1025 WELLINGTON STREET WEST PERTH WA 6005 • PH: 9322 1944 • FAX: 9322 1599 • ACN 088 821 425 • ABN 63 088 821 425
www.ecologia.com.au

9th July 2008

To: James Nelson, Gary May,

Dear James and Gary,

RE: Area A extended Rare and Priority Flora survey.

Introduction:

Area A has been identified as a potential spoil management area for proposed dredging activities on Finucane Island. The area was surveyed by Biota in 2008 and MPJV asked *ecologia* Environment (*ecologia*) to conduct a targeted Rare and Priority over a small piece of land to the south of the originally surveyed area, as shown in. Appendix 1.

Methods:

The survey was undertaken on the 3rd July 2008, was conducted by Melissa Hay of *ecologia* and was carried out on foot.

A GPS was used to thoroughly search the area using 10 m gridlines.

The vegetation communities occurring in the area and any introduced species were recorded also. Plant species either were identified in the field or were collected for later identification and verification. Life-form strata, percentage cover, and disturbance details were recorded for all flora taxa. Nomenclature and taxonomy follow the conventions currently adopted by the Western Australian Herbarium.

Results:

Flora

Fifty-one vascular flora taxa were recorded during the survey (Appendix 2) and this total includes 22 families and 39 genera.

Flora of Conservation Significance

No flora taxa listed under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* were recorded during the survey. *Lepidium catapycnon* (vulnerable) is protected by this act and is known to occur in the Pilbara region; however, the survey area does not contain the rocky habitat in which this species is usually found.

No flora taxa listed as Declared Rare Flora (DRF) under the Western Australian *Wildlife Conservation Act (1950),* or *Wildlife Conservation (Rare Flora) Notice 2008* were recorded during the survey. Two species protected by this act are known from the Pilbara region; *Lepidium catapycnon* and *Thryptomene wittweri.* These species were not expected to be recorded during the survey area because the habitats where they are commonly found are stony plains and rocky hill tops.

The Department of Environment and Conservation (DEC) maintains a list of Priority Flora taxa, which are considered poorly known, uncommon, or under threat, but for which there is insufficient justification based on known distribution and population sizes for inclusion on the DRF schedule. Currently, 96 Priority Flora taxa are listed as occurring in the Pilbara region (FloraBase, 2008). No Priority Flora species were recorded in the survey area.

Vegetation

Biota (2008) recorded two vegetation units during the original survey of Area A. These included;

- *Halosarcia halocnemoides* subsp. tenuis, (*Halosarcia indica* subsp. *leiostachya*) low open shrubland, to open low heath on the saline mudflats; and
- *Triodia epactia* / *pungens* (*Triodia secunda*), closed hummock grassland, over **Cenchrus ciliaris* and *Sporobolus virginicus* open tussock grassland on the low sandy islands occurring within the saline mudflats.

The habitat types and vegetation units recorded by Biota (2008) were also recorded in the southern extension area (Table 1).

Table 1: Vegetation units recorded at the southern extension of Area A.

Type	Habitat	Vegetation summary	
1	Saline mudflats	Open mixed *Halosarcia* spp. (*Halosarcia indica* and *Halosarcia halocnemoides* subsp. *longispicata*) low shrubland.	
2	Low sandy island	Moderately dense *Triodia pungens* hummock grassland.	

Weeds

Four weed species, **Aerva javanica* (Kapok Bush),**Cenchrus ciliaris* (Buffel Grass), **Chloris virgata* (Feather Top Grass) and **Indigofera sessiliflora* were recorded during the survey and their locations are provided in Appendix 3.

**Aerva javanica* (Kapok Bush) is a perennial herb native to northern Africa and south-west Asia, which grows to 1.6 m in height, and is covered in dense, branched hairs (Hussey *et. al*., 1997). **A. javanica* was introduced to Australia to assist with the revegetation of degraded rangelands. It is now widespread in many types of vegetation from Carnarvon to the Kimberley. It was recorded in several scattered locations along the disturbed edge of the survey area.

