

VEGETATION OF THE BOYNE SMELTERS LTD BUFFER ZONE

A REPORT TO BOYNE SMELTERS LTD



by A. J. Melzer, J. Brushe and P. Rey

with contributions from N. Bonner, L. Childs, N. Clancy, W. Houston and C. Melzer

**CENTRE FOR LAND AND WATER
RESOURCE DEVELOPMENT**



**Central Queensland
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CONTENTS:

<u>SECTION</u>	<u>HEADING</u>	<u>PAGE NO</u>
1.0	INTRODUCTION	1
2.0	METHODOLOGY	2
3.0	RESULTS OF THE VEGETATION SURVEY	3
4.0	RESULTS OF THE ASSESSMENT OF DISTURBANCE	6
5.0	THE REGIONAL SIGNIFICANCE OF THE PLANTS AND ECOLOGICAL COMMUNITIES WITHIN THE BUFFER ZONE	8
6.0	SPECIFIC QUESTIONS PERTAINING TO THE MANAGEMENT OF THE BUFFER ZONE	9
7.0	CONCLUSIONS	11
	BIBLIOGRAPHY	
	APPENDICES	

1.0 INTRODUCTION

The Boyne Smelters Ltd buffer zone consists of a mosaic of plant communities covering about 400 ha. These plant communities range from beach strand communities and coastal vine thickets to dry *Eucalyptus* forests.

There is a complex array of impacts on the buffer zone. The effects of fluoride emission on species composition and community structure (Doley 1986) are generally the most widely recognised impacts. Fire (Purdie and Slayter 1976, Gill, Groves and Noble 1981), climate (Landsberg and Wylie 1983), storm damage (Kitching 1988), and human impacts (Saunders, Hopkins and How 1990), however, can individually as well as in concert induce significant changes in the composition and structure of plant communities. All of these agents are affecting the buffer zone to varying degrees. The zone has been isolated from larger tracts of natural vegetation, and hence the capacity for species immigration following catastrophe has been reduced. Additionally, the architecture of the buffer zone has produced extensive edges with consequently increased risks of community degradation through modified light and moisture environments and fire regimes.

If unchecked these impacts have the potential to degrade the buffer zone and reduce its effectiveness as a barrier between the aluminium smelter and adjacent urban and recreational areas. Appropriate management can influence the nature and direction of some changes within the buffer zone plant communities. These changes, however, must firstly be either recognisable or predictable and this requires an initial description of the species and community structure of the site. Ideally such a description would be made before human impacts are imposed on the plant communities. In this case the smelter has been operational for about 13 years and emission effects on the buffer zone have been well documented in a series of internal reports to Boyne Smelters Ltd (formally Gladstone Aluminium Ltd) from 1979 to 1993 by Dr D. Doley, Botany Department, University of Queensland. Although not documented, urban and recreational impacts would have increased on the site as the Boyne Island township expanded due to the influx of the Smelter work force from 1982. As a result any contemporary study must endeavour to take account of the existing impacts (and any consequential changes in process) when describing and commenting on ecosystem dynamics and the composition and structure of the plant communities within the buffer zone.

This study attempts to do this. The report provides a description of the composition and structure of the plant communities as well as a consideration of the current impacts on, and their implication for the future integrity of, the buffer zone.

2.0 METHODOLOGY

2.1 General details

A team of seven people spent ten days in the field during January 1995. Additional time was spent by four people on species identification, aerial photo interpretation and data analysis. In all, nine people were directly involved with the project. The team included experts in the taxonomy of *Eucalyptus* forest, rainforest and coastal plant communities and their ecology, natural resource management, as well as aerial photo interpretation, and geographic information systems.

All sites were accessed by foot or by four-wheel drive vehicle.

2.2 Site selection

Stereo examination of colour aerial photographs (Australian Aerial Mapping (Brisbane) A.A.M. 2059-3c, 1: 15,000 2,310m A.S.L. 7/9/94 runs 1,2,3 and A.A.M. 2059c 1:30,000 Frame N° 119) was used to map structurally distinct plant communities. These preliminary plant community delininations were ground-truthed to confirm their extent and name the plant community involved. A refined vegetation map was overlayed on an aerial photomosaic (1:15,000, 2.5 m pixel), rectified to match the Australian map grid, as a base map (Fig. 1). To thoroughly define each plant community, sites were selected within each community and a floristic and structural analysis undertaken. Care was taken to position sites in areas representative of the homogeneous community types they were contained within.

2.3 Sampling Details

Thirty five sites were surveyed around the smelter, twenty one of which were located on siliceous sands, two on saline clay plains adjacent to tidal flats, seven on the duplex soils or lithosols of the ridge mid and upper slopes and three on low slopes with deep duplex soils. Two further sites were located on revegetated lands. The distribution of these sites is shown in Figure 1 and a description and location for each site is presented in Appendix 1.

Information collected at each site included:-

- locality information,
- topographic details,
- geological information,
- details of site disturbance,
- vegetation structure and floristic dominants,
- species composition, and
- a photographic record.

The proforma sheet used to survey the sites and the options for completing the proforma were taken from Melzer (1994) with the permission of the Queensland Department of Environment and Heritage. Plant specimens were collected for subsequent identification and for the construction of a reference herbarium (to be housed within Central Queensland University) and two field herbaria. One field herbarium will be

used by the research team and the other by Boyne Smelters Ltd. Species which could not be identified were referred to the Queensland Herbarium for identification.

2.4 Vegetation classification

The structural classification Walker and Hopkins (1990) was used to classify non-rainforest vegetation while the classification of Webb (1978) was used to classify rainforest vegetation.

A floristic classification was performed manually at each site. This classified the vegetation according to the dominant and characteristic species within the dominant stratum. These species were determined in the field using qualitative abundance ratings. Species area curves were constructed for nine sites (sites 2, 3, 5, 10, 11, 12, 13, 23, and 24) which were representative of the vegetation communities in the buffer zone (see Appendix 2). These curves allow the determination of quadrat sizes appropriate for monitoring these vegetation types as well as providing a quantitative floristic analysis for the major structural forms present.

3.0 RESULTS OF THE VEGETATION SURVEY

3.1 Species identification

Two hundred and sixty two species and subspecies of plants were identified from the 1300 recordings at the 35 sites. The species are listed in Appendix 3a. Of these 55 (21% of species) were exotic (Appendix 3b). No species were listed as rare, threatened or vulnerable by the Queensland Herbarium (Anon 1994). The occurrence of species within the sites and map unit (see below) is presented in Appendix 3c while their abundance on each site is presented in Appendix 3d. Prevailing drought conditions at the time of the survey precluded a full species inventory and some specimens collected could not be identified due to the lack of fertile material.

3.2 Vegetation classification

Twenty nine structural forms of vegetation were recognised within nine assemblages. These forms are listed in Table 1.0. The forms are designated as vegetation map units and each is located in Figure 1. These map units are more fully described (with notes on their management) in Appendix 4a. One of the nine assemblages comprised forms of rainforest. The remainder were non-rainforest forms. Two of these non-rainforest forms (Map unit 2a and 4b) are closely allied with the rainforest forms and may represent successional stages in the development of these forms.

The rainforest assemblage was composed of forms of low microphyll vine forest (map units 1a and 1b). This assemblage occurred solely on stranded beach ridges along the seaward side of the buffer zone. It is closely related to the *Eucalyptus tessellaris* open-woodland (map unit 2a) which occurred in juxtaposition with the low microphyll vine forest on the stranded beach ridges. This open-woodland generally had a mid-stratum of rainforest species and there was a gradation from the *E. tessellaris* open-woodland to low microphyll vine forest. The differences tended to be related to changes in relative dominance between the communities. There was a gradation from *E. tessellaris* open-woodland with a midstorey composed, in part, of low microphyll vine forest species through low microphyll vine forest with emergent *E. tessellaris* to low microphyll vine forest in which *E. tessellaris* occurs rarely or is absent. This is possibly a result of the fire regimes occurring on the buffer zone. *The latter form may be, in places, artificial as there was evidence of selective felling of formally emergent E. tessellaris within the vine forest.*

Along the active coast, east of the stranded beach ridges supporting low microphyll vine forest and *E. tessellaris* open-woodland, open grasslands (map units 6a and 6b) intergrade with *Casuarina equisetifolia* tall closed-forest (map unit 4c). In at least one site the *C. equisetifolia* tall closed-forest has been invaded by low microphyll vine forest species (map unit 4b). Different communities dominate the swales between the stranded beach ridges. At the southern end of the buffer zone tall forests of *Melaleuca dealbata*

dominate the swales in association with *C. glauca* (map unit 3a) or *E. tereticornis* (map unit 3b). At the northern end of the buffer zone the swales open out to tidal flats on saline clays fringed with *C. glauca* tall open-woodland or forest (map unit 4a). Although these woodlands are common in this section of the buffer zone they are generally too small to map.

On their western edge these siliceous sands, in low beach ridges and swales, abut ridges of red-yellow podsolic soils and lithosols over sedimentary rock. On the gentle lower slopes and along some drainage lines deep duplex soils support *E. tereticornis* tall very open woodland (map unit 2i), woodland (map unit 2h) or open-forest (map unit 2g). On the mid and upper slopes *Eucalyptus* forests and woodlands dominated by *E. exserta* (map units 2e and 2f) or *E. citriodora* (map units 2c and 2d) are supported on the moderately deep duplex soils. An artificial community of immature *Eucalyptus* spp., *Alphitonia exelsa*, *Lophostemon suaveolens*, *Melaleuca nervosa* and other species form a mid-high woodland on disturbed red-yellow podsolic soils (map unit 2k). This is a revegetation area planted in 1984. A summary of map units classified according to landform is presented in Appendix 4b.

Table 1.0

Major structural forms of vegetation, and their map unit designations, recognised from the survey. See also Appendix 4a.

	Assemblage	Form	Map Unit
Rainforest	Low microphyll vine forest/thicket	Low microphyll vine forest/thicket dominated by <i>Cupaniopsis anacardioides</i> , <i>Polyalthia nitidissima</i> , <i>Exocarpos latifolius</i> and <i>Drypetes deplanchii</i> .	1a
		Low microphyll vine forest with emergent <i>Eucalyptus tessellaris</i> .	1b
Non-rainforest	<i>Eucalyptus</i> woodland/forest	<i>Eucalyptus tessellaris</i> tall woodland with a mid dense midstratum of low microphyll vine forest/thicket.	2a
		<i>Eucalyptus tessellaris</i> tall woodland with a mid dense mid stratum of shrubs (including some littoral rainforest species) and a grassy ground stratum.	2b
		<i>Eucalyptus citriodora</i> tall /very tall woodland with a mid stratum of <i>Allocasuarina luehmannii</i> / <i>Allocasuarina torulosa</i> and a sparse ground stratum of grasses and <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> .	2c
		<i>Eucalyptus citriodora</i> tall woodland with a shrub mid stratum (including occasional rainforest species) and grassy ground stratum.	2d
		<i>Eucalyptus exserta</i> / <i>E. crebra</i> tall woodland with a mid dense stratum of small trees and shrubs with a grassy ground stratum	2e
		<i>Eucalyptus exserta</i> / <i>E. clarksoniana</i> tall woodland with a shrub mid stratum and a grassy ground stratum.	2f
		<i>Eucalyptus tereticornis</i> tall open forest/woodland with a very sparse shrub midstratum and a very sparse grassy ground stratum.	2g

	<i>Eucalyptus tereticornis</i> tall open woodland with a mid dense small tree and shrub mid stratum and a grassy ground stratum with <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> .	2h
	<i>Eucalyptus tereticornis</i> tall very open woodland with a dense grass and forb ground stratum.	2i
	<i>Eucalyptus tereticornis</i> / <i>Melaleuca dealbata</i> tall forest/open forest with a very sparse understorey	2j
	Mid high woodland of juvenile <i>Eucalyptus</i> spp., small trees and shrubs with a sparse ground stratum of grasses, forbs and <i>Xanthorrhoea latifolia</i> subsp. <i>latifolia</i> .	2k
Melaleuca forest	<i>Melaleuca dealbata</i> / <i>Casuarina glauca</i> very tall closed forest/forest with a sparse to very sparse understorey.	3a
	<i>Melaleuca dealbata</i> / <i>Eucalyptus tereticornis</i> tall open forest with a sparse understorey.	3b
Casuarina forest/woodland	<i>Casuarina glauca</i> tall/mid high forest/open forest/woodland/ with a <i>Sporobolus virginicus</i> ground stratum.	4a
	<i>Casuarina equisetifolia</i> tall closed forest/forest/ open forest with a mixed understorey of littoral rainforest species, strand vegetation and mangrove species.	4b
	<i>Casuarina equisetifolia</i> tall forest/open forest with a sparse ground stratum of grasses and herbaceous vines.	4c
Mixed woodlands/shrublands	<i>Cupaniopsis anacardioides</i> / <i>Acacia aulacocarpa</i> tall/mid high open woodland.	5a
	<i>Acacia aulacocarpa</i> very tall shrubland.	5b
	Closed shrubland.	5c
Grasslands	Open grassland with or without <i>Casuarina equisetifolia</i> .	6a
	<i>Spinifex sericeus</i> open grassland.	6b
	Closed grassland.	6c
Riparian communities	Vegetation of stream banks and drainage areas.	7
Inter tidal communities	Mangroves.	8a
	Saltmarsh.	8b
	Sandflats.	8c
Highly disturbed environments	Vegetation largely removed by human action.	9

3.3 Species Area Curves

Individual species area curves are shown in Appendix 2. Ideally, a species area curve takes an exponential form as new species are encountered at a high frequency at first then less frequently as the sample area is increased exponentially. The sample area at which the inflection occurs is usually considered to represent the minimum sampling area for that particular plant assemblage. Generally the next increment in sample area is taken as the recommended sampling area for that assemblage (Kent and Coker 1992). The minimum recommended sampling areas, derived from the species area curves in

Appendix 2, for the major plant assemblages in the Boyne Smelters buffer zone are presented in Table 2. This table also contains an estimate of the percentage of the total species located in each assemblage which would be sampled using the minimum sampling area.

Table 2.0

Minimum sampling areas and expected percentage species recovery derived from the species area curves in Appendix 2

Vegetation form	Map unit	Site number	Minimum sampling area (m ²)	Species recovery (%)
Open grassland	6a,6b	10,24	400	92
<i>Casuarina</i> open forest/woodland	4a,4c	11,23	640	77
<i>Melaleuca</i> closed forest	3a	13	1125	79
<i>Eucalyptus</i> tall woodland	2d,2e	2,5	1024	95
<i>Eucalyptus tessellaris</i> tall woodland	2b	12	2500	82
Low microphyll vine forest	1b	3	640	96

4.0 THE RESULTS OF THE ASSESSMENT OF DISTURBANCE

All the plant assemblages within the buffer zone were disturbed to some extent. This is a consequence of the size and architecture of zone in combination with soil disturbance and the opening up of some canopies which has facilitated the establishment of some particularly invasive exotic species. Additional problems are associated with the disturbance caused by massive earth works and low levels of maintenance on tracks, drainage lines and fire breaks.

4.1 Physical disturbance

Physical disturbance was associated with the construction of the smelter, subsequent minor track construction for access to bore holes and as fire breaks, and inappropriate recreational activities within the strand communities and the *E. citriodora* vegetation forms. Generally there has been no attempt to mitigate the impact of the disturbance or limit future disturbance.

Physical disturbance on the point at the mouth of South Trees Inlet (Plate 1) is degrading the vegetation forms present and may soon make the area susceptible to wind erosion. Vehicle tracks across and behind the dunes (Plates 2 and 3) have the potential to provide foci for wind blows. This land falls within *Erosion Prone Area Plan SC 3379 D 3-12-1984* prepared by the Beach Protection Authority of Queensland under the *Beach Protection Act 1968-1990*. As such, under section 43 of the act, Boyne Smelters Ltd should, at their own cost, protect such lands from wind erosion. The exclusion of vehicles from the land above the high tide mark in conjunction with some minor remediation work could prevent more serious degradation.

The construction of tracks for drill rig access, particularly on the siliceous sands to the east of the haul road have breached the natural plant communities - changing the light environment, drainage patterns, and removing protection from winds and salt spray.



Plate 1: Uncontrolled 4WD activity and camping adjacent to South Trees Inlet have fragmented the plant assemblages and destabilised the dune.



Plate 2: Repeated four wheel driving access to frontal dunes has destroyed the protective strand vegetation and exposed the adjacent low microphyll vine thicket to wind, aeolian sand and increased salt spray.



Plate 3: Aeolian sand from a small blow-out, developing behind the mouth of the track in Plate 2, is invading and smothering the low microphyll vine thicket it formerly protected.

The fire break tracks on the duplex soils of the adjacent hills are a potential problem. Earlier landuse has resulted in a severe erosion gully in a minor drainage line - demonstrating the erosive potential of the soils. The fire break tracks (Plate 4) take no account of the erosive nature of the soil and their extent and nature of construction will produce an ongoing and difficult management problem. Currently water is channelled along the track and this will increase erosion throughout these hills. The current use of these tracks for two and four wheel drive recreation and horse riding will compound the erosion risk and provide a conduit for the spread of weed species.

4.2 Exotic animals

Dogs and cats use the buffer zone but were not sighted during this study. Cane toads (*Bufo marinus*) were extremely abundant throughout the buffer zone. These species do not represent a threat to the vegetation and are discussed more fully in a subsequent report. No feral goats, cattle, horses or rabbits were seen. Horse riding does occur within the buffer zone. This represents a potential risk to subsequent management of the buffer zone as trampling may cause erosion on some soil types and weed species will be spread through horse manure.

4.3 Exotic plants

Twenty one percent of all species collected (55 of 261 species) within the buffer zone were exotic (see Appendix 3b). This high representation of introduced species reflects the architecture and the extent of physical disturbance within the buffer zone. Where roads, tracks and bicycle paths have been constructed, weeds have been able to invade along the zones of soil disturbance and in the canopy gaps where sufficient light allows exotics to outcompete native species. Of these, 14 species were well established across a number of communities. These were *Passiflora suberosa* var. *suberosa* (Corky passion flower) 61% of sites, *Lantana camara* (Lantana) 44% of sites, *Melinis repens* (Red Natal grass) 33% of sites, *Opuntia stricta* (Prickly pear) 31% of sites, *Panicum maximum* var. *maximum* (Guinea grass) 31% of sites, *Cenchrus echinatus* (Mossman River grass) 25% of sites, *Cryptostegia grandiflora* (Rubber vine) 25% of sites, *Crotalaria pallida* (Streaked rattlepod) 22% of sites, *Solanum seaforthianum* (Brazilian nightshade) 19% of sites, *Tridax procumbens* (Tridax) 17% of sites, *Rivina humilis* (Coral berry) 17% of sites, *Salvia coccinea* (Red salvia) 17% of sites, *Sida cordifolia* (Flannel weed) 17% of sites, and *Passiflora foetida* (Stinking passion flower) 14% of sites. Of these *Lantana camara* (Lantana), *Cryptostegia grandiflora* (Rubber vine), (Plate 5) and *Panicum maximum* var. *maximum* (Guinea grass) (Plate 6) have the potential to displace species or alter the structure of the plant assemblages in which they occur. *Baccharis halimifolia* (Groundsel bush) and *Bryophyllum* spp. (Mother-of-millions) occurred at very few sites. Both these species, however, have the potential to dominate plant assemblages and exclude native species. The occurrence of exotic species within the map units is identified in Appendix 3c.

The large number of weed species in the buffer zone is a reflection of the extent and nature of disturbance in the zone. Weed species are continually being introduced and spread through the movement of soils, sand and gravel, and on the machinery used to move the material. Domestic garden waste and rubbish as well as household amenity plantings are adding many, potentially serious, weed species to the buffer zone. Dealing with weed invasion will require a focused and persistent management effort

4.4 Nutrients

Apparent overflows or leakages from the Boyne Island sewage treatment plant (see Fig. 1) in combination with soil excavation and canopy removal have facilitated the invasion and vigorous development of a wide range of herbaceous weeds. Of particular significance are the dense stands of *Panicum maximum* var. *maximum* (Guinea grass) which exclude native ground stratum species, prevent regeneration of upper and midstorey species and provide a large potential fuel load adjacent to vegetation forms which would have a very low fire frequency.

4.5 Fire

Fire is a normal part of the Australian environment and can be considered a natural disturbance. Within a disturbed landscape, however, fire can be the agent of significant change in vegetation structure and floristic composition. Too frequent burning in the *E. citriodora* tall woodlands (map units 2c and 2d) may reduce the density of the mid stratum. Fire in the *E. tessellaris* woodlands (map units 2a and 2b) will reduce or remove the littoral rainforest species from the mid and ground stratum possibly preventing the low microphyll vine thickets from expanding. The low microphyll vine thickets (map units 1a and 1b) are sensitive to fire. The presence of *Panicum maximum* var. *maximum* (Guinea grass) along the disturbed edges of these forms increases the fire risk and provides a significant risk to the integrity of these vine thickets. At the same time fire creates an environment favourable to the spread and dominance of *Panicum maximum* var. *maximum* (Guinea grass).

4.6 Fluoride

Fluoride emissions have had a significant impact on the vegetation of the buffer zone. Past management of some of these impacts may have increased the intensity of the impact on the plant communities. The species composition and structure of the vegetation forms affected by fluoride emissions have changed during the life of the smelter. Fluoride sensitive species have declined in favour of fluoride resistant species. The opening of the canopy in the *Eucalyptus* communities and the decline in vigour of *Xanthorrhoea latifolia* subsp. *latifolia* has been matched by an increase in the importance of grasses in the ground stratum. Unquantified observations of these changes from 1979 to 1993 are recorded in the unpublished reports of Dr D. Doley, held by Boyne Smelters Ltd. The extent of these disturbances has apparently declined as the fluoride output declined. The imminent expansion of smelter production will see an increase in the extent of the fluoride damage to the smelter buffer zone.

During the 1979 to 1993 life of the smelter management of the buffer zone involved, in part at least, the felling and removal of fluoride affected trees. It is likely that this management approach (now apparently discontinued) would have facilitated the invasion of the buffer zone by grasses and other weed species. Furthermore this process may have impeded the succession of fluoride resistant native species. If the canopy of fluoride sensitive species is allowed to decline slowly then fluoride resistant species may have time to expand and hence excluding weed species.

There appears to be a number of fluoride resistant species occurring naturally within the buffer zone. Doley identified a number of these in the *Eucalyptus* woodland/forest assemblages adjacent to the smelter. His observations do not include the low microphyll vine forest/thicket or the majority of vine forest associated with the *Eucalyptus tessellaris* tall woodlands. Our general observations suggest that the vine forest canopy trees (*Cupaniopsis anacardioides*, *Pleiogynium timorense*, *Jagera pseudorrhus*) appeared little affected by fluoride strike. In particular *Jagera pseudorrhus* may be expanding into adjacent disturbed areas. If the vine forest species are resistant to fluoride then appropriate management of fire and weeds could see the expansion of forms of the low microphyll vine forest. Doley (1986) confirms the fluoride tolerance of some of these species and species from the other plant assemblages as well. Although there are many species on the buffer zone whose fluoride sensitivity is not known it seems likely that with further trials, careful observation and strategic management of fire and weeds, locally occurring species will fill the gaps left by the fluoride sensitive species.

5.0 THE REGIONAL SIGNIFICANCE OF THE PLANTS AND ECOLOGICAL COMMUNITIES WITHIN THE BUFFER ZONE

No rare, threatened, vulnerable or restricted species were collected from the buffer zone. The plant assemblage - low microphyll vine thicket and the related forms (map units 1a, 1b, 2a, 4b and possibly 5a) is, however, significant at a regional, state and national level. Low microphyll vine thickets and forests



Plate 4: Fire break in *E. citriodora* tall woodland. In many areas the break is cut below the land surface and has the potential to channel rainfall, concentrating flow and increasing the risks of erosion.



Plate 5: *Cryptostegia grandiflora* (Rubber Vine) is common in the plant assemblages on the stranded beach ridges. In places, as here in a *Casuarina glauca* woodland, it forms dense stands capable of smothering the native vegetation.

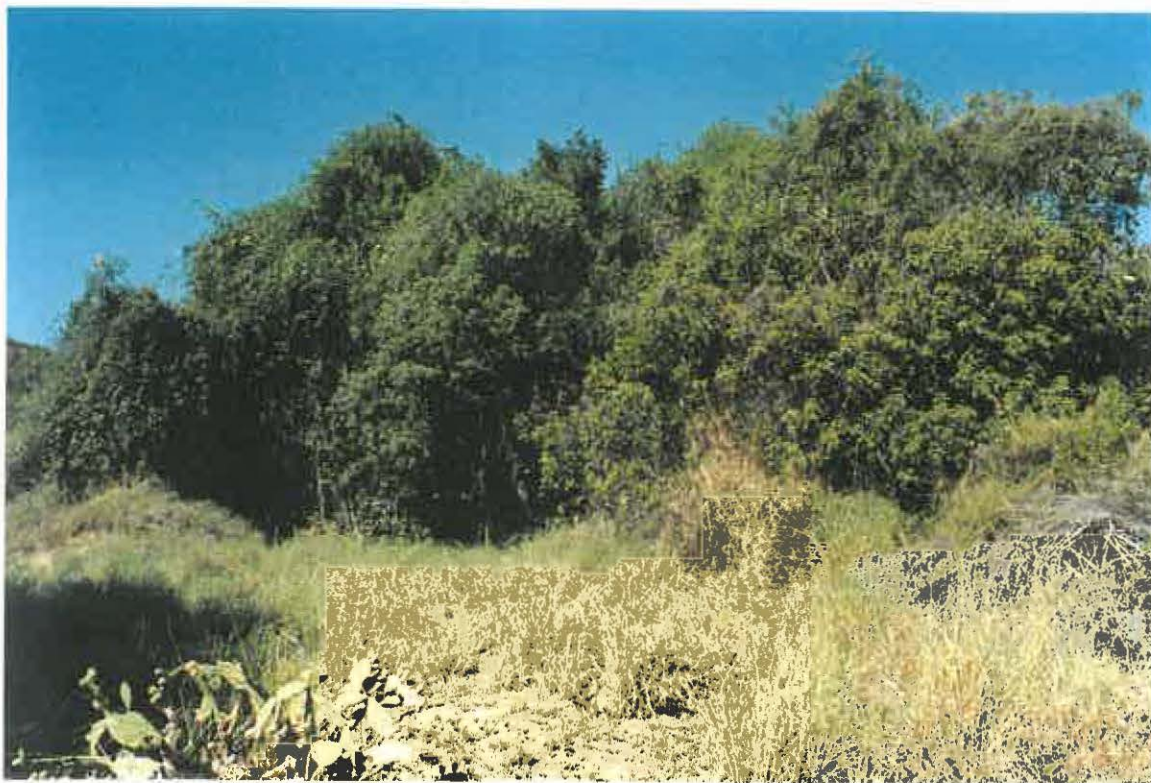


Plate 6: *Panicum maximum* var. *maximum* (Guinea Grass) dominates disturbed ground to the edge of the canopy of the low microphyll vine thicket. This grass assemblage brings the risk of fire to the edge of the vine thicket and also provides a seed source to colonise any breach in the canopy. Note *Opuntia stricta* (Prickly Pear) on bottom left of photo.

