



Draft Yellow-bellied Glider
Conservation Policy Project
St Georges Basin.

Draft Results

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Shoalhaven City Council and
NSW
Department of Environment &
Conservation

Document Preparation

The background paper for the study was prepared by SCC's Threatened Species Officer, Dimitri Young. David Coombes from DEC undertook all fieldwork and provided raw mapping data and records. Owen Maguire prepared the Old-growth Forest aerial photograph interpretation (API) work. Sandie Jones (SCC) compiled the first draft of the document and undertook habitat, zoning and tenure analysis and wrote the associated text. Subsequent drafts were compiled by Kate Hopkins (SCC) in consultation with Michael Smith (SCC). This strategic planning study has been undertaken in consultation with DEC officers, Mike Saxon and Damon Oliver.

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Introduction

The Yellow-bellied Glider (YBG) *Petaurus australis*, is a threatened glider species that is listed as Vulnerable under Schedule 2 of the *NSW Threatened Species Conservation Act 1995*. This iconic arboreal mammal has been frequently detected in forest habitats in the St Georges Basin area. The known forest habitats of this species are now highly fragmented in the St Georges Basin area from historical clearing and recent residential developments. Currently, there are thought to be a number of parcels of freehold land that potentially provide habitat (for denning, foraging, breeding and dispersal) for the species.

Loss and fragmentation of YBG habitat in the St Georges Basin area has reached a point where development applications for even small-scale proposals are likely to result in a significant impact on the species pursuant to section 5A of the *NSW Environmental Planning & Assessment Act 1979*, necessitating preparation of a Species Impact Statement (SIS). This has been exemplified by the inability of Council to determine the potential impacts from a number of subdivision applications for infill development, without the provision of further detailed ecological information on threatened species at the subject site and whether an SIS may be required. By necessity, without detailed information of the distribution, abundance and habitat selection of threatened species in the St Georges Basin area, Council staff must assess each individual development applications and their potential impacts on these species. This case-by-case approach to environmental assessment may require undertaking fauna and flora surveys for individual dwelling applications. As a consequence, proponents are experiencing delays in the processing of development applications.

Furthermore, without an overall understanding of the landscape ecology of the YBG in the St George's Basin, a precautionary approach must be taken when considering the impacts of individual developments. In other words, in the absence of detailed information on the population or populations in the St Georges Basin area, any loss of known YBG habitat is likely to be considered a significant impact.

In the absence of a strategic planning approach toward habitat retention for the YBG this untenable situation will continue and likely be exacerbated, with the expectation of many future proposals in the St Georges Basin area impacting significantly on the YBG.

To facilitate a strategic planning approach to threatened species conservation in the St Georges Basin area a meeting was held between Council officers, the NSW National Parks & Wildlife Service (NPWS) and some affected landholders in February 2003. The meeting identified the need for Council to develop a policy for the conservation of the YBG in the St Georges Basin area that had the dual aims of protecting sufficient habitat for the species to remain viable in the area while providing assurance to the development industry as to the efficacy of future proposals. Once this policy is developed and implemented it is the intention of Council to use this strategic framework and apply it to other areas in the SCC the local government area where appropriate and to other key threatened species, such as the Glossy Black Cockatoo once sufficient ecological information is available. The policy outcomes may also be developed into a Development Control Plan if appropriate.

Project Aims

1. Ensure the long-term viability of the YBG within the St Georges Basin area through the retention and appropriate management of suitable habitat and the provision of other development controls, as appropriate;
2. Provide certainty with regard to future development proposals in the St Georges Basin area in relation to potential conflict with the ongoing conservation of the YBG;
3. Allow consent and concurrence authorities to make better-informed decisions in regard to developments and activities with the potential to have effects upon the habitat of the YBG; and,
4. Reduce environmental impact assessment costs to landholders, the development industry and relevant determining authorities by decreasing the frequency of proposals triggering the need for Species Impact Statements for the YBG and the time taken for applications to be approved.

General Ecology

YBGs are large gliding possums from the family Petauridae. This species is listed as Vulnerable under Schedule 2 of the *NSW Threatened Species Conservation Act 1995*. YBGs have a patchy distribution, being found along the coast from Victoria to Central Queensland. In NSW the distribution is essentially coastal, extending inland to adjacent ranges. The species is reported to be more abundant in the south-east of the state compared to other regions.

There are many records of the species in the Shoalhaven from both coastal and inland sites, particularly the Nowra area, the surrounding escarpment, the St Georges Basin area, the Jervis Bay area and along the coast to Kioloa. A significant number of these records come from forest isolates and production forestry areas, which are not formally reserved. Records have come from . YBGs are restricted to tall mature eucalypt forests dominated by Grey Gum *Eucalyptus punctata*, Spotted Gum *Corymbia maculata* and Red Bloodwood *Corymbia gummifera* forests. Their diet mainly consists of the nectar, pollen and sap of eucalypts, as well as insects. In southern Australia about two dozen species of eucalypts are used as food trees, but the number of tree species utilised varies between location and season (references?). The YBG requires a diverse range of forest resources including tree hollows for dens, winter-flowering eucalypts which provide nectar and pollen, eucalypt sap-site trees, invertebrates within decorticated bark, honeydew, manna and occasionally *Acacia* gum. On the south coast of NSW, the species lives in family groups of up to six individuals. Animals den in large deep hollows of both living and dead trees and family groups have a notional home range of between 20 and 85 ha.

The main threat to the species is habitat loss as a result of land clearing, and changes to forest structure resulting from logging and wildfire. These structural changes involve the loss of sap tree species, winter-flowering tree species and the loss of suitable mature hollow-bearing den trees.

Study Area

The project study area was determined by Council and the Department of Environment and Conservation, and comprises about 7819 ha of land bounded by:

- The Commonwealth boundary and the shores of St Georges Basin in the south;
- Wandandian Creek and the high voltage power line easement in the west;
- Turpentine Road, Pine Forest Road, heathlands, wetlands and Vincentia in the north, and;
- The shores of Jervis Bay in the east.

The study area borders on Booderee national Park where reports indicate YBGs are not found (D.Coombes pers. com)

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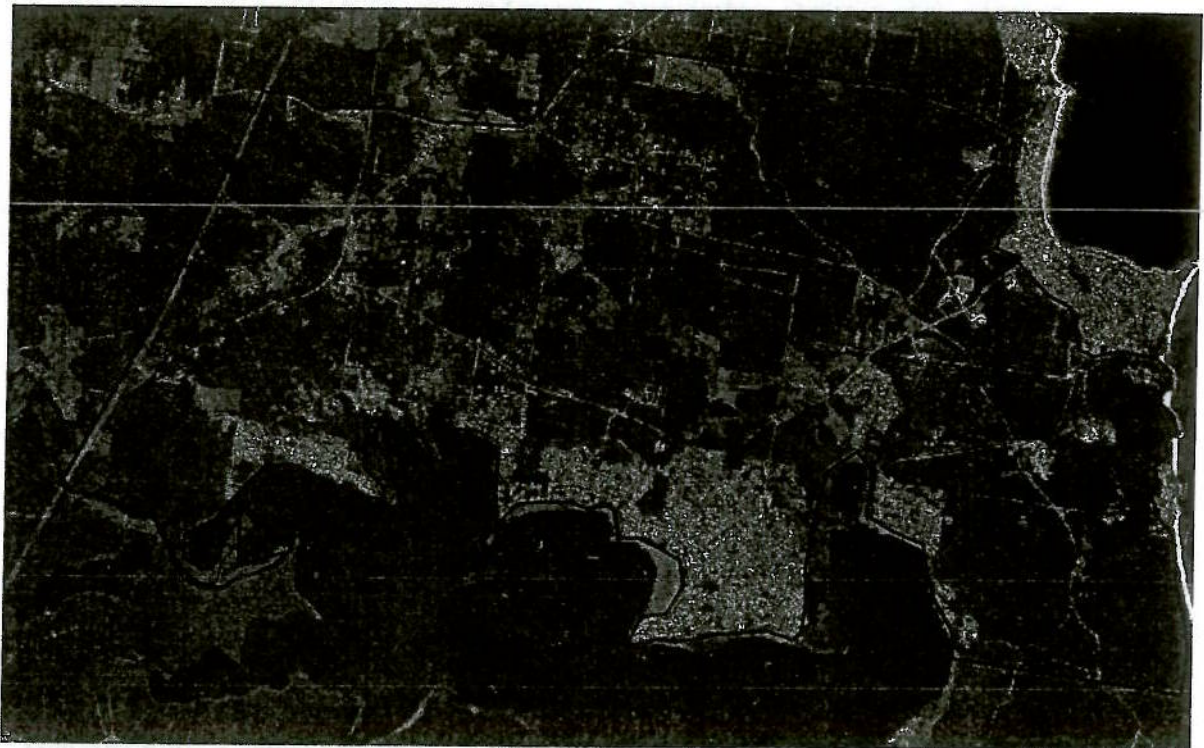


Figure 1. Aerial photograph showing boundaries of YBG Study area

Methodology

Survey for Groups of YBGs

The main objective of the survey was to determine the number and distribution of YBG family groups within the study area. To maximise the efficiency of the surveys and gather preliminary information on the YBG in the St Georges Basin area a review of the

relevant Literature on YBGs, and a search for Atlas of NSW Wildlife records and recent surveys was conducted

Survey Site selection

YBG survey sites were selected to provide a comprehensive and representative coverage of suitable YBG habitat within the study area. The extent of suitable habitat was determined by the interpretation of colour aerial photography and existing GIS vegetation mapping, which was verified in the field. Survey Sites were located in areas of suitable habitat that were accessible by a four-wheel-drive vehicle (figure 2). Site selection was independent of land tenure or zoning.

Survey sites were initially sampled at a broad scale, with sites separated by at least 800 m to gain a broad understanding of YBG distribution within the study area. Following the initial broad-scale sampling, targeted surveys were undertaken at a finer (m?) scale to distinguish between adjacent YBG family groups, if required. During this secondary stage, surveys were generally conducted at locations that most aided differentiation of YBG groups. These subsequent investigations also aided in estimating the home range size and delineation of boundaries between family groups.



Figure 2. YBG survey sites for Stage 1 of the project

Field location of YBGs

Nocturnal listening and call playback techniques were used primarily to locate YBGs, as the species is highly vocal and responds readily to call playback survey methods. Call playback surveys involved an initial five minute listening period, followed by up to five minutes of call playback and then a ten minute listening period. Up to five minutes of spotlighting was undertaken following the final ten minute listening period to detect any YBGs in the vicinity of the survey site. Spotlighting is conducted to detect animals

which may not have responded vocally to call playback. If YBGs were heard calling during the initial listening period, a shorter period of call playback was usually employed in an attempt to elicit vocal responses from other YBGs within the survey area. Sixty-eight hours of call playback were conducted at 106 sites within the study area, on 27 nights between 20 May 2003 and 20 October 2003.

