophylla* (shrub cover 5%)	Red loam with some exposed limestone
1	1	338840 E	7700595 N	*M. cardiophylla.*	Exposed Limestone
1	1	338518 E	7700591 N	*Triodia*	Red sandy loam
1	1	338744 E	7700646 N	*T. angusta*	Low limestone rise
2	1	338400 E	7700470 N	-	-
2	1	338382 E	7700596 N	*M. cardiophylla*	Limestone ridge
3	1	339124 E	7700000 N	*A. bivenosa* over *Triodia* sp.	
3	1	338274 E	7700001 N	*M. cardiophylla*	Limestone ridge
3	1	338630 E	7700075 N	*Triodia angusta* with *Hakea chordophylla* and mixed *Acacia*	-
3	1	3391114 E	7700066 N	-	-
3	1	338913 E	7700059 N	-	-
3	1	338697 E	7700045 N	-	-
3	1	338638 E	7700025 N	-	-
5	1	338525 E	7700209 N	*M. cardiophylla* with *Triodia* sp.	Loam no exposed limestone
5	1	338123 E	7700165 N	*M. cardiophylla* with *Triodia* sp.	Exposed Limestone

5	1	338438 E	7700262 N	*M. cardiophylla* over *Triodia wiseana*	-
5	1	339145 E	7700241 N	-	-
6	1	338317 E	7700255 N	-	-
6	1	338927 E	7700400 N	*A. bivenosa*	Loam
7	1	339432 E	7700398 N	*A. bivenosa*	Loam
7	1	339477 E	7700426 N	*T. angusta* with *A. bivenosa*	-
7	1	339618 E	7700453 N	-	-
8	1	339752 E	7700552 N	*A. coriacea*	Sand
8	1	339780 E	7700510 N	*T. angusta* with 15% *A. bivenosa*	Sandy Loam plain
8	2	339560 E	7700549 N	*T. wiseana* with *A. bivenosa*	Low rise with limestone exposed

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Technical Appendix C4

Short Range Endemics and Other Terrestrial Invertebrates

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

SHORT RANGE ENDEMICS AND OTHER TERRESTRIAL INVERTEBRATES

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1 Introduction

1.1 Project Background and Current Status

The Gorgon Venture is seeking approval to develop the Gorgon gas fields, located some 130 km off the north-west coast of Western Australia. The Gorgon field is the largest gas field ever discovered in Australia and, together with the other fields in the area, represents an estimated 40 trillion cubic feet of resource. Investigations and project design work are currently underway for the proposed development of gas processing facilities on Barrow Island off the north-west coast of Western Australia.

The Island has been an active onshore oilfield since 1967 and was gazetted as a Class A Nature Reserve in 1910. The proposed development proposal has passed through an Environmental, Social and Economic Review (the ESE Review) under the provisions of the *Environmental Protection Act 1986* (the EPA Act). The review addressed the proposed development's general ability to mitigate potential on-site impacts and generate social and economic benefits for the region, state and nation. The State Government has determined that the proposed development could proceed to a more detailed level of formal environmental assessment. The proposed development is currently subject to a more detailed definition and environmental investigation under the *EPA Act* at the level of an Environmental Review and Management Programme (ERMP). Consideration of the proposed development's implications for the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) are also being evaluated.

This report on terrestrial invertebrates and potential short-range endemics (SREs) provides input to the ERMP on this ecological factor.

1.2 Overview of Issues Relating to Terrestrial Invertebrates

Terrestrial invertebrates are of interest in the current formal assessment process for several reasons (see also EPA 2003), as outlined below:

- The principle issue of potential significance relating to this fauna is the potential of some groups to contain species that are SREs. Many recent publications have highlighted taxonomic groups of invertebrates with naturally small distributions (less than 10 000 km^2) (general; Harvey 2002, freshwater snails; Ponder and Colgan 2002, land snails; Clark and Richardson 2002). These taxa are variously described as narrow range endemics or SREs (see Harvey 2002) and are, in part, characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the importance of short-range endemism to the conservation of biodiversity, the assessment of such invertebrate taxa is potentially an important component of impact assessment. Examples of taxonomic groups that show high levels of short-range endemism in this respect include millipedes, mygalomorph spiders and freshwater and terrestrial molluscs.
- The terrestrial invertebrate fauna of Barrow Island is not well collected or described, thus the potential for currently undescribed fauna to be collected is relatively high. Some of these undescribed species may be of conservation significance or taxonomic interest.
- Although not the primary focus of this report, documentation of terrestrial invertebrates currently occurring in the study area will be important in a baseline context for future quarantine monitoring.

1.3 Previous Surveys

Terrestrial invertebrates on Barrow Island have been poorly surveyed and collected in the past. Most surveys have been primarily focused on particular groups of invertebrates and do not provide a detailed baseline inventory of the Island's terrestrial invertebrate assemblages. The majority of the specimens registered with the Western Australian Museum (WAM) have resulted from opportunistic collections by its Arachnology Department and various honorary associates of the museum, including Harry Butler.

The Arachnology Department collected a number of specimens in 1993, in conjunction with a vertebrate fauna survey for WAPET. That trip enabled the Department to collect a number of unique taxa for the WAM's collections. Various techniques were used to collect specimens, including wet pitfall traps, collection of leaf litter, vehicle vibration, head-torching at night, sweep-netting, and general opportunistic foraging. Coastal localities were chosen to look specifically for a particular species of pseudoscorpion (*Anagarypus heatwolei*), which was of taxonomic significance at the time. Other localities such as John Wayne Country, Bandicoot Bay, and the Valley of the Giants were also sampled to maximise collecting from a number of different habitat types on the Island.

A preliminary survey of land snails on Barrow Island was undertaken in 2002 by Shirley Slack-Smith, and represents the first systematic survey of non-marine molluscs on any part of the Island. The objective of the survey was to assess areas that may have been impacted by the land-based components of the proposed development and equivalent areas adjacent to the impact zone (Slack-Smith, 2002). The survey showed that none of the species found within the impact zone had distributional ranges restricted to that area, but it did not provide comprehensive information about the broader distributions of these species outside the area of the study (Slack-Smith, 2002).

2 Methodology

Biota Environmental Sciences was engaged to sample invertebrate assemblages from the proposed Development area to assess the importance of this area to potentially site-restricted invertebrate taxa. The surveys were conducted mainly by Dr Roy Teale, Dr Mike Craig, Karen Edward and Lee Mould. The survey team has considerable collection experience in terrestrial invertebrate surveys in the Pilbara region.

2.1 Field Collection

Several targeted invertebrate groups were sampled through opportunistic collections, which were supplemented with material from systematic pit trapping during the first survey (24 November to 2 December 2003). In the second survey (25 August to 1 September 2004), a combination of wet pitfall trapping, leaf litter collection and opportunistic collection methods were used to sample terrestrial invertebrate taxa within the project area, proposed alternative campsites, and areas of non-impact. WAM staff were consulted to identify invertebrate groups of interest, such as SRES, to enable prioritisation of collecting effort.

Invertebrate groups targeted during the surveys included:

- Araneae (spiders, in particular trapdoor and wolf spiders)
- Pseudoscorpionida (pseudoscorpions)
- Scorpionida (scorpions)
- Diplopoda (millipedes)

- Pulmonata (camaenid land snails).

Specific spider taxa, such as trapdoor, wolf and huntsman spiders, were collected whilst head-torching at night and from pit traps from systematic trapping sites. Burrow excavation was also undertaken to collect trapdoor spiders.

Hand foraging for invertebrates was carried out, including lifting rocks, peeling bark, and foraging through leaf litter and under *Triodia*. This enabled collection of other spider taxa, camaenid land snails, insects, scorpions, millipedes, centipedes, and pseudoscorpions. Leaf litter and other debris found beneath *Triodia* was collected and later sieved for invertebrates.

Rhagada sp. 2 land snails were colleted after rain from a wide range of sites on Barrow Island during 2004. These snails were transported live to the University of Western Australia for genetic analyses. Electrophoresis was used to determine levels of polymorphism in *Rhagada* sp. 2 and the degree of genetic connection between snails from different parts of Barrow Island. The laboratory report and interpretation of the analyses is included as Attachment 4.

2.1.1 Survey One

During the first survey, invertebrate pit traps, consisting of plastic ice-cream containers were placed in the ground (Trap sites BIIT1 – BIIT8) to supplement opportunistic collection and material from vertebrate pit traps.

The wet pitfall traps that were used in the second survey consisted of a 2 litre ice-cream container filled with ethylene glycol to a depth of 2 cm. A lid (with an 82 mm diameter hole) was then placed on the trap to reduce the potential by-catch of vertebrates. Four of these traps were placed flush with the ground at each trapping site. Traps were placed, if possible, in shaded microhabitats such as beneath *Triodia* hummocks or shrubs. Traps were open for six nights and the collected material from the four traps were pooled for each site. Material was rinsed from the traps using water and placed in jars which were labelled for each site and stored for processing.

A selection of sites were also chosen for collection of leaf litter samples during the 2004 survey. Two full bags of leaf litter and soil were collected from areas beneath large *Triodia* bushes and melaleuca trees. Bags were labelled and later sieved and examined for invertebrates.

Table 2-1 outlines the site codes for each sampling site and the type of collection method used at each of the different sites during the first survey. Figure 2-1, Figure 2-2 and Figure 2-3 show the positions of sampling sites for opportunistic and systematic invertebrate collections on Barrow Island during 2003.

2.1.2 Survey Two

During the 2004 survey, thirty sites were established for systematic wet pitfall trapping over six days from 25 August to 1 September. A selection of these sites were chosen for leaf litter sampling and hand foraging. In total, there were 30 wet pitfall sites, 22 leaf litter sites, and 21 hand foraging sites. Photos of the trapping sites and a list of the site codes, localities and type of collection method used are provided in Attachment 1.

Sites were chosen within the impact areas [(IA), including town point (TP)], proposed alternative campsites [(AC), including proposed administration block (AD)], and non-

impact areas (NI). In each of these three categories, a number of replicated sites of four different vegetation associations were chosen for systematic invertebrate collections. These were *Triodia angusta* valleys (AV), *T. wiseana* on loamy soil (TL), *T. wiseana* on limestone (LM), and *Melaleuca cardiophylla* on limestone (ML). Six sites were also chosen in areas which are disturbed or more likely to support introduced species due to their proximity to points of entry onto the Island, such as the Barge Landing and the Warehouse.

Further details regarding sampling methods and sampling sites during the second survey in 2004 can be found in Attachment 1.

2.2 Curation and Limits on Identification

Trapdoor, wolf, and huntsman spiders were curated in 70 per cent ethanol with one or two legs removed and placed in 100 per cent ethanol for future molecular studies.

Invertebrate material which was collected via wet pitfalls was stored in ethylene glycol until it was transported to the WAM for processing and sorting. Material was first rinsed with water, then sieved out of the glycol and rinsed again. Specimens were then placed in jar of 70% ethanol to be sorted and identified.

Leaf litter samples were collected and stored in plastic bags. Each sample was sieved and examined for live invertebrates. All invertebrate material collected was immediately stored in 70% ethanol. All other material collected via foraging was placed in 70% ethanol. All material will be lodged with the WAM at the end of the project.

Specimens were identified by Biota scientists in consultation with WAM staff and using the WAM invertebrate collections. The level of specimen identification achievable was dependent on the level of taxonomic knowledge and expertise currently available. As a result, only a limited number of specimens could be identified to genus or species level. Only taxa belonging to groups known to include short-range endemics (mygalomorphs, pulmonate land snails, pseudoscorpions, millipedes), or for which expertise was readily available at the WAM (wolf spiders, other spider groups, scorpions, centipedes) were identified to genus or species level.

A large percentage of specimens collected from wet pitfall traps or sieved from leaf litter were juveniles. These individuals could not be identified to genus or species level and were not included in this report. This suggests that further surveys are required to collect adult specimens of certain taxa. Many groups are seasonal, with juveniles maturing at certain times of the year or after periods of rain. This is particularly prevalent in Mygalomorph spiders, where the males are generally only active after heavy rain. Female Mygalomorph spiders generally remain near or within their burrows. Attempts to dig up specimens from burrows only revealed juvenile spiders.

Many invertebrate taxa in Western Australia are currently under taxonomic revision, or in need of revision. In the absence of taxonomic keys or taxonomic resolution for many taxa, it is not possible to positively identify these invertebrates. While the WAM database was revised and updated specifically for this project, the lack of comprehensive collections of many invertebrate groups in Western Australia make it impossible to determine their distribution in other areas of the state.

2.3 Databasing for Regional Context

Key data for specimens lodged with the WAM were entered into the arachnology database. Data captured included taxonomy, location, number of specimens, sex of specimen, habitat, method of collection, and who determined the identification. In addition, a systematic search of the Department of Arachnology's collection was undertaken to locate all previous specimens collected from Barrow Island. The data from these specimens were then added to the arachnology database to provide a readily-accessible source of information on the Barrow Island collection. This was further supplemented by a second search of the arachnology collection to locate all those species or 'types' known to occur on Barrow Island (from the above work) that had also been collected from elsewhere on the mainland or other islands. The locations of these specimens were added to the database to provide regional context.

Table 2-1 – Localities of Sampling Sites and Collection Methods Used During the 2003 Survey

SITE CODE	LATITUDE	LONGITUDE	COLLECTION METHOD
BITP1	-20.789383	115.463033	Opportunistic
BITP2	-20.78925	115.46255	Opportunistic
BITP4	-20.788766	115.4636	Opportunistic
BIAP1	-20.800966	115.454366	Opportunistic
BIAP2	-20.802466	115.4483	Opportunistic
BIAP3	-20.80250	115.44833	Opportunistic
BIHT01	-20.78842	115.4629	Head-torching/opportunistic
BIHT02	-20.79488	115.42878	Head-torching/opportunistic
BIHT03	-20.80718	115.45078	Head-torching/opportunistic
BIHT04	-20.80247	115.4483	Head-torching/opportunistic
BIHT05	-20.80643	115.4524	Head-torching/opportunistic
BIHT06	-20.78938	115.46304	Head-torching/opportunistic
BIHT07	-20.78877	115.4636	Head-torching/opportunistic
BIHT08	-20.78892	115.46255	Head-torching/opportunistic
BIHT09	-20.77443	115.43518	Head-torching/opportunistic
BIHT10	-20.80453	115.44935	Head-torching/opportunistic
BIHT11	-20.78985	115.45583	Burrow excavation
BIHT12	-20.808	115.45063	Burrow excavation
BIHT13	-20.80683	115.45042	Burrow excavation
BIHT14	-20.78892	115.45528	Burrow excavation
BIHT15	-20.78894	115.45475	Burrow excavation
BIHT16	-20.77617	115.44979	Head-torching/opportunistic
BIHT17	-20.78408	115.45648	Head-torching/opportunistic
BIOP1	-20.6712	115.437316	Opportunistic
BIOP2	-20.670983	115.437	Opportunistic
BIOP3	-20.774433	115.435183	Opportunistic
BIOP4	-20.671083	115.43715	Opportunistic
BIOP5	-20.667633	115.454366	Opportunistic
BIOP6	-20.795033	115.4577	Opportunistic
BIOP7	-20.79235	115.438466	Opportunistic
BIOP8	-20.788333	115.463233	Opportunistic
BIMB01	-20.786793	115.45636	Vertebrate pitfall traps

SITE CODE	LATITUDE	LONGITUDE	COLLECTION METHOD
BIMB02	-20.784397	115.456096	Vertebrate pitfall traps
BIMB03	-20.799503	115.453349	Vertebrate pitfall traps
BIMB04	-20.78847	115.462011	Vertebrate pitfall traps
BIMB05	-20.791421	115.458619	Vertebrate pitfall traps
BIMB06	-20.776467	115.448205	Vertebrate pitfall traps
BI1.19	-20.7902	115.45645	Litter samples
BI1.21	-20.790033	115.456066	Litter samples
BI1.22	-20.789716	115.4557	Litter samples
BI1.23	-20.789583	115.455516	Litter samples
BI1.24	-20.789516	115.455383	Litter samples
BI1.25	-20.789316	115.455333	Litter samples
BI1.26	-20.789266	115.455066	Litter samples
BI1.27	-20.7891	115.454966	Litter samples
BI1.28	-20.789	115.454866	Litter samples
BI1.29	-20.79065	115.45695	Litter samples
BI1.41	-20.789816	115.45575	Litter samples
BI3.1	-20.788416	115.4629	Litter samples
BI3.3	-20.788283	115.462816	Litter samples
BI3.5	-20.78815	115.462716	Litter samples
BI3.7	-20.78807	115.4626	Litter samples
BI3.9	-20.787933	115.462483	Litter samples
BI3.10	-20.787866	115.462416	Litter samples
BI3.11	-20.787816	115.462383	Litter samples
BIIT1	-20.79587	115.4533	Invertebrate pitfall traps
BIIT2	-20.7958	115.4532	Invertebrate pitfall traps
BIIT3A	-20.79522	115.45287	Invertebrate pitfall traps
BIIT3B	-20.7953	115.4527	Invertebrate pitfall traps
BIIT4	-20.78802	115.45703	Invertebrate pitfall traps
BIIT5	-20.78435	115.46201	Invertebrate pitfall traps
BIIT6	-20.78478	115.4619	Invertebrate pitfall traps
BIIT7	-20.78549	115.4613	Invertebrate pitfall traps
BIIT8	-20.80573	115.45071	Invertebrate pitfall traps

Figure 2-1 - Survey Areas and Sampling Sites for Opportunistic and Systematic Invertebrate Collections on Barrow Island in 2003. See inserts A (Figure 2-2) and (Figure 2-3) for Detailed Sampling Localities and Site Codes

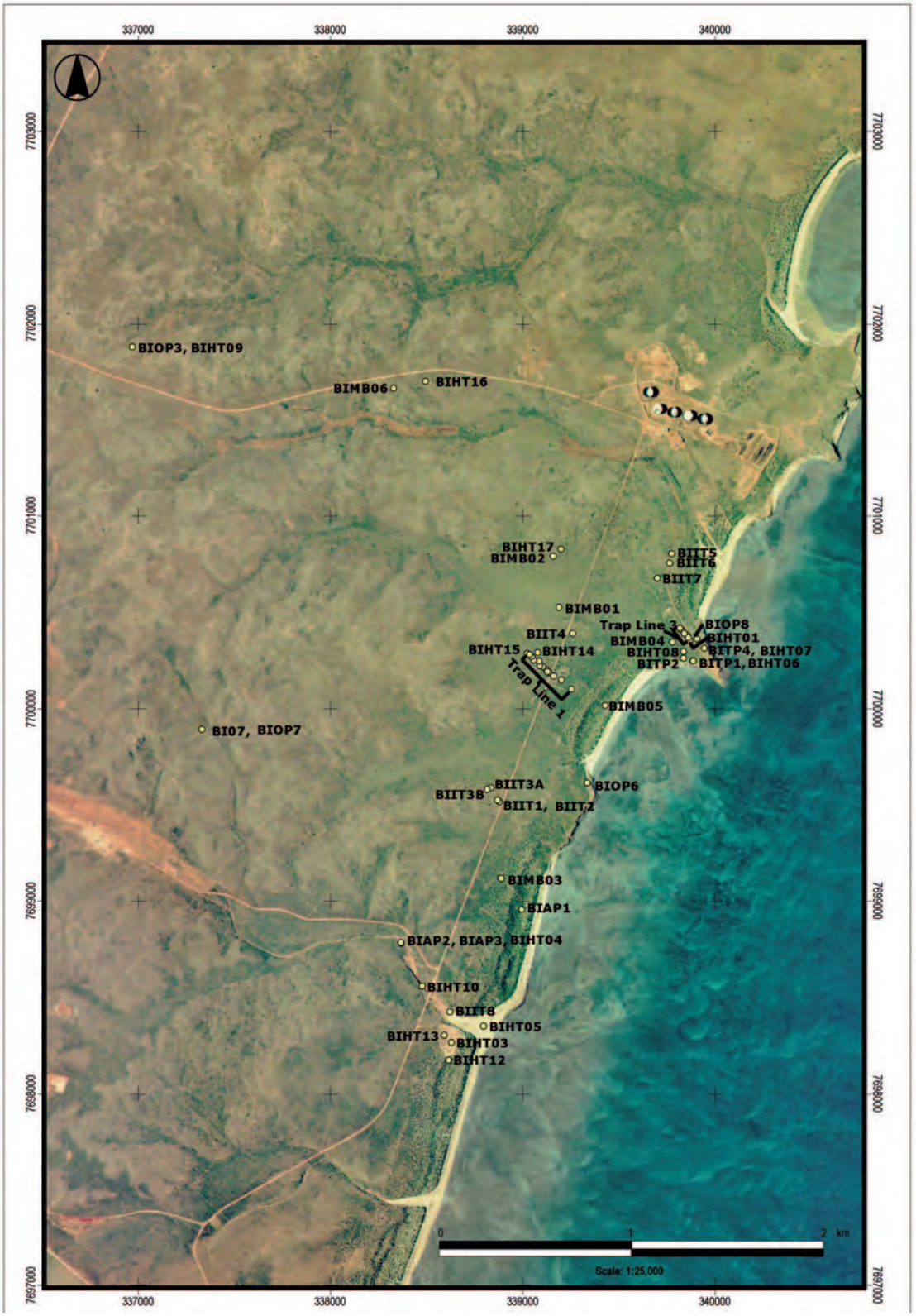

Figure 2-2 - (Insert A) Sampling Site Localities and Site Codes for Invertebrate Collections around Town Point and South-West of the Terminal Tanks in 2003. Trapline 1 Includes Litter Sample Sites BI1.19 - BI1.41. Trapline 3 Includes Litter Sample Sites BI3.1 - BI3.11

Figure 2-3 - (Insert B) Sampling Site Localities and Site Codes for Invertebrate Collections around Cape Dupuy in 2003

3 Results

3.1 Overview

More than 99 invertebrate taxa have been collected from Barrow Island, many of which could not be identified beyond family level. Of the invertebrate taxa specifically targeted during 2003, 22 spider taxa, four species of pseudoscorpion, three species of centipede, one millipede species, two species of scorpion (including a potentially new species), and five species of land snail were collected and identified (Table 3-1). A detailed breakdown of all specimens captured during the survey is provided in Attachment 2. Other species records for Barrow Island that were not collected during the study but have been recorded in the past are also shown in Attachment 2. Work is ongoing on many of these groups and further collecting on Barrow Island will add to this.

Table 3-1 - Summary of Invertebrate Taxa Collected During 2003

Class	Order	No. families	No. genera	No. identified species
Arachnida	Araneae	13	15	22
Arachnida	Pseudoscorpionida	2	3	4
Arachnida	Scorpionida	2	2	2
Myriapoda	Diplopoda	1	1	1
Myriapoda	Chilopoda	2	3	3
Gastropoda	Pulmonata	2	3	5

Sampling of terrestrial invertebrate taxa in 2004, particularly Arachnids and myriapods (known to contain short-range endemics) revealed more than 50 taxa. Many types of insects were also collected from this survey but could not be identified to species level at this stage due to poor taxonomic information, time and logistical constraints. Of the invertebrate taxa specifically targeted, 43 spider taxa, three genera of pseudoscorpion, four species of centipede, one millipede species, and two species of scorpion were collected and identified. Work is ongoing on many of these groups and in many cases, more detailed and extensive sampling is needed to provide further information on their natural distributions.

An order level summary of the invertebrate specimens collected from impact and non-impact sites during the study is provided in Table 3-2. A detailed breakdown of all specimens captured during the survey is provided as raw data in Attachment 1 and a list of all species found on Barrow Island has been collated from past field trips and past Museum records in Attachment 3.

Table 3-2 - Summary of Invertebrate Taxa Collected during 2004

Class	Order	No. families	No. genera	No. morphospecies
Arachnida	Acari	3+	4+	7+
Arachnida	Araneae	19	14	43
Arachnida	Pseudoscorpionida	1	3	3
Arachnida	Scorpionida	1	1	2
Myriapoda	Diplopoda	1	1	1
Myriapoda	Chilopoda	3	4	4

The section below represents an annotated list of the various invertebrate taxa collected during the 2003 study and new records for Barrow Island collected during the 2004 survey.

3.2 Acari (Mites/Ticks)

No Acari were collected in the 2003 survey. Three families of Acari could be identified from material collected from wet pitfall traps in 2004. These included Ioxidae, Caeculidae, and Trombiidae. Four specimens could not be placed within a family. Three juveniles were identified as *Amblyomma* but could not be identified. Two specimens of the family Caeculidae were collected from sites TLAC1 (*T. weiseana* on loam, alternate campsite) and LMAC2 (*T. wiseana* on limestone, alternate campsite), see Figure 2.2 in Appendix 1 for further details. A total of 12 specimens of the family Trombiidae were collected from numerous different habitats.

Very little research has been conducted on Acari, particularly mites, limiting identification of a number of groups. Caeculidae and Trombiidae are new family records for Barrow Island. Other species previously recorded from Barrow Island include: *Erythracarus decoris* (Anystidae), *Argas 'persicus'* (Argasidae) *Ornithodoros gurneyi* (Argasidae), *Amblyomma limbatum* (Ixodidae), *Haemaphysalis ratti* (Ixodidae), *Haemolaelaps marsupialis* (Laelapidae), and *Mesolaelaps antipodianus* (Laelapidae).

3.3 Araneae (Spiders)

Thirteen and 19 spider families were collected from the study area in 2003 and 2004, respectively (Table 3-1 and Table 3-2). Most spider families belong within the super family Araneomorphae ('modern spiders'), but one family (Nemesiidae) belongs within the super family Mygalomorphae ('ancient spiders').

3.3.1 Mygalomorph Spiders

Nemesiidae (Trapdoor Spiders)

Seven mygalomorph spider specimens belonging to the family Nemesiidae (Plate 3-1) were excavated from Y-shaped burrows, generally within *Triodia*-dominated habitats (sites BIHT11 – BIHT15) in 2003. Unfortunately, all specimens collected were juveniles and identification beyond family level was not possible. Specimens identified as *Aname mainae-group* have been previously collected from Barrow Island. However, taxonomic revision of this group is needed to determine whether Barrow Island specimens are taxonomically distinct from mainland species.

Systematic searches of the arachnology collection and database at the WAM discovered only one other species of mygalomorph spider, *Synothele butleri,* Raven 1994. This species of the family Barychelidae (brush-footed trapdoor spiders), has been found only on Barrow Island and is known only from one male specimen (T29867) (Attachment 2). The locality on Barrow Island where the specimen was collected is unknown.

Plate 3-1 - Juvenile Trapdoor Spider (Family Nemesiidae) Excavated from Y-shaped Burrow

3.3.2 Araneomorph Spiders (Modern Spiders)

Araneidae (Master Weavers)

One male, five females and one juvenile *Austracantha minax* Thorell 1859 (Christmas Spiders) were recorded from the study area in 2003. These specimens were collected by hand from webs at opportunistic site BIHT01 near Town Point (Attachment 2; Registration number T57725).

This particular species is relatively common and widespread (Figure 3-1) throughout Western Australia, South Australia, Tasmania and Queensland (Raven et al. 2002).

Other species of the family Araneidae that were not collected, but are known from Barrow Island, include *Argiope protensa* and *A. trifasciata* (Attachment 3).

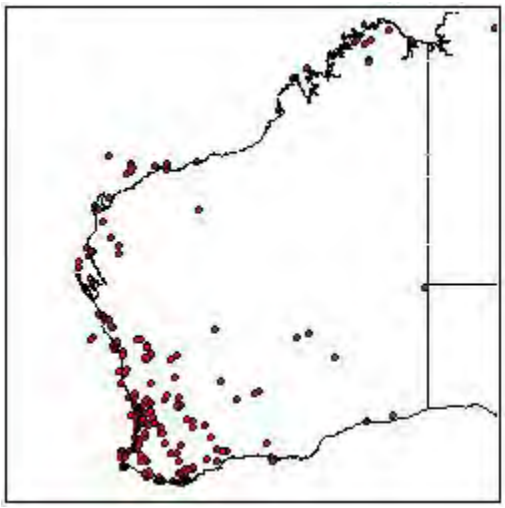

Figure 3-1 - Distribution of *Austracantha minax*

Deinopidae (Net-casting Spiders)

Two adult males of the genus *Deionopis* were collected in 2003 at vertebrate pit trapping sites BIMBO2 and BIMBO6, south-west of the Terminal Tanks in the proposed Development area (Registration numbers T57723, T57724; Attachment 2). A search of the WAM's arachnology database indicated that this species was the first record of *Deionopis* or other genera of Deinopidae from Barrow Island.

Gnaphosidae (Sac Spiders)

One female specimen belonging to the genus *Ceryerda* (T57715) was collected from BITP1, and one female of an unidentified genus (T57716) was collected at BI1.21 from beneath *Triodia* growing along a creek bed near Town Point in 2003.

A total of nine undescribed morpho-species of Gnaphosid spider were collected, mainly from wet pitfall traps, during 2004. Details of localities and habitat descriptions where the different species were collected are shown in Table 3.2 of Attachment 1. Two females differed in a number of characters to all males of this family and are considered to be different morphospecies.

Gnaphosid spiders are very abundant and diverse in the arid zone of Western Australia, so it is not surprising that many morphospecies were collected from this survey. Wet pitfall trapping is the most efficient method of surveying for these spiders. Nothing is known about the potential for this group to contain short-range endemics. More extensive surveying is needed to answer questions about wider distribution patterns and ecology of these species.

Lamponidae (White-tailed Spiders)

One species, *Lamponina scutata* Strand, was collected from the proposed development area in 2003. Two adult male specimens (T57721, T57722) were collected from vertebrate pit trapping sites BIMBO1 and BIMBO5 respectively. This species has previously been recorded from Barrow Island and is widespread within Western Australia (Figure 3-2). It also occurs in central and drier parts of Eastern Australia (Platnick 2000).

Three species belonging to the family Lamponidae were collected during the 2004 survey. Two of the species belong within the subfamily Lamponinae and one species within the subfamily Centrothelinae.

Within the Lamponinae, one male *Lampona ampeinna* and one male *Lamponina scutata* were collected in wet pits at sites MLIA1 and MLIA2 respectively (Figure 2.2 Attachment 1). These sites were in areas of *Melaleuca* on limestone within the proposed Development area. *Lampona ampeinna* is widespread in Western and central Australia. This particular species has not been collected from Barrow Island before but is known from Enderby Island in the Dampier Archipelago. *Lamponina scutata* is widespred in Western Australia (Figure 3-2).

A female specimen of *Notsodipus* sp 1 belonging to the subfamily Centrothelinae was collected near Town Point in an area of *T. wiseana* on loamy soil. In general, *Notsodipus* spp. are not an SRE and given the general biology of the group, the Barrow Island species is expected to occur on the mainland. This species is similar to *N.capaensis*, which

is only known from the type locality at Cape Range. Although only known from the type locality, it is unlikely that it would be restricted to that area.

Lampona and *Notsodipus* are new genus records and Centrothelinae is a new subfamily record for Barrow Island. Neither have been recorded from Barrow Island previously.

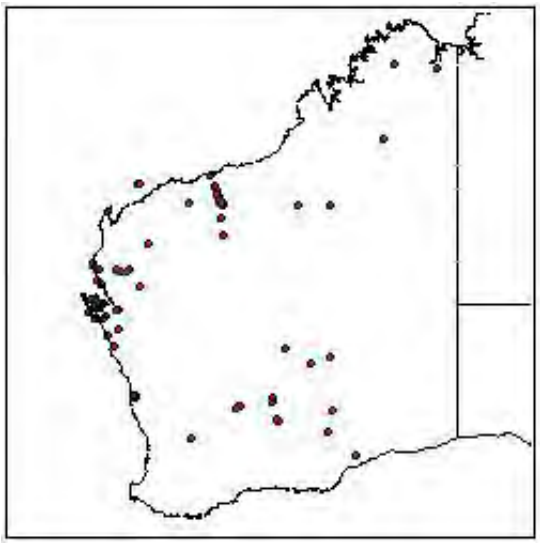

Figure 3-2 - Distribution of *Lamponina scutata*

Lycosidae (Wolf Spiders)

The family Lycosidae is the subject of a detailed taxonomic review by Dr. Volker W. Framenau of the Western Australian Museum. There are currently 145 wolf spider species in 22 genera in Australia (http://www.alphalink.com.au/~framenau/Lycosidae/) with an estimated 300–500 species awaiting description (Dr. Volker Framenau personal communication 2004). As a result, species names could not be allocated to a number of specimens collected from the proposed development area.

Four species of Lycosidae were collected during the 2003 survey, including *Hogna kuyani*-group, *Hoggicosa bicolor*-group, *Lycosa clara*, and *Venator* sp1. Most specimens were collected whilst head torching at night. Sixteen juvenile wolf spiders were collected from BIHT02 –05 and BIHT17 and could not be identified beyond family level.

Five specimens of the *H. kuyanii*-group (one adult male and four adult females; T57692-T57696) were collected from the ground whilst head torching at night (Plate 3-2). These specimens are similar to *H. kuyanii* and may be considered the same species (Dr. Volker Framenau personal communication 2004). The female genitalia (epigynum) of the specimens collected from the study area appear to be very similar to *H. kuyanii*, but colour patterning differs slightly. Variation in colour pattern is quite common within a number of wolf spider taxa, but may also be an artefact of the technique or duration of preservation of the WAM specimens.

Plate 3-2 - Adult Female *Hogna kuyani*-group (T57694)

Two male specimens of the *H. bicolor*-group were collected from site BIHT16 whilst head-torching at night. There are a number of species within the bicolor group which are currently under revision.

One specimen of *L. clara* was collected whilst head-torching at night at site BIMB02 south-west of the Terminal Tanks (T58762). This species is found throughout Australia and occurs across northern Western Australia (Figure 3-3) and also in the Northern Territory, Queensland, and New South Wales.

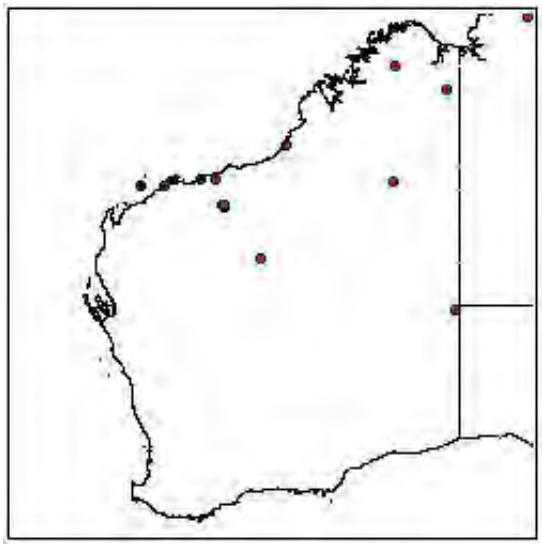

Figure 3-3 - Distribution of *Lycosa clara*

The most abundant wolf spider collected was *Venator* sp1. This particular species was miss-identified as *Lycosa meracula* Simon 1909 by McKay in 1979 and is a junior synonym of *Tetralycosa oraria* L.Koch 1876 (Dr Volker Framenau personal communication.). A total of 61 individuals (41 males, 17 females, and three juveniles) were collected from a number of sites within the proposed development area in 2003 (Attachment 2). Most specimens were collected in areas of *Acacia coriacea* and *Triodia* on pinkish-brown sands, either from vertebrate pitfall traps or whilst head-torching at night. This was the only species of wolf spider to be collected during the 2004 survey and was collected whilst head-torching at night on the beach near the existing ChevronTexaco camp. This species is known to inhabit coastal sandy soils and its habitat generally ranges from the wind-protected slopes of the coastal dunes to the wet sand of the beach (McKay 1979). Based on work undertaken by Dr Volker Framenau, this species of *Venator* is now considered to be a distinct taxon and will shortly be given a new name (Framenau et al., in press). It is known from a few sites in the adjacent Pilbara and Kimberley regions (Figure 3-4).