7.0 CONCLUSIONS

The undeveloped natural lands surrounding the Boyne Island smelter are in a largely natural state. Although there appear to have been changes in community structure due to fluoride effects, particularly on the *Eucalyptus* assemblages, the natural processes appear to be still operating. In the mosaic of vegetation assemblages on the siliceous sands and saline muds on the eastern sector of the buffer zone, these processes are exemplified by the apparent expansion of low microphyll vine forest species into surrounding *Eucalyptus* and *Allocasuarina* woodlands. In the *Eucalyptus* assemblages on the podsollic soils, fire appears to be a determining process in the structure of the vegetation forms present.

These natural lands, however, are disturbed and weed invasion is widespread. The contribution of weed species to the floristic composition of the site is high and largely a result of physical disturbance and the movement of soil and fill in conjunction with the fluoride associated thinning of the canopy. These impacts are still manageable and with care the natural processes can be maintained.

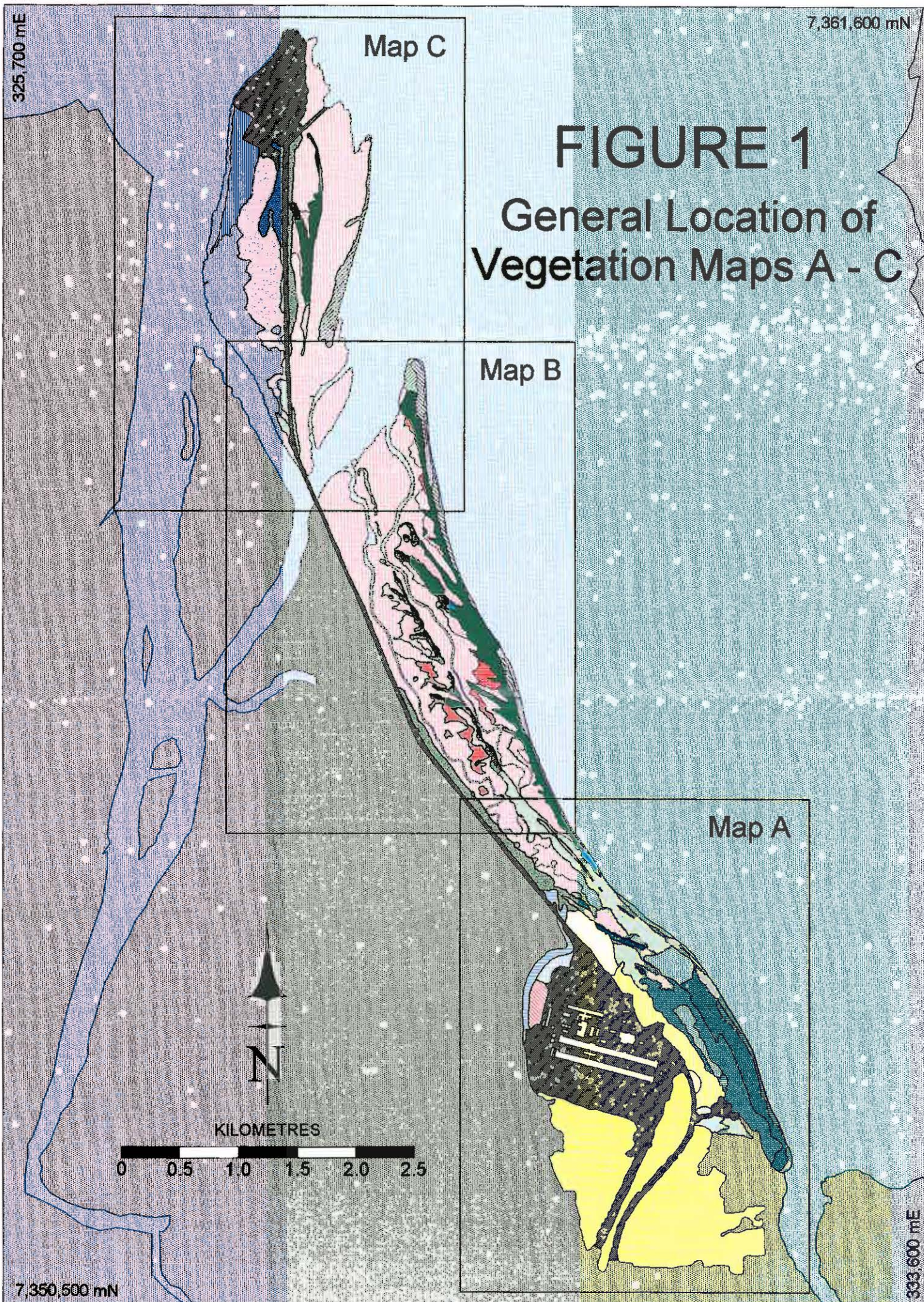
Although no rare, threatened or vulnerable plants were found within the buffer zone, the assemblages formed by some of these plants constitute a community (low microphyll vine forest) which is nationally significant and poorly conserved. This community should be managed in such a way as to protect the integrity of the vine forest and to maintain the normal successional processes in adjoining plant assemblages.

Integral to the sustainable management of the low microphyll vine forest is the retention of the strand woodlands and grasslands. These assemblages stabilise the beach ridges along the active coast, providing a barrier against salt spray and allowing subsequent colonisation of the beach ridges by other, less salt tolerant species. The strand communities are sensitive to disturbance from camping, vehicle tracks and excessive frequent trampling. This disturbance is closely linked to recreation and may form foci for wind erosion (blowout). Boyne Smelters Ltd has a duty of care under section 43 of the Beach Protection Act 1968 - 1990.

Despite the operational history of Boyne Smelters, the relative integrity of the plant assemblages around the smelter suggests that monitoring of future changes within these assemblages by comparison with related assemblages remote from the smelter (control site) would produce meaningful results.



BIBLIOGRAPHY

- Anon. (1994) *Queensland vascular plants: names and distribution*. Queensland Herbarium, Queensland Department of Environment and Heritage.
- Batianoff, G.N. and Elsol, J.A. (1989) *Vegetation of the Sunshine Coast: description and management*. Queensland Botany Bulletin 7. Department of Primary Industries, Queensland Government.
- Doley, D. (1986). *Plant-fluoride relationships: an analysis with particular reference to Australian vegetation*. Inkata Press, Melbourne.
- Gill, A.M., Groves, R.H. and Noble, I.R. (eds) (1981). *Fire and the Australian biota*. Australian Academy of Science, Canberra.
- Gillison, A.N. (1987) *The 'dry' rainforests of Terra Australis*. In *The rainforest legacy. Australian National Rainforest Study, vol. 1, The nature, distribution and status of rainforest types*, pp. 305-321. Special Australian Heritage Publication Series 7 (1), Australian Heritage Commission, Australian Government Publishing Service, Canberra.
- Kent, M. and Coker, P. (1992) *Vegetation description and analysis: a practical approach*. CRC Press Inc., Florida.
- Kitching, R. (ed.) (1988). *Ecology of Australia's wet tropics. Proceedings of the Ecological Society of Australia*, 15. Surrey Beatty and Sons, Chipping Norton, New South Wales.
- Landsberg, J. and Wylie, F.R. (1983). Water stress, leaf nutrients and defoliation: a model of dieback of rural eucalypts. *Australian Journal of Ecology*, 8, pp. 27-41.
- Melzer, R. (1993) *Rainforests of the Central Coast Region*. Unpublished report, Queensland Department of Environment and Heritage.
- Melzer, R. (1994) *A system for the collection of site data in the Central Coast Region*. Unpublished report, Queensland Department of Environment and Heritage.
- Purdie, R.W. and Slatyer, R.O. (1976). Vegetarian succession after fire in sclerophyll woodland communities in south-eastern Australia. *Australian Journal of Ecology*, 1, pp. 223-236.
- Saunders, D.A., Hopkins, A.J.M. and How, R.A. (eds) (1990). *Australian ecosystems: 200 years of utilisation, degradation and reconstruction. Proceedings of the Ecological Society of Australia*, 16. Surrey Beatty and Sons, Chipping Norton, New South Wales.
- Specht, R.L. (1970) *Vegetation*. In *The Australian Environment* (4th edition) (ed. G.W. Leeper) pp. 44-67. CSIRO, Melbourne University Press, Melbourne, Victoria.
- Walker, J. and Hopkins, M.S. (1990) *Vegetation*. In : *Australian soil and land survey field handbook* (2nd edition) (eds R.C. McDonald, R.F. Isbell, J.G. Speight, J. Walker & M.S. Hopkins) pp. 58-77. Inkata Press, Melbourne.
- Webb, L.J. (1978) *A general classification of Australian Rainforests*. *Australian Plants*, 9, pp. 349-363.
- Young, P.A.R. and McDonald, W.J.F. (1987) *The distribution, composition and status of the rainforests of southern Queensland*. In *The rainforest legacy. Australian National Rainforest Study, vol. 1, The nature, distribution and status of rainforest types*, pp. 119-141. Special Australian Heritage Publication Series 7 (1), Australian Heritage Commission, Australian Government Publishing Service, Canberra.














VEGETATION MAP UNIT KEY - CLASSIFIED INTO STRUCTURAL/FLORISTIC GROUPS



1 Rainforest Dominated Communities

-  1a Low Microphyll Vine Forest
-  1b Low Microphyll Vine Forest with emergent *Eucalyptus tessellaris*




2 Eucalypt Dominated Communities

-  2a *Eucalyptus tessellaris* Tall Woodland with understorey of Low Microphyll Vine Forest / Low Microphyll Vine Thicket
-  2b *Eucalyptus tessellaris* Tall Woodland with mid stratum of shrubs and grassy ground stratum
-  2c *Eucalyptus citriodora* Very Tall / Tall Woodland with mid stratum of *Allocasuarina leuhmannii* / *Allocasuarina torulosa* and grassy ground stratum
-  2d *Eucalyptus citriodora* Tall Woodland with shrub mid stratum and grassy ground stratum
-  2e *Eucalyptus exserta* / *E. crebra* Tall Woodland with mid stratum of shrubs and grassy ground stratum
-  2f *Eucalyptus exserta* / *E. clarksoniana* Tall Woodland with mid stratum of shrubs and grassy ground stratum
-  2g *Eucalyptus tereticornis* / *Lophostemon suaveolens* Tall Open Forest / Woodland with grassy ground stratum
-  2h *Eucalyptus tereticornis* Tall Open Woodland with dense small tree and shrub mid stratum, and grassy ground stratum
-  2i *Eucalyptus tereticornis* Tall Very Open Woodland with dense grass and forb ground stratum
-  2j *Eucalyptus tereticornis* / *Melaleuca dealbata* Tall Forest / Open Forest with very sparse understorey
-  2k Mid-high Woodland of immature eucalypts, small trees and shrubs with sparse ground stratum of grasses and forbs




3 Melaleuca Dominated Communities

-  3a *Melaleuca dealbata* / *Casuarina glauca* Very Tall Closed Forest / Forest with very sparse understorey
-  3b *Melaleuca dealbata* / *Eucalyptus tereticornis* Tall Open Forest with sparse understorey



4 Casuarina Dominated Communities

-  4a *Casuarina glauca* Tall / Mid-high Forest / Open Forest / Woodland with *Sporobolus virginicus* ground stratum
-  4b *Casuarina equisetifolia* Tall Forest / Open Forest with understorey of Low Microphyll Vine Forest / Low Microphyll Vine Thicket and strand vegetation
-  4c *Casuarina equisetifolia* Tall Forest / Open Forest with sparse ground stratum of grasses and herbaceous vines

5 Communities Dominated by Low Trees and Shrubs

-  5a *Cupaniopsis anacardioides* / *Acacia aulacocarpa* Mid-high Open Woodland
-  5b Very Tall *Acacia* Shrubland
-  5c Closed / Open Shrubland




6 Grasslands

-  6a Open Grassland +/- emergent *Casuarina equisetifolia*
-  6b *Spinifex sericeus* Open Grassland

7 Vegetation of Streambanks and Drainage Areas

-  7 Vegetation of streambanks and drainage areas

8 Littoral Communities

-  8a Mangrove Communities
-  8b Saltmarsh Communities
-  8c Saltflats

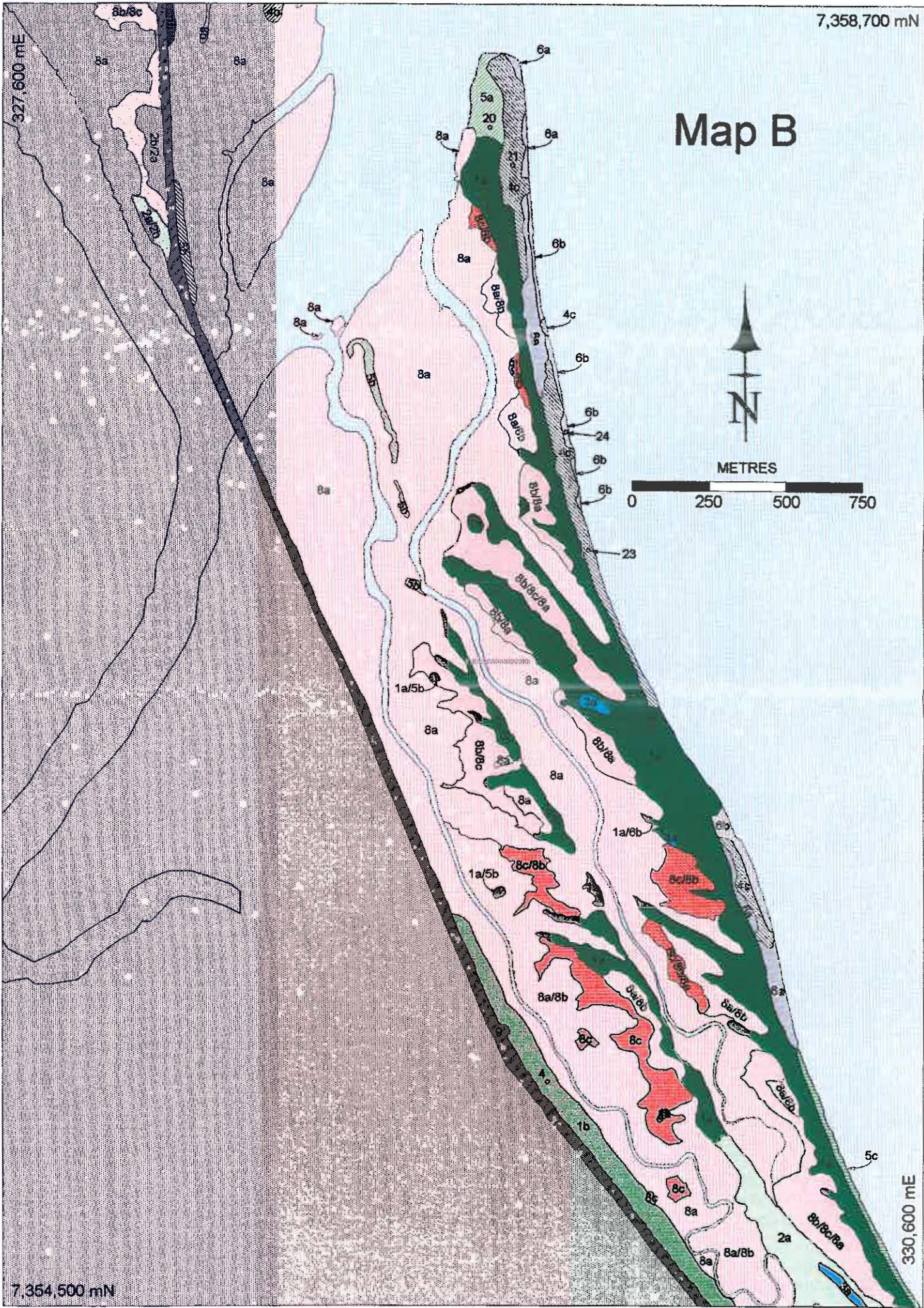
9 Highly Disturbed Areas

-  9 Highly disturbed areas

Sampling Sites

-  21 Vegetation Sampling Site



[illegible][illegible]

Map B

327,600 mE

330,600 mE

7,354,500 mN

7,358,700 mN

0 250 500 750 METRES

N

Map B

327,600 mE

330,600 mE

7,354,500 mN

7,358,700 mN

0 250 500 750 METRES

N

Map B

327,600 mE

330,600 mE

7,354,500 mN

7,358,700 mN

0 250 500 750 METRES

N

Map B

327,600 mE

330,600 mE

7,354,500 mN

7,358,700 mN

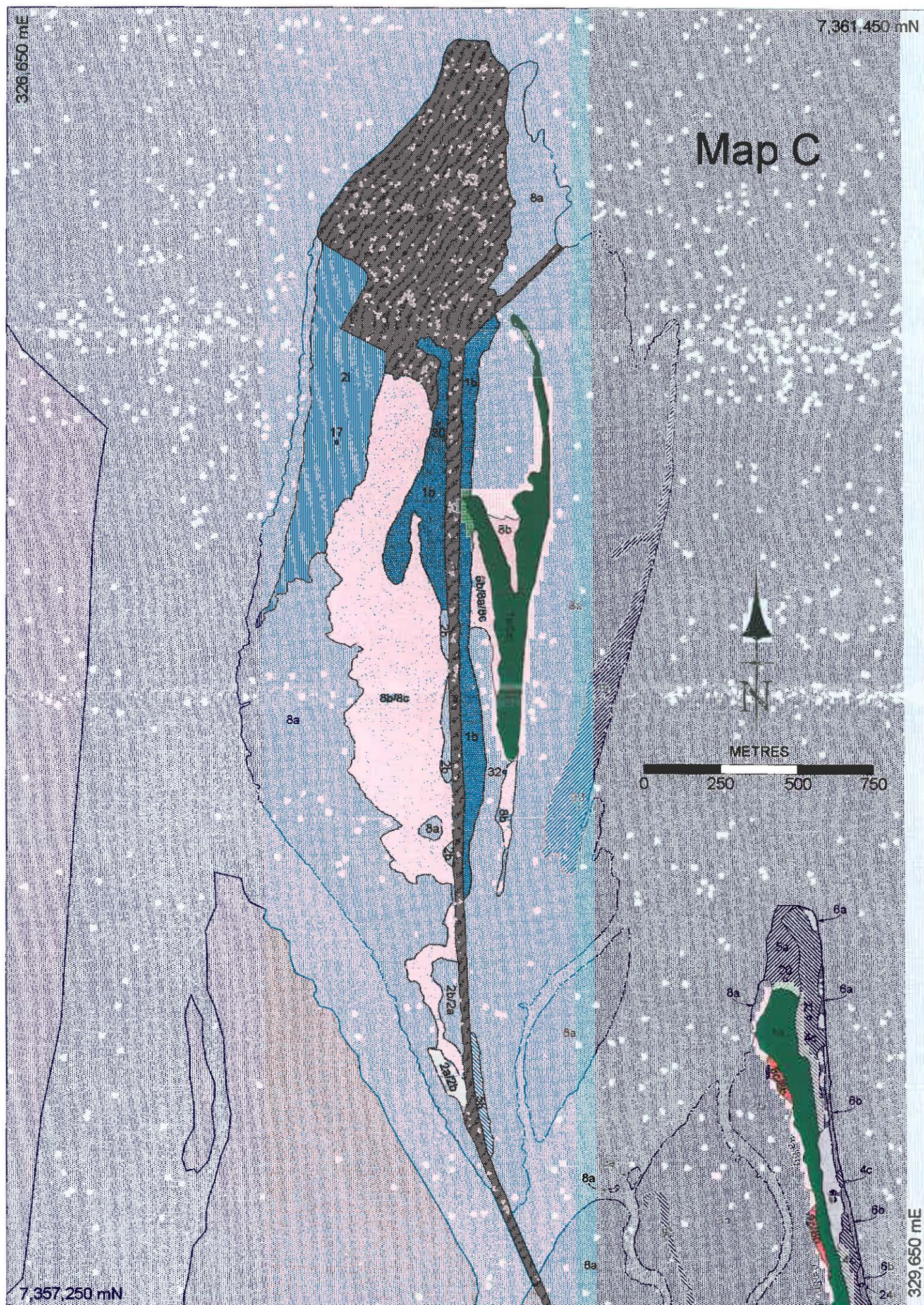
0 250 500 750 METRES

N

[illegible]

7,361,450 mN

Map C



are of restricted distribution occurring in small stands along 240 km of coast from the Tropic of Capricorn to the Bundaberg region (Young and McDonald 1987). Their ecology is poorly understood (Gillison 1987) and they are very poorly represented in nature conservation reserves (Melzer 1993). These littoral rainforests are extensively affected by ongoing coastal development and, in 1991 at least, a total of only 22 ha was conserved in Central Queensland (Melzer 1993). The presence of this community within the buffer zone provides Boyne Smelters Ltd with an opportunity to demonstrate the sustainable management of a plant community of high conservation value outside of the formal nature conservation system.

Although the other forests, woodlands and grasslands are not considered to be of significant conservation value at a regional, state or national level, they are highly significant at a local level. The complex of relatively undisturbed vegetation, in conjunction with adjoining land under local government control, has been isolated by ongoing industrial and urban development. These natural lands provide:-

- a buffer between the industrial and residential zones on Boyne Island,
- an aesthetic and recreational asset to the local community, and
- a reserve of native flora and fauna within a highly alienated environment.

The grassland assemblage (map units 6a,6b) and forms of the *Casuarina* woodland/forest assemblage (map units 4b,4c) constitute the beach strand community. According to Conservation Officers of the Department of Environment and Heritage this community is well represented within regional conservation reserves. It is, however, extremely vulnerable outside of these reserves being subject to degradation through mismanagement, coastal development and recreation (Batianoff and Elsol 1989). In this context the strand community within the buffer zone is a significant non-government reserve of this community and, as land controlled by Boyne Smelters Ltd, can be managed to avoid the degrading impacts identified by Batianoff and Elsol.

6.0 SPECIFIC QUESTIONS PERTAINING TO THE MANAGEMENT OF THE BUFFER ZONE

6.1 Haul road verges

The eastern verge of the haul road is mowed regularly to control grass growth and possibly to improve visibility. This practice encourages and maintains the presence of *Panicum maximum* var. *maximum* (Guinea grass) and other weed species along the edges of the low microphyll vine forests and the *Eucalyptus* assemblages. Where possible the haul road verge should be allowed to be recolonised by native woody species. Judicious spraying and reduced mowing will encourage seedling establishment and sucker regrowth. Woody species which grow towards the powerlines can be lopped back. It is, however, unlikely that the low microphyll vine forest species would grow sufficiently high to cause a problem at this location.

6.2 Minor tracks and bore access road

Revegetation should be encouraged in all cleared areas not needed for access. Revegetation should be with locally occurring native species. Generally fire should not be used unless it is followed up with selective spot spraying. Fire should not be used near any microphyll vine forests or related communities unless the repression of vine forest species is desired. Uncontrolled use of fire will promote the spread of weeds unless it is followed up with secondary management. Where possible roads and tracks should not be slashed or graded as this spreads weed species, particularly *Panicum maximum* var. *maximum* (Guinea grass). As much as possible a canopy should be retained or re-established over minor tracks and roads to limit weed growth.

6.3 Fire breaks

A fire break should be maintained between the residential areas and the buffer zone. Elsewhere formal fire breaks should not be maintained. All disturbed areas in the buffer zone should be encouraged to regenerate. Where fire breaks are retained they should be constructed so that they do not channel water. Weed management should be maintained along all fire break verges.

6.4 Fire management

All plant assemblages within the buffer zone contain fire sensitive species. In some assemblages (map units 1a,1b,2a,2b,4b) these species either dominate or contribute substantially to community structure. Even cool fires will affect the structure of these assemblages. The nature of the fire management regime depends on the desired vegetation structure and other management objectives such as vegetation density and fire risks to infrastructure. In principle, however, fire should be excluded from the low microphyll vine forests and related assemblages. In the *Eucalyptus* woodlands fire provides an effective management tool. The pattern of burning should be a mosaic reflecting local variations in topography and the desire to expand or reduce the extent and density of fire sensitive species.

South Trees Island (map unit 2i) requires special attention. The *Eucalyptus tereticornis* open woodland is heavily infested with *Panicum maximum* var. *maximum* (Guinea grass). Adjoining this unit is the most diverse stand of low microphyll vine forest in the buffer zone (a part of map unit 1a). The juxtaposition of this stand to the dense stands of *Panicum maximum* var. *maximum* (Guinea grass) presents a significant fire risk to the vine forest. Consequently these two assemblages must be managed together although each require separate specific management actions.

6.5 Trail bikes

Recreational trail bike use within the buffer zone degrades the zone by creating erosion or aggravating existing erosion problems. Trail bikes should be excluded from the buffer zone or confined to intensively managed purpose-built bike ways. Old bike tracks and associated erosion scars should be actively stabilised and revegetated. Trail bike riding appears to be a widespread recreational pursuit in the region. The imposition of access limits to the buffer zone may require the simultaneous development of an alternative venue for such activities or an active public education program.

6.6 Four-wheel drive vehicles

The use of four-wheel drive vehicles is mainly a feature of recreational access to the coast line. Despite council permitting access to the beach, vehicle damage to the foredunes is evident in places. Associated camping has degraded plant assemblages on the northern tip of the beach and breached the protective wind shear vegetation at a number of locations. Track access points onto the beach have the potential for degradation of the foredune and the microphyll vine thickets and swales through which they drive to access the beach. These vehicles also act as a dispersal agent for weed species which proliferate in the disturbed sand associated with tracks and camp sites. Domestic pets carried into the buffer zone may disturb or kill fauna. This, however, will be discussed further in a subsequent report.

6.7 Domestic rubbish disposal

Despite the aesthetic considerations the dumping of domestic rubbish has the potential to introduce highly destructive weeds to the buffer zone. Already *Bryophyllum* spp. (Mother-of-millions) is established in some dump areas. This plant has the potential to completely dominate the understorey of the *Eucalyptus* assemblages on podsolic soils. Weeds should be controlled on existing dumps and a public education program instigated to control further dumping of domestic rubbish on Boyne Smelters Ltd. land.

