

Appendices

9 August 2006

Ms Anne Clements
Anne Clements and Associates
5 Bligh St
KIRRIBILLI NSW 2061

Dear Ms Clements

**PROPOSED REZONING FOR RESIDENTIAL, ROAD AND BIODIVERSITY
MACQUARIEDALE ROAD, APPIN
WOLLONDILLY SHIRE**

1. I understand that you will be visiting Walker's North Appin project tomorrow.
2. While you are there, I would appreciate it if you could consider the Walker site shown on the plan below.



LEGEND



SUBJECT SITE

3. Walker is preparing a rezoning application to be submitted to Wollondilly Shire Council. It will seek rezoning of the eastern section to Residential, and the western section as Arterial Road and Biodiversity Conservation.

Appendix 2.

Soil survey of the Site by Dr Pamela Hazelton

Areas Adjacent to Macquariedale Road

Hole 1 – Quadrat 5

GPS 295448 6213309



Depth cm	Texture	Colour	Munsell(colour)
0-1 top soil			
1-28	silt loam	dark brown	7.5YR 3/2
28-<30	clay loam	dark brown	7.5YR 3/4

There was leaf litter mixed with the topsoil. Layer 2 was soft with ant bioturbation
Marginal transition some small fragments small s/stones in Layer 3

Hole 3
GPS 295216 6213238



Depth cm	Texture	colour	Munsell (colour)
0-4 topsoil			
4-28	clayey sand	strong brown	2.5YR 4/4
28-55	clay loam with sand	strong brown	2.5YR 4/6

Hole 7
GPS 29590 6213669



Depth cm	Texture	Colour	Munsell (colour)
0-2 top soil			
2-8	sandy loam	dark brown	7.5YR 4/4
8-60	light sandy loam with sandstones	strong brown	7.5YR 4/6

Hole 9

GPS 295597 6214142



Depth cm	Texture	Colour	Munsell (colour)
0-2 (topsoil)			
2-10	loamy sand	dark brown	7.4YR 4/4
10-60	sandy loam	strong brown	7.4YR 4/6

Sandstone fragments were evident. Colour very slight influence from shale. The texture is definitely from a sandstone source

Conclusion

Using Site A as an indicator of the transition it is evident that the excavated soil profiles provides the limit of shale sandstone transition soil in the surveyed area. The boundary of this shale sandstone transition is delineated on the map provided.

Dr P A Hazelton

Appendix 1: Descriptions of Map Units

A list of diagnostic species has been compiled for all Map Units. For each species the following have been calculated:

- Cover/Abundance¹ within Map Unit (50 percentile): the median cover/abundance score recorded for the species in sites representing the Map Unit;
- Frequency (%) within Map Unit: the number of times the species was recorded in sites representing the Map Unit divided by the total number of sites representing the Map Unit;
- Cover/Abundance¹ in other Map Units (50 percentile): the median cover/abundance score recorded for the species in sites sampled in other Map Units.
- Frequency (%) within other Map Units: the number of times the species was recorded in sites representing other Map Units divided by the number of sites representing other Map Units;
- Fidelity class: positive (the species occurs more frequently in the Map Unit than in sites representing other Map Units; constant (the species occurs frequently within the Map Unit as well as sites representing other Map Units, and is therefore characteristic rather than diagnostic of the Map Unit); uninformative (the species does not occur frequently in the Map Unit nor in sites representing other Map Units).

¹Cover/abundance scores:

- 1 = Rare, few individuals present AND cover < 5%
- 2 = Uncommon AND cover < 5%
- 3 = Common AND Cover < 5%
- 4 = (Very Abundant AND Cover < 5%) OR (5% ≤ Cover < 20%)
- 5 = (20% ≤ Cover < 50%)
- 6 = (50% ≤ Cover < 75%)
- 7 = (75% ≤ Cover < 100%)

Procedure for using positive diagnostic species for the identification of Map Unit type.

1. Determine the location of test plots using a random procedure. For example: Use a tape measure to define a grid then consult a table of random numbers to obtain coordinates for the location of the plots.
2. Mark out a search area of 0.04 ha (20 x 20 m is convenient) and record all vascular plant species with stems rooted within the search area.
3. Compile a shortlist of possible Map Unit types by comparing the vegetation structure and physical characteristics of the site with the descriptions contained in Appendix 1. The species composition of the test plot will be compared with each of these Map Unit types.
4. Count the number of **native** species occurring within the test plot. A minimum species count has been specified for each Map Unit type and is located in the diagnostic species table caption. The test can not proceed unless the test plot contains the minimum number of species specified for the Map Unit under consideration.
5. Considering each of the candidate Map Unit types in turn, consult the list of diagnostic species and count the number of species classified **positive** that were found in the test plot. The minimum expected number of positive diagnostic species has been specified for each Map Unit type and is located in the diagnostic species table caption. If the test plot contains the minimum number of positive diagnostic species ('pass') then it is a good match for that Map Unit type. A 'pass' result may be obtained for more than one of the candidate communities. In such cases the number of species by which the minimum was exceeded may be used to assess the closeness of the match to each of the possible candidates. A 'fail' result (the test plot contains fewer species than the expected minimum) does not exclude the possibility that the test plot is a match, however the fewer positive species recorded, the less likely it is that the Map Unit is a match (see discussion).

Map Unit 1:

Shale Sandstone Transition Forest (Low sandstone influence)

Sample sites: (38)

Area (ha) 1750 / 1997 (± range): 12834 / 1243 (±173)

Proportion extant (± range): 9.7 (±1.3)%

No. taxa (total / unique): 264 / 6

No. taxa per plot (±sd): 42.6 (±7.9)

Description:

Shale Sandstone Transition Forest (Low sandstone influence) is dominated by *Eucalyptus tereticornis*, with *E. eugenioides*, *E. crebra*, *E. fibrosa* and *E. punctata* occurring less frequently. A small tree stratum is usually present and dominated by *Eucalyptus* spp., with *Allocasuarina littoralis* and *Acacia decurrens* sometimes present. A shrub layer dominated by *Bursaria spinosa* is usually present, frequently this is of high density, although the foliage of this shrub is sparse and does not translate into high cover values. A diverse array of forb species is always present, frequently exceeding 50% in projected foliage cover. Species frequently present in the ground stratum include *Microlaena stipoides* var. *stipoides*, *Cheilanthes sieberi* subsp. *sieberi*, *Dichondra repens*, *Themeda australis*, *Echinopogon ovatus*, *Entolasia marginata*, *Pratia purpurascens*, *Solanum prinophyllum* and *Oxalis perennans*. Although this community marks the start of the transition from the pure shale communities of the Cumberland Plain to the surrounding sandstone communities, it contains relatively few species commonly observed on sandstone derived soils.

Shale Sandstone Transition Forest (Low sandstone influence) occurs around the margins of the Cumberland Plain on soils derived from Wianamatta Shale. It is most extensive in the south-eastern and south-western sections of the Study area. The community is only found in close proximity to a transition in parent geology from Wianamatta Shale to high-quartz sedimentary substrates such as the Hawkesbury and Narrabeen group Sandstones, as well as fine to medium grain quartz of the Mittagong formation. In these peripheral areas shale soils form a shallow layer over the underlying sandstone. The majority of sample sites were located within approximately 2 km of a sandstone/shale boundary. The community may also be found at greater distances from the sandstone/shale boundary where watercourses have eroded the shale stratum down close to the level of sandstone.