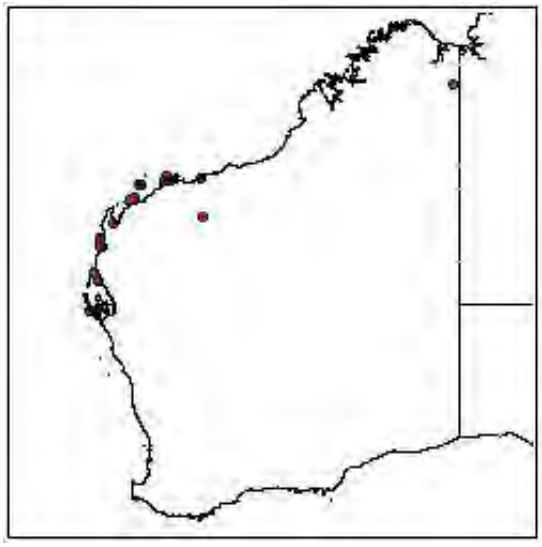

Figure 3-4 - Distribution of *Venator* sp1

Two additional species, *Lycosa laeta* and *Lycosa snelli*, have previously been collected from Barrow Island (Attachment 2). Both species have distributions outside Barrow Island. *L. laeta* is found in the Northern Territory, Queensland, Victoria, and Western Australia. *L. snelli* occurs on the mainland of Western Australia, ranging from the Wheatbelt to the Kimberley (Figure 3-5).

Figure 3-5 - Distribution of *Lycosa snelii.*

Miturgidae (Large Sac Spiders)

Four females, sixteen males, and six juveniles of the family Miturgidae were collected from vertebrate trapping sites BIMBO1- BIMBO6 in 2003. There is currently no comprehensive key available for the identification of species within the family Miturgidae (J. Waldock, WAM, personal communication 2004), and therefore, specimens could not be identified beyond family level. However, through visual assessment of male genitalia (male palp), at least three species of Miturgid spider are represented amongst the material collected from Barrow Island. Robert Raven from the Queensland Museum is currently revising the systematics of this family. The specimens lodged with the WAM will be available for his reviews.

Two described species of Miturgid spider, *Miturga serrata* and *Miturga occidentalis* were collected on previous field trips to Barrow Island. *M. serrata* was collected from Bandicoot Bay and the ChevronTexaco camp and is known only from these two specimens. *M. occidentalis* was collected near the camp. This species is known only from a few specimens but it has been collected from Barrow Island and Exmouth (Figure 3-6).

Figure 3-6 - Distribution of *Miturga occidentalis*

Oonopidae

One male and one female belonging to the genus *Opopaea* were collected from under *Triodia* on a creek bed (Site BI1.21, registration T57726) in 2003. The systematics of this spider family is currently being revised by Dr Mark Harvey at the WAM.

Five morphospieces belonging to four genera of Oonopid spider were collected from wet pitfall traps during the 2004 survey. These include *Gamasomorpha, Grymeus, Myrmopopae,* and *Opopaea*. Table 3.3 in Attachment 1 details the number of morphospecies of each genus, their localities and habitat descriptions.

Oonopids can generally only be collected by pitfall trapping. Most of the specimens collected are undescribed species and little can be said about their abundance or distribution on and off Barrow Island until further sampling is completed. It is likely that they are widely distributed on Barrow Island and may occur on the mainland also.

Two species of Oonopid spider have been described recently: *Grymeus 'nasutus'* (Harvey, in press) and *Orchestina 'barrow'* (Harvey, in press). *Grymeus 'nasutus'* has a distribution from Barrow Island to south of Shark Bay (Figure 3-7). *Orchestina 'barrow'* is only known from specimens from the ChevronTexaco camp and from Bandicoot Bay on Barrow Island (Figure 3-8).

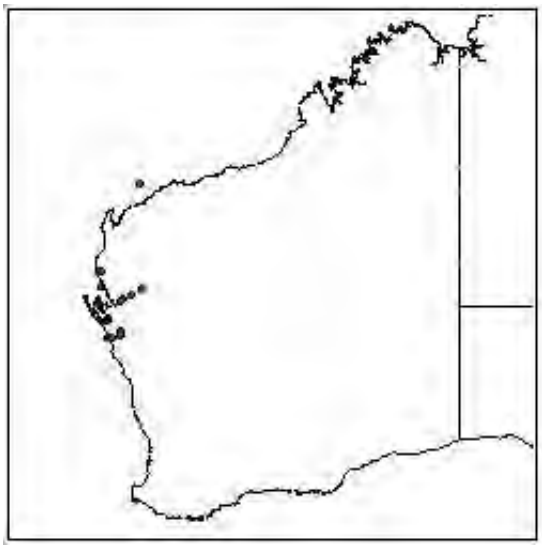

Figure 3-7 - Distribution of *Grymeus 'nasutus'*

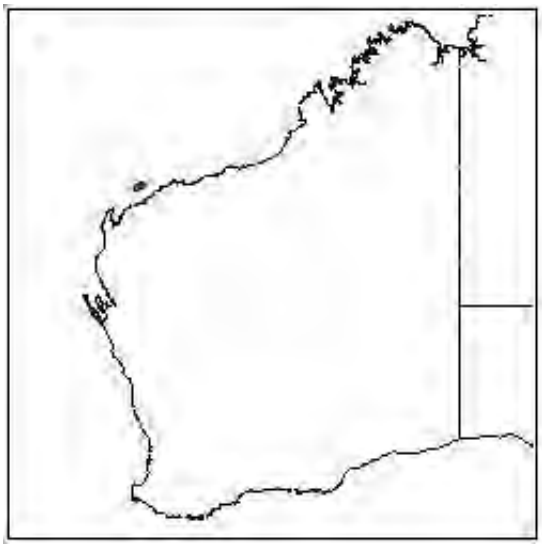

Figure 3-8 - Distribution of *Orchestina 'barrow'*

Salticidae (Jumping Spiders)

Two species of jumping spider belonging to the genus *Lycidas* were sieved from leaf litter collected from beneath *Triodia* in 2003 (Attachment 2). One female specimen of each species, *Lycidas* sp. 1 (T57717) and *Lycidas* sp. 2 (T57718), was collected from vertebrate trapping sites (BI3.11).

Five species from five Satticid genera were collected from Barrow Island during the 2004 survey: *Clynotis albobarbatus*-group, *Grayenulla waldochae*, *Lycidas* sp 1, *Pellenes* sp 1, and *Zenodorus* sp1. Table 3.5 in Attachment 1 shows the specimens of each species collected and provides the site code and site description for each species.

Clynotis albobarbatus-group has also been recorded from Bandicoot Bay on Barrow Island and is widespread on the mainland (Figure 3-9). Specimens of *Grayenulla waldochae* have only been collected from a limited number of sites. The genus is relatively common and

widespread, but this species is only known from few specimens (Woodstock Station, Newman). It has not been previously collected from Barrow Island.

Undescribed species of *Lycidas* were collected from Barrow Island during the 2003 survey. The distribution of these morphospecies outside Barrow Island is unknown. However, it is unlikely that this genus would contain SRE's given the biology of the group.

Two genera, *Pellenes* sp. 1 and *Zenodorus* sp. 1 have not been recorded from Barrow Island previously, making them new genus records for the island. Other genera known from Barrow Island include *Jotus* (Bandicoot Bay), *Cytaea* (ChevronTexaco base), and *Holoplatys* (Cave B2).

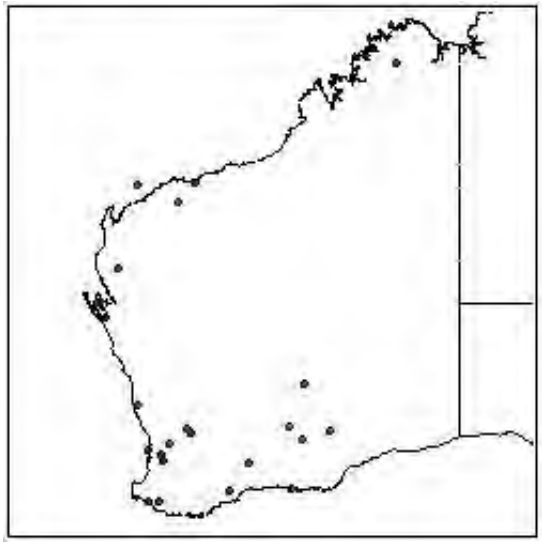

Figure 3-9 - Distribution of *Clynotis albobarbatus*-group

Sparassidae (Huntsman spiders)

Three species of huntsman spider, *Heteropoda hermitis* (Plate 3-3), *Neosparassus* sp. 1 and *Neosparassus* sp. 2, were collected from the proposed development area in 2003. One individual was a juvenile and could not be identified to genus or species level.

Plate 3-3 - *Heteropoda hermitis* (T57699)

Four specimens (three males and one female; T57699 – T57702) of *Heteropoda hermitis* Hogg were hand collected from the ground or rock wall whilst head torching at night (sites BIHT01 and BIHT04). This species is known from the Montebello Islands, Barrow Island, Lowendal Island, and Woodstock Station, Western Australia (Davies, 1993 Figure 3-10).

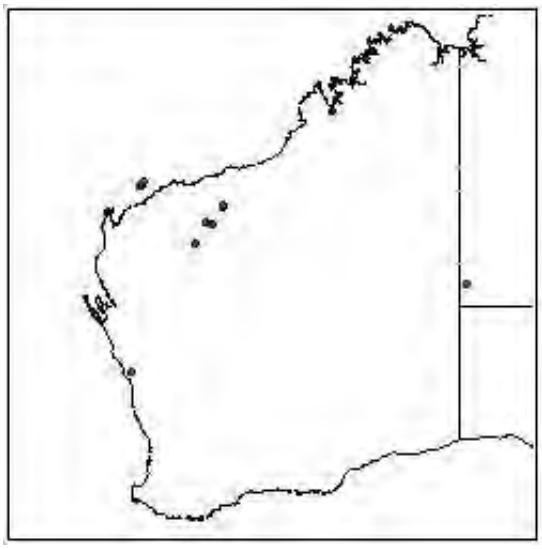

Figure 3-10 - Distribution of *Heteropoda hermitis*

Two distinct species of *Neosparassus* were collected from the proposed development area. As there is currently no identification key for this particular genus, species names could not be assigned but have been nominally referred to as sp. 1 and sp. 2. Two adult male *Neosparassus* sp. 1 were collected from beneath *Triodia* (sites BIHT02, BI3.5). A single *Neosparassus* sp. 1 was hand collected from *T. wiseana* on limestone at night whilst head-

torching (site LMAD1) in 2004 (Attachment 1). One male and one female *Neosparassus* sp. 2 were collected from *A. coriacea* and beneath *Triodia* over pinkish-brown sands in 2003 (sites BIMBO4 and BIHT01).

Irileka iridescens (Hirst 1998) is another species of Sparassidae known from Barrow Island but not collected in the 2003 or 2004 survey. *Irileka iridescens* was collected on a previous field trip from Bandicoot Bay and lodged with the WAM. Huntsman spiders are currently under revision by David Hirst from the South Australian Museum, with many Australian species yet to be described.

Theridiidae (Comb-footed Spiders)

One male specimen (T57728) belonging to the genus *Euryopis* was collected from beneath *Triodia* along a creek bed (Site BI1.21). A female specimen (T57729) belonging to the family Theridiidae was damaged and could not be identified beyond family level.

The arachnology database has records of two described species of Theridiid spider from Barrow Island: the red-back spider, *Latrodectus hasseltii* and *Argyrodes* 'antipodiana-group'. The red-back spider has a widespread distribution covering much of Western Australia (Figure 3-11) whereas *Argyrodes* 'antipodiana-group' is only known from Barrow Island and the Montebello Islands (Figure 3-12).

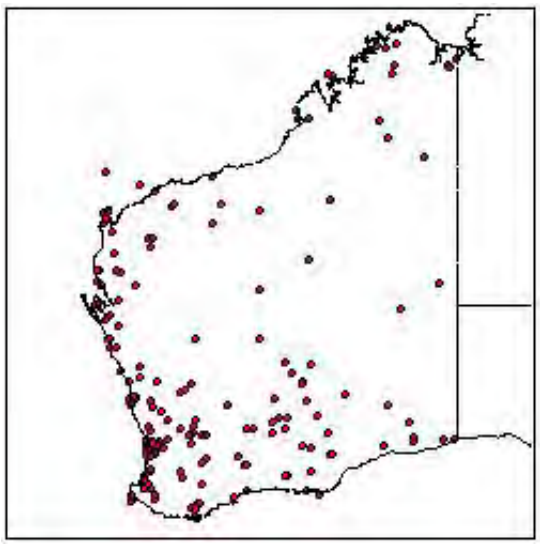

Figure 3-11 - Distribution of the Red back spider, *Latrodectus hasseltii*

Figure 3-12 - Distribution of *Argyrodes* 'antipodiana – group', Known from Barrow Island and Montebello Islands

Thomisidae (Crab Spiders)

Two spider genera of the family Thomisidae were collected in 2003. Two adult male *Tharpyna* (T57720) were collected from under *Triodia* along a creek bed (Site BI1.21) and one female *Stephanopis* (T57719) was collected from under *Triodia* over pale red sand (Site BI3.1).

Three female *Stephanopis* sp 1 were hand collected from leaf litter under *T. wiseana* on limestone (site LMIA2) and one male *Tharpyn*a sp 1 was collected from a wet pitfall trap amongst *T. angusta* (site AVIA1).

Zodariidae

An unknown species of the family Zodariidae was collected from beneath *Melaleuca* (Site BIIT4) during the 2003 survey. The specimen was an adult female (T57727). Similarly, a single female specimen was collected under *Melaleuca* on limestone (site MLNI2) in 2004. This species has not been described and could not be identified to genus or species level.

A search of the WAM arachnology collection and database has shown that two described species of Zodariid spider occur on Barrow Island: *Minasteron minusculum* Baehr and Jocque 2000 and *Spinasteron 'harveyi'* Baehr (in press). *M. minisculum* occurs on the mainland of Western Australia as well as Barrow Island (Figure 3-13), but *S. 'harveyi'* is known only from Barrow Island.

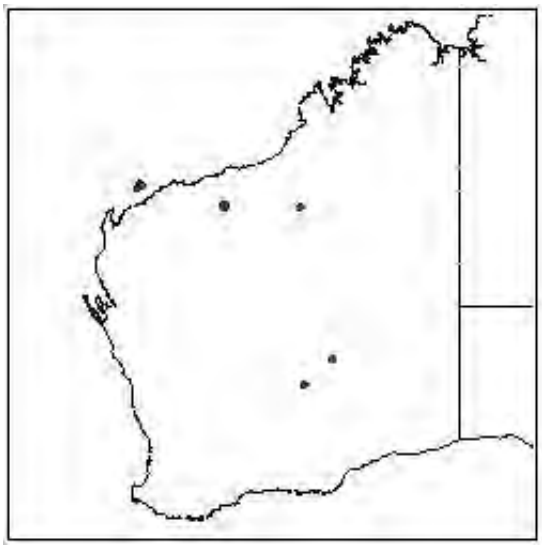

Figure 3-13 - Distribution of *Minasteron minusculum*

Corrinidae

Two adult male and one female *Supunna picta* (c.f) were collected from *T. angusta* valleys (sites AVAC1, AVAC2, AVNI2) using wet pitfall traps in 2004. This is a new record for Barrow Island. *Supunna picta* (c.f) is very common and has a widespread distribution on the Western Australian mainland.

Filistatidae

Four adult male specimens of *Wandella* sp 1 were collected from a range of different habitat types in 2004: *T. angusta* valleys (AVAC2), *T. wiseana* on limestone (LMNI1), *Melaleuca* on limestone (MLNI1), and *T. wiseana* on sandy loam soils (TLTP1) (Attachment 1). Three specimens were collected from wet pitfall traps and one specimen was sieved from leaf litter.

These specimens are different but quite similar to the described species *Wandella waldockae* Gray, which has not been collected from Barrow Island before. Other specimens from this family have been recorded from Shark Point, west of the ChevronTexaco warehouse and at Bandicoot Bay on Barrow Island, but have not been identified to a higher level.

Oxyopidae (Lynx Spiders)

Two morphospecies of Lynx spiders were collected in wet pitfall traps at sites QUCA and QUOA in 2004. No described species of Oxyopidae could be identified amongst the Barrow Island collection, but one genus, *Oxyopes* has been recorded previously. The WAM collection of lynx spiders is currently on loan overseas so no material could be databased for Barrow Island. These spiders are not generally ground dwellers, preferring to inhabit vegetation and would be better sampled by sweep-netting vegetation.

Pholcidae (Daddy long-legs)

Two native species of *Trichocyclus* were collected from wet pitfall traps in 2004. *Trichocyclus* sp. 1, a new, undescribed species, was found at the ChevronTexaco camp (site QUCA). *Trichocyclus nigropunctatus* was collected from an area dominated by *T. weiseana* on loamy soil (site TLAC1). *Trichocyclus nigropunctatus* has been recorded from Barrow in the past. Two other Pholcid spiders, *Crossopriza lyoni* and *Trichocyclus aranda,* are known from Barrow Island.

Prodidomidae

Two species of Prodidomid spiders belonging within the subfamily Molycriinae were collected during the 2004 survey from wet pitfall traps. A total of 12 individuals were collected. See table 3.4 in Attachment 1 for an outline of the localities where they were collected.

Two species have already been described for Barrow Island. *Prodidomus 'woodleigh'* has been collected from the ChevronTexaco camp on Barrow Island, and is known from the mainland. *'Wydundra' 'barrow'* was collected from Shark Point and is only known from Barrow Island.

Selenopidae

Two undescribed morphospecies of Selenopidae were collected from Barrow Island in 2004. One female Selenopid sp.1 was hand collected from under rocks amongst *Melaleuca* on limestone (site MLNI2) and two male specimens of Selenopid sp. 2 were collected from wet pitfall traps amongst *T. wiseana* on limestone (site LMNI1)). These morphospecies could not be identified to genus or species level. No other specimens of this family have been collected from Barrow Island in the past.

Tetragnathidae

One male spider of the family Tetragnathidae, subfamily Metinae, was collected from wet pitfall traps amongst *T. wiseana* on loamy soil (site TLAC1) in 2004. This species is undescribed and could not be identified beyond subfamily level. *Nephila edulis* and the genus *Tetragnatha* are known from Barrow Island and are recorded in the WAM arachnology database.

3.4 Pseudoscorpionida (Pseudoscorpions)

3.4.1 Garypidae

One specimen of a new species of *Synsphyronus* sp. nov. '*Barrow'* (Plate 3-4) was sieved from leaf litter beneath *Triodia* on limestone, west of Town Point (T57749, site BI1.41) in 2003. No specimens had been collected from the mainland or Barrow Island previously (M. Harvey personal communication 2004). This species has the potential to be a SRE, as many other species of this genus are restricted to small areas. A taxonomic description of this new species by Dr Mark Harvey at the WAM is currently in progress.

Plate 3-4 - Magnified image of *Synsphyronus* sp. nov. '*Barrow*'

Another Garypid pseudoscorpion (*Anagarypus heatwolei)* is also endemic to Barrow Island. It is found in more coastal areas on Barrow Island such as Bogg's Beach and Cape Malouet (Attachment 3).

3.4.2 Olpiidae

One species of *Austrohorus* and two species of *Xenolpium* were recorded from the proposed Development area in 2003. A number of specimens of this family were nymphs that could not be identified further.

Four specimens of *Austrohorus* (T57745 – T57748) were collected from beneath limestone (sites BITP2, BIHT-06, 07 and 09). Species of this genus are currently undescribed and the genus needs revision.

Six specimens of *Xenolpium* sp. 1 (Plate 3-5) were collected from beneath limestone (T57740 - T57742 from sites BIHT07 and BIHT08). Two specimens of *Xenolpium* sp. 2 (one male, one female) were collected from under *Triodia* on pale pink dunes and beneath limestone (T57743 & T57744 from sites BIHT-06 & BIIT-8).

In 2004, three genera of Olpiid pseudoscorpions, were collected from Barrow Island. These include *Indolpium*, *Xenolpium*, and Genus 1.

Six specimens of *Indolpium* sp 1 were found in a number of sites within the proposed Development area and at other sites. Two specimens were collected from wet pitfall traps and four were sieved from leaf litter. A total of 32 specimens of *Xenolpium* sp 1 were collected from leaf litter within the proposed Development area and other sites. This species was found at a number of different localities on the Island and within a number of different habitat types. One male specimen of an unknown genus was sieved from leaf litter collected at amongst *T. weiseana* on limestone (site LMAC2).

No specimens of *Synsphyronus* sp nov. `barrow`, or *Anagarypus heatwolei* were collected in the 2004 survey. *Synsphryronus* sp nov. `barrow` has only been collected from one site on Barrow Island within the project area. It is only known from one specimen and has the potential to be a short range endemic. There is insufficient information to determine the potential distribution of this species outside the project area, but it is unlikely that it would be restricted to the Development area.

Plate 3-5 – *Xenolpium* sp.

3.5 Scorpionida (Scorpions)

3.5.1 Buthidae

Six specimens of *Isometroides* were collected from beneath *Triodia* in 2003 (Attachment 2). The specimens are probably *Isometroides multipunctata* which has been previously recorded from Barrow Island and the adjacent mainland (Figure 3-14). The specimens collected during the current study have a slightly different colour pattern to preserved specimens of *I. multipunctata* in the WAM collections, possibly due to differing stages of development.

Two species of *Archisometrus* were collected during the 2004 survey, the first from a wet pitfall trap amongst *Melaleuca* on limestone (site MLNI1) and similar habitat at the barge-landing site (site QUBL1) and the other from leaf litter at Whites Beach amongst *T. wiseana* on limestone (site LMIA2) and amongst *T. wiseana* on loamy soil (site TLTP1) (Attachment 1). It is unknown whether these species have the potential to be SRE's. A taxonomic revision of this group is currently being completed.

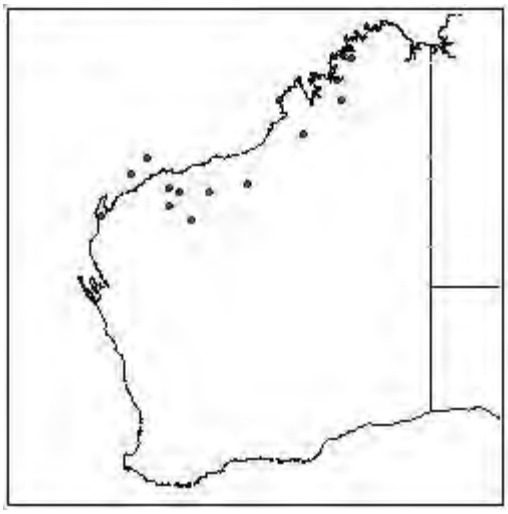

Figure 3-14 - Distribution of *Isometroides multipunctata*

3.5.2 Urodacidae

A single specimen of a large, dark scorpion belonging to the genus *Urodacus* was collected from the proposed development area whilst head-torching in an area dominated by *Triodia* over loamy soils in 2003. The specimen is different to any described species and is considered to represent a new, undescribed species (M. Harvey personal communication 2004). The only other specimen of this species was collected by W.H. Butler but no specific Barrow Island locality was recorded. However, unconfirmed sightings of large, black scorpions around the ChevronTexaco base from night-shift operators suggest that this species may occur outside the proposed Development area. No specimens of *Urodacus* sp. nov. *`barrow`* were collected on the 2004 survey.

3.6 Myriapoda (Centipedes and Millipedes)

3.6.1 Scutigeridae (House Centipedes)

During 2003, one species of Scutigerid centipede, *Allothereua leuseuri* was collected from two sites in the proposed Development area (BIMBO2 & BIMBO4). This species is widespread throughout Western Australia (Figure 3-15).

Two specimens of *Allothereua* were collected from leaf litter at sites TLNI2 (*T. wiseana* on loamy soil) and LMIA2 (*T. wiseana* on limestone, impact area) in 2004. As the individuals were juveniles, they could not be identified to species.

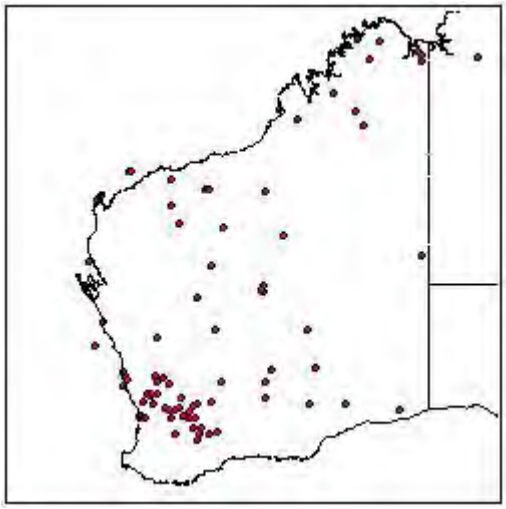

Figure 3-15 - Distribution of *Allothereua leuseuri*

3.6.2 Scolopendridae (Centipedes)

Two species of Scolopendrid centipede, *Ethmostigmus curtipes* and *Scolopendra laeta* were recorded from the proposed Development area.

Two specimens of *E. curtipes* were collected from dry pit-traps (Sites BIMB-O4, BIMB-05). This species has a wide distribution and is known to occur from central Western Australia at Robe River, between Roy Hill and Nullagine to the Eastern Goldfields (Koch 1983; Figure 3-16).

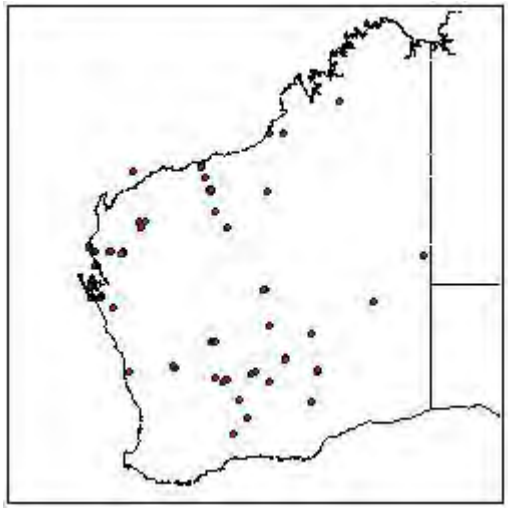

Figure 3-16 - Distribution of *Ethmostigmus curtipes*

Four specimens of *S. laeta* were collected from dry pit-traps and by opportunistic collecting (sites BIMBO1- 03, BIAP3). *Scolopendra laeta* is widely distributed over Australia, but is absent from north-east Queensland and Tasmania (Koch 1982; Figure 3-17).

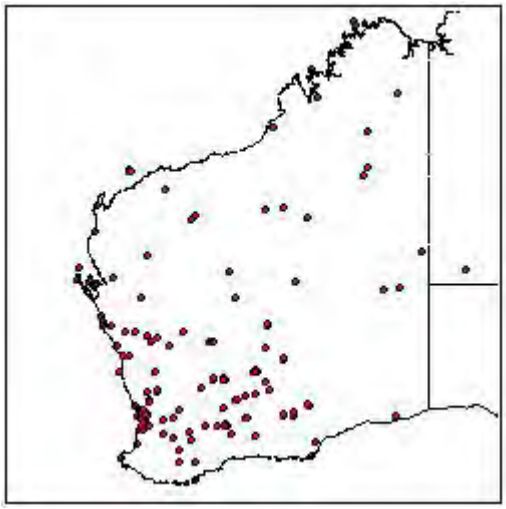

Figure 3-17 - Distribution of *Scolopendra laeta*

Three other species of Scolopendrid centipede have been collected from Barrow Island. These species are: *Scolopendra morsitans, Arthrorhabdus mjobergi* and *Cormocephalus strigosus* (Attachment 1). All three species have broad distributions outside of Barrow Island (Figure 3-18, Figure 3-19 and Figure 3-20).

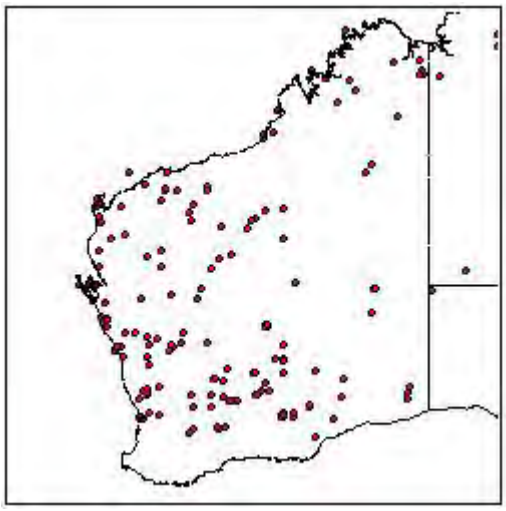

Figure 3-18 - Distribution of *Scolopendra morsitans*

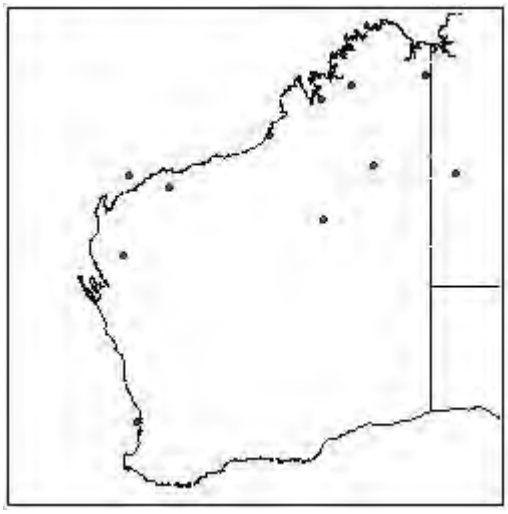

Figure 3-19 - Distribution of *Arthrorhabdus mjobergi*

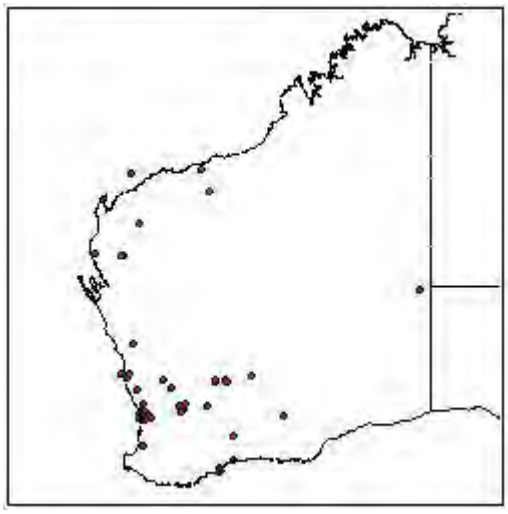

Figure 3-20 - Distribution of *Cormocephalus strigosus*

3.6.3 Geophilida

One unknown genus of centipede belonging to the order Geophilida was collected from leaf litter amongst *Melaleuca* on limestone (site MLNI1) in 2004. As no taxonomic key is available, further identification was not possible

3.6.4 Synxenidae (Pin cushion Millipedes)

One pin cushion millipede specimen was collected from the proposed Development area from leaf litter beneath *Triodia* (Site BI3.7) in 2003. This juvenile specimen probably belongs to the genus *Unixenis* but could not be identified to species.

A further 14 pin cushion millipedes belonging to the family Synxenidae were collected from wet pitfall traps at a number of sites within and outside the Development areas in 2004. Unfortunately further identification was not possible. These millipedes have been known to occur in plague proportions under certain conditions.

3.7 Pulmonata (Land Snails)

3.7.1 Camaenidae

Identification based on shell morphology indicated that there were two distinct species of *Rhagada* collected from the proposed development area in 2003. A total of 96 specimens of *Rhagada* sp. 1 and 53 specimens of *Rhagada* sp. 2 were collected (Attachment 2). Most specimens were hand-collected from beneath *Triodia* on pale red sand, red loamy sand or pale brown sand. A number of live specimens of each species were collected for genetic analysis.

Electrophoretic genetic analysis on *Rhagada* sp. 2 from a wide range of sites across Barrow Island indicated a low level of genetic divergence in this taxon (Attachment 4). This indicates that this species has not formed isolated genetic 'races' on the island and that snails in the development areas are genetically similar to snails in other parts of the island.

Quistrachia barrowensis was also collected from the proposed development area. A total of 85 specimens were collected from leaf litter under *Triodia* over pale red sand, under rocks on limestone ridge and rocky headlands, and under *Triodia* near cliff face (Attachment 2). A number of live specimens were kept for genetic analysis. The same camaenid taxa were also collected from several sites on Barrow Island by Slack-Smith (2002).

3.7.2 Pupillidae

Shells of Pupillid snails were collected from leaf litter under *Triodia* and under rocks (Attachment 2). As no live specimens were collected, further identification was limited. A total of 162 pupillid shells were collected, with species identified to date including the sinistrally coiling species *Pupoides contrarius* Smith, 1984 and the dextrally coiling species *Pupoides beltianus* Tate, 1894. Both of these species have been previously recorded from Barrow Island and other parts of the Western Australian mainland coast (Slack-Smith 2002).

3.8 Insecta (Insects)

Insects were identified to order or family level where possible. A summary of the insect orders and families collected is provided in Table 3-3.

Table 3-3 - Summary of Insect Taxa Recorded During the Survey

Order	Family	Common name
Thysanura	Lepismatidae	Silverfish
Blattodea	Blattidae	Cockroaches
Isoptera		Termites
Mantodea	Mantidae	Praying Mantids
Orthoptera	Acrididae	Grasshoppers
Hemiptera	Reduviidae	Assassin bugs
Coleoptera	Carabidae	Ground beetles
Diptera		Flies
Hymenoptera	Formicidae	Ants
Neuroptera	Myrmeleontidae	Ant Lions

A summary of the morphospecies of different insect orders and families collected during the 2004 survey is provided in Table 3.7 of Attachment 1.

Given that it is unlikely that the insect groups represented contain any SREs, they will not form a focus for currently ongoing identification work. They may, however, include some of the more significant focal groups for quarantine base line studies and the specimens have been retained for future analysis.

4 Discussion

Invertebrate taxa collected during the 2003 survey comprised 22 spider taxa, four species of pseudoscorpion, three species of centipede, one millipede species, two species of scorpion and five species of land snail.

Of the taxa recorded, those with the highest conservation significance were:

- The seven mygalomorph (trapdoor) spiders collected from *Triodia* habitats at five sites (see Section 3.2). Mygalomorph spiders are widespread on Barrow Island. This group contains known SREs, particularly in the Wheatbelt and other parts of the south-west of the state. The specimens from this study were too immature for identification, but further sampling could result in the collection of adult animals.
- The pseudoscorpions *Synsphronus* sp. nov. '*barrow', Angarypus heatwolei, Austrohorus* sp. 1*, Xenolpium* sp. 1 and *Xenolpium* sp. 2. The first species has not been recorded elsewhere on Barrow Island or the mainland, and is known only from one specimen collected from the proposed Development area (Section 3.4). This species could potentially be a SRE, with a highly-restricted distribution. *Angarypus heatwolei* is known only from Barrow Island, but has been collected from a number of localities across the Island. The other species are unlikely to be restricted to the Development area.
- The scorpion *Urodacus* sp nov. '*barrow'*. This species is known only from two specimens collected from Barrow Island and appears to be a new species (see Section 3.5). One specimen was collected within the proposed Development area and the other in the WAM collection came from an unknown locality. As so few specimens have been collected, it is unclear if the distribution of this species is restricted to a certain area.
- The land snails *Rhagada* sp. 1 and sp. 2, *Quistrachia barrowensis, Pupoides contrarius* and *P. beltianus* (Section 3.7). With poor dispersal powers, this group includes known SREs (Slack-Smith 2002). However, the genetic study has shown that *Rhagada* sp. 2 is not genetically fragmented on Barrow Island. *Rhagada* sp. 2 populations in the proposed Development area interbreed, at least periodically, with snails across the whole Island.