APPENDICES

Appendix 1

Site **BOYIJ01** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 22"S 151° 20' 4"E	Local authority	Calliope
Locality	End of track leading east from haul road just north of smelter park		
Site type	Site	Site area	400m ²
Date collected	Tuesday, 17 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0007 m	Aspect	S
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	sand		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Minor infestation of alien plant species		

Vegetation Type Eucalyptus tessellaris tall open woodland with a mid dense midstratum of low microphyll vine forest and a ground stratum of sedges and forbs			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	17.0	Very sparse	
Upper stratum			
Midstratum	8.0	Mid-dense	
Lower stratum			
Ground	0.7	Sparse	
Number of plant species		42	

General Notes photo1/1 - rubber vine infestation adjacent to site
photo 1/2 - site photo



←Photo 1/1



←Photo 1/2

Site **BOYIJ02** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 19"S 151° 20' 1"E	Local authority	Calliope
Locality	About half way along southern track from the haul road to the weather station on the SE side of the track		
Site type	Site	Site area	900m ²
Date collected	Tuesday, 17 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0015 m	Aspect	W
Landform:			
Pattern	Gently undulating rises		
Element	Hillcrest		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Crest		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance			

Vegetation Type Eucalyptus exserta/E. crebra tall woodland with a mid dense mid stratum of small trees & shrubs and a grassy ground stratum			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	15.0	Sparse	
Upper stratum	7.0	Mid-dense	
Midstratum			
Lower stratum			
Ground	1.0		
Number of plant species		65	

General Notes camera lens = 50 mm; square quadrat NNE & SSE from perm. monitoring point; photo 1/3 - 5m from pole - bearing of 90 degrees from perm. point - base of pole at centre of viewfinder; photo 1/4 - as 1/3 except top of pole at centre of viewfinder



←Photo 1/3



←Photo 1/4

Site **BOYIJ03** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 14"S 151° 19' 56"E	Local authority	Calliope
Locality	north of the track leading east from the haul road to pisometer, just to the north of the bridge over the drainage channel. Site is to the west of the fence		
Site type	Site	Site area	400m ²
Date collected	Wednesday, 18 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0005 m	Aspect	E
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	sand		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Minor infestation of alien plant species		

Vegetation Type low microphyll vine forest with emergent Eucalyptus tessellaris				
Strata	Height(m)	Foliage Cover	Classification Technique	
Emergents	17.0	Dense	Webb	
Canopy	11.0			
Upper stratum	4.0	Mid-dense		
Midstratum				
Lower stratum	0.3	Very sparse		
Ground				
Number of plant species 101				

General Notes square quadrat between 230 & 320 degrees from perm. monitoring point: Photo1/5 - bearing of 275 degrees from perm. point: photo 1/6 - ground stratum - same bearing but closer (4m from pole) as trees obscured view; 50 mm lens: photo1/7 - as for photo 1/6 but aimed at canopy



←Photo 1/5



←Photo 1/6



←Photo 1/7

Site **BOYIJ04** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 54' 23"S 151° 19' 21"E	Local authority	Calliope
Locality	east of haul road adjacent to post number 20, just in from the slashed edge		
Site type	Site	Site area	400m ²
Date collected	Wednesday, 18 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0005 m	Aspect	ENE
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Ridge		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Broken canopy and fallen trees - ? storm damage Major infestation of alien plant species - only on slashed edges (Guinea grass) and where canopy is open (Lantana)		

Vegetation Type low microphyll vine forest with emergent <i>Eucalyptus tessellaris</i>		
Strata	Height(m)	Foliage Cover
Emergents	19.0	Mid-dense
Canopy	12.0	
Upper stratum	5.0	Sparse
Midstratum		
Lower stratum		
Ground		
Number of plant species 35		

Classification Technique

Walker and Hopkins

General Notes photo 1/8 - area with disturbed canopy



←Photo 1/8

Site **BOYIJ05** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 34"S 151° 20' 32"E	Local authority	Calliope
Locality	Southern boundary of buffer zone east of Hadley Dr. on the western side of the track		
Site type	Site	Site area	2500m ²
Date collected	Thursday, 19 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0025 m	Aspect	NNW
Landform:			
Pattern	Undulating low hills		
Element	Hillslope		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Partial clearing-selective logging: older than 3 years Evidence of mid-stratum fire: older than 3 years Currently used extensively for recreational trail bike riding by local residents with resulting erosion problems		

Vegetation Type	Eucalyptus citriodora/E. crebra tall woodland with a sparse shrub midstratum and a grassy ground stratum		
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents	26.0		Walker and Hopkins
Canopy	18.0	Sparse	
Upper stratum	8.0	Very sparse	
Midstratum	2.0	Sparse	
Lower stratum	1.0	Very sparse	
Ground	0.3		
Number of plant species	56		

General Notes square quadrat between 245 & 335 degrees from perm. monitoring point; Photo 1/9 - bearing of 290 degrees, 5 m from pole - viewfinder aimed at base of the pole; photo 1/10 - as above viewfinder aimed at top of pole: 50mm camera lens



←Photo 1/9



←Photo 1/10

Site **BOYIJ06** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 5"S 151° 20' 32"E	Local authority	Calliope
Locality	South of smelter, west of Hadley Dr.		
Site type	Site	Site area	2500m ²
Date collected	Thursday, 19 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0025 m	Aspect	NNW
Landform:			
Pattern	Undulating rises		
Element	Hillslope		
Slope Class	Moderately inclined (5.75-18 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit	Fine sedimentary rocks		
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance	Very few (<2%)		
Size	Course gravelly (20-60mm)		
Disturbance	Partial clearing-selective logging: older than 3 years		
	Evidence of mid-stratum fire: older than 3 years		
	Intermittent use by trail bike riders		

Vegetation Type Eucalyptus citriodora very tall/tall woodland with mid-dense mid stratum of Allocasuarina leuhmanii /Acacia spp. & sparse ground stratum of grasses & Xanthorrhoea			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	20.0	Sparse	
Upper stratum	8.0	Mid-dense	
Midstratum	2.0	Very sparse	
Lower stratum			
Ground	0.3	Sparse	
Number of plant species		16	

General Notes photo 1/11 - site photo



←Photo 1/11

Site **BOYIJ07** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 5"S 151° 20' 30"E	Local authority	Calliope
Locality	South of smelter, west of Hadley Dr.		
Site type	Site	Site area	750m ²
Date collected	Friday, 20 January 1995		
Recorders	J. Brushe, C. Melzer, L. Childs		

Altitude	0015 m	Aspect	NNE
Landform:			
Pattern	Undulating rises		
Element	Gully		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Open depression		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance	Common (10-20%)		
Size	Course gravelly (20-60mm)		
Disturbance	Partial clearing-selective logging: older than 3 years		
	Minor infestation of alien plant species: including groundsel		
	Some earthworks adjacent to site		

Vegetation Type Eucalyptus citriodora tall woodland with sparse mid stratum of Acacia spp. & Melaleuca nervosa & dense ground stratum of Typha sp., sedges, grasses, forbs & ferns			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	15.0	Sparse	
Upper stratum	8.0	Sparse	
Midstratum			
Lower stratum	4.0		
Ground	1.0	Dense	
Number of plant species 53			

General Notes Photos 1/12 & 1/13 - site photos



←Photo 1/12



←Photo 1/13

Site **BOYIJ08** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 48"S 151° 20' 23"E	Local authority	Calliope
Locality	Adjacent to contractors car park		
Site type	Site	Site area	2500m ²
Date collected	Friday, 20 January 1995		
Recorders	J. Brushe, L. Childs		

Altitude	0015 m	Aspect	NE
Landform:			
Pattern	Rolling rises		
Element	Hillslope		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance	Few (2-10%)		
Size	Course gravelly (20-60mm)		
Disturbance	Erosion: on road and steep embankment		
	Evidence of upper mid-stratum fire:		

Vegetation Type Eucalyptus exserta/E. clarksoniana tall woodland with sparse mid strataum of Alphitonia excelsa/Petalostigma pubescens/Acacia spp. & sparse grassy ground stratum of predominantly Heteropogon contortus			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	15.0	Sparse	
Upper stratum	8.0	Sparse	
Midstratum			
Lower stratum	3.0	Very sparse	
Ground	1.0	Sparse	
Number of plant species		36	

Site **BOYIJ09** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 27"S 151° 20' 37"E	Local authority	Calliope
Locality	East of Hadley Dr., behind the houses		
Site type	Site	Site area	2500m ²
Date collected	Friday, 20 January 1995		
Recorders	J. Brushe, L. Childs		

Altitude	0025 m	Aspect	NNE
Landform:			
Pattern	Undulating rises		
Element	Hillslope		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance	Few (2-10%)		
Size	Course gravelly (20-60mm)		
Disturbance	Some trees had been cut down Evidence of canopy fire: 6 months - 3 years old		

Vegetation Type Eucalyptus citriodora/E. exserta tall woodland with sparse upper mid stratum of Allocasuarina torulosa/Allocasuarina leuhmanii/Lophostemon suaveolens/Melaleuca nervosa and very sparse ground stratum of grasses and Xanthorrhoea			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	18.0	Sparse	
Upper stratum	8.0	Sparse	
Midstratum			
Lower stratum	2.0	Sparse	
Ground	1.0	Very sparse	
Number of plant species 19			

General Notes Photo 1/14 - site photo



←Photo 1/14

Site**BOYIJ10****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 26"S 151° 20' 36"E	Local authority	Calliope
Locality	Adjacent to beach. Access via southernmost track heading east from haul road then walking east to beach or via beach road. 1 m E of track		
Site type	Site	Site area	2500m ²
Date collected	Saturday, 21 January 1995		
Recorders	L. Childs, C. Melzer		

Altitude	0005 m	Aspect	WSW
Landform:			
Pattern	Parrallel Dune Gently undulating plain		
Element	Dune		
Slope Class	Very gently inclined (0.5-1.75 degrees)		
Morph type	Ridge		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	sand		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Active erosion: by waves Minor infestation of alien plant species including Lantana camara		

Vegetation Type open grassland

Strata	Height(m)	Foliage Cover	Classification Technique
Emergents Canopy Upper stratum Midstratum Lower stratum Ground	1.0	Sparse	
Number of plant species 19			

General Notes Square quadrat placed between 45 & 135 degrees from perm. monitoring point; photo 1/17
 - site photo; photo 1/15 - 5m from perm. monitoring point - bearing of 90 degrees:
 camera lens = 50mm



←Photo 1/15



←Photo 1/17

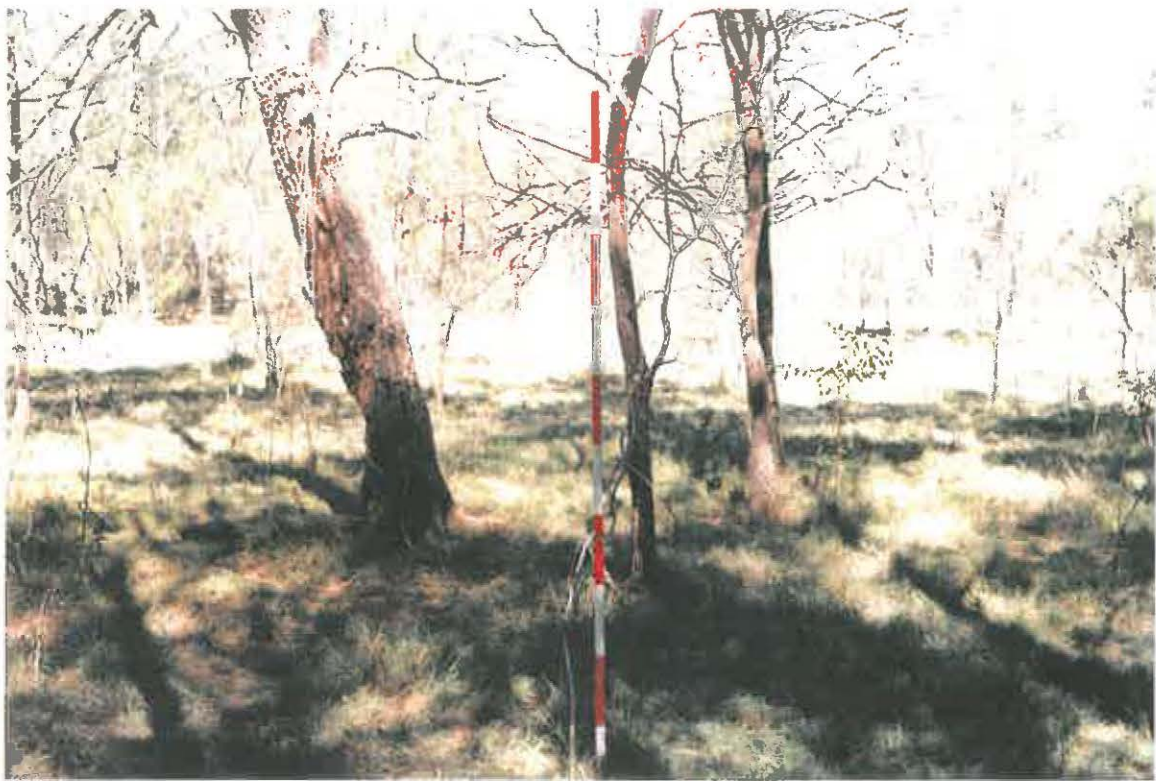
Site **BOYIJ11** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 25"S 151° 20' 24"E	Local authority	Calliope
Locality	NNW corner of salt flats to the east of the southernmost track heading eastwards from the haul road;		
Site type	Site	Site area	2600m ²
Date collected	Saturday, 21 January 1995		
Recorders	L. Childs, C. Melzer		

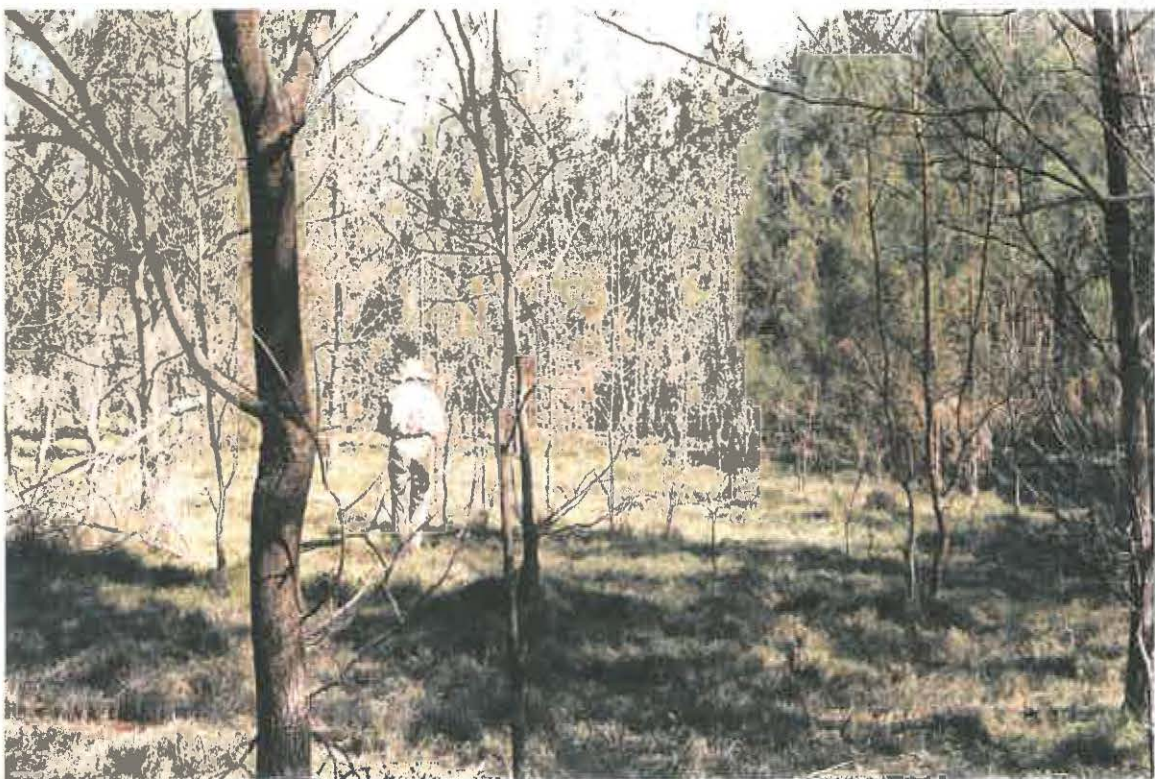
Altitude	0003 m	Aspect	Not Applicable
Landform:			
Pattern	Tidal Flat Level plain		
Element	Plain		
Slope Class	Level (<0.5 degrees)		
Morph type	Flat		
Geology:			
Corveg unit			
Map unit	Coastal tidal flats, mangrove flats, supratidal flats and grasslands - sand and mud.		
Soil:			
Group	silty soil		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Salinity Minor infestation of rubber vine		

Vegetation Type Casuarina glauca tall woodland with a sparse midstratum of juvenile Casuarina glauca and a dense ground stratum of Sporobolus virginicus			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	13.0	Sparse	
Upper stratum			
Midstratum	5.0	Sparse	
Lower stratum	1.0	Very sparse	
Ground	0.3	Dense	
Number of plant species		15	

General Notes 60 m X40 m quadrat between 35 & 125 degrees from the perm. monitoring point: Camera lens = 50 mm; photo 1/18 - site photo; photo 1/19 - taken 5 m from pole (? f80 degree bearing from perm. monitoring point)



←Photo 1/18



←Photo 1/19

Site **BOYIJ12** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 39"S 151° 20' 39"E	Local authority	Calliope
Locality	track heading west from main track to contractors car park		
Site type	Site	Site area	2500m ²
Date collected	Sunday, 22 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0008 m	Aspect	
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Very gently inclined (0.5-1.75 degrees)		
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	INumerous dead trees and tall shrubs - ? cause		

Vegetation Type Eucalyptus tessellaris tall woodland with a mid dense midstratum of juvenile E. tessellaris, Alphitonia excelsa, Acacia aulacocarpa, Turraea pubescens & other littoral rainforest species

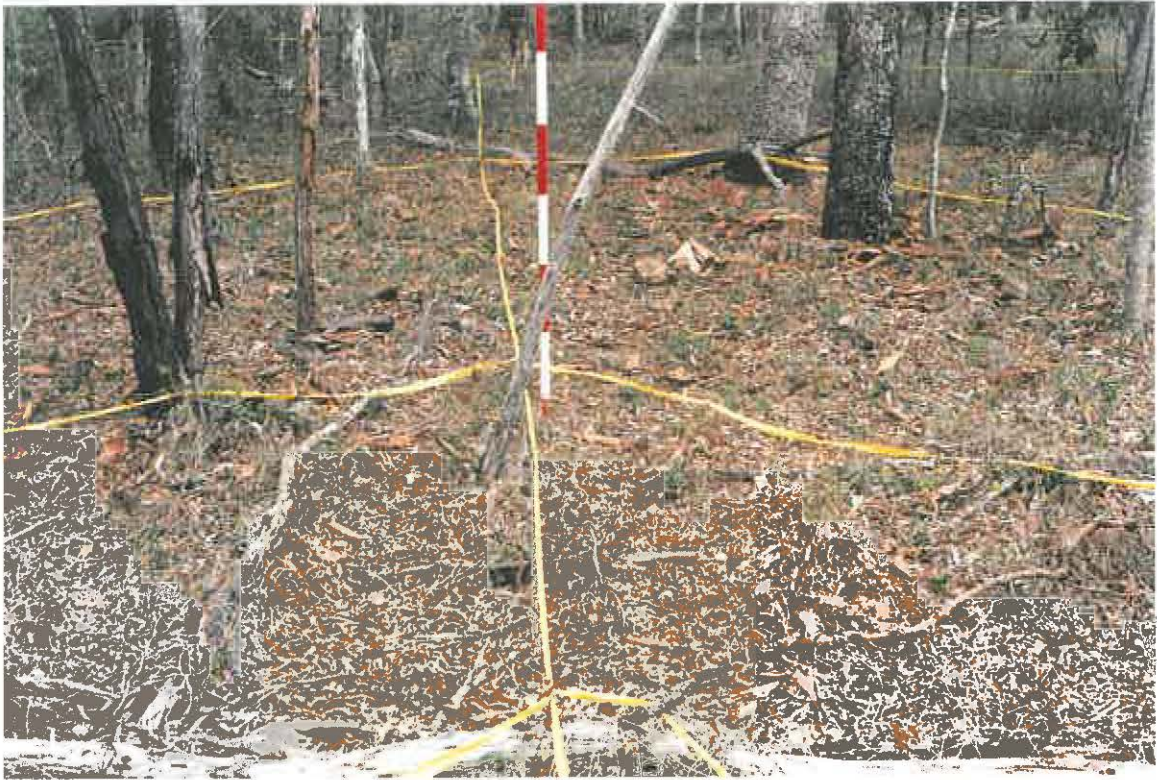
Strata	Height(m)	Foliage Cover
Emergents	22.0	
Canopy	18.0	Sparse
Upper stratum	10.0	Mid-dense
Midstratum	2.0	Very sparse
Lower stratum		
Ground		Sparse

Classification Technique

Walker and Hopkins

Number of plant species 80

General Notes square quadrat between 300 & 30 degrees from perm. monitoring point; photos 1/20 (ground stratum) & 1/21 (canopy) - bearing of 345 degrees from perm. monitoring point, 5m from pole: camera lens = 50 mm



←Photo 1/20



←Photo 1/21

Site**BOYIJ13****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 42"S 151° 20' 50"E	Local authority	Calliope
Locality	eastern side of main track between sewage works and turn off to contractors car park just south of turnoff to contractors car park		
Site type	Site	Site area	2450m ²
Date collected	Sunday, 22 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude 0004 m **Aspect** WNW

Landform:

Pattern Beach Ridge Gently undulating plain
Element Swale
Slope Class Very gently inclined (0.5-1.75 degrees)
Morph type Open depression

Geology:

Corveg unit
Map unit Beach ridge - sand

Soil:

Group Sands

Colour
Texture

Fragments:

Abundance
Size

Disturbance Minor infestation of rubber vine
 Evidence of mid-stratum fire:

Vegetation Type tall *Melaleuca dealbata*/*Casuarina glauca* closed forest with a sparse ground stratum of grasses

Strata	Height(m)	Foliage Cover
Emergents		
Canopy	20.0	Dense
Upper stratum	12.0	Sparse
Midstratum		
Lower stratum		
Ground	0.3	Sparse

Classification Technique

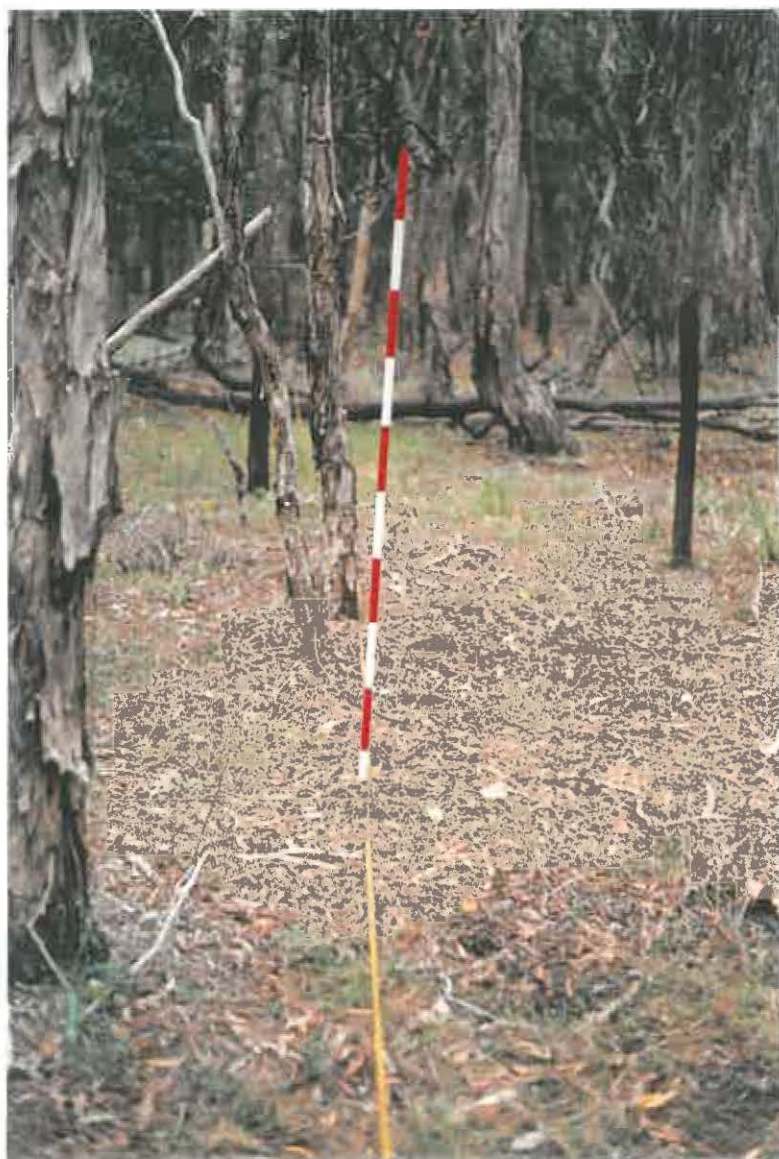
Walker and Hopkins

Number of plant species 37

General Notes rectangular quadrat parallel to swale between 50 degrees and 140 degrees from perm. monitoring point; photo 1/22 - fungi in site; photo 1/23 - 5m from pole - bearing of 95 degrees from perm. point - ground stratum; photo 1/24 - as 1/23 for canopy; photo 1/25 - view along swale



←Photo 1/22



←Photo 1/23



←Photo 1/24



←Photo 1/25

Site **BOYIJ14** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 39"S 151° 20' 43"E	Local authority	Calliope
Locality	adjacent to (north of) track heading west from main track to contractors car park		
Site type	Site	Site area	1225m ²
Date collected	Monday, 23 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	Not Applicable
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Swale		
Slope Class	Level (<0.5 degrees)		
Morph type	Open depression		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Minor infestations of ruber vine and guinea grass Evidence of fire Very large fallen tree creating a large canopy gap		

Vegetation Type Melaleuca dealbata /Eucalyptus tereticornis tall open forest with sparse mid stratum of Ficus racemosa, Lophostemon suaveolens/Acacia aulacocarpa & littoral rainforest species and sparse grassy ground stratum of predominantly Imperata cylindrica & Passiflora suberosa			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	19.0	Mid-dense	
Upper stratum	11.0	Sparse	
Midstratum	6.0	Sparse	
Lower stratum		Very sparse	
Ground	0.5	Sparse	
Number of plant species		32	