Shale Sandstone Transition Forest (Low sandstone influence) is typically found on the middle or upper slopes of gently undulating land. As distance to the sandstone/shale boundary increases Map Unit 1 grades into Map Unit 10 or, less frequently, Map Unit 9. The boundary between these communities is indistinct by nature, and Shale Sandstone Transition Forest includes areas with only a very slight influence of sandstone. As distance to the sandstone/shale boundary decreases, Map Unit 1 grades into Map Unit 2. Again, the boundary between these communities is indistinct and largely arbitrary.

Previous floristic classifications:

Map Units 1 and 2 combined correspond to the western form of Shale/Sandstone Transition Forest described in NPWS (1997) and subsequently listed under the *TSC Act* (1995). Eastern Shale/Sandstone Transition Forest (*sensu* NPWS (1997)) is herein included in Map Unit 3, an EEC listed under the name Cooks River/Castlereagh Ironbark Forest. Map Unit 43 also occurs on soils transitional between Shale and Sandstone, however this community is floristically most similar to Map Unit 15 and together they comprise the EEC Sydney Turpentine Ironbark Forest. Benson and Howell (1994b) described a Shale/Sandstone Transition Forest (Map Unit 9r) occurring on the sandstone side of the ecotone and this community is considered to fall outside the definition of Map Units 1, 2 and 43. However, Bargo Brush Forest (Benson and Howell 1994b, Map Unit 9mf) may fall within the definition of either Map Unit 1 or Map Unit 2.

400 m of the shale/sandstone boundary and varied considerably in the degree of sandstone influence evident in the soil. Map Unit 2 is essentially a shale community, and is most likely to occur on shallow, residual clay soils derived from Wianamatta Shale. However, it may also be found on high-quartz sandstone-derived soils where there is a strong colluvial shale influence (eg the upper slopes of sandstone gullies adjoining shale soils), and on outcrops of pure shale soils derived from the Mittagong Formation. Map Unit 2 occurs primarily on upper slopes and ridges on gently undulating terrain.

Map Unit 2 grades into Map Unit 1 with increasing distance from the sandstone/shale boundary. If the transition is abrupt, then Map Unit 2 may grade directly into Map Unit 10. Along the western edge of the Georges River Map Unit 2 makes an abrupt transition into sandstone communities and there is a pronounced change in floristic composition.

Previous floristic classifications:

Shale Sandstone Transition Forest (High sandstone influence) is one of two communities which together correspond to Shale Sandstone Transition Forest as listed under the *TSC Act* (1995). Further discussion is included under the description of Map Unit 1.

Habitat:

Parent Geology: Wianamatta Shale (53%), Mittagong Formation (31%), Hawkesbury Sandstone (16%)

	Mean ($\pm$ sd)	Range
Elevation (m)	146.3 (78.2)	14–393
Slope ($^{\circ}$ above horizontal)	4.2 (3.9)	0–17.7
Annual Rainfall (mm)	880.0 (46.1)	756–981
Ruggedness (900m)	12.3 (6.8)	4–43
Maximum Temperature, Jan. ($^{\circ}$ C)	27.3 (7.0)	26.3–28.9
Solar Radiation, January	215.0 (2.6)	204–220
Distance from sandstone derived soils (m)	132.8 (234.1)	0–1398.7

Structure:

Growth form	Frequency (%)	Mean height (m) ($\pm$ sd)	Mean foliage cover (%) ($\pm$ sd)
Tree	100	21.1 (4.4)	19.9 (9.9)
Small Tree	84	10.1 (4.0)	10.9 (9.1)
Shrub	91	3.2 (1.3)	11.6 (10.6)
Forb	96	0.7 (0.7)	33.8 (21.3)

Diagnostic Species: Positive diagnostic species are shaded. A 0.04 ha plot located in this Map Unit is expected to contain at least 20 positive diagnostic species (95% confidence interval) provided the total number of native species in the plot is 40 or greater. A 95% confidence interval means that five percent of plots sampled (1 in 20 plots) in this Map Unit may contain fewer than 20 positive diagnostic species.

C/A: Cover/Abundance within Map Unit (50 percentile)

Freq: Frequency (%) within Map Unit

C/A O: Cover/Abundance in other Map Units (50 percentile)

FreqO: Frequency (%) within other Map Units

FC: Fidelity class

Species	C/A	Freq	C/AO	FreqO	FC
Tree stratum					
<i>Acacia binervata</i>	2	14	1	1	positive
<i>Acacia decurrens</i>	2	24	1	11	positive
<i>Allocasuarina littoralis</i>	2	50	2	22	positive
<i>Angophora bakeri</i>	1	27	3	12	positive
<i>Corymbia maculata</i>	4	13	4	3	positive
<i>Eucalyptus crebra</i>	3	57	4	14	positive
<i>Eucalyptus fibrosa</i>	4	39	4	14	positive
<i>Eucalyptus punctata</i>	3	61	2	20	positive
<i>Exocarpos cupressiformis</i>	1	26	1	11	positive
Shrub stratum					
<i>Acacia falcata</i>	1	23	1	10	positive
<i>Bursaria spinosa</i>	2	60	3	47	constant

<i>Exocarpos strictus</i>	2	30	2	9	positive
<i>Gompholobium species B</i>	2	10	2	2	positive
<i>Hibbertia aspera</i>	2	40	2	15	positive
<i>Hibbertia diffusa</i>	2	36	2	13	positive
<i>Jacksonia scoparia</i>	2	29	1	3	positive
<i>Kunzea ambigua</i>	2	60	2	12	positive
<i>Leucopogon juniperinus</i>	2	47	2	16	positive
<i>Leucopogon muticus</i>	2	13	1	2	positive
<i>Notelaea longifolia</i> f. <i>longifolia</i>	1	31	1	16	positive
<i>Olearia microphylla</i>	1	17	1	6	positive
<i>Ozothamnus diosmifolius</i>	2	63	1	25	positive
<i>Persoonia linearis</i>	2	84	2	27	positive
<i>Phyllanthus hirtellus</i>	2	53	2	32	positive
<i>Pimelea linifolia</i> subsp. <i>linifolia</i>	2	59	2	25	positive
<i>Pomaderris lanigera</i>	2	10	1	1	positive