Plate 1: **Aerva javanica.*

* *Cenchrus ciliaris* (Buffel Grass) is a tufted, perennial grass growing to 1 m high with purplish flowers produced for much of the year (FloraBase, 2008). Native to Africa and India, **C. ciliaris* is widely planted in pastoral regions of Western Australia for cattle fodder. This species has become a widespread weed along roadsides, creeklines, river edges, and occurs in most vegetation types from Shark Bay to the Pilbara (Hussey *et al.,* 1997). **C. ciliaris* was common on the disturbed edges of the survey area.

Plate 2: **Cenchrus ciliaris.*

**Chloris virgata* (Feathertop Rhodes Grass, Windmill Grass) is an annual grass growing to around 0.5 m high. Green and purple flowers are produced between April to September (FloraBase, 2008). Native to Africa, it is now widespread on roadsides and other disturbed sites throughout Western Australia (Hussey *et al.,* 1997). **C. virgata* was found at one location on the disturbed edge of the survey area.

**Indigofera sessiliflora is* a semi-prostrate annual or biennial, herb, to 0.05 m high. Its flowers are red and are produced in September. Native to Southern Asia, **I. sessiliflora has* become a weed of the coast of Western Australia. It grows in sand, on dunes and growing in disturbed natural vegetation. This species had a scattered distribution throughout the survey area (FloraBase, 2008).

Management Recommendations:

To minimise the environmental impacts in the area it is recommended that:

1. Land disturbance activities are undertaken only in those areas surveyed by the botanist.
2. To reduce the likelihood of the introduction of new and spread of existing weeds, machinery should be cleaned and washed free of soil before entering and leaving the area.
3. Environmental procedures should be implemented for staff and contractors. These include managing the risk of fire, the spread of weeds and encouraging general environmental impact awareness.

References

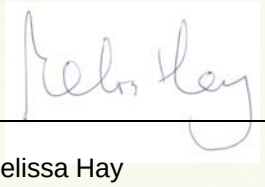
Biota (2008). A Flora and Fauna Assessment of RGP5 Spoil Areas A and H, Port Hedland Harbour. Unpublished Report for MPDJV. March 2008.

Project Staff and Licences

Project Staff		
Christina Cox	PhD	Project Manager, Manager Botany
Melissa Hay	BSc. (Honours)	Botanist
Peter Jobson	MSc.	Plant Taxonomist

Licences - "Licence to take flora for scientific purposes"		
The Area A extended Rare and Priority Flora survey was conducted under the authorisation of the following licence issued by the Department of Environment and Conservation:		
	Permit Number	**Valid Until**
Melissa Hay	SL008100	30th April, 2009

Yours sincerely,



Melissa Hay
Botanist

Appendix 1:

Figure 1: Area A extension.

Appendix 2:

Table 2: Vascular Flora Species Recorded.

FAMILY	TAXA
Aizoaceae	*Trianthema turgidifolia*
Amaranthaceae	***Aerva javanica***
	Gomphrena canescens subsp. *canescens*
	Ptilotus astrolasius
	Ptilotus polystachyus
Asteraceae	*Pluchea rubelliflora*
	Pluchea tetranthera
	Pterocaulon sphacelatum
Boraginaceae	*Heliotropium inexplicitum*
Capparaceae	*Cleome viscosa*
Chenopodiaceae	*Enchylaena* sp.
	Enchylaena tomentosa
	Halosarcia halocnemoides subsp. *longispicata*
	Halosarcia indica
	Neobassia astrocarpa
	Salsola tragus subsp. *grandiflora*
	Salsola tragus subsp. *tragus*
	Tecticornia pruinosa
	Tecticornia sp.
Commelinaceae	*Commelina ensifolia*
Convolvulaceae	*Evolvulus alsinoides* var. *villosicalyx*
Cucurbitaceae	*Cucumis maderaspatana*
Euphorbiaceae	*Phyllanthus maderaspatensis*
Frankeniaceae	*Frankenia ambita*
Goodeniaceae	*Goodenia forrestii*
Lauraceae	*Cassytha* sp.
Malvaceae	*Sida fibulifera* (sens lat)
	Sida rohlenae subsp. *rohlenae*
Mimosaceae	*Acacia holosericea*
	Acacia stellaticeps
Molluginaceae	*Mollugo molluginae*
Papilionaceae	*Desmodium filiforme*
	Indigofera sessiliflora
	Sesbania cannabina
	Tephrosia rosea var. *rosea*
Poaceae	*Aristida contorta*
	Aristida holathera var. *holathera*
	Cenchrus ciliaris
	Chloris virgata
	Dactyloctenium radulans
	Eragrostis eriopoda