General Notes Photo 2/1 - site photo



←Photo 2/1

Site **BOYIJ15** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 39"S 151° 20' 54"E	Local authority	Calliope
Locality	end of road to beach which heads east off main track from sewage treatment plant		
Site type	Site	Site area	2500m ²
Date collected	Monday, 23 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	
Landform:			
Pattern	Dune Undulating plain		
Element	Beach ridge		
Slope Class			
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	some destruction of vegetation due to camping and vehicle use, occasional weed (garden escape)		

Vegetation Type low microphyll vine forest with emergent <i>E. tessellaris</i> - canopy dominated by <i>Cupaniopsis anacardiodes</i> , <i>Polyalthia nitidissima</i> & <i>Drypetes deplanchii</i> and midstratum dominated by <i>Ixora queenslandica</i>			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents	18.0	Dense	
Canopy	14.0		
Upper stratum	3.0	Mid-dense	
Midstratum			
Lower stratum		Very sparse	
Ground			
Number of plant species		42	

General Notes Photos 2/2 & 2/3 - site photos



←Photo 2/2



←Photo 2/3

Site **BOYIJ16** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 57"S 151° 20' 50"E	Local authority	Calliope
Locality	just to the north of the sewage treatment plant		
Site type	Site	Site area	5000m ²
Date collected	Monday, 23 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	Not Applicable
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Depressions		
Slope Class	Level (<0.5 degrees)		
Morph type	Closed depression		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Site of previous excavations - ? sand extraction to a depth of approx 2 m. Lots of herbaceous weeds as would be expected in a disturbed site		

Vegetation Type closed herbland																							
<table border="1"> <thead> <tr> <th>Strata</th> <th>Height(m)</th> <th>Foliage Cover</th> </tr> </thead> <tbody> <tr> <td>Emergents</td> <td></td> <td></td> </tr> <tr> <td>Canopy</td> <td></td> <td></td> </tr> <tr> <td>Upper stratum</td> <td></td> <td></td> </tr> <tr> <td>Midstratum</td> <td></td> <td></td> </tr> <tr> <td>Lower stratum</td> <td></td> <td></td> </tr> <tr> <td>Ground</td> <td></td> <td></td> </tr> </tbody> </table>	Strata	Height(m)	Foliage Cover	Emergents			Canopy			Upper stratum			Midstratum			Lower stratum			Ground			Classification Technique	
Strata	Height(m)	Foliage Cover																					
Emergents																							
Canopy																							
Upper stratum																							
Midstratum																							
Lower stratum																							
Ground																							
Number of plant species 22																							

General Notes photos 2/4 & 2/5 - site photos



←Photo 2/4



←Photo 2/5

Site**BOYIJ17****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 51' 53"S 151° 18' 28"E	Local authority	Calliope
Locality	South of storage area/car park at loading facility on South Trees Island		
Site type	Site	Site area	5000m ²
Date collected	Monday, 23 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	Not Applicable
Landform:			
Pattern	Sand - Level plain		
Element	Plain		
Slope Class	Level (<0.5 degrees)		
Morph type	Flat		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	brown sandy soil		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Major infestation of alien plant species including Lantana, Prickly pear and Guinea grass Evidence of past land use - tree clearing, well, fruit trees		

Vegetation Type Eucalyptus tereticornis tall very open woodland with a very sparse lower canopy of young E. tereticornis, sparse upper mid stratum of Acacia aulacocarpa, sparse lower mid stratum of Lantana camara & juvenile rainforest species and dense ground stratum of grasses & weeds			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents			Walker and Hopkins
Canopy	18.0	Very sparse	
Upper stratum	13.0	Very sparse	
Midstratum	10.0	Sparse	
Lower stratum	4.0	Sparse	
Ground	1.0	Dense	
Number of plant species		37	

General Notes Photo 2/6 & 2/7 - site photos
Numerous grey kangaroos seen, bird life abundant



←Photo 2/6



←Photo 2/7

Site **BOYIJ18** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 5"S 151° 20' 50"E	Local authority	Calliope
Locality	area between sewage treatment plant and houses, west of bike path		
Site type	Site	Site area	2500m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0010 m	Aspect	NE
Landform:			
Pattern	Undulating rises		
Element	Hillslope		
Slope Class	Very gently inclined (0.5-1.75 degrees)		
Morph type	Lower slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group	powdery pale coloured soil		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	evidence of slashing, previous revegetation work and construction of fire breaks. Guinea grass prevalent adjacent to site on road edges and other sunny areas		

Vegetation Type Eucalyptus tereticornis tall open forest with very sparse shrub midstratum & very sparse grassy ground stratum			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	19.0	Mid-dense	
Upper stratum	11.0	Very sparse	
Midstratum	2.0	Very sparse	
Lower stratum			
Ground	0.2	Very sparse	
Number of plant species		37	

General Notes photo 2/8 - site photo looking NW
 Photo 2/9 - site photo looking SW



←Photo 2/8



←Photo 2/9

Site**BOYIJ19****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 56' 5"S 151° 20' 53"E	Local authority	Calliope
Locality	between sewage treatment plant and houses east of site 18 site included an area east of bike path as well as an area between bike path and houses.		
Site type	Site	Site area	400m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0007 m	Aspect	
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Very gently inclined (0.5-1.75 degrees)		
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Heavily disturbed with numerous canopy gaps and diminished regeneration, frequent fire in past, some minor weed invasion including naturalised exotic garden plants, past regeneration work including spraying of weeds with glycophosphate & construction of bike track & fire breaks		

Vegetation Type Eucalyptus tessellaris woodland with an understorey of low microphyll vine thicket

Strata	Height(m)	Foliage Cover
Emergents		
Canopy	17.0	Sparse
Upper stratum	7.0	Mid-dense
Midstratum	2.0	Very sparse
Lower stratum		
Ground	0.5	Very sparse

Classification Technique

Walker and Hopkins

Number of plant species 46**General Notes** photo 2/10 - site photo looking NE
photo 2/11 - site photo looking E



←Photo 2/10



←Photo 2/11

Site**BOYIJ20****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 42"S 151° 19' 20"E	Local authority	Calliope
Locality	western side of the spit at the mouth of the southern branch of South Trees Inlet		
Site type	Site	Site area	2500m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	W
Landform:			
Pattern	Dune Undulating plain		
Element	Dune		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour	Yellow		
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Intermittent use - vehicles & camping		

Vegetation Type Cupaniopsis anacardioides/Acacia aulacocarpa mid-high open woodland with very sparse mid stratum of littoral rainforest species and very sparse ground stratum of grasses, vines & forbs		
Strata	Height(m)	Foliage Cover
Emergents		
Canopy	7.0	Very sparse
Upper stratum		
Midstratum	2.0	Very sparse
Lower stratum		
Ground	0.5	Very sparse

Classification Technique

Walker and Hopkins

Number of plant species 30

General Notes Photo 2/12 - mistletoe on acacia Aulacocarpa
photo 2/13 site photo



←Photo 2/12



←Photo 2/13

Site **BOYIJ21** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 49"S 151° 19' 24"E	Local authority	Calliope
Locality	Dunes south of the spit at the mouth of the southernmost branch of South Trees Inlet		
Site type	Site	Site area	2500m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	
Landform:			
Pattern	Parrallel Dune Undulating plain		
Element	Dune		
Slope Class			
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Intermittent use - vehicles & camping		

Vegetation Type Eragrostis interrupta grassland with emergent Casuarina equisetifolia		
Strata	Height(m)	Foliage Cover
Emergents	8.0	Sparse
Canopy	0.2	
Upper stratum		
Midstratum		
Lower stratum		
Ground		
Number of plant species		23

General Notes red tailed black cocatoos feeding on Casuarina equisetifolia seeds adjacent to site

Site**BOYIJ22****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 53' 44"S 151° 19' 22"E	Local authority	Calliope
Locality	adjacent to beach approx 2 km S of spit at the mouth of southernmost branch of South Trees Inlet		
Site type	Site	Site area	2500m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0007 m	Aspect	
Landform:			
Pattern	Dune Gently undulating plain		
Element	Beach ridge		
Slope Class			
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	numerous fallen trees lying within & parallel to swales - ? flood damage due to tidal surges		

Vegetation Type low microphyll vine forest dominated by *Cupaniopsis anacardiodes*, *Polyalthia nitidissima*, *Exocarpos latifolius* & *Drypetes deplanchii*

Strata	Height(m)	Foliage Cover
Emergents		
Canopy	15.0	Dense
Upper stratum		
Midstratum	4.0	Mid-dense
Lower stratum		
Ground		Very sparse

Classification Technique

Webb

Number of plant species 42**General Notes** Photo 2/14 - site photo



←Photo 2/14

Site **BOYIJ23** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 49"S 151° 19' 22"E	Local authority	Calliope
Locality	adjacent to beach approx 1.5 km south of the spit at the mouth of the southernmost branch of South Trees Inlet		
Site type	Site	Site area	2400m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	NNW
Landform:			
Pattern	Parrallel Dune Undulating plain		
Element	Dune		
Slope Class			
Morph type	Open depression		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance			

Vegetation Type Casuarina equisetifolia tall closed forest with very sparse midstratum of predominantly juvenile C. equisetifolia and sparse ground stratum of grasses & vines			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents	13.0	Dense	
Canopy			
Upper stratum	4.0	Very sparse	
Midstratum			
Lower stratum			
Ground		Sparse	
Number of plant species 38			

General Notes rectangular quadrat 105 X16m between 340 & 70 degrees from perm. monitoring point parallel to swale. Photo 2/15 - 8m (half way) along the 70 degree baseline - bearing of 340 degrees - 5m from Nathan - ground stratum; Photo 2/16 as 2/15 - canopy; Camera lens 50mm; Nathans height - 180 cm



←Photo 2/15



←Photo 2/16

Site **BOYIJ24** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 53' 20"S 151° 19' 31"E	Local authority	Calliope
Locality	Foredunes approx 1.5 km S of spit at the mouth of the southernmost branch of South Trees Inlet		
Site type	Site	Site area	2500m ²
Date collected	Tuesday, 24 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0004 m	Aspect	ENE
Landform:			
Pattern	Parrallel Dune Undulating plain		
Element	Foredune		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Intermittent vehicle use Wind & wave erosion Salt spray		

Vegetation Type mid-high Spinifex sericeus open grassland		
Strata	Height(m)	Foliage Cover
Emergents Canopy Upper stratum Midstratum Lower stratum Ground	0.3	Sparse
Number of plant species 5		

Classification Technique

Walker and Hopkins

General Notes rectangular quadrat between 70 & 160 degrees from perm. monitoring point - long side of rectangle along 160 degree baseline; photo 2/17 - 5 m from Nathan - bearing of 115 degrees - viewfinder aimed at feet; photo 2/18 as 2/17 - viewfinder aimed at waist; Nathan = 80cm; camera lens = 50 mm



←Photo 2/17



←Photo 2/18

Site **BOYIJ25** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 19"S 151° 20' 1"E	Local authority	Calliope
Locality	North of revegetated area between smelter and spillway channel bank road		
Site type	Site	Site area	2500m ²
Date collected	Wednesday, 25 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0015 m	Aspect	NNE
Landform:			
Pattern	Gently undulating rises		
Element	Hillslope		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group	fine grey/whitish clay		
Colour			
Texture			
Fragments:			
Abundance	Few (2-10%)		
Size	Medium gravelly (6-20mm)		
Disturbance	Evidence of mid-stratum fire: older than 3 years Trees have been cut down in the past Most plants adversely affected by smelter emmissions particularly eucalypts & Xanthorrhoeas		

Vegetation Type Eucalyptus tereticornis tall woodland with mid dense upper mid stratum of Lophostemon suaveolens/ Melaleuca nervosa/Petalostigma pubescens/Alphitonia excelsa & sparse ground stratum of grasses & Xanthorrhoea

Strata	Height(m)	Foliage Cover
Emergents		
Canopy	19.0	Sparse
Upper stratum	9.0	Mid-dense
Midstratum	6.0	Sparse
Lower stratum	3.0	Sparse
Ground		Sparse

Classification Technique

Walker and Hopkins

Number of plant species 44

General Notes fewer Acacias present than would be expected. All specimens of Jagera pseudomorus appeared very healthy and resistant to smelter emissions, also good regeneration of this species. - potential reveg species; Photo 2/22 & 2/23 site photos



←Photo 2/22



←Photo 2/23

Site **BOYIJ26** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 38"S 151° 19' 53"E	Local authority	Calliope
Locality	Southern end of revegetated area between smelter & spillway channel, adjacent to the smelter		
Site type	Site	Site area	2500m ²
Date collected	Wednesday, 25 January 1995		
Recorders	J. Brushe, L. Childs		

Altitude	0015 m	Aspect	W
Landform:			
Pattern	Gently undulating rises		
Element	Hillslope		
Slope Class	Gently inclined (1.75-5.75 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group	powdery whitish/grey clay		
Colour			
Texture			
Fragments:			
Abundance	Few (2-10%)		
Size	Course gravelly (20-60mm)		
Disturbance	Partial clearing-selective logging in past		
	Minor infestation of alien plant species		
	Most plants adversely affected by smelter emmissions and covered in black particles		

Vegetation Type mid-high woodland of immature eucalypts/ <i>Alphitonia excelsa</i> / <i>Lophostemon suaveolens</i> / <i>Melaleuca nervosa</i> with <i>E. crebra</i> / <i>E. exserta</i> emergents and sparse mid stratum of <i>Pogonolobus reticulatus</i> /juvenile shrubs & trees & a ground stratum of grasses, forbs & <i>Xanthorrhoea</i>			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents	20.0		
Canopy	9.0	Sparse	
Upper stratum	5.0	Sparse	
Midstratum	2.0	Very sparse	
Lower stratum			
Ground	0.3	Very sparse	
Number of plant species 40			

General Notes Photo 2/24 - site photo



←Photo 2/24

Site **BOYIJ28** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 23"S 151° 19' 54"E	Local authority	Calliope
Locality	banks of spillway channel between smelter & QAL red mud disposal area		
Site type	Incidental Site	Site area	250m ²
Date collected	Wednesday, 25 January 1995		
Recorders	J. Brushe, L. Childs		

Altitude	0005 m	Aspect	
Landform:			
Pattern	Gently undulating rises		
Element	Stream bank		
Slope Class	Moderately inclined (5.75-18 degrees)		
Morph type	Open depression		
Geology:			
Corveg unit			
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Artificial disturbance - construction of outlet drainage channel by alumina refinery		

Vegetation Type herbland			
			Classification Technique
Strata	Height(m)	Foliage Cover	
Emergents			
Canopy			
Upper stratum			
Midstratum			
Lower stratum			
Ground			
Number of plant species 7			

Site **BOYIJ29** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 52"S 151° 20' 36"E	Local authority	Calliope
Locality	west of Hadley Dr, south of smelter, immediately to the south of the truck car park		
Site type	Site	Site area	2500m ²
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0025 m	Aspect	SSW
Landform:			
Pattern	Undulating rises		
Element	Hillslope		
Slope Class	Moderately inclined (5.75-18 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit	Fine sedimentary rocks		
Map unit	Quartz arenite, mudstone, schist		
Soil:			
Group	yellow brown finw clay soil		
Colour			
Texture			
Fragments:			
Abundance	Many (20-50%)		
Size	Course gravelly (20-60mm)		
Disturbance	gully erosion evidence of past tree felling		

Vegetation Type Eucalyptus citriodora tall woodland with mid-dense mid stratum of Acacia spp./Alphitonia excelsa/Melaleuca nervosa & sparse lower midstratum of shrubs & occasional rainforest species and very sparse grassy ground stratum			
Strata	Height(m)	Foliage Cover	Classification Technique Walker and Hopkins
Emergents			
Canopy	14.0	Sparse	
Upper stratum	7.0	Mid-dense	
Midstratum	2.0	Sparse	
Lower stratum			
Ground	0.3	Very sparse	
Number of plant species		42	

Site **BOYIJ30** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 8"S 151° 18' 38"E	Local authority	Calliope
Locality	South Trees Island, adjacent to & west of the haul road, approx 500 m south of the northern end of the conveyor belt		
Site type	Site	Site area	2400m²
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0005 m	Aspect	W
Landform:			
Pattern	Beach Ridge Undulating rises		
Element	Beach ridge		
Slope Class	Moderately inclined (5.75-18 degrees)		
Morph type	Simple slope		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour	Brown		
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Minor weed infestation of guinea grass & lantana - restricted to edges - no weeds inside under closed canopy		

Vegetation Type low microphyll vine forest with emergent Eucalyptus tessellaris			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents	17.0		Webb
Canopy	10.0	Dense	
Upper stratum	6.0	Dense	
Midstratum	2.0	Mid-dense	
Lower stratum			
Ground		Sparse	
Number of plant species		54	

General Notes Most well developed & floristically diverse rainforest observed in buffer zone

Site **BOYIJ31** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 9"S 151° 18' 49"E	Local authority	Calliope
Locality	South trees Island east of haul road, between salt marsh & beach		
Site type	Incidental Site		
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0004 m	Aspect	
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Beach ridge		
Slope Class	Very gently inclined (0.5-1.75 degrees)		
Morph type	Ridge		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance			

Vegetation Type tall shrubland dominated by <i>Acacia aulacocarpa</i> with grassy ground stratum			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents			
Canopy			
Upper stratum			
Midstratum			
Lower stratum			
Ground			
Number of plant species		7	

Site **BOYIJ32** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 13"S 151° 18' 45"E	Local authority	Calliope
Locality	South Trees Island between haul road & beach on landward margin of mangroves		
Site type	Incidental Site		
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0003 m	Aspect	Not Applicable
Landform:			
Pattern	Tidal Flat Level plain		
Element	Supratidal flat		
Slope Class	Level (<0.5 degrees)		
Morph type	Flat		
Geology:			
Corveg unit			
Map unit	Coastal tidal flats, mangrove flats, supratidal flats and grasslands - sand and mud.		
Soil:			
Group	silty mud deposits		
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance			

Vegetation Type Casuarina glauca tall forest with occasional littoral rainforest species and ground stratum of Sporobolus virginicus			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents			
Canopy			
Upper stratum			
Midstratum			
Lower stratum			
Ground			
Number of plant species		13	

Site **BOYIJ33** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 52' 39"S 151° 18' 56"E	Local authority	Calliope
Locality	South trees Island adjacent to eastern shoreline		
Site type	Site	Site area	2530m ²
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe, L. Childs, Nathan Bonner		

Altitude	0004 m	Aspect	
Landform:			
Pattern	Parallel Dune Gently undulating plain		
Element	Dune		
Slope Class			
Morph type			
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group	Sands		
Colour	Yellow		
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Exposure to salt spray, winds & shoreline erosion		

Vegetation Type Casuarina equisetifolia/Mallotus discolor tall closed forest with an understorey of littoral rainforest species			
Strata	Height(m)	Foliage Cover	Classification Technique
Emergents			
Canopy	15.0	Dense	
Upper stratum	10.0	Mid-dense	
Midstratum	3.0	Sparse	
Lower stratum			
Ground		Very sparse	
Number of plant species		40	

General Notes Photo 2/25 - site photo



←Photo 2/25

Site**BOYIJ34****Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 54' 59"S 151° 19' 58"E	Local authority	Calliope
Locality	Approx 1km north of the smelter to the east of the haul road		
Site type	Incidental Site		
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe		

Altitude	0004 m	Aspect	
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Landform:

Pattern	Beach Ridge Gently undulating plain
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Element	Beach ridge
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Slope Class	
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Morph type	
-------------------	--

Geology:

Corveg unit	
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Map unit	Beach ridge - sand
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Soil:

Group	
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Colour	
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Texture	
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Fragments:

Abundance	
------------------	--

Size	
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Disturbance	
--------------------	--

Vegetation Type	low microphyll vine forest with emergent Eucalyptus tessellaris
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Strata	Height(m)	Foliage Cover
---------------	------------------	----------------------

Emergents		
Canopy		
Upper stratum		
Midstratum		
Lower stratum		
Ground		

Classification Technique

Number of plant species	22
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General Notes	Fog site
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Site **BOYIJ35** **Boyne Island, Boyne Smelter Buffer Zone**

Lat/Long	23° 55' 6"S 151° 20' 5"E	Local authority	Calliope
Locality	immediately to east of haul road on spillway drainage area adjacent to bridge		
Site type	Incidental Site		
Date collected	Thursday, 26 January 1995		
Recorders	J. Brushe		

Altitude	0003 m	Aspect	
Landform:			
Pattern	Beach Ridge Gently undulating plain		
Element	Drainage depression		
Slope Class			
Morph type	Open depression		
Geology:			
Corveg unit			
Map unit	Beach ridge - sand		
Soil:			
Group			
Colour			
Texture			
Fragments:			
Abundance			
Size			
Disturbance	Artificial disturbance - drainage area for spillway channel. In close proximity to bridge & haul road, vehicle tracks close by. Weed infestations		

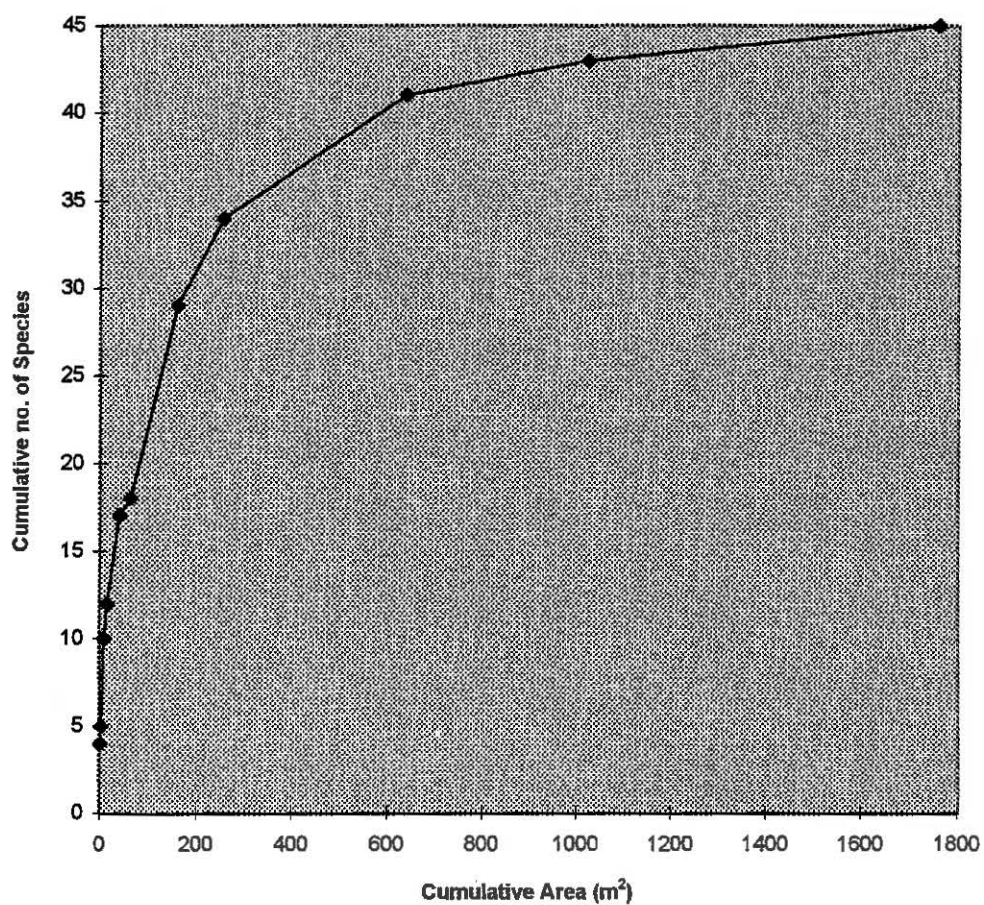
Vegetation Type open to closed herbland with emergent melaleuca																								
<table border="1"> <thead> <tr> <th>Strata</th> <th>Height(m)</th> <th>Foliage Cover</th> </tr> </thead> <tbody> <tr> <td>Emergents</td> <td></td> <td></td> </tr> <tr> <td>Canopy</td> <td></td> <td></td> </tr> <tr> <td>Upper stratum</td> <td></td> <td></td> </tr> <tr> <td>Midstratum</td> <td></td> <td></td> </tr> <tr> <td>Lower stratum</td> <td></td> <td></td> </tr> <tr> <td>Ground</td> <td></td> <td></td> </tr> </tbody> </table>			Strata	Height(m)	Foliage Cover	Emergents			Canopy			Upper stratum			Midstratum			Lower stratum			Ground			Classification Technique
Strata	Height(m)	Foliage Cover																						
Emergents																								
Canopy																								
Upper stratum																								
Midstratum																								
Lower stratum																								
Ground																								
Number of plant species 25																								

Appendix 2

SPECIES AREA CURVE - site 02

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
2	1	2	4	2	4
	2	2	1	4	5
	3	6	5	10	10
	4	6	2	16	12
	5	24	5	40	17
	6	24	1	64	18
	7	96	11	160	29
	8	96	5	256	34
	9	384	7	640	41
	10	384	2	1024	43
	11	738	2	1762	45