Some of the above taxa are likely to be SREs (distributions of less than 10 000 km^2 after Harvey 2002). In some cases, however, this is likely to amount to a distribution equating to Barrow Island. A number of endemic species, including *Quistrachia barrowensis* and *Angarypus heatwolei,* are known from several locations across the Island but have not been found on the mainland or nearby islands.

Terrestrial invertebrate sampling on Barrow Island in 2004 revealed more that 60 taxa of Arachnids and myriapods. In total, 43 spider taxa, over 7 morphospecies of mites/ticks, three species of pseudoscorpion, two species of scorpion, one species of millipede, and four species of centipede were collected.

No described species collected during this latter survey is known to be a Short-Range Endemic (SRE). Currently, there are nine species of Arachnid and one species of millipede that are considered endemic to Barrow Island. Many of these species are only known from one locality, so little is known about the distribution range of these species within Barrow Island. As more taxonomic work is undertaken, many more endemic species are expected to be discovered from material lodged with the WAM.

Groups of arachnids that have the potential to contain short-range endemics include Mygalomorph spiders, Oonopidae, Gnaphosidae, Prodidomidae, Miturgidae, Garypidae (and other pseudoscorpions), Buthidae and *Urodacus*. Some species within these groups have only been collected from Barrow Island. Many of these groups have been poorly collected in the state or are in need of taxonomic revision.

The pseudoscorpion *Synsphyronus* sp. nov. *'barrow'* is known only from the Town Point area. This species is potentially an SRE, with a highly restricted distribution. No further specimens of this species were collected from the 2004 survey, even though this group was targeted and a total of 39 pseudoscorpions were collected. Of the other pseudoscorpions, *Indolpium* sp. 1 and *Xenolpium* sp. 1 are considered to be common species also found on the mainland while the status of the specimen belonging within the unknown genus is uncertain.

The scorpion *Urodacus* sp. nov. *'barrow'* is only known from two specimens collected from Barrow Island. One specimen was collected within the impact area and the other came from an unknown locality on the Island. This species is likely to occur at low densities in similar habitats outside the proposed Development area. However, more sampling is needed to understand how restricted its distribution is, if restricted at all.

The status of Mygalomorph spiders on Barrow remains poorly understood, due to the lack of adult specimens and the need for further taxonomic work on some genera. One species known to be endemic to Barrow Island is the brush-footed trapdoor spider *Synothele butleri*, which is only known from one male specimen collected from an unknown locality on Barrow. Another species of the *Aname mainae* – group, has been collected from the island, but a taxonomic revision of this group is needed to determine whether specimens from Barrow Island are taxonomically distinct from the mainland specimens.

A longer term, widespread invertebrate survey on Barrow Island is needed to collect adult specimens of taxa that mature, or are active, at different times of the year. A minimum of 12 months is recommended for wet pitfall trapping, with the traps cleared every 3 to 4 months.

A review and comparative analysis of the existing collections of the Western Australian Museum aimed to address the status of invertebrates collected from Barrow Island and provide a greater understanding of their distributions. It involved comparisons of the specimens collected from the proposed development area with those already contained within the Western Australian Museum collections. The systematic search and review of the arachnology collection and database revealed a number of unique taxa (11 species) that are known only from Barrow Island (Attachment 3). A number of these species are known only from one specimen (Holotype), and for some, a specific locality on Barrow Island had not been recorded. Many Western Australian invertebrates are poorly known at high taxonomic levels. The specimens from the 2003 and 2004 surveys, lodged with

the WAM, will provide a valuable resource for ongoing taxonomic revision of many invertebrate groups.

None of the invertebrate taxa known from the proposed development area are listed as Schedule or Priority fauna by the Department of Conservation and Land Management, or listed as threatened under the EPBC Act.

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Attachment 1 - Barrow Island Short Range Endemics and Other Terrestrial Invertebrates (Biota Invertebrate Survey April 2005 Report)

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Biota Environmental Sciences

Barrow Island Short Range Endemics and Other Terrestrial Invertebrates

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Invertebrate Fauna Survey

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Barrow Island SREs and Terrestrial Invertebrates

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1.0 Introduction

1.1 Project Background and Current Status

The Gorgon Venture (a joint venture between ChevronTexaco, Shell and ExxonMobil), is in the process of seeking approval to develop the Gorgon gas fields located some 130 km off the north-west coast of Western Australia. The Gorgon field is the largest gas field ever discovered in Australia and together with the other fields in the area represents an estimated 40 trillion cubic feet of resource. Investigations and project design work are currently underway for the development of gas processing facilities on Barrow Island off the north-west coast of Western Australia.

The island has been an active onshore oilfield since 1967 and was also gazetted as a Class A Nature Reserve in 1910. The proposal has already passed through an Environmental, Social and Economic Review (the ESE Review) under the provisions of the *Environmental Protection Act 1986*. This addressed the Gorgon Gas development's general ability to mitigate potential on-site impacts and generate social and economic benefits for the region, state and the nation. The outcome of this process was that the State Government determined that the proposal could proceed to a more detailed level of formal environmental assessment. The project is currently subject to this more detailed definition and environmental investigation under the *Environmental Protection Act 1986* at the level of an Environmental Review and Management Programme (ERMP). Consideration of the project implications for the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the *EPBC Act*) are also being evaluated.

This report on terrestrial invertebrates and potential short-range endemics (SREs) represents a supporting technical document, providing input to the ERMP on this ecological factor.

1.2 Overview of Issues Relating to Terrestrial Invertebrates

Terrestrial invertebrates are of interest in the current formal assessment process for several reasons (see also EPA 2003 and Biota 2004). These are outlined below.

- There is potential for some groups of terrestrial invertebrates to contain species that are short-range endemics (SREs). This issue can be of great consequence, especially when considering the conservation of biodiversity (see Biota 2004 & Harvey 2002 for detailed overview of issues). As a result, the assessment of such invertebrate taxa is a potentially important component of impact assessment.

- The terrestrial invertebrate fauna of Barrow Island is still poorly documented and only a small proportion has been described. The potential for currently undescribed fauna to be collected is still relatively high. Very little is known about wider distributions of certain taxa, and many taxa may be of conservation significance or taxonomic interest.

- Quarantine issues are becoming increasingly important. Documentation of terrestrial invertebrates occurring on Barrow Island for a quarantine monitoring program is essential in addressing these issues.

1.3 Previous Surveys

Terrestrial invertebrates on Barrow Island have generally been poorly documented in the past. Most surveys have been primarily focused on particular groups of invertebrates and do not provide a detailed baseline inventory of the terrestrial invertebrate assemblages on Barrow Island.

The Arachnology department collected a number of specimens in 1993 in conjunction with a Verterbrate fauna survey for WAPET. This trip was not a specific survey for the company, but enabled the department to collect a number of unique taxa for the museum collections. Coastal localities were chosen to look specifically for a particular species of pseudoscorpion (*Anagarypus heatwolei*), which was of taxonomic significance at the time.

A preliminary survey of Land snails on Barrow Island was undertaken in 2002 by Shirley Slack-Smith, and represents the first survey of non-marine molluscs on any part of Barrow Island. The objective of the survey was to assess areas that may have been impacted by the land-based components of the proposed Gorgon Development on Barrow Island, and equivalent areas adjacent to the impact zone (Slack-Smith, 2002).

A recent survey of the terrestrial invertebrates of Barrow Island (Biota 2004) aimed to provide preliminary assessment of potential SRE's and other terrestrial invertebrates that may be adversely affected by the development. In addition to this, a search of the Department of Arachnology's collection and database was undertaken to locate species or "types" that were known to occur on Barrow Island. Two undescribed species were identified as potential SRE's and were considered endemic to the island. These species were *Synsphyronus* sp. nov. 'barrow' and *Urodacus* sp. nov. 'barrow'. Both specimens were found within the project area and are only known from a single locality. As a result, insufficient information was available to determine how restricted their distributions were.

1.4 Objectives of this report

The objective of this report is to provide further assessment of potential short-range endemics (SREs) and other terrestrial invertebrates that may occur within the project area and proposed alternative campsites on Barrow Island. Sampling for invertebrates was focused within the impact zones and equivalent areas adjacent to the project area and alternative campsites. Sites were chosen to maximise the number of habitat types surveyed. This report will also provide regional context for the species collected within the impact area and to provide a baseline species list to aid future quarantine programmes.

2.0 Methodology

2.1 Field Collection

A combination of wet pitfall trapping, leaf litter collection and opportunistic collection methods were used to sample terrestrial invertebrate taxa within the project area, proposed alternative campsites, and areas of non impact. Particular invertebrate groups that have the potential to exhibit SREs were targeted during the survey. These include:

- Araneae (Spiders);
- Pseudoscorpionida (Pseudoscorpions);
- Scorpionida (Scorpions);
- Diplopoda (Millipedes)

Wet pitfall traps

The wet pitfall traps that were used in the survey consisted of a 2 litre ice-cream container filled with ethylene glycol to a depth of 2cm. A lid (with an 82mm diameter hole) was then placed on the trap to reduce the potential by-catch of vertebrates. Four of these traps were placed flush with the ground at each trapping site. Traps were placed, if possible, in shaded microhabitats such as beneath Spinifex or shrubs. Traps were open for six nights and the collected material from the four traps were pooled for each site. Material was rinsed from the traps using water and placed in jars which were labelled for each site and stored for processing.

Leaf litter samples

A selection of sites were chosen for collection of leaf litter samples. Two full bags of leaf litter and soil were collected from areas beneath large Spinifex bushes and melaleuca trees. Bags were labelled and later sieved and examined for invertebrates.

Hand foraging

Hand foraging was conducted at each leaf litter site for one hour. Foraging included lifting rocks for pseudoscorpions and foraging through raked leaf litter and under Spinifex. Planned head torching and black-lighting at night for wolf spiders, huntsman spiders and scorpions was not successful due to the presence of a full moon at the time of the field survey. The moon is said to have an effect on the activity of certain invertebrate taxa. However, some specimens were collected via head-torching.

2.2 Survey sites

Thirty survey sites were established for systematic wet pitfall trapping over six days from the 25th August to the 1st September 2004. A selection of these sites were chosen for leaf litter sampling and hand foraging. In total, there were 30 wet pitfall sites, 22 leaf litter sites, and 21 foraging sites. Photos of the trapping sites were shown in Appendix 1, and a list of the site codes, localities, and type of collection method used is provided in Table #.

Sites were chosen within the impact areas [(IA), including town point (TP)], proposed alternative campsites [(AC), including proposed administration block (AD)], and non-

impact areas (NI). In each of these three categories, a number of replicated sites of four different vegetation associations were chosen for systematic invertebrate collections. These were *Triodia angusta* valleys (AV), *Triodia weiseana* on loamy soil (TL), *Triodia weiseana* on limestone (LM), and *Melaleuca* on limestone (ML). Six quarantine sites were also chosen in areas which are disturbed or have the potential to possess introduced species, such as the Barge landing and the Warehouse.

2.3 Curation and Limits on Identification

Invertebrate material which was collected via wet pitfalls was stored in ethyene glycol until it was transported to the WAM for processing and sorting. Material was first rinsed with water, then sieved out of the glycol and rinsed again. Specimens were then placed in jar of 70% ethanol to be sorted and identified.

Leaf litter samples were collected and stored in plastic bags. Each sample was sieved and examined for live invertebrates. All invertebrate material collected was immediately stored in 70% ethanol. All other material collected via foraging was placed in 70% ethanol. All material will be lodged with the WAM at the end of the project.

The level of specimen identification achievable was dependent on the level of taxonomic knowledge and expertise currently available. As a result, only a limited number of specimens could be identified to genus or species level. Only taxa belonging to groups known to include short-range endemics, or for which expertise was readily available at the WA Museum (eg wolf spiders, other spider groups, scorpions, and centipedes) were identified to genus or species level.

Table 2.1. Sampling sites, habitat descriptions, and collection method used (T-trap, L–litter, F–foraged)

SITE TYPE	SITE CODE	EASTING	NORTHING	HABITAT DESCRIPTION	T	L	F
IMPACT SITES	AVIA1	338883	7700492	*Triodia angusta* valley	*	*	*
	AVIA2	338789	7700333	*Triodia angusta* valley	*		
	LMIA1	338509	7700465	*Triodia weiseana* on limestone	*		
	LMIA2	339270	7700280	*Triodia weiseana* on limestone	*	*	*
	MLIA1	338941	7700598	*Melaleuca* on limestone	*	*	*
	MLIA2	338889	7700210	*Melaleuca* on limestone	*		
	TLIA1	339284	7700636	*Triodia weiseana* on loamy soil	*	*	*
	TLTP1	339934	7700416	*Triodia weiseana* on loamy soil	*	*	*
ALTERNATE CAMP	AVAC1	337398	7699196	*Triodia angusta* valley	*	*	*
	AVAC2	338404	7699386	*Triodia angusta* valley	*	*	*
	LMAC1	337346	7697104	*Triodia weiseana* on limestone	*	*	*
	LMAC2	338511	7699431	*Triodia weiseana* on limestone	*	*	*
	LMAD1	339056	7699662	*Triodia weiseana* on limestone	*	*	*
	MLAC1	337503	7697172	*Melaleuca* on limestone	*	*	*
	MLAC2	337312	7699160	*Melaleuca* on limestone	*	*	*
	TLAC1	338592	7699512	*Triodia weiseana* on loamy soil	*	*	*
NON IMPACT SITES	AVNI1	337563	7700791	*Triodia angusta* valley	*		
	AVNI2	338259	7701134	*Triodia angusta* valley	*	*	*
	LMNI1	338532	7701830	*Triodia weiseana* on limestone	*	*	*
	MLNI1	339262	7700983	*Melaleuca* on limestone	*	*	*
	MLNI2	338236	7701339	*Melaleuca* on limestone	*	*	*
	TLNI1	339450	7700894	*Triodia weiseana* on loamy soil	*	*	*
	TLNI2	339217	7701636	*Triodia weiseana* on loamy soil	*	*	*
	TLNI3	337899	7699073	*Triodia weiseana* on loamy soil	*		
QUARANTINE SITES	QUBL1	340945	7707607	Barge landing	*		
	QUBL2	341044	7707397	Barge landing	*		
	QUCA1	338212	7696255	Campsite	*		*
	QUNA1	334200	7691887	New Airport	*		
	QUOA1	336058	7699963	Old Airport	*		
	QUWH1	331998	7697305	Warehouse	*		
OTHER	WHTSBCH	334697	7710312	Whites Beach		*	*
	FLACBAY	331199	7705342	Flacourt Bay		*	*
	SHRUBBY	339877	7707052	*Eucalyptus* grove		*	

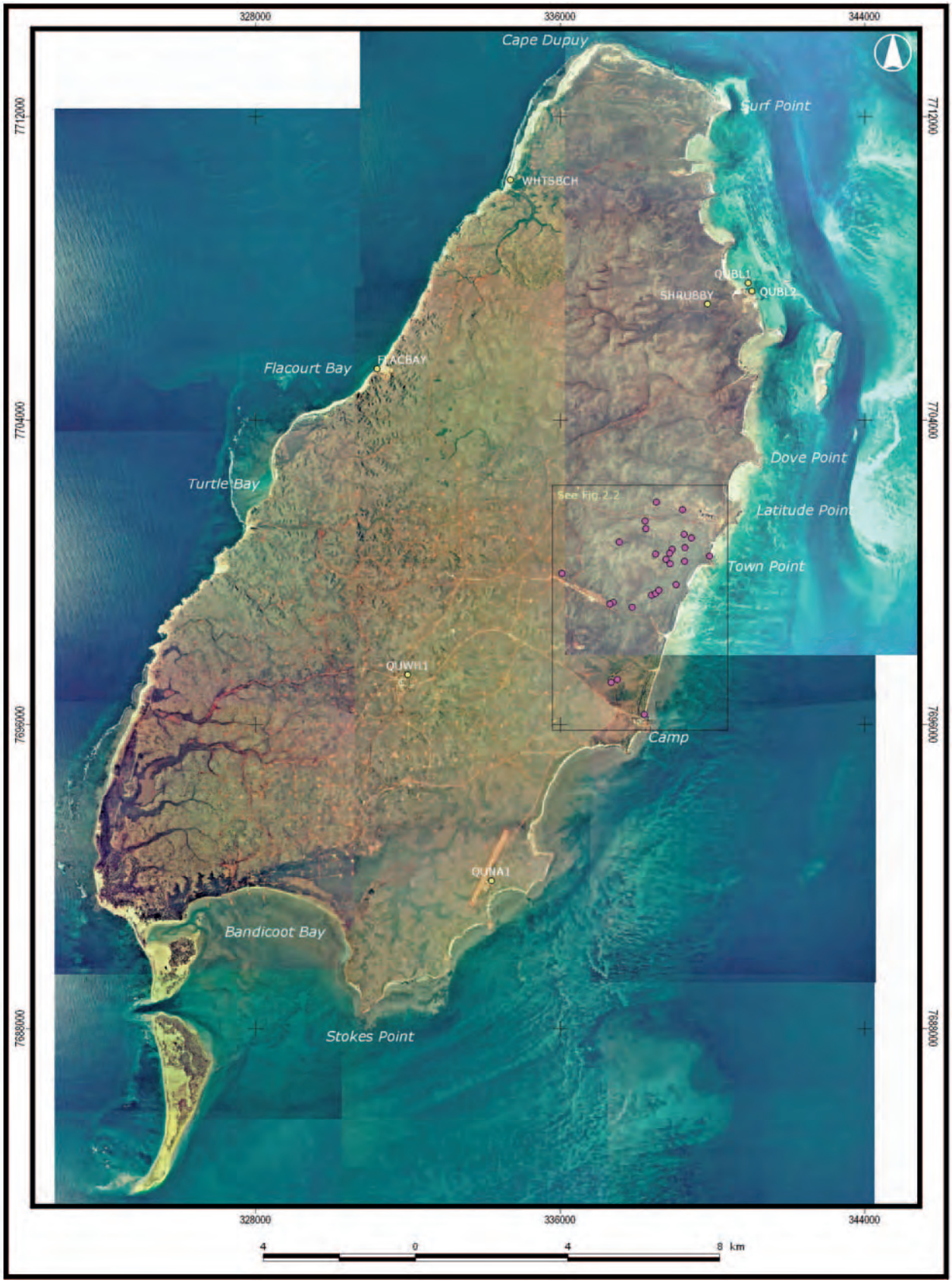

Figure 2.1. Survey areas and sampling sites for systematic wet pitfall trapping, leaf litter sampling, and opportunistic collections of invertebrates on Barrow Island. See Figure 2.2 for detailed sampling localities and site codes.

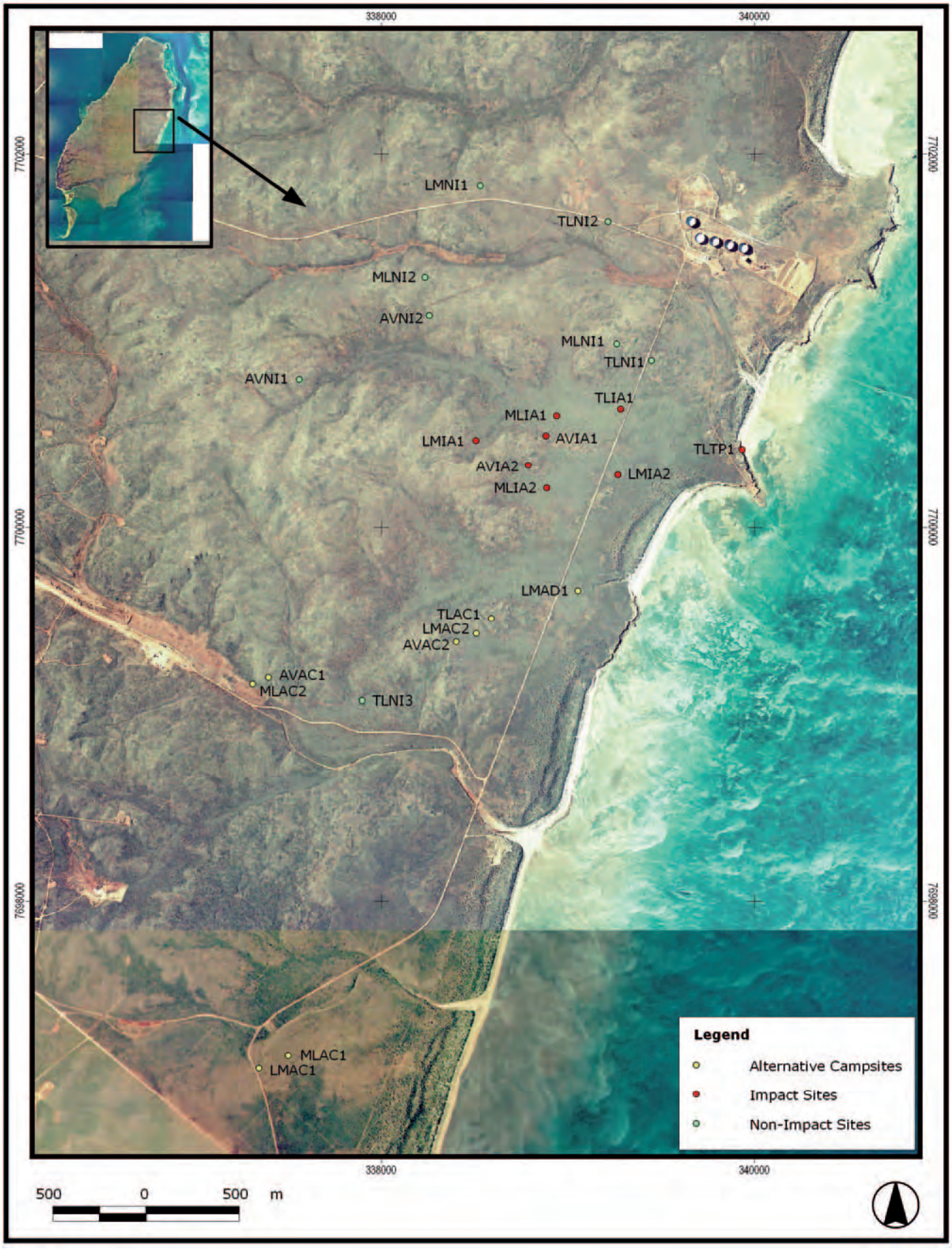

Figure 2.2. Sampling site localities and site codes for invertebrate collections within impact areas, alternative campsite areas, and non-impact areas.

3.0 Results

3.1 Overview

Sampling of terrestrial invertebrate taxa, particularly Arachnids and myriapods (known to contain short-range endemics) revealed more than 50 taxa. Many types of insects were also collected from this survey but could not be identified to species level at this stage due to poor taxonomic information, time and logistical constraints. Of the taxa identified, the majority are still undescribed and many could not be identified beyond family level. Of the invertebrate taxa specifically targeted, 43 spider taxa, three genera of pseudoscorpion, four species of centipede, one millipede, and two species of scorpion were collected and identified. Work is still ongoing on many of these groups and in many cases, more detailed and extensive sampling is needed to provide further information on their natural distributions.

An order level summary of the invertebrate specimens collected from impact and non-impact sites during the study is provided in Table 3.1. A detailed breakdown of all specimens captured during the survey is provided as raw data in Appendix 2 and a list of all species found on Barrow Island, collated from past field trips and past Museum records, is shown in Appendix 3.

Table 3.1: Summary of invertebrate taxa collected

Class	Order	No. families	No. genera	No. morphospecies
Arachnida	Acari	3+	4+	7+
Arachnida	Araneae	19	14	43
Arachnida	Pseudoscorpionida	1	3	3
Arachnida	Scorpionida	1	1	2
Myriapoda	Diplopoda	1	1	1
Myriapoda	Chilopoda	3	4	4

3.3 Acari (Mites/ Ticks)

Three families of Acari could be identified from material collected from wet pitfall traps. These included Ioxidae, Caeculidae, and Trombiidae. Four specimens could not be placed within a family. *Amblyomma triguttatum* (Ioxidae) was hand collected near Base and has been collected previously on Barrow Island and on the mainland. Three specimens were identified as *Amblyomma* but could not be identified further as they were juveniles. Two specimens belonging within the family Caeculidae were collected from sites TLAC1 (*Triodia weiseana* on loam, alternate campsite) and LMAC2 (*Triodia weiseana* on limestone, alternate campsite). A total of 12 specimens belonging within the family Trombiidae were collected from numerous sites within both impact and non-impact sites, covering different habitat types.

Very little research has been conducted on Acari, particularly mites, limiting identification of a number of groups. Caeculidae and Trombiidae are new family records for Barrow Island. Other species recorded from Barrow Island previously include: *Erythracarus decoris* (Anystidae), *Argas 'persicus'* (Argasidae) *Ornithodoros gurneyi* (Argasidae), *Amblyomma limbatum* (Ixodidae), *Haemaphysalis ratti* (Ixodidae), *Haemolaelaps marsupialis* (Laelapidae), and *Mesolaelaps antipodianus* (Laelapidae).

3.4 Araneae (Spiders)

Araneidae (Master Weavers)
The species *Austracantha minax* Thorell (Christmas spiders) has previously been collected from Barrow island (North of Town Point). An additional female specimen was hand

collected from site LMAD1 during the current survey. The site is situated in an area proposed for the development of the administration block and is dominated by *Triodia weiseana* on limestone. This particular species is relatively common and widespread throughout Western Australia, Tasmania, and Queensland (see Biota 2004). No other species belonging to the family Araneidae were collected during this survey.

Corrinidae

Two adult male and one female *Supunna picta* (c.f) were collected from *Triodia angusta* valleys at alternate camp and non-impact sites AVAC1, AVAC2, and AVNI2 using wet pitfall traps. This species is very common and has a widespread distribution on the mainland of WA. However, *S. picta* (c.f.) is a new record for Barrow Island.

Filistatidae

Four adult male specimens of *Wandella* sp 1 were collected from a range of different habitat types: *Triodia angusta* valleys (AVAC2), *Triodia weiseana* on limestone (LMNI1), *Melaleuca* on limestone (MLNI1), and *Triodia weiseana* on sandy loam soils (TLTP1). These sites encompass areas within the proposed alternative campsites, as well as non-impact areas. Three specimens were collected from wet pitfall traps and one specimen was sieved from leaf litter.

These specimens are different but quite similar to the described species *Wandella waldockae* Gray, which has not been collected from Barrow Island before. Other specimens from this family have been recorded from Sharp Point, West of Warehouse, and Bandicoot Bay on Barrow Island, but have not been identified to a higher level.

Gnaphosidae (Sac Spiders)

A total of nine undescribed morpho-species of Gnaphosid spider were collected mainly from wet pitfall traps. Details of localities and habitat descriptions where the different species were collected are shown in Table 3.2. The two female species could not be matched to any males that were collected and are considered to be different morphospecies, differing in a number of characters.

Table 3.2: Localities, site descriptions, and details of Gnaphosid morphospecies collected.

Morpho-species	No.	Sex	Site code	Site description
Sp 1	1	Male	QUOA1	Old airport quarantine site
Sp 2	2	Male	AVNI2 QUOA1	*Triodia angusta* valley, non-impact site Old airport quarantine site
Sp 3	1	Male	MLAC2	*Melaleuca* on limestone, alternate campsite area
Sp 4	2	Male	AVIA1 QUBL2	*Triodia angusta* valley, impact area Barge landing Quarantine site
Sp 5	1	Male	AVNI1	*Triodia angusta* valley, non-impact site
Sp 6	1	Male	MLAC1	*Melaleuca* on limestone, alternate campsite area
Sp 7	2	Female	WHBC	Whites Beach
Sp 8	1	Female	AVAC1	*Triodia angusta* valley, alternate campsite area
Sp 9	1	Male	MLIA2	*Melaleuca* on limestone, impact area

Gnaphosid spiders are known to be very abundant and diverse in the arid zone, so it is not surprising that there were large numbers of morphospecies collected from this survey. Wet pitfall trapping is the most efficient method of surveying for these spiders. In the preliminary survey, another species of Gnaphosid, *Ceryerda* sp 1, was collected from Town Point. This specimen could only be identified to genus level. Nothing is known about the potential for this group to contain short-range endemics. More extensive surveying is needed to answer questions about wider distribution patterns and ecology of these species.

Lamponidae (White-tailed Spiders)

Three species belonging to the family Lamponidae were collected from this survey. Two species belong within the sub family Lamponinae and one species within the Centrothelinae.

Within the Lamponinae, one male *Lampona ampeinna* and one male *Lamponina scutata* were collected in wet pits at sites MLIA1 and MLIA2 respectively. These sites were situated in areas of *Melaleuca* on limestone within the impact area. *Lamponina scutata* Strand, has been previously recorded from Barrow Island and has a widespread distribution within Western Australia (Biota 2004). *Lampona ampeinna* is widespread in Western and central Australia. This particular species has not been collected from Barrow Island before but is known from Enderby Island.

A female specimen *Notsodipus* sp 1 belonging to the subfamily Centrothelinae was collected near Town Point in an area of *Triodia weiseana* on loamy soil. In general this genus does not have the potential for SRE given the general biology of the group and would be expected to occur on the mainland. This species is similar to *N.capaensis*, which is only known from the type locality at Cape Range. Although only known from the type locality, it is unlikely that it would be restricted to that area.

Lampona and *Notsodipus* are new genus records and Centrothelinae is a new subfamily record for Barrow Island. Neither have been recorded from Barrow Island previously.

Lycosidae (Wolf Spiders)

One species of wolf spider was collected whilst head-torching at night on the Beach near the camp. This species, *Venator* sp 1, was collected in abundance during the preliminary survey of Barrow Island Terrestrial Invertebrates. Many more species were collected on the previous survey because they were specifically targeted and the conditions were more suitable for head-torching at night. This method is the most efficient method of collecting wolf spiders. Six species are known to occur on Barrow Island. These include *Venator* sp 1, *Lycosa snelli*, *Lycosa laeta*, *Lycosa clara*, *Hoggicosa bicolour*, and *Hogna kuyanii* group. All these species have distributions outside Barrow Island.

Oecobiidae

Five specimens of *Oecobius navus* were collected from wet pitfall traps. 1 male specimen from site LMIA2 (*Triodia weiseana* on limestone, impact area) and 4 male specimens from site QUWH (Warehouse quarantine site) were collected. This species has previously been recorded from the camp area and is a common introduced species. Three species can be found in Australia, two of which are introduced.

Oonopidae

Five morphospieces belonging to four genera of Oonopid spider were collected from wet pitfall traps during the survey. These include *Gamasomorpha, Grymeus, Myrmopopae, and Opopaea*. Table 3.3 details the number of morphospecies of each genus, their localities and habitat descriptions.

Oonopids are generally only collected from pitfall trapping. Because the traps were only open for a short period of time, there is not enough data to state whether they are short-range endemics. Most of the specimens collected are undescribed species and little can be said about their abundance or distribution on and off Barrow Island. Trapping efforts need to be more widespread on the island and over longer time frames.

Table 3.3: Localities, site descriptions, and details of Oonopid spiders collected.

Genus	Species	No.	Sex	Site code	Site description
Gamasomorpha	Sp 1	2	Male	LMAC1	*Triodia weiseana* on limestone, alternate campsite
				LMAC2	*Triodia weiseana* on limestone, alternate campsite
	Sp 2	1	Male	LMIA2	*Triodia weiseana* on limestone, impact area
Grymeus	Sp 1	1	Male	TLNI3	*Triodia weiseana* on loamy soil, non-impact site
Myrmopopae	Sp 1	3	Male	AVAC2	*Triodia angusta* valley, alternate campsite
				MLIA1	*Melaleuca* on limestone, impact area
				MLNI1	*Mlealeuca* on limestone, non-impact area
Opopaea	Sp 1	2	Male	LMNI1	*Triodia weiseana* on limestone, non-impact site

Five genera have been recorded from Barrow previously, but only two species have been described, *Grymeus* '*nasutus*' and *Orchestina 'barrow'* (Harvey, in press). *Grymeus 'nasutus'* has a distribution from Barrow Island to South of Shark Bay. *Orchestina 'barrow'* is only known from Barrow Island but has been collected from different areas of the island (Biota 2004).

Oxyopidae (Lynx Spiders)

Two morphospecies of Lynx spiders have been identified from wet pitfalls at sites QUCA (Campsite Quarantine site) and QUOA (Old airport Quarantine site). No identified species of Oxyopidae have been found on Barrow Island, but one genus, *Oxyopes* has been recorded. The museum collection of lynx spiders is currently on loan overseas so no material could be databased for Barrow Island. These spiders are not generally ground dwellers, preferring to inhabit vegetation. Pitfall trapping for these particular spiders is not the most appropriate method. The most efficient method is sweep-netting vegetation.

Pholcidae (Daddy long-legs)

It appears that two female species of *Trichocyclus* have been collected from wet pitfall traps. *Trichocyclus* sp 1, a new undescribed native species, was found at the campsite quarantine site (QUCA). *Trichocyclus nigropunctatus* was collected from an alternate campsite area dominated by *Triodia weiseana* on loamy soil (TLAC1). *Trichocyclus nigropunctatus*, which is a native species, has been recorded from Barrow in the past. *Crossopriza lyoni* and *Trichocyclus aranda* have been recorded for Barrow Island and are also found on the mainland (Biota 2004).

Prodidomidae

Two species of Prodidomid spiders belonging within the subfamily Molycriinae were collected during the survey from wet pitfall traps. A total of 12 individuals were collected. See table 3.4 for an outline of the localities were they were collected.

Two species have already been described for Barrow Island. *Prodidomus 'woodleigh'* has been collected from the Camp on Barrow Island, and is known from the mainland.

'Wydundra' 'barrow' was collected from Shark Point and is only known from Barrow Island (Biota, 2004).

Table 3.4: Localities, site descriptions, and details of Prodidomid spiders collected.

Species	Site code	Females	Males	Site description
Sp 1	MLIA2		1	*Melaleuca* on limestone, impact area
	MLNI2	1		*Melaleuca* on limestone, non- impact site
	QUBL2		2	Barge landing Quarantine site
	QUNA1	1	2	New airport Quarantine site
	QUOA1	1		Old airport Quarantine site
	AVIA2	1		*Triodia angusta* valley, alternate campsite
	LMAD1		1	*Triodia weiseana* on loamy soil, administration block site
Sp 2	LMAD1	1		*Triodia weiseana* on loamy soil, administration block site
	MLAC2	1		*Melaleuca* on limestone, alternate campsite

Salticidae (Jumping Spiders)

Five species (five genera) of jumping spiders were collected from Barrow Island: *Clynotis albobarbatus-group*, *Grayenulla waldochae*, *Lycidas* Sp 1*, Pellenes* Sp 1*,* and *Zenodorus* Sp1. Table 3.5 shows the specimens of each species collected and the site code and site description for each species.

Clynotis albobarbatus-group has been recorded from Barrow Island in the past from Bandicoot Bay and is widespread on the mainland (see Biota 2004). Specimens of *Grayenulla waldochae* have only been collected from a limited number of sites. The genus is relatively common and widespread, but this species is only known from few specimens (Woodstock station, Newan). It has not been previously collected from Barrow Island.

Table 3.5: Localities, site descriptions, and details of Jumping spiders collected.