FAMILY	TAXA
Poaceae	*Eragrostis falcata*
	Eriachne lanata
	Triodia pungens
	Triodia secunda
Portulacaceae	*Calandrinia* sp. Pinga (T.R. Lally TRL 722)
	Portulaca pilosa
Solanaceae	*Solanum diversiflorum*
	Solanum ellipticum
Tiliaceae	*Corchorus incanus* subsp*. incanus*
Violaceae	*Hybanthus aurantiacus*

(Classification and nomenclature according to the Western Australian Herbarium) (* = introduced species)

Appendix 3:

Table 3: General weed locations recorded at the survey area.

Weed species	Zone	Easting (mE)	Northing (mN)	Cover
**Aerva javanica*	50K	661200	7748690	< 2%
		661214	7748515	< 2%
**Cenchrus ciliaris*	50K	661205	7748478	2 – 10%
		661164	7748619	2 – 10%
		661160	7748621	< 2%
		661183	7748660	< 2%
		661211	7748667	< 2%
**Chloris virgata*	50K	661205	7748478	< 2%
**Indigofera sessiliflora*	50K	661177	7748705	< 2%
		661127	7748679	< 2%
		661174	7748657	< 2%
		661167	7748623	< 2%
		661167	7748559	< 2%

(Co-ordinates are in datum WGS84)

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11th July 2008

To: James Nelson and Gary May

Dear James and Gary,

RE: Finucane Island (DMMA B2) Rare and Priority Flora Survey – Draft Version 3

Introduction:

MPJV proposes to use an area of beach off Finucane Island for the disposal of dredge materials. MPJV contracted *ecologia* Environment (*ecologia*) to conduct a targeted Rare and Priority flora survey over an area of approximately 1.4 ha. The survey was to concentrate on searching for the Priority 3 species *Euphorbia inappendiculata* thought to occur in the area, but was also to target any other conservation significant taxa that could occur in the area.

The areas to be surveyed were specified by MPDJV and are mapped in Appendix 1.

Methods:

The survey was undertaken on the 3rd July 2008, was conducted by Melissa Hay of *ecologia* and was carried out on foot.

A GPS with the boundaries of the survey area/s marked with waypoints was used to search the area using 10 m gridlines.

The vegetation communities occurring in the area and any introduced species were recorded also. Plant species either were identified in the field or were collected for later identification and verification. Life-form strata, percentage cover, and disturbance details were recorded for all flora taxa. Nomenclature and taxonomy follow the conventions currently adopted by the Western Australian Herbarium.

Results:

Flora

Thirty-two vascular flora taxa from 15 families and 23 genera were recorded during the survey (Appendix 2).

Flora of Conservation Significance

No flora taxa listed under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* were recorded during the survey. *Lepidium catapycnon* (vulnerable) is protected by the Act and is known to occur in the Pilbara region; however, the survey area does not contain the rocky habitat in which this species is usually found.

No flora taxa listed as Declared Rare Flora (DRF) under the Western Australian *Wildlife Conservation Act (1950),* or *Wildlife Conservation (Rare Flora) Notice 2008* were recorded during the survey. Two species protected by the Act are known from the Pilbara region; *Lepidium catapycnon* and *Thryptomene wittweri.* These species were not expected to be recorded in the coastal survey area as usually found on stony plains and rocky hill tops.

The Department of Environment and Conservation (DEC) maintains a list of Priority Flora taxa, which are considered poorly known, uncommon, or under threat, but for which there is insufficient justification based on known distribution and population sizes for inclusion on the DRF schedule. Currently, 96

Priority Flora taxa are listed as occurring in the Pilbara region (FloraBase, 2008). No Priority Flora species were recorded in the survey area.