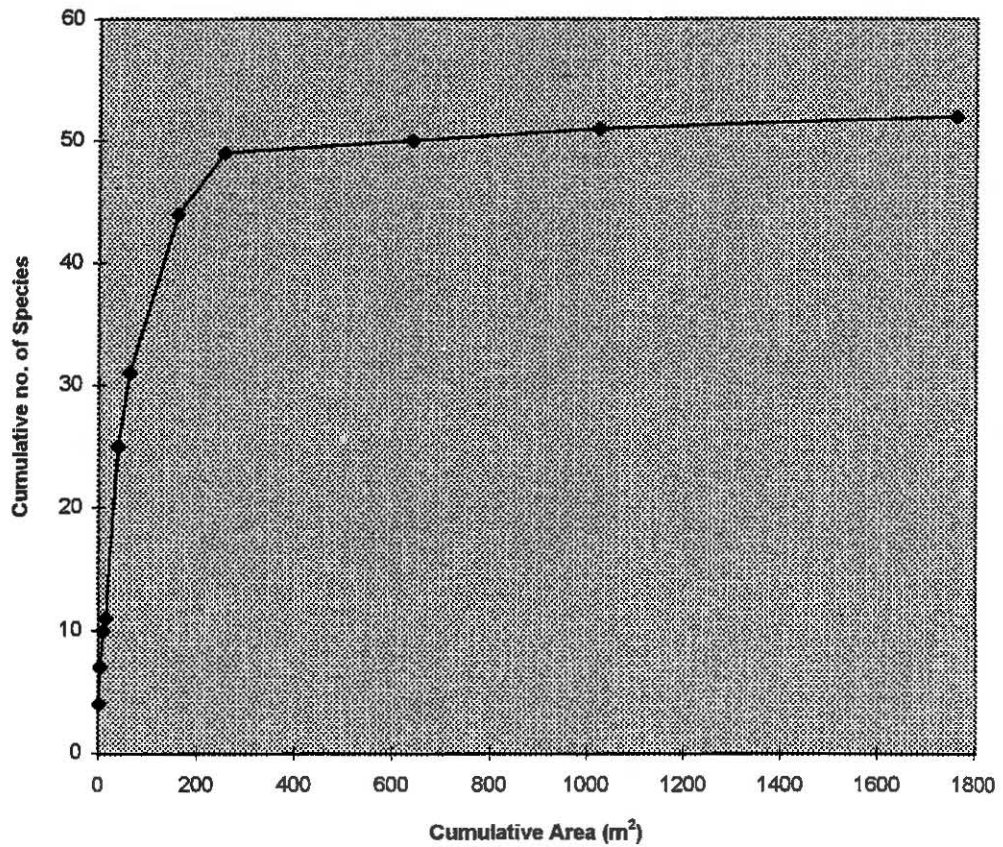
Species Area Curve - site 02



SPECIES AREA CURVE - Site 03

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
3	1	2	4	2	4
	2	2	3	4	7
	3	6	3	10	10
	4	6	1	16	11
	5	24	14	40	25
	6	24	6	64	31
	7	96	7	160	44
	8	96	5	256	49
	9	384	1	640	50
	10	384	1	1024	51
	11	738	1	1762	52

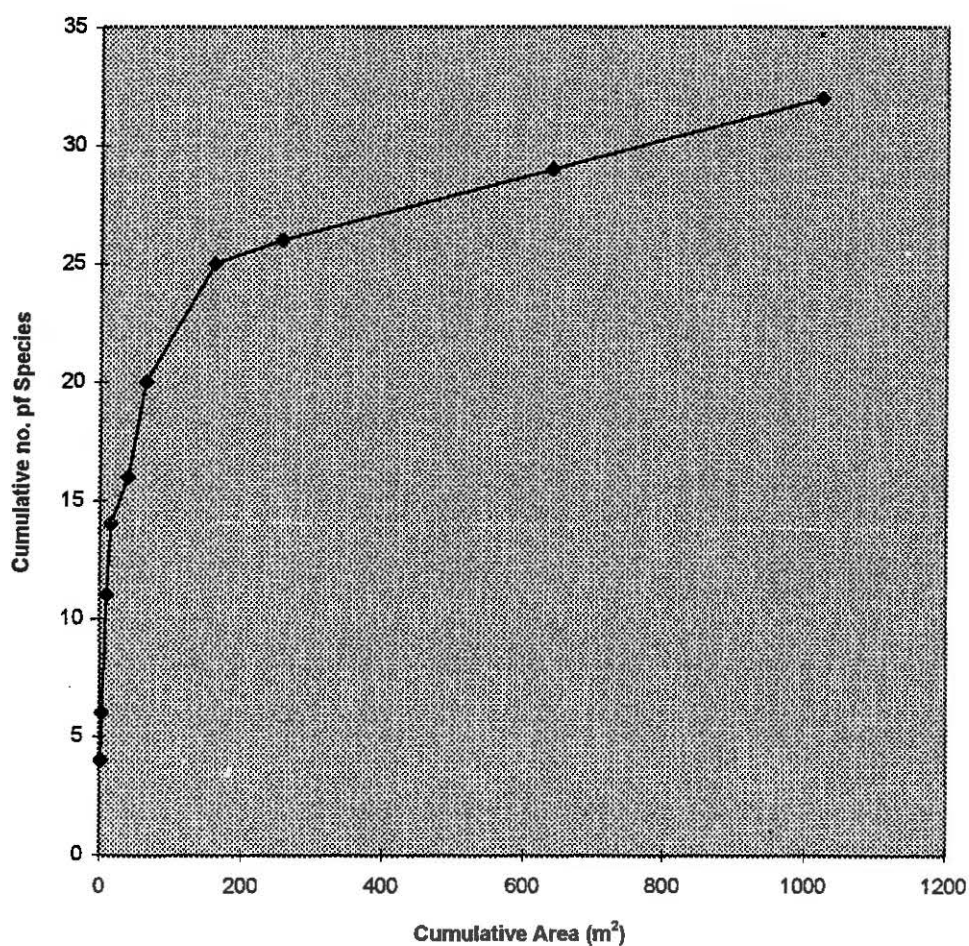
Species Area Curve - site 03



SPECIES AREA CURVE - site 05

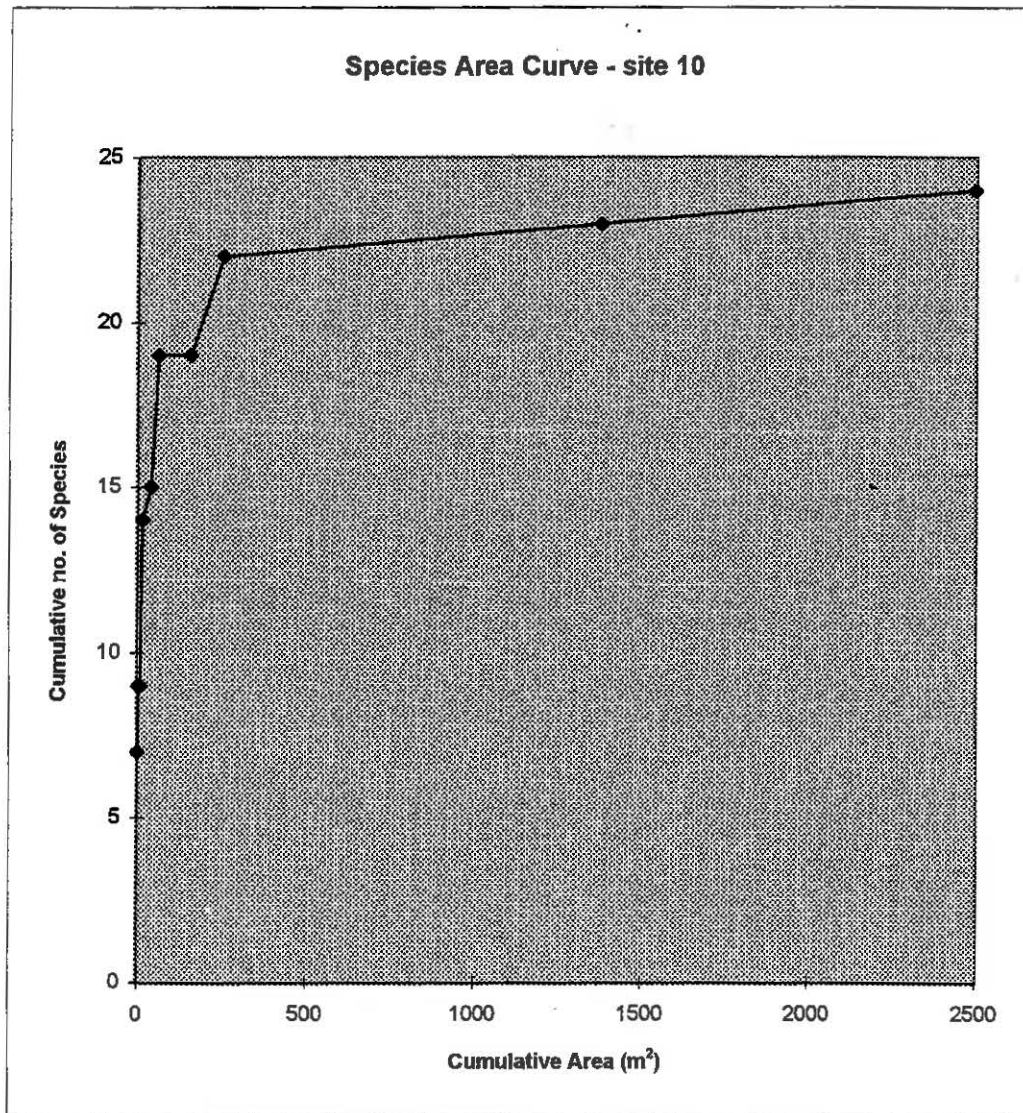
SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
5	1	2	4	2	4
	2	2	2	4	6
	3	6	5	10	11
	4	6	3	16	14
	5	24	2	40	16
	6	24	4	64	20
	7	96	5	160	25
	8	96	1	256	26
	9	384	3	640	29
	10	384	3	1024	32

Species Area Curve - site 05



SPECIES AREA CURVE - site 10

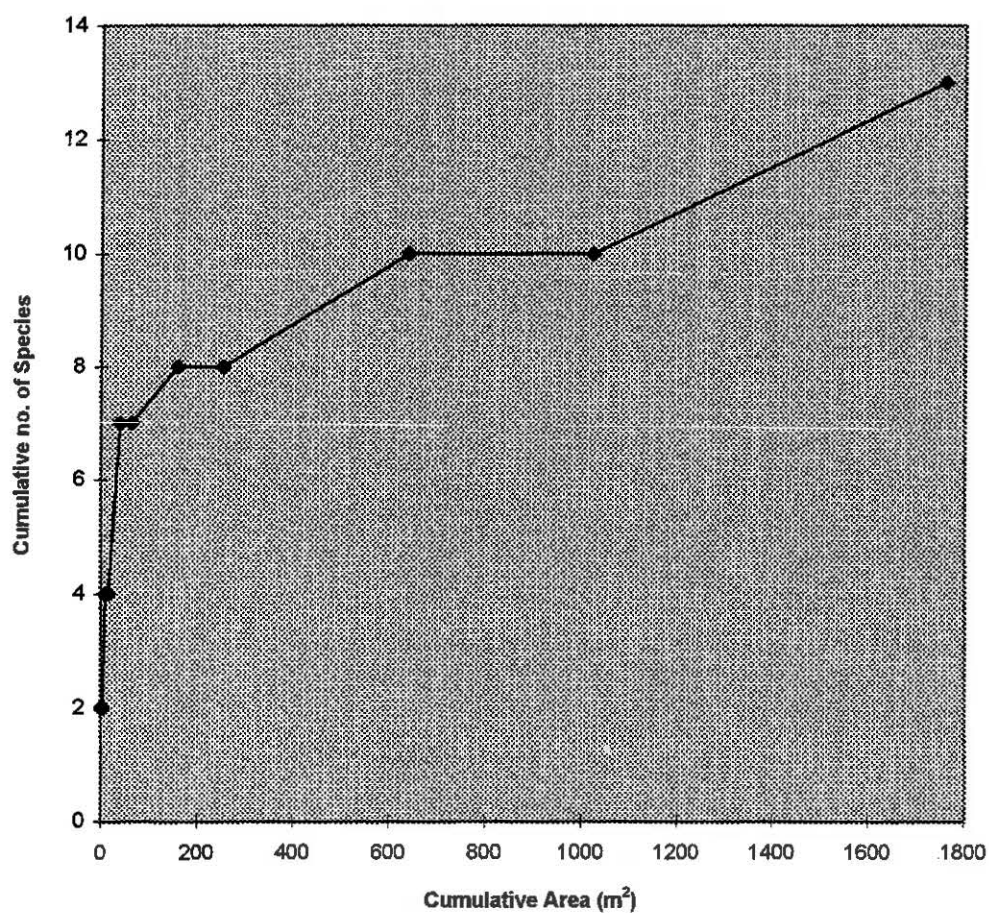
SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
10	1	2	7	2	7
	2	2	2	4	9
	3	6	0	10	9
	4	6	5	16	14
	5	24	1	40	15
	6	24	4	64	19
	7	96	0	160	19
	8	96	3	256	22
	9	1122	1	1378	23
	10	1122	1	2500	24



SPECIES AREA CURVE - site 11

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
11	1	2	2	2	2
	2	2	0	4	2
	3	6	2	10	4
	4	6	0	16	4
	5	24	3	40	7
	6	24	0	64	7
	7	96	1	160	8
	8	96	0	256	8
	9	384	2	640	10
	10	384	0	1024	10
	11	738	3	1762	13

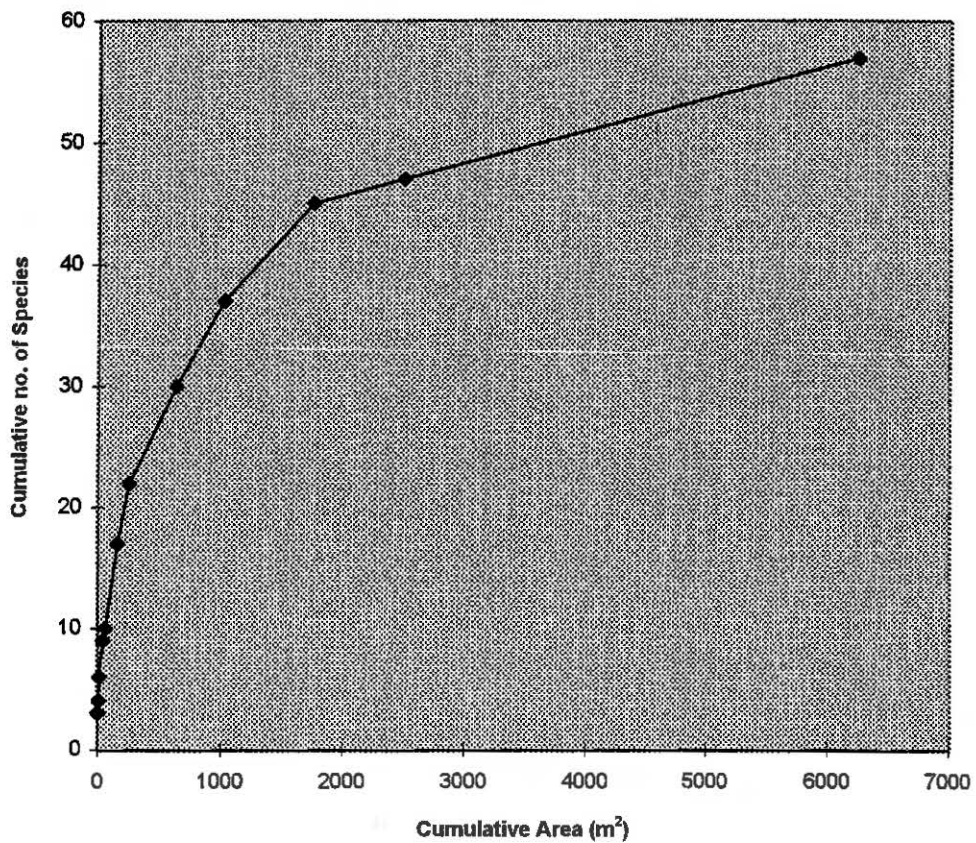
Species Area Curve - site 11



SPECIES AREA CURVE - site 12

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
12	1	2	3	2	3
	2	2	0	4	3
	3	6	1	10	4
	4	6	2	16	6
	5	24	3	40	9
	6	24	1	64	10
	7	96	7	160	17
	8	96	5	256	22
	9	384	8	640	30
	10	384	7	1024	37
	11	738	8	1762	45
	12	738	2	2500	47
	13	3750	10	6250	57

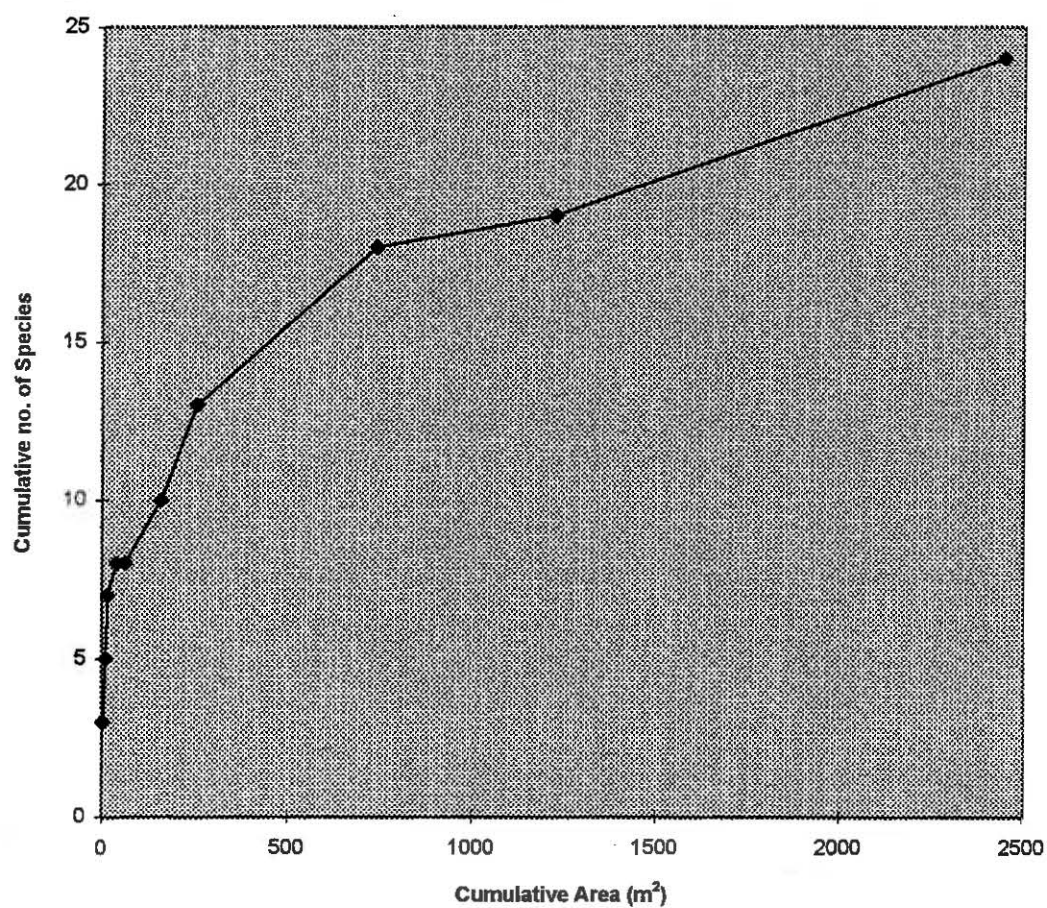
Species Area Curve - site 12



SPECIES AREA CURVE - site 13

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
13	1	2	3	2	3
	2	2	0	4	3
	3	6	2	10	5
	4	6	2	16	7
	5	24	1	40	8
	6	24	0	64	8
	7	96	2	160	10
	8	96	3	256	13
	9	484.5	5	740.5	18
	10	484.5	1	1225	19
	11	1225	5	2450	24

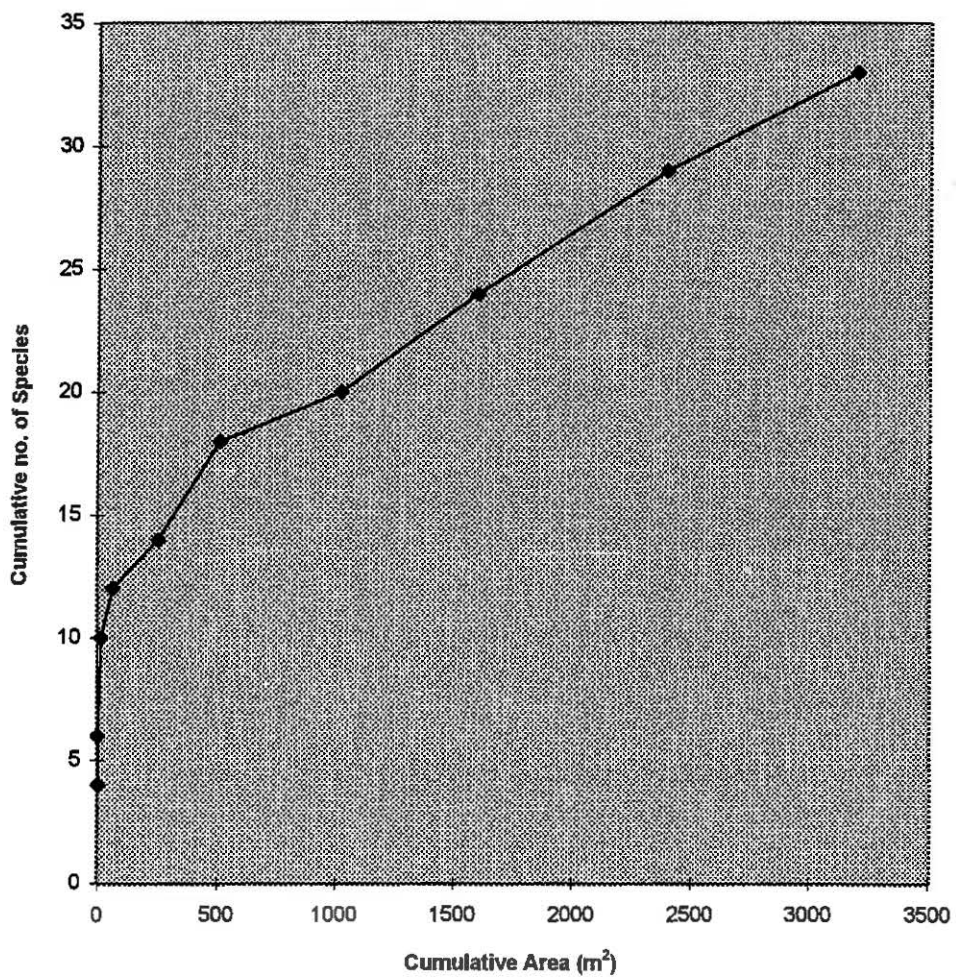
Speceis Area Curve - site 13



SPECIES AREA CURVE - site 23

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
23	1	2	4	2	4
	2	2	2	4	6
	3	12	4	16	10
	4	48	2	64	12
	5	192	2	256	14
	6	256	4	512	18
	7	512	2	1024	20
	8	576	4	1600	24
	9	800	5	2400	29
	10	800	4	3200	33

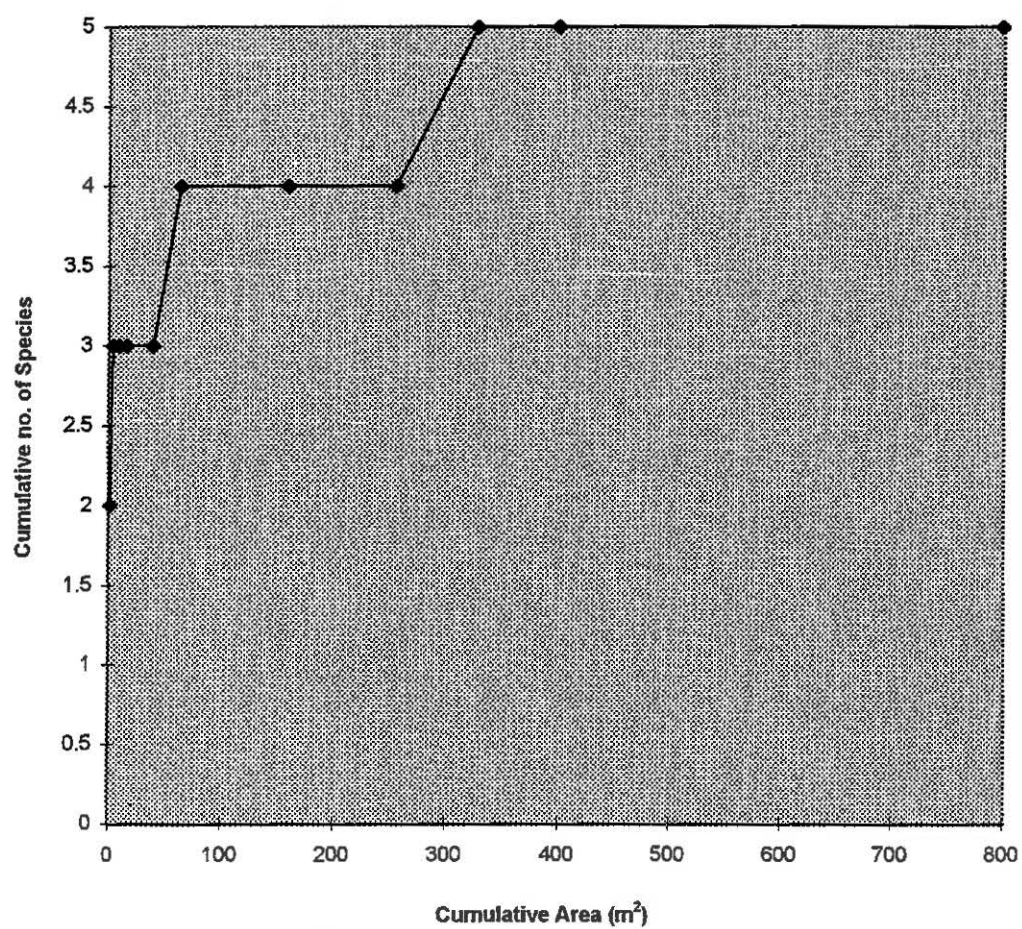
Species Area Curve - site 23



SPECIES AREA CURVE - site 24

SITE NO	QUADRAT NO.	AREA m ²	NO OF NEW SPECIES	CUMULATIVE AREA (m ²)	CUMULATIVE NO. OF SPECIES
24	1	2	2	2	2
	2	2	1	4	3
	3	6	0	10	3
	4	6	0	16	3
	5	24	0	40	3
	6	24	1	64	4
	7	96	0	160	4
	8	96	0	256	4
	9	72	1	328	5
	10	72	0	400	5
	11	400	0	800	5