Wherever possible, clusters of proximate sites were surveyed in the same night to achieve a systematic coverage of the study area to maximise the likelihood of detecting all glider groups. Most sites were surveyed twice within the study period, including all sites in areas of apparently high quality habitat where gliders were not initially detected. Sites with no initial YBG records were re-surveyed after a period of at least two weeks. A small number of sites were surveyed on three occasions where more information was needed to differentiate between glider groups.

YBGs were also indirectly detected by the presence of characteristic incisions in the bark of sap-trees that were indicative of glider feeding sites. Searching for sap-tree incisions was undertaken opportunistically during fieldwork sessions, from a slow-moving vehicle and on foot.

Another method for detecting the presence of YBGs is to spend up to an hour at potential hollow-bearing den trees. This technique is known as stagwatching. A total of Twelve hours was spent of stagwatching at nine sites where gliders were suspected of denning, or where high quality tree hollow resources occurred within known glider habitat. Up to two surveyors were used to stagwatch potential den trees for up to one hour after sunset.

Identification of glider groups

Glider groups were identified and differentiated from adjacent groups by several methods. Distances of over 1.5 km between groups of gliders were generally sufficient to enable differentiation based primarily on spatial separation and known home range size. Adjacent groups occurring at closer proximities could be differentiated if simultaneously recorded groups were found to be substantially separated from adjacent groups (and their habitat) on at least two nights.

Up to four nights of survey activities comprising call playback, stagwatching and/or listening for calls were spent in any one area to differentiate between glider groups. This involved up to three surveyors listening simultaneously from different positions. Credible anecdotal reports and results from previous surveys were also considered when identifying and differentiating between groups and assisted in focussing survey efforts.

Estimation of Home Range Areas

Two methods were used to estimate home range size for the YBG groups. The first involved applying a circular buffer encompassing an area of 30 ha around the estimated centrepont of the YBG group based on current knowledge of home range size of YBGs (references). The circular home range area had a radius of x metres. The second method was developed by David Coombes and indicatively defines home ranges based on the

distribution of YBGs in the study area and the distribution of preferred and suitable habitat available to each group. The extent of suitable habitat was based on the interpretation of colour aerial photography and vegetation mapping and was broadly verified by fieldwork. The secondary surveys aided interpretations of home range use and delineation of boundaries between groups. The availability of suitable habitat to each YBG group was based on the extent of habitat loss and fragmentation and hence the ability of YBGs to physically access areas of habitat, as well as the distribution of adjacent YBG territories. The location of incised sap-feeding trees and other recent records of YBGs were also considered during the estimation of home range boundaries. The estimation of home range sizes was kept within the notional range of 20-85 ha where suitable habitat was available. Both methods have limitations, but were the best available given the scope and resources provided to this study.

Habitat Identification

Habitat selection data relating to dominant tree species and other habitat variables were recorded at 43 sites where YBGs were detected. These measurements were taken to provide a basic understanding of specific habitat selection by YBGs in the St Georges Basin area. Such data are important for habitat modelling analyses. The recording of habitat data was only conducted at sites whose locations were accurate to within 50 metres. Habitat data were recorded from within a 50 m radius of sites where YBGs were initially detected, rather than at sites where a YBG was known to have moved to in response to call playback.

The point location data of YBG groups and their estimated home range polygons were overlaid with GIS vegetation community mapping data to determine the most common vegetation communities utilised by YBGs. Three types of vegetation community data were used; 1) Shoalhaven City Council's vegetation community mapping (see Appendix 1), 2) Broad vegetation type mapping (by whom?) which describes dominant overstorey tree species only and 3) Department of Environment and Conservation vegetation type mapping that was undertaken as part of the Southern Comprehensive Regional Assessment (Appendix 2).

Aerial Photo interpretation Old Growth Forests

Aerial photographic interpretation (API) was undertaken to check for correlation between Old growth forest habitat and YBG habitat. Vegetation that appeared to contain senescent crowns (ie old growth forest) that are likely to provide YBG habitat were broadly identified by API. These potential old growth areas were then ground truthed to determine the photo signatures of senescence in various forest eucalypt species. The polygons which comprised old growth forest with senescent crown attributes were then delineated on 1:25000 scale aerial photography. Polygon boundary lines were marked onto acetate overlays using Rotring Isograph Pen (0.25mm nib) in red ink. Polygons were coded with labels in black ink. This linework information was then digitised onscreen to orthorectified digital photos by the air photo interpreter to create a GIS shapefile and polygon attribute table. Forest areas classed as having mainly mature crowns (to be

senescent in the near future) were coded M, areas categories as mainly exhibiting senescent crowns were coded S and areas containing a mixture of the two were coded SM. The creation of digitised GIS mapping information required the application of ArcView 3.2 GIS software.

Limitations of the study

YBGs are known to alter their foraging behaviour in relation to fluctuating availability of resources at different times of the year (reference). Foraging strategies employed by YBGs to cope with changes in resources include using different areas of their home range at different times of the year or selecting different foods and foraging substrates. Surveys were restricted to winter and spring and were not conducted over the warmer months, so any change in the gliders' use of forest resources or other parts of their home range could not be taken into account when estimating home ranges or obtaining habitat use data. Radio tracking of gliders to obtain accurate home range data was beyond the scope of this study, so home range estimations were based mainly on known glider locations over the winter months and predicted use of habitat within suitable forest types.

Results

Population

Number of Groups

There were 31 active YBG groups identified from the study area occupying an estimated total area of 1580 ha. This represents about 20 % of the total study area.

Home Ranges

Home ranges estimated by D. Coombes varied between 17 and 83 ha with an average of 52.7 ha.

Distribution

YBG groups were found throughout the study area, with the exception of the SE corner of the study site. This area was not greatly surveyed because previous studies indicated that YBGs were not present in the area. These studies concluded that the SE corner comprised unsuitable or poor YBG habitat. The largest concentration of YBG groups occurred around the Princes highway, with 10 groups adjacent to or west of the highway. As expected, fewer YBG groups were located in the suburban area of St Georges Basin/Sanctuary Point. However, seven groups were still recorded within or adjacent to residential areas. Habitat utilised by two of these groups extends to the waters edge of St Georges Basin. Thirteen of the 31 groups were found in the northern half of the study area in largely undeveloped rural lands (Figure 3).

Historical Change in Distribution

Estimations of historic home range distribution (based on former vegetation cover?) suggest the area of occupied territory has decreased by 426 ha from 2006 ha, based on loss and fragmentation of YBG habitat. It is likely that a further reduction in area

occupied has occurred as a result of the highway upgrade at Tomerong, recent subdivision and developments in the area. In particular, new residential areas around Links Ave and Anson St in Sanctuary Point have caused a reduction in available habitat.

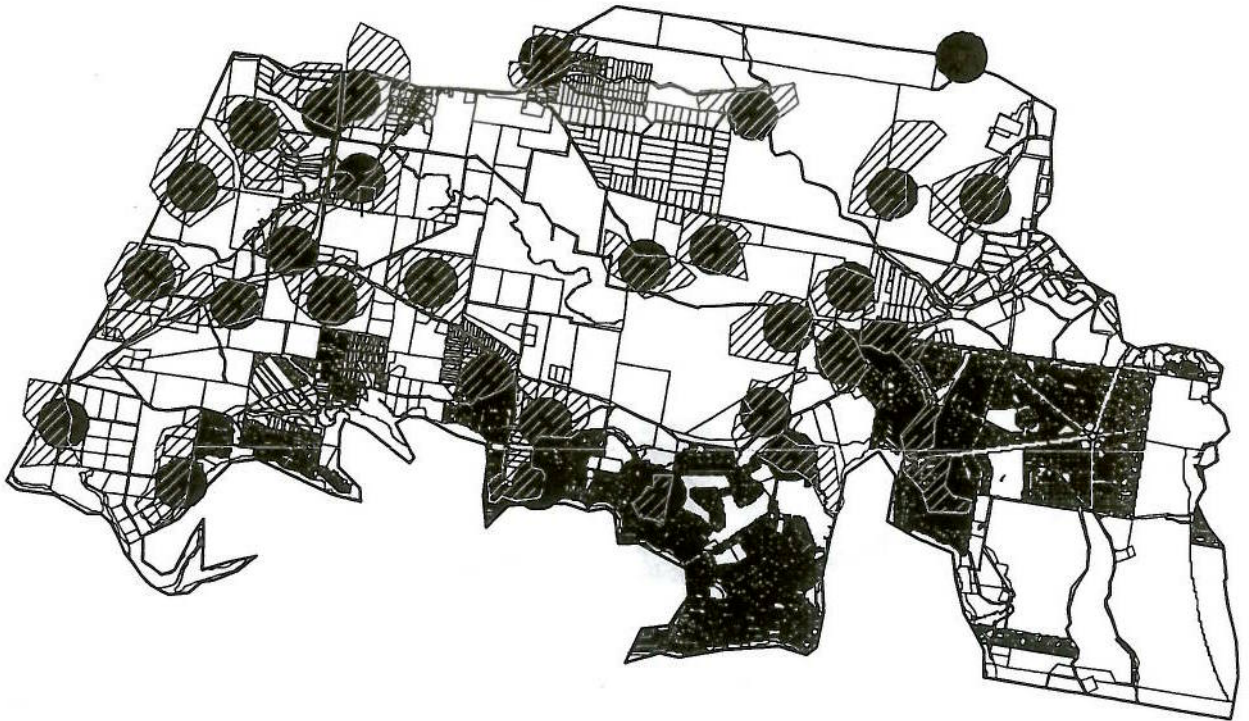


Figure 3. YBG groups, 30 ha circular estimated home ranges and determined home ranges in the St Georges Basin study area.

Habitat selection

Field observation of habitat selection

Habitat selection data recorded in the field at locations where YBGs were detected indicate that YBGs were most often found in forests dominated by Spotted Gum (*Corymbia maculata*) (49.1% of observations). A further 14.5% of observations of YBGs were in Blackbutt (*Eucalyptus pilularis*) dominated forest. YBGs were also seen in Sydney Blue Gum/Bangalay hybrid (*Eucalyptus saligna* x *botryoides*) dominated forest (9.1%), Red Bloodwood (*Corymbia gummifera*) and Turpentine (*Syncarpia glomifera*) forest (7.3%), Wollybutt (*Eucalyptus longifolia*) and Thin-leaved Stringybark (*Eucalyptus eugenioides*) forest (3.6%) and forest dominated by Scribbly Gum

(*Eucalyptus sclerophylla*), Swamp Mahogany (*Eucalyptus robusta*) and Bangalay (*Eucalyptus botryoides*) (1.8%).