Euphorbia inappendiculata (Priority 3)

MPD JV asked *ecologia* to target *Euphorbia inappendiculata,* a Priority 3species, during the survey. *Euphorbia inappendiculata* is a poorly known and collected species, and apart from the type specimens only three additional specimens have been collected. These three specimens were collected from: West Fortescue River; Barlee Range and Warralong Station. These collections indicate that the species has an inland rather than a coastal distribution. David Halford, the plant taxonomist currently revising the Australian members of *Euphorbia* for the *Flora of Australia* treatment, does not believe that *E. inappendiculata* occurs in coastal areas and does not believe that the *Euphorbia* sp. occurring at the Finucane Island survey area is *E. inappendiculata* (pers. comm., D. Halford to P. Jobson, July 2008).

David Halford mentioned a possible new taxon that might be occurring along the Pilbara coast (he is uncertain of its taxonomic status, as *E. drummondii* is a highly variable entity). Halford has seen the different entity at the beach front at Onslow and has collected it from other parts of the coastline also. However, this taxon is not recognized on FloraBase and is therefore beyond the scope of this project. The *Euphorbia drummondii* material collected from the Finucane Island survey area is dioecious (single sex flowers) and *E. drummondii* is monoecious (both sexes on the flower). The monoecious form might be of interest to David Halford and some of the material collected will be sent to Queensland for David's collection.

Vegetation

Three vegetation units associated with one landform type were recorded at the Finucane Island survey area. These vegetation units are described below (Table 1) and are mapped in Appendix 3; they are typical of coastal dune vegetation of the Pilbara.

Table 1: Vegetation units seen at the Finucane Island survey area.

Type	Habitat	Vegetation summary	
1	Sandy beach dune	Scattered *Acacia bivenosa* medium to tall shrubs, over sparse mixed *Acacia stellaticeps* and *Tephrosia rosea* var. *rosea* low shrubs, with moderately dense to dense patches of **Cenchrus ciliaris* tussock, and sparse patches of *Spinifex longifolius* hummock grasses.	
2		Open *Spinifex longifolius* hummock grassland, with open patches of *Ipomoea pes-caprae* running shrubs.	
3		Open to moderately dense patches of *Acacia bivenosa* medium to tall shrubs, over sparse mixed *Acacia bivenosa* and *Indigofera Tephrosia rosea* var. *rosea* white low shrubs, with sparse *Spinifex longifolius* hummock grass.	

Weeds

Four weed species, **Aerva javanica* (Kapok Bush),**Cenchrus ciliaris* (Buffel Grass), **Indigofera sessiliflora* and **Tribulus terrestris* (Caltrop), were recorded during the survey and their locations are provided in Appendix 4.

**Aerva javanica* (Kapok Bush) is a perennial herb native to northern Africa and south-west Asia, which grows to 1.6 m in height, and is covered in dense, branched hairs (Hussey *et. al*., 1997). **A. javanica* was introduced to Australia to assist with the revegetation of degraded rangelands. It is now widespread in many types of vegetation from Carnarvon to the Kimberley. It was recorded in several locations scattered throughout the survey area.

Plate 1: **Aerva javanica.*

* *Cenchrus ciliaris* (Buffel Grass) is a tufted, perennial grass growing to 1 m high with purplish flowers produced for much of the year (FloraBase, 2008). Native to Africa and India, **C. ciliaris* is widely planted in pastoral regions of Western Australia for cattle fodder. This species has become a widespread weed along roadsides, creeklines, river edges, and occurs in most vegetation types from Shark Bay to the Pilbara (Hussey *et al*., 1997). **C. ciliaris* is a widespread weed of this area and makes up a dominant part of the vegetation community.

Plate 2: **Cenchrus ciliaris.*

**Indigofera sessiliflora is* a semi-prostrate annual or biennial, herb, to 0.05 m high. It produces red flowers in September. Native to Southern Asia **I. sessiliflora* has become a weed of the Western Australia coast occurring in sand; occupying dunes and growing in disturbed natural vegetation (FloraBase, 2008). This species was recorded only once in the survey area.