Species Area Curve - site 24



SPECIES NAME	VEGETATION MAP UNITS																								% OF SITES WITH SPECIES
	1a	1b	2a	2b	2c	2d	2e	2f	2g	2h	2i	2j	2k	3a	3b	4a	4b	4c	5a	5b	5c	6a	6b	6c	
BOYIMIS																									
BOYIJ35																									
BOYIJ28																									
BOYIJ16																									
BOYIJ24																									
BOYIJ21																									
BOYIJ10																									
BOYIJ31																									
BOYIJ20																									
BOYIJ23																									
BOYIJ33																									
BOYIJ32																									
BOYIJ11																									
BOYIJ14																									
BOYIJ13																									
BOYIJ27																									
BOYIJ26																									
BOYIJ17																									
BOYIJ25																									
BOYIJ18																									
BOYIJ08																									
BOYIJ02																									
BOYIJ29																									
BOYIJ07																									
BOYIJ05																									
BOYIJ09																									
BOYIJ06																									
BOYIJ12																									
BOYIJ19																									
BOYIJ01																									
BOYIJ34																									
BOYIJ30																									
BOYIJ15																									
BOYIJ04																									
BOYIJ03																									
BOYIJ22																									
Abutilon sp.																									3
Acacia amblygona																									3
Acacia sulcata																									69
Acacia biwaillii																									3
Acacia conferta																									25
Acacia kiliformis																									11
Acacia flavescens																									3
Acacia holosericea																									3
Acacia julifera																									3
Acacia velutina																									3
Acacia leptocarpa																									8
Acacia macrodonia																									3
Acacia sp.																									3
Achyrocline saturei																									6
Acronychia imperforata																									19
Acrodictum speciosum																									3
Aegle marmelos																									3
Ageratum houstonianum																									3
Aldia racemosa																									6
Aichroea ilicifolia																									3
Alectryon comatus																									31
Alectryon suberectus																									3
Albizia leucodermis																									6
Albizia leucodermis																									11
Albizia leucodermis																									6
Albizia leucodermis																									39
Albizia leucodermis																									3
Albizia leucodermis																									3
Albizia leucodermis																									22
Albizia leucodermis																									3
Albizia leucodermis																									19
Albizia leucodermis																									3
Albizia leucodermis																									33
Albizia leucodermis																									6
Albizia leucodermis																									6
Albizia leucodermis																									3

NAME	VEGETATION MAP UNITS																										% OF SITES WITH SPECIES								
	1a 1b													2a																					
	BOYIJ22	BOYIJ03	BOYIJ04	BOYIJ15	BOYIJ30	BOYIJ34	BOYIJ01	BOYIJ19	BOYIJ12	BOYIJ06	BOYIJ09	BOYIJ05	BOYIJ07	BOYIJ29	BOYIJ02	BOYIJ08	BOYIJ18	BOYIJ25	BOYIJ17	BOYIJ26	BOYIJ13	BOYIJ14	BOYIJ11	BOYIJ32	BOYIJ23	BOYIJ20		BOYIJ31	BOYIJ10	BOYIJ21	BOYIJ24	BOYIJ16	BOYIJ28	BOYIJ35	BOYIMIS
EXOTIC																																			
Avicennia marina																																			3
Baccharis helimifolia																																			3
Bidens pilosa																																			6
Boerhavia sp.																																			3
Breynia oblongifolia																																			61
Brideia leichhardtii																																			6
Brunonella acutula																																			3
Caesalpinia bonduca																																			6
Calochortus dubia																																			3
Canavalia rosea																																			3
Centotheca coprosmaeoides																																			25
Centotheca sp.																																			3
Capparis arborea																																			6
Capparis sp.																																			3
Cassia ovata																																			29
Cassia melanocarpa																																			3
Cassipourea pubescens																																			3
Cassipourea sp.																																			42
Casuarina equisetifolia																																			8
Casuarina glauca																																			17
Cathartanthus roseus																																			6
Celtis paniculata																																			25
Cenchrus echinatus																																			25
Centella asiatica																																			6
Ceripha legal																																			3
Chelidonium elegans																																			6
Chloris sp.																																			8
Chrysanthemum apiculatum																																			3
Citrus vulgaris																																			3
Citrus limon																																			3
Clerodendrum floribundum																																			14
Croalaria medicaginea																																			14
Croalaria montana																																			

[illegible]

VEGETATION MAP UNITS																								% OF SITES WITH SPECIES								
1a 1b	2a	2b 2c	2d	2e 2f 2g 2h 2i 2j 2k	3a 3b 3c 3d	4a	4b	4c	4d	5a	5b	5c	6a	6b	6c	7	8a	8b	8c	9	BOYIMIS											
EXOTIC	NAME	BOYIJ34	BOYIJ19	BOYIJ12	BOYIJ06	BOYIJ09	BOYIJ05	BOYIJ07	BOYIJ29	BOYIJ02	BOYIJ08	BOYIJ18	BOYIJ25	BOYIJ17	BOYIJ26	BOYIJ27	BOYIJ13	BOYIJ14	BOYIJ11	BOYIJ32	BOYIJ33	BOYIJ23	BOYIJ20	BOYIJ31	BOYIJ10	BOYIJ21	BOYIJ24	BOYIJ16	BOYIJ28	BOYIJ35		
	Indigofera hirsuta																															3
	Ipomoea callica																															3
	Ipomoea paracarpa subsp. bradioides																															14
	Ischaemum sp.																															3
	Ixora queenslandica																															14
	Jacksonia scoparia																															17
	Jagers pseudorhus																															22
	Jasminum didymum subsp. didymum																															39
	Jasminum elaeagnifolium																															25
	Juncus continuus																															3
	Juncus sp.																															6
	Lantana camara																															44
	Lantana montevidensis																															3
	Limonium australe																															3
	Lobelia sp.																															3
	Lomandra longifolia																															11
	Lomandra sp.																															3
	Lophosiphon confertus																															19
	Lophosiphon suaveolens																															11
	Ludwigia sp.																															3
	Lumnitzera racemosa																															6
	Lycopersicon esculentum																															6
	Macropodium atropurpureum																															33
Malaleuca scandens subsp. scandens																															50	
Malotus discolor																															3	
Mangifera indica																															11	
Malaleuca dealbata																															22	
Malaleuca nervosa																															3	
Malaleuca quinqueveneria																															11	
Malaleuca sp.																															17	
Meila azedarach																															6	
Melichrus adpressus																															33	
Melilot repens																															6	
Meiodorum leichardtii																															17	
Micromelum minutum																															3	
Mulda medeolapana																																

EXOTIC	VEGETATION MAP UNITS																										% OF SITES WITH SPECIES																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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NAME	BOYIJ22	BOYIJ03	BOYIJ04	BOYIJ15	BOYIJ30	BOYIJ34	BOYIJ01	BOYIJ19	BOYIJ12	BOYIJ06	BOYIJ09	BOYIJ05	BOYIJ07	BOYIJ29	BOYIJ02	BOYIJ08	BOYIJ18	BOYIJ25	BOYIJ17	BOYIJ26	BOYIJ27	BOYIJ13	BOYIJ14	BOYIJ11	BOYIJ32	BOYIJ33	BOYIJ23	BOYIJ20	BOYIJ31	BOYIJ10	BOYIJ21	BOYIJ24	BOYIJ16	BOYIJ28	BOYIJ35	BOYIJMIS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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Appendix 3d

Site BOYIJ09

Species list for site BOYIJ09 according to strata.

Note: Some species may occur in more than one stratum, but in general they are recorded only for the stratum in which they occur most commonly.

Flow Frui Fert

CANOPY

<i>Eucalyptus citriodora</i>	Lemon scented gum	4
<i>Eucalyptus exserta</i>	Queensland peppermint	4
<i>Eucalyptus clarksoniana</i>		2
<i>Eucalyptus crebra</i>	Narrow-leaved ironbark	1

UPPER MID

<i>Allocasuarina torulosa</i>	Forest oak or Rose she-oak	6
<i>Allocasuarina luehmannii</i>	Bull oak	3
<i>Lophostemon suaveolens</i>	Swamp mahogany	2
<i>Melaleuca nervosa</i>		2

MID

<i>Acacia conferta</i>		6
<i>Pogonolobus reticulatus</i>	Medicine bush	4
<i>Jacksonia scoparia</i>	Dogwood	2
<i>Melaleuca nervosa</i>		2

LOWER MID

<i>Pogonolobus reticulatus</i>	Medicine bush	4
<i>Acacia aulacocarpa</i>	Hickory wattle	2

GROUND

<i>Eriachne sp.</i>		5
<i>Themeda triandra</i>	Kangaroo grass	4
<i>Xanthorrhoea latifolia subsp. latifolia</i>	Grass tree	4
<i>Entolasia stricta</i>	Wiry panic	3
<i>Melichrus adpressus</i>		1

Site BOYIJ10

Species list for site BOYIJ10 according to strata.

Note: Some species may occur in more than one stratum, but in general they are recorded only for the stratum in which they occur most commonly.

Flow Frui Fert

GROUND

* <i>Melinis repens</i>	Red natal grass	6	
<i>Aristida sp.</i>	Wiregrass	3	
<i>Crotalaria medicaginea</i>	Trefoil rattlepod	3	
<i>Cymbopogon refractus</i>	Barbed wire grass	3	
<i>Eragrostis interrupta</i>	Love grass	3	
* <i>Lantana camara</i>	Lantana	3	
<i>Breynia oblongifolia</i>	Coffee bush	2	
* <i>Digitaria didactyla</i>	Qld blue couch	2	
<i>Enneapogon lindleyanus</i>	Prickly couch	2	?
<i>Euphorbia tannensis</i>	Desert spurge	2	
<i>Imperata cylindrica</i>	Blady grass	2	
<i>Ipomoea pescaprae subsp. brasiliensis</i>	Dune morning glory	2	
* <i>Passiflora suberosa var. suberosa</i>	Corky passion flower	2	
* <i>Salvia coccinea</i>	Red salvia	2	
* <i>Sida cordifolia</i>	Flannel weed	2	
* <i>Tridax procumbens</i>	Tridax	2	
* <i>Opuntia stricta</i>	Prickly pear	1	
<i>Pleiogynium timorense</i>	Burdekin plum	1	
<i>Euphorbia sp.</i>			

Site BOYIJ11

Species list for site BOYIJ11 according to strata.

Note: Some species may occur in more than one stratum, but in general they are recorded only for the stratum in which they occur most commonly.

Flow Frui Fert

CANOPY

<i>Casuarina glauca</i>	Swamp she-oak	7
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MID

<i>Casuarina glauca</i>	Swamp she-oak	6
* <i>Cryptostegia grandiflora</i>	Rubber vine	2

LOWER MID

<i>Casuarina glauca</i>	Swamp she-oak	6
* <i>Cryptostegia grandiflora</i>	Rubber vine	3
<i>Suaeda australis</i>	Samphire	

GROUND

<i>Sporobolus virginicus</i>	Marine couch	6
<i>Epaltes australis</i>	Epaltes	2
* <i>Cryptostegia grandiflora</i>	Rubber vine	
<i>Fimbristylis sp.</i>		
* <i>Passiflora suberosa var. suberosa</i>	Corky passion flower	
<i>Sarcocornia quinqueflora</i>	Samphire	
<i>Sesuvium portulacastrum</i>	Sea purslane	

UNKNOWN

<i>Melaleuca sp.</i>		
<i>Myoporum acuminatum</i>	Boobialla, waterbush	

Site BOYIJ12

Species list for site BOYIJ12 according to strata.

Note: Some species may occur in more than one stratum, but in general they are recorded only for the stratum in which they occur most commonly.

Flow Frui Fert

EMERGENT

<i>Ficus</i> sp.		1	
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CANOPY

<i>Eucalyptus tessellaris</i>	Moreton bay ash	7	
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UPPER MID

<i>Alphitonia excelsa</i>	Red ash	6	
<i>Eucalyptus tessellaris</i>	Moreton bay ash	6	
<i>Acacia aulacocarpa</i>	Hickory wattle	4	
<i>Turraea pubescens</i>	Turraea	4	
<i>Petalostigma pubescens</i>	Quinine tree	3	
<i>Alectryon connatus</i>	Alectryon	2	
<i>Cupaniopsis anacardioides</i>	Tuckeroo	2	
<i>Diospyros fasciculosa</i>	Grey ebony	2	
<i>Diospyros geminata</i>	Scaly ebony	2	
<i>Mallotus discolor</i>	White kamala	2	
<i>Melia azedarach</i>	White cedar	2	P
<i>Planchonia careya</i>	Cocky apple	2	
<i>Pleiogynium timorense</i>	Burdekin plum	2	
<i>Sterculia quadrifida</i>	Redfruit kurrajong	2	
<i>Drypetes deplanchei</i>	Yellow tulip	1	
<i>Glochidion lobocarpum</i>	Findlay's silky oak	1	
<i>Jasminum didymum</i> subsp. <i>didymum</i>	Native jasmine	1	
<i>Polyscias elegans</i>	Celerywood	1	

MID

<i>Turraea pubescens</i>	Turraea	6	
<i>Alectryon connatus</i>	Alectryon	3	
<i>Alphitonia excelsa</i>	Red ash	3	
<i>Drypetes deplanchei</i>	Yellow tulip	3	
<i>Eucalyptus tessellaris</i>	Moreton bay ash	3	
<i>Ficus opposita</i>	A sandpaper fig	3	
<i>Glochidion lobocarpum</i>	Findlay's silky oak	3	
<i>Acacia aulacocarpa</i>	Hickory wattle	2	
<i>Acronychia imperforata</i>	Beach achronychia	2	P
<i>Alyxia ruscifolia</i>	Chain fruit	2	
<i>Carissa ovata</i>	Currant bush	2	
<i>Cupaniopsis anacardioides</i>	Tuckeroo	2	
<i>Diospyros fasciculosa</i>	Grey ebony	2	
* <i>Lantana camara</i>	Lantana	2	
<i>Malaisia scandens</i> subsp. <i>scandens</i>	Firevine	2	
<i>Mallotus discolor</i>	White kamala	2	
<i>Planchonia careya</i>	Cocky apple	2	
<i>Pleiogynium timorense</i>	Burdekin plum	2	
<i>Pleogyne australis</i>	Pleogyne	2	
<i>Stephania japonica</i>	Tape vine	2	
<i>Diospyros geminata</i>	Scaly ebony	1	
<i>Exocarpos latifolius</i>	Broad-leaved native cherry	1	
<i>Ficus</i> sp.		1	
<i>Geijera salicifolia</i> var. <i>latifolia</i>	Scrub wilga or green satinhear	1	
<i>Petalostigma pubescens</i>	Quinine tree	1	
<i>Pittosporum ferrugineum</i>		1	
<i>Polyalthia nitidissima</i>	Polyalthia	1	
<i>Polyscias elegans</i>	Celerywood	1	

Appendix 4a

APPENDIX 4A

VEGETATION MAP UNIT DESCRIPTIONS

1 RAINFOREST DOMINATED COMMUNITIES

1a Low Microphyll Vine Forest/Thicket

Sites: BOYIJ22

Landform: dune systems adjacent to shoreline

Substrate: sand

Management issues: Fire should be excluded from this unit. Closed canopy should be maintained to prevent weed invasion. Current rubber vine infestations should be treated and lantana infestations monitored. Fires in adjacent units should also be prevented from burning close to the rainforest edges to ensure that existing patches do not become progressively smaller and so that regeneration around the edges is promoted.

Species Composition/Relative Abundance

Site: BOYIJ22

Canopy

Cupaniopsis anacardioides (5), *Drypetes deplanchei* (4), *Acacia aulacocarpa* (3), *Mallotus discolor* (3), *Alectryon connatus* (2), *Pleiogynium timorense* (2)

Upper Mid

Polyalthia nitidissima (5), *Pleogyne australis* (3), *Acronychia imperforata* (2), *Malaisia scandens subsp. scandens* (2), *Pouteria sericea* (2), *Harpullia hillii* (1)

Mid

Exocarpos latifolius (5), *Alectryon connatus* (4), *Turraea pubescens* (4), *Carissa ovata* (3), *Geijera salicifolia* var. *latifolia* (3), *Micromelum minutum* (3), * *Passiflora suberosa* var. *suberosa* (3), *Secamone elliptica* (3), *Alyxia ruscifolia* (2), *Celtis paniculata* (2), *Diospyros geminata* (2), *Ficus opposita* (2), *Glochidion lobocarpum* (2), *Jagera pseudorhus* (2), * *Lantana camara* (2), *Pavetta australiensis* (2), *Polyscias elegans* (2), *Psychotria loniceroides* (2), *Rhynchosia acuminatissima* (1)

Lower Mid

Jasminum didymum subsp. didymum (3), *Breynia oblongifolia* (2), * *Cryptostegia grandiflora* (2)

Ground

Ancistrachne uncinulata (3), *Stephania japonica* (3), *Cymbopogon refractus* (2), *Cyperus enervis* (2), *Imperata cylindrica* (2), *Jasminum simplicifolium* (2), *Oplismenus* sp. (2), * *Salvia coccinea* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

1b Low microphyll vine forest with emergent *Eucalyptus tessellaris*

Sites: BOYIJ03, BOYIJ04, BOYIJ15, BOYIJ30, BOYIJ34

Landform: Beach ridges

Substrate: sand

Management issues: Rubber vine and *Lantana camara* were present in some parts of this unit. However, major infestations of these weeds appeared to be restricted to disturbed areas such as road edges, edges adjoining slashed/cleared areas and under canopy gaps. The absence of these weeds in undisturbed areas with no canopy gaps demonstrates the importance of maintaining a closed canopy in this vegetation type. Fire should be excluded from this unit to maintain the rainforest understorey and minimise weed invasion.

Species Composition/Relative Abundance

BOYIJ03

Canopy

Eucalyptus tessellaris (4), *Ficus* sp. (1), *Melaleuca* sp. (1)

Upper Mid

Mallotus discolor (6), *Acacia aulacocarpa* (2), *Acronychia imperforata* (2), *Alectryon connatus* (2), *Alphitonia excelsa* (2), *Drypetes deplanchei* (2), *Eucalyptus tessellaris* (2), *Geijera salicifolia* (2), *Pittosporum ferrugineum* (2), *Pleiogynium timorense* (2), *Cupaniopsis anacardioides* (1), *Diospyros geminata* (1), *Glochidion lobocarpum* (1), *Polyalthia nitidissima* (1), *Turraea pubescens* (1)

Mid

Drypetes deplanchei (6), *Micromelum minutum* (4), *Alectryon connatus* (3), *Breynia oblongifolia* (3), *Carissa ovata* (3), *Cupaniopsis anacardioides* (3), *Exocarpos latifolius* (3), *Mallotus discolor* (3), *Polyalthia nitidissima* (3), *Acronychia imperforata* (2), *Alphitonia excelsa* (2), *Alyxia ruscifolia* (2), *Diospyros fasciculosa* (2), *Diospyros geminata* (2), *Ficus opposita* (2), *Geijera salicifolia* var. *latifolia* (2), *Ixora queenslandica* (2), *Pavetta australiensis* (2), *Pleiogynium timorense* (2), *Sterculia quadrifida* (2), *Turraea pubescens* (2), *Bridelia leichhardtii* (1), *Eucalyptus tessellaris* (1), *Glochidion lobocarpum* (1), * *Lantana camara* (1)

Lower Mid

Drypetes deplanchei (6), *Breynia oblongifolia* (5), *Alectryon connatus* (4), *Carissa ovata* (4), *Exocarpos latifolius* (4), *Cupaniopsis anacardioides* (3), *Diospyros geminata* (3), *Polyalthia nitidissima* (3), *Alyxia ruscifolia* (2), *Diospyros fasciculosa* (2), *Mallotus discolor* (2), *Micromelum minutum* (2), * *Opuntia stricta* (2), *Turraea pubescens* (2), *Acacia aulacocarpa* (1), *Acronychia imperforata* (1), *Alphitonia excelsa* (1), *Celtis paniculata* (1), *Geijera salicifolia* var. *latifolia* (1), *Glochidion lobocarpum* (1), *Pleiogynium timorense* (1)

Ground

Alectryon connatus (6), *Drypetes deplanchei* (6), *Malaisia scandens* subsp. *scandens* (5), *Breynia oblongifolia* (4), *Alphitonia excelsa* (3), *Alyxia ruscifolia* (3), *Ancistrachne uncinulata* (3), *Cyperus enervis* (3), *Exocarpos latifolius* (3), *Pleogyne australis* (3), *Turraea pubescens* (3), *Aristida* sp. (2), *Carissa ovata* (2), * *Cenchrus echinatus* (2), *Cupaniopsis anacardioides* (2), *Digitaria parviflora* (2), *Diospyros fasciculosa* (2), *Diospyros geminata* (2), *Ixora queenslandica* (2), * *Panicum maximum* (2), *Sterculia quadrifida* (2), *Arytera divaricata* (1), *Celtis paniculata* (1), *Jagera pseudorhus* (1), *Mallotus discolor* (1), *Pleiogynium timorense* (1), *Polyalthia nitidissima* (1), *Secamone elliptica* (1), * *Rivina humilis*

Vine

* *Passiflora suberosa* var. *suberosa* (6), *Pleogyne australis* (5), *Jasminum didymum* subsp. *didymum* (3), *Jasminum simplicifolium* (3), *Secamone elliptica* (3), *Cassytha* sp. (2), * *Cryptostegia grandiflora* (2), *Rhynchosia acuminatissima* (2)

BOYU04

Emergent

Eucalyptus tessellaris (2)

Canopy

Pleiogynium timorense (6), *Malaisia scandens* subsp. *scandens* (4), *Cupaniopsis anacardioides* (3), *Ficus* sp. (2), * *Passiflora suberosa* var. *suberosa* (2)

Upper Mid

Alectryon connatus (4), *Exocarpos latifolius* (4), *Diospyros fasciculosa* (3), *Mallotus discolor* (2), *Melodorum leichhardtii* (2), *Pouteria sericea* (2)

Mid

Carissa ovata (5), *Ixora queenslandica* (5), * *Lantana camara* (5), *Diospyros geminata* (3), *Drypetes deplanchei* (3), *Micromelum minutum* (3), *Acacia aulacocarpa* (2), *Aidia racemosa* (2), *Breynia oblongifolia* (2), *Diospyros fasciculosa* (2), *Ficus opposita* (2), *Jasminum simplicifolium* (2), *Turraea pubescens* (2), *Cymbidium canaliculatum* (1), *Dendrobium bowmanii* (1)

Lower Mid

Alyxia ruscifolia (2), *Rapanea variabilis* (2), * *Solanum seaforthianum* (1)

Ground

* *Rivina humilis* (6), *Ancistrachne uncinulata* (2), * *Panicum maximum* var. *maximum* (2), *Secamone elliptica* (2)

Vine

Pleogyne australis (4)

BOYU15

Emergent

Eucalyptus tessellaris (2)

Canopy

Cupaniopsis anacardioides (5), *Drypetes deplanchei* (5), *Polyalthia nitidissima* (5), *Acronychia imperforata* (3), *Pittosporum ferrugineum* (3), *Pleiogynium timorense* (3), *Acacia aulacocarpa* (2), *Diospyros fasciculosa* (2), *Mallotus discolor* (2), *Polyscias elegans* (2), *Melaleuca dealbata* (1)

Upper Mid

Pouteria sericea (3)

Mid

Ixora queenslandica (6), *Carissa ovata* (4), *Drypetes deplanchei* (4), *Alyxia ruscifolia* (3), *Exocarpos latifolius* (3), *Malaisia scandens* subsp. *scandens* (3), *Sarcostemma viminalis* subsp. *brunonianum* (3), *Alchornea ilicifolia* (2), *Alectryon connatus* (2), *Glochidion lobocarpum* (2), *Pleogyne australis* (2), *Rapanea variabilis* (2), *Sterculia quadrifida* (2), *Turraea pubescens* (2), *Cymbidium canaliculatum* (1), *Pavetta australiensis* (1)

Lower Mid

* *Passiflora suberosa* var. *suberosa* (4), *Breynia oblongifolia* (2), *Diospyros geminata* (2), *Jasminum didymum* subsp. *didymum* (2), *Secamone elliptica* (2), *Crotalaria medicaginea* (1), *Micromelum minutum* (1)

Ground

Cyperus enervis (4), * *Rivina humilis* (3), * *Salvia coccinea* (3), *Ancistrachne uncinulata* (2), * *Opuntia stricta* (2), *Oplismenus* sp. (1)

BOYII30

Emergent

Eucalyptus tessellaris (1)

Canopy

Malaisia scandens subsp. *scandens* (4), *Pleogyne australis* (4), *Strychnos axillaris* (4), *Aphananthe philippinensis* (3), *Austromyrtus bidwillii* (3), *Drypetes deplanchei* (3), *Melodorum leichhardtii* (3), *Alectryon connatus* (2), *Cupaniopsis anacardioides* (2), *Diospyros geminata* (2), *Jagera pseudorhus* (2), *Mallotus discolor* (2), *Pleiogynium timorense* (2)

Upper Mid

Aidia racemosa (4), *Cassine melanocarpa* (4), *Capparis arborea* (3), *Acacia aulacocarpa* (2), *Capparis* sp. (2), *Ficus* sp. (2), *Geijera salicifolia* var. *latifolia* (2), *Pisonia aculeata* (2), *Polyalthia nitidissima* (2), *Secamone elliptica* (2)

Mid

Alyxia ruscifolia (3), *Pouteria sericea* (3), * *Solanum seaforthianum* (3), *Acronychia imperforata* (2), *Alectryon subdentatus* (2), *Arytera divaricata* (2), *Breynia oblongifolia* (2), *Bridelia leichhardtii* (2), *Canthium coprosmoides* (2), *Carissa ovata* (2), *Cassytha* sp. (2), *Celtis paniculata* (2), *Clerodendrum floribundum* (2), *Diospyros fasciculosa* (2), *Exocarpos latifolius* (2), *Geitonoplesium cymosum* (2), *Glossocarya hemiderma* (2), *Hoya australis* (2), *Ixora queenslandica* (2), *Jasminum didymum* subsp. *didymum* (2), *Jasminum simplicifolium* (2), * *Lantana camara* (2), *Micromelum minutum* (2), * *Panicum maximum* var. *maximum* (2), *Sarcostemma viminalis* subsp. *brunonianum* (2), *Scolopia braunii* (2), *Turraea pubescens* (2), *Dendrobium bowmanii* (1), *Rhamnella vitiensis* (1)

Ground

Ancistrachne uncinulata (2)

BOYII34 (incomplete site)

Emergent

Eucalyptus tessellaris

Ground

Ancistrachne uncinulata

Unknown

Ixora queenslandica (6), *Alectryon connatus*, *Alyxia ruscifolia*, *Breynia oblongifolia*, *Capparis arborea*, *Carissa ovata*, *Celtis paniculata*, *Cupaniopsis anacardioides*, *Diospyros fasciculosa*, *Diospyros geminata*, *Drypetes deplanchei*, *Exocarpos latifolius*, *Jasminum didymum* subsp. *didymum*, *Malaisia scandens* subsp. *scandens*, *Mallotus discolor*, * *Passiflora suberosa* var. *suberosa*, *Pleiogynium timorense*, *Pleogyne australis*, *Polyalthia nitidissima*, *Pouteria sericea*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2 EUCALYPT DOMINATED COMMUNITIES

2a *Eucalyptus tessellaris* Tall Woodland with understorey of Low Microphyll Vine Forest/ Low Microphyll Vine Thicket

This unit closely resembled unit 1b. Species composition was similar in the two units, the major difference being in relative dominance of the Eucalypt and rainforest strata. This may possibly be related to fire history.

Sites: BOYIJ01, BOYIJ19

Landform: Beach ridges

Substrate: sand

Management issues: Rain forest elements may increase in dominance in the absence of fire with a possible transition towards unit 1b vegetation. Frequent fire may result in a transition towards unit 2b vegetation.