Centrepont of Group

Using the centrepont of the YBG group, as identified by David Coombes' survey work, the mostly commonly utilised broad vegetation community is Spotted Gum forest (Figure 4). When repeating the analysis for DEC vegetation communities, communities mapped as Northern Coastal Sands Shrub/Fern Forest (*E. pilularis*/*B. serrata*) are most commonly selected by YBGs although both Northern Coastal Hinterland Moist Shrub Forest (*C. maculata*/*E. pilularis*) and Northern Coastal Lowlands Shrub/Grass Dry Forest – mixed tree species are also selected frequently (Figure 5). Council's vegetation community mapping type MAC-PIL (*C. maculata*, *E. pilularis* Forest) was the vegetation mapping unit that most commonly intersected with YBG home range centreponts (Figure 6). Interestingly however there was no correlation between centreponts and the presence of old-growth forest components (Figure 7).

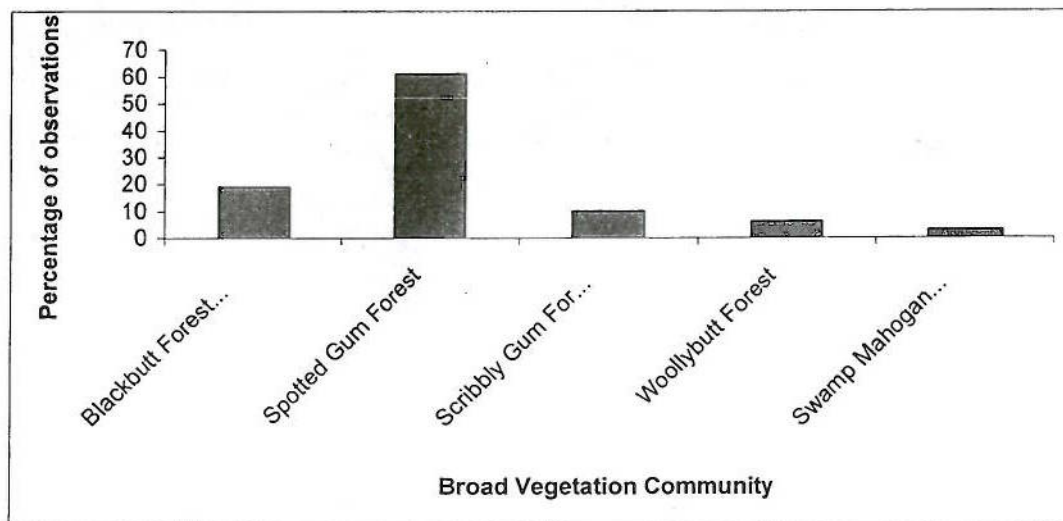


Figure 4. Frequency Histogram of Broad Vegetation Community Types where YBG groups were found in St Georges Basin.

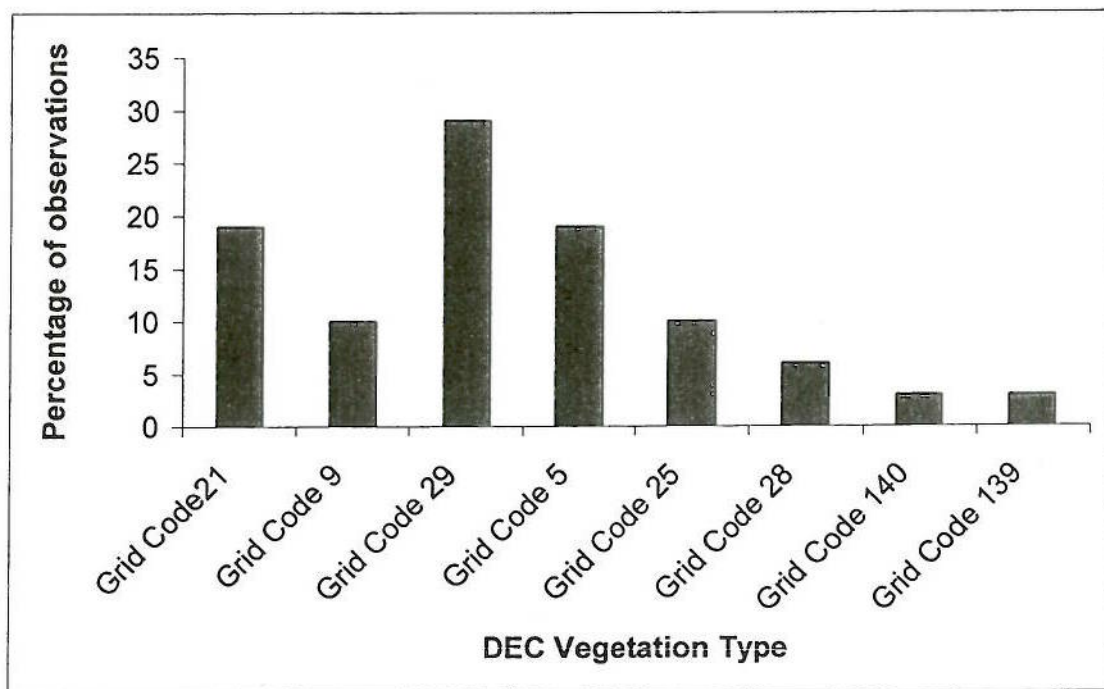


Figure 5. Frequency Histogram showing selection of Department of Environment and Conservation Broad Vegetation Community Types by YBG groups in St George's Basin study area.

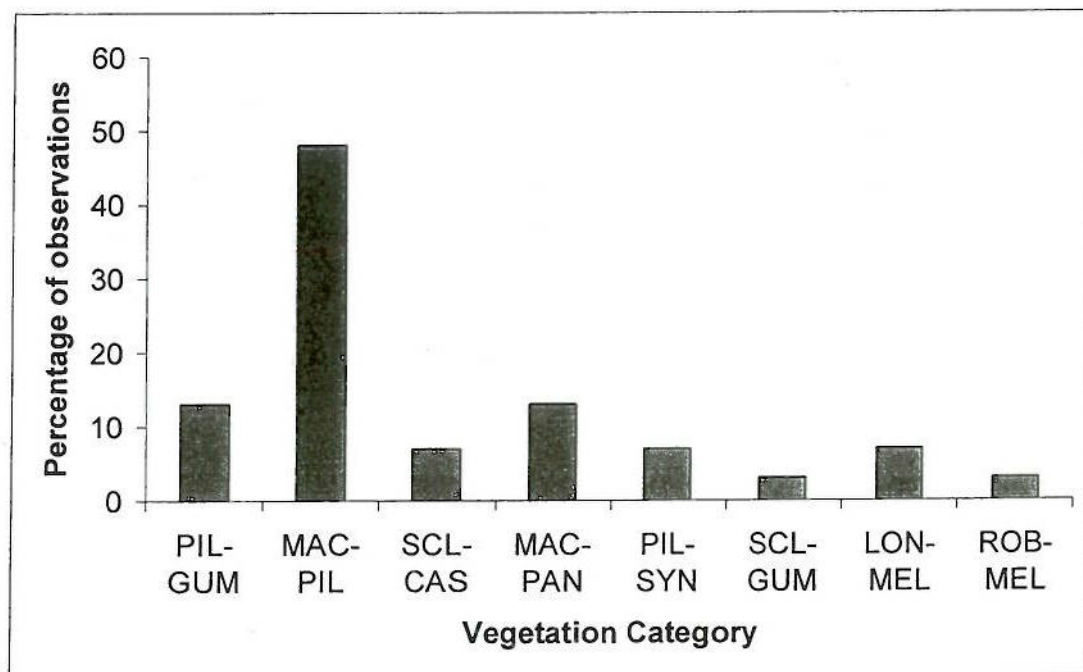


Figure 6. Frequency histogram of Council's vegetation community types that were selected by YBG groups in St Georges Basin.

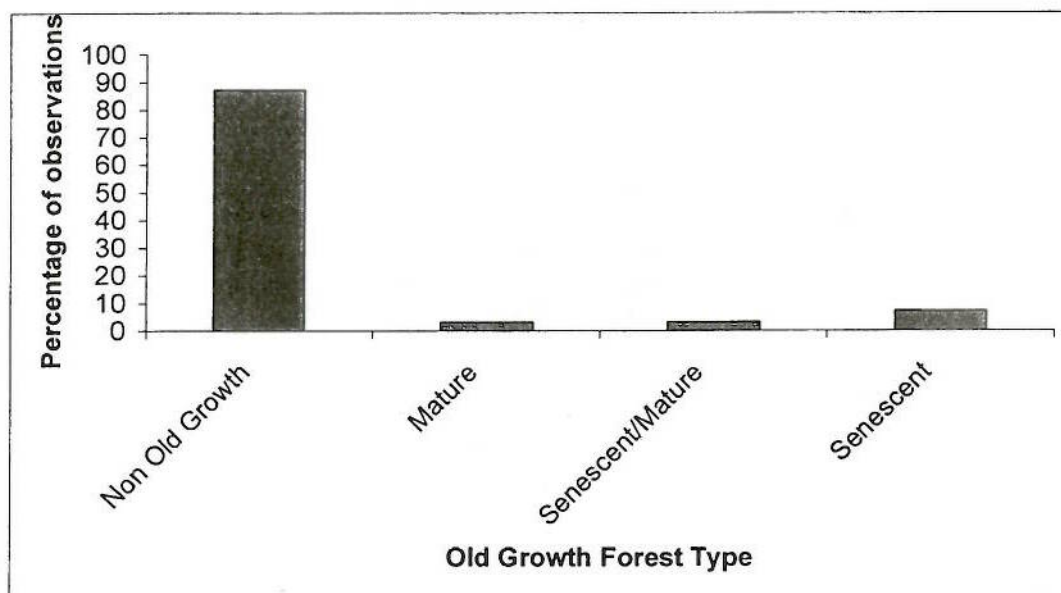


Figure 7. Frequency Histogram of Old Growth Forest type where YBG groups were found in St Georges Basin.

Estimated Home Range

i. 30 Hectare radius area

Nearly 50 % of SCC mapped vegetation types found within the 30 ha estimated home range is Spotted Gum-Blackbutt forest type (MAC-PIL) (Table 1). Analysis repeated with broad vegetation communities also indicated that Spotted Gum forests support most of the home range of YBGs in the study area (Table 2). Results for DEC vegetation community types were slightly different, with most of the home range area recorded as Northern Coastal Sands Shrub/Fern Forest – *E. pilularis*/*B. serrata* (type 29)(28% of home range area). A relatively large proportion (19%) of home range area comprised Coastal Lowlands Cycad/Shrub Dry Forest, *Corymbia maculata* (type 9) (Table 3). Old growth forest constitutes a small proportion of the total estimated home ranges, with less than 10% old growth forest constituting the age structure within home ranges (Table 4).

Table 1. Area and proportion of Council vegetation community in estimated 30 ha yellow bellied YBG home range (total home range area of 681 ha).