Genus	Species	No.	Sex	Site code	Site description
Clynotis	*albobarbatus* - group	1	Female	MLIA1	*Melaleuca* on limestone, impact area
Grayenulla	*waldochae*	1	Male	LMIA1	*Triodia weiseana* on limestone, impact area
		1	Male	TLAC1	*Triodia weiseana* on loamy soil, alternate camp
		1	Male	TLNI3	*Triodia weiseana* on loamy soil, non-impact
		1	Male	QUBL2	Barge landing Quarantine site
Lycidas	Sp 1	1	Male	TLIA1	*Triodia weiseana* on loamy soil, impact area
Pellenes	Sp 1	1	Female	QUCA	Campsite Quarantine site
Zenodorus	Sp 1	1	Female	FLBAY	Flacourt Bay

Undescribed species of *Lycidas* have been collected from Barrow previously. No information is known about the distribution of these morphospecies outside Barrow Island. However, it is unlikely that this genus would contain SRE's given the biology of this group. The two genera, *Pellenes* and *Zenodorus* have not been recorded from Barrow Island

previously, making them new genus records for the island. Other genera known from Barrow Island include *Jotus* (Bandicoot Bay), *Cytaea* (Base), and *Holoplatys* (Cave B2).

Selenopidae

Two undescribed morphospecies of Selenopidae were collected from Barrow Island. One female Sp 1 was hand collected from under rocks at site MLNI2 (*Melaleuca* on limestone, non-impact area), and two male specimens of Sp 2 were collected from wet pitfall traps at site LMNI1 (Triodia weiseana on limestone, non-impact area). These morphospecies could not be identified to genus or species level. No other specimens of this family have been collected from Barrow in the past.

Sparassidae

One male *Neosparassus* sp 1 was hand collected from Spinifex at night whilst head-torching at site LMAD1 (*Triodia weiseana* on limestone, alternate campsite). Two other unidentified species belonging to the genus Neosparassus had been collected on the previous survey but are yet to be named. The taxonomy of this genus is currently being revised by David Hirst of the South Australian Museum.

Described species belonging to the family Sparassidae that have been recorded from Barrow Island include *Heteropoda hemitis* and *Irileka iridescens* (See Biota 2004). *H. hermitis* is known from outside Barrow Island but it is unknown whether *I. Iridescens* is found outside Barrow.

Tetragnathidae

One male specimen belonging within the family Tetragnathidae, and the subfamily Metinae, was collected from wet pitfall traps at site TLAC1 (*Triodia weiseana* on loamy soil, alternate campsite). This species is undescribed and could not be identified beyond subfamily level. *Nephila edulis and* the genus *Tetragnatha* are known from Barrow Island and are recorded in the Arachnology database at the Western Australian Museum.

Thomisidae

Two genera belonging the family Thomisidae were represented amongst the specimens collected during the survey. Three female *Stephanopis* sp 1 were hand collected from leaf litter at site LMIA2 (*Triodia weiseana* on limestone, impact area). One male *Tharpyn*a sp 1 was collected from wet pitfall traps at site AVIA1 (*Triodia angusta* valley, impact area). These genera have been found on the previous field trip near terminal tanks, at the campsite and North of town point (Biota 2004). No described species have been registered for Barrow Island previously.

Zodariidae

One female specimen belonging within the family Zodariidae was collected from leaf litter at site MLNI2 (Melaleuca on limestone, non-impact area). This species has not been described and could not be identified to genus or species level.

Only two described species of Zodariidae has been recorded from Barrow. *Minasteron minusculum* and *Spinasteron `harveyi`. M. minisculum* occurs on the mainland of WA as well as Barrow Island, but *S.`harveyi`* is only known from Barrow Island. Other genera previously recorded from Barrow include: *Asteron*, *Australutica*, *Habronestea, Neostorena,* and *Nostera*.

Zoridae

Four morphospecies belonging to the family Zoridae were identified from wet pitfall traps during the survey. Table 3.6 shows the morphospecies, which are currently undescribed, the site were they were collected and the habitat they were collected from.

Table 3.6: Localities, site descriptions, and details of Zorid spiders collected.

Species	Site code	Females	Males	Site description
Sp 1	AVIA2		1	*Triodia angusta* valley, impact site
	AVNI2		1	*Triodia angusta* valley, non- impact site
	MLNI1		2	*Melaleuca* on limestone, non- impact site
	TLNI1		1	*Triodia weiseana* on loamy soil, non-impact site
	TLNI3		1	*Triodia weiseana* on loamy soil, non-impact site
	TLTP1		1	*Triodia weiseana* on loamy soil, Town Point
Sp 2	TLNI2	2		*Triodia weiseana* on loamy soil, non-impact site
Sp 3	LMNI1	1		*Triodia weiseana* on limestone, non-impact site
Sp 4	AVNI1	1		*Triodia angusta* valley, non- impact site

One genus of Zorid spider, *Argoctenus*, has previously been collected from Barrow Island from litter outside a cave and from the campsite. No described species have been recorded for Barrow Island.

3.5 Pseudoscorpionida (Pseudoscorpions)

Four genera of pseudoscorpions, belonging to the family Olpiidae, have been collected from Barrow Island. These include *Austrohorus* (Biota 2004), *Indolpium*, *Xenolpium*, and Genus 1.

Six specimens of *Indolpium* sp 1 were found in a number of sites within the impact area and alternate camp sites. Two specimens were collected from wet pitfall traps and four were sieved from leaf litter. A total of 32 specimens of *Xenolpium* sp 1 were collected from leaf litter within impact, non-impact, and alternate camp sites. This species was found at a number of different localities on the Island and within a number of different habitat types. One male specimen of an unknown genus was sieved from leaf litter collected at site LMAC2 (*Triodia weiseana* on limestone, alternate camp site). There is insufficient information to determine whether this species has the potential to be a SRE.

No specimens of *Synsphyronus* sp nov. `barrow`, or *Anagarypus heatwolei* were collected in this secondary survey. *Synsphryronus* sp nov. `barrow` has only been collected from one site on Barrow Island within the project area (Biota 2004). It is only known from one specimen and has the potential to be a short range endemic. There is insufficient information to determine the potential distribution of this species outside the project area, but it is unlikely that it would be restricted within the bounds of the impact area.

3.5 Scorpionida (Scorpions)

Two species belonging to the genus *Archisometrus* (Buthidae) were collected during the survey. One species was collected from wet pitfall traps at sites MLNI1 (*Melaleuca* on limestone) and QUBL1 (Barge-landing site) and another species was collected from leaf litter at Whites Beach and sites LMIA2 (*Triodia weiseana* on limestone) and TLTP1 (*Triodia weiseana* on loamy soil). It is unknown whether these species have the potential to be SRE's. A taxonomic revision of this group is currently being completed.

No specimens of Urodacus sp nov. `barrow` were recollected on this survey (Biota 2004).

3.6 Myriapoda (Centipedes and Millipedes)

Scutigeridae (House centipedes)
Two specimens of *Allothereua* were collected from leaf litter at sites TLNI2 (*Triodia weiseana* on loamy soil, non-impact site) and LMIA2 (*Triodia weiseana* on limestone, impact area). As the individuals were juveniles, they could not be identified further. The previous survey collected the species *Allothereua leuseuri* which is known to be widespread throughout WA.

Scolopendridae (Centipedes)
Two species of Scolopendrid centipede, *Etmostigmus curtipes* Koch and *Scolopendra laeta* Haase were collected from wet pitfall traps at sites QUBL1, MLAC2, and LMNI1. Both species are known to be widely distributed over the mainland (Koch 1982; Koch 1983). Other species known from Barrow include *Scolopendra morsitans, Arthrohabdus mojoberg,* and *Cormocephalus strigosus*. All have distributions outside of Barrow Island (Biota 2004).

Geophilida
One unknown genus of centipede belonging to the order Geophilida was collected from leaf litter at site MLNI1 (*Melaleuca* on limestone, non-impact site). As no key is available, further identification was not possible.

Synxenidae (Pin cushion millipedes)
A total of 14 pin cushion millipedes belonging to the family Synxenidae were collected from wet pitfall traps at a number of sites within and outside the impact areas. Unfortunately further identification was not possible. These millipedes have been known to occur in plague proportions under certain conditions.

3.7 Insecta (Insects)

Insect specimens were sorted and identified to morphospecies where possible. A summary of the number of morphospecies collected for different insect orders and families is provided in Table 3.7.

Table 3.7: Summary of insect morphospecies numbers collected from Barrow Island

Common Name	Order	No. Morphospecies
	Embioptera	1
Praying Mantis	Mantodea	2
Beetles	Coleoptera	19
Moths/Buterflies	Lepidoptera	5
Termites	Isoptera	2
Grasshoppers	Orthoptera	8
Bugs	Hemiptera	16
Flies	Diptera	14
Wasps/bees	Hymenoptera	24
Ants	Hymenoptera - Formicidae	24
Silverfish	Thysanura	3
Cockroaches	Blattodea	4

Spring tails	Collembola	2

3.8 Isopoda

Four morphospecies of Isopoda were identified from the material collected from wet pitfall traps. Three species were collected within both impact and non-impact sites but one species was only collected from site TLTP1 (Town Point).

4.0 Discussion

4.1 Summary of Findings

Terrestrial invertebrate sampling on Barrow Island revealed more that 60 taxa of Arachnids and myriapods. In total, 43 spider taxa, over 7 morphospecies of mites/ticks, three species of pseudoscorpion, two species of scorpion, one species of millipede, and four species of centipede were identified from material collected from wet pitfall traps and leaf litter.

No described species collected on this survey were known to be Short-Range Endemics (SRE's). Currently, there are nine species of Arachnid and one species of millipede that are considered endemic to Barrow Island. Many of these species are only known from one locality, so little is known about the distribution range of these species within Barrow Island. As more taxonomic work is undertaken, many more endemic species are expected to be discovered from material lodged with the Western Australian Museum (WAM).

Many spiders have the ability to disperse through ballooning and are thus expected not to exhibit short-range endemism. However, this may not be the case in a number of arachnid taxa (Harvey 2002). Groups of arachnids that have the potential to contain short-range endemics include Mygalomorph spiders, Oonopidae, Gnaphosidae, Prodidomidae, Miturgidae, Garypidae (and other pseudoscorpions), Buthidae, and *Urodacus*. Some species within these groups have only been collected from Barrow Island in the past. Many of these groups have been poorly collected or are in need of taxonomic revision. As a result, data were insufficient in assessing potential SRE's that may be adversely affected by the development.

The pseudoscorpion *Synsphyronus sp. nov. 'barrow'* has not been recorded elsewhere on Barrow or on the mainland, and is only known from one specimen collected from the impact area on a previous survey (Biota 2004). This species could potentially be a SRE, with a highly restricted distribution. No further specimens of this species were collected from the current survey, even though this group was targeted for in the survey and a total of 39 pseudoscorpions were collected. All pseudoscorpions collected belonged within the family Olpiidae, and included three genera: *Indolpium*, *Xenolpium*, and an unknown genus. The species of *Indolpium* and *Xenolpium* are considered to be a common species that is also found on the mainland. The status of the specimen belonging within the unknown genus is uncertain.

The scorpion *Urodacus sp nov. 'barrow'* is only known from two specimens collected from Barrow Island (Biota 2004). One specimen was collected within the impact area and the other came from an unknown locality on the Island. No further specimens have been collected and it is unclear if the distribution of this species is restricted to a certain area. More detailed sampling is needed to understand how restricted its distribution is, if restricted at all.

A large percentage of specimens collected from wet pitfall traps or sieved from leaf litter were juveniles. These individuals could not be identified to genus or species level and were not included in this report. This suggests that the survey was conducted at the wrong time of year to collect adult specimens of certain taxa. Many groups are seasonal, with juveniles maturing at certain times of the year or after periods of rain. This is particularly prevalent in Mygalomorph spiders, where the males are generally only active after heavy rain. Female Mygalomorph spiders generally remain near or within their burrows. Attempts to dig up specimens from burrows only revealed juvenile spiders (Biota 2004). This group contains known SRE's on the mainland, particularly in the south-west of WA.

The status of Mygalomorph spiders on Barrow has been poorly assessed, due to the lack of adult specimens collected in the past. One species known to be endemic to Barrow Island is the Brush-footed trapdoor spider *Synothele butleri* Raven, which is only known from one male specimen collected from an unknown locality on Barrow. Another species, *Aname mainae* – group, has been collected from the island, but a taxonomic revision of this group is needed to determine whether specimens from Barrow Island are taxonomically distinct from the mainland specimens.

A longer term, widespread invertebrate survey on Barrow Island is needed to collect adult specimens of taxa that mature, or are active, at different times of the year. A minimum of 12 months is recommended for wet pitfall trapping, with the traps cleared every 3 to 4 months.

5.0 References

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Site photos

Appendix 1

BIOta

Plate 1. Site AVAC1

Plate 2. Site AVAC2

Plate 3. Site AVIA1

Plate 4. Site AVIA2

Plate 5. Site AVNI1

Plate 6. Site AVNI2

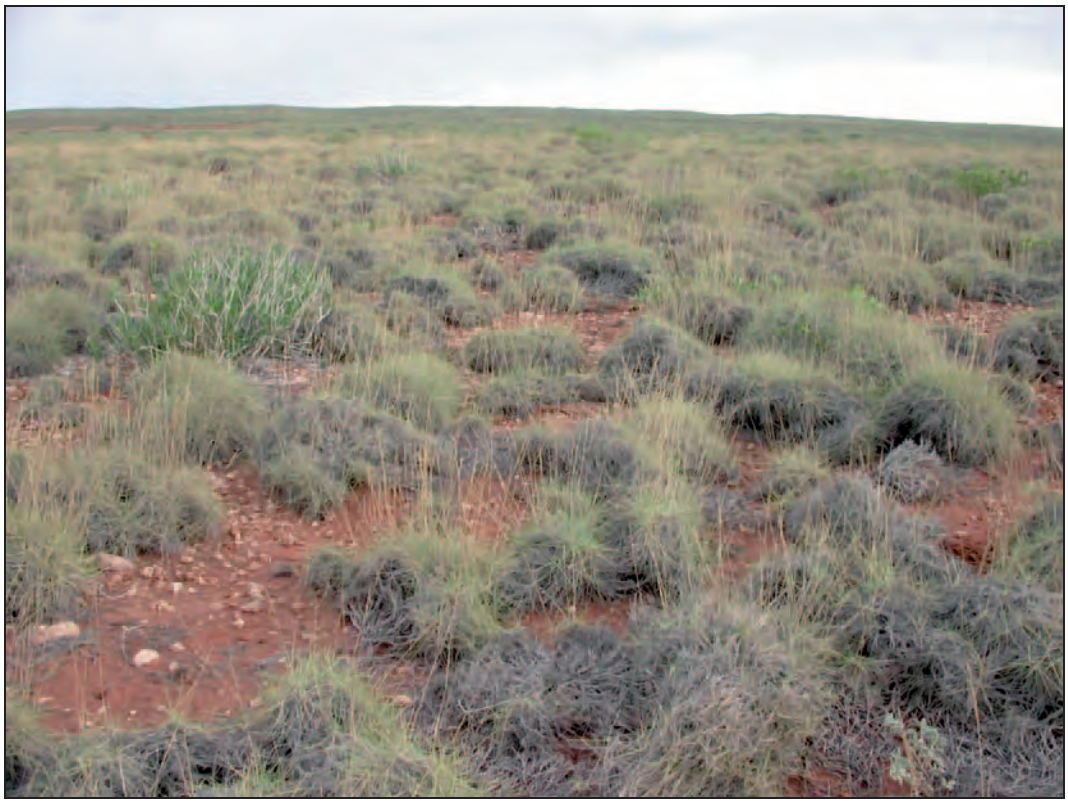

Plate 7. Site LMAC1

Plate 8. Site LMAC2

Plate 9. Site LMAD1

Plate 10. Site LMIA1

Plate 11. Site LMIA2

Plate 12. Site LMNI1

Plate 13. Site MLAC1

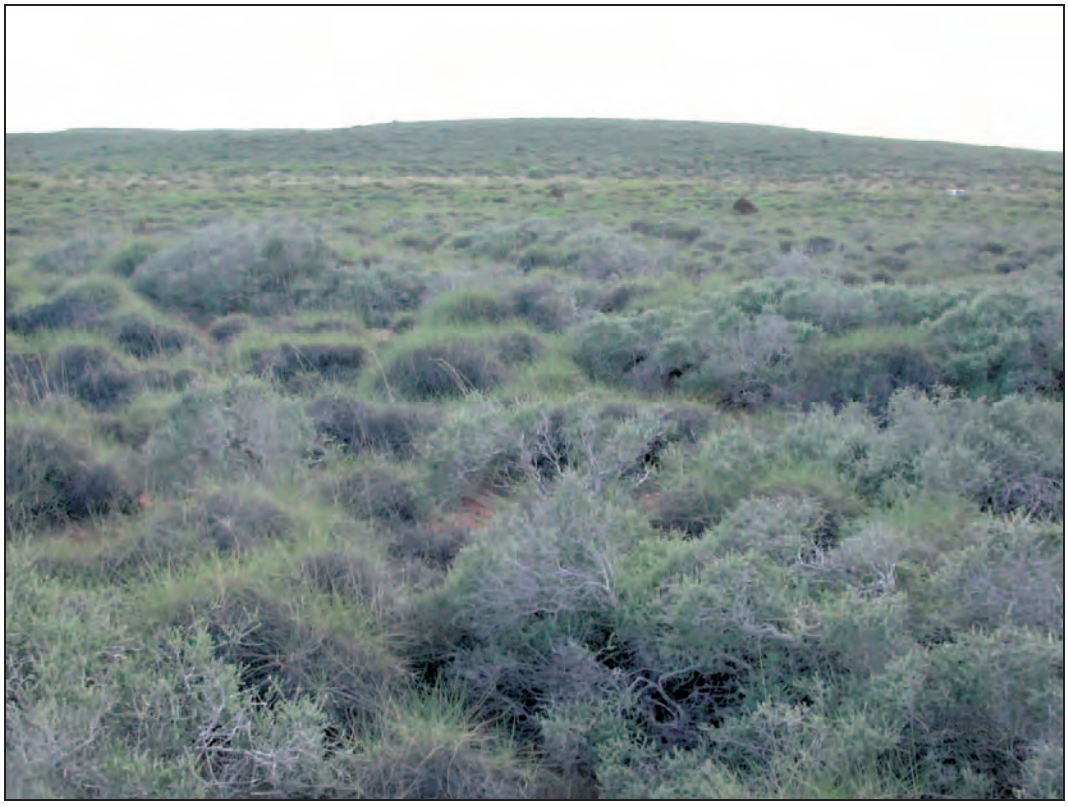

Plate 14. Site MLAC2

Plate 15. Site MLIA1

Plate 16. Site MLIA2

Plate 17. Site MLNI1

Plate 18. Site MLNI2

Plate 19. Site QUAP1

Plate 20. Site QUBL1

Plate 21 Site QUBL2

Plate 22. Site QUOA1

Plate 23. Site QUWH1

Plate 24. Site TLAC1

Plate 25. Site TLIA1

Plate 26. Site TLNI1

Plate 27. Site TLNI2

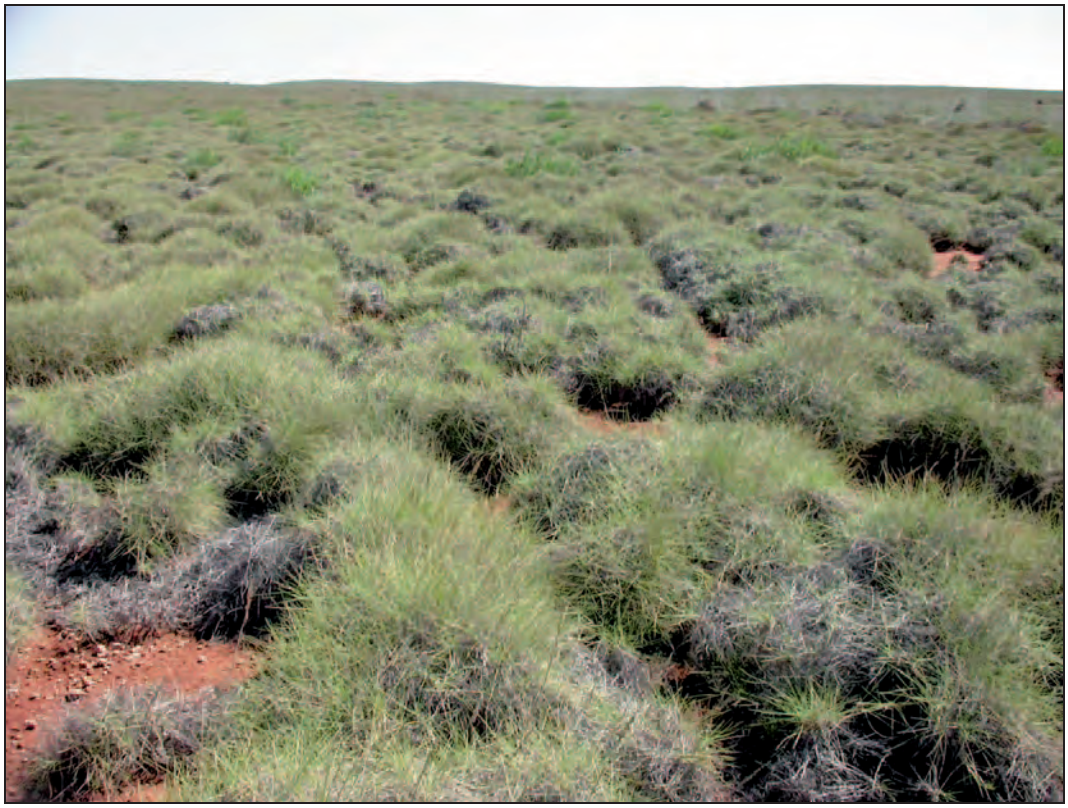

Plate 28. Site TLNI3

Plate 29. Site TLTP1

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Arachnid and Myriapod Taxa collected from survey

Appendix 2

Appendix 2: Fauna collected from Barrow Island Invertebrate survey (M – male, F – female, J – juvenile).

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	NO.	METHOD
Arachnida	Acari			sp 1	LMAC1	1	Wet pitfalls
Arachnida	Acari			sp 2.	MLAC2	1	Wet pitfalls
Arachnida	Acari			sp 3.	QUCA	1	Wet pitfalls
Arachnida	Acari			sp 4.	QUNA1	1	Wet pitfalls
Arachnida	Acari	Caeculidae			LMAC2	1	Wet pitfalls
Arachnida	Acari	Caeculidae			TLAC1	1	Wet pitfalls
Arachnida	Acari	Ixodidae	*Amblyomma*	*triguttatum*	Basecamp	2F	Hand col.
Arachnida	Acari	Ixodidae	*Amblyomma*		LMAD1	1J	Wet pitfalls
Arachnida	Acari	Ixodidae	*Amblyomma*		TLTP1	1J	Wet pitfalls
Arachnida	Acari	Ixodidae	*Amblyomma*		QUOA1	1J	Wet pitfalls
Arachnida	Acari	Trombiidae			AVAC1	4	Wet pitfalls
Arachnida	Acari	Trombiidae			LMAC2	3	Wet pitfalls
Arachnida	Acari	Trombiidae			MLIA2	1	Wet pitfalls
Arachnida	Acari	Trombiidae			MLNI1	1	Wet pitfalls
Arachnida	Acari	Trombiidae			MLNI2	2	Wet pitfalls
Arachnida	Acari	Trombiidae			QUBL2	1	Wet pitfalls
Arachnida	Araneae	Araneidae	*Austracantha*	*minax*	LMAD1	1F	Hand col.
Arachnida	Araneae	Corrinidae	*Supunna*	*picta (c.f)*	AVAC1	1F	Wet pitfalls
Arachnida	Araneae	Corrinidae	*Supunna*	*picta (c.f)*	AVAC2	1M	Wet pitfalls
Arachnida	Araneae	Corrinidae	*Supunna*	*picta (c.f)*	AVNI2	1M	Wet pitfalls
Arachnida	Araneae	Corrinidae	*Supunna*	*picta (c.f)*	TLTP1	1F	Wet pitfalls
Arachnida	Araneae	Filistatidae	*Wandella*	sp 1.	AVAC2	1M	Wet pitfalls
Arachnida	Araneae	Filistatidae	*Wandella*	sp 1.	LMNI1	1M	Wet pitfalls
Arachnida	Araneae	Filistatidae	*Wandella*	sp 1.	MLNI1	1M	Wet pitfalls
Arachnida	Araneae	Filistatidae	*Wandella*	sp 1.	TLTP1	1M	leaf litter
Arachnida	Araneae	Gnaphosidae		sp 1.	QUOA1	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 2.	AVNI2	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 2.	QUOA1	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 3.	MLAC2	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 4.	AVIA1	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 4.	QUBL2	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 5	AVNI1	1M	Wet pitfalls

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	NO.	METHOD
Arachnida	Araneae	Gnaphosidae		sp 6	MLAC1	1M	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 7	Whites Beach	2F	leaf litter
Arachnida	Araneae	Gnaphosidae		sp 8	AVAC1	1F	Wet pitfalls
Arachnida	Araneae	Gnaphosidae		sp 9	MLIA2	1M	Wet pitfalls
Arachnida	Araneae	Lamponidae	*Lampona*	*ampeinna*	MLIA1	1M	Wet pitfalls
Arachnida	Araneae	Lamponidae	*Lamponina*	*scutata*	MLIA2	1M	Wet pitfalls
Arachnida	Araneae	Lamponidae	*Notsodipus*	sp 1.	TLTP1	1F	Wet pitfalls
Arachnida	Araneae	Lycosidae	*Venator*	sp 1	Yacht Club Beach	1M	Head torch
Arachnida	Araneae	Oecobiidae	*Oecobius*	*navus*	LMIA2	1M	Wet pitfalls
Arachnida	Araneae	Oecobiidae	*Oecobius*	*navus*	QUWH1	4M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Gamasomorpha*	sp 1	LMAC1	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Gamasomorpha*	sp 1	LMAC2	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Gamasomorpha*	sp 2.	LMIA2	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Grymeus*	sp 1	TLNI3	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Myrmopopaea*	sp 1	AVAC2	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Myrmopopaea*	sp 1	MLIA1	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Myrmopopaea*	sp 1	MLNI1	1M	Wet pitfalls
Arachnida	Araneae	Oonopidae	*Opopaea*	sp 1	LMNI1	2M	Wet pitfalls
Arachnida	Araneae	Oxyopidae		sp 1	QUCA	1F	Wet pitfalls
Arachnida	Araneae	Oxyopidae		sp 2.	QUOA1	1M	Wet pitfalls
Arachnida	Araneae	Pholcidae	*Trichocyclus*	sp 1	QUCA	1F	Wet pitfalls
Arachnida	Araneae	Pholcidae	*Trichocyclus*	*nigropunctatus*	TLAC1	1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	AVIA2	1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	AVNI1	1M	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	AVNI2	1M, 1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	LMAD1	1M	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	MLIA2	1M	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	MLNI2	1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	QUBL2	2M	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	QUNA1	2M, 1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 1	QUOA1	1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 2.	LMAD1	1F	Wet pitfalls
Arachnida	Araneae	Prodidomidae		sp 2.	MLAC2	1F	Wet pitfalls

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	NO.	METHOD
Arachnida	Araneae	Salticidae	*Clynotis*	*albobarbatus - group*	MLIA1	1F	leaf litter
Arachnida	Araneae	Salticidae	*Grayenulla*	*waldochae*	LMIA1	1M	Wet pitfalls
Arachnida	Araneae	Salticidae	*Grayenulla*	*waldochae*	QUBL2	1M	Wet pitfalls
Arachnida	Araneae	Salticidae	*Grayenulla*	*waldochae*	TLAC1	1M	Wet pitfalls
Arachnida	Araneae	Salticidae	*Grayenulla*	*waldochae*	TLNI3	1M	Wet pitfalls
Arachnida	Araneae	Salticidae	*Lycidas*	sp 1.	TLIA1	1M	Wet pitfalls
Arachnida	Araneae	Salticidae	*Pellenes*	sp 1.	QUCA	1F	Wet pitfalls
Arachnida	Araneae	Salticidae	*Zenodorus*	sp 1.	Flacourt Bay	1F	leaf litter
Arachnida	Araneae	Selenopidae		sp 1.	MLNI2	1F	Hand col.
Arachnida	Araneae	Selenopidae		sp 2.	LMNI1	2M	Wet pitfalls
Arachnida	Araneae	Sparassidae	*Neosparassus*	sp 1.	LMAD1	1M	Leaf litter
Arachnida	Araneae	Tetragnathidae		sp 1.	TLAC1	1M	Wet pitfalls
Arachnida	Araneae	Thomisidae	*Stephanopis*	sp 1.	LMIA2	3F	Leaf litter
Arachnida	Araneae	Thomisidae	*Tharpyna*	sp 1.	AVIA1	1M	Wet pitfalls
Arachnida	Araneae	Zodariidae		sp 1.	MLNI2	1F	leaf litter
Arachnida	Araneae	Zoridae		sp 1.	AVIA2	1M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 1.	AVNI2	1M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 1.	MLNI1	2M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 1.	TLNI1	1M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 1.	TLNI3	1M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 1.	TLTP1	1M	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 2.	TLNI2	2F	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 3.	LMNI1	1F	Wet pitfalls
Arachnida	Araneae	Zoridae		sp 4.	AVNI1	1F	Wet pitfalls
Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp 1.	LMAC2	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp 1.	LMIA2	1	Wet pit
Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp 1.	MLAC2	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Indolpium*	sp 1.	QUBL1	1	Wet pitfalls
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	Flacourt Bay	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	LMAD1	1	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	LMIA2	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	LMIA2	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	MLIA1	2	Leaf litter

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	NO.	METHOD
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	MLNI1	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	MLNI1	3	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	MLNI2	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	TLAC1	1	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	TLIA1	1	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	TLNI2	9	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	TLTP1	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	Valley of Giants	1	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp 1.	Whites Beach	2	Leaf litter
Arachnida	Pseudoscorpiones	Olpiidae	Genus 1	sp 1.	LMAC2	1M	Leaf litter
Arachnida	Scorpiones	Buthidae	*Archisometrus*	sp 1.	MLNI1	1M	Wet pitfalls
Arachnida	Scorpiones	Buthidae	*Archisometrus*	sp 1.	QUBL1	1M	Wet pitfalls
Arachnida	Scorpiones	Buthidae	*Archisometrus*	sp 2.	LMIA2	1F	Leaf litter
Arachnida	Scorpiones	Buthidae	*Archisometrus*	sp 2.	TLTP1	1M	Leaf litter
Arachnida	Scorpiones	Buthidae	*Archisometrus*	sp 2.	Whites Beach	1J	Leaf litter
Myriapoda	Geophiliida				MLNI1	1	Leaf litter
Myriapoda	Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*	MLAC2	1	Wet pitfalls
Myriapoda	Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*	QUBL1	1	Wet pitfalls
Myriapoda	Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*	LMNI1	1J	Wet pitfalls
Myriapoda	Scutigerida	Scutigeridae	*Allothereua*		LMIA2	1J	Leaf litter
Myriapoda	Scutigerida	Scutigeridae	*Allothereua*		TLNI2	1J	Leaf litter
Myriapoda	Polyxenida	Synxenidae			AVAC2	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			AVNI1	2	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			AVNI2	2	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			LMIA2	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			MLIA1	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			MLIA2	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			MLNI2	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			QUBL1	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			TLAC1	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			TLNI3	1	Wet pitfalls
Myriapoda	Polyxenida	Synxenidae			TLTP1	2	Wet pitfalls

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List of Taxa recorded from Barrow Island

Appendix 3

Appendix 3. List of families, genera, and species recorded from Barrow Island (Species in bold are Endemic to Barrow Island).