Ground stratum

<i>Aristida vagans</i>	2	90	2	40	positive
<i>Astroloma humifusum</i>	1	20	1	6	positive
<i>Billardiera scandens</i>	2	71	1	34	positive
<i>Calotis dentex</i>	2	26	2	4	positive
<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	2	81	2	49	positive
<i>Dampiera purpurea</i>	2	13	1	4	positive
<i>Desmodium rhytidophyllum</i>	1	14	1	5	positive
<i>Dianella caerulea</i>	2	44	2	27	constant
<i>Dianella revoluta</i> var. <i>revoluta</i>	2	54	2	36	positive
<i>Dichelachne micrantha</i>	2	47	2	30	constant
<i>Digitaria ramularis</i>	2	39	1	4	positive
<i>Echinopogon caespitosus</i> var. <i>caespitosus</i>	2	73	2	21	positive
<i>Entolasia stricta</i>	3	90	3	55	positive
<i>Eragrostis brownii</i>	2	39	2	19	positive
<i>Gahnia aspera</i>	1	20	2	6	positive
<i>Gonocarpus tetragynus</i>	2	44	2	20	positive
<i>Goodenia hederacea</i> subsp. <i>hederacea</i>	2	49	2	32	constant
<i>Lagenifera gracilis</i>	2	40	2	12	positive
<i>Laxmannia gracilis</i>	1	39	2	15	positive
<i>Lepidosperma laterale</i>	3	90	2	40	positive
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	2	34	2	13	positive
<i>Lomandra multiflora</i> subsp. <i>multiflora</i>	2	87	2	46	positive
<i>Microlaena stipoides</i> var. <i>stipoides</i>	3	83	3	68	constant
<i>Notodanthonia longifolia</i>	2	11	2	1	positive
<i>Opercularia diphylla</i>	2	54	2	33	positive
<i>Panicum simile</i>	2	79	2	29	positive
<i>Paspalidium distans</i>	2	40	2	25	constant
<i>Poa labillardieri</i> var. <i>labillardieri</i>	2	37	2	15	positive
<i>Pomax umbellata</i>	2	84	2	30	positive
<i>Pratia purpurascens</i>	2	74	2	40	positive
<i>Pterostylis concinna</i>	2	9	–	0	positive
<i>Solanum prinophyllum</i>	1	46	2	25	positive
<i>Stipa pubescens</i>	3	56	2	24	positive
<i>Stypana glauca</i>	2	30	1	2	positive
<i>Themeda australis</i>	3	80	3	54	positive
<i>Veronica plebeia</i>	1	41	2	21	positive
Climbers					
<i>Glycine clandestina</i>	2	77	2	38	positive
<i>Hardenbergia violacea</i>	2	47	1	29	positive

Other tree species occurring less frequently in this community:

Species	C/A	Freq	C/AO	FreqO	FC
Tree stratum					
<i>Angophora costata</i>	1	10	2	20	uninform.
<i>Angophora floribunda</i>	2	9	2	8	uninform.
<i>Corymbia eximia</i>	3	7	2	3	uninform.
<i>Corymbia gummifera</i>	2	29	3	29	uninform.

<i>Schoenus ericetorum</i>	1	34	2	1	positive
<i>Stipa pubescens</i>	2	56	3	25	positive
<i>Tetralochea neglecta</i>	1	32	2	1	positive
<i>Xanthorrhoea concava</i>	1	37	1	8	positive
<i>Xanthorrhoea media</i>	2	56	2	7	positive
<i>Xanthosia tridentata</i>	2	32	1	6	positive

Climbers

<i>Cassytha pubescens</i>	2	54	2	17	positive
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Other tree species occurring less frequently in this community:

Species	C/A	Freq	C/AO	FreqO	FC
Tree stratum					
<i>Angophora bakeri</i>	3	7	2	13	uninform.
<i>Angophora costata</i>	2	24	2	19	uninform.
<i>Corymbia eximia</i>	2	2	2	3	uninform.
<i>Eucalyptus agglomerata</i>	1	2	2	2	uninform.
<i>Eucalyptus consideniana</i>	3	10	—	0	uninform.
<i>Eucalyptus globoidea</i>	3	10	2	8	uninform.
<i>Eucalyptus</i> <i>parramattensis</i> subsp. <i>parramattensis</i>	3	2	1	4	uninform.
<i>Eucalyptus pilularis</i>	1	7	4	13	uninform.
<i>Eucalyptus punctata</i>	2	22	3	24	uninform.
<i>Eucalyptus sieberi</i>	3	12	—	0	uninform.
<i>Eucalyptus sparsifolia</i>	2	10	3	4	uninform.
<i>Eucalyptus squamosa</i>	2	2	2	1	uninform.
<i>Syncarpia glomulifera</i>	2	2	3	21	uninform.

Map Unit 32:**Upper Georges River Sandstone Woodland**

Sample Sites: (59)

Area (ha) 1750 / 1997 ($\pm$ range): Not calculatedProportion Extant ($\pm$ range): Not calculated

No. Taxa (total / unique): 338 / 5

No. Taxa per Plot ($\pm$ sd): 51.9 ($\pm$ 8.5)

Upper Georges River Sandstone Woodland is dominated by *Eucalyptus punctata* and *Corymbia gummifera*, with *E. oblonga* occurring frequently at lower abundance. *Allocasuarina littoralis* is frequently present, particular on the upper slopes of gullies where it forms a small tree layer. Diverse shrub and ground strata are always present. Typical shrub species include *Acacia ulicifolia*, *A. terminalis*, *A. linifolia*, *Persoonia linearis*, *Leptospermum trinervium* and *Exocarpos strictus*. The ground stratum is often dominated by grass species such as *Entolasia stricta*, *Themeda australis*, *Stipa pubescens*, *Aristida vagans* and *Danthonia linkii*. Other species frequently recorded in the ground stratum include *Dianella revoluta*, *Pomax umbellata*, *Lepidosperma laterale*, *Cyathochaeta diandra*, *Lomandra multiflora* and *Lomandra cylindrica*.

Field sampling of this community was restricted to two main areas; along the south-eastern boundary of the Cumberland Plain between Appin and Holsworthly and to the north-west between Springwood and Bowen Mountain. Map Unit 32 is most commonly found on soils of the Mittagong Formation and further sampling is warranted to verify its presence in other parts of the study area where this soil landscape occurs. South of Campbelltown, the community is restricted to within 1 km of the shale/sandstone boundary, but this zone extends to approximately 4.5 km further north. This community is typically found on upper slopes and ridges, with *E. pilularis* becoming dominant descending into the gullies. Field survey sites always contained sandy soils and sandstone outcropping was often evident. Nevertheless, a strong shale influence in the soil was implied at most sites by landscape position and proximity to the shale/sandstone boundary. Map Unit 32 grades into Map Unit 31 with increasing distance from the shale/sandstone boundary. Descending into gullies, the community grades into Map Unit 33, a transition that may be abrupt in steep sided gullies and is often associated with a break in slope.

Previous floristic classifications:

Upper Georges River Sandstone Woodland is likely to be floristically similar to Sandstone/Shale Transition community described by Benson and Howell (1994) in the Bargo area.

Habitat:

Parent Geology: Mittagong Formation (65%), Wianamatta Shale (17%), Hawkesbury Sandstone (17%), Tertiary alluvium (1%)

	Mean ($\pm$ sd)	Range
Elevation (m)	129.8 (61.8)	23–275
Slope ($^{\circ}$ above horizontal)	4.7 (4.8)	0–20.5
Annual Rainfall (mm)	932.0 (43.4)	855–1069
Ruggedness (900m)	15.5 (7.0)	3–32
Maximum Temperature, Jan. ($^{\circ}$ C)	26.8 (3.8)	25.7–27.4
Solar Radiation, January	215.1 (3.2)	200–218
Distance to Shale (m)	694.6 (774.0)	0–4536.6

Structure:

Growth form	Frequency (%)	Mean height (m) ($\pm$ sd)	Mean foliage cover (%) ($\pm$ sd)
Tree	100	16.3 (3.9)	21.4 (10.4)
Small tree	43	8.1 (2.3)	10.2 (6.0)
Shrub	98	2.6 (0.9)	16.3 (14.6)
Forb	100	0.6 (0.6)	26.6 (17.7)

Diagnostic Species: Positive diagnostic species are shaded. A 0.04 ha plot located in this Map Unit is expected to contain at least 27 positive diagnostic species (95% confidence interval) provided the total number of native species in the plot is 42 or greater. A 95% confidence interval means that five percent of plots sampled (1 in 20 plots) in this Map Unit may contain fewer than 27 positive diagnostic species.