(provide figures in descending order)

Vegetation Type	Area (Ha)	% of home range
BOT-BAN	5.19	0.76
GLB-GUM	5.47	0.80

JUN-SAL	2.16	0.32
LON-MEL	21.41	3.14
MAC-PAN	56.07	8.23
MAC-PIL	333.43	48.94
MEL-ERI	4.77	0.70
PIL-GUM	77.79	11.41
PIL-SYN	33.00	4.84
ROB-MEL	32.95	4.84
SAL-SYN	16.80	2.47
SCL-CAS	73.23	10.75
SCL-GUM	14.56	2.13
SST-HTH	4.38	0.64
Totals	681.24	100

Table 2. Area and proportion of broad vegetation community types in estimated 30 ha YBG home range (total of home ranges of 681 hectares).

(in descending order..)

Vegetation Type	Area (Ha)	% of home range
Bangalay Forest/Woodland	5.19	0.76
Stringybark Forest	5.47	0.80
Rushland	2.16	0.32
Woollybutt Forest	21.41	3.14
Spotted Gum Forest	389.5	57.2
Paperbark Forest/Shrubland	4.77	0.70
Blackbutt Forest/Woodland	110.79	16.25
Swamp Mahogany Forest	32.95	4.84
Blue Gum Forest	16.80	2.47
Scribbly Gum Forest/Woodland	87.79	12.9
Heathland	4.38	0.64
Totals	681.24	100

Table 3. Area and proportion of DEC vegetation types in estimated 30 ha yellow bellied YBG home range (total of home ranges of 717 hectares).

(provide figures in descending order)

Grid Code	Vegetation Type	Area (Ha)	Proportion
5	Northern Coastal Lowlands Shrub/Grass Dry Forest – mixed tree species	74.85	10.42
9	Coastal Lowlands Cycad/Shrub Dry Forest, <i>Corymbia maculata</i>	140.65	19.59
21	Northern Coastal Hinterland Moist Shrub Forest – <i>C. maculata</i> / <i>E. pilularis</i>	74.55	10.38
24	Coastal Tall Wet Heath Swamp Forest – <i>Casuarina glauca</i> / <i>Melaleuca ericifolia</i>	1.64	0.23

25	South Coast Swamp Forest – <i>Casuarina glauca</i>	32.34	4.50
28	Coastal Sands Shrub/Fern Forest – <i>E. botryoides/B. serrata</i>	28.28	3.93
29	Northern Coastal Sands Shrub/Fern Forest – <i>E. pilularis/B. serrata</i>	201.22	28.02
139	Northern Coastal Hinterland dry Forest <i>C. gummifera/E. sclerophylla</i>	102.98	14.34
140	Northern Coastal Tall Wet Heath	29.84	4.16
175	Northern Coastal Lowlands Swamp Forest – <i>E. robusta</i>	28.93	4.03
185	Mangrove/Estuarine Low Forest	2.32	0.33
Totals		717.68	100

Table 4. Area and proportion of old growth forest in estimated 30 ha YBG home ranges (total of home range area of 925 hectares)

(provide figures in descending order...)

Age Structure	Area (Ha)	Proportion
Non Old Growth	838.02	90.6
Mostly Dead (Stags)	0.92	0.1
Mostly Senescent	24.45	2.64
Senescent/Dead	6.28	0.68
Senescent/Mature	54.82	5.92
Totals	925.16	100

ii. Estimated Home Range

The proportions of vegetation types in determined home ranges were similar to those proportions calculated for estimated home ranges. In particular, both measures of home range area comprised about 48% of MAC-PIL forest type (*C. maculata/E. pilularis* forest) (Table 5). The Spotted Gum broad vegetation community type was found to occur most frequently within the home range areas (Table 6). Fifty six percent of determined home range areas were located within this vegetation community. Proportions of DEC vegetation types within determined home ranges were distributed relatively evenly between (29) Northern Coastal Sands Shrub/Fern Forest – *E. pilularis/B. serrata* (26%), (9) Coastal Lowlands Cycad/Shrub Dry Forest, *Corymbia maculata* (24%) and (139) Northern Coastal Hinterland dry Forest *C. gummifera/E. sclerophylla* (19%) (Table 7). Again, there was little correlation between home range of YBGs and old-growth forest components. In fact with 90% of home range area was located in forest mapped as non-old growth forest (Table 8).

Table 5. Area and proportion of Council vegetation community in determined YBG home range.

(provide figures in descending order)

Vegetation Type	Polygons	Area (Ha)	% of home range
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BOT-BAN	3	18.09	1.33
CAS-GLA	1	2.70	0.2
GLB-GUM	1	11.14	0.82
LON-MEL	7	37.28	2.73
MAC-PAN	10	115.28	8.46
MAC-PIL	30	652.35	47.9
MEL-ERI	3	0.19	0.01
MEL-FOR	1	1.63	0.12
PIL-GUM	4	175.77	12.9
PIL-SYN	4	49.12	3.61
ROB-MEL	5	33.57	2.46
SAL-SYN	12	46.75	3.43
SCL-CAS	13	182.4	13.39
SCL-GUM	4	34.13	2.5
SST-HTH	5	1.72	0.13

Table 6. Area and proportion of broad vegetation community in determined YBG home range.

(provide figures in descending order)

Vegetation Type	Area (Ha)	% of home range
Bangalay Forest/Woodland	18.09	1.33
Casuarina Forest/Woodland	2.70	0.2
Stringybark Forest	11.14	0.82
Woolybutt Forest	37.28	2.73
Spotted Gum Forest	767.63	56.4
Paperbark Forest/Shrubland	1.82	0.13
Blackbutt Forest/Woodland	224.89	16.5
Swamp Mahogany Forest	33.57	2.46
Blue Gum Forest	46.75	3.43
Scribbly Gum Forest/Woodland	216.53	15.9
Heathland	1.72	0.13
Totals		

Table 7. Area and proportion of DEC vegetation communities in determined YBG home range.

(provide figures in descending order)

Grid Code	Vegetation Type	Area (Ha)	Proportion
5	Northern Coastal Lowlands Shrub/Grass Dry Forest – mixed tree species	109.8	8.3
9	Coastal Lowlands Cycad/Shrub Dry Forest, <i>Corymbia maculata</i>	313.4	23.7
21	Northern Coastal Hinterland Moist Shrub Forest – <i>C. maculata</i> / <i>E. pilularis</i>	158.8	12.0
25	South Coast Swamp Forest – <i>Casuarina glauca</i>	52.9	4.0

28	Coastal Sands Shrub/Fern Forest – <i>E. botryoides/B. serrata</i>	56.9	4.3
29	Northern Coastal Sands Shrub/Fern Forest – <i>E. pilularis/B. serrata</i>	339.9	25.8
139	Northern Coastal Hinterland dry Forest <i>C. gummifera/E. sclerophylla</i>	243.9	18.5
140	Northern Coastal Tall Wet Heath	15.4	1.2
175	Northern Coastal Lowlands Swamp Forest – <i>E. robusta</i>	28.3	2.1
Totals		1319.7	100

Table 8. Forest age Structure and vegetation type in determined YBG home ranges (provide in descending order - need to provide some comment on proportion of home range in non-old growth = 90%)

Age Structure	Vegetation Type	Area (Ha)	Total Area (Ha)	% of Home Ranges
Mostly Dead (Stags)	SCL-CAS	5.5	5.5	0.35
Mostly Good Mature	MAC-PIL	1.8	3.5	0.22
	SAL-SYN	1.7		
Mostly Senescent	GLB-GUM	6.9	53.2	3.37
	MAC-PAN	2.6		
	MAC-PIL	1.2		
	PIL-GUM	3.2		
	PIL-SYN	4.5		
	ROB-MEL	3.0		
	SCL-CAS	30.0		
	SCL-GUM	1.8		
Senescent/Dead	GLB-GUM	1.0	38.9	2.46
	MAC-PAN	1.0		
	PIL-GUM	1.3		
	PIL-SYN	0.8		
	ROB-MEL	1.9		
	SCL-CAS	33.0		
Sensecent/Mature	GLB-GUM	1.0	92.7	5.88
	MAC-PAN	8.3		
	MAC-PIL	28.0		
	PIL-GUM	43.4		
	SAL-SYN	1.0		
	SCL-CAS	3.0		
	SCL-GUM	8.0		

Ownership and Zoning (Land Tenure?)

The majority of YBG group centrepoin^ts and home ranges found within the study area occur on land zoned for rural use (Tables 9, 10, 11). Only four YBG groups occur fully or partially within National Park or Council zoned environmental protection lands. Four groups were found within medium density residential areas (Table 9). Most of the YBG groups have been found on privately owned land (~80%), with only 6 (it says 4 in previous sentence?) protected in National Park estate (Tables 9, 12, 13). These results may seem inconsistent, however the differences between zone boundaries and ownership relate to the lack of rezoning when management of lands has changed eg from Crown to National Park.

Table 9. Zoning and ownership of YBG group centrepoin^ts

Group Number	Zone	Ownership
1	1D	Private
2	1B	Private
3	1B	Private
4	1D	Private
5	1D	Private
6	2C	Private
7	1D	Private
8	2C	Private
9	2C	Private
10	7D1	National Park
11	1D	Private
12	1B	Private
15	1B	National Park
16	1B	Private
17	1B	Private
18	1D	Private
21	1B	Private
22	JB	National Park
23	JB	National Park
24	1D	National Park
25	2a4	Private
27	6A	Council
28	1D	Private
29	1D	Private
30	1D	Private
31	1D	Private
33	1D	Private
34	1D	Private
35	1D	Private
37	1D	Private

38	JB	National Park
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Table 10. Zoning for YBG estimated home ranges
(provide figures in descending order)

Zone	Area (Ha)	Proportion
1B	180.164	21.37
1C	8.396	1.00
1D	420.997	49.92
1G	12.012	1.42
2A1	35.616	4.22
2A4	4.803	0.57
2C	62.799	7.45
2E	18.303	2.17
3G	14.019	1.66
5A	4.04	0.48
6A	14.592	1.73
7A	4.338	0.51
7D1	8.934	1.06
JB	45.92	5.45
Totals	843.263	100

Table 11. Zoning for YBG determined home ranges
(provide figures in descending order)

Zone	Area (Ha)	Proportion
1A	8.34	0.58
1B	292.26	20.33
1C	17.70	1.2
1D	805.14	56.00
1G	12.655	0.88
2A1	18.286	1.27
2A4	2.683	0.19
2C	66.612	4.63
2D	3.339	0.23
2E	24.737	1.72
3G	24.202	1.68
4B	8.77	0.61
5A	4.961	0.35
6A	17.983	1.25
6C	3.835	0.27
7A	27.697	1.93
7D1	11.712	0.81
7D2	4.057	0.28
JB	80.277	5.58
Totals	1437.65	100