ORDER	FAMILY	GENUS	SPECIES
Acari	Anystidae	*Erythracarus*	*decoris*
Acari	Argasidae	*Argas*	*`persicus`*
Acari	Argasidae	*Ornithodoros*	*gurneyi*
Acari	Caeculidae		
Acari	Ixodidae	*Amblyomma*	*limbatum*
Acari	Ixodidae	*Amblyomma*	*triguttatum*
Acari	Ixodidae	*Haemaphysalis*	*ratti*
Acari	Laelapidae	***Haemolaelaps***	***marsupialis***
Acari	Laelapidae	***Mesolaelaps***	***antipodianus***
Acari	Trombiidae		
Araneae	Ammoxenidae	***Barrowammo***	***waldockae***
Araneae	Araneidae	*Argiope*	*protensa*
Araneae	Araneidae	*Argiope*	*trifasciata*
Araneae	Araneidae	*Austracantha*	*minax*
Araneae	Araneidae	*Larinia*	
Araneae	Barychelidae	***Synothele***	***butleri***
Araneae	Clubionidae	*Cheiracanthium*	
Araneae	Clubionidae	*Clubiona*	
Araneae	Ctenizidae	*Conothele*	
Araneae	Deinopidae	*Deinopis*	
Araneae	Desidae	*Badumna*	
Araneae	Filistatidae	*Wandella*	
Araneae	Gallieniellidae	*Meedo*	*houstoni*
Araneae	Gnaphosidae	*Ceryerda*	
Araneae	Lamponidae	*Lampona*	*ampeinna*
Araneae	Lamponidae	*Lamponina*	*scutata*
Araneae	Lamponidae	*Notsodipus*	
Araneae	Lycosidae	*Hogna*	*kuyanii*
Araneae	Lycosidae	*Lycosa*	*clara*
Araneae	Lycosidae	*Lycosa*	*laeta*
Araneae	Lycosidae	*Lycosa*	*snelli*
Araneae	Lycosidae	*Venator*	
Araneae	Micropholcommatidae	*Textricella*	
Araneae	Miturgidae	*Miturga*	*occidentalis*
Araneae	Miturgidae	***Miturga***	***serrata***
Araneae	Mysmenidae		
Araneae	Nemesiidae	*Aname*	*mainae group*
Araneae	Oecobiidae	*Oecobius*	*navus*
Araneae	Oonopidae	*Gamasomorpha*	
Araneae	Oonopidae	*Grymeus*	*`nasutus`*
Araneae	Oonopidae	*Myrmopopaea*	
Araneae	Oonopidae	*Opopaea*	
Araneae	Oonopidae	***Orchestina***	***`barrow`***
Araneae	Pholcidae	*Crossopriza*	*lyoni*
Araneae	Pholcidae	*Trichocyclus*	*aranda*
Araneae	Pholcidae	*Trichocyclus*	*nigropunctatus*
Araneae	Prodidomidae	***`Wydundra`***	***`barrow`***
Araneae	Prodidomidae	*Prodidomus*	*`woodleigh`*

ORDER	FAMILY	GENUS	SPECIES
Araneae	Salticidae	*Clynotis*	*albobarbatus - group*
Araneae	Salticidae	*Cytaea*	
Araneae	Salticidae	*Grayenulla*	
Araneae	Salticidae	*Holoplatys*	
Araneae	Salticidae	*Jotus*	
Araneae	Salticidae	*Lycidas*	
Araneae	Salticidae	*Pellenes*	
Araneae	Salticidae	*Zenodorus*	
Araneae	Segestriidae		
Araneae	Selenopidae		
Araneae	Sparassidae	*Heteropoda*	*hermitis*
Araneae	Sparassidae	*Irileka*	*iridescens*
Araneae	Sparassidae	*Neosparassus*	
Araneae	Tengellidae	*Bengalla*	
Araneae	Tetragnathidae	*Nephila*	*edulis*
Araneae	Tetragnathidae	*Tetragnatha*	
Araneae	Theridiidae	*Argyrodes*	*`antipodiana` group*
Araneae	Theridiidae	*Euryopsis*	
Araneae	Theridiidae	*Icona*	
Araneae	Theridiidae	*Latrodectus*	*hasseltii*
Araneae	Thomisidae	*Stephanopis*	
Araneae	Thomisidae	*Tharpyna*	
Araneae	Trochanteriidae	*Morebilus*	*diversus*
Araneae	Zodariidae	*Asteron*	
Araneae	Zodariidae	*Australutica*	
Araneae	Zodariidae	*Habronestes*	
Araneae	Zodariidae	*Minasteron*	*minusculum*
Araneae	Zodariidae	*Nostera*	
Araneae	Zodariidae	*Spinasteron*	*`harveyi`*
Araneae	Zoridae	*Argoctenus*	
Pseudoscorpiones	Chernetidae	*Nesidiochernes*	
Pseudoscorpiones	Garypidae	***Anagarypus***	***heatwolei***
Pseudoscorpiones	Garypidae	***Synsphyronus***	***sp. nov. `barrow`***
Pseudoscorpiones	Olpiidae	*Austrohorus*	
Pseudoscorpiones	Olpiidae	*Indolpium*	
Pseudoscorpiones	Olpiidae	*Xenolpium*	
Schizomida	Hubbardiidae	*Draculoides*	*bramstokeri*
Scorpiones	Buthidae	*Archisometrus*	
Scorpiones	Buthidae	*Isometroides*	*`multipunctata`*
Scorpiones	Urodacidae	***Urodacus***	***sp. nov. `barrow`***
Scolopendrida	Scolopendridae	*Arthrorhabdus*	*mjobergi*
Scolopendrida	Scolopendridae	*Cormocephalus*	*strigosus*
Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*
Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*
Scolopendrida	Scolopendridae	*Scolopendra*	*morsitans*
Scutigerida	Scutigeridae	*Allothereua*	*leuseuri*
Geophilida	Oryidae		
Polydesmida	Pachybolidae	***Speleostrophus***	***nesiotes***
Polydesmida	Paradoxosomatidae		
Polyxenida	Polyxenidae	*Unixenus*	

ORDER	FAMILY	GENUS	SPECIES
Polyxenida	Synxenidae		

Attachment 2 - Invertebrate Specimens Collected from Systematic and Opportunistic Sampling

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	SPECIMENS	REGISTRATION No.
Arachnida	Araneae	Araneidae	*Austracantha*	*minax*	BIHT01	1 M, 5 F, 1 J	T57725
Arachnida	Araneae	Deinopidae	*Deinopis*		BIMBO2	1 M	T57724
Arachnida	Araneae	Deinopidae	*Deinopis*		BIMBO6	1 M	T57723
Arachnida	Araneae	Gnaphosidae			BI1.21	1 F	T57716
Arachnida	Araneae	Gnaphosidae	*Ceryerda*		BITP1	1 F	T57715
Arachnida	Araneae	Lamponidae	*Lamponina*	*scutata*	BIMBO1	1 M	T57721
Arachnida	Araneae	Lamponidae	*Lamponina*	*scutata*	BIMBO5	1 M	T57722
Arachnida	Araneae	Lycosidae	*Hogna*	*kuyanii group*	BIHT05	1M, 4 F	T57692 to 57696
Arachnida	Araneae	Lycosidae	*Hoggicosa*	*bicolor*	BIHT16	2	T57697 to 57698
Arachnida	Araneae	Lycosidae	*Lycosa*	*clara*	BIMBO2		T58762
Arachnida	Araneae	Lycosidae	*Venator*	sp1	BIHT01	16	T57673 to 57681
Arachnida	Araneae	Lycosidae	*Venator*	sp1	BIMBO3	18	T57691
Arachnida	Araneae	Lycosidae	*Venator*	sp1	BIMBO4	3	T57689
Arachnida	Araneae	Lycosidae	*Venator*	sp1	BIMBO5	24	T57690
Arachnida	Araneae	Miturgidae			BIMBO1	1 F	T57714
Arachnida	Araneae	Miturgidae			BIMBO2	5 M, 1F , 1J	T57712
Arachnida	Araneae	Miturgidae			BIMBO3	5	T57707
Arachnida	Araneae	Miturgidae			BIMBO4	4 M	T57708 to 57710
Arachnida	Araneae	Miturgidae			BIMBO5	3 M, 1 J	T57711
Arachnida	Araneae	Miturgidae			BIMBO6	1 M, 2 J	T57713
Arachnida	Araneae	Nemesiidae			BIHT11-BIHT15	7J	Not registered
Arachnida	Araneae	Oonopidae	*Opopaea*		BI1.21	1 M, 1 F	T57726
Arachnida	Araneae	Salticidae	*Lycidas*	sp2	BI3.11	1 F	T57718
Arachnida	Araneae	Salticidae	*Lycidas*	sp1	BI3.11	1 F	T57717
Arachnida	Araneae	Sparassidae	*Heteropoda*	*hermitis*	BIHT01	1M	T57701
Arachnida	Araneae	Sparassidae	*Heteropoda*	*hermitis*	BIHT04	2 M, 1 F	T57699 to 57702
Arachnida	Araneae	Sparassidae	*Neosparassus*	sp1	BI3.5	1 M	T57703

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	SPECIMENS	REGISTRATION No.
Arachnida	Araneae	Sparassidae	*Neosparassus*	sp1	BIHT02	1 M	T57704
Arachnida	Araneae	Sparassidae	*Neosparassus*	sp2	BIHT01	1 F	T57706
Arachnida	Araneae	Sparassidae	*Neosparassus*	sp2	BIMBO4	1 M	T57705
Arachnida	Araneae	Theridiidae			BIHT10	1 F	T57729
Arachnida	Araneae	Theridiidae	*Euryopis*		BI1.21	1 M	T57728
Arachnida	Araneae	Thomisidae	*Stephanopis*		BI3.1	1 F	T57719
Arachnida	Araneae	Thomisidae	*Tharpyna*		BI1.21	2 M	T57720
Arachnida	Araneae	Zodariidae			BIIT4	1 F	T57727
Arachnida	Pseudoscorpiones	Garypidae	*Synsphyronus*	sp. Nov. `*barrow*`	BI1.41	1	T57749
Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*		BIHT06	1 F	T57746
Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*		BIHT07	1	T57747
Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*		BIHT09	1 J	T57748
Arachnida	Pseudoscorpiones	Olpiidae	*Austrohorus*		BITP1	1 F	T57745
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp1	BIHT07	1 F	T57740
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp1	BIHT08	1 M, 2 F, 2 J	T57741 to 57742
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp2	BIIT8	1 M	T57744
Arachnida	Pseudoscorpiones	Olpiidae	*Xenolpium*	sp2	BIHT06	1 F	T57743
Arachnida	Scorpiones	Buthidae	*Isometroides*	*multipunctata*	BI1.21	1	T57752
Arachnida	Scorpiones	Buthidae	*Isometroides*	*multipunctata*	BIHT10	2	T57753 to 57754
Arachnida	Scorpiones	Buthidae	*Isometroides*	*multipunctata*	BIMBO4	1	T57750
Arachnida	Scorpiones	Buthidae	*Isometroides*	*multipunctata*	BIMBO5	1	T57751
Arachnida	Scorpiones	Urodacidae	*Urodacus*	sp. Nov. '*barrow*`	BIMBO1	1	T57739
Chilopoda	Scolopendrida	Polyxenidae	*unixenis*		BI3.7	1	T57738
Chilopoda	Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*	BIMBO4	1	T57732
Chilopoda	Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*	BIMBO5	1	T57733
Chilopoda	Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*	BIAP3	1	T57737
Chilopoda	Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*	BIMBO1	1	T57734
Chilopoda	Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*	BIMBO2	1	T57736
Chilopoda	Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*	BIMBO3	1	T57735
Chilopoda	Scutigerida	Scutigeridae	*Allothereua*	*leuseuri*	BIMBO2	1	T57731

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	SPECIMENS	REGISTRATION No.
Chilopoda	Scutigerida	Scutigeridae	*Allothereua*	*leuseuri*	BIMBO4	1	T57730
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BITP1	4 (live)1(dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BI3.1	1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BI3.3	7 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BIOP1	8 (live) 8(dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BIOP2	11(live) 24(dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BIOP3	2 (live) 2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BI1.19	3 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BIOP4	20 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BI1.29	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BIOP7	3 (live) 9 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp1	BI1.25	1 (live) 5 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BITP1	1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BITP4	7 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.1	1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIOP1	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIOP2	7 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIOP3	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI1.19	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.5	1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.10	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIOP5	2 (live)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIAP1	2 (live) 1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.11	3 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.9	1 (live) 2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI3.3	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIAP2	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BI1.26	1 (live) 2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Rhagada*	sp2	BIOP8	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BITP1	9 (live)	

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	SPECIMENS	REGISTRATION No.
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BITP2	5 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BITP4	5 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.1	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.3	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.19	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.5	4 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.10	5 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BIOP5	2 (live) 3 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BIAP1	1 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.11	2 (live) 7 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI3.9	1 (live) 3 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BIAP2	5 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.21	4 (live) 1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BIOP6	2 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.29	6 (live)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.24	5 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.28	2 (live) 2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.26	1 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.27	2 (dead)	
Gastropoda	Pulmonata	Camaenidae	*Quistrachia*	*barrowensis*	BI1.22	2 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI3.1	3 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI3.3	9 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI3.5	16 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI3.11	10 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI3.9	10 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.21	6 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.24	20 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.28	8 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.26	11 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.25	28 (dead)	

CLASS	ORDER	FAMILY	GENUS	SPECIES	SITE CODE	SPECIMENS	REGISTRATION No.
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.23	3 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BIOP8	4 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.27	15 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.41	12 (dead)	
Gastropoda	Pulmonata	Pupillidae	*Pupoides*		BI1.22	7 (dead)	

Attachment 3 - Registered Species Collected from Barrow Island (Species in bold are Endemic to Barrow Island)

ORDER	FAMILY	GENUS	SPECIES
Acari	Anystidae	*Erythracarus*	*decoris*
Acari	Argasidae	*Argas*	*`persicus`*
Acari	Argasidae	*Ornithodoros*	*gurneyi*
Acari	Caeculidae		
Acari	Ixodidae	*Amblyomma*	*limbatum*
Acari	Ixodidae	*Amblyomma*	*triguttatum*
Acari	Ixodidae	*Haemaphysalis*	*ratti*
Acari	Laelapidae	***Haemolaelaps***	***marsupialis***
Acari	Laelapidae	***Mesolaelaps***	***antipodianus***
Acari	Trombiidae		
Araneae	Ammoxenidae	***Barrowammo***	***waldockae***
Araneae	Araneidae	*Argiope*	*protensa*
Araneae	Araneidae	*Argiope*	*trifasciata*
Araneae	Araneidae	*Austracantha*	*minax*
Araneae	Araneidae	*Larinia*	
Araneae	Barychelidae	***Synothele***	***butleri***
Araneae	Clubionidae	*Cheiracanthium*	
Araneae	Clubionidae	*Clubiona*	
Araneae	Ctenizidae	*Conothele*	
Araneae	Deinopidae	*Deinopis*	
Araneae	Desidae	*Badumna*	
Araneae	Filistatidae	*Wandella*	
Araneae	Gallieniellidae	*Meedo*	*houstoni*
Araneae	Gnaphosidae	*Ceryerda*	
Araneae	Lamponidae	*Lampona*	*ampeinna*
Araneae	Lamponidae	*Lamponina*	*scutata*
Araneae	Lamponidae	*Notsodipus*	
Araneae	Lycosidae	*Hogna*	*kuyanii*
Araneae	Lycosidae	*Lycosa*	*clara*
Araneae	Lycosidae	*Lycosa*	*laeta*
Araneae	Lycosidae	*Lycosa*	*snelli*
Araneae	Lycosidae	*Venator*	
Araneae	Micropholcommatidae	*Textricella*	
Araneae	Miturgidae	*Miturga*	*occidentalis*
Araneae	Miturgidae	***Miturga***	***serrata***
Araneae	Mysmenidae		
Araneae	Nemesiidae	*Aname*	*mainae group*
Araneae	Oecobiidae	*Oecobius*	*navus*
Araneae	Oonopidae	*Gamasomorpha*	
Araneae	Oonopidae	*Grymeus*	*`nasutus`*
Araneae	Oonopidae	*Myrmopopaea*	
Araneae	Oonopidae	*Opopaea*	
Araneae	Oonopidae	***Orchestina***	***`barrow`***
Araneae	Pholcidae	*Crossopriza*	*lyoni*
Araneae	Pholcidae	*Trichocyclus*	*aranda*
Araneae	Pholcidae	*Trichocyclus*	*nigropunctatus*
Araneae	Prodidomidae	***`Wydundra`***	***`barrow`***
Araneae	Prodidomidae	*Prodidomus*	*`woodleigh`*
Araneae	Salticidae	*Clynotis*	*albobarbatus* - group

ORDER	FAMILY	GENUS	SPECIES
Araneae	Salticidae	*Cytaea*	
Araneae	Salticidae	*Grayenulla*	
Araneae	Salticidae	*Holoplatys*	
Araneae	Salticidae	*Jotus*	
Araneae	Salticidae	*Lycidas*	
Araneae	Salticidae	*Pellenes*	
Araneae	Salticidae	*Zenodorus*	
Araneae	Segestriidae		
Araneae	Selenopidae		
Araneae	Sparassidae	*Heteropoda*	*hermitis*
Araneae	Sparassidae	*Irileka*	*iridescens*
Araneae	Sparassidae	*Neosparassus*	
Araneae	Tengellidae	*Bengalla*	
Araneae	Tetragnathidae	*Nephila*	*edulis*
Araneae	Tetragnathidae	*Tetragnatha*	
Araneae	Theridiidae	*Argyrodes*	*`antipodiana`* group
Araneae	Theridiidae	*Euryopsis*	
Araneae	Theridiidae	*Icona*	
Araneae	Theridiidae	*Latrodectus*	*hasseltii*
Araneae	Thomisidae	*Stephanopis*	
Araneae	Thomisidae	*Tharpyna*	
Araneae	Trochanteriidae	*Morebilus*	*diversus*
Araneae	Zodariidae	*Asteron*	
Araneae	Zodariidae	*Australutica*	
Araneae	Zodariidae	*Habronestes*	
Araneae	Zodariidae	*Minasteron*	*minusculum*
Araneae	Zodariidae	*Nostera*	
Araneae	Zodariidae	*Spinasteron*	*`harveyi`*
Araneae	Zoridae	*Argoctenus*	
Pseudoscorpiones	Chernetidae	*Nesidiochernes*	
Pseudoscorpiones	Garypidae	***Anagarypus***	***heatwolei***
Pseudoscorpiones	Garypidae	***Synsphyronus***	***sp. nov. `barrow`***
Pseudoscorpiones	Olpiidae	*Austrohorus*	
Pseudoscorpiones	Olpiidae	*Indolpium*	
Pseudoscorpiones	Olpiidae	*Xenolpium*	
Schizomida	Hubbardiidae	*Draculoides*	*bramstokeri*
Scorpiones	Buthidae	*Archisometrus*	
Scorpiones	Buthidae	*Isometroides*	*`multipunctata`*
Scorpiones	Urodacidae	***Urodacus***	***sp. nov. `barrow`***
Scolopendrida	Scolopendridae	*Arthrorhabdus*	*mjobergi*
Scolopendrida	Scolopendridae	*Cormocephalus*	*strigosus*
Scolopendrida	Scolopendridae	*Ethmostigmus*	*curtipes*
Scolopendrida	Scolopendridae	*Scolopendra*	*laeta*
Scolopendrida	Scolopendridae	*Scolopendra*	*morsitans*
Scutigerida	Scutigeridae	*Allothereua*	*leuseuri*
Geophilida	Oryidae		
Polydesmida	Pachybolidae	***Speleostrophus***	***nesiotes***
Polydesmida	Paradoxosomatidae		
Polyxenida	Polyxenidae	*Unixenus*	
Polyxenida	Synxenidae		

Attachment 4 - Genetic Diversity of Rhagada Land Snails on Barrow Island

Genetic diversity of *Rhagada* land snails on Barrow Island

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(5 November 2004)

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Summary

(a) Genetic analyses confirmed the presence of two genetically distinct species of *Rhagada* snails on Barrow Island: a smaller species restricted to the northern tip of the island, and a larger species widespread over the remainder of the island.
(b) These two species are genetically the most distinctive of all species of *Rhagada* examined from the Pilbara Region, highlighting the conservation value of Barrow Island for these endemic snails.
(c) Comparisons amongst 19 samples of the widespread large species revealed distinct populations, with unusually low levels of genetic subdivision, and no detectable geographic pattern on the island.
(d) No evidence was found to indicate that populations of these snails in the area of the proposed Gorgon development are genetically distinctive.

1. Introduction

Terrestrial invertebrates often have less capacity for dispersal and smaller geographic distributions than species of vertebrates (e.g., Harvey 2002). Limited dispersal and narrow distributions increase both the likelihood of locally distinct genetic forms and their vulnerability to extinction. Land snails are well recognised in both contexts (e.g., Ponder 1997).

In the Pilbara Region, the dominant group of land snails is the genus *Rhagada*, which is endemic to northern Western Australia (Solem 1997). Although mainland species tend to have distributions spanning hundreds of km, unique species restricted to islands have been described in the Dampier Archipelago (Solem 1997). There appear to be two species of *Rhagada* on Barrow Island, the smaller species being approximately 10 mm diameter, and the larger species about 20 mm diameter. These species have not been taxonomically described or assigned to any described species. The small species has been found only on the northern end of Barrow Island, whereas the large species is abundant and widespread over the rest of the island.

In this study, allozyme electrophoresis was used to examine genetic diversity of *Rhagada* on Barrow Island, to answer questions at three levels:

(a) Are the two apparent species on Barrow Island genetically distinct? Because shells can vary greatly among populations of the same species (e.g., Johnson *et al.* 1993; Johnson & Black 2000), independent genetic evidence for species distinctness is important for evaluating the relationships of the small and large forms.

(b) Are the species on Barrow Island genetically unique? Unusually high levels of genetic similarity have been found among species of *Rhagada* on the mainland and in the Dampier Archipelago (Johnson *et al.* 2004). Comparison of the species on Barrow Island with those from the Pilbara Region will determine whether the Barrow species are unique.

(c) How much genetic divergence is there among populations, and what is the pattern of that divergence, in the widespread larger species on Barrow Island? Are there genetically distinct groups of populations? Specifically, does the area of the proposed Gorgon development include genetically unique populations?

2. Methods

2.1 Samples

Samples of live, adult *Rhagada* were obtained between March and July 2004, at 21 sites, providing a good coverage of the island (Fig. 1). These included two samples of the small species, restricted to the northern portion of the island, and 19 of the large species, spanning the remainder of the island. Three of the samples of the large species were from the Gorgon area.

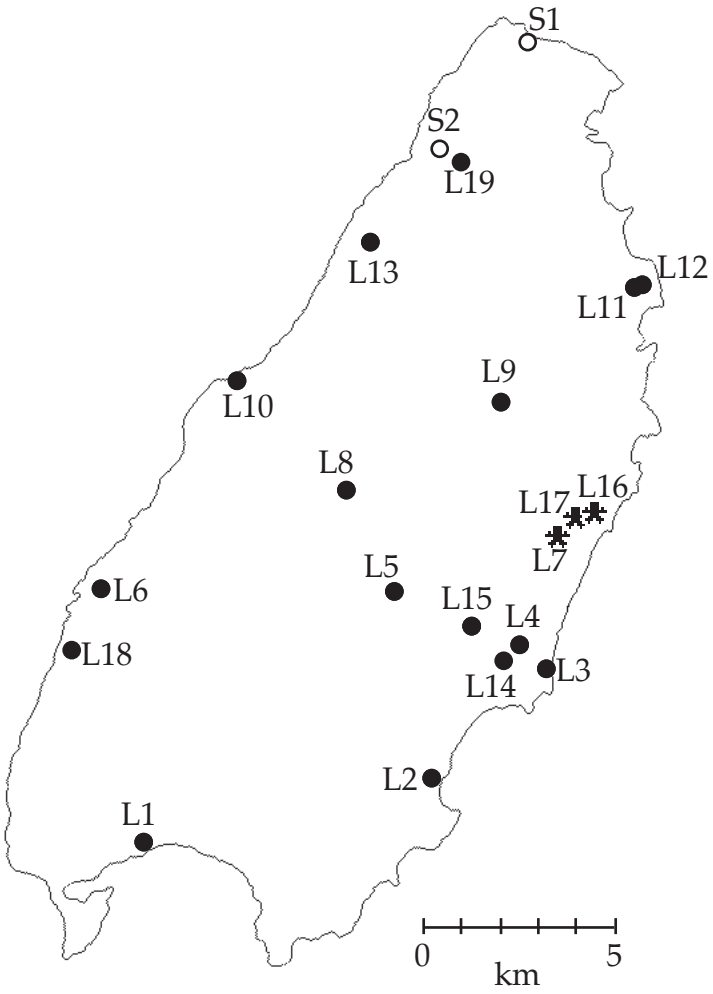

Figure 1. Sample sites of *Rhagada* on Barrow Island. Open circles = small species. Filled symbols = large species, with asterisk = Gorgon area.

In the laboratory, the snails were activated overnight, by placing them on moist tissue paper in sealed plastic boxes, and were then frozen at -80°C, pending allozyme electrophoresis. This ensured that the processed snails were alive and active.

2.2 Allozyme electrophoresis

Preparation of samples and allozyme electrophoresis followed the procedures used in a previous study of *Rhagada* from the Pilbara mainland and Dampier Archipelago (Johnson *et al.* 2004). Thirteen enzymes, representing 15 gene loci,

were successfully examined: adenylate kinase (EC 2.7.4.3; *Ak* locus); arginine phosphokinase (EC 2.7.3.3; *Apk*); glucosephosphate isomerase (EC 5.3.1.9; *Gpi*); isocitrate dehydrogenase (EC 1.1.1.42; *Idh1* and *Idh2*); lactate dehydrogenase (EC 1.1.1.27; *Ldh*); leucine amino peptidase (EC 3.4.-.-; *Lap*); leucyl-glycylglycine peptidase (EC 3.4.-.-; *Pep-lgg*; TEB); leucyl-leucine peptidase (EC 3.4.-.-; *Pep-ll*); leucyl-tyrosine peptidase (EC 3.4.-.-; *Pep-lt*); valyl-leucine peptidase (EC 3.4.-.-; *Pep-vl*); phosphoglucomutase (EC 5.4.2.2; *Pgm1* and *Pgm2*); phosphogluconate dehydrogenase (EC 1.1.1.43; *Pgd*); superoxide dismutase (EC 1.15.1.1; *Sod*).

Samples were processed in two stages. First, four snails from each site were examined for all fifteen loci. Both the large and the small species were included, providing genetic comparison between the two apparent species on Barrow Island. In addition, a sample of *Rhagada convicta* (the most widspread species on the mainland) from Mundabullagana Station (20°08'09.7"S, 118°01'31.0"E) was included. This provided a link to the published genetic comparisons among all known species of *Rhagada* from the Pilbara mainland and most of the species from the Dampier Archipelago (Johnson *et al.* 2004), placing the species on Barrow Island in the broader context.

In addition to determining whether the species on Barrow Island are genetically distinct, this first stage of electrophoresis determined which enzymes were genetically variable in the large, widespread species on Barrow Island. These variable enzymes were then examined in larger samples of this species from all 19 sites. Five sites (L14-17, L19 in Fig. 1) were represented by small samples (10-11 snails), while the other 14 sites had more reliable samples of 33 to 52 snails.

2.3 Analysis of data

Allelic frequencies were calculated at each locus, and differences between populations were measured over all 15 loci as Nei's (1978) genetic distance. The matrix of genetic distances was summarized by a UPGMA phenogram, using PHYLIP (Felsenstein 1993). The phenogram was illustrated with the help of TreeView (Page 1996). This analysis included all 21 samples from Barrow Island, and the species of *Rhagada* from the Pilbara mainland and the Dampier Archipelago (Johnson *et al.* 2004).

For the variable loci in the large species on Barrow Island, genetic subdivision among all 19 samples was measured as Wright's fixation index, F_{ST} , using GENEPOP (Raymond & Rousset 1995), as implemented on the web (http://biomed.curtin.edu.au/genepop). Statistical significance of genetic differences among populations was tested by randomization contingency tests, using GENEPOP. Differences between pairs of sites were measured as pairwise F_{ST} . The matrix of pairwise F_{ST} was summarized by multidimensional scaling (MDS; Systat version 5.0 for Macintosh computers), to look for possible genetic groupings across the island. Pairwise F_{ST} was also plotted against geographic distance between sites, to determine whether there was a pattern of isolation by distance. In these analyses, special attention was paid to the samples from the proposed Gorgon area, to determine whether these populations are genetically unique.

3. Results and Discussion

3.1 Comparisons between species

The genetic comparisons confirmed the distinctness of the large and small species of *Rhagada* on Barrow Island. The two species are completely distinct at the *Ldh*, *Pgd* and *Pgm1* loci, and have very different frequencies of alleles at the *Gpi*, *Idh1* and *Pep-vl* loci (Table 1). Co-occurrence of species of *Rhagada* is extremely rare (Solem 1997; Johnson *et al.* 2004). The two species on Barrow Island fit this general pattern, with complementary distributions on the island. The absence of local co-occurence means that we do not have direct evidence of intrinsic reproductive isolation. Nevertheless, the species were found within 0.8 km of each other, and the genetic differences were consistent throughout the distributions of both types.

The genetic distinctness of these two species on Barrow Island is unusual, because comparisons amongst all species of *Rhagada* on the Pilbara mainland did not reveal unique alleles in any of them. Although not unusually divergent for congeneric species, the Barrow Island species are genetically the most distinctive in this region. The phenogram illustrates the distinctness from the species of *Rhagada* on the Pilbara mainland and the Dampier Archipelago, as well as the high degree of similarity of populations within each of the species (Fig. 2).

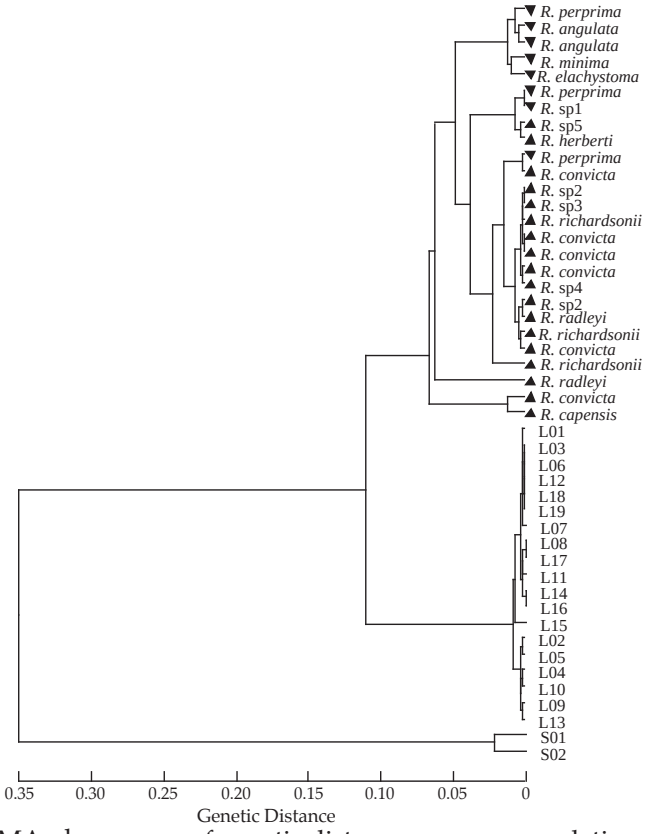

Figure 2. UPGMA phenogram of genetic distances among populations of the two species of *Rhagada* on Barrow Island and species on the Pilbara mainland (upright triangles) and Dampier Archipelago (inverted triangles). Site codes for Barrow Island as in Fig. 1 (small species = S01 to S02; large species = L01 to L19).

Table 1. Allelic frequencies at variable gene loci in samples of *Rhagada* species from Barrow Island. N = sample sizes for *Gpi*, *Idh1* and *Pgm1*; for other loci, sample sizes were four individuals. The nine invariant loci examined are not shown. * = Gorgon area

		Gpi			*Idh1*		*Ldh*		*Pep-vl*		*Pgd*		*Pgm1*			
Site	N	*152*	*100*	*52*	*100*	*91*	*111*	*100*	*100*	*95*	*100*	*67*	*144*	*111*	*100*	*78*
Large species																
L01	33	0.045	0.894	0.061	0.303	0.697	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L02	40	0.025	0.975	...	0.138	0.863	1.000	...	1.000	...	1.000	...	0.062	...	0.938	...
L03	40	...	1.000	...	0.262	0.738	1.000	...	1.000	...	1.000	...	0.025	...	0.975	...
L04	40	0.013	0.913	0.075	0.363	0.637	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L05	48	...	0.938	0.062	0.229	0.771	1.000	...	1.000	...	1.000	...	0.010	...	0.990	...
L06	40	...	1.000	...	0.389	0.611	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L07*	30	...	1.000	...	0.350	0.650	1.000	...	1.000	...	1.000	...	0.017	...	0.983	...
L08	40	...	0.988	0.013	0.112	0.887	1.000	...	1.000	...	1.000	...	0.025	...	0.975	...
L09	40	...	0.925	0.075	0.375	0.625	1.000	...	1.000	...	1.000	...	0.025	...	0.975	...
L10	36	...	0.972	0.028	0.278	0.722	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L11	40	...	0.925	0.075	0.262	0.738	1.000	...	1.000	...	1.000	...	0.062	...	0.938	...
L12	48	...	0.969	0.031	0.302	0.698	1.000	...	1.000	...	1.000	...	0.083	...	0.917	...
L13	40	...	0.950	0.050	0.325	0.675	1.000	...	1.000	...	1.000	...	0.062	...	0.938	...
L14	11	...	0.955	0.045	0.227	0.773	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L15	11	0.045	0.864	0.091	0.136	0.864	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L16*	10	...	0.950	0.050	0.150	0.850	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L17*	10	...	1.000	...	0.300	0.700	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L18	52	0.048	0.952	...	0.404	0.596	1.000	...	1.000	...	1.000	...	...	...	1.000	...
L19	10	...	0.950	0.050	0.200	0.800	1.000	...	1.000	...	1.000	...	...	...	1.000	...
Small species																
S20	4	0.500	0.500	...	...	1.000	...	1.000	0.500	0.500	...	1.000	...	1.000	...	...
S21	4	1.000	...	...	...	1.000	...	1.000	0.375	0.625	...	1.000	...	0.875	...	0.125

3.2 Spatial variation within the large species on Barrow Island

Because the small species of *Rhagada* is restricted to the northern end of Barrow Island, it is well away from the area of the Gorgon development. Further genetic analysis was conducted on the widespread, large species, to determine the amount and pattern of genetic divergence across the island, and how the Gorgon area fits into this pattern. Only three of the 15 allozyme loci had multiple alleles in the large species on Barrow Island. At two of these (*Gpi* and *Pgm1*), one allele predominated in all sites, with alternative alleles occurring at frequencies < 0.1 at many sites (Table 1). Only the *Idh1* locus was consistently polymorphic, with the less common $Idh1^{100}$ allele having frequencies of 0.112 to 0.404 among the 19 sites. Based on these three variable loci, the level of genetic subdivision across the island was small, with an overall F_{ST} of 0.023. For land snails, this is a low level of subdivision over the distances represented by these sites. The low level of genetic subdivision suggests that these populations do not have a long history of isolation. However, additional variable genetic markers would be necessary to have confidence in the actual level of subdivision. Nevertheless, although the subdivision was modest, it was statistically significant ($P < 0.01$) for each of the three loci. This indicates that populations are locally independent, as expected for land snails, with their limited capacity for dispersal. On the mainland, for example, demographically independent populations of *R. capensis* span less than 40 m (Johnson & Black 1991), well below the scale of resolution of the present study.

The multidimensional scaling of the pairwise values of F_{ST} showed no distinct groupings of populations (Fig. 3). There was also no pattern of isolation by distance across the island (Fig. 4). These analyses include the five small samples, as well as the 14 large samples. Removal of the small samples had no effect on the search for spatial pattern.

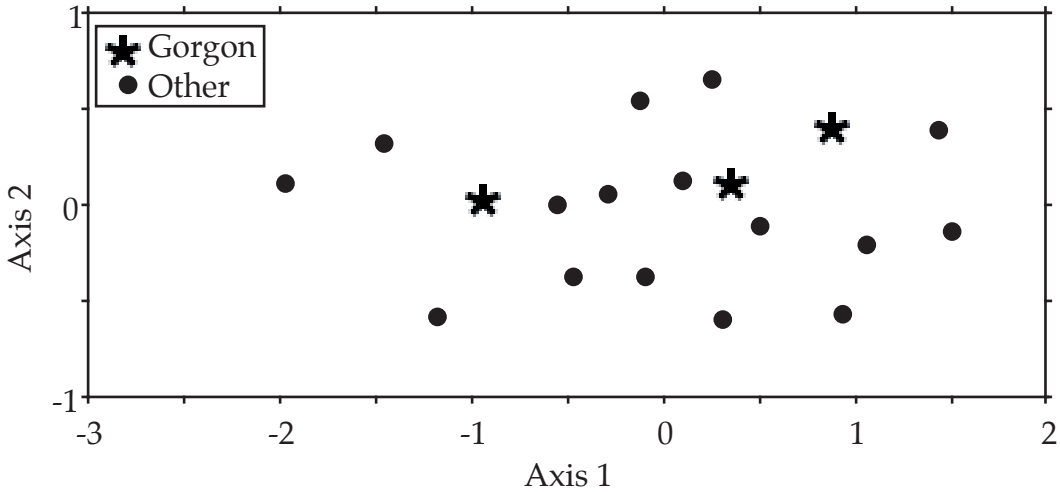

Figure 3. Multidimensional scaling of pairwise F_{ST} among 19 samples of the large species of *Rhagada* on Barrow Island. Sites from the Gorgon area indicated by asterisks.

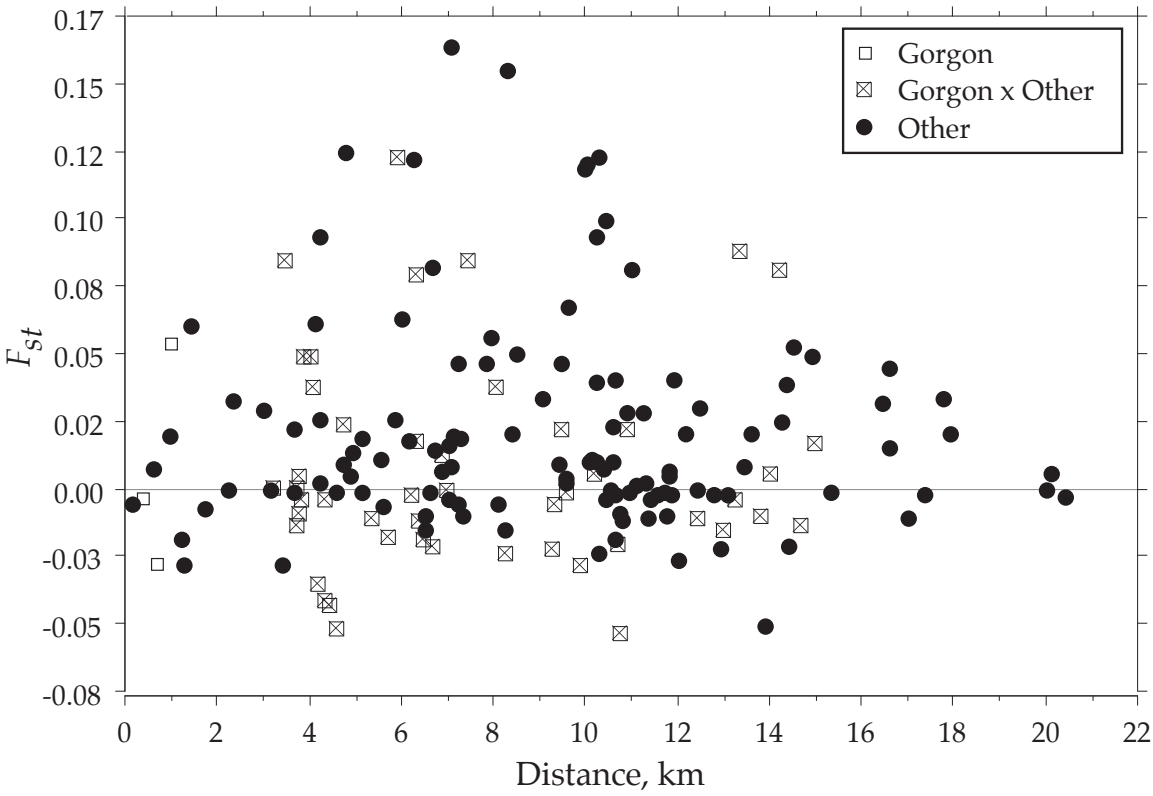

Figure 4. Plot of pairwise F_{ST} against geographic distance between populations of the large species of *Rhagada* on Barrow Island.