C/A: Cover/abundance within Map Unit (50 percentile)

Freq: Frequency (%) within Map Unit

C/A O: Cover/abundance in other Map Units (50 percentile)

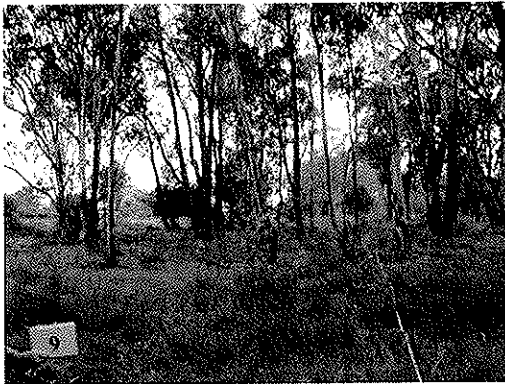
FreqO: Frequency (%) within other Map Units

FC: Fidelity class

Species	C/A	Freq	C/AO	FreqO	FC
Tree stratum					
<i>Allocasuarina littoralis</i>	2	66	2	21	positive
<i>Angophora bakeri</i>	2	34	2	11	positive
<i>Angophora costata</i>	2	39	2	17	positive
<i>Corymbia gummifera</i>	3	81	2	24	positive
<i>Eucalyptus oblonga</i>	2	44	3	6	positive
<i>Eucalyptus pilularis</i>	4	27	4	12	positive
<i>Eucalyptus punctata</i>	4	78	2	20	positive
Shrub stratum					
<i>Acacia linifolia</i>	2	63	2	16	positive
<i>Acacia longifolia</i>	2	20	1	8	positive
<i>Acacia myrtifolia</i>	1	25	1	5	positive
<i>Acacia suaveolens</i>	1	24	2	9	positive
<i>Acacia terminalis</i>	2	63	2	14	positive
<i>Acacia ulicifolia</i>	2	76	1	19	positive
<i>Astroloma pinifolium</i>	1	12	1	1	positive
<i>Banksia spinulosa</i> var. <i>spinulosa</i>	2	75	2	20	positive
<i>Bossiaea obcordata</i>	2	25	2	11	positive
<i>Brachyloma daphnoides</i>	2	20	1	3	positive
<i>Dillwynia retorta</i>	2	53	2	11	positive
<i>Eriostemon australasius</i>	2	41	2	8	positive
<i>Exocarpos strictus</i>	2	49	1	8	positive
<i>Gompholobium minus</i>	2	32	2	2	positive
<i>Grevillea diffusa</i> subsp. <i>diffusa</i>	2	15	2	2	positive
<i>Grevillea mucronulata</i>	2	34	2	15	positive
<i>Grevillea sphacelata</i>	1	19	2	4	positive
<i>Hakea dactyloides</i>	1	46	2	15	positive
<i>Hakea sericea</i>	2	54	2	20	positive
<i>Hibbertia serpyllifolia</i>	1	17	2	3	positive

Appendix 4.
Photographic record

Photographic Record



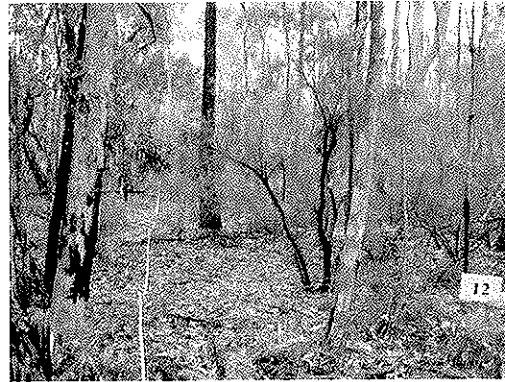
Quadrat 9



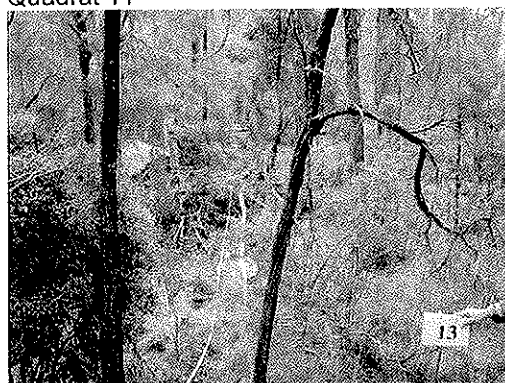
Quadrat 10



Quadrat 11



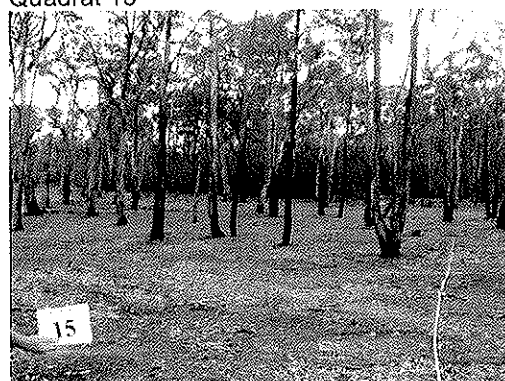
Quadrat 12



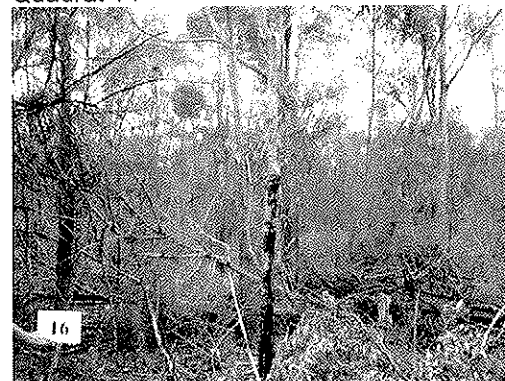
Quadrat 13



Quadrat 14

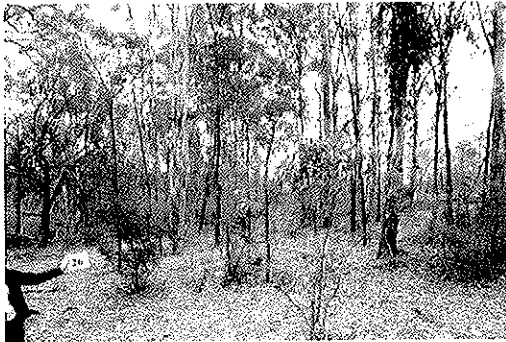


Quadrat 15



Quadrat 16

Photographic Record



Quadrat 26



Australian Government

Department of the Environment and Heritage

Threatened Species and Threatened Ecological Communities

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Shale/Sandstone Transition Forest

Recommendation to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on a public nomination for an ecological community listing on the *Environment Protection and Biodiversity Conservation Act 1999* (the Act)

- [1. Generally accepted name](#)
- [2. International/National Context](#)
- [3. How judged by TSSC in relation to the EPBC Act criteria](#)
- [4. Conclusion](#)
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1. Generally accepted name

Shale/Sandstone Transition Forest

2. International/National Context

The ecological community **Shale/Sandstone Transition Forest** is restricted to transitional areas between the clay soils derived from the Wianamatta shale and the sandy soils derived from Hawkesbury sandstone within the Sydney Basin Bioregion.