Table 12. Ownership details for estimated YBG home ranges
(provide figures in descending order)

Ownership	Sum (Ha)	Proportion
Crown Reserve	12.858	1.39
National Park	139.79	15.11
Council	22.452	2.43
Vacant Crown Land	7.871	0.85
Freehold	741.96	80.2
Total	924.93	100

Table 13. Ownership details for determined YBG home ranges
(provide figures in descending order - keep to two decimal points)

Ownership	Area (Ha)	Proportion
Crown Reserve/Land	32.94	2.084836517
National Park	240.67	15.2324713
Council	22.603	1.430587729
State Forest	0.987	0.062469145
Freehold	1282.78	81.18963531
Totals	1579.98	100

Appendix 1. Shoalhaven Vegetation community codes and description

Veg Code	Description
ACA-FOR	Wattle Forest <i>Acacia mearnsii</i> (sometimes other species)
ACA-SPH	Coast Wattle Shrubland <i>Acacia sophorae</i> , <i>Cryptocarya glaucescens</i>
ACM-WRF	Lily Pilly Warm Temperate Rainforest <i>Acmena smithii</i>
AGG-SIE	<i>E. agglomerata</i> , <i>E. sieberi</i> , <i>E. gummifera</i> / <i>E. smithii</i> Open Forest
AGG-VER	Low Closed Forest <i>E. agglomerata</i> , <i>Allocasuarina verticillata</i>
AMP-MED	<i>E. amplifolia</i> / <i>E. melliodora</i>
AVI-AEG	Mangrove Shrubland <i>Avicennia marina</i> , <i>Aegiceras corniculatum</i>
AVI-MAR	Mangrove Forest <i>Avicennia marina</i>
BAC-WRF	Ironwood Warm Temperate Rainforest <i>Backhousia myrtifolia</i>
BAN-CAS	<i>Banksia-Casuarina</i> Shrubland <i>Banksia ericifolia</i> , <i>Allocasuarina</i>
BAN-FOR	Coast <i>Banksia</i> Forest, <i>Banksia integrifolia</i>
BAU-HBL	Saltwater <i>Baumea</i> Herbland, <i>Baumea juncea</i> , Herbaceous species
BAU-PHR	Saltwater Sedge-Reedland, <i>Baumea juncea</i> , <i>Phragmites australis</i>
BAU-SAL	Saltwater <i>Baumea</i> Sedgeland, <i>Baumea juncea</i>
BOS-EUG	<i>E. bosistoana</i> , <i>E. eugenoides</i> , <i>E. cinerea</i> / <i>E. amplifolia</i>
BOT-BAN	Bangalay Forest <i>Eucalyptus botryoides</i> , <i>Banksia serrata</i> , <i>Banksia</i>
BOT-LRF	Bangalay - Rainforest Forest <i>Eucalyptus botryoides</i> , rainforest
BOT-WLD	Bangalay - <i>Banksia</i> woodland <i>Eucalyptus botryoides</i> , <i>Banksia</i>
CAL-KUN	Bottlebrush Shrubland <i>Callistemon linearis</i> , <i>Kunzea ambigua</i>
CAS-CUN	River Oak Forest <i>Casuarina cunninghamiana</i>
CAS-GAH	Swamp Oak - Swordgrass Forest
CAS-GLA	Swamp Oak Forest <i>Casuarina glauca</i>
CAS-SHR	<i>Casuarina</i> Shrubland <i>Allocasuarina verticillata</i> , <i>Casuarina glauca</i>
CER-WRF	Coachwood Warm Temperate Rainforest <i>Ceratopetalum</i>
CLU-RDL	Saltwater Clubbrush-Reedland, <i>Bolboschoenus</i> spp., <i>Phragmites</i>
COM-LRF	Complex Littoral Rainforest <i>Ficus obliqua</i> , <i>Podocarpus elatus</i> ,
COM-SRF	Complex Subtropical Rainforest <i>Ficus</i> spp, <i>Toona ciliata</i>
CON-GUM	Yertchuk-Bloodwood Woodland <i>Eucalyptus consideniana</i> , <i>E.</i>
DIV-MAN	Brittle Gum - Peppermint Woodland <i>E. dives</i> , <i>E. mannifera</i>
DRY-SRF	Dry Subtropical Rainforest <i>Dendrocnide excelsa</i> , <i>Toona ciliata</i>
ELA-FOR	River Peppermint Forest <i>Eucalyptus elata</i>
ELE-SDG	Spike-rush Sedgeland <i>Eleocharis sphacelata</i> , <i>Schoenoplectus</i>
EUR-CRF	Plumwood Cool Temperate Rainforest <i>Eucryphia moorei</i> ,
EXI-WDL	<i>E. eximia</i> of Ettrema
FAS-CYP	Brown Barrel Tall Forest <i>E. fastigata</i> , <i>E. cypellocarpa</i>
FAS-FRA	Forest <i>E. fastigata</i> , <i>E. fraxinoides</i> , <i>E. smithii</i>
FAS-MUE	<i>E. piperita</i> , <i>E. fastigata</i> and <i>E. mueleriana</i> forest
FAS-SAL	Tall Open Forest, <i>E. fastigata</i> , <i>E. saligna</i>
FAS-VIM	Forest <i>E. fastigata</i> , <i>E. viminalis</i> , <i>E. radiata</i>
FRA-CYP	Mountain Grey Gum - White Mountain Ash Forest <i>E.</i>
FRH-HBL	Freshwater Herbland, <i>Triglochin procerum</i> , <i>Myriophyllum</i> spp.,
FRH-SDG	Freshwater <i>Baumea</i> Sedgeland

FRH-SHR	Freshwater Shrubland, <i>Leptospermum</i> spp., <i>Melaleuca</i> spp.
GLB-FOR	Stringybark Forest <i>E. globoidea</i>
GLB-GUM	Stringybark - Bloodwood Forest <i>E. globoidea</i> , <i>E. gummifera</i>
GLB-PAN	Stringybark - Ironbark <i>E. globoidea</i> , <i>E. paniculata</i>
GLB-PIP	<i>E. globoidea</i> , <i>E. piperita</i> and <i>E. saligna</i> forest
GLB-RAD	Open Forest <i>E. globoidea</i> , <i>E. radiata</i> , <i>E. moluccana</i>
GLB-VIM	Open Forest <i>E. globoidea</i> , <i>E. viminalis</i> , <i>E. radiata</i>
GUM-BAN	Bloodwood - Banksia Forest/Woodland <i>E. gummifera</i> , <i>Banksia</i>
GUM-CON	Bloodwood-Yertchuk Open Forest
GUM-MAL	Bloodwood Woodland/Mallee <i>E. gummifera</i> mallee trees and
GUM-WDL	Bloodwood Woodland
JUN-FRH	Fresh Juncus Rushland <i>Juncus</i> spp
JUN-SAL	Saltwater Juncus Rushland <i>Juncus kraussii</i>
KUN-SHR	Kunzea Shrubland <i>Kunzea ambigua</i> , <i>Calytrix tetragona</i>
LEP-LAV	Coast Teatree Shrubland <i>Leptospermum laevigatum</i> , <i>Banksia</i>
LEP-MEL	Teatree Shrubland <i>Leptospermum polygalifolium</i> , <i>Melaleuca</i>
LEP-SHR	<i>Leptospermum</i> Shrubland, <i>Leptospermum polygalifolium</i> ,
LON-MEL	Woollybutt - Paperbark Forest <i>E. longifolia</i> , <i>Melaleuca</i> spp.
MAC-LON	Spotted Gum - Woollybutt <i>E. maculata</i> , <i>E. longifolia</i>
MAC-PAN	Spotted Gum - Ironbark Forest <i>E. maculata</i> , <i>E. paniculata</i>
MAC-PIL	Spotted Gum - Blackbutt Forest <i>E. maculata</i> , <i>E. pilularis</i>
MAC-SYN	Spotted Gum Tall Forest <i>E. maculata</i> , <i>Syncarpia glomulifera</i>
MAL-WDL	Mallee woodland (quasi concentrics)
MED-BRI	Woodland <i>E. melliodora</i> / <i>E. bridgesiana</i>
MEL-BAU	<i>Melaleuca</i> - <i>Baumea</i> Shrubland, <i>Melaleuca ericifolia</i> , <i>Baumea</i>
MEL-ERI	Paperbark Shrubland <i>Melaleuca ericifolia</i>
MEL-FOR	Paperbark Forest <i>Melaleuca stypheloides</i> , <i>Melaleuca linariifolia</i>
MEL-GAH	Paperbark-Swordgrass Shrubland, <i>Melaleuca ericifolia</i> , <i>Gahnia</i>
MLT-AGG	<i>E. multicaulis</i> , <i>E. agglomerata</i> , <i>E. sieberi</i> on rocky dry ridges
MST-SRF	Moist Subtropical Rainforest <i>Pennantia cunninghamii</i> , <i>Ficus</i> spp.,
MST-VRF	Moist Vine Rainforest <i>Cissus hypoglauca</i> , <i>Rapanea howittiana</i>
MUL-CYP	Forest <i>E. muelleriana</i> , <i>E. cypellocarpa</i>
OBL-FAS	Forest <i>E. obliqua</i> , <i>E. fastigata</i> , <i>E. piperita</i>
OBL-RAD	Forest <i>E. obliqua</i> , <i>E. radiata</i> , <i>E. rubida</i>
PHR-RDL	Phragmites Reedland <i>Phragmites australis</i>
PIL-BAN	Blackbutt - Banksia Forest <i>E. pilularis</i> , <i>Banksia serrata</i>
PIL-GUM	Blackbutt - Bloodwood Forest <i>E. pilularis</i> , <i>E. gummifera</i>
PIL-HAK	Blackbutt Open Woodland/Heathland <i>E. pilularis</i> , <i>Hakea</i>
PIL-PAN	Blackbutt - Ironbark Forest <i>E. pilularis</i> , <i>E. paniculata</i>
PIL-PUN	Blackbutt - Grey Gum Forest <i>E. pilularis</i> , <i>E. punctata</i>
PIL-SYN	Blackbutt Tall Forest <i>E. pilularis</i> , <i>Syncarpia glomulifera</i>
PIP-GLB	Peppermint - Stringybark Forest <i>E. piperita</i> , <i>E. globoidea</i>
PIP-GUM	Peppermint - Bloodwood Forest <i>E. piperita</i> , <i>E. gummifera</i>
PIP-PIL	Peppermint - Blackbutt Forest, <i>E. piperita</i> , <i>E. pilularis</i>

