Appendix 2

Cumberland Ecology Letter/Report 30 June 2011

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ADVICE REGARDING THE PRESENCE OF SHALE SANDSTONE TRANSITION FOREST IN THE EXTRACTION EXCLUSION AREA AT DIXON SAND QUARRY, PART LOTS 1 & 2, DP 547255, OLD NORTHERN ROAD, MAROOTA

Dear David,

This letter provides an analysis and discussion relating to the presence of Shale-Sandstone Transition Forest (SSTF) within the current 'extraction exclusion area' of Dixon Sand Quarry. Shale-Sandstone Transition Forest is an Endangered Ecological Community listed under the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The presence of SSTF was first claimed to have been detected in the 'extraction exclusion area' during ecological studies by Fanning *et al.* (1998), which was conducted for the Environmental Impact Statement (EIS) of the initial extraction proposal for Lots 1 and 2, DP 547255 (ERM, 2001). The occurrence of SSTF has since been refuted in a recent study by Hawkeswood (2010), which determines that the vegetation in the exclusion area is Sydney Sandstone Ridgetop Woodland (SSRW). Sydney Sandstone Ridgetop Woodland is not listed as a threatened ecological community under State and Commonwealth legislation. Therefore, the purpose of this letter is to re-examine the vegetation within the 'extraction exclusion area' and to provide an opinion as to whether the SSTF mapped within this exclusion area conforms to the legal description of the community.

To this end, Cumberland Ecology has reviewed background literature, collected field sample data and conducted an analysis of this data against the Final Determination for SSTF (NSW Scientific Committee, 1998) and the Commonwealth Listing Advice on SSTF (Threatened Species Scientific Committee, 2001). We have also reviewed the data against a number of other published descriptions within Tozer (2003), DECCW (2009) and Tozer *et al.*

(2010). Our methodology is described in further detail below.

Note that the 'extraction exclusion area' referred to above and throughout this letter is the area described in the aforementioned EIS prepared for the initial extraction proposal (ERM, 2001). The specific area to which our analysis and discussion refers is the '*sensitive vegetation area*' depicted in the plan provided to us by McKinlay Morgan and Associates and which has been reproduced in **Appendix A**. The '*sensitive vegetation area*' is the portion of the extraction exclusion area that contains the alleged occurrence of SSTF and will hereafter be referred to as the 'subject site'.

1. METHODS

In order to determine whether or not the vegetation on the subject site corresponds to the accepted definitions of SSTF, a range of evidence was acquired and examined. As the Final Determination for SSTF (NSW Scientific Committee, 1998) represents the legal definition of this community, the focus of our examination was on the extent to which the vegetation data collected on site corresponded with the definitions prescribed in the Final Determination.

Since the original gazettal of SSTF, two reports (Tozer, 2003; Tozer *et al.* 2010) have been published that provide further descriptions of SSTF and an additional method of analysis for the verification of SSTF. We have therefore completed an analysis consistent with the Tozer *et al.* (2010) method as an ancillary test for determining the presence of SSTF on the subject site.

The final stage of our analysis reviews additional literature regarding SSTF, such as underlying geology and mapped extent of the community within the Sydney Basin Bioregion, and discusses how the subject site vegetation and habitat compares with this literature.

The detailed methodology is provided below.

1.1 Literature Review

1.1.1 Previous Studies

We referred to the Fanning *et al.* (1998) and Hawkeswood (2010) studies to obtain site-specific information on the floristics of the subject site. Neither of the two studies has provided sample data to quantify how the floristics of the vegetation changes across the subject site. Nevertheless there is useful information contained within these reports to indicate that our field data about plant species present on the subject site is generally consistent with that of previous surveys.

1.1.2 Existing Mapping

We examined relevant mapping of vegetation within the locality and in the Sydney Basin Bioregion. The main vegetation mapping projects that are relevant to SSTF include the work contained in Tozer (2003), DEH (2005), DECCW (2009), Tozer *et al.* (2010) and the vegetation mapping provided by the Baulkham Hills Shire Council (The Hills Shire Council, 2010). We have referred principally to the DEH (2005) mapping for information regarding the distribution of SSTF in the Sydney Bioregion because it is the most comprehensive map available to date. For

community profile descriptions, we have relied mostly on Tozer *et al.* (2010) as it is the most current publication available.