3. How judged by TSSC in relation to the *Environment Protection and Biodiversity Conservation Act 1999* criteria.

The TSSC judges the nomination to be eligible for listing as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*. The justification against the criteria is as follows:

- [Criterion 1 - Decline in geographic distribution](#)
- [Criterion 2 - Small geographic distribution coupled with demonstrable threat](#)
- [Criterion 3 - Loss or decline of functionally important species](#)
- [Criterion 4 - Reduction in community integrity](#)
- [Criterion 5 - Rate of continuing detrimental change](#)
- [Criterion 6 - Quantitative analysis showing probability of extinction](#)

The determination for the ecological community **Shale / Sandstone Transition Forest** includes those areas identified by the NSW Scientific Advisory Committee (1998) and subsequent advice regarding locational information (NSW NPWS, 2000).

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Last updated: Friday, 15-Apr-2005 14:38:30 EST

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Shale/sandstone transition forest - endangered ecological community listing

NSW Scientific Committee - final determination

The Scientific Committee, established by the Threatened Species Conservation Act, has made a Final Determination to list the Shale/Sandstone Transition Forest in the Sydney Basin Bioregion as an ENDANGERED ECOLOGICAL COMMUNITY on Part 3 of Schedule 1 of the Act. The listing of endangered ecological communities is provided for by Part 2 of the Act.

The Scientific Committee has found that:

1. Shale/Sandstone Transition Forest (SSTF) is the name given to the plant community characterised by the species assemblage listed in paragraph 4, which occurs on areas transitional between the clay soils derived from Wianamatta Shale and the sandy soils derived from Hawkesbury Sandstone on the margins of the Cumberland Plain. All sites are within the Sydney Basin Bioregion. (The community is identified and discussed in UBBS (1997) under the name Western Shale/Sandstone Transition Forest. Most of the UBBS Eastern Shale/Sandstone Transition Forest is attributable to Cooks River Clay Plain Scrub Forest.)

2. SSTF occurs or has occurred in the Bankstown, Baulkham Hills, Blue Mountains, Campbelltown, Hawkesbury, Liverpool, Parramatta, Penrith, and Wollondilly Local Government Areas (LGAs).

3. The floristic composition of the community includes species otherwise characteristic of, or occurring in, either sandstone or shale habitats. The structure of the community is forest or woodland.

4. SSTF is characterised by an assemblage of species:

- *Acacia brownii*
- *Acacia decurrens*
- *Acacia falcata*
- *Acacia implexa*
- *Acacia parramattensis*
- *Acacia parvipinnula*
- *Allocasuarina littoralis*
- *Allocasuarina torulosa*
- *Angophora bakeri*
- *Angophora costata*
- *Angophora floribunda*
- *Aristida vagans*
- *Arthropodium milleflorum*
- *Astrotricha latifolia*
- *Banksia spinulosa*

- *Grevillea mucronulata*
- *Hakea dactyloides*
- *Hakea sericea*
- *Hardenbergia violacea*
- *Hibbertia aspera*
- *Hibbertia diffusa*
- *Hypericum gramineum*
- *Indigofera australis*
- *Kunzea ambigua*
- *Lasiopetalum parviflorum*
- *Lepidosperma laterale*
- *Leptospermum trinervium*
- *Leucopogon juniperinus*
- *Leucopogon lanceolatus*
- *Leucopogon microphyllus*
- *Leucopogon muticus*
- *Lomandra filiformis*
- *Lomandra longifolia*
- *Lomatia silaifolia*
- *Melaleuca thymifolia*
- *Microlaeana stipoides*
- *Microlaeana stipoides*
- *Olearia microphylla*
- *Ozothamnus diosmifolius*
- *Persoonia linearis*
- *Phyllanthus gasstroemii*
- *Phyllanthus hirtellus*
- *Pimelea linifolia*
- *Platylobium formosum*
- *Poa labillardieri*
- *Poa sieberiana*
- *Pomax umbellata*
- *Pratia purpurascens*
- *Pultenaea flexilis*
- *Pultenaea villosa*
- *Siegesbeckia orientalis*
- *Solanum prinophyllum*
- *Sporobolus creber*
- *Stackhousia muricata*
- *Stellaria flaccida*
- *Styphelia laeta*
- *Syncarpia glomulifera*
- *Themeda australis*
- *Vernonia cinerea*
- *Wahlenbergia gracilis*

Not all these species will be present in every single stand, and the total species list from all stands

- *Phyllanthus similis*
- *Platylobium formosum*
- *Polymeria calycina*
- *Prostanthera incisa*
- *Pterostylis saxicola*
- *Pultenaea scabra* var *biloba*
- *Scaevola albida*
- *Senecio hispidulus*
- *Solenogyne bellioides*
- *Sporobolus creber*
- *Stackhousia muricata*
- *Tetradlea glandulosa*
- *Thysanotus juncifolius*
- *Thysanotus tuberosus*
- *Viola betonicifolia*

9. SSTF generally occurs on soils derived from a shallow shale or clay material overlying sandstone, or where shale-derived materials has washed down over sandstone-derived substrate. Such sites are generally close to the geological boundary between the Wianamatta Shale and the Hawkesbury Sandstone.

10. SSTF occurs on plateaux and hillsides and at the margins of shale cappings over sandstone.

11. Many occurrences of SSTF are as linear stands, which may be as narrow as 20 metres. The small size and scattered distribution of the remnant stands of the community makes provision of a comprehensive map of occurrences impractical. Details of the distribution of many stands are provided in UBBS (1997).

12. Adjacent communities on shale soils are generally Cumberland Plain Woodland, while adjacent communities on sandstone soils are generally part of the Sydney Sandstone Complex (sensu Benson & Howell 1990).

13. Small areas of SSTF are presently included in only three conservation reserves, Blue Mountains National Park, Cattai National Park and Gulguer Nature Reserve.

14. A large proportion of the area where SSTF occurred in the past has been cleared for agriculture and urban development. Remnants are small and scattered. Identified threats include: clearing, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion.

15. In view of the small size of existing remnants the threat of further clearing and other threatening processes, the Scientific Committee is of the opinion that SSTF in the Sydney Basin Bioregion is likely to become extinct in nature unless the circumstances and factors threatening its survival cease to operate and that listing as an endangered ecological community is warranted.

Proposed gazettal date: 11/9/98
Exhibition period: 11/9/98 to 23/10/98

References

UBBS (1997) - Urban Bushland Biodiversity Survey, National Parks and Wildlife Service

Appendix 7.

Noxious weeds for the Wollondilly Local Government Area

This is an All of NSW declaration		
Blackberry [Rubus fruticosus aggregate species] except cultivars Black satin, Chehalem, Chester Thornless, Dirksen Thornless, Loch Ness, Murrindindi, Silvan, Smoothstem, Thornfree	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed This is an All of NSW declaration
Bridal creeper [Asparagus asparagoides]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Broomrapes [Orobanchae species] Includes all Orobanchae species except the native O. cernua variety australiana and O. minor	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Burr ragweed [Ambrosia confertiflora]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cabomba [Cabomba caroliniana]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cayenne snakeweed [Stachytarpheta cayennensis]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Chilean needle grass [Nassella neesiana]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Chinese violet [Asystasia gangetica subspecies micrantha]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Clockweed [Gaura lindheimeri]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Clockweed [Gaura parviflora]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cockle burrs [Xanthium species]		See Bathurst/Noogoora/Californian/cockle burrs
Columbus grass [Sorghum x alium]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Corn sowthistle [Sonchus arvensis]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Dodder [Cuscuta species] Includes All Cuscuta species except the native species C. australis, C. tasmanica and C. victoriana	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