POL-CRF	Featherwood Cool Temperate Rainforest <i>Polyosma</i>
PUN-AGG	Grey Gum - Stringybark Woodland <i>E. punctata</i> , <i>E. agglomerata</i>
PUN-FOR	Grey Gum Forest
QUD-PAN	<i>E. quadrangulata</i> , <i>E. paniculata</i> and <i>Syncarpia glomulifera</i>
RAD-PAU	<i>E. radiata</i> , <i>E. viminalis</i> , <i>E. pauciflora</i> woodland
RAD-SIE	Forest <i>E. radiata</i> , <i>E. smithii</i> , <i>E. sieberi</i>
RIP-SHR	Riparian Shrubland <i>Tristaniopsis laurina</i> , <i>Callistemon</i> spp.
ROB-MEL	Swamp Mahogany - Paperbark Forest <i>E. robusta</i> , <i>Melaleuca</i>
ROS-GLB	Woodland <i>E. rossii</i> , <i>E. globoidea</i>
SAL-MAC	Blue-Gum - Spotted Gum Tall Forest <i>E. saligna</i> / <i>E. botryoides</i> , <i>E.</i>
SAL-PIL	Blue Gum - Blackbutt Tall Forest <i>E. saligna</i> / <i>E. botryoides</i> , <i>E.</i>
SAL-QUD	Blue Gum - White Box Tall Forest <i>E. saligna</i> / <i>E. botryoides</i> , <i>E.</i>
SAL-SYN	Blue Gum Tall Forest <i>E. botryoides</i> / <i>E. saligna</i> , <i>Syncarpia</i>
SAL-TER	Blue Gum - Red Gum Forest <i>E. saligna</i> / <i>E. botryoides</i> , <i>E.</i>
SAR-SUA	Saltmarsh <i>Sarcocornia quinqueflora</i> , <i>Suaeda australis</i>
SCH-SDG	Saltwater Schoenoplectus Sedgeland, <i>Schoenoplectus</i> spp.
SCL-AGG	<i>E. sclerophylla</i> , <i>E. globoidea</i> , <i>E. agglomerata</i> Open Forest
SCL-CAS	Scribbly Gum - Casuarina Forest <i>E. sclerophylla</i> , <i>Allocasuarina</i>
SCL-GMF	Scribbly Gum - Bloodwood Forest <i>E. sclerophylla</i> , <i>E. gummifera</i>
SCL-GUM	Scribbly Gum - Bloodwood Woodland/Open Woodland <i>E.</i>
SCL-HAK	Scribbly Gum Open Woodland <i>E. sclerophylla</i> , <i>Hakea</i> spp.
SIE-GUM	Silvertop Ash - Bloodwood Forest <i>E. sieberi</i> , <i>E. gummifera</i>
SIE-MAN	Woodland <i>E. sieberi</i> , <i>E. mannifera</i> , <i>E. sclerophylla</i>
SIM-LRF	Simple Littoral Rainforest <i>Glochidion ferinandi</i> , <i>Guioa</i>
SPN-GRL	Spinifex Grassland <i>Spinifex sericeus</i>
SST-HTH	Sandstone Heathland <i>Banksia</i> spp., <i>Hakea</i> spp.
SST-SDG	Sandstone Sedgeland <i>Restionaceae</i> , <i>Cyperaceae</i> , <i>Melaleuca</i>
SYN-FOR	Turpentine Forest <i>Syncarpia glomulifera</i>
TER-ANG	Red Gum - Angophora Forest <i>Eucalyptus tereticornis</i> , <i>Angophora</i>
TER-WDL	<i>E. tereticornis</i> woodland
TYP-RDL	Cumbingi Reedland <i>Typha orientalis</i>
VIM-RAD	Open Forest <i>E. viminalis</i> , <i>E. radiata</i> , <i>E. bridgesiana</i>
WET-HTH	Heath wet heath
WRF-SRF	Warm Temperate - Subtropical Rainforest <i>Pennantia</i>
ZOS-RUP	Seagrass <i>Zostera</i> sp., <i>Ruppia</i> spp.

Appendix 2. Department of Environment and Conservation Vegetation Communities

No	Name
1	Southern Coastal Foothills Dry Shrub Forest - <i>E. sieberi</i>
2	Lowland Dry Shrub Forest - <i>Corymbia gummifera</i> / <i>Syncarpia glomulifera</i>
3	Northern Hinterland Shrub Dry Forest - <i>Syncarpia glomulifera</i> / <i>E. scias ssp callimastha</i>
4	Shoalhaven Gorge Dry Heathy Shrub Forest - <i>E. punctata</i> / <i>E. agglomerata</i>
5	Jervis Bay Lowlands Shrub/Grass Dry Forest - mixed tree species
7	Southern Coastal Hinterland Shrub/Tussock Grass Dry Forest - <i>E. agglomerata</i> / <i>E. muelleriana</i>
8	Far Southern Coastal Shrub Dry Forest - <i>E. sieberi</i>
9	Coastal Lowlands Cycad Dry Shrub Dry Forest - <i>Corymbia maculata</i> / <i>Macrozamia communis</i>
10	Southern Coastal Lowlands Shrub/Grass Dry Forest - <i>E. globoidea</i> / <i>E. longifolia</i>
11	Coastal Shrub/Grass Dry Forest - <i>E. botryoides</i> / <i>E. globoidea</i> / <i>Imperata cylindrica</i>
12	Coastal Hinterland (Buckenbowra) Shrub/Cycad Dry Forest - <i>Corymbia gummifera</i> / <i>Macrozamia communis</i>
13	Rainshadow Dry Shrub/Tussock Grass Forest - <i>E. agglomerata</i>
14	Northern Coastal Hinterland Shrub/Grass Dry Forest - <i>E. fibrosa</i> / <i>Corymbia maculata</i>
15	North East Tableland Dry Shrub Forest - <i>E. sieberi</i>
16	Shoalhaven Gorge Dry Shrub Forest - <i>E. agglomerata</i> / <i>E. punctata</i> / <i>Dianella revoluta</i>
17	Kowmung Dry Shrub Forest - <i>E. punctata</i> / <i>Stypandra glauca</i>
18	Southern Coastal Hinterland Moist Shrub/Vine/Grass Forest - <i>E. cypellocarpa</i> / <i>E. muelleriana</i>
19	Coastal Escarpment and Hinterland Dry Shrub/Fern Forest - <i>E. muelleriana</i>
20	Coastal Hinterland Ecotonal Gully Rainforest
21	Northern Foothills Moist Shrub Forest - <i>C. maculata</i> / <i>E. pilularis</i>
22/23	Southern Coastal Hind Dune/Headland Scrub & Southern Coastal Dune Scrub Complex
6	Southern Coastal Dune Scrub Complex & Coastal Dune Herb/Grassland
24	Coastal Wet Heath Swamp Forest - <i>Casuarina glauca</i> / <i>Melaleuca ericifolia</i>
25	South Coast Swamp Forest Complex- <i>Casuarina glauca</i>
27	Ecotonal Coastal Swamp Forest - <i>Casuarina glauca</i> / <i>E. botryoides</i>

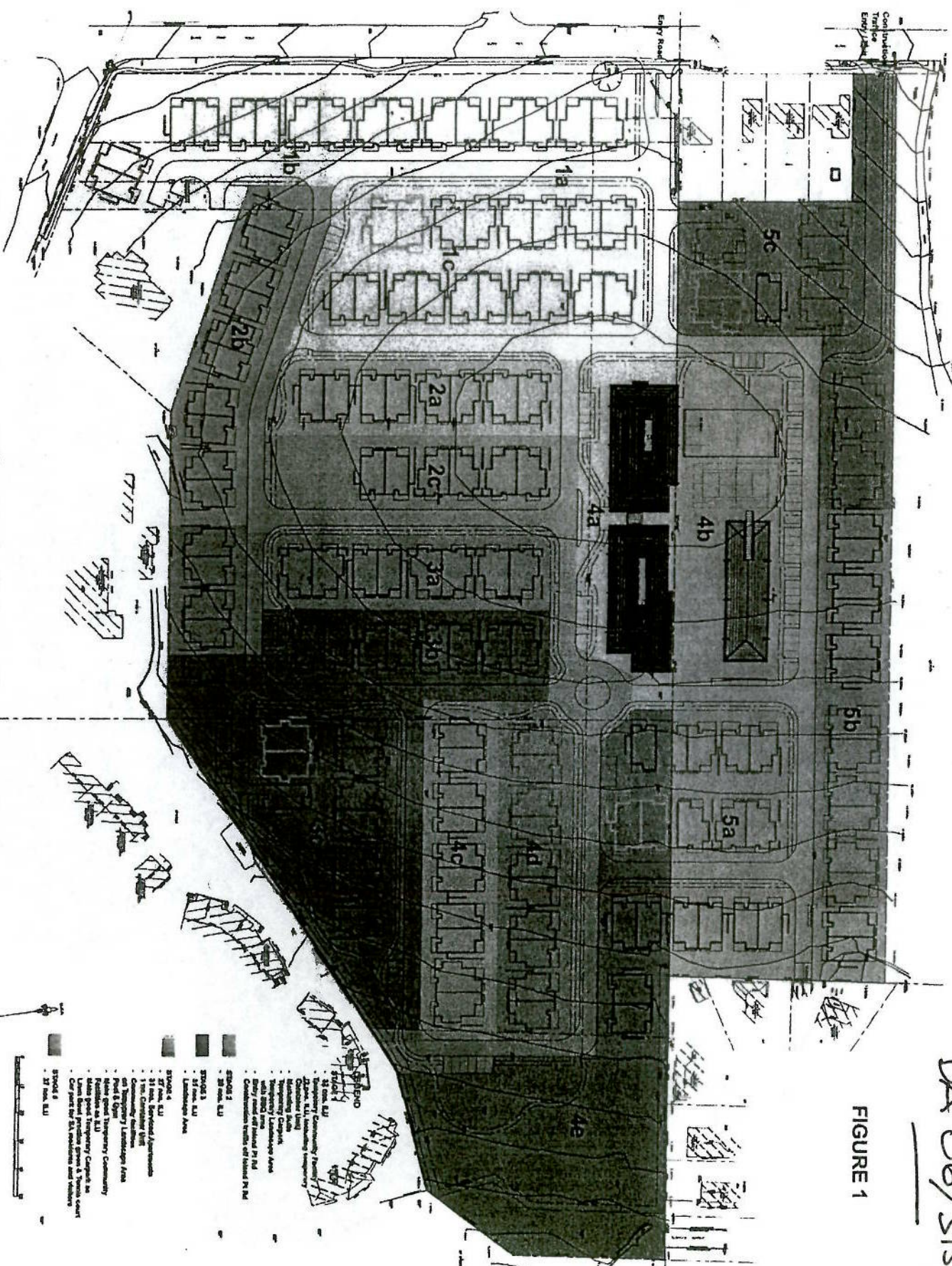
28	Coastal Sands Shrub/Fern Forest - <i>E. botryoides</i> / <i>Banksia serrata</i>
29	Northern Coastal Sands Shrub/Fern Forest - <i>E. pilularis</i> / <i>Banksia serrata</i>
31	<i>E. viminalis</i> Shrub/Fern Herb/Grass Forest