The differences between populations were due largely to the variation of allelic frequencies at the more variable *Idh1* locus, and these frequencies showed no obvious pattern across the island (Fig. 5).

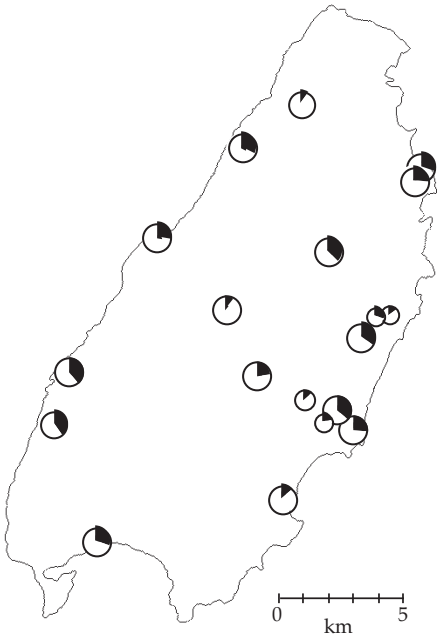

Figure 5. Frequencies of the $Idh1^{100}$ (shaded segments) and $Idh1^{91}$ (white segments) alleles. Small circles = small samples.

The Gorgon sites were well within the range of variation among the populations of the large species (Figs. 3 and 4). At the *Gpi* locus, the Gorgon site with a large sample was one of four sites with only the Gpi^{100} allele (Table 1). That Gorgon site was one of nine sites with the $Pgm1^{144}$ allele, which it had at a frequency of 0.017, compared with the average of 0.020 among all 19 sites. Allelic frequencies at the *Idh1* locus in the Gorgon sample were also unexceptional (Fig. 5, Table 1).

Taken together, the genetic patterns within the large species of *Rhagada* on Barrow Island give no indication of areas with genetically distinct populations. The frequencies of the common alleles at the *Idh1* locus show only modest variation across the island, and even the relatively uncommon alleles at the *Gpi* and *Pgm1* loci are widespread, not characterizing particular portions of the island. In the specific context of the area of the Gorgon development, there is no indication of genetically unusual populations of these snails.

4. Conclusions

These genetic comparisons confirm the occurrence of two morphologically and genetically distinct species of *Rhagada* on Barrow Island. These are the two most genetically divergent species of *Rhagada* so far examined in the Pilbara Region, highlighting the conservation significance of Barrow Island for these endemic snails. In contrast with the substantial genetic divergence between the two species, little genetic divergence was found among populations of the widespread, larger species. The small genetic differences were statistically significant, however, indicating that populations are locally independent, as is typical of land snails. Despite independence of local populations, the level of genetic subdivision of the large species on Barrow Island over distances of up to 20 km is exceptionally low for a land snail. The low level of subdivision, combined with the lack of clear spatial pattern, suggests that these populations do not have a history of major isolation of sets of populations within the island. Although additional genetic markers would be desirable, the present study gave no indication that the area of the proposed Gorgon development includes genetically unusual populations of these snails.

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Technical Appendix C5

Subterranean Fauna

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GORGON DEVELOPMENT ON BARROW ISLAND

TECHNICAL REPORT

SUBTERRANEAN FAUNA

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1 Introduction

ChevronTexaco Australia and its joint venturers propose to develop a gas processing facility at Town Point on Barrow Island and to construct a pipeline across the island from North White's Beach to the gas facility. Potential impacts to the underlying karst habitats and the rich diversity of subterranean fauna that it supports, require assessment under the *Environmental Protection Act 1986* (EP Act) and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Biota Environmental Sciences were engaged to collate existing literature on the subterranean fauna of Barrow Island and to instigate field studies to redress the lack of knowledge on diversity and distribution of the fauna.

This report describes the current understanding of the subterranean fauna of the proposed Development area and its likely conservation significance. It also documents progress on the genetic investigations and investigative sampling work conducted in the vicinity of the proposed Gorgon Development. Field studies and identifications are ongoing and the completed studies will be reported separately. Recent draft field reports are attached to this Technical Appendix to illustrate the status of the surveys..

1.1 Overview of Subterranean Fauna

Subterranean fauna has been known from Western Australia since the 1940s, with the blind gudgeon *Milyeringa veritas*, amongst other fauna, being documented from groundwater beneath the coastal plain at Cape Range (Humphreys 2001). However, little work was carried out in relation to subterranean communities until the early 1990s. The increase in knowledge and general profile of subterranean communities in Western Australia has been due largely to work conducted by the Western Australian Museum, which focussed initially on Cape Range (Humphreys 1993), and has also included substantial work on Barrow Island (see Section 1.2).

Two broad categories of fauna are generally considered to comprise true subterranean fauna:

- stygofauna — groundwater-dwelling, aquatic fauna (including stygobites; obligate groundwater dwellers)
- troglobites — obligate cave or karst-dwelling, terrestrial subterranean fauna occurring above the watertable.

A broad overview of typical ecological characteristics of subterranean fauna and their environment is provided in Table 1-1.

Table 1-1 - Characteristics of Subterranean Ecosystems and their Components (adapted from Gibert et al. 1994)

Environment	Constant darkness
	Physical inertia which increases with depth
	Predictability: hydrologic and chemical variation usually not very evident in interstitial environments
	Restricted variety of habitats: lack of vegetation, reduction of space
	Habitat heterogeneity results from arrangement of grains, void size, physical and chemical characteristics of aquifers within the pore space
Organisms	Obligate groundwater dwellers
	Morphological, physiological and behavioural specialisations to subterranean environment: • general lack of pigmentation • ocular regression • appendages long and numerous • highly developed chemical and mechanical receptors • convergence of vermiform body shape for different taxa
Biocenosis	Dominance of one species
	Richness, diversity and density low and variable
	A-type strategy of Greenslade (1983): • slower metabolic rates and growth, reduced motor output • lengthening of each stage of the lifecycle, late maturity, increase in longevity • less frequent reproduction, lower fecundity • unique behaviours such as stereotropism, thigmotropism and thigmotactism
Functional Characteristics	Heterotrophy and allotrophy
	Short, simple food webs with few trophic links
	Detritus feeders dominant
	System with low productivity
	Invertebrate diets not specialised, polyphagous

Groundwater food webs are typically almost entirely heterotrophic, with bioproduction primarily dependent on the transport of resources (biomass, detritus) from the surface (allotrophy; Gibert et al. 1994). There are few primary producers (chemolithotrophic bacteria; Danielopol et al. 1994). Groundwater microbes (i.e. bacteria, fungi and protozoans) are the primary consumers, with general short direct trophic links to most meiofauna in the system. It is worth noting that Barrow Island appears to potentially represent an exception to this rule (see Section 1.3; Humphreys in press).

The distribution of subterranean fauna species appears to be generally more restricted than that of surface fauna analogues. High levels of endemicity are also typically characteristic of subterranean taxa, often at high taxonomic levels. Endemic species tend to be concentrated in regions that support relatively diverse communities, rather than being distributed randomly (see review in Strayer 1994; also Humphreys 2000).

Stygofauna in Western Australia, and in particular Barrow Island and Cape Range, are regarded as geological relicts, descendants from ancient pre-Gondwanan lineages, with species characterised by restricted distributions and a low tolerance to disturbance. The stygofauna of Barrow Island represent relict lineages closely related to fauna of Gondwana, the Tethys Sea and epigean ancestors that occurred prior to the break-up of Pangaea (see review in Humphreys 2001).

1.2 Previous Work on Barrow Island

Work on Barrow Island's subterranean ecosystems has been carried out for a number of years by the Western Australian Museum. This has included seven sampling visits to the Island over the past decade and Humphreys (in press) has recently assembled a summary account of the findings of this work on stygofauna and troglofauna. This included documentation of the known subterranean fauna, its distribution and conservation status. Stable isotope analysis data were also presented indicating that some of the groundwater ecosystems on the Island may be chemoautotrophic — that is that their energy production is derived via bacterial systems from petroleum rather than surface inputs, as with most subterranean systems (Humphreys in press).

Other key studies that have been completed on the subterranean fauna of Barrow Island include:

- *Haptolana pholeta* sp. nov., the first subterranean flabelliferan isopoda crustacean (Cirolanidae) from Australia (Bruce and Humphreys 1993).
- *Speleostrophus nesiotes*, the first known troglobitic spiroboloid millipede, from Barrow Island, Western Australia (Hoffman 1994).
- Freshwater amphipods from Barrow Island, Western Australia (Bradbury and Williams 1996).
- Two new species of anchialine amphipods from Barrow Island, Western Australia (Bradbury and Williams 1996a).
- The hypogean fauna of Cape Range Peninsula and Barrow Island, north -Western Australia (Humphreys 2000).

1.3 Legislative Framework

In addition to the more general requirements of the *Environmental Protection Act 1986* (EP Act), there are two acts relevant to subterranean fauna.

1.3.1 Wildlife Conservation Act 1950

In Western Australia, all native fauna species are protected under the *Wildlife Conservation Act 1950* (Wildlife Conservation Act). The Act is administered by the Department of Conservation and Land Management (CALM). Fauna species that are considered rare, threatened with extinction or have high conservation value are specially protected under the Act. Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice* recognises four distinct schedules of taxa, with Schedule One taxa being those 'which are rare or likely to become extinct'. In addition to this statutory classification, CALM also classifies other fauna under four different Priority codes, recognising other species which are of poorly known conservation status or which could become threatened if conditions change.

1.3.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Under the EPBC Act, an 'action' consists of 'a project, development, undertaking, activity or series of activities'. Actions are required to be referred under the EPBC Act if they take place on Commonwealth land or are an action by the Commonwealth, or are likely to significantly impact a matter of National Environmental Significance (NES). There are currently seven NES factors identified in the Act. One of these, relating to threatened flora and fauna species and threatened ecological communities, is relevant to the conservation of subterranean biota. Certain threatened species, including some subterranean fauna, are formally listed under the EPBC Act and actions which impact on these require referral to the Federal Minister for the Environment to determine if the action will be a 'controlled action' for the purposes of the Act and be subject to Federal formal environmental assessment.

2 Approach and Methodology

2.1 General Approach

The approach to this study has consisted of:

- liaison and consultation with the Western Australian Museum (Drs. Bill Humphreys and Mark Harvey), CALM Woodvale (Dr. Stuart Halse, Adrian Pinder and Jane McRae), CALM Karratha (Dr. Peter Kendrick) and the University of WA School of Animal Sciences (Dr. Terrie Finston);
- a search of the specimen records database of the Western Australian Museum for stygofauna and troglobite records from Barrow Island
- background literature searches (via on-line databases, biological abstracts and other sources), sourcing and review
- Three phases of field survey and subterranean fauna sampling within the proposed development area, with additional reference sampling across the rest of the Island.

More detail on the methodology for specific components of the work completed to date is provided in the Sections 2.2 and 2.3. Phase three work that is still in progress is outlined in Section 2.4, Attachment 2 (November/December 2004 field survey) and Attachment 3 (February/March 2005 field survey).

2.2 Field Sampling Methodology

2.2.1 Stygofauna Sampling – Phase One (August 2002)

Stygofauna were sampled from 34 bores, drillholes and wells by means of modified plankton haul nets between 9/8/02 and 13/8/02. The nets were constructed from 200 μm mesh, with apertures of various sizes attached to a weighted catch jar. Each hole was dragged at least three times. If fauna were observed in the sample, further samples were taken. Once the net reached the bottom, it was agitated gently to bring the benthos and any fauna above the net before dragging the column. On the surface, the net was flushed thoroughly with water bailed from the same hole and the resultant sample placed in a labelled plastic bag within a shaded esky. A hygiene protocol was followed at the completion of each hole whereby nets and catch bottles were washed clean to avoid any sample contamination between boreholes.

Samples were not fixed prior to sorting as live stygofauna are more easily observed and recovered. Samples were sorted under a dissecting microscope (magnification up to 40 x). Stygofauna specimens were tracked and preserved in 100 per cent ethanol (suitable for both morphological and DNA analyses). A subsample of live amphipods collected was frozen in liquid nitrogen for use in ongoing genetic (allozyme) analysis work being conducted at the University of Western Australia (see Section 2.3).

Sampling for stygofauna was conducted at 18 boreholes closest to the proposed gas processing facility, most of which were located in the immediate vicinity of the Terminal Tank farm (see Table 2-1). Of these, four were substantially affected by hydrocarbons and could not be adequately sampled. A further 20 boreholes were sampled on other parts of Barrow Island to provide additional reference data and material for genetic and morphological analysis (see Section 2.3; Table 2-1).

Table 2-1 - Boreholes Sampled on Barrow Island During the August 2002 Survey (Coordinates in UTMs, AGD84 datum)

Borehole	Area	Easting	Northing	Comments
MW3	Terminal tanks area	-	-	
MW4	Terminal tanks area	-	-	Oil affected – not sampled
MW7	Terminal tanks area	340159.00	7701530.00	
MW7nr1	Terminal tanks area	340158.00	7701532.00	Trog fauna trap installed
MW8	Terminal tanks area	-	-	
MW9	Terminal tanks area	-	-	
MW13	Terminal tanks area	340228.00	7701084.00	
MW14	Terminal tanks area	-	-	
MW15	Terminal tanks area	-	-	Oil affected –sampled
MW16	Terminal tanks area	340001.00	7701183.00	
MW16nr1	Terminal tanks area	340068.00	7701219.00	Trog fauna trap installed
MW16nr2	Terminal tanks area	340246.00	7701370.00	Oily – trog trap installed
MW17	Terminal tanks area	340343.00	7701456.00	
MW18	Terminal tanks area	340421.00	7701304.00	
MW21	Terminal tanks area	-	-	Oil affected –sampled
MW22	Terminal tanks area	-	-	Oil affected – not sampled
Terminal tanks water bore	Terminal tanks area	-	-	Clean
Abandoned seismic hole	Terminal tanks area	-	-	Dry – trog trap installed
AMW10	Reference	334192.00	7691344.00	Airport monitoring well
AMW11	Reference	334188.00	7691340.00	Airport monitoring well
AMW15	Reference	334191.00	7691330.00	Airport monitoring well
AMW18	Reference	334206.00	7691339.00	Airport monitoring well

Borehole	Area	Easting	Northing	Comments
AMW19	Reference	334196.00	7691301.00	Airport monitoring well
AMW20	Reference	334206.00	7691327.00	Airport monitoring well
B14 South	Reference	328637.00	7692399.00	
C62	Reference	332790.00	7690453.00	
C62NR1	Reference	332797.00	7690466.00	
C65	Reference	331896.00	7689829.00	
F41A North	Reference	330400.00	7694380.00	
L18A	Reference	333183.00	7699032.00	
L32j	Reference	331038.00	7697999.00	
L4N1	Reference	332213.00	7698310.00	
J16j	Reference	331488.18	7697437.23	
L8	Reference	332663.63	7697030.81	> 30 m water column
Tip MW 1	Reference	328195.00	7699302.00	Very turbid
Tip MW 2	Reference	328195.00	7699302.00	Very turbid – not sampled
Washdown pond MW1	Reference	-	-	Very turbid
Washdown pond MW2	Reference	-	-	Very turbid

2.2.2 Stygofauna Sampling – Phase Two (November 2003)

The second phase of stygofauna sampling followed essentially the same methodology as earlier sampling work on the proposed development area. Stygofauna were sampled from bores, drillholes and wells by means of modified plankton haul nets between 25/11/03 and 28/11/03. The sampling, curation and data management procedures were completed as outlined for the August 2002 sampling phase (see Section 2.2.1).

Stygofauna were sampled from 19 bores during this second phase of sampling; seven in the Terminal Tanks area (north of the proposed gas processing facility site) and a further 12 boreholes on other parts of Barrow Island (Table 2-1). This was largely a targeted exercise, focussing on holes that previously yielded fauna. Boreholes that proved to be contaminated with hydrocarbons, blocked or excessively turbid during the phase one sampling (Section 2.2.1; Biota Environmental Sciences 2002) were not revisited as part of the November 2003 sampling.

Table 2-2 - Boreholes Sampled on Barrow Island During the November 2003 Survey (Coordinates in UTMs, AGD84 datum)

Borehole	Location	Easting	Northing	Comments
MW3	Terminal tanks area	340102	7701401	
MW7	Terminal tanks area	340159	7701530	
MW7nr1	Terminal tanks area	340158	7701532	Trog fauna trap installed
MW9	Terminal tanks area	-	-	
MW13	Terminal tanks area	340228	7701084	
MW14	Terminal tanks area	-	-	
MW16nr1	Terminal tanks area	340068	7701219	Troglofauna trap installed
MW16nr2	Terminal tanks area	340246	7701370	Troglofauna trap installed
MW17	Terminal tanks area	340343	7701456	
MW18	Terminal tanks area	340421	7701304	
AMW10	Remainder of Barrow I	334192.00	7691344.00	Airport monitoring well
AMW11	Remainder of Barrow I	334188.00	7691340.00	Airport monitoring well
AMW15	Remainder of Barrow I	334191.00	7691330.00	Airport monitoring well
AMW18	Remainder of Barrow I	334206.00	7691339.00	Airport monitoring well
AMW19	Remainder of Barrow I	334196.00	7691301.00	Airport monitoring well
C62	Remainder of Barrow I	332790.00	7690453.00	
C65j	Remainder of Barrow I	331896	7689829	
C77j	Remainder of Barrow I	-	-	
L32j	Remainder of Barrow I	331038	7697999	
L4N1	Remainder of Barrow I	332213	7698310	
L8	Remainder of Barrow I	332663	7697030	> 30 m water column
X62M	Remainder of Barrow I	-	-	

2.2.3 Stygofauna Sampling – Phase Three

Phase three represents the initiation of the Subterranean Fauna Sampling Programme designed in consultation with the EPA and CALM. Phase three sampling takes advantage of recently drilled geotechnical/subterranean fauna bores within the proposed Development area.

Stygofauna was sampled from a range of bores both within and outside the proposed Development area from 30 November 2004 to 3 December 2004 (Attachment 3) and 28 February 2005 and 4 March 2005 (Attachment 4). Additional sampling in April 2005 will be reported separately.

2.2.4 Troglobitic Fauna Sampling

There are no known caves located within the proposed development area or any other obvious surface expressions of substantial karst development. Foot traverses of the area were carried out by members of the Gorgon terrestrial study team and no significant formations were noted. As a result, troglobitic fauna sampling was limited to installation of litter traps in four abandoned drill holes within the proposed development area (Table 2-1). Traps were again installed in these locations during the second phase of sampling (Table 2-2). Troglobitic fauna sampling was also undertaken as part of the latter two sampling surveys. Results from the November/December 2004 survey and February/March 2005 survey can be found in Attachment 3 and Attachment 4, respectively.

Traps were constructed from 60 mm internal diameter PVC stormwater pipe cut to a length of 120 mm. Both ends were blocked with aviary mesh after the tubing was filled with wet leaf litter. Leaf litter material was gathered from the ground surface on the Island, particularly from the bases of *Melaleuca* and *Ficus* shrubs. The litter was soaked in water and irradiated in a microwave oven on the maximum power setting (to kill any invertebrates present and assist in break-down). Wet litter was added to the traps and kept in sealed containers until immediately prior to insertion into the boreholes. After the installation of each trap, the opening of each borehole was sealed to maintain humidity and to minimise the input of surface fauna into the traps.

2.3 Identifications and Genetic Analyses

Specimens were sorted live and, as far as possible, identified in an on-site laboratory prior to curation. In some cases it was possible to identify material to species level at this stage, but for most of the recovered fauna, this represented order or family level taxonomic resolution.

More detailed identification of the Phase One material was carried out by Jane McRae at CALM Woodvale, utilising existing taxonomic descriptions and keys published by various taxonomic authorities. Adrian Pinder of CALM Woodvale carried out further identification of worm taxa collected. With the exception of amphipods consumed in genetic investigations, the collected specimens have been lodged with the Western Australian Museum and are currently contributing to ongoing taxonomic work.

Frozen material, primarily amphipods, was also subject to electrophoretic analysis by Dr. Terrie Finston at the University of Western Australia, School of Animal Sciences. This work is also ongoing and has more recently been extended to include mitochondrial DNA analyses.

2.4 Limitations of this Report

Several limitations should be recognised in the interpretation of this report:

The installation of purpose-built bores for sampling subterranean fauna within the proposed gas processing facility was not completed during phases 1 or 2. Consequently, sampling reported in this document has been limited to the opportunistic use of existing boreholes, resulting in poor spatial coverage of the proposed gas processing facility. The closest bores to the proposed development were those in the vicinity of the Terminal Tanks, located approximately 500 m to the north of the proposed development. These

bores had only a few metres of penetration into the aquifer, and therefore limited saturated thickness present to sample. No sampling for stygofauna or troglobitic fauna has been possible in the proposed development area during phases 1 or 2. Sampling during November/December 2004 (Attachment 3) and February/March 2005 (Attachment 4) was undertaken within the proposed development area. The results of these two sampling surveys can be found in those respective attachments.

As most bores in the study area are cased for their entire length, troglobitic fauna sampling has been limited to a small number of relatively shallow, opportunistic sites.

As outlined in Section 2.3 the work completed to date represents work in progress in respect of species level consideration of fauna distribution.

3 Results

3.1 Stygofauna

3.1.1 Summary

Stygofauna were recovered from 13 of the 38 bores visited during the phase one sampling (34 per cent of sites; 345 specimens). Five of these locations were within the Terminal Tanks area to the north of the proposed gas facility site (see Figure 3-1). Stygofauna were recovered from ten of the 19 bores visited during the second field survey (53 per cent of sites). This relatively high rate was due to targeting of prospective sites (see Section 2.2.2). Two hundred and four specimens were collected, of which 25 were recorded from three bores in the Terminal Tanks area (MW13, MW17 and MW18).

A combined summary of the relative abundances of the various stygal taxa collected during both rounds of sampling for the proposed development is presented in Table 1-1. The collected specimens represented five classes, nine orders and 12 families, with a total of 23 taxa (including ten described species). Thirteen of these taxa were recorded from the Terminal Tanks area, the closest location sampled to the proposed gas processing facility. Nine of the 23 taxa were recorded from both this area and other parts of the Island (see Table 1-1).

Further sampling for stygofauna, including within the proposed development area, was undertaken in November/December 2004 and February/March 2005. The results of these surveys can be found in Attachment 3 and Attachment 4 for the 2004 and 2005 surveys, respectively.

Table 3-1 - Stygofauna Abundance Recorded from the Terminal Tanks Area and Other Reference Sites Sampled Across the Island (August 2002 and November 2003 data sets combined)

Taxon	Terminal	Reference	Total
Isopoda: Cirolanidae (*Haptolana pholeta)*	-	27	27
Isopoda: Oniscideae sp. nov. 1	1	-	1
Amphipoda: Melitidae (*Nedsia sculptilis/macrosculptilis*)	-	2	2
Amphipoda: Melitidae (*Nedsia* nr. *hulberti)*	-	1	1
Amphipoda: Melitidae (*Nedsia* spp.)	27	125	152
Amphipoda: Bogidiellidae (*Bogidella* sp.)	1	3	4
Copepoda: Cyclopoida (*Diacyclops* aff. *humphreysi)*	4	4	8
Copepoda: Cyclopoida (*Diacyclops* sp.)	2	-	2
Copepoda: Cyclopoida (*Halicyclops rochai)*	-	15	15
Copepoda: Cyclopoida (*Halicyclops* sp.)	1	2	3
Copepoda: Cyclopoida	-	28	28
Copepoda: Harpacticoida (*Sarsameira* sp.)	17	3	20
Copepoda: Harpacticoida (*Phyllopodopsyllus wellsi)*	1	-	1
Copepoda: Harpacticoida (*Phyllopodopsyllus* aff. *thiebaudi)*	1	3	4
Copepoda: Harpacticoida (*Phyllopodopsyllus* sp. 1)	1	-	1
Copepoda: Calinoida: sp. nov. 1	1	81	82
Decapoda: Atyidae (*Stygiocaris stylifera*)	-	148	148
Thermosbenacea (*Halosbaena tulki)*	13	48	61
Vertebrata: Perciformes (*Milyeringa veritas)*	-	2	2
Ostracoda: sp.	-	4	4
Nematoda: sp. 1	-	4	4
Oligochaeta: Phreadrilidae: sp. 1	2	4	6
Polychaeta: sp. 1	-	3	3
	72	507	579

Figure 3-1 - Borehole Sampling Locations on Barrow Island which Yielded Stygofauna

(Red = historical sampling, yellow = current study).

Copepods were the most abundant and taxonomically diverse component of the recorded fauna, accounting for 28 per cent of the 507 specimens collected and nine of the 22 taxa currently documented (41 per cent of the species richness) (see Table 1-1). The amphipods were the next most common and species-rich group, with 159 individuals (31 per cent) representing at least four species. The numerical and species level dominance of these two orders is a common feature of stygal communities (Biota Environmental Sciences unpublished data). The identification of amphipods belonging to the genus *Nedsia* was limited by the lack of mature and intact animals amongst the collected specimens. The aytid decapod *Stygiocaris stylifera* was the next most abundant group and species recorded during the sampling programme (148 individuals; Table 1-1).

With the exception of the polychaete worm collections, the second phase of sampling did not collect any new taxa beyond those of the first sampling phase for the proposed development (Biota Environmental Sciences 2003). The stygal polychaete collections are of considerable interest, however, being the first records of stygal polychaetes from

Barrow Island (Humphreys, W.F. 2003. Personal communication). The resolution of morphological identification and taxonomic work on this material is limited at present. This is being advanced as part of ongoing work (see Section 1). Additional taxa may be resolved from the collected material as part of this.

3.1.2 Annotated List

Phylum Nematoda

Four nematodes were collected during the survey but the specimens were extremely small and have curated poorly. They could not be located for more detailed examination. The animals were not recorded from the sample sites near the proposed gas processing facility and, given the state of stygal nematode taxonomy, it is unlikely that they could have been identified beyond the family level (Pinder, A. 2002. Personal communication).

Class Oligochaeta

Four oligochaete specimens were collected from well L8 (outside the proposed development area) during the phase one sampling, and two from the Terminal Tanks area during phase 2. These specimens belonged to the family Phreadrilidae and represent the first record of this family from Barrow Island (Pinder, A. 2002. Personal communication; Attachment 2). The specimens are therefore likely to represent an undescribed species, but the material collected was not mature enough to allow for a formal description.

Class Ostracoda

Four ostracods were collected during the survey, all from areas away from the site of the proposed gas facility (Table 3-1). These await examination by an ostracod specialist, but it is possible that they represent a previously unknown species, given that the recent review of the Island's fauna by Humphreys (in press) lists no ostracods for Barrow Island and the Western Australian Museum's records contain only two other ostracod records (see Attachment 1).

Order Copepoda

The copepods were the most diverse group amongst the stygofauna, with nine taxa representing three families (see Table 1-1). The presence of the calinoid copepods was significant in that there are no calinoid copepod species currently described for Barrow Island (McRae, J. 2002. Personal communication), although material has previously been collected by the Western Australian Museum (Attachment 1).

Most other species were either confirmed or tentatively identified as previously described species (Table 3-1). Three of the copepod taxa, *Diacyclops* sp., *Phyllopodopsyllus wellsi* and *Phyllopodopsyllus* sp. 1, were recorded from the Terminal Tanks area (Figure 3-2). *Phyllopodopsyllus wellsi* has been previously described and is known to occur on Cape Range (McRae, J. 2004. Personal communication). The other two taxa appear to represent currently undescribed species.

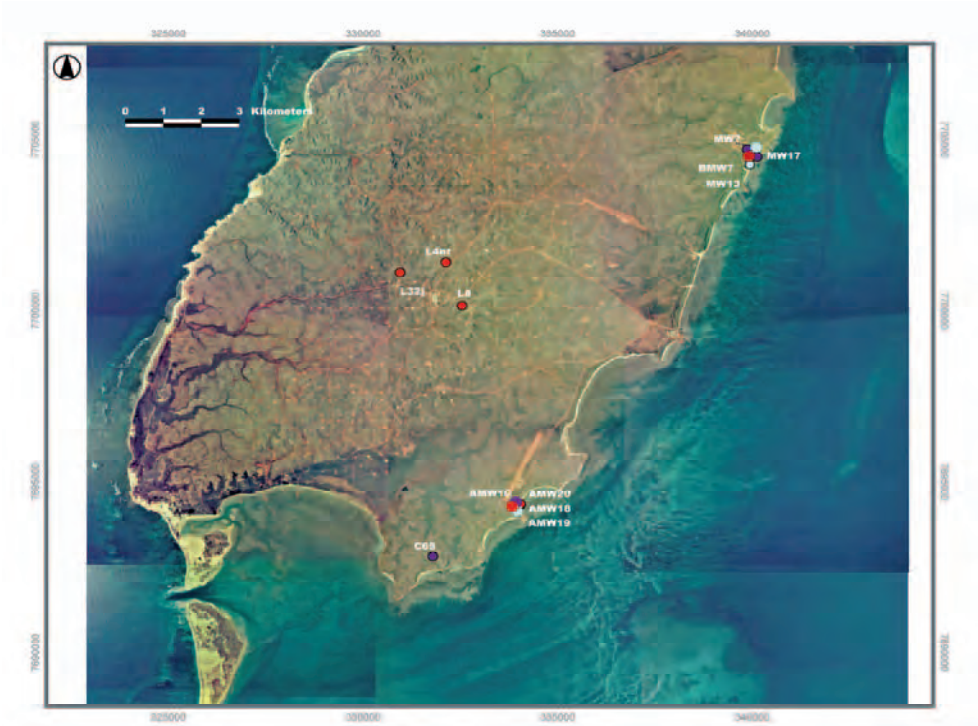

Figure 3-2 - Copepod Records
(Red = Calinoida, light blue = Harpacticoida, dark blue = Cyclopoida).

Order Thermosbaenacea

A single species of thermosbaenacean was collected during the survey, *Halosbaena tulki*, which has previously been documented as relatively widespread and common across the Island (Humphreys in press). The species was present in reasonable abundance within the Terminal Tanks area (near the proposed gas processing facility; n=13) and elsewhere on the Island (n=48) (Table 1-1).

Order Isopoda

Two families were represented amongst the isopods, the Cirolanidae and the Oniscideae (Table 3-1). The most commonly recorded species was the cirolanid *Haptolana pholeta* (27 records from four locations, all away from the proposed gas processing facility) (Plate 3-1; Figure 3-3). This species was described from Barrow Island in 1993 (Bruce and Humphreys 1993) and occurs at least four other sites on the Island (Humphreys in press; Appendix 1).

Plate 3-1 - Isopoda: *Haptolana pholeta*

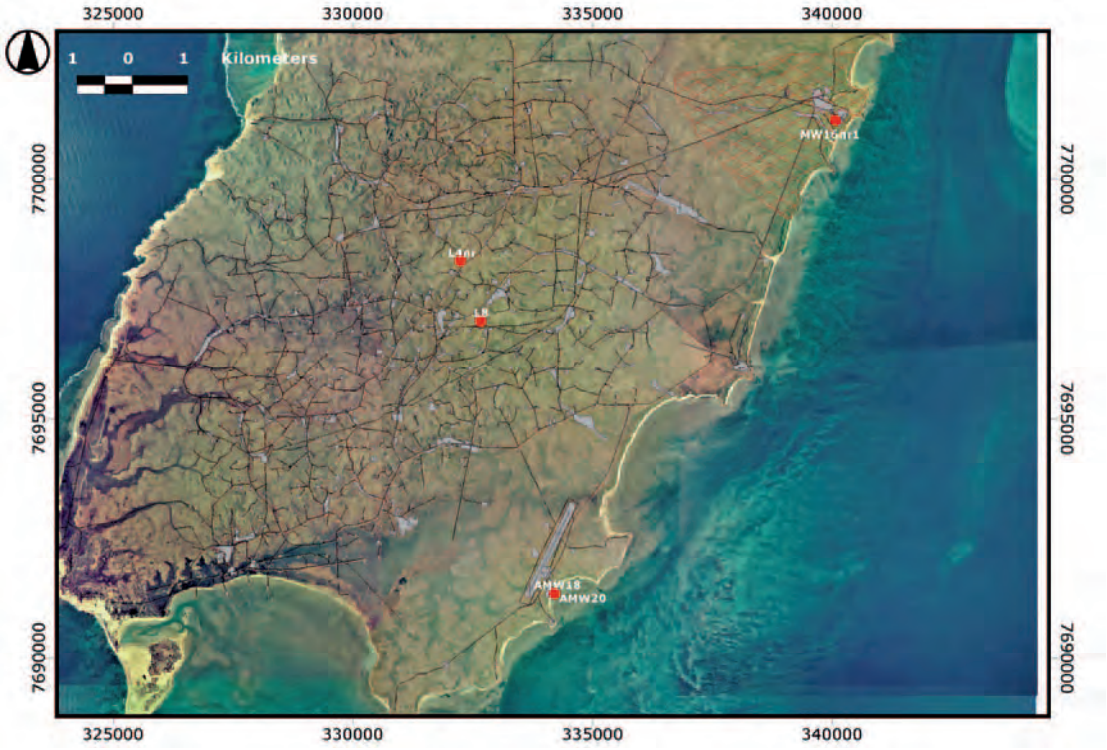

Figure 3-3 - Isopod records

The other family of isopods represented was the Oniscideae, with a single animal recorded from an old bore adjacent to Terminal Tanks monitoring well MW16 (MW16nr1) (Figure 3-3). This is a significant specimen as it is the first record of an aquatic oniscoid isopod from Barrow Island and probably represents a previously undescribed species (see Section 4).

Order Amphipoda

Two families were represented amongst the collected material (

Figure 3-4). The majority of the amphipods collected (156 of 160 individuals) were melitid amphipods of the genus *Nedsia* (Table 3-1). This is a difficult group to identify with confidence and this material needs to be dissected and slide-mounted to be identified. Two animals recorded from areas away from the gas processing facility have been identified as *Nedsia sculptilis/ macrosculptilis* (bores AMW18 and L4nr) and one as *Nedsia* nr. *hulberti* (bore L32j) (Bradbury and Williams 1993; Humphrey in press). Many of the remaining amphipod specimens were juvenile, damaged or incomplete, lacking many of the diagnostic characters required by Bradbury and Williams (1993) and Bradbury (2001). It may not be possible to take this material to species-level identification based on morphology but the material has been lodged with the Western Australian Museum and is currently being examined by John Bradbury of the University of Adelaide. Allozyme electrophoretic data have provided some insight into species level distributions in this genus (Section 3.1.3, and DNA analyses may provide further clarification on species distributions).

Plate 3-2 - Amphipoda: *Nedsia sculptilis*

(Photo: J. McRae, CALM)

Figure 3-4 – Amphipoda Records

(Pl blue = Melitidae, Dk blue = Bogidiellidae)

The remaining amphipods were all from areas other than the Terminal Tank farm (AMW18 at the airport and L8 near the base), and belong to the family Bogidiellidae. These four specimens are of considerable significance, as the only previously described member of this family from Barrow Island is *Bogidomma australis*. This monospecific genus was erected specifically as Bogidomma was the only stygal amphipod with eyes — a feature absent from the bogidiellids collected during the current study. It is most likely that these new specimens belong to the genus *Bogidiella* (McRae, J. 2002. Personal communication) and probably represent an undescribed species.