Some parts of this unit have severe rubber vine & Lantana infestations. Existing rubber vine should be eliminated by basal bark spraying (taking care to minimise spraying of juvenile non target species) with follow up monitoring and treatment.

Site 19 (adjacent to the houses) has been highly disturbed in the past, however it has been included within this unit as it still retains a good species diversity & with appropriate management should regenerate back to its former structural & floristic composition. Naturalised exotics originating from dumping of garden refuse and garden escapes from nearby houses may be a problem for vegetation management at this site.

Species Composition/Relative Abundance

BOYIJ01

Canopy

Eucalyptus tessellaris (5), *Cupaniopsis anacardioides* (2), *Pleiogynium timorense*

Upper Mid

Acronychia imperforata (6), *Cupaniopsis anacardioides* (5), *Drypetes deplanchei* (5), *Malaisia scandens* subsp. *scandens* (4), *Acacia aulacocarpa* (3), *Alectryon connatus* (3), *Alstonia constricta* (3), *Casuarina glauca* (3), * *Cryptostegia grandiflora* (3), *Jagera pseudorhus* (3), *Pleiogynium timorense* (3), *Celtis paniculata* (2), *Exocarpos latifolius* (2), *Ficus opposita* (2), *Secamone elliptica* (2), *Diospyros geminata* (1), *Mallotus discolor* (1), *Melaleuca dealbata* (1)

Mid

Breynia oblongifolia (4), * *Passiflora suberosa* var. *suberosa* (3), *Turraea pubescens* (3), *Alphitonia excelsa* (2), * *Lantana camara* (2), *Polyalthia nitidissima* (2), *Stephania japonica* (2), *Cassytha* sp. (1), *Melodorum leichhardtii* (1)

Lower Mid

Jasminum didymum subsp. *didymum* (3), *Alyxia ruscifolia* (2), *Carissa ovata* (2), * *Opuntia stricta* (2), *Geitonoplesium cymosum* (1)

Ground

* *Passiflora suberosa* var. *suberosa* (5), *Abutilon* sp. (4), *Cyperus enervis* (4), * *Rivina humilis* (4), * *Cenchrus echinatus* (2), *Cyperus* sp. (2), * *Panicum maximum* var. *maximum* (2)

BOYLI19

Canopy

Eucalyptus tessellaris

Upper Mid

Acacia aulacocarpa, *Acronychia imperforata*, *Alphitonia excelsa*, *Canthium coprosmoides*, *Cupaniopsis anacardioides*, *Drypetes deplanchei*, *Euroschinus falcata*, *Ficus opposita*, *Grevillea robusta*, *Malaisia scandens* subsp. *scandens*, *Mallotus discolor*, *Petalostigma pubescens*, *Planchonia careya*, *Pleiogynium timorense*

Mid

Alectryon connatus, *Breynia oblongifolia*, *Carissa ovata*, *Diospyros geminata*, *Exocarpos latifolius*, *Ficus opposita*, *Glochidion lobocarpum*, *Hibiscus tiliaceus*, *Jasminum didymum* subsp. *didymum*, *Melia azedarach*, *Pittosporum revolutum*, *Pleogyne australis*, *Polyalthia nitidissima*, *Polyscias elegans*, *Secamone elliptica*, *Sterculia quadrifida*, *Turraea pubescens*

Lower Mid

Ficus sp., *Glochidion lobocarpum*, *Harpullia hillii*, * *Opuntia stricta*

Ground

* *Cenchrus echinatus*, *Cyperus enervis*, *Imperata cylindrica*, *Lomandra longifolia*, * *Panicum maximum* var. *maximum*, * *Passiflora suberosa* var. *suberosa*, * *Rivina humilis*, * *Salvia coccinea*, * *Setaria surgens*, *Stephania japonica*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2b *Eucalyptus tessellaris* Tall Woodland with mid stratum of shrubs and grassy ground stratum

A continuum of communities exists between units 2a and 2b and the differences in these communities may, again, possibly be the result of differences in past fire regimes.

Site: BOYU12

Landform: Beach ridges

Substrate: Sand

Management Issues: Rainforest elements may increase in dominance in the absence of fire, however exclusion of fire may be difficult as fire induced grassy ground strata tend to be self perpetuating. Grass growth (and thus increased fuel load) is also enhanced by reduction in canopy density. Fire is only recommended where high fuel loads would prevent control of wildfires in high fire hazard conditions.

Species Composition/Relative Abundance

BOYU12

Emergent

Ficus sp. (1)

Canopy

Eucalyptus tessellaris (7)

Upper Mid

Alphitonia excelsa (6), *Eucalyptus tessellaris* (6), *Acacia aulacocarpa* (4), *Turraea pubescens* (4), *Petalostigma pubescens* (3), *Alectryon connatus* (2), *Cupaniopsis anacardioides* (2), *Diospyros fasciculosa* (2), *Diospyros geminata* (2), *Mallotus discolor* (2), *Melia azedarach* (2), *Planchonia careya* (2), *Pleogynium timorense* (2), *Sterculia quadrifida* (2), *Drypetes deplanchei* (1), *Glochidion lobocarpum* (1), *Jasminum didymum subsp. didymum* (1), *Polyscias elegans* (1)

Mid

Turraea pubescens (6), *Alectryon connatus* (3), *Alphitonia excelsa* (3), *Drypetes deplanchei* (3), *Eucalyptus tessellaris* (3), *Ficus opposita* (3), *Glochidion lobocarpum* (3), *Acacia aulacocarpa* (2), *Acronychia imperforata* (2), *Alyxia ruscifolia* (2), *Carissa ovata* (2), *Cupaniopsis anacardioides* (2), *Diospyros fasciculosa* (2), * *Lantana camara* (2), *Malaisia scandens subsp. scandens* (2), *Mallotus discolor* (2), *Planchonia careya* (2), *Pleogynium timorense* (2), *Pleogyne australis* (2), *Stephania japonica* (2), *Diospyros geminata* (1), *Exocarpos latifolius* (1), *Ficus sp.* (1), *Geijera salicifolia var. latifolia* (1), *Petalostigma pubescens* (1), *Pittosporum ferrugineum* (1), *Polyalthia nitidissima* (1), *Polyscias elegans* (1)

Lower Mid

Alectryon connatus (6), *Alphitonia excelsa* (6), *Drypetes deplanchei* (6), *Turraea pubescens* (6), *Breynia oblongifolia* (4), *Eucalyptus tessellaris* (3), *Jasminum didymum subsp. didymum* (3), * *Opuntia stricta* (3), *Pleogynium timorense* (3), *Acacia aulacocarpa* (2), *Cupaniopsis anacardioides* (2), *Ficus opposita* (2), *Glochidion lobocarpum* (2), *Jasminum simplicifolium* (2), *Secamone elliptica* (2), *Canthium coprosmoides* (1), *Carissa ovata* (1), *Polyalthia nitidissima* (1), * *Solanum seaforthianum* (1)

Ground

* *Passiflora suberosa var. suberosa* (5), *Cyperus enervis* (4), *Cyperus sp.* (4), * *Rivina humilis* (4), * *Salvia coccinea* (4), *Imperata cylindrica* (3), *Ancistrachne uncinulata* (2), *Aristida sp.* (2), *Digitaria parviflora* (2), *Enneapogon lindleyanus* (2), * *Cenchrus echinatus* (1), *Eragrostis sp.* (1), *Paspalidium sp.* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

**2c *Eucalyptus citriodora* Very Tall/Tall Woodland with mid stratum of
Allocasuarina luehmannii/*Allocasuarina torulosa* and grassy ground stratum**

Sites: BOYIJ06, BOYIJ09

Landform: Mid & lower slopes of low hills and rises

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues: Increased fire frequency as a result of proximity to houses may reduce the density of the mid stratum. Extension of backyard gardens and the dumping of garden refuse into the buffer zone area may facilitate invasion of the natural bushland by environmental weeds. Fire management may need to incorporate prescribed burning & maintenance of fire breaks for protection of property.

Trail bike riding and vehicle use has caused erosion in some areas.

Species Composition/Relative Abundance

BOYIJ06

Canopy

Eucalyptus citriodora (5), *Eucalyptus crebra* (2), *Eucalyptus exserta* (2)

Upper Mid

Allocasuarina luehmannii (5), *Acacia aulacocarpa* (4), *Acacia falciformis* (4), *Alphitonia excelsa* (2),
Allocasuarina torulosa (1)

Mid

Jacksonia scoparia (5), *Pogonolobus reticulatus* (5), *Acacia conferta* (3), *Parsonsia straminea* (2)

Ground

Entolasia stricta (6), *Xanthorrhoea latifolia* subsp. *latifolia* (5), *Themeda triandra* (2)

Vine

Cassytha sp. (4)

BOYIJ09

Canopy

Eucalyptus citriodora (4), *Eucalyptus exserta* (4), *Eucalyptus clarksoniana* (2), *Eucalyptus crebra* (1)

Upper Mid

Allocasuarina torulosa (6), *Allocasuarina luehmannii* (3), *Lophostemon suaveolens* (2), *Melaleuca nervosa* (2)

Mid

Acacia conferta (6), *Pogonolobus reticulatus* (4), *Jacksonia scoparia* (2), *Melaleuca nervosa* (2)

Lower Mid

Pogonolobus reticulatus (4), *Acacia aulacocarpa* (2)

Ground

Eriachne sp. (5), *Themeda triandra* (4), *Xanthorrhoea latifolia* subsp. *latifolia* (4), *Entolasia stricta* (3), *Melichrus adpressus* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2d *Eucalyptus citriodora* Tall Woodland with shrub mid stratum and grassy ground stratum

Sites: BOYIJ05, BOYIJ07, BOYIJ29

Landform: Mid & upper slopes of low hills and rises

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues: Trail bike riding and vehicle use have created severe erosion problems in some areas. Severely eroded areas should be closed for rehabilitation. Trail bike riding should be excluded from areas with potential for severe erosion problems.

Excavated tracks (surface of tracks is well below ground level in many places) with inadequate drainage act as watercourses during periods of intense rainfall, creating /enhancing erosion problems.

Some prescribed burning may be necessary occasionally.

Species Composition/Relative Abundance

BOYIJ05

Canopy

Eucalyptus citriodora (6), *Eucalyptus clarksoniana* (3), *Eucalyptus crebra* (3), *Eucalyptus exserta* (3)

Upper Mid

Acacia falciformis (6), *Eucalyptus clarksoniana* (6), *Eucalyptus crebra* (3), *Eucalyptus exserta* (3), *Eucalyptus citriodora* (2), *Melaleuca nervosa* (2), *Acacia conferta* (1)

Mid

Acacia conferta (6), *Acacia falciformis* (4), *Acacia leiocalyx* (3), *Pogonolobus reticulatus* (3), *Acacia aulacocarpa* (2), *Alphitonia excelsa* (2), *Cassytha* sp. (2), *Eucalyptus citriodora* (2), *Eucalyptus crebra* (2), *Eucalyptus exserta* (2), *Eucalyptus* sp. (2), *Jacksonia scoparia* (2), *Melaleuca nervosa* (2), *Parsonsia straminea* (2), *Petalostigma pubescens* (2), *Acacia leptocarpa* (1)

Lower Mid

Acacia falciformis (6), *Acacia leiocalyx* (6), *Melaleuca nervosa* (6), *Acacia aulacocarpa* (4), *Acacia conferta* (4), *Pogonolobus reticulatus* (4), *Eucalyptus citriodora* (3), *Acacia leptocarpa* (2), *Eucalyptus exserta* (2), *Lophostemon suaveolens* (2), *Petalostigma pubescens* (2), *Cassytha* sp. (1)

Ground

Xanthorrhoea latifolia subsp. *latifolia* (6), *Aristida* sp. (3), *Dianella caerulea* (3), *Themeda triandra* (3), *Alloteropsis semialata* (2), *Digitaria parviflora* (2), *Entolasia stricta* (2), *Goodenia rotundifolia* (2), *Lomandra* sp. (2), *Parsonsia straminea* (2), *Paspalum* sp. (2), *Tricoryne* sp. (2), *Acacia amblygona* (1), *Acacia leptocarpa* (1), *Eucalyptus* sp. (1), *Fimbristylis* sp. (1), *Melichrus adpressus* (1)

BOYU07

Canopy

Eucalyptus citriodora (4), *Eucalyptus crebra* (2), *Eucalyptus exserta* (2)

Upper Mid

Acacia aulacocarpa (4), *Eucalyptus exserta* (4), *Alphitonia excelsa* (3), *Acacia falciformis* (2), *Eucalyptus clarksoniana* (2), *Melaleuca nervosa* (2)

Mid

Acacia conferta (3), *Alphitonia excelsa* (3), *Cassytha* sp. (2), *Planchonia careya* (2)

Lower Mid

* *Lantana camara* (4), *Ludwigia* sp. (4), * *Baccharis halimifolia* (3), *Eustrephus latifolius* (3), *Typha* sp. (3), *Hibiscus* sp. (2), * *Passiflora foetida* (2), *Petalostigma pubescens* (2), *Solanum* sp. (2), *Drypetes deplanchei* (1), *Mallotus discolor* (1)

Ground

Alloteropsis semialata (4), * *Cyperus brevifolius* (4), *Juncus* sp. (4), * *Bidens pilosa* (3), *Eragrostis* sp. (3), *Juncus continuus* (3), * *Passiflora suberosa* var. *suberosa* (3), * *Ageratum houstonianum* (2), *Aristida* sp. (2), *Calochlaena dubia* (2), * *Crotalaria pallida* (2), *Cyclosorus interruptus* (2), *Cyperus* sp. (2), *Dianella* sp. (2), *Digitaria parviflora* (2), * *Emilia sonchifolia* (2), *Entolasia stricta* (2), *Fimbristylis* sp. (2), *Glycine* sp. (2), *Imperata cylindrica* (2), *Nephrolepis cordifolia* (2), *Pterocaulon redolens* (2), *Sida* sp. (2), * *Sigesbeckia orientalis* (2), *Themeda triandra* (2), *Xyris complanata* (2), *Lobelia* sp. (1), *Phyllanthus virgatus* (1), * *Richardia brasiliensis*

BOYU29

Canopy

Eucalyptus citriodora (3), *Eucalyptus clarksoniana* (2), *Eucalyptus exserta* (2), *Eucalyptus tereticornis* (2), *Eucalyptus crebra* (1)

Upper Mid

Acacia aulacocarpa (4), *Acacia falciformis* (4), *Alphitonia excelsa* (4), *Petalostigma pubescens* (3), *Eucalyptus tessellaris* (2), *Lophostemon suaveolens* (2), *Melaleuca nervosa* (2), *Polyscias elegans* (1)

Mid

Acacia conferta (3), *Pogonolobus reticulatus* (3), *Acacia julifera* (2), *Canthium coprosmoides* (2), *Cassytha* sp. (2), *Jacksonia scoparia* (2), * *Lantana camara* (2), *Planchonia careya* (2), *Breynia oblongifolia* (1), *Celtis paniculata* (1), *Exocarpos latifolius* (1), *Ficus opposita* (1)

Lower Mid

Cupaniopsis anacardioides (2), *Drypetes deplanchei* (2), *Jasminum didymum* subsp. *didymum* (1)

Ground

Aristida sp. (3), *Dianella* sp. (3), *Heteropogon contortus* (3), *Xanthorrhoea latifolia* subsp. *latifolia* (3), *Cheilanthes sieberi* (2), *Digitaria parviflora* (2), *Entolasia stricta* (2), *Fimbristylis* sp. (2), *Goodenia rotundifolia* (2), * *Hyparrhenia rufa* (2), * *Lantana montevidensis* (2), * *Panicum maximum* var. *maximum* (2), * *Passiflora suberosa* var. *suberosa* (2), *Sida subspicata* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2e *Eucalyptus exserta*/ *E. crebra* Tall Woodland with mid stratum of shrubs and grassy ground stratum

Site: BOYIJ02

Landform: Crests and ridge tops of low hills and rises

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues: Although canopy thinning had occurred in areas adjacent to the smelter, weeds were not a significant problem in this unit. Some prescribed burning may be necessary occasionally.

Species Composition/Relative Abundance

BOYIJ02

Canopy

Eucalyptus exserta (7)

Upper Mid

Alphitonia excelsa (6), *Petalostigma pubescens* (4), *Acacia conferta* (3), *Eucalyptus exserta* (3), *Acacia aulacocarpa* (2), *Eucalyptus clarksoniana* (2), *Eucalyptus crebra* (2), *Melaleuca* sp. (2), *Planchonia careya* (2)

Mid

Acacia conferta (6), *Alphitonia excelsa* (4), *Petalostigma pubescens* (4), *Pogonolobus reticulatus* (4), *Acacia aulacocarpa* (3), *Acacia leptocarpa* (2), *Alectryon connatus* (2), *Breynia oblongifolia* (2), *Canthium coprosmoides* (2), *Cupaniopsis anacardioides* (2), *Eucalyptus crebra* (2), *Eucalyptus exserta* (2), *Eucalyptus* sp. (2), *Jacksonia scoparia* (2), * *Lantana camara* (2), *Melaleuca* sp. (2), *Planchonia careya* (2), *Canthium* sp. (1), *Carissa ovata* (1), *Jagera pseudorhus* (1), *Jasminum simplicifolium* (1), *Mallotus discolor* (1), *Pleiogynium timorense* (1), *Turraea pubescens* (1)

Lower Mid

Alectryon connatus (6), *Petalostigma pubescens* (5), *Pogonolobus reticulatus* (5), *Alphitonia excelsa* (4), *Breynia oblongifolia* (3), *Acacia conferta* (2), *Carissa ovata* (2), *Drypetes deplanchei* (2), *Eucalyptus exserta* (2), *Eucalyptus* sp. (2), *Melaleuca* sp. (2), *Pleiogynium timorense* (2), *Cupaniopsis anacardioides* (1), *Exocarpos latifolius* (1), *Jagera pseudorhus* (1), * *Lantana camara* (1), *Cassytha* sp.

Ground

* *Sida cordifolia* (2), *Xanthorrhoea latifolia* subsp. *latifolia* (2), *Gahnia aspera* (1), *Secamone elliptica* (1), *Aristida* sp., *Dianella caerulea*, *Digitaria parviflora*, *Eustrephus latifolius*, *Heteropogon contortus*, *Jasminum didymum* subsp. *didymum*, *Lomandra* sp., * *Melinis repens*, *Paspalidium* sp., * *Passiflora suberosa* var. *suberosa*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2f Tall *Eucalyptus exserta*/E. clarksoniana Woodland with mid stratum of shrubs and grassy ground stratum

Site: BOYIJ08

Landform: Lower slopes of low hills and rises

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues: Although canopy thinning had occurred in areas adjacent to the smelter, weeds were not a significant problem in this unit. Some prescribed burning may be required occasionally.

Species Composition/Relative Abundance

BOYIJ08

Canopy

Eucalyptus exserta (5), *Eucalyptus clarksoniana* (4), *Eucalyptus crebra* (1), *Eucalyptus tereticornis* (1), *Eucalyptus tessellaris* (1)

Upper Mid

Petalostigma pubescens (3), *Euroschinus falcata* (1)

Mid

Acacia conferta (4), *Alphitonia excelsa* (4), *Petalostigma pubescens* (4), *Pogonolobus reticulatus* (4), *Acacia aulacocarpa* (3), *Glochidion lobocarpum* (3), * *Macroptilium atropurpureum* (2), *Melaleuca nervosa* (2), *Planchonia careya* (2), *Canthium coprosmoides* (1), *Drypetes deplanchei* (1)

Lower Mid

* *Passiflora suberosa* var. *suberosa* (4), *Breynia oblongifolia* (2), *Cupaniopsis anacardioides* (1)

Ground

Heteropogon contortus (6), *Aristida* sp. (4), * *Melinis repens* (3), *Brunoniella acaulis* (2), *Cheilanthes sieberi* (2), *Dianella* sp. (2), *Entolasia stricta* (2), *Eragrostis* sp. (2), *Eustrephus latifolius* (2), *Fimbristylis* sp. (2), * *Panicum maximum* var. *maximum* (2), *Paspalum* sp. (2), *Phyllanthus virgatus* (2), * *Sida cordifolia* (2), *Xanthorrhoea latifolia* subsp. *latifolia* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2g *Eucalyptus tereticornis* Tall Open Forest/ Woodland with a very sparse shrub midstratum and a very sparse grassy ground stratum

Site: BOYIJ18

Landform: Alluvial plains, drainage lines and lower foot slopes of low hills & rises.

Substrate: Sedimentary rock (quartz arenite, mudstone, schist).

Management Issues: Site BOYU18 was disturbed and therefore not representative of other parts of this unit, particularly in the understorey. Lantana may become a problem in this unit as it tends to occur in wetter areas. Also Guinea Grass was prevalent on road edges or areas where the canopy was sparse or absent.

Minimising edge area and maintaining canopy cover should minimise weed problems. Use of herbicide may be necessary to suppress guinea grass & promote regeneration of natural vegetation. Refer to information on weed management in management section.

It is important to ensure that adequate regeneration of *E. tereticornis* is occurring, particularly in areas being slashed.

This unit occurs along numerous drainage lines throughout the site. Most of these units are too small to map as they form a narrow linear zones along drainage lines. Some of these drainage lines have erosion problems as a result of the presence of vehicle tracks and trail bike riding. This erosion is enhanced by flow of runoff water during rainy weather. Natural vegetation along these drainage lines should not be disturbed as it offers protection against erosion. Vehicle tracks should avoid these areas if possible and trail bike riding should be excluded from gullies and drainage lines.

Species Composition/Relative Abundance

BOYU18

Canopy

Eucalyptus tereticornis (6), *Eucalyptus exserta* (2)

Upper Mid

Eucalyptus exserta (3), *Lophostemon suaveolens* (3), *Acacia aulacocarpa* (2), *Eucalyptus clarksoniana* (2), *Eucalyptus tessellaris* (2), *Melaleuca* sp. (2), *Petalostigma pubescens* (2)

Mid

Acacia aulacocarpa (3), *Melaleuca nervosa* (3), *Canthium coprosmoides* (2), *Casuarina glauca* (2), *Euroschinus falcata* (2), *Melaleuca* sp. (2), *Petalostigma pubescens* (2), *Acacia flavescens* (1), *Acacia macradenia* (1), *Acacia* sp. (1)

Lower Mid

Alphitonia excelsa (3), *Breynia oblongifolia* (2), *Planchonia careya* (2), *Pogonolobus reticulatus* (2)

Ground

Aristida sp. (3), *Eragrostis* sp. (3), *Fimbristylis* sp. (3), * *Melinis repens* (3), *Phyllanthus virgatus* (3), * *Cenchrus echinatus* (2), * *Chloris* sp. (2), * *Gomphrena celosioides* (2), *Murdannia graminea* (2), * *Panicum maximum* var. *maximum* (2), *Paspalidium* sp. (2), * *Sida rhombifolia* (2), *Hibiscus* sp. (1), *Hybanthus monopetalus* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2h *Eucalyptus tereticornis* Tall Open Woodland with dense small tree & shrub mid stratum and grassy ground stratum

Site: BOYU25

Landform: Flat to gently undulating land immediately adjacent to the north western side of the smelter

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues: Vegetation in this unit may have undergone transition from unit 2g vegetation with an increase in density of the mid stratum due to a combination of severe canopy thinning and absence of fire. The eucalypt canopy as well as some understorey species such as *Xanthorrhoea* are obviously suffering deleterious effects probably due to smelter emissions. These species may be useful as indicator species for monitoring smelter emissions in other sites. On the other hand, it was noted that *Jagera pseudorhus* (Foam Bark) appeared to be very healthy and growing & regenerating well at the site and may prove to be a useful rehabilitation species. Use of fire is not recommended at this site as the fire sensitive species appear to be thriving better than the fire resistant species. Also the grassy ground stratum was quite sparse at the time of the survey and should not become a problem as long as the mid stratum remains relatively dense.

Species Composition/Relative Abundance

BOYIJ25

Canopy

Eucalyptus tereticornis (5), *Eucalyptus exserta* (2), *Eucalyptus crebra* (1)

Upper Mid

Alphitonia excelsa (5), *Lophostemon suaveolens* (5), *Melaleuca nervosa* (4), *Petalostigma pubescens* (4), *Allocasuarina torulosa* (2), *Jagera pseudorhus* (2), *Planchonia careya* (2)

Mid

Acacia aulacocarpa (2), *Acacia leptocarpa* (2), *Canthium coprosmoides* (2), *Eucalyptus clarksoniana* (2), *Ficus opposita* (2), *Ficus sp.* (2), *Glochidion lobocarpum* (2), *Jacksonia scoparia* (2), *Jagera pseudorhus* (2), *Pogonolobus reticulatus* (2), *Jasminum simplicifolium* (1), *Pleiogynium timorense* (1)

Lower Mid

Breynia oblongifolia (2), *Eucalyptus exserta* (2), *Eustrephus latifolius* (2), *Jagera pseudorhus* (2), *Acacia conferta* (1), *Cupaniopsis anacardioides* (1), *Drypetes deplanchei* (1)

Ground

Xanthorrhoea latifolia subsp. *latifolia* (5), *Dianella sp.* (4), *Aristida sp.* (3), *Heteropogon contortus* (3), *Cymbopogon refractus* (2), *Digitaria parviflora* (2), *Eragrostis sp.* (2), *Fimbristylis sp.* (2), *Lomandra sp.* (2), * *Melinis repens* (2), * *Passiflora foetida* (2), * *Passiflora suberosa* var. *suberosa* (2), * *Sida cordifolia* (2), * *Cenchrus echinatus* (1), *Cassytha sp.*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2i *Eucalyptus tereticornis* Tall Very Open Woodland with dense grass and forb ground stratum

Site: BOYIJ17

Landform: Sand plain

Substrate: sand

Management Issues: This area has obviously been cleared in the past and currently has a very dense ground stratum of grasses and weeds. Regeneration of *Eucalyptus tereticornis* appears to be minimal and it would be desirable to increase canopy density in this area. Possibly a patchy controlled burn, which targets areas of dense Guinea Grass & Lantana and excludes areas where *E. tereticornis* or rainforest species are regenerating, may be useful.