DA 06/3156

FIGURE 1



dem



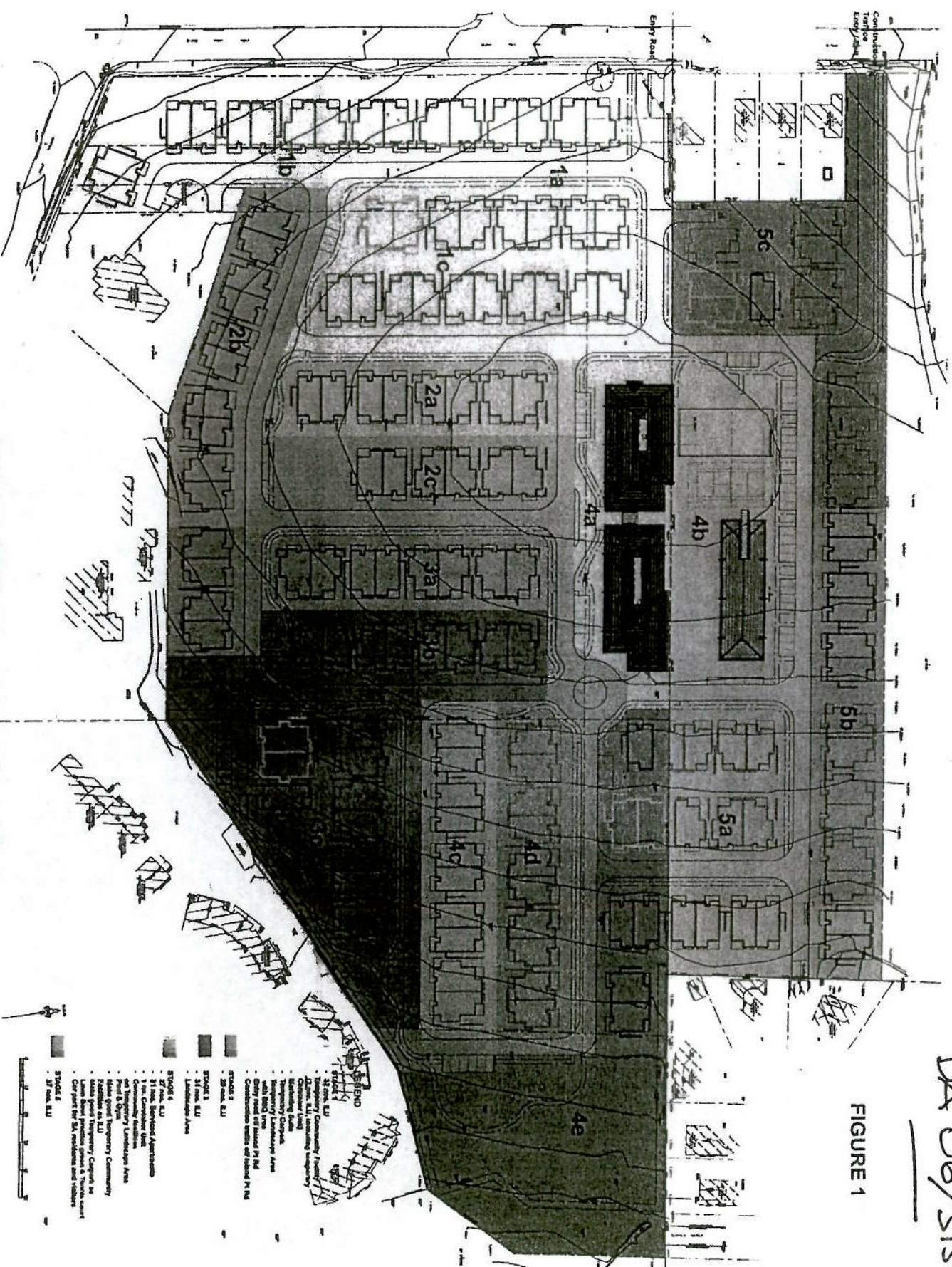
retirement village – st georges basin

concept plan - staging

DA 06/3156

FIGURE 1

dem



retirement village - st georges basin

concept plan - staging

TO: Alison Dalyell – Subdivisions Development Planner
FROM: Michael Smith - Threatened Species Officer
SUBJECT: **Proposed subdivision of 2 lots into 5 residential lots at
Island Point Rd St Georges Basin Lots 25 & 26
DP25550**

DATE: 18 October 2006
FILE: SF9795 **CONTACT:** Michael Smith - 3209

Background

Previous comments raised the issue of yellow-bellied gliders (YBG) and glossy black-cockatoos (GBC), both vulnerable species listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act) for which studies in the area had been undertaken. The results of those studies indicated the subject land was within a predicted home range for YBG and may contain important habitat for GBC. The applicant was asked to assess the impact of the proposal in light of these studies.

The proposal

The subject lots are zoned 3g business (lot 26) and 2c residential (lot 25). A portion of lot 26 has already been approved for development and subdivided (SF9679) to allow for the acquisition of land by council for the proposed extension to Anson Street from the east.

The proposal seeks to further subdivide the lots to create an additional five lots.

Area of native vegetation to be cleared or modified

The current proposal will involve the clearing of the remnant 2ha of native vegetation over the lots.

Review of provided Flora & Fauna Assessment

The applicant has submitted a report (*Investigation of Yellow-bellied Glider and Glossy Black-cockatoo habitat Lot 25 and part Lot 26 DP25550 Island Point Road, St Georges Basin City of Shoalhaven*) by Kevin Mills & Associates (KMA) Ecological and Environmental Consultants (August 2006 – Ref: 06/28) which assesses the impact of the proposal against a list of minimum standards for the retention of YBG and GBC habitat.

The report outlines the survey effort undertaken for the assessment which is adequate for the scale of the proposal and in line with survey effort guidelines recommended by the NSW Department of Environment & Conservation (DEC, 2004). Survey techniques included nocturnal surveys (spotlighting) on two nights for YBG and diurnal searches for potential den and nest sites, YBG incised feed trees, GBC feed trees, and a tree survey of vegetation within the study site (the development areas of

lots 25 and 26). KMA have defined the study area as the subject land and all areas within 100m of the perimeter of the subject land.

In summary, KMA did not find any potential nest or den trees, no YBG incised feed trees, and only 2 minor GBC feed trees. The site does contain approximately 2ha of spotted gum (*Corymbia maculata*) YBG foraging habitat though KMA have assessed this as isolated from larger contiguous patches of vegetation to the south and having only tenuous connections to forested areas to the north due to recent land clearing for approved developments.

KMA have assessed the impact of the proposal against the "minimum standards" within council's draft YBG and GBC policy and completed an assessment of significance pursuant to s5A of the *NSW Environmental Planning & Assessment Act 1979*. Because of the lack of GBC feed trees, YBG incised sap feed trees, potential nest and den sites (hollow-bearing trees), and the isolated nature of the site, KMA have concluded the proposed subdivision of the land is unlikely to have a significant impact on either of the species. Council concurs with this conclusion subject to the clearing of vegetation for roads (SF9679) through the site and along the eastern boundary as being approved requiring no further assessment.

Site inspection and assessment details/survey methods

The site was inspected on Tuesday 24 October 2006 following a review of the provided plans and council's planning and environmental data.

The inspection took place from approximately 11 to 11:30am and involved a general viewing of the entire property. No specialised or nocturnal surveys were undertaken. The inspection involved a general habitat analysis searching for general flora and fauna signs (yellow-bellied glider incised trees) and components such as hollow-bearing trees. The property owner Mr David Debatista was present during the inspection and identified the location of the council acquired land (for the purposes of the Anson Road extension).

Site description

The site description as provided by KMA is accurate in terms of habitat available on the site. The tenuous habitat connection to the forested lands to the north mentioned by KMA correlates with the "proposed road 18m wide" portion of site as depicted on Figure 1 (page 2) and described in "Area G" (page 3) of the KMA report. This portion of the lot is described as cleared (with an existing development approval) by KMA but was observed to be vegetated at the time of council's 24 October 2006 inspection (Figures 1 & 2 below). The location of this portion of the subject land was determined using a hand-held GPS and Pocket PC containing the cadastre which may not have been available to KMA.



Figure 1 – Looking west past the end of Anson St with existing trees providing habitat connections to the north.



Figure 2 - Looking east from the subject site towards the end of Anson St with existing trees providing habitat connections to the north.

No GBC feed trees, no YBG incised sap feed trees and few large trees likely to contain hollows were observed during council's inspection. The site does however contain tree species known to be associated with foraging areas for YBG. These tree species include spotted gum (*Corymbia maculata*) and blackbutt (*Eucalyptus pilularis*).

Conclusion re "assessment of significance" (s5A assessment)

Council concurs with the KMA view that the connections to forested areas to the north which represent YBG habitat are tenuous. The existing narrow strip of trees at the eastern end of the lot may still provide access to larger foraging areas on the subject land. However, if this connection (proposed road 18m wide and the Anson Rd extension) can be cleared without the requirement for further assessment and approvals (see SF9679), then the YBG habitat on the subject land is already isolated by way of these approvals.

The YBG and GBC habitat on the subject lot, as assessed by KMA against the draft YBG and GBC policy prescriptions, is not of high value due to the lack of potential den sites, no potential nest sites, no important GBC feed trees, and no YBG incised sap feed trees being found.

Under these circumstances, council concurs with the conclusion of non-significance pursuant to s5A of the *NSW EP&A Act* by KMA.

Recommendations and recommended consent conditions:

Recommendations

Future landscaping of the lots and streetscape should use local native tree species of a size appropriate for urban areas.

Recommended Consent Conditions

Habitat Modification, Removal and Management

There shall be no removal or disturbance of indigenous vegetation on the property, including canopy trees, understorey and groundcover vegetation, without the prior written consent of the Shoalhaven City Council Director of Development & Environmental Services, except in line with this consent.

There shall be no disturbance or clearing of vegetation on the lot prior to the issuing of a construction certificate.

Shoalhaven City Council's Subdivisions and Environmental Health sections must be notified in writing at least 7 days prior to the commencement of any vegetation disturbance or clearing works on the lot.

A suitably qualified and appropriately licensed wildlife handler must be on site prior to, and during the removal of any trees or areas of potential habitat on the property, to rescue and relocate native fauna as necessary.

Hollow-bearing trees must be felled carefully in sections utilising a "cherry picker" or crane to allow the rescue of native fauna. Hollow-bearing sections must be carefully lowered to the ground so as not to injure native fauna.

Your reference:

Our reference: 04284



7 June 2006

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Dear Matt,

Re: Flora and fauna issues raised by the Department of Planning, Proposed Residential Subdivision, Lots 6 and 15 DP 25550, Island Point Road, St Georges Basin

I am writing to provide a response to the flora and fauna issues raised by the Department of Planning (DOP) in correspondence dated 3 May 2006, regarding the application for development consent for the proposed residential subdivision at Lots 6 and 15 DP 25550, Island Point Road, St Georges Basin.