Order Decapoda

One decapod crustacean was collected during the current study, the atyid *Stygiocaris stylifera* (Plate 3-3). It was relatively abundant where present (n=148 from three locations, all outside the proposed development area). This species is known to be fairly widespread on the Island, having been recorded from 16 locations during previous Western Australian Museum surveys (Humphreys in press).

Plate 3-3 - Decapoda*: Stygiocaris stylifera*

Plate 3-4 - Vertebrata*: Milyeringa veritas*

Class Vertebrata

One stygal vertebrate was recorded during the study, the blind gudgeon *Milyeringa veritas* (Plate 3-4). This species is listed as Schedule One under the Wildlife Conservation Act and as Vulnerable under the EPBC Act. It is one of only two-known stygal vertebrate species in Australia, with Cape Range the only known locality outside Barrow Island (Humphreys 2001). Two individuals were collected (one during each sampling phase), both from bore L8 away from the proposed gas processing facility. The recovered specimens were preserved in liquid nitrogen to provide for any future electrophoretic work that may be undertaken.

3.1.3 Results of Genetics Investigations to Date

Genetic analyses of stygal specimens from Barrow Island have recently been advanced by Dr Terrie Finston of the School of Animal Sciences, University of Western Australia. Electrophoretic investigations completed to date have focussed on the amphipod fauna. This order is the most diverse and widespread stygal group on the Island, making it a key group for such study. Analysis to date has resulted in the identification of five genetic

groups approximately equating to species 'types' in terms of genetic difference (see Attachment 2).

Amphipods from Barrow Island were analysed for 20 allozyme loci following standard methods for protein electrophoresis (see Attachment 2). For comparative purposes, known specimens of amphipods from the families Bogidiellidae and Melitidae (genus *Nedsia*), were included in these analyses.

Of the seven bores from which material was analysed, five contained a single genetic type, while two of the bores (L32j and AMW18) contained two genetic types (Attachment 1). A cluster analysis using Nei's genetic distances among samples and the neighbour-joining clustering algorithm suggested the presence of five genetic types or 'species' level groups (Attachment 2). These were differentiated by the presence of two or more fixed differences among the 20 loci. Six of the groups showed affinities with the Melitids from other regions of the Pilbara. Two (MW14nr1 and MW17-4) represent unique types.

Table 3-2 - Species Level Group Results from Electrophoretic Analyses of Amphipoda to Date

Bore	Number of genetic types	Genetic type group ('species')	Comments
L32j	2	Group 2 Group 5	1 common type (n = 13), similar to Paraburdoo Melitids 1 rare type (n = 1), similar to Mt. Brockman Melitids
L8	1	Group 2	(n = 2) similar to Mt. Brockman Melitids
MW14nr1	1	Group 1	(n = 1) unique genetic type
MW7	1	Group 5	(n = 1) similar to Paraburdoo Melitids
AMW19	1	Group 5	(n = 1) similar to Paraburdoo Melitids
AMW18	2	Group 3	(n = 2) similar to Mt. Brockman Melitids (n = 3) similar to Paraburdoo Melitids but unable to score many loci
MW17	1	Group 4	(n = 1) unique genetic type

Two of the species level groups therefore appear to be relatively widespread on the Island (Table 3-2). Species Group Two is represented at both L32j and L8 (~2.5 km apart), whilst Group Five was recorded from both AMW19 (at the airport) and MW7 (~12 km away at the Terminal Tanks area). Three of the species groups suggested by the electrophoretic data are currently only known from single bore locations, two of which are not near the proposed gas processing facility (Table 3-2).

The findings available to date indicate several species level groups within the genus *Nedsia* on Barrow Island. This is broadly consistent with the morphological analysis of Bradbury and Williams (1996) and Bradbury (2002), in the sense that several, patchily-distributed species were recognised. However, specific paired comparisons between genetic and morhphological analyses have not yet been carried out. These results should therefore be interpreted with caution, as a limited number of loci could be scored for some individuals, and sample sizes were relatively low (Attachment 2). Ongoing work

may help resolve the situation, including the use of mitochondrial DNA markers to better address specific questions regarding species level distributions (see Section 4).

3.2 Troglobitic Fauna

As limited field sampling has been possible to date (see Section 2.2), an initial assessment was completed based on the habitat of the area and known records from previous work on the Island (Biota Environmental Sciences 2002; Section 3.2.1). The results of surveys carried out in November/December 2004 and February/March 2005 can be found in Attachment 3 and Attachment 4, respectively.

3.2.1 Desktop Review

The Western Australian Museum's database includes 324 records of terrestrial invertebrate taxa collected from caves or other subterranean environments on Barrow Island. The distribution of these records on the Island is shown in Figure 3-4. A detailed listing of these records is provided in Attachment 1.

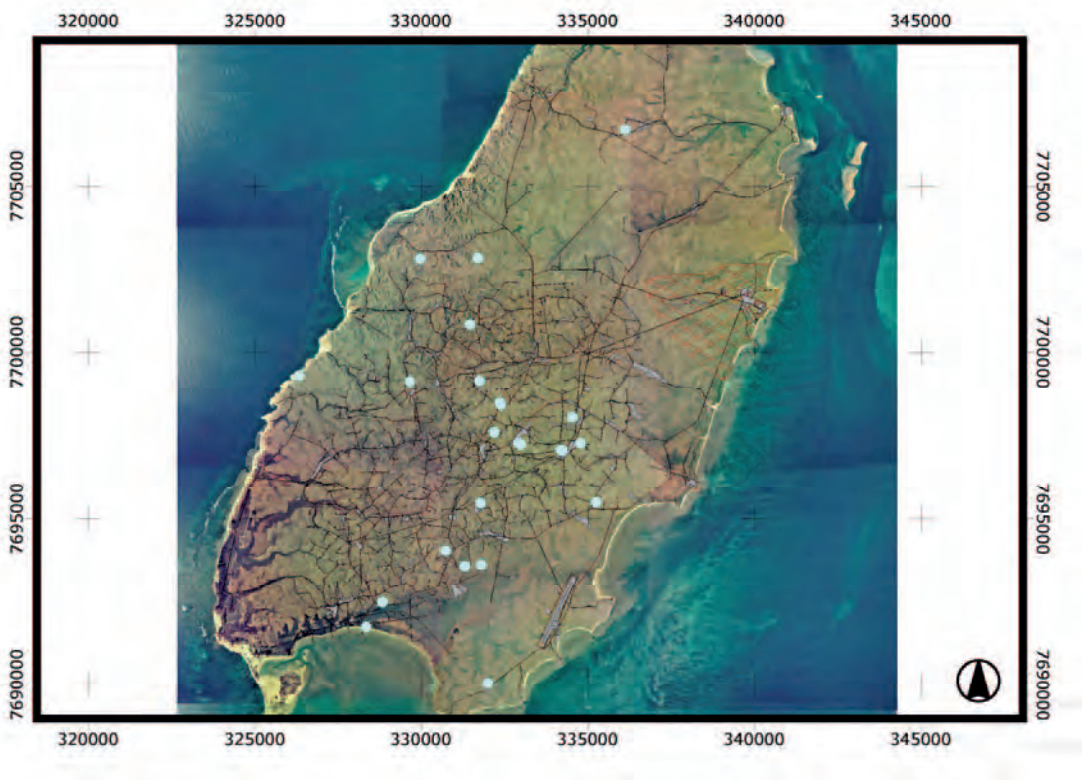

Figure 3-5 - Troglobitic Fauna Records from Barrow Island (Source: Western Australian Museum)

The majority of the known troglofauna records are associated with caves, although some are from fauna recorded during borehole sampling (see Appendix 1). There are no previous records of troglobitic fauna from the proposed development area. This is probably a function of sampling access availability to the karst underlying the site as well as the apparent lack of caves with suitable microclimates. There is considerable evidence of subsurface cavities on the Island that do not open to the surface (Humphreys in press), but current seismic and geotechnical data do not indicate any significant voids at the proposed development area. It is likely that the limestone strata below the proposed

development area provide suitable habitat for troglobitic fauna, but this is likely to be limited by the extent of caverns and fracturing.

It is expected that most of the area traversed by the proposed feed gas pipeline is similar in nature in this respect, with the exception of the area on the western side of the Island approaching the Flacourt Bay option. In this locality the karstic development becomes more massive and developed with the formation of gorges and incised drainages reminiscent of the geomorphological features of Cape Range (Biota Environmental Sciences 2002).

A proportion of this fauna contains terrestrial invertebrate taxa that are not strongly troglobitic and are probably accidentals or troglophiles rather than a true component of the troglofauna. This includes ants (Hymenoptera: Formicidae), several beetle taxa (Coleoptera), springtails *(Collembola),* and ticks (Acarina: Ixodidae) (see Attachment 2).

Humphreys (in press), provides an account of the true troglobitic species currently described from Barrow Island and this is summarised in Table 3-3.

Table 3-3 - Troglobitic Fauna Species Known from Barrow Island

Species	Records	Conservation Status
Draculoides bramstokeri (Schizomida: Hubbardiidae)	7	Schedule 1 (Wildlife Conservation Act)
Speleostrophus nesiotes (Diplopoda: Trigoniulinae)	1	Schedule 1; (Wildlife Conservation Act)
Nocticola sp. nov. (Blattodea: Nocticolidae)	1	Undescribed species
Isopoda: Oniscidea: sp. indet.	5	Undescribed species
Arachnida: Scorpiones: sp. nov. (family uncertain)	1	Undescribed genus

The majority of these troglofauna records have come from cave 6B1 (Ledge Cave), which is a highly significant site for this fauna. It is situated in the south-west of the Island, well removed from the proposed gas processing facility. Of the troglobitic species documented from the Island, the schizomid *Draculoides bramstokeri* is known to be widespread, having been recorded from several sites on Barrow Island and also occurring across Cape Range (Biota Environmental Sciences 2002; Humphreys in press).

Other potentially troglobitic species have also been collected from Barrow Island (see Attachment 1) but the taxonomy of some of these groups has not been advanced. One potentially troglobitic species stands out in particular: the blind snake *Ramphotyphlops longissimus*. This species is known from only a single specimen recovered during removal of a well casing on the Island (Aplin 1988; Humphreys in press). The species is depigmented, has very reduced eyes and an extremely vermiform morphology. It is possibly troglobitic, which would make *R. longissimus* the only known reptile troglobite in the world (Humphreys in press).

3.2.2 Sampling Results

Litter traps recovered during Phase one and Phase two of the sampling program have collected largely epigean and edaphobitic (deep soil) fauna. This has included isopods (slaters), ants (epigean taxa) and collembolans (springtails). The only troglobitic species

recorded during sampling for the proposed development to date is a single schizomid from MW16nr in the Terminal Tanks area. Liaison with Dr Mark Harvey of the Western Australian Museum determined that the specimen was a *Draculoides* and probably *D. bramstokeri* (Schedule 1). This species has been recorded from several other locations on Barrow Island and on Cape Range (Biota Environmental Services 2003). Unfortunately, the traps installed during November 2003 could not be recovered due to sediment burial arising from run-off during a cyclonic event during early 2004.

Preliminary data from Phase three sampling is included in Attachments 3 and 4.

4 Summary

4.1 Conservation Significance

Barrow Island is well recognised as being of high conservation significance for subterranean fauna communities at the state, national and international levels of consideration. The subterranean fauna of the Island demonstrates a high level of endemicity and species diversity, with over twenty species known only from Barrow Island. The fauna of the Island includes one of only two stygal vertebrate species occurring in Australia and, potentially, the only troglobitic reptile known globally. There is also evidence to suggest that the subterranean ecosystems of Barrow Island may be at least locally driven by chemautotrophic energy sources, rather than traditional allotrophic (surface energy) inputs.

Twelve of the species known from the Island are listed as Schedule fauna under the Wildlife Conservation Act and one is listed as 'vulnerable' under the EPBC Act. This tally includes three Schedule One species recorded during the current study, *Milyeringa veritas, Nedsia hulbertii* and *N. macrosculptilis,* none of which were recorded from the proposed development area (see Section 3.1). Five other *Nedsia* species are also Schedule listed and it is possible that some of these are represented amongst the specimens collected from the Terminal Tanks area. This includes *Nedsia hulbertii* which has previously been recorded from the area by the Western Australian Museum (MW17; Humphreys in press).

In addition to the currently described and Schedule listed fauna, a significant component of the Island's troglofauna and stygofauna comprises poorly sampled or undescribed taxa. This is illustrated by the results of the current survey which yielded several specimens that are either currently undescribed or are entirely new records for the Island (see Section 3.1). Of these taxa, four were recorded outside and four within the proposed development area. Of the undescribed taxa within the area of investigation, two are copepods and may correspond to material contained within the 'Copepoda: indet.' group listed in Humphreys (in press). The oniscid Isopod specimen appears to be the first representative of this family known from the Island and was recovered from MW16nr1. Further work is being undertaken on this material. The status and conservation significance of these undescribed taxa is unknown, but it is likely that they are endemic to Barrow Island, given the biogeographic patterns generally evident amongst the described fauna (Humphreys, 2000). It is worth noting that these specimens are not only new species, but representatives of new genera and family level records for the Island in some instances, highlighting the levels of biodiversity involved.

All of Barrow Island has high conservation value. On the basis of the available information , the specific conservation values represented in the vicinity of the proposed

development area would be ascribed high conservation value in a regional context because it:

- has records of Schedule One fauna (the stygobite *Nedsia hulbertii* and the troglobite *Draculoides bramstokeri*)
- is the only known location for *Nedsia chevronia* (well MW15; Bradbury, 2002)
- has records of undescribed stygofauna taxa not known from elsewhere on the Island.

4.1.1 Ongoing Work

Investigations into troglobitic and stygobitic subterranean fauna of Barrow Island are ongoing. Additional sampling in Phase three of the study will provide quantitative data with which to better assess the significance of the subterranean assemblages in the potential impact areas of Barrow Island.

Additional sampling is in progress in the proposed development area to address the key limitations that exist with respect to the sampling completed to date and the resulting data. The results of the first two of these surveys (November/December 2004 and February/March 2005) can be found in Attachment 3 and Attachment 4. The data from these surveys will be presented separately when identifications are complete.

4.1.2 Lack of Data on Subterranean Fauna in the Proposed Development Area

Project definition and other investigations (including geotechnical, hydrology and hydrogeology studies), have now allowed for the more accurate delineation of the actual impact on the proposed development area. This impact area is, however, outside the sampling work completed during either the first or second phases of sampling that is reported here. The lack of data within 'impact' sites is being redressed in Phase three sampling. A subterranean fauna sampling program has been developed and agreed with environmental agencies. The program is tied-in with the geotechnical investigation of the karst structure of the proposed development area, that was completed in August-September 2004.

The preliminary results are included in Attachments 3 and 4. Further data will be provided by the April 2005 sampling and reported subsequently. All of the data collected to date will be reviewed once the agreed sampling plan has been completed.

4.1.3 Limitations on Existing Electrophoretic Data

Dr Terrie Finston at the University of Western Australia is currently continuing her analysis of material collected from Barrow Island. This will include additional electrophoresis, and has expanded to analysis of DNA markers. It is hoped that this work, particularly the latter technique (which allows for increased samples sizes), will clarify the situation with respect to species level relationships amongst amphipod populations on Barrow Island, and between populations on the Island and the mainland. These relationships are important in assessing the conservation significance of the Barrow Island subterranean taxa and the potential impacts of the proposed development.

4.1.4 Level of Morphological Identification and Taxonomic Resolution

Whilst genetic analysis is a valuable and powerful tool, there is also a requirement to advance alpha (morphology-based) taxonomy in relation to this fauna. A proportion of the material collected to date could be identified to species level, but some groups

(particularly the Amphipoda) are more problematic. Additional efforts are ongoing to engage specialist taxonomists to resolve morphology-based identifications as far as possible. This may be limited in some cases by the nature of the material, in respect of size, intactness and maturity. Lodgement of the collected fauna with the Western Australian Museum is the first step in this process and has been completed. Ongoing collections will significantly increase the representation of Barrow Island subterranean fauna in the Western Australian Museum collection.

Preliminary contact has been made with key taxonomists in some groups who have agreed to examine the material collected for the proposed development (specifically Mr John Bradbury of the University of Adelaide (Amphipoda) and Dr Mark Harvey of the Western Australian Museum (Schizomida and other troglobitic taxa). This work will pursue the identification of collected specimens against existing keys where possible, and the advancement of new taxonomic descriptions for previously undocumented taxa (notably the polychaete worms and the oniscid isopods previously uncollected from Barrow Island).

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6 Glossary

Allotrophy	External inputs of organic matter to the ecosystem.
Allozyme	Alternative forms of the same protein coded for by different genes at the same locus.
Aytid	Decapod crustacean belonging to the family Aytidae.
Chemautotrophs	Organisms deriving nourishment from chemical reactions and inorganic substances.
Chemolithotroph	An organism which obtains its energy from the oxidation of inorganic compounds.
Detritus	The mixture of organic and inorganic material on surfaces that forms the food of some animals.
DNA	Deoxyribonucleic Acid – the fundamental genetic material of all cells.
Electrophoresis	A lab technique for separating proteins based on their different mobility through an electric field.
Epigean habitat	Terrestrial, dwelling in habitats on the ground surface.
Heterogeneity	The provision of a variety of habitats through increased habitat complexity; provides for a greater number of niches.
Heterotrophy	the process where existing organic molecules are used by an organism for its energy needs. All organic constituents in the organism are derived from preformed organic molecules.
Locus	The place at which a particular gene resides on the DNA or genetic map.
Meiofauna	Fauna that will pass through a 500 μm sieve but not a 40 μm sieve.
Melitid	Amphipod crustacean belonging to the family Melitidae
Oniscid	Isopod crustacean belonging to the family Oniscideae
Protozoan	Single celled organisms in the Kingdom Protista.
Stereotropism	See Thigmotropism.
Stygobites	Obligate groundwater-dwelling fauna.
Stygofauna	A general term to describe groundwater-dwelling fauna.
Thigmotactism	The tendency of many small organisms to seek maximum surface area contact.
Thigmotropism	Directional growth in response to the stimulus of direct contact.
Vermiform	Worm-type body organisation.

Attachment 1 - Western Australian Museum Stygofauna and Troglofauna Records from Barrow Island

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-1	-20.79806	115.33139	Arachnida	Araneae	Ctenidae (JW)		
B-1	-20.79806	115.33139	Arachnida	Acarina	Ixodidae	*Amblyomma*	*triguttatum*
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Arachnida	Acarina			
B-1	-20.79806	115.33139	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*hurlberti* Bradbury & Williams, HOLOTYPE
B-1	-20.79806	115.33139	Malacostraca	Amphipoda	Hadziidae	*Liagoceradocus subthalassicus Bradbury & Williams*	
B-1	-20.79806	115.33139	Arachnida	Araneae	Oecobiidae	*Oecobius*	sp.
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Ctenidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Arachnida	Araneae	Stiphidiidae	*Janusia*	
B-1	-20.79806	115.33139	Arachnida	Araneae	Gnaphosidae		
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria			
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Insecta	Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139		Blattaria	Nocticolidae	*Nocticola*	sp.
B-1	-20.79806	115.33139	Maxillopoda: Copepoda	Calanoida			
B-1	-20.79806	115.33139	Maxillopoda: Copepoda	Calanoida			

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-1	-20.79806	115.33139	Insecta	Coleoptera	Carabidae		
B-1	-20.79806	115.33139	Insecta	Collembola			
B-1	-20.79806	115.33139	Insecta	Collembola			
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Diptera			
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera	Reduviidae: Emesinae	*Ploiaria*	sp.1
B-1	-20.79806	115.33139	Insecta	Hemiptera			
B-1	-20.79806	115.33139	Insecta	Hemiptera	Cixiidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139	Insecta	Hymenoptera	Formicidae		
B-1	-20.79806	115.33139		Hymenoptera	Formicidae		
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda	Philosciidae	*Laevophiloscia yalgoonensis Wahrberg 1922*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda			
B-1	-20.79806	115.33139		Isopoda: Oniscidea	Philosciidae	*?Laevophiloscia Wahrberg, 1922 sp. nov.*	
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Malacostraca	Isopoda: Oniscidea			
B-1	-20.79806	115.33139	Insecta	Psocoptera			
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-1	-20.79806	115.33139	Arachnida	Scorpionida	Ischnuridae	*Liocheles*	sp.
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Diplopoda	Spirobolida	Pachybolidae :Trigoniulinae	*Speleostrophus nesiotes Hoffman 1994*	
B-1	-20.79806	115.33139	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-1	-20.79806	115.33139			Japygidae		
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae	*Icona*	sp.
B-2	-20.71667	115.38333	Arachnida	Acarina			
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae		
B-2	-20.71667	115.38333	Arachnida	Araneae			
B-2	-20.71667	115.38333	Arachnida	Araneae	Pholcidae		
B-2	-20.71667	115.38333	Arachnida	Araneae	Theridiidae		
B-2	-20.71667	115.38333	Insecta	Coleoptera			
B-2	-20.71667	115.38333	Insecta	Collembola			
B-2	-20.71667	115.38333	Insecta	Hemiptera	Cixiidae?		
B-2	-20.71667	115.38333	Insecta	Hymenoptera	Formicidae		
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-2	-20.71667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-2	-20.71667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-2	-20.71667	115.38333	Insecta	Lepidoptera			
B-2	-20.71667	115.38333	Insecta	Psocoptera			
B-2	-20.71667	115.38333	Insecta	Psocoptera			
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-3	-20.80000	115.36331	Arachnida	Acarina			
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae	*Omorgus*	*dilaticollis* (Macleay)
B-3	-20.80000	115.36331	Insecta	Coleoptera	Dermestidae	*Dermestes*	*frischi* Kugelann
B-3	-20.80000	115.36331	Insecta	Collembola			
B-3	-20.80000	115.36331	Insecta	Collembola			

Cave or well	**Dec Lat**	**Dec Long**	**Class**	**Order**	**Family**	**Genus**	Species
B-3	-20.80000	115.36331	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-3	-20.80000	115.36331	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Arachnida	Acarina	Ixodidae	*Amblyomma*	sp.
B-3	-20.80000	115.36331	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp
B-3	-20.80000	115.36331	Arachnida	Araneae	Pholcidae		
B-3	-20.80000	115.36331	Arachnida	Araneae	Ctenidae		
B-3	-20.80000	115.36331	Arachnida	Araneae	Pholcidae	*Trichocyclus*	
B-3	-20.80000	115.36331	Insecta	Coleoptera	Trogidae		
B-3	-20.80000	115.36331	Insecta	Collembola			
B-3	-20.80000	115.36331	Insecta	Diptera			
B-3	-20.80000	115.36331	Insecta	Hemiptera			
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Insecta	Hymenoptera	Formicidae		
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Armadillidae: Buddelundiinae	*Barrowdillo pseudopyrgoniscus Dalens*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda	Philosciidae		*Laevophiloscia yalgoonensis* Wahrberg 1922
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea	Philosciidae		
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea	"Porcellenid"		
B-3	-20.80000	115.36331	Malacostraca	Isopoda: Oniscidea			
B-3	-20.80000	115.36331		Pscocidae			
B-3	-20.80000	115.36331	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-3	-20.80000	115.36331	Diplopoda				epigean species

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-3	-20.80000	115.36331		Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	sp.
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Insecta	Coleoptera	Tenebrionidae	*Brises*	sp.
B-4	-20.76667	115.38333	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-4	-20.76667	115.38333	Arachnida	Araneae	? Gnaphosidae (JW)		
B-4	-20.76667	115.38333	Arachnida	Araneae	? Cyclotenidae (JW)		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda (JW)*	
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Pholcidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Cyclotenidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Gnaphosidae		
B-4	-20.76667	115.38333	Arachnida	Araneae	Heteropodidae	*Heteropoda*	
B-4	-20.76667	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-4	-20.76667	115.38333	Malacostraca	Isopoda: Oniscidea			
B-4	-20.76667	115.38333	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-4	-20.76667	115.38333	Insecta	Psocoptera			
B-4	-20.76667	115.38333	Diplopoda				epigean species
B-5	-20.76667	115.36667	Arachnida	Acarina	Ixodidae	*Amblyomma*	*limbatum* Neumann
B-5	-20.76667	115.36667	Arachnida	Araneae	Pholcidae		
B-5	-20.71667	115.38333	Arachnida	Araneae	Pholcidae		
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Arachnida	Pseudoscorpionida	Atemnidae	*Oratemnus*	sp. nov.
B-5	-20.76667	115.36667	Arachnida	Araneae	Heteropodidae (JW)	*Heteropoda*	
B-5	-20.76667	115.36667	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-5	-20.76667	115.36667	Malacostraca	Isopoda: Oniscidea		*Buddelundia*	
B-5	-20.76667	115.36667	Malacostraca	Isopoda: Oniscidea	Pholoscidae		

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-5	-20.76667	115.36667	Arachnida	Pseudoscorpionida	Atemnidae	*Oratemnus*	sp. nov.
B-5	-20.76667	115.36667	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Arachnida	Acarina			
B-6	-20.83333	115.38333	Arachnida	Acarina			
B-6	-20.85000	115.38333	Arachnida	Araneae	Araneidae	*Argiope*	*protensa*
B-6	-20.83333	115.38333	Arachnida	Araneae	Oonopidae	*?Opopaea*	sp.
B-6	-20.83333	115.38333	Arachnida	Araneae	Theridiidae	*Euryopis*	sp.
B-6	-20.85000	115.38333	Arachnida	Araneae			
B-6	-20.85000	115.38333	Arachnida	Araneae	Desidae	*Badumna*	
B-6	-20.83333	115.38333	Arachnida	Araneae	Oonopidae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Gnaphosidae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Zoridae		
B-6	-20.83333	115.38333	Arachnida	Araneae	Amaurobidae		
B-6	-20.85000	115.38333	Arachnida	Araneae	Pholcidae		
B-6	-20.83333	115.38333	Insecta	Blattodea			
B-6	-20.83333	115.38333	Insecta	Blattodea			
B-6	-20.83333	115.38333	Insecta	Coleoptera	Carabidae: Pterostichini	*Prosopogmus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Entiminae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Cryptorhynchinae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Ectychini	*Ectyche*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Crypticini	*Microcrypticus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Opatrini	*Mesomorphus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Carabidae: Pterostichini	*Prosopogmus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae: Entiminae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Ectychini	*Ectyche*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Tenebrionidae: Opatrini	*Mesomorphus*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Curculionidae:		

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
					Crytptorhynchinae		
B-6	-20.83333	115.38333	Insecta	Coleoptera	Lathridiidae: Lathridiinae	*genus?*	
B-6	-20.83333	115.38333	Insecta	Coleoptera	Ptiliidae		
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.83333	115.38333	Insecta	Collembola			
B-6	-20.85000	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Insecta	Diptera			
B-6	-20.83333	115.38333	Mollusca	Gastropoda			
B-6	-20.83333	115.38333	Mollusca	Gastropoda			
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae	*Centrogonus*	sp. 1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera	Reduviidae: Reduviinae	*Centrogonus*	sp.1
B-6	-20.85000	115.38333	Insecta	Hemiptera			
B-6	-20.85000	115.38333	Insecta	Hemiptera			
B-6	-20.83333	115.38333	Insecta	Hemiptera			
B-6	-20.83333	115.38333	Insecta	Hemiptera			
B-6	-20.85000	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.83333	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.83333	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.85000	115.38333	Insecta	Hymenoptera	Formicidae		
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.83333	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Malacostraca	Isopoda: Oniscidea			
B-6	-20.85000	115.38333	Insecta	Isoptera			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B-6	-20.83333	115.38333	Insecta	Orthoptera			
B-6	-20.85000	115.38333	Insecta	Orthoptera			
B-6	-20.83333	115.38333	Diplopoda	Polyxenida	Polyxenidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Olpiidae	*Xenolpium*	sp.
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Cheiridiidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Olpiidae		
B-6	-20.83333	115.38333	Arachnida	Pseudoscorpionida	Cheiridiidae		
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.83333	115.38333	Insecta	Psocoptera			
B-6	-20.85000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Acrotelsella*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Acrotelsella*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae	*Heterolepisma*	sp.
B-6	-20.83333	115.38333	Insecta	Thysanura	Lepismatidae		
B-6	-20.83333	115.38333	Insecta				
B-6	-20.85000	115.38333	Gastropoda				
B-8	-20.83333	115.41667	Insecta	Hemiptera	Reduviidae: Emesinae	*Stenolemus*	*giraffa* Wygodzinsky
B-10	-20.80000	115.38333	Insecta	Coleoptera	Pselaphidae		
B-10	-20.80000	115.38333	Insecta	Diptera			
B-10	-20.80000	115.38333	Insecta	Hemiptera			
B-10	-20.80000	115.38333	Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
B-10	-20.80000	115.38333	Insecta	Psocoptera			
B-10	-20.80000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-10	-20.80000	115.38333	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B-18	-20.85000	115.31667	Ostracoda	Ostracoda	Candonidae: Paracypridinae	*Phlyctenophora mesembria Wouters*	
B-18	-20.85000	115.31667	Copepoda				
B -1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B -1	-20.79806	115.33139	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
Q5	-20.78472	115.38083		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
"F Cave"			Arachnida	Araneae	Pholcidae	*Trichocyclus*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*fragilis* Bradbury & Williams, HOLOTYPE
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Maxillopoda: Copepoda	Calanoida			
B2	-20.86667	115.35000	Insecta	Coleoptera	Curculionidae: Cryptorhynchinae		
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86667	115.35000	Insecta	Hymenoptera	Formicidae		
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2			Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
B2	-20.86667	115.35000	Malacostraca	Isopoda: Oniscidea	Armadillidae		
B2	-20.86667	115.35000	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B2	-20.86000	115.35472	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B2	-20.86667	115.35000	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae,	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Malacostraca	Syncarida Bathynellacea	Parabathynellidae,	*Atopobathynella*	sp. nov.
B2	-20.86667	115.35000	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
B2	-20.86000	115.35472		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
B2	-20.86000	115.35472	Maxillopoda: Copepoda	Calanoida			
B2	-20.86000	115.35472		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
B2	-20.86000	115.35472	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
B7			Malacostraca: Pancarida	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
C38	-20.86917	115.40111		Araneae	Pholcidae		
C38	-20.86917	115.40111		Collembola			
C65	-20.88222	115.38500	Arachnida	Acarina			
C65	-20.88222	115.38500	Arachnida	Araneae			
C65	-20.88222	115.38500	Maxillopoda: Copepoda	Calanoida			
C65	-20.88222	115.38500		Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
C65	-20.88222	115.38500	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C65	-20.88222	115.38500		Isopoda: Oniscidea			
C65	-20.88222	115.38500		Collembola			
C65	-20.88222	115.38500		Araneae			
C65N	-20.87833	115.39250	Ostracoda				
C66	-20.87917	115.39167	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*macrosculptilis* Bradbury & Williams, HOLOTYPE
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Maxillopoda: Copepoda	Calanoida			
C66	-20.87917	115.39167	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C66	-20.87917	115.39167	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
C66	-20.87917	115.39167	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
C66	-20.87917	115.39167	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
C77J	-20.88278	115.39556	Maxillopoda: Copepoda	Calanoida			
C77J	-20.88278	115.39556	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
E1	-20.83472	115.40250	Maxillopoda: Copepoda	Calanoida			
E1	-20.83472	115.40250		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
F11	-20.84606	115.37309	Arachnida	Araneae			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
F11	-20.84606	115.37309	Arachnida	Araneae	Trochanteriidae		
F11	-20.84611	115.37306	Maxillopoda: Copepoda	Calanoida			
F11	-20.84606	115.37309	Maxillopoda: Copepoda	Calanoida			
F11	-20.84611	115.37306	Insecta	Coleoptera			
F11	-20.84611	115.37306	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
F11	-20.84611	115.37306		Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
F11	-20.84611	115.37306		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
F41A			Maxillopoda: Copepoda	Calanoida			
F41A			Maxillopoda: Copepoda	Calanoida			
F41A				Hemiptera	Meenoplidae		
F53S	-20.84361	115.38083		Collembola			
F7	-20.85028	115.37861	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
G19			Maxillopoda: Copepoda	Calanoida			
G19			Maxillopoda: Copepoda	Calinoida			
G19			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
G19			Arachnida	Scorpionida	Buthidae	*Lychas*	*marmoreus*?
G19			Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
K11	-20.81778	115.37250	Malacostraca	Amphipoda	Melitidae	*Nedsia*	?*urifimbriata* Bradbury & Williams ALLOTYPE?
K11	-20.81778	115.37250	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*urifimbriata* Bradbury & Williams, HOLOTYPE
K11			Arachnida	Araneae			
K11			Insecta	Hymenoptera			
K3N	-20.80944	115.36389	Copepoda	Cyclopoida	Cyclopidae	*Halicyclops*	*longifurcatus*
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Cyclopoida	Cyclopidae	*Halicyclops*	*longifurcatus*
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; HOLOTYPE & PARATYPES
K3N	-20.80944	115.36389	Maxillipoda: Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; HOLOTYPE & PARATYPES
K3N	-20.80944	115.36389	Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; PARATYPES
L 16			Malacostraca	Amphipoda	Melitidae	*Nedsia*	straskaba Bradbury & Williams, HOLOTYPE
L 16			Malacostraca	Amphipoda	Melitidae	*Nedsia*	*straskraba* Bradbury & Williams, 1996
L 16			Maxillopoda: Copepoda	Calanoida			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L 16			Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L 16			Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L17			Maxillopoda: Copepoda	Calanoida			
L17			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L17			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L2	-20.80917	115.36417		Collembola			
L32J	-20.80944	115.37833		Amphipoda			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Calanoida			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Calanoida			
L32J	-20.80944	115.37833		Collembola			
L32J	-20.80944	115.37833	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
L32J	-20.80944	115.37833	Amphipoda				
L32J	-20.80944	115.37833		Araneae	Pholcidae		
L4	-20.80667	115.38944	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*humphreysi* Bradbury & Williams, HOLOTYPE
L4	-20.80667	115.38944	Malacostraca	Amphipoda		*Nedsia*	sp. nov.? (cf *sculptilis*)
L4	-20.80667	115.38944	Malacostraca	Amphipoda			
L4	-20.80611	115.38917	Maxillopoda: Copepoda	Calanoida			
L4	-20.80667	115.38944	Maxillopoda: Copepoda	Calanoida			
L4	-20.80667	115.38944	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80611	115.38917		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80611	115.38917		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L4	-20.80608	115.38922	Copepoda	Harpacticoida			
L4	-20.80611	115.38917	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri*	
L4	-20.80667	115.38944	Arachnida	Schizomida	Hubbardiidae	*Draculoides bramstokeri Harvey and Humphreys sp. nov.*	
L4	-20.80667	115.38944	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80611	115.38917		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80667	115.38944		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L4	-20.80667	115.38944	Amphipoda				
L4N	-20.80608	115.38922	Malacostraca	Amphipoda			
L4N	-20.81728	115.39506	Malacostraca	Amphipoda			
L4N	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L4N	-20.81728	115.39506	Insecta	Coleoptera			
L5	-20.81409	115.38747	Maxillopoda: Copepoda	Calanoida			
L5	-20.81409	115.38747	Maxillopoda: Copepoda	Calanoida			
L5	-20.81409	115.38747	Insecta	Hymenoptera	Formicidae		
L8	-20.81739	115.39497	Arachnida	Acarina			
L8	-20.81728	115.39506	Arachnida	Acarina			
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Bogidiellidae	*Bogadomma*	*australis* Bradbury & Williams
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Bogidiellidae	*Bogidomma*	*australis* Bradbury & Williams, HOLOTYPE
L8	-20.81694	115.39444	Malacostraca	Amphipoda		*Nedsia*	*sculptilis*
L8	-20.81694	115.39444	Malacostraca	Amphipoda	Melitidae	*Nedsia*	*sculptilis* Bradbury & Williams, HOLOTYPE
L8	-20.81728	115.39506	Malacostraca	Amphipoda			
L8	-20.81694	115.39444	Arachnida	Araneae			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81739	115.39497	Maxillopoda: Copepoda	Calanoida			
L8	-20.81739	115.39497	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Calanoida			
L8	-20.81694	115.39444	Insecta	Coleoptera			
L8	-20.81728	115.39506	Insecta	Collembola			
L8	-20.81728	115.39506	Insecta	Collembola			
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
L8	-20.81694	115.39444	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
L8	-20.81728	115.39506	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L8	-20.81694	115.39444		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81739	115.39497		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81739	115.39497		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81728	115.39506		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
L8	-20.81694	115.39444	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	*stylifera* Holthuis, 1960
L8	-20.81694	115.39444	Copepoda	Harpacticoida	Ameiridae	*Inermipes*	*humphreysi* Lee & Huys; PARATYPE
L8	-20.81728	115.39506	Insecta	Hymenoptera	Formicidae		
L8	-20.81694	115.39444	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444		Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81728	115.39506	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
L8	-20.81694	115.39444	Insecta	Psocoptera			
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Malacostraca	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81728	115.39506		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81694	115.39444	Amphipoda				
L8	-20.81889	115.40667	Amphipoda				
L8	-20.81739	115.39497	Amphipoda				