Species Composition/Relative Abundance

BOYIJ17

Canopy

Eucalyptus tereticornis (6), *Eucalyptus tessellaris* (2)

Upper Mid

Eucalyptus tereticornis (6), *Acacia aulacocarpa* (5), * *Mangifera indica* (1)

Mid

* *Lantana camara* (6), *Clerodendrum floribundum* (3), *Ficus opposita* (3), *Alphitonia excelsa* (2), *Breynia oblongifolia* (2), *Cassytha* sp. (2), *Cupaniopsis anacardioides* (2), *Exocarpos latifolius* (2), *Mallotus discolor* (2), *Melia azedarach* (2), * *Psidium guajava* (2), * *Solanum seaforthianum* (2), * *Citrus limon* (1), *Turraea pubescens* (1)

Lower Mid

Sida subspicata (4), *Alphitonia excelsa* (2), *Breynia oblongifolia* (2), *Drypetes deplanchei* (2), *Jasminum didymum* subsp. *didymum* (2), * *Opuntia stricta* (2), * *Passiflora foetida* (2), *Stephania japonica* (2), *Eucalyptus tereticornis* (1)

Ground

Imperata cylindrica (4), *Heteropogon contortus* (3), * *Panicum maximum* var. *maximum* (3), * *Crotalaria pallida* (2), * *Melinis repens* (2), *Aristida* sp. (1), *Cyperus enervis* (1), *Vernonia cinerea*

Vine

* *Passiflora suberosa* var. *suberosa* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

2j *Eucalyptus tereticornis* / *Melaleuca dealbata* Tall Forest/Open Forest with very sparse understorey

This unit was very similar to unit 3b differing only in relative dominance of the canopy species

Landform: Beach ridges

Substrate: sand

Management Issues:

Refer to unit 3b

2k Mid high woodland of immature eucalypts, small trees and shrubs with sparse ground stratum of grasses and forbs

Sites: BOYIJ26, BOYIJ27

Landform:

Substrate: Sedimentary rock (quartz arenite, mudstone, schist)

Management Issues:

Smelter emissions have severely thinned the eucalypt canopy with subsequent invasion of numerous herbaceous weeds in the ground stratum. This area is currently the most severely affected by smelter emissions and is a useful area for trial plantings and experimental monitoring. The area should be closely monitored for the presence of noxious weeds.

Species Composition/Relative Abundance

BOYIJ26

Emergent

Eucalyptus crebra (1), *Eucalyptus exserta* (1)

Canopy

Alphitonia excelsa (4), *Eucalyptus* sp. (4), *Lophostemon suaveolens* (3), *Allocasuarina torulosa* (2), *Eucalyptus tereticornis* (2), *Melaleuca nervosa* (2), *Planchonia careya* (2)

Mid

Lophostemon suaveolens (4), *Pogonolobus reticulatus* (4), *Petalostigma pubescens* (3), *Breynia oblongifolia* (2), *Cassytha* sp. (2), *Ficus opposita* (2), * *Lantana camara* (2), *Mallotus discolor* (1), * *Solanum seafortianum* (1)

Lower Mid

* *Passiflora foetida* (3), * *Bidens pilosa* (2), *Eustrephus latifolius* (2), *Hibiscus* sp. (2), * *Macroptilium atropurpureum* (1)

Ground

Aristida sp. (3), * *Sida cordifolia* (3), *Xanthorrhoea latifolia* subsp. *latifolia* (3), * *Cenchrus echinatus* (2), *Crotalaria montana* (2), * *Crotalaria pallida* (2), *Desmodium* sp. (2), *Dianella caerulea* (2), * *Euphorbia hirta* (2), *Fimbristylis* sp. (2), *Glycine* sp. (2), *Heteropogon contortus* (2), *Indigofera hirsuta* (2), * *Melinis repens* (2), * *Setaria sphacelata* (2), * *Sporobolus pyramidalis* (2), *Lomandra* sp. (1)

BOYIJ27 (incomplete site)

Emergent

Eucalyptus tereticornis

Canopy

Grevillea robusta

Lower Mid

Acacia conferta

Unknown

Acacia holosericea, * *Chloris sp.*, *Jagera pseudorhus*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

3 MELALEUCA DOMINATED COMMUNITIES

3a *Melaleuca dealbata*/ *Casuarina glauca* Very Tall Closed Forest/Forest with a sparse to very sparse understorey

Site: BOYIJ13

Landform: Low lying swales in beach ridge systems possibly with elevated salinity levels due to close proximity to areas which are currently or previously have been subject to periodic seawater inundation.

Substrate: sand

Management Issues:

Rubber vine is present in this unit and should be eliminated.

Species Composition/Relative Abundance

BOYIJ13

Canopy

Melaleuca dealbata (6), *Casuarina glauca* (3), * *Cryptostegia grandiflora* (2), *Eucalyptus tessellaris* (2), *Ficus racemosa* var. *racemosa* (2)

Upper Mid

Melaleuca dealbata (6), *Ficus racemosa* var. *racemosa* (4), *Casuarina glauca* (3), * *Cryptostegia grandiflora* (3), *Acacia aulacocarpa* (2), *Mallotus discolor* (2), *Cupaniopsis anacardioides* (1), *Eucalyptus tessellaris* (1)

Mid

Melaleuca dealbata (6), * *Cryptostegia grandiflora* (4), *Mallotus discolor* (4), *Casuarina glauca* (3), *Ficus racemosa* var. *racemosa* (3), *Cupaniopsis anacardioides* (2), *Eucalyptus tessellaris* (2)

Lower Mid

Casuarina glauca (2), *Sesbania cannabina* (2), * *Asclepias curassavica* (1), *Drypetes deplanchei* (1), * *Euphorbia cyathophora* (1), *Melia azedarach* (1), * *Solanum torvum* (1)

Ground

* *Cynodon sp.* (6), * *Cryptostegia grandiflora* (5), * *Passiflora suberosa* var. *suberosa* (5), *Centella asiatica* (4), * *Cirsium vulgare* (2), * *Cyperus rotundus* (2), *Paspalum sp.* (2), * *Phyla nodiflora* var. *nodiflora* (2), * *Lycopersicon esculentum* (1), *Stephania japonica* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

3b *Melaleuca dealbata/Eucalyptus tereticornis* Tall Open Forest with sparse understorey

Site: BOYIJ14

Landform: Beach ridge swales of slightly higher elevation than unit 3a

Substrate: sand

Management Issues:

Guinea grass invasion was a major problem in this unit. Further track construction should be avoided and canopy cover should be maintained over existing tracks where possible to minimise ground stratum light intensity. Invasive weeds such as guinea grass are often introduced with road construction materials brought in from outside the area. Fire is not necessarily a good management tool as conditions are created which favour re-establishment of guinea grass (refer to general management Issues section below).

Species Composition/Relative Abundance

BOYIJ14

Canopy

Melaleuca dealbata (6), *Eucalyptus tereticornis* (4), *Melaleuca quinquenervia* (3), *Eucalyptus tessellaris* (2), *Casuarina glauca* (1)

Upper Mid

Acacia aulacocarpa (2), *Lophostemon suaveolens* (2)

Mid

Ficus racemosa var. *racemosa* (4), *Glochidion lobocarpum* (3), *Mallotus discolor* (2), *Casuarina glauca* (1), *Cupaniopsis anacardioides* (1), *Malaisia scandens* subsp. *scandens* (1), *Planchonia careya* (1), *Schefflera actinophylla* (1)

Lower Mid

* *Crotalaria pallida* (2), *Drypetes deplanchei* (2), *Jagera pseudorhus* (2), *Melia azedarach* (2), *Trema tomentosa* (2), *Turraea pubescens* (2), * *Solanum seaforthianum* (1)

Ground

Imperata cylindrica (5), * *Passiflora suberosa* var. *suberosa* (5), *Paspalum* sp. (4), *Cyperus* sp. (3), * *Asclepias curassavica* (2), * *Cryptostegia grandiflora* (2), *Eragrostis* sp. (2), * *Panicum maximum* (2), *Paspalidium* sp. (2), * *Sonchus oleraceus* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

4 CASUARINA DOMINATED COMMUNITIES

4a *Casuarina glauca* Tall/Mid high Forest/Open Forest/Woodland with *Sporobolus virginicus* ground stratum

Site: BOYIJ11, BOYIJ32

Landform: - landward margins of Intertidal areas
- beach ridge swales which have been subject to past or periodic inundation by sea water.

Substrate: sand/mud

Management Issues:

Rubber vine is present in this unit and should be eliminated. Monitoring for the presence of groundsel is also recommended

Species Composition/Relative Abundance

BOYIJ11

Canopy

Casuarina glauca (7)

Mid

Casuarina glauca (6), * *Cryptostegia grandiflora* (2)

Lower Mid

Casuarina glauca (6), * *Cryptostegia grandiflora* (3), *Suaeda australis*

Ground

Sporobolus virginicus (6), *Epaltes australis* (2), * *Cryptostegia grandiflora*, *Fimbristylis* sp., * *Passiflora suberosa* var. *suberosa*, *Sarcocornia quinqueflora*, *Sesuvium portulacastrum*

Unknown

Melaleuca sp., *Myoporum acuminatum*

BOYIJ32 (incomplete site)

Canopy

Casuarina glauca (5), *Cupaniopsis anacardioides* (2), *Drypetes deplanchei* (2), *Pleiogynium timorense* (2)

Mid

Breynia oblongifolia, *Canthium coprosmoides*, *Celtis paniculata*, * *Lantana camara*, *Malaisia scandens* subsp. *scandens*, *Vitex trifolia*

Ground

* *Opuntia stricta*, * *Passiflora suberosa* var. *suberosa*, *Sporobolus virginicus*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

4b *Casuarina equisetifolia* Tall Forest/ Open Forest with a mixed understorey of littoral rainforest species, strand vegetation and mangrove species

Site: BOYIJ33

Landform: Low energy sandy shoreline

Substrate: sand

Management Issues: This unit occurs on the eastern shoreline of South Trees Island and does not appear to be suffering from any signs of human disturbance

Species Composition/Relative Abundance

BOYIJ33

Canopy

Casuarina equisetifolia (6), *Mallotus discolor* (5)

Upper Mid

Melia azedarach (3), *Sophora tomentosa* subsp. *australis* (3), *Acacia aulacocarpa* (2), *Drypetes deplanchei* (2), *Malaisia scandens* subsp. *scandens* (2), *Geijera salicifolia* var. *latifolia* (1)

Mid

Caesalpinia bonduc (4), * *Solanum seaforthianum* (4), *Sophora tomentosa* subsp. *australis* (4), *Stephania japonica* (4), *Clerodendrum floribundum* (3), *Cupaniopsis anacardioides* (3), *Jasminum didymum* subsp. *didymum* (3), *Vitex trifolia* (3), *Breynia oblongifolia* (2), *Cassytha* sp. (2), *Celtis paniculata* (2), * *Cryptostegia grandiflora* (2), *Excoecaria agallocha* (2), * *Lantana camara* (2), *Rhizophora stylosa* (2), *Turraea pubescens* (2)

Lower Mid

Crotalaria medicaginea (2), * *Crotalaria pallida* (2), *Jasminum simplicifolium* (2), * *Opuntia stricta* (2), *Polyalthia nitidissima* (2), * *Salsola kali* (2), *Tetragonia tetragonioides* (2)

Ground

* *Passiflora suberosa* var. *suberosa* (3), *Achyranthes aspera* (2), *Cymbopogon refractus* (2), *Eragrostis interrupta* (2), *Imperata cylindrica* (2), * *Melinis repens* (2), * *Panicum maximum* var. *maximum* (2), * *Salvia coccinea* (2), *Spinifex sericeus* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

4c *Casuarina equisetifolia* Tall Forest/Open Forest with sparse ground stratum of grasses and herbaceous vines

Site: BOYIJ23

Landform: Crests of frontal dunes

Substrate: Sand

Management Issues:

Vegetation of this unit is very easily damaged by camping and vehicle use and rehabilitation difficult. If these activities are to continue, they should be excluded from this unit with campsites situated well back from the foredune area and vehicle access to the beach restricted to one or two tracks which incorporate appropriate beach protection measures.

Species Composition/Relative Abundance

BOYIJ23

Canopy

Casuarina equisetifolia (6), *Acacia aulacocarpa* (2)

Upper Mid

Casuarina equisetifolia (1)

Mid

Casuarina equisetifolia (3), *Acacia aulacocarpa* (2), *Geijera salicifolia* var. *latifolia* (2), *Cupaniopsis anacardioides* (1), *Exocarpos latifolius* (1), *Mallotus discolor* (1), *Vitex trifolia* (1)

Lower Mid

* *Opuntia stricta* (2), *Acacia aulacocarpa* (1), * *Crotalaria pallida* (1), *Cupaniopsis anacardioides* (1), *Euphorbia tannensis* (1), *Pleiogynium timorense* (1)

Ground

* *Passiflora suberosa* var. *suberosa* (6), *Jasminum didymum* subsp. *didymum* (4), *Breynia oblongifolia* (2), *Cassytha* sp. (2), * *Cenchrus echinatus* (2), *Clerodendrum floribundum* (2), *Crotalaria medicaginea* (2), * *Cryptostegia grandiflora* (2), *Cymbopogon refractus* (2), *Cyperus* sp. (2), *Eragrostis interrupta* (2), *Exocarpos latifolius* (2), *Hibbertia scandens* (2), *Imperata cylindrica* (2), *Ipomoea pescaprae* subsp. *brasiliensis* (2), * *Melinis repens* (2), *Paspalidium* sp. (2), *Spinifex sericeus* (2), *Stephania japonica* (2), * *Tridax procumbens* (2), *Mallotus discolor* (1), * *Sida cordifolia* (1)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

5 COMMUNITIES DOMINATED BY LOW TREES & SHRUBS

5a *Cupaniopsis anacardioides* / *Acacia aulacocarpa* Tall/Mid high Open Woodland

Site: BOYIJ20

Landform: sand dunes on northern end of sand spit

Substrate: sand

Management Issues: Camping and vehicle use possibly in conjunction with natural disturbances (wind, storms & changes in currents and sedimentation patterns at the mouth of South trees Inlet) has caused major damage to the vegetation in this unit and this area should be closed for regeneration. If camping and vehicle access is to continue, it is recommended that a camping area be established in a more suitable area.

Species Composition/Relative Abundance

BOYIJ20

Canopy

Cupaniopsis anacardioides (5), *Acacia aulacocarpa* (4), *Alectryon connatus* (3), *Exocarpos latifolius* (3), *Petalostigma pubescens* (3), *Diospyros geminata* (2), *Pleiogynium timorense* (2), *Sterculia quadrifida* (2)

Upper Mid

Clerodendrum floribundum (3), *Celtis paniculata* (2), *Mallotus discolor* (2)

Mid

Jasminum simplicifolium (4), *Breynia oblongifolia* (3), * *Opuntia stricta* (3), *Cassytha* sp. (2), *Glochidion lobocarpum* (2), *Jasminum didymum* subsp. *didymum* (2), * *Lantana camara* (2), *Micromelum minutum* (2), *Turraea pubescens* (2)

Lower Mid

* *Passiflora suberosa* var. *suberosa* (3), *Caesalpinia bonduc* (1)

Ground

Eragrostis interrupta (5), * *Melinis repens* (4), *Cymbopogon refractus* (2), *Ipomoea pescaprae* subsp. *brasiliensis* (2), * *Panicum maximum* var. *maximum* (2), *Stephania japonica* (2), * *Tridax procumbens* (2), *Boerhavia* sp.

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

5b Acacia Very Tall Shrubland

Site: BOYIJ31

Landform: sand ridges surrounded by tidal flats

Substrate: sand

Management Issues: Although the vegetation of this area currently appears to be in a relatively natural state, monitoring for the presence of noxious weeds such as groundsel & rubber vine is recommended.

Species Composition/Relative Abundance

BOYIJ31 (incomplete site)

Canopy

Acacia aulacocarpa (5), *Cupaniopsis anacardioides* (2), *Drypetes deplanchei* (2)

Mid

Myoporum acuminatum, *Vitex trifolia*

Ground

* *Digitaria didactyla*, *Limonium australe*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

5c Closed Shrubland

This unit consists of wind sheared vegetation growing densely in a narrow zone between the littoral rainforest zone and the foredune grasslands.

No sites were surveyed in this units. Photographs 2/19 & 2/20 illustrate the vegetation of this unit

Landform: crests of hind dunes

Substrate: sand

Management Issues: It is important to maintain the integrity of this vegetation to prevent dune erosion and protect the landward littoral rainforest vegetation

6 GRASSLANDS

6a Open Grassland +/- emergent *Casuarina equisetifolia*

Site: BOYIJ10, BOYIJ21

Landform: foredunes, landward of the frontal dune.

Substrate: sand

Management Issues:

The vegetation of this unit is very susceptible to damage and rehabilitation is difficult. Vehicles should be excluded from these areas as for unit 4c

Species Composition/Relative Abundance

BOYIJ10

Ground

* *Melinis repens* (6), *Aristida* sp. (3), *Crotalaria medicaginea* (3), *Cymbopogon refractus* (3), *Eragrostis interrupta* (3), * *Lantana camara* (3), *Breynia oblongifolia* (2), * *Digitaria didactyla* (2), *Enneapogon lindleyanus* (2), *Euphorbia tannensis* (2), *Imperata cylindrica* (2), *Ipomoea pescaprae* subsp. *brasiliensis* (2), * *Passiflora suberosa* var. *suberosa* (2), * *Salvia coccinea* (2), * *Sida cordifolia* (2), * *Tridax procumbens* (2), * *Opuntia stricta* (1), *Pleiogynium timorense* (1), *Euphorbia* sp.

BOYIJ21

Emergent

Casuarina equisetifolia (7)

Lower Mid

Casuarina equisetifolia (2), *Crotalaria medicaginea* (2), *Euphorbia tannensis* (2), * *Salsola kali* (2), *Vitex trifolia* (2), *Myoporum acuminatum* (1)

Ground

Eragrostis interrupta (6), *Mukia maderaspatana* (4), *Canavalia rosea* (3), *Ipomoea pescaprae* subsp. *brasiliensis* (3), * *Melinis repens* (3), *Spinifex sericeus* (3), *Tetragonia tetragonioides* (3), * *Tridax procumbens* (3), *Achyranthes aspera* (2), *Cassytha* sp. (2), * *Cenchrus echinatus* (2), * *Crotalaria pallida* (2), * *Emilia sonchifolia* (2), * *Passiflora foetida* (2), *Stephania japonica* (2), *Vigna marina* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

6b *Spinifex sericeus* Open Grassland

Site: BOYIJ24

Landform: seaward slope of the frontal foredune.

Substrate: sand

Management Issues:

The vegetation of this unit is very susceptible to damage and rehabilitation is difficult. Vehicles should be excluded from these areas as for unit 4c.

Species Composition/Relative Abundance

BOYIJ24

Lower Mid

* *Salsola kali* (2)

Ground

Spinifex sericeus (6), *Ipomoea pescaprae* subsp. *brasiliensis* (3), *Cassytha pubescens* (2), *Vigna marina* (2)

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

6c Closed Grasslands

Slashed road edges.

Management Issues:

Within the buffer zone, slashing should only be carried out where absolutely necessary as Guinea Grass, Lantana and other weeds thrive on edges of natural vegetation adjoining slashed areas. For example along the edges of the haul road, it may be more effective to allow the road edges to regenerate. The canopy may never grow tall enough to become a problem under the power lines and tall trees could be lopped from the roadside if necessary.

7 VEGETATION OF STREAM BANKS AND DRAINAGE AREAS

These areas have commonly been either artificially created or extensively modified.

Site: BOYIJ16, BOYIJ28, BOYIJ35, ground & lower mid strata of BOYIJ07

Management Issues:

In most of these sites the canopy has been removed or severely disturbed and the ground was very moist. Consequently there were a large number of weed species present. Site BOYIJ16 and possibly site BOYIJ35 have had surface material excavated and removed and sewage plant overflow has introduced a number of weed species into this area. Plant pots containing soil were found hidden in the bush at a few sites within this unit (? used for growing drugs).

Species Composition/Relative Abundance

BOYIJ16

Lower Mid

* *Crotalaria pallida* (4), *Ludwigia* sp. (3), * *Lycopersicon esculentum* (2), *Sesbania cannabina* (2), * *Solanum torvum* (2)

Ground

* *Cynodon dactylon* var. *dactylon* (6), *Typha* sp. (5), * *Cyperus polystachyos* (3), *Fimbristylis* sp. (3), * *Phyla nodiflora* var. *nodiflora* (3), * *Sigesbeckia orientalis* (3), *Alternanthera* sp. (2), * *Catharanthus roseus* (2), *Chrysocephalum apiculatum* (2), *Eragrostis* sp. (2), *Imperata cylindrica* (2), *Juncus* sp. (2), *Pterocaulon redolens* (2), * *Tridax procumbens* (2), *Philydrum lanuginosum* (1), * *Heliotropium indicum*

Unknown

* *Physalis* sp.

BOYIJ28

Mid

Sesbania cannabina (2)

Ground

Cyperus sp. (4), *Fimbristylis* sp. (4), *Typha* sp. (4), * *Cynodon* sp. (3), *Ludwigia* sp. (2), *Sesuvium portulacastrum*

BOYIJ35 (incomplete site)

Unknown

Acacia aulacocarpa, *Acrostichum speciosum*, *Breynia oblongifolia*, * *Catharanthus roseus*, *Centella asiatica*, * *Chloris* sp., * *Cryptostegia grandiflora*, * *Cynodon dactylon* var. *dactylon*, *Enchylaena tomentosa*, *Eucalyptus tessellaris*, *Fimbristylis* sp., * *Gomphocarpus physocarpus*, * *Hyparrhenia rufa*, * *Lantana camara*, *Ludwigia* sp., * *Macroptilium atropurpureum*, *Melaleuca* sp., * *Melinis repens*, * *Panicum maximum* var. *maximum*, *Sporobolus virginicus*, * *Stachytarpheta jamaicensis*, *Suaeda australis*, * *Tridax procumbens*, *Typha* sp., * *Xanthium pungens*

BOYIJ07 (lower mid & ground stratum)

Lower Mid

* *Lantana camara* (4), *Ludwigia* sp. (4), * *Baccharis halimifolia* (3), *Eustrephus latifolius* (3), *Typha* sp. (3), *Hibiscus* sp. (2), * *Passiflora foetida* (2), *Petalostigma pubescens* (2), *Solanum* sp. (2), *Drypetes deplanchei* (1), *Mallotus discolor* (1)

Ground

Alloteropsis semialata (4), * *Cyperus brevifolius* (4), *Juncus* sp. (4), * *Bidens pilosa* (3), *Eragrostis* sp. (3), *Juncus continuus* (3), * *Passiflora suberosa* var. *suberosa* (3), * *Ageratum houstonianum* (2), *Aristida* sp. (2), *Calochlaena dubia* (2), * *Crotalaria pallida* (2), *Cyclosorus interruptus* (2), *Cyperus* sp. (2), *Dianella* sp. (2), *Digitaria parviflora* (2), * *Emilia sonchifolia* (2), *Entolasia stricta* (2), *Fimbristylis* sp. (2), *Glycine* sp. (2), *Imperata cylindrica* (2), *Nephrolepis cordifolia* (2), *Pterocaulon redolens* (2), *Sida* sp. (2), * *Sigesbeckia orientalis* (2), *Themeda triandra* (2), *Xyris complanata* (2), *Lobelia* sp. (1), *Phyllanthus virgatus* (1), * *Richardia brasiliensis*

The numbers in brackets indicate relative abundance within the stratum on a scale of 1-7

8 INTERTIDAL COMMUNITIES

8a Mangrove Communities

8b Saltmarsh Communities

8c Saltflats

Intertidal communities were not surveyed as they are the subject of a separate study.

Landform: tidal flats

Substrate: sand/mud

9 HIGHLY DISTURBED AREAS

Areas where natural vegetation has been completely removed or almost completely removed. It was not possible to assign a vegetation unit to these areas.

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Appendix 4b

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APPENDIX 4B

VEGETATION MAP UNITS - CLASSIFIED ACCORDING TO LANDFORM

VEGETATION OF THE BEACH RIDGES

- 1a Low Microphyll Vine Forest/Thicket
- 1b Low Microphyll Vine Forest with emergent *Eucalyptus tessellaris*
- 2a *Eucalyptus tessellaris* Tall Woodland with understorey of Low Microphyll Vine Forest/ Low Microphyll Vine Thicket
- 2b *Eucalyptus tessellaris* Tall Woodland with midstratum of shrubs and grassy ground stratum
- 2i *Eucalyptus tereticornis* Tall Very Open Woodland with dense grass and forb ground stratum
- 2j *Eucalyptus tereticornis* /*Melaleuca dealbata* Tall Forest/Open Forest with very sparse understorey
- 3a *Melaleuca dealbata*/ *Casuarina glauca* Very Tall Closed Forest/Forest with a sparse to very sparse understorey
- 3b *Melaleuca dealbata*/*Eucalyptus tereticornis* Tall Open Forest with sparse understorey
- 5b Very Tall *Acacia* Shrubland

VEGETATION OF LOW HILLS & RISES

- 2c *Eucalyptus citriodora* Very Tall/Tall Woodland with mid stratum of *Allocasuarina leuhmannii*/*Allocasuarina torulosa* and grassy ground stratum
- 2d *Eucalyptus citriodora* Tall Woodland with shrub mid stratum and grassy ground stratum
- 2e *Eucalyptus exserta*/ *E. crebra* Tall Woodland with midstratum of shrubs and grassy ground stratum
- 2f *Eucalyptus exserta*/ *E. clarksoniana* Tall Woodland with mid stratum of shrubs and grassy ground stratum
- 2k Mid high Woodland of immature eucalypts, small trees and shrubs with sparse ground stratum of grasses and forbs

SAND DUNE/STRAND VEGETATION

- 4b *Casuarina equisetifolia* Tall Forest/ Open Forest with a mixed understorey of littoral rainforest species, strand vegetation and mangrove species

- 4c *Casuarina equisetifolia* Tall Forest/Open Forest with sparse ground stratum of grasses and herbaceous vines
- 5a *Acacia aulacocarpa/Cupaniopsis anacardiodes* Mid high Open Woodland
- 5c Closed Shrubland
- 6a Open Grassland +/- emergent *Casuarina equisetifolia*
- 6b *Spinifex sericeus* Open Grassland

VEGETATION OF ALLUVIAL PLAINS & DRAINAGE LINES

- 2g *Eucalyptus tereticornis* Tall Open Forest/ Woodland with grassy ground stratum
- 2h *Eucalyptus tereticornis* Tall Open Woodland with dense small tree & shrub mid stratum and grassy ground stratum
- 7 Vegetation of Streambanks and Drainage Areas

LITTORAL VEGETATION

- 4a *Casuarina glauca* Tall/Mid high Forest/Open Forest/Woodland with *Sporobolus virginicus* ground stratum
- 8a Mangrove Communities
- 8b Saltmarsh Communities
- 8c Saltflats

HIGHLY DISTURBED AREAS