Hygrophila [Hygrophila costata]	2	The plant must be eradicated from the land and the land must be kept free of the plant
Hymenachne [Hymenachne amplexicaulis]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Italian bugloss [Echium species]		See Paterson's curse, Vipers bugloss, Italian bugloss
Johnson grass [Sorghum halepense]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Karoo thorn [Acacia karroo]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Kochia [Bassia scoparia] except Bassia scoparia subspecies trichophylla	1	except B.scoparia subspecies trichophylla The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Lagarosiphon [Lagarosiphon major]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Lantana [Lantana species]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Long-leaf willow primrose [Ludwigia longifolia]	3	The plant must be fully and continuously suppressed and destroyed
Long-leaf willow primrose [Ludwigia longifolia]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Long-style feather grass [Pennisetum villosum]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Mexican feather grass [Nassella tenuissima]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mexican poppy [Argemone mexicana]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Miconia [Miconia species]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mimosa [Mimosa pigra]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Mossman River grass [Cenchrus echinatus]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

Sand oat [<i>Avena strigosa</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Senegal tea plant [<i>Gymnocoronis spilanthoides</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Serrated tussock [<i>Nassella trichotoma</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Siam weed [<i>Chromolaena odorata</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Smooth-stemmed turnip [<i>Brassica barrelieri</i> subspecies 5 <i>oxyrrhina</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Soldier thistle [<i>Picnomon acarna</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Spiny burrgrass [<i>Cenchrus incertus</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Spiny burrgrass [<i>Cenchrus longispinus</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority and the plant may not be sold, propagated or knowingly distributed
Spotted knapweed [<i>Centaurea maculosa</i>]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
St. John's wort [<i>Hypericum perforatum</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Sweet briar [<i>Rosa rubiginosa</i>]	4	The growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority
Texas blueweed [<i>Helianthus ciliaris</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Water caltrop [<i>Trapa</i> species]	1	The plant must be eradicated from the land and the land must be kept free of the plant This is an All of NSW declaration
Water hyacinth [<i>Eichhornia crassipes</i>]	3	The plant must be fully and continuously suppressed and destroyed

Appendix 8.

**Department of Land and Water Conservation guidelines for the Rivers and
Foreshores Improvement Act 1948 (R&FI Act)**

the top of their banks or shores, as shown in Figure 1, and associated deposits of material. However, Part 3A may also apply to land further than 40 metres from a water body, if an activity poses a threat to protected waters or protected land.

How is Part 3A Used to Regulate Activities?

A 3A permit is generally required for any excavation on, in or under protected land, or for removal of material (eg. soil or rock) from protected land, or to do anything that might obstruct or detrimentally affect water flow (eg. structures or fill). Each permit has **conditions** that are specific to the type of activity being undertaken to ensure there are no adverse impacts upon the riverine environment and to manage an environmentally acceptable outcome.

Activities that need Part 3A permits include:

- excavations
- sand, soil and gravel extraction
- dredging
- modification of stream channels (deepening, widening, diverting, piping, channelising or doing restoration works)
- erosion control works
- constructing retaining walls
- making stream crossings (bridges, culverts, causeways)
- doing subdivisions involving road works, drainage, stormwater collection, erosion control or other earthworks
- constructing some dams, weirs, stormwater basins and artificial wetlands
- laying cables or pipelines across streams
- building structures on freehold foreshore land (eg. seawalls, boat ramps, boat sheds, marinas, buildings, etc.)
- any works that may cause instability or may have a detrimental effect on river systems

In certain cases a permit may not be required. Exemptions apply to lawfully exercisable rights on Crown land or to mining operations and to public and local authorities. Table 1 summarises these exemptions.

Table 1. A 3A Permit is not required if a proposal is:

- more than 40m from the top of bank (refer figure 1)
- entirely on Crown Land and has a lawful approval under the Crown Lands Act
- undertaken by a council or a public authority (does not include business ventures such as state-owned corporations or commercial undertakings)
- authorised under any Act relating to mining

Regardless of who is carrying out the works, or whether a permit is required, Part 3A gives DLWC the authority to order remediation works if it considers an

- environmental impact assessment (flood flows, storage and hazard on and off site, erosion, flora and fauna, water use, groundwater, contaminants, salinity, etc.)

Structural works are to be designed by a suitably qualified person. DLWC will assess environmental suitability but will not conduct an assessment of structural adequacy.

Council will need to supply DLWC with all documentation forwarded as part of the DA, including a copy of the completed DA form. **Early discussions of proposals with DLWC, prior to lodging the DA**, is strongly recommended, to avoid problems and delays with the project later.

Recommendations for All DAs

The following recommendations are relevant for all DAs in the vicinity of rivers, estuaries, lakes and wetlands, regardless of whether a formal approval is required from DLWC or not.

- The NSW State Rivers and Estuaries Policy and the NSW Wetlands Management Policy provide general guidelines for DAs. The principles contained in these policies aim to protect, restore and enhance riparian and wetland ecosystems for the benefit of present and future generations. Consideration needs to be given to the biodiversity, water quality, the physical form and function of these systems.
- All developments should employ effective methods to prevent the entry of sediments into waterbodies. Council guidelines, together with the Department of Housing's manual, Managing Urban Stormwater: Soils and Construction 1998 (the Blue Book), can be used to address this issue.
- A riparian area of local native vegetation (comprising tree, shrub and groundcover species) should be maintained and enhanced wherever possible adjacent to rivers, estuaries and lakes. This riparian area will provide a natural filter for runoff, will stabilise stream banks and will provide habitat and corridor functions for flora and fauna. Generally, a minimum riparian area of 40 metres wide measured from the top of each bank is recommended for major watercourses and 20 metres for minor watercourses.
- In all areas (especially new urban release and rural-residential areas) careful planning of rezonings and subdivisions is essential to ensure sustainability of riparian environments. Particular care is to be taken to identify riparian areas, and to avoid development within them. Ideally, riparian areas should be given an appropriate land use zoning reflective of its purpose of maintaining catchment health.
- Identification of floodways is also necessary, to avoid unsuitable development in these areas. Streams are to be maintained in their

Appendix 9.

Paterson Britton (2007) Preliminary Riparian Corridor Investigation

3. Riparian Corridor Objectives

Riparian land is defined as land which adjoins or directly influences a body of water (*Tubman & Price 1999*). It forms the transition between terrestrial and aquatic environments.

"Riparian land provides a number of important environmental and other values which can include:

- *A diversity of habitat for terrestrial, riparian and other aquatic species;*
- *A food source for a diversity of aquatic and terrestrial fauna (such as organic material, fruiting and flowering plants);*
- *Promotion of the movement and re-colonisation of individual species and plant and animal populations;*
- *Shading and temperature regulation;*
- *Conveyance of flood flows;*
- *Settlement of high debris loads;*
- *Reduction of bank and channel erosion through root systems binding the soil;*
- *Water quality maintenance through the trapping of sediments, nutrients and other contaminants;*
- *An interface between developments and waterways;*
- *Visual amenity; and*
- *A sense of place with green belts naturally dividing localities and suburbs" (DNR Draft Wollongong Riparian Corridor Management Study - May 2003).*