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
L8	-20.81739	115.39497		Collembola			
L8	-20.81739	115.39497	Amphipoda				
L8	-20.81728	115.39506	Pisces		Eleotridae	*Milyeringa*	*veritas*
L8	-20.81728	115.39506	Amphipoda			*Nedsia*	
M13	-20.81719	115.41233	Malacostraca	Amphipoda			
M13	-20.81719	115.41233	Arachnida	Araneae	Desidae		
M13	-20.81719	115.41233	Insecta	Diptera			
M13	-20.81719	115.41233	Insecta				
M5	-20.81222	115.40972		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
M5	-20.81222	115.40972	Malacostraca	Isopoda	Cirolanidae	*Haptolana*	*pholeta* Bruce & Humphreys
M52	-20.81586	115.40814	Maxillopoda: Copepoda	Calanoida			
M52	-20.81586	115.40814	Maxillopoda: Copepoda	Calanoida			
M52	-20.81586	115.40814		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M5N	-20.81017	115.41006	Arachnida	Araneae	Pholcidae		
M5N	-20.81017	115.41006	Arachnida	Araneae	Pholcidae		
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Calanoida			
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Calanoida			
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* De Laurentiis et al 1999
M5N	-20.81017	115.41006	Maxillopoda: Copepoda	Cyclopoida		*Halicyclops*	*rochai* Delaurentiis et al 1999
M5N	-20.81017	115.41006	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
M5N	-20.81017	115.41006	Insecta	Hemiptera: Fulgoroidea?			
M5N	-20.81017	115.41006		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M62	-20.81889	115.40667	Arachnida	Acarina			
M62	-20.81919	115.40706	Arachnida	Acarina			
M62	-20.81919	115.40706	Malacostraca	Amphipoda			
M62	-20.81919	115.40706	Malacostraca	Amphipoda			
M62	-20.81889	115.40667	Maxillopoda: Copepoda	Calanoida			
M62	-20.81919	115.40706	Maxillopoda: Copepoda	Calanoida			
M62	-20.81919	115.40706	Maxillopoda: Copepoda	Calanoida			
M62	-20.81889	115.40667	Maxillopoda: Copepoda	Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
M62	-20.81889	115.40667		Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
M62	-20.81889	115.40667	Amphipoda				

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
M62	-20.81919	115.40706	Foramenifera				
M62			Maxillopoda: Copepoda	Calanoida			
M62			Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
Malouet Cave			Arachnida	Araneae	Ctenidae	*Janusia*	sp.3
Malouet Cave			Arachnida	Araneae	Pholcidae		
MW13	-20.78083	115.46694		Harpacticioda		*Inermipes*	*humphreysi* Lee & Huys
MW13 / SB31	-20.78083	115.46694		Harpacticioda		*Inermipes*	*humphreysi* Lee & Huys
MW15	-20.78278	115.46472	Amphipoda				
MW15	-20.78278	115.46472	Amphipoda				
MW15	-20.78278	115.46472	Amphipoda				
MW17	-20.77861	115.46778	Amphipoda				
MW3 /SB8	-20.77972	115.46333	Malacostraca	Syncarida Bathynellacea			
MW3 /SB8	-20.77972	115.46333	Syncaridae	Bathynellacea			
MW7	-20.77775	115.46561		Cyclopoida		*Diacyclops*	"*humphreysi unispinosa* n. ssp."
N62			Arachnida	Acarina			
N62			Arachnida	Araneae	Pholcidae	*Trichocyclus*	
N62			Arachnida	Araneae			
N62			Insecta	Collembola			
N62			Insecta	Diptera			
N62			Insecta	Hemiptera	Reduviidae: Emesinae		
N62			Malacostraca	Isopoda: Oniscidea			
N62			Malacostraca	Isopoda: Oniscidea		*Barrowdillo*	
N62			Insecta	Orthoptera			
Old batch plant bore	-20.82417	115.43861		Cyclopoida		*Allocyclops*	"*barrowi* n.sp. Karanovic"
Old batch plant bore	-20.82417	115.43861		Collembola			
Old batch plant bore	-20.82417	115.43861		Acarina			
Q5	-20.78472	115.38083	Maxillopoda: Copepoda	Calanoida			
Q5	-20.78472	115.38083	Maxillopoda: Copepoda	Calanoida			
Q5	-20.78472	115.38083	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
Q5	-20.78472	115.38083	Insecta	Hymenoptera			

Cave or well	Dec Lat	Dec Long	Class	Order	Family	Genus	Species
Q5	-20.78472	115.38083	Thermosbaenacea	Thermosbaenacea		*Halosbaena*	*tulki* Poore & Humphreys, 1992
S87	-20.76667	115.38333	Arachnida	Araneae	Salticidae	*Zenodorus*	?*orbiculatus*
S87	-20.76667	115.38333	Arachnida	Araneae	Zodariidae	*Habronestes*	sp
W62JW	-20.73222	115.42611	Malacostraca	Amphipoda		*Nedsia*	*hurlberti*
W62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
W62JW	-20.73222	115.42611	Malacostraca	Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.
X62JW	-20.73222	115.42611	Malacostraca	Amphipoda			
X62JW	-20.73222	115.42611	Arachnida	Araneae	Theridiidae	*Latrodectus*	*hasseltii*
X62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
X62JW	-20.73222	115.42611	Maxillopoda: Copepoda	Calanoida			
X62JW	-20.73222	115.42611		Decapoda: Natantia	Atyidae	*Stygiocaris*	sp.

Attachment 2 - Interim Advice on Electrophoretic Investigations by University of Western Australia Zoology

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Genetic Diversity in samples of stygobitic amphipods from Barrow Island

4 June 2004

Frozen specimens of amphipods from seven bores from Barrow Island were analysed for 20 allozyme loci following standard methods for protein electrophoresis. For comparative purposes, specimens of amphipods from the families Bogidiellidae and Melitidae (genus *Nedsia*), were included in the analyses from other sites where they are known (Cape Preston, Mount Brockman, and Paraburdoo)

In the following discussion, the word “group” may be loosely interpreted to mean “species” however, as will be explained in the concluding remarks, we must be cautious with the interpretation of species boundaries based on allozyme data alone.

Of the seven bores, five contained a single genetic group, while two of the bores (L32j and AMW18) contained two genetic groups (Table 1). In order to test for similarities among groups from different bores, a cluster analysis (using multi-dimensional scaling of Nei’s genetic distances among samples) was used to group genetically similar samples. This analysis indicated the presence of six distinct genetic groups in the Barrow Island material, which were differentiated by the presence of two or more fixed differences among the 20 loci (Figure 1). Three of the groups (2, 3, and 5), accounting for six bores, showed affinities with melitids from other regions of the Pilbara. The other three (1, 4, and 6) represent groups that have not yet been detected in other bores.

Table 1. Number of genetic groups in each sample and brief description of their affinities. Where two distinct groups were found in a bore, they are labelled species a and b.

Bore	**Number of genetic groups**	**Comments**
L32j	2	species a (n = 13), similar to Paraburdoo melitids species b (n = 1), similar to Mt. Brockman melitids
L8	1	(n = 2) similar to Mt. Brockman melitids
14nr1	1	(n = 1) unique genetic type
MW7	1	(n = 1) similar to Paraburdoo melitids
AMW19	1	(n = 1) similar to Paraburdoo melitids
AMW18	2	species a (n = 2) similar to Mt. Cape Preston melitids species b (n = 3) unique genetic group but unable to score many loci
M17-4	1	(n = 1) unique genetic type

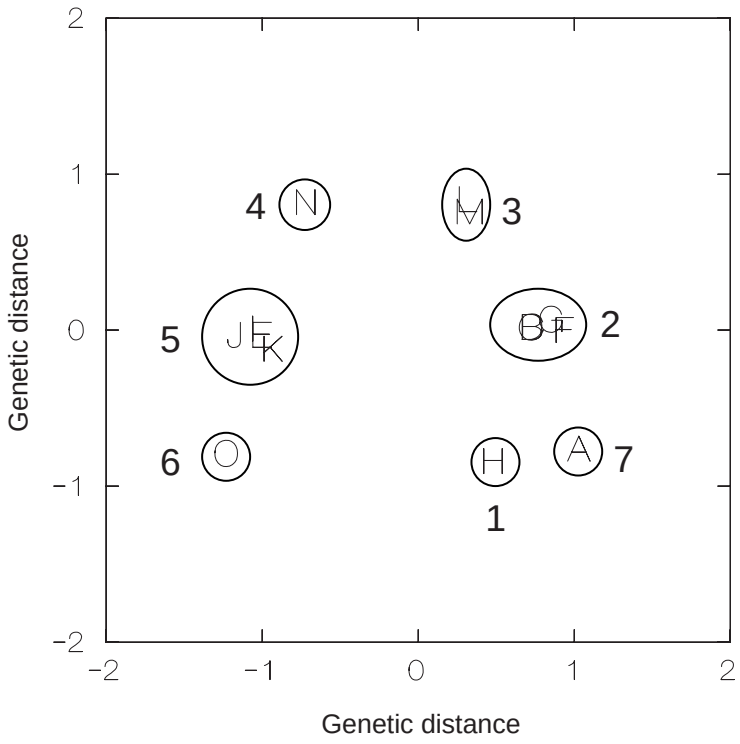

Figure 1. Multidimensional scaling of genetic distances for distinct bore x species groups.

Group 1:
H Barrow 14nr1

Group 2:
B Homestead meltid
C Homestead meltid
D Homestead meltid
F Barrow L32J-species b
G Barrow L8

Group 3:
L Cape Preston melitid
M Barrow AMW18-species a

Group 4:
N Barrow AMW18-species b

Group 5:
E Barrow L32J-species a
I Barrow MW7
J Barrow AMW19
K Paraburdoo melitid

Group 6:
O: Barrow M17-4

Group 7:
A Paraburdoo bogidiellid

In 1996, Bradbury and Williams described seven new species of the genus *Nedsia* (family Melitidae) plus a single species in the family Bogidiellidae from samples from Barrow Island. These descriptions were based on exhaustive documentation of morphological differences among specimens. The allozyme data showed the presence of six distinct genetic groups some of which may correspond to species already described by Bradbury and Williams.

In this study, distinct genetic groups were identified by fixed differences at two or more loci between populations. Fixed differences may arise when movement of individuals or gene flow between two populations ceases. If the populations remain isolated for a long period of time, differentiation may arise to the point that the two populations are no longer able to interbreed. Speciation occurs as a result of this process. Fixed differences may also arise between groups that are isolated for shorter periods of time, but may still retain the ability to interbreed if they were to come into contact again. Given the small sample sizes at each bore, differences may also arise from sampling error. That is, what appears to be a fixed difference may in fact be due to sampling an individual from a population that carries a rare allele, while other individuals not sampled carry that allele in heterozygous form along with other more common alleles found in other populations. If sample sizes were increased, we may find that populations that differ at only one or two loci actually converge. Finally, differences may arise due to localised selection acting on isolated populations.

In this study, there is a large split between groups 1, 2, 3 and 7, and groups 4, 5, and 6 (Figure 1). This is due to differences at 6-8 loci between the two groups. However, differences between populations within groups differ by only 1-3 loci. At this level of differentiation, it is sometimes difficult to determine if the differences represent real species differences, or are due to stochastic events such as sampling error described above. Breeding experiments are sometimes used as a test of reproductive incompatibility, however, given the protracted life cycles of stygobitic fauna, this sort of test is impractical. For this reason, it is important to combine both morphological and genetic data to come to a final conclusion on the number of species present. If the genetic groups correspond well to morphological groups, then differences detected at only a few loci in this study indeed represent species differences. However, if the genetic groups do not correspond to morphological species, then other factors such as small sample sizes may be playing a part. Finally, the use of other molecular markers, such as sequence divergence at mitochondrial genes, may help clarify species boundaries.

Attachment 3 - Barrow Island – Interim Subterranean Fauna Sampling Results – November/December 2004

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Barrow Island – Interim Subterranean Fauna Sampling Results – November/December 2004

We provide here a summary of the recent work completed on Barrow Island in commencing implementation of the Gorgon development Subterranean Fauna Sampling Programme.

Sampling for stygofauna was undertaken over five days from 30th November 2004 to 3rd December 2004. A total of 43 boreholes were sampled for stygofauna during this period (Table 1.1). These included recently installed boreholes situated inside and outside of the plant footprint. Boreholes were also sampled in two locations outside of the plant area, at the island Base and processing facility areas. The methodology for this work was consistent with both the Subterranean Fauna Sampling Programme and previous work undertaken by Biota on Barrow Island.

Ten boreholes were also profiled for water physico-chemical parameters (Table 1.2). These boreholes were selected due to their target geology (halocline). The halocline depth bores were installed specifically in order to investigate the potential for marine lineage stygofauna below the halocline, which would indicate a deeper, marine origin fauna. Readings were taken every five metres below ground level, to the total drilled depth (typically ~50 m). Various parameters were recorded, including dissolved oxygen, conductivity, depth and temperature. The data from this exercise will be combined within the full report, pending 2005.

Troglofauna traps were installed within 43 boreholes (see Table 1.3), in accordance with the Subterranean Fauna Sampling Programme. The sorting and curation of specimens to preliminary identification level was undertaken in the camp laboratory, with further analysis and identification undertaken in the office laboratory in Perth. More detailed taxonomic identification (i.e. to species level) is planned to be undertaken by the submission of the curated specimens to staff at the University of Western Australia and Western Australian Museum and other specialist taxonomists. Stygofauna were collected from 10 bores, including one borehole within the project impact area and nine outside of the project area (see Table 1.4). Some troglobitic taxa were also collected during the field visit, opportunistically recovered from bores sampled for stygofauna.

The installed troglofauna traps are scheduled for retrieval in January 2005, and sorting of samples to be undertaken on return to Perth, in the Biota office laboratory.

Table 1.1: Details of boreholes visited inside and outside of the proposed Gorgon Gas project area, indicating which boreholes were sampled and the Stygofauna collected (WGS84 datum Zone 51).

Boreholes	Easting	Northing	Comments	Dates Sampled
A4	335329	7702611	3 hauls	29/11/04 - 01/12/04
B1	340113	7700371	3 hauls	29/11/04 - 01/12/04
B3	339690	7700465	3 hauls	29/11/04 - 01/12/04
B4	339459	7700690	3 hauls	29/11/04 - 01/12/04
B5	339304	7700415	3 hauls	29/11/04 - 01/12/04
6A	338869	7700186	3 hauls	29/11/04 - 01/12/04

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B7	339265	7700282	3 hauls	29/11/04 - 01/12/04
B8	339183	7700106	3 hauls	29/11/04 - 01/12/04
B9	339064	7700221	3 hauls	29/11/04 - 01/12/04
B10	338966	7700305	3 hauls	29/11/04 - 01/12/04
B11	338790	7700469	3 hauls	29/11/04 - 01/12/04
B12	338578	7700655	3 hauls	29/11/04 - 01/12/04
B13	338968	7700106	3 hauls	29/11/04 - 01/12/04
B14	339096	7699852	3 hauls	29/11/04 - 01/12/04
B15	338862	7700009	3 hauls	29/11/04 - 01/12/04
B16	338762	7700078	3 hauls	29/11/04 - 01/12/04
B17	338648	7700195	3 hauls	29/11/04 - 01/12/04
B18	338582	7700270	3 hauls	29/11/04 - 01/12/04
B19	338491	7700337	3 hauls	29/11/04 - 01/12/04
B20	338335	7700480	3 hauls	29/11/04 - 01/12/04
B21	338125	7700679	3 hauls	29/11/04 - 01/12/04
B22	338388	7700222	3 hauls	29/11/04 - 01/12/04
B23	338393	7699997	3 hauls	29/11/04 - 01/12/04
B24	338291	7700118	3 hauls	29/11/04 - 01/12/04
B26	338681	7699356	3 hauls	29/11/04 - 01/12/04
B27	338462	7699556	3 hauls	29/11/04 - 01/12/04
CHW1	331945	7697424	3 hauls	29/11/04 - 01/12/04
CHW2	332913	7700890	3 hauls	29/11/04 - 01/12/04
CHW3	332870	7700851	3 hauls	29/11/04 - 01/12/04
BMW1	332847	7700930	3 hauls	29/11/04 - 01/12/04
BMW4	332820	7700883	3 hauls	29/11/04 - 01/12/04
BMW5	331999	7697055	3 hauls	29/11/04 - 01/12/04
BMW6	331870	7697078	3 hauls	29/11/04 - 01/12/04
BMW7	331864	7697228	3 hauls	29/11/04 - 01/12/04
S1	337433	7701733	3 hauls	29/11/04 - 01/12/04
S2	338465	7701878	3 hauls	29/11/04 - 01/12/04
S3	339423	7701776	3 hauls	29/11/04 - 01/12/04
S4	336298	7699910	3 hauls	29/11/04 - 01/12/04
S5	337101	7699396	3 hauls	29/11/04 - 01/12/04
S6	338220	7699071	3 hauls	29/11/04 - 01/12/04
S7	335167	7698272	3 hauls	29/11/04 - 01/12/04
S8	336189	7697735	3 hauls	29/11/04 - 01/12/04
S9	337097	7696971	3 hauls	29/11/04 - 01/12/04

Table 1.2: Details of halocline boreholes profiled for physico-chemical parameters.

Boreholes	Date logged	Comments
A4	29/11/04	Logged
B5	29/11/04	Logged
B8	29/11/04	Logged
B12	29/11/04	Possible collapse or pinched pipe at ~10 m
B18	29/11/04	Logged
B24	29/11/04	Logged
B26	29/11/04	Logged
S3	29/11/04	Logged
S5	29/11/04	Logged
S9	29/11/04	Logged

Table 1.3: Details of boreholes where Troglofauna traps were installed, including trap and interval depths in Metres. BGL = Below Ground Level

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
A4	335329	7702611	3 traps	5, 10, 15
A6	337811	7700967	1 trap	6-10
B1	340113	7700371	1 trap	5
B3	339690	7700465	1 trap	6
B4	339459	7700690	1 trap	5
B5	339304	7700415	1 trap	6
6A	338869	7700186	2 traps	6, 11
B8	339183	7700106	2 traps	5, 10
B9	339064	7700221	2 traps	6, 11
B10	338966	7700305	1 trap	6-10
B11	338790	7700469	1 trap	6-10
B12	338578	7700655	2 traps	5, 10
B13	338968	7700106	1 trap	6-10
B15	338862	7700009	2 traps	5, 10
B16	338762	7700078	1 trap	6-10
B17	338648	7700195	1 trap	6-10
B18	338582	7700270	2 traps	5, 10
B19	338491	7700337	1 trap	6-10
B20	338335	7700480	2 traps	5, 10
B21	338125	7700679	1 trap	6-10
B22	338388	7700222	1 trap	6-10
B23	338393	7699997	1 trap	6-10
B24	338291	7700118	3 traps	5, 10, 15
B26	338681	7699356	3 traps	5, 10, 15
B27	338462	7699556	3 traps	5, 10, 15
CHW1	331945	7697424	4 traps	5, 12, 25, 46
CHW2	332913	7700890	4 traps	5, 12, 21, 36
CHW3	332870	7700851	4 traps	7, 16, 30, 44
BMW1	332870	7700851	4 traps	6, 15, 24, 37
BMW4	332847	7700930	4 traps	5, 18, 26, 39

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
BMW5	332820	7700883	4 traps	5, 11, 21, 37
BMW6	331999	7697055	3 traps	5, 15, 33
BMW7	331870	7697078	1 trap	5, 9, 16, 26
S1	331864	7697228	Blocked past 7m, 1 trap	7
S2	338465	7701878	3 traps	7, 14, 22
S3	339423	7701776	2 traps	5, 11
S4	336298	7699910	2 traps	6, 12
S5	337101	7699396	1 trap	6
S6	338220	7699071	1 trap	6
S7	335167	7698272	3 traps	7, 13, 19
S8	336189	7697735	2 traps	7, 13
S9	337097	7696971	1 trap	5
Tony's Hole	338113	7700633	2+ traps	5, 10

Stygofauna Sampling Results

One of the bores where stygofauna were collected was within the impact area of the development footprint (B18), with nine bores outside (B18, BMW1, BMW4, BMW5, BMW6, BMW7, S4, S5, S6 and S9) (Table 4.1). Four stygofauna taxa and two species of troglofauna were collected. The stygofauna collected represented three higher taxonomic groups as follows; Class Malacostraca (Order Amphipoda), Class Copepoda, Class Ostracoda and Class Decapoda (*Stygiocaris stylifera*). Troglofauna taxa collected represented two higher groups; Class Arachnida (Schizomid; *Draculoides bramstokerii*) and Class Collembola. The preliminary results from the stygofauna sampling are listed in Table 1.4.

Table 1.4: Preliminary results of stygofauna sampling (Am = Amphipod, Col = Collembola, Co = Copepod, Os = Ostracod, Sh = Schizomid, St = *Stygiocaris stylifera* (Decapoda)).

Boreholes	Easting	Northing	Taxa
B18	338582	7700270	Am (1) Co (1)
BMW1	332847	7700930	Col (1) Sc (2)
BMW4	332820	7700883	Co (4)
BMW5	331999	7697055	Col (1)
BMW6	331870	7697078	Sc (1)
BMW7	331864	7697228	Am (1) Co (1) Sc (1)
S4	336298	7699910	Co (2)
S5	337101	7699396	Am (1) Co (3)
S6	338220	7699071	Am (5) Co (4) St (3)
S9	337097	7696971	Os (1) St (9)

Other Comments

A small percentage of the boreholes were inaccessible beyond a certain depth due to possible PVC piping constrictions or possible hole collapse. This affected the both the data logging of one bore (B12), depth of stygofauna sampling and the installation of the anticipated number of troglofauna traps in a number of other bores.

Attachment 4 - Barrow Island – Interim Subterranean Fauna Sampling Results – February/March 2005

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Barrow Island – Interim Subterranean Fauna Sampling Results – March 2005

We provide here a summary of the recent work completed on Barrow Island in the ongoing implementation of the Gorgon development Subterranean Fauna Sampling Programme.

Sampling for stygofauna and troglofauna trap insertion was undertaken over five days from 28 February 2005 to 4 March 2005. A total of 33 boreholes were visited for stygofauna sampling, of which 31 were sampled (Table 1.1). These included recently installed boreholes situated inside and outside of the plant footprint. Boreholes were also sampled in two locations outside of the plant area, at the island base and the central processing facility areas. The methodology for this work was consistent with both the Subterranean Fauna Sampling Programme and previous work undertaken by Biota on Barrow Island.

Following the stygofauna sampling exercise, troglofauna traps were installed within 43 boreholes (Table 1.2), in accordance with the Subterranean Fauna Sampling Programme. The sorting and curation of specimens to preliminary identification level was undertaken in the camp laboratory, with further analysis and identification undertaken in the office laboratory in Perth. More detailed taxonomic identification (i.e. to species level) and genetic analyses are scheduled to be undertaken after the submission of the specimens to staff at the University of Western Australia, the Western Australian Museum and other specialist taxonomists. Stygofauna were collected from 13 bores, including five boreholes within the project impact area and eight outside of the project area (Table 1.3). Some troglobitic taxa were also collected during the field visit, opportunistically recovered from bores sampled for stygofauna.

The troglofauna traps installed in December 2004 were retrieved on 24 January 2005, and sorting of trap contents was undertaken on return to Perth, in the Biota office laboratory. The results of the troglofauna survey are given in Table 1.4. Troglofauna were recorded from 35 of the 42 boreholes sampled, and are further discussed in the Troglofauna Sampling Results section.

Table 1.1: Details of boreholes visited inside and outside of the proposed Gorgon Gas project area, indicating which boreholes were sampled for stygofauna (WGS84 datum Zone 50).

Boreholes	Easting	Northing	Comments	Dates Sampled
A4	335329	7702611	3 hauls	28/02/05 - 03/02/05
B1	340113	7700371	3 hauls	28/02/05 - 03/02/05
B3	339690	7700465	3 hauls	28/02/05 - 03/02/05
B4	339459	7700690	3 hauls	28/02/05 - 03/02/05
B5	339304	7700415	3 hauls	28/02/05 - 03/02/05
6A	338869	7700186	3 hauls	28/02/05 - 03/02/05
B8	339183	7700106	3 hauls	28/02/05 - 03/02/05
B9	339064	7700221	3 hauls	28/02/05 - 03/02/05
B12	338578	7700655	Heavily silted, sample aborted	28/02/05 - 03/02/05
B15	338862	7700009	3 hauls	28/02/05 - 03/02/05

B18	338582	7700270	3 hauls	28/02/05 - 03/02/05
B20	338335	7700480	Possible blockage at 30m	28/02/05 - 03/02/05
B21	338125	7700679	3 hauls	28/02/05 - 03/02/05
B24	338291	7700118	3 hauls	28/02/05 - 03/02/05
B26	338681	7699356	3 hauls	28/02/05 - 03/02/05
B27	338462	7699556	3 hauls	28/02/05 - 03/02/05
CHW1	331945	7697424	3 hauls	28/02/05 - 03/02/05
CHW2	332913	7700890	3 hauls	28/02/05 - 03/02/05
CHW3	332870	7700851	3 hauls	28/02/05 - 03/02/05
BMW1	332847	7700930	3 hauls	28/02/05 - 03/02/05
BMW4	332847	7700930	3 hauls	28/02/05 - 03/02/05
BMW5	331999	7697055	3 hauls	28/02/05 - 03/02/05
BMW6	331870	7697078	3 hauls	28/02/05 - 03/02/05
BMW7	331864	7697228	3 hauls	28/02/05 - 03/02/05
S1	337433	7701733	3 hauls	28/02/05 - 03/02/05
S2	338465	7701878	3 hauls	28/02/05 - 03/02/05
S3	339423	7701776	3 hauls	28/02/05 - 03/02/05
S4	336298	7699910	3 hauls	28/02/05 - 03/02/05
S5	337101	7699396	3 hauls	28/02/05 - 03/02/05
S6	338220	7699071	3 hauls	28/02/05 - 03/02/05
S7	335167	7698272	3 hauls	28/02/05 - 03/02/05
S8	336189	7697735	3 hauls	28/02/05 - 03/02/05
S9	337097	7696971	3 hauls	28/02/05 - 03/02/05

Table 1.2: Details of boreholes where troglofauna traps were installed, including trap and interval depths in metres. BGL = Below Ground Level

Boreholes	Easting	Northing	Comments	Depth/ Intervals BGL
A4	335329	7702611	3 traps	5, 10, 15
A6	337811	7700967	1 trap	8
B1	340113	7700371	1 trap	5
B3	339690	7700465	1 trap	6
B4	339459	7700690	1 trap	5
B5	339304	7700415	1 trap	6
6A	338869	7700186	2 traps	6, 11
B8	339183	7700106	2 traps	5, 10
B9	339064	7700221	2 traps	6, 11
B10	338966	7700305	1 trap	6-10
B11	338790	7700469	1 trap	6-10
B12	338578	7700655	2 traps	5, 10
B13	338968	7700106	1 trap	6-10
B15	338862	7700009	2 traps	5, 10
B16	338762	7700078	1 trap	6-10
B17	338648	7700195	1 trap	6-10
B18	338582	7700270	2 traps	5, 10
B19	338491	7700337	1 trap	6-10
B20	338335	7700480	2 traps	5, 10
B21	338125	7700679	1 trap	6-10
B22	338388	7700222	1 trap	7
B23	338393	7699997	1 trap	6-10
B24	338291	7700118	3 traps	5, 10, 15
B26	338681	7699356	3 traps	5, 10, 15
B27	338462	7699556	3 traps	5, 10, 15
CHW1	331945	7697424	4 traps	5, 12, 25, 46
CHW2	332913	7700890	4 traps	5, 12, 21, 36
CHW3	332870	7700851	4 traps	7, 16, 30, 44
BMW1	332870	7700851	4 traps	6, 15, 24, 37
BMW4	332847	7700930	4 traps	5, 18, 26, 39
BMW5	332820	7700883	4 traps	5, 11, 21, 37
BMW6	331999	7697055	3 traps	5, 15, 33
BMW7	331870	7697078	4 traps	5, 9, 16, 26
S1	331864	7697228	Blocked past 7m, 1 trap	7
S2	338465	7701878	3 traps	7, 14, 22
S3	339423	7701776	2 traps	5, 11
S4	336298	7699910	2 traps	6, 12
S5	337101	7699396	1 trap	6
S6	338220	7699071	1 trap	6
S7	335167	7698272	3 traps	7, 13, 19
S8	336189	7697735	2 traps	7, 13
S9	337097	7696971	1 trap	5
Non-referenced	338113	7700633	1 trap	8

Stygofauna Sampling Results

Four of the bores where stygofauna were collected are located within the proposed development footprint (impact area); B4, B18, B21 and B24. Stygofauna were recorded from five bores outside of the proposed development footprint (A4, BMW7, S5, S6 and S9) (Table 1.3). Five stygofauna taxa and three species of troglofauna were represented amongst the collected specimens. The stygofauna represented amongst collected represent four higher taxonomic groups as follows; Class Malacostraca (Order Amphipoda and Order Bathynellacea), Class Copepoda, Class Ostracoda and Order Decapoda (*Stygiocaris stylifera*). The troglofauna species represent three higher groups; Class Arachnida (Schizomid; *Draculoides bramstokerii*), Class Collembola and Class Malocastraca (Order Isopoda). The preliminary results from the stygofauna sampling are listed in Table 1.3.

Table 1.3: Preliminary results of stygofauna sampling (including troglofauna records in bold) Am = Amphipod, Ba = Bathynellid Col = Collembola, Co = Copepod, Is = Isopod, Os = Ostracod, Sc = Schizomid, St = *Stygiocaris stylifera* (Decapoda). Boreholes where stygofauna have previously been recorded are indicated with *****.

Boreholes	Easting	Northing	Taxa
A4	335329	7702611	Am (1) + remains, **Is (remains)**
B4	339459	7700690	Am (5)
B18 *	338582	7700270	Am (4)
B21	338125	7700679	Ba (4)
B24	338291	7700118	Am (1)
B27	338462	7699556	**Is (1)**, **Sc (1)**
BMW1	332847	7700930	**Is (1)**, **Sc (2)**
BMW5	331999	7697055	**Is (1)**, **Sc (2)**
BMW6	331870	7697078	**Sc (2)**
BMW7 *	331864	7697228	Am (1), Co (1)
S5 *	337101	7699396	Am (1), St (4)
S6 *	338220	7699071	Co (10), Is (1), St (4)
S9 *	337097	7696971	Am (1), **Col (1)**, St (7)

Troglofauna Sampling Results

Troglofauna taxa were collected form bores located both inside and outside of the proposed development footprint. A total of 10 species were collected, representing four higher taxonomic groups, Class Arachnida, Class Collembola, Class Insecta and Class Oligochaeta. These groups comprise seven orders, Acarina, Haplotaxida, Hemiptera Hymenoptera Isoptera, Psuedoscorpionida and Schizomida. The preliminary results from the troglofauna sampling are listed in Table 1.4.

Table 1.4: Preliminary results of troglofauna sampling. (n=number of specimens)

Borehole	Trap No	Taxa	N	Depth m
A4	1	Isoptera	5	5
	2	Collembola	1	10
	2	Isoptera	1	10
A6	1	Acarina	2	6
B4	1	Isoptera	2	5
B5	1	Acarina	2	6
6A	1	Oligochaete	6	6
	2	Collembola	1	11
	2	Oligochaete	4	11
B8	1	Isoptera	3	5

Borehole	Trap No	Taxa	N	Depth m
B9	1	Collembola	1	6
	2	Collembola	1	11
B10	1	Archaeognath	1	6-10
B11	1	Collembola	7	6-10
	1	Schizomid	1	6-10
B12	1	Isoptera	2	5
	2	Oligochaete	11	10
B13	1	Collembola	2	6-10
	1	Oligochaete	5	6-10
B15	2	Acarina	2	10
	2	Collembola	2	10
B18	1	Collembola	3	5
	1	Hemiptera	1	5
	1	Schizomid	1	5
	2	Collembola	3	10
	2	Schizomid	3	10
B20	1	Acarina	2	5
	1	Collembola	2	5
B23	1	Collembola	1	6
	1	Oligochaete	8	6
B24	1	Isoptera	1	5
	1	Undetermined taxon	1	5
	1	Thysanura	1	5
B26	1	Acarina	2	5
	3	Collembola	8	15
	3	Oligochaete	1	15
B27	1	Oligochaete	30+	5
	2	Collembola	12	10
	3	Collembola	1	15
CHW1	1	Isoptera	4	5
	3	Isoptera	30	12
	4	Collembola	1	46
	4	Acarina	1	46
CHW2	1	Acarina	6	5
	2	Collembola	6	12
	3	Collembola	30	21
CHW3	2	Isoptera	3	16
	3	Isoptera	1	30
	4	Isoptera	3	44
BMW1	1	Isoptera	7	6
BMW5	1	Isoptera	25	5
	2	Diptera	16	11
	3	Diptera	3	21
	3	Hymenoptera	1	21
	4	Collembola	1	37
BMW6	1	Collembola	6	5
	2	Collembola	3	15
	2	Oligochaete	5	15
	3	Isopod	1	33

Borehole	Trap No	Taxa	N	Depth m
	3	Oligochaete	5	33
	3	Schizomid	1	33
BMW7	1	Isoptera	30	5
	1	Pseudoscorpion	1	5
	3	Collembola	1	16
	3	Oligochaete	11	16
S1	1	Isoptera	1	7
S2	2	Collembola	3	14
	2	Schizomid	1	14
S3	1	Collembola	2	5
S4	2	Schizomid	1	6
S5	1	Oligochaete	10	6
S6	1	Collembola	4	6
S7	1	Isopod	2	7
	2	Isopod	4	13
	2	Schizomid	1	13
	3	Schizomid	1	19
S8	1	Acarina	2	7
S9	1	Collembola	5	5
Non- referenced	1	Acarina	1	5
	1	Isopod	1	5
	1	Schizomid	1	5

Other Comments

Some of the species recorded still require further taxonomic and genetic work to confirm their status as troglobitic invertebrates, and not troglophilic specimens sharing similar morphological characteristics.

A small percentage of the boreholes were inaccessible beyond a certain depth due to possible PVC piping constrictions or possible hole collapse. This affected the sampling and the installation of the planned number of troglofauna traps in a number of other bores. One bore (B12) was not sampleable for stygofauna due to the heavy silts content and difficulty retrieving the nets.

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