**Tribulus terrestris* (Caltrop) is a prostrate annual herb with pinnate leaves and very spiny fruits. The yellow flowers are 1 cm in diameter and occur in January to December (FloraBase, 2008). **T. terrestris* had a scattered distribution throughout the survey area.

Management Recommendations:

To minimise the environmental impacts in the area it is recommended that:

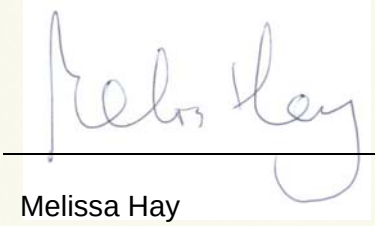
1. Land disturbance activities are undertaken only in those areas surveyed by the botanist and are kept to that which is absolutely necessary.
2. Machinery should be cleaned and washed free of soil before entering and leaving the area - to reduce the likelihood of the introduction of new and spread of existing weeds,.
3. MPDJV should implement environmental procedures for staff and contractors. These include managing the risk of fire, the spread of weeds and encouraging general environmental impact awareness.

Project Staff and Licences

Project Staff		
Christina Cox	PhD	Project Manager, Manager Botany
Melissa Hay	BSc. (Honours)	Botanist
Peter Jobson	MSc.	Plant Taxonomist

Licences - "Licence to take flora for scientific purposes"		
The Finucane Island flora survey was conducted under the authorisation of the following licence issued by the Department of Environment and Conservation:		
	Permit Number	**Valid Until**
Melissa Hay	SL008100	30th April, 2009

Yours sincerely,



Melissa Hay
Botanist

Appendix 1:

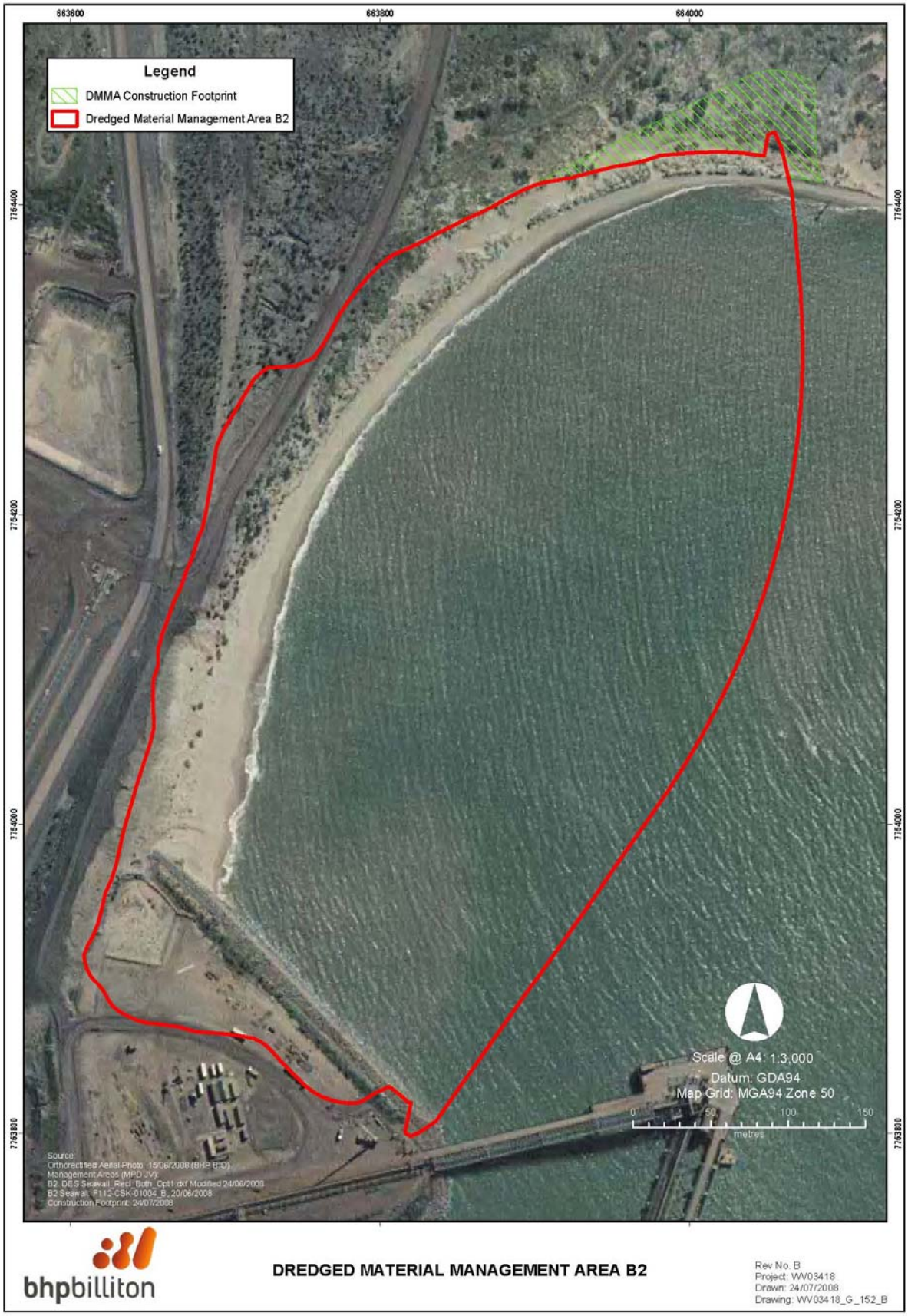


Figure 1: Finucane Island Survey Area.

Appendix 2:

Table 2: Vascular Flora Species List.

FAMILY	SPECIES
Aizoaceae	*Trianthema turgidifolia*
Amaranthaceae	**Aerva javanica*
	Gomphrena canescens subsp. *canescens*
	Ptilotus exaltatus var. *exaltatus*
	Ptilotus villosiflorus
Caesalpiniaceae	*Petalostylis labicheoides*
Capparaceae	*Cleome viscosa*
Chenopodiaceae	*Salsola tragus* subsp. *grandiflora*
	Salsola tragus subsp. *tragus*
	Threlkeldia diffusa
Convolvulaceae	*Ipomoea pes-caprae*
Cucurbitaceae	*Cucumis maderaspatana*
Euphorbiaceae	*Adriana urticoides* var. *urticoides*
	Euphorbia coghlanii (sens lat)
	Euphorbia drummondii
	Euphorbia tannensis subsp. *eremophila*
Mimosaceae	*Acacia ampliceps*
	Acacia bivenosa
	Acacia stellaticeps
	Acacia tumida var. *tumida*
Myrtaceae	*Eucalyptus* sp.
Nyctaginaceae	*Boerhavia coccinea*
Papilionaceae	*Crotalaria cunninghamii*
	Indigofera colutea
	**Indigofera sessiliflora*
	Sesbania cannabina
	Tephrosia rosea var. *glabrior*
	Tephrosia rosea var. *rosea*
Poaceae	**Cenchrus ciliaris*
	Spinifex longifolius
Tiliaceae	*Corchorus incanus* subsp. *incanus*
Zygophyllaceae	**Tribulus terrestris*

(Classification and nomenclature according to the Western Australian Herbarium) (* = introduced species)

Appendix 3:

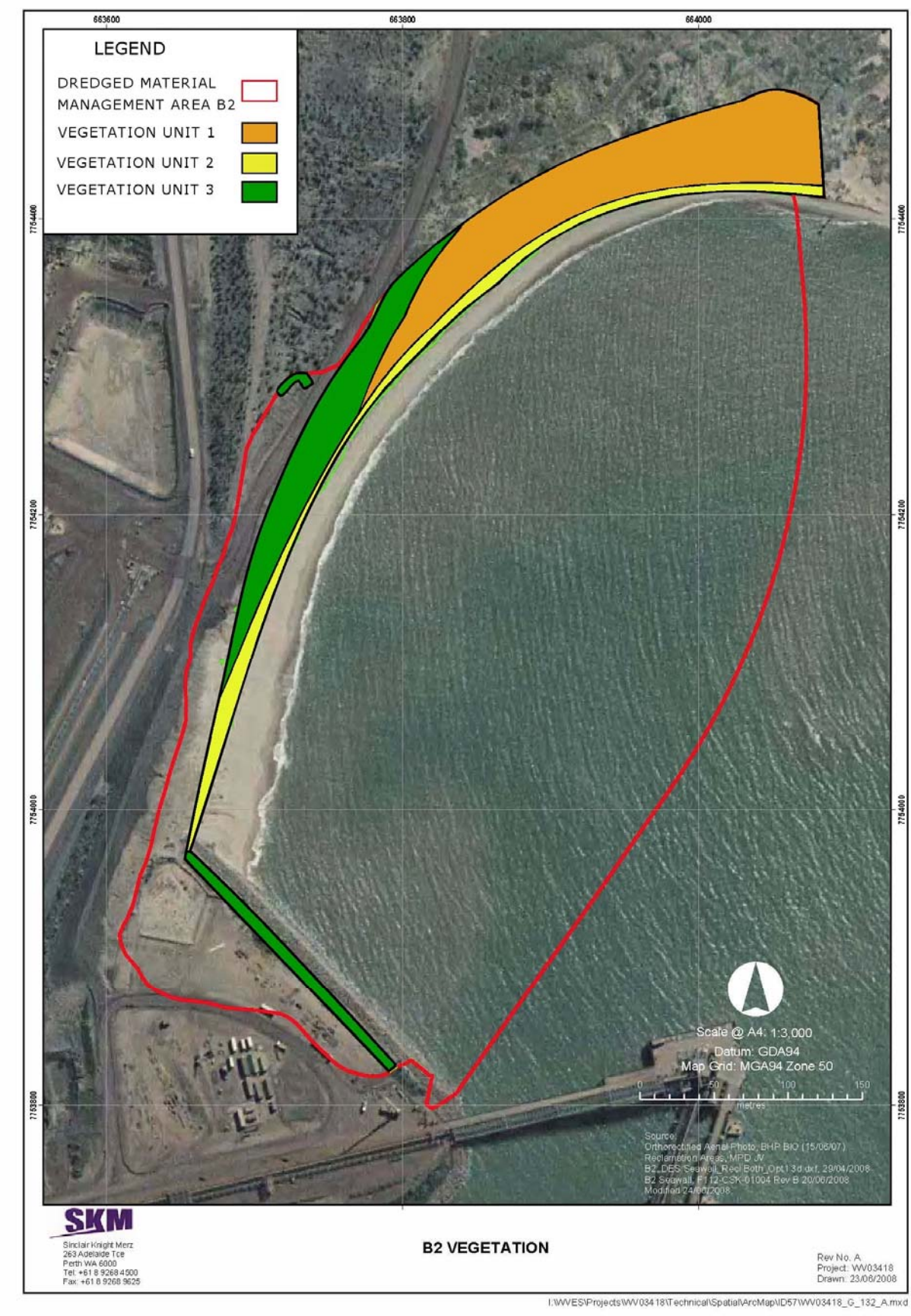


Figure 2: Vegetation Units of the Finucane Island Survey Area.

Appendix 4:

Table 3: General weed locations recorded at the survey area.

Weed species	Zone	Easting (mE)	Northing (mN)	Cover
**Aerva javanica*	50K	664073	7754484	< 2%
		664079	7754470	2 – 10%
		664043	7754456	< 2%
		664059	7754447	< 2%
		664079	7754428	< 2%
		663673	7754049	< 2%
		663680	7754111	< 2%
		663712	7754177	< 2%
**Cenchrus ciliaris*	50K	Throughout the entire survey area		30 – 70%
**Indigofera sessiliflora*	50K	663712	7754177	2 – 10%
**Tribulus terrestris*	50K	664079	7754428	< 2%
		664078	7754427	< 2%
		664048	7754426	< 2%
		663966	7754424	< 2%

Co-ordinates are provided in datum WGS84