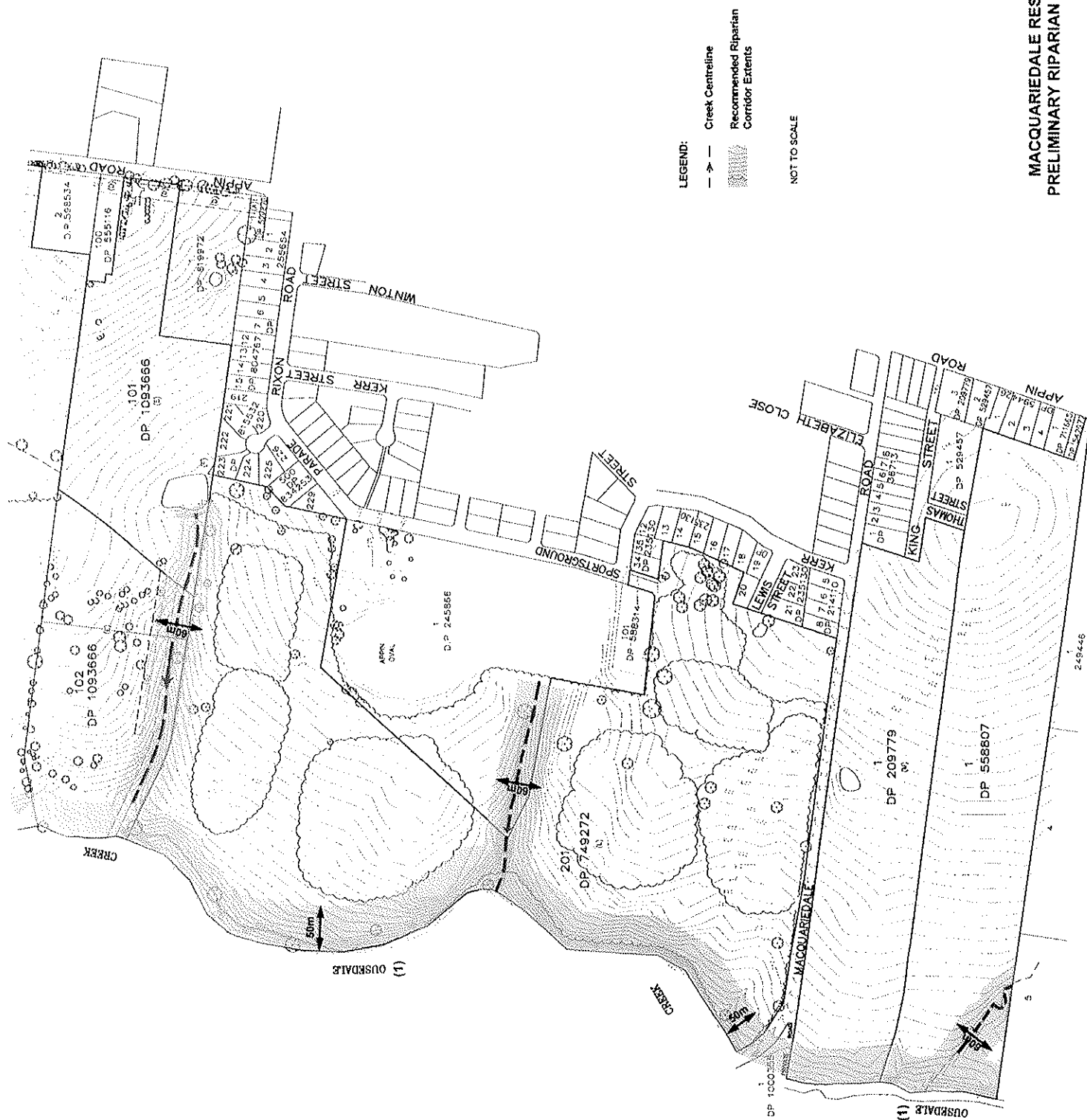
The minimum environmental objectives for riparian land are summarised by DNR in the Draft Wollongong Riparian Corridor Management Study (*May 2003*) as follows:

- Delineating the riparian zone on a map and zoning it appropriately for environmental protection;
- Providing a minimum core riparian zone width;
- Providing additional width to counter edge effects on the urban interface;
- Providing continuity for movement of terrestrial and aquatic habitat;
- Rehabilitating/re-establishing local provenance native vegetation;
- Locating services outside the core riparian zone wherever possible;
- Locating playing fields and recreational activities outside the core riparian zone; and
- Treating stormwater runoff before discharge into the riparian zone or watercourse.

In addition to environmental objectives, there are other considerations which are important to the sustainable function of a riparian corridor such as flooding and geomorphology. Objectives such as containing significant flooding within the riparian corridor and allowing sufficient room for geomorphologic processes to occur are equally valid objectives.

The detailed list of the natural resource outcomes to be pursued when considering riparian lands is detailed in Section 2.6 of the DNR Draft Wollongong Riparian Corridor Management Study (*May 2003*).

For the purposes of this study the stream category definitions as adopted by DNR in the May 2003 Wollongong Riparian Corridor Management Study have been adopted ie a Category 1 stream is an environmental corridor providing important linkages for wildlife, a Category 2 stream provides basic habitat and preserves the natural features of a watercourse and a



**Patterson Britton
& Partners Pty Ltd**

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**MACQUARIEDALE RESIDENTIAL REZONING
PRELIMINARY RIPARIAN CORRIDOR EXTENTS**

Annexure 8 – Preliminary Riparian Corridor Investigation

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lr6684mjs061102-rip corridor investigation.doc

Walker Corporation
PO Box 3456
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Wednesday, 8 November 2006

Attention: Sally Lewis

PROPOSED RESIDENTIAL DEVELOPMENT AT MACQUARIEDALE RD, APPIN – PRELIMINARY RIPARIAN CORRIDOR INVESTIGATION

1. Background

Patterson Britton & Partners (*PBP*) have been engaged by Walker Corporation (*Walker*) to assist in definition of appropriate riparian corridor extents for a proposed residential development site at Macquariedale Rd, Appin.

This preliminary report is in support of the proposed rezoning stage of the development process. Our advice should be considered in conjunction with the advice from Anne Clements and Associates (*ACA*) and Pam Hazelton (*PH*).

The site is located immediately west of the Appin township on Lot 1, DP558807, Lot 1, DP 209779 and Lot 201, DP 749272. The western boundary is Ousedale Creek and the creek has three tributaries located on the subject site (refer **Figure 1**).

The site is within the Wollondilly LGA.

2. Information Gathering

The information gathering phase of the investigation involved a detailed site inspection, collection and review of available background reports/drawings, liaison with the Department of Natural Resources (*Darrell Goldrich, Greg Brady and Jan Grose*) and coordination with *ACA* and *PH*.

A detailed site inspection was undertaken by PBP on the 29th of September, 2006 in conjunction with *ACA* and *PH*. A flora assessment report has been prepared by *ACA* and should be read in conjunction with our report.



Principals

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Category 3 stream has limited habitat value but contributes to the overall health of a catchment.

The DNR recommended minimum riparian corridor widths for each category are:-

- Category 1 – 40m from top of bank
- Category 2 – 20m from top of bank
- Category 3 – no minimum

4. Riparian and Protected Waterways

The site is bounded on the western side by Ousedale Creek and is intersected by three minor tributaries which drain in a westerly direction (refer to **Figure 1** for details).

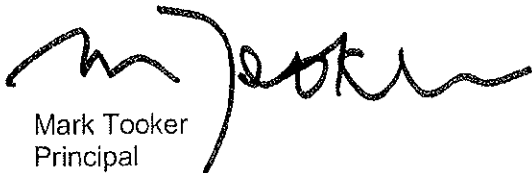
The three minor tributaries that cross the site drain small catchment areas. The tributaries are generally ephemeral and have formed extensive gullies.