The DOP has reviewed the Flora and Fauna Assessment report prepared by BES in October 2004 and raised various issues regarding threatened species and the loss of wildlife. Each of these issues is presented below and a response provided to the matters raised.

DOP Issue A

The Department is of the opinion that there are considerable inconsistencies in the assessment and conclusions of the 8-part test. The Assessment has identified the existence of threatened species onsite; suitable den, roosting and nesting trees; and acknowledged that the proposal involves clearing of approximately 3.4 ha of open forest. The Department is of the opinion that the conclusions of the 8-part test are not supported by the relevant findings of the accompanying Flora and Fauna Assessment.

BES Response

BES strongly rejects the assertion that there are inconsistencies in the assessment and conclusions of the 8-part test. Whilst it is acknowledged that three threatened species, Glossy Black-cockatoo, Powerful Owl and Yellow-bellied Glider were recorded onsite, the intensity and timing of the fieldwork undertaken for the study provided strong evidence that key habitat resources for these threatened species would not be affected by the proposal.

Even though suitable habitat, including potential den, roosting and nesting trees will be removed for the proposal, the BES study demonstrated via stagwatching surveys on eight nights spread over 12 months, that none of these species were utilising any of the trees with hollows on the site as dens, roosts or nests. The fieldwork was designed to sample these habitat components across a range of seasons and included targeted observations during the breeding seasons of the Powerful Owl and Glossy Black-cockatoo and observations for breeding by the Yellow-bellied Glider, which were led by BES staff members who have specialist knowledge of each of these species.

With respect to the Glossy Black-cockatoo, this highly mobile and wide-ranging species is likely to utilise Black She-oak trees and possibly trees with hollows in any remnant patch of native vegetation in the St Georges Basin area. Hence, any patch of forest with such habitat resources could be identified as comprising suitable habitat. The key factors in making a judgement regarding the significance or otherwise of the effects of a proposal on this species involve consideration of whether the site contains key habitat resources, particularly for breeding. The BES report documented fieldwork of a suitable intensity to demonstrate that the species was not using trees with hollows on the site for breeding. Whilst the site contained stands of Black She-oak in the mid-canopy, only one of these trees showed evidence of feeding by the species and the feeding evidence under this tree was not heavy. These data indicated that the site does not comprise a key feeding area for the species. BES has undertaken many targeted surveys for this species in the Shoalhaven and has found that some sites contain large numbers of heavily utilised Black She-oak feeding trees, indicating that such stands comprise key feeding areas, unlike the site at St Georges Basin. It was acknowledged that the status of the species' feeding resource is dynamic, but there was no evidence to suggest that the Black She-oak trees to be removed for the proposal would be utilised by the species in the future. The loss of one known feeding tree was considered unlikely to reduce the viability of the local population of Glossy Black-cockatoo. The proposal includes the retention of some Black She-oak trees along the eastern and western boundaries of the site as well as the use of Black She-oak trees in landscaping and in streetscape planting. The loss of 3.4 ha of native vegetation would have no quantifiable effect on the ability of the species to access other areas of habitat as it is capable of flying large distances and has been recorded in isolated Black She-oak trees within residential areas. The conclusions of the BES study regarding the Glossy Black-cockatoo are not inconsistent with the findings of the fieldwork and research documented in the report.

With respect to the Powerful Owl, it is likely that all forest remnants in the St Georges Basin area would lie within the home range of one or another individual of this highly mobile and wide-ranging species. Hence, any patch of forest could be identified as comprising suitable habitat. The key factors in making a judgement regarding the significance or otherwise of the effects of a proposal on this species involve consideration of whether the site contains key habitat resources, particularly for breeding. The BES report documented fieldwork of a suitable intensity to demonstrate that the species was not using trees with hollows on the site for breeding. No evidence of diurnal roosting was found and the study area did not contain high quality roosting resources. The small area of prey habitat to be removed (3.4 ha) comprises a very small

proportion of the estimated home range of the species (between 300 ha and 1500 ha) indicating that the loss of this prey habitat would be unlikely to affect the viability of a local population of the species. The proposal includes the retention of some prey habitat along the eastern and western boundaries of the site as well as the retention of trees within 5m of the rear of residential lots throughout the subdivision. The loss of 3.4 ha of native vegetation would have no quantifiable effect on the ability of the species to access other areas of habitat as it is capable of flying large distances and has been recorded within areas of residential development. The conclusions of the BES study regarding the Powerful Owl are not inconsistent with the findings of the fieldwork and research documented in the report.

With respect to the Yellow-bellied Glider, this species is known to utilise a variety of forested habitats in the St Georges Basin area and is also known to utilise trees in the yards of residential properties adjoining forested areas. The species was recorded during five of the eight nocturnal surveys, and was recorded onsite on two occasions, when the species was observed via spotlighting. It was heard calling from adjoining vegetation to the SE and NW of the site on three nights. The key factors in making a judgement regarding the significance or otherwise of the effects of a proposal on this species involve consideration of whether the site contains key habitat resources, particularly for breeding, and whether a proposal would result in the isolation of the species since it requires canopy connectivity for dispersal. The BES report documented fieldwork of a suitable intensity to demonstrate that the species was not using trees with hollows on the site for breeding or denning. The site did not contain any sap trees incised by the species so the loss of foraging resources would be mostly limited to potential eucalypt nectar resources. These foraging resources are not unique to the site and not particularly concentrated suggesting that the site does not offer key foraging habitat for the species. The species is known to have a home range of between 20 ha and 85 ha, and the loss of 3.4 ha of foraging habitat would reduce a Yellow-bellied Glider home range by between 4% and 17%. The BES study acknowledged that the issue of habitat connectivity was the key factor in the assessment of significance for this species and the proposal was amended before the development application was lodged to incorporate the retention of canopy trees along the eastern and western boundaries of the site to facilitate habitat connectivity to proximate native vegetation to the north and south. Data sourced by BES from a study commissioned by Shoalhaven City Council was used to provide context to the role of the affected family group in the maintenance of the local Yellow-bellied Glider population in the St Georges Basin area. These data demonstrated that the affected Yellow-bellied Glider family group was part of a much larger local population and that this group was unlikely to contribute significantly to the viability of the local population. The conclusions of the BES study regarding the Yellow-bellied Glider are not inconsistent with the findings of the fieldwork and research documented in the report.

DOP Issue B

It is noted that the proposal includes a 10m corridor along the eastern and western boundaries of the site, retained for fauna movement. The Department is of the opinion that these corridors will be of little value for many fauna species and that the subdivision will result in the isolation of one or more of the identified threatened species from the broader regional population.

BES Response

The BES study clearly stated that the 10m corridors were proposed to facilitate habitat connectivity for the Yellow-bellied Glider, not fauna species in general. The corridors would contain canopy trees and recruitment trees as well as some Black She-oak trees, with canopy spacing determined by the specifications required for bushfire asset protection. Other vegetation strata would be modified in accordance with such specifications so that the retention of the corridors would not impact on building setbacks by increasing bushfire hazards. As demonstrated in the assessment of significance, the proposal would not isolate habitat for the Glossy Black-cockatoo or Powerful Owl.

The provision of corridors of canopy connectivity for the Yellow-bellied Glider, managed via a vegetation management plan to provide for future tree recruitment, was considered an appropriate mitigation strategy to sustain habitat connectivity. The species is known to occur in residential areas where canopy connectivity is present and so there is evidence that trees proposed to be retained along rear boundaries would be likely to facilitate appropriate habitat connectivity for the species. The proposal would not isolate habitat for the Yellow-bellied Glider.

Since the publication of the BES report and the lodgement of the development application, adjoining land to the north of the site has been cleared of native vegetation in accordance with existing development consent. This clearing has created a break in canopy connectivity in the order of about 100m and the trees either side of the gap do not appear to be of sufficient height to allow the Yellow-bellied Glider to glide across the gap. BES has made several observations of this gap from the east, west and south, and it would appear that there are few, if any, canopy trees on adjacent properties that could be used by the species to cross the cleared area. This clearing may have already isolated the affected family group and substantially reduced its viability.

DOP Issue C

Given the significant number of flora and fauna species identified in the Flora and Fauna Assessment and the considerable area of land to be cleared, the applicant would be advised to review the Assessment and the 8-part test, having regard to wildlife habitat and corridors in accordance with the principles of Ecologically Sustainable Development and then review and redesign, if necessary, the proposal having regard to the Assessment.

BES Response

The number of flora and fauna species identified onsite is not particularly large given that the BES study documented fieldwork undertaken across a range of seasons over a period of 12 months. Most sites comprising native vegetation would yield similar numbers of species if subjected to fieldwork at a similar intensity. The number of species recorded is no reason to review the Assessment and the 8-part test as it would have little bearing on the analysis.

The BES study considered wildlife habitat and corridors in detail, both in section 5.2 and 5.3. The information presented was adequate and was substantiated by data collected from a combination of fieldwork, desktop analysis and literature review. There is no reason to revisit these matters.

In terms of ecologically sustainable development (ESD), the matters requiring consideration are the precautionary principle, inter-generational equity, the conservation of biological diversity and ecological integrity, and improved valuation, pricing and incentive mechanisms. The BES study incorporated a precautionary approach and sought data over a lengthy period of time to enable an informed judgement to be made regarding the impacts of the proposal on biological diversity and ecological integrity. The proposal sought to sustain the key matter of biological diversity to be affected, Yellow-bellied Glider, by providing for habitat connectivity along the eastern and western boundaries of the site. Sustaining the ability of the Yellow-bellied Glider to disperse through the site addressed issues of inter-generational equity by providing for dispersal that would sustain the viability of the species. Improved valuation, pricing and incentive mechanisms were not relevant to this proposal.

DOP Issue D

Given the existing heavily vegetated nature of the site and the aims of SEPP 71 of preserving visual amenity and native coastal vegetation stated in section 2(1)(e) and 2(1)(g) of SEPP 71 respectively the current layout would appear to fall short in responding to these aims. A revised scheme better addressing these critical aims is required. In this regard it is suggested that significant stands of vegetation in visually prominent locations be incorporated into any revised subdivision pattern.

BES Response

Whilst BES will not provide comment regarding the sections of SEPP 71 raised by the DOP, BES is of the opinion that the site is not heavily vegetated. The site has been severely under-scrubbed in part, has been cleared for the construction of two dwelling houses and associated infrastructure such as driveways, yards, storage, bushfire protection and a tennis court, has been used in part to grow cut flowers, and has been cleared along fence lines.

If you require any further information then please contact me at your convenience and quote reference number 04284.

Yours sincerely,



Dimitri Young
Manager
Environmental Services Division