Ousedale Creek is considered a Category 2 stream as are the tributaries. The recommended widths of the riparian zones are mainly governed in hydrology terms by the steep gully topograph of the streams. The recommended riparian widths from the creek centreline (to permit depiction on **Figure 1**) are 50m for Ousedale Creek and 30m for the tributaries. These distances readily accommodate the DNR zone width recommendations.

5. Preliminary Riparian Corridor Widths

The recommended preliminary riparian corridor widths are presented on **Figure 1**. The recommended widths take into account the natural topography, creek channel widths, flooding, geomorphology, category and DNR recommendations.

Yours faithfully
PATTERSON BRITTON


Mark Tooker
Principal

Review / Verification by Date

.....

Annexure 9 – Pre-rezoning Traffic Report



Traffic Report

South West Appin Rezoning 27 April 2007

Prepared for

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MASSON | WILSON | TWINEY
T R A F F I C A N D T R A N S P O R T C O N S U L T A N T S



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2. Background

The location of Appin Township is shown in Figure 1. The Walker Corporation land which is the subject of the current rezoning application is shown in Figure 2.

The subject site is located on the western side of Appin Road providing a southern extension to the existing township.

Analysis of the transport effects of development of existing urban zoned land in Appin along with possible development to be rezoned was conducted on behalf of Walker Corporation by Dobinson and Associates in conjunction with Masson Wilson Twiney in 2006¹. This found that with rezoning, the population of Appin would potentially increase to 4560 persons by 2015.

Quantitative analysis in the report found that the existing Appin road network would be able to accommodate the traffic associated with the rezoning subject to appropriate new connections being made to Appin Road, some road capacity increases through the Town Centre being achieved through kerbside parking restrictions until the proposed Bypass was in place and the intersection of Macquariedale Road with Appin Road being signalised.

Traffic volumes on Appin Road were found to increase over time with such development but would remain within its operational capacity with the improvements indicated. In due course when the Appin Bypass is constructed (expected by 2016) through traffic would largely be removed from Appin Road through the Township, permitting Appin Road to become a local collector street.

¹ Proposed Expansion of Residential Development of Appin Lots 101 and 102 DP 1093066, Lot D DP 1602904 Assessment of Traffic and Transport Implications. Report for Walker Corporation Pty Ltd by Dobinson and Associates Pty Ltd in association with Masson Wilson Twiney June 2006.

potential to provide access to the southern two sections. As indicated above, the northern section would be accessed through the already rezoned North Appin area when its road system was developed.

The relatively low side street traffic volumes indicate that the majority of vehicle movements on Appin Road are through trips between Appin Road and Church Street/Bulli Appin Road i.e. they have an origin and destination outside of Appin. Therefore the majority of Appin traffic would utilise the proposed Appin Bypass when completed.

4.2 Future Traffic Volumes

The 2006 rezoning report by Dobinson and Associates and MWT estimated that with combined rezonings plus infill development of already zoned land there is the potential for about 1100 additional dwellings by 2016. Based on this Table 2 below was prepared to compare forecast future traffic flows for cases without (Future Base 2016) and with the proposed rezonings (Future 2016)

Table 2 – Future Two-way Peak Hourly Flows

	AM			PM		
	Future Base 2016 ⁽¹⁾	Future 2016 ⁽²⁾	Change (1 to 2)	Future Base 2016 ⁽¹⁾	Future 2016 ⁽²⁾	Change (1 to 2)
Appin Rd (North of Rixon Rd)	1257	1652	395	1196	1591	395
Rixon Rd (West of Appin Rd)	123	207	84	118	202	84
Appin Road (North of Church St)	1193	1304	111	1164	1275	111
Church St (East of Appin Rd)	1107	1181	74	1033	1107	74
Willon Rd (South of Church St)	220	257	37	289	326	37
Macquariedale Rd* (West of Appin Rd)	104	432	328	99	394	295
Appin Rd (North of Proposed)	-	1740	-	-	1679	-

- Estimated

Notes: (1) Scenario 1 – Background Growth Only

(2) Scenario 2 – Scenario 1 plus traffic due to rezoned land

With the subject rezoning, Macquariedale Road would indicatively provide access for about 204 lots and King Street about 100 lots. This allows for an improved Macquariedale Road /Appin Road intersection. Additional traffic flows on these two roads at their intersection with Appin Rd would be 175 and 85 vehicles per hour respectively. Thus in total these roads would carry about 250 and 100 vehicles per hour respectively in peak periods. This estimate represents a reduction below the previous estimate for Macquariedale Road because it allows for some traffic to use King Street. This was not assumed in the 2006 study.

It is noted that there is potential for further land to be rezoned in the area to the south of the subject land. This land would most likely be served by a prolongation of Church Street to the west of Appin Road. The potential for and desirability of such occurring is the matter for future consideration when development of the land to the south of the subject site is assessed. In the previous assessment it was assumed that

Table 4 – Intersection Operations Future 2016 (with rezoning)

Intersection	Control	AM Peak		PM Peak	
		LOS	Delay (secs/veh)	LOS	Delay (secs/veh)
Appin Rd/ Rixon Rd	Roundabout	A	6.0	A	5.5
Appin Rd/ Wilton Rd	Unsignalised	B	15 (South Thru & Right) 737.8	A	13.9 (South Thru & Right) 372.5
Appin Rd/ Macquariedale Rd	Unsignalised	F	737.6 (West Left) 30.7 (West Right)	E	372.3 (West left) 23.4 (West Right)
Appin Rd/ Macquariedale Rd	Signalised ⁽¹⁾	C	30.9 (West Left) 30.9 (West Right)	B	23.7 (West Left) 23.7 (West Right)
Appin Rd/ King St	Unsignalised	A	4.4	A	4.0

(1) Scenario 1 – Background Growth Only

To cope with the increase in traffic volume resulting from future developments on the rezoned land it is expected that the Appin Rd/ Macquariedale Rd intersection will need to be signalised prior to the construction of the bypass. The need for this will need to be confirmed when a subdivision plan is prepared.

Otherwise the analysis indicates that these intersections work well during the AM and PM peaks with relatively minor delays.

4.4 Local Amenity Implications

With the proposed future development Rixon Road/Sportsground Parade and Macquariedale Road would operate as collector roads.

King Street and other new subdivision roads within the rezoned area would operate as local roads.

RTA guidelines indicate that collector and local roads operate with good residential amenity within the following limits:

Road	Environmental Goal	Environmental Limit
Local	200 veh/hr	300 veh/hr
Collector	300 veh/hr	500 veh/hr

All of the above roads would operate within their respective environmental limits. Thus satisfactory residential amenity would apply.



5. Summary and Conclusions

This report addresses transport implications of the proposed rezoning of land for residential purposes in South Appin. The land would have the potential to accommodate in the order of 342 dwellings.

This level of development on the subject site was included in assumptions for total potential development in Appin that was considered a previous transport assessment conducted in 2006. The assessment found that subject to some minor intersection improvements, the Appin road system would be able to accommodate all prospective development.

More localised traffic effects of the subject rezoning proposal have been found to be satisfactory in respect of intersection operation and of local residential amenity. However the following aspects will need to be addressed in a development application:

- Likely need for signalisation of the Macquariedale Road/Appin Road intersection;
- The form of control at the Macquariedale Road/Sportsground Parade intersection;
- Provision of cycle connections and footpaths;
- A possible bus route along Macquariedale Road/Sportsground Parade/Rixon Road collector route.

Subject to consideration of these future matters at development application stage, rezoning of the subject land for residential purposes is supported from a transport planning perspective.