1.1.3 Geology Data

The distribution of SSTF in the Sydney Bioregion is closely associated with the underlying geology and is highly dependent on the subtle intergrade between clay rich shale soil and coarse sandy substrates, as will be discussed in the following sections. As one of the key points made by Hawkeswood (2010) is that there is distinct lack of shale soils on the subject site such that it precludes SSTF, we have referred to geological sources (Etheridge, 1980; McRae and Ferguson, 1993) to ascertain whether the geology of the Maroota area could support occurrences of SSTF, particularly on the subject site which is a sand quarry that extracts sand from the so-called "Maroota Sands".

1.2 Field Survey

Field survey took place over three visits and was led by Dr. David Robertson and David Thomas (**Table 1**). Dr. David Robertson is a senior ecologist with over 20 years experience in botanical and faunal survey. David Thomas is highly experienced botanist with more than 20 years of experience. Both Dr. Robertson and Mr. Thomas are very familiar with the vegetation of the Sydney region and have worked extensively with SSTF in many projects.

Table 1 Survey Details

Date of survey	Personnel	Tasks Performed
March 28, 2011	Dr. David Robertson	Site Inspection
	Cecilia Phu	
April 21, 2011	Dr. David Robertson	Quadrat sampling
	Cecilia Phu	
May 6, 2011	David Thomas	Quadrat sampling
	Cecilia Phu	

1.2.1 Quadrat Sampling

The subject site was pegged out by registered surveyors so that it could easily be identified on ground during survey. A meandering transect was walked during the initial inspection of the site to identify changes in the vegetation so that stratified sampling could take place. The vegetation appeared to be relatively uniform but there were very subtle differences between the central/northern sections and the south/south-east sections of the subject site that warranted further investigation.

Five 20 x 20 metre quadrats were sampled over the subject site and included the central/northern and south/south-east sections. The locations of sampling that took place are shown in **Appendix B**. In each quadrat the following information was recorded as a minimum:

- All vascular flora species present within the plot or directly adjacent to the plot;
- The stratum in which each species occurred;
- The relative frequency of occurrence of each plant species;
- Vegetation structural data (i.e. height and percentage cover of each stratum);
- A waypoint to mark the location of the quadrat, using a handheld GPS; and
- Photographs of the quadrat.

Cover-abundance scores used are as indicated in **Table 2** below and are generally consistent with methods used by the NSW National Parks and Wildlife Service.

Table 2 Cover-Abundance Scores used in Quadrat Sampling

Score	Abundance
1	Rare, few individuals present, and cover < 5%
2	Occasional, and cover < 5%
3	Common but cover < 5%
4	Very common but cover < 5%
5	5-25%
6	26-50%
7	51-75%
8	76-100%

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (1990-1993). Other references used to assist identification of more cryptic specimens include Richardson *et al.* (2006) and Brooker and Kleinig (1990). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from The Botanic Gardens Trust (1999-2011). Any specimens that were not readily identifiable were lodged with the National Herbarium of NSW at the Royal Botanic Gardens, Sydney.

1.3 Data Analysis

1.3.1 Final Determination

Plant species from the five quadrats were used to compile a data matrix showing a composite species list and the occurrences of each plant species in the list in each quadrat (**Table 4**,

Appendix C). The data matrix was compared to lists of species from the Final Determination for SSTF.

Aside from characteristic species, the other defining criteria in the Final Determination were also examined systematically to determine whether they applied to the vegetation and environment on the subject site.

1.3.2 Tozer et al. (2010)

The data matrix was compared to the diagnostic floristics of candidate map units from the vegetation mapping of Tozer *et al.* (2010).

The first community for consideration was the equivalent Tozer *et al.* (2010) map unit to SSTF. Although the study indicates that the corresponding map unit to SSTF is *Cumberland Shale Sandstone Transition Forest* (Table 6, Tozer *et al.*, 2010), there is no description within the article that describes this community (see Appendix 3 of Tozer *et al.*, 2010). In this instance, we have referred to *Shale Sandstone Transition Forest (High Sandstone Influence)* from Tozer (2003) instead.

We then also compared the data matrix against *Sydney Hinterland Transition Woodland* and *Coastal Sandstone Ridgetop Woodland*, which are both contained within Tozer *et al.* (2010) and were considered to be the best alternative candidates for the vegetation on site.

The method used follows that prescribed in Tozer *et al.* (2010) and is reproduced below:

1. *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 given in the diagnostic species table caption. The test cannot be applied unless the test plot contains the minimum number of species specified for the map unit under consideration.*

2. *Considering each of the candidate map unit types in turn, consult the list of positive diagnostic species and count the number that were found in the test plot. The minimum expected number of positive diagnostic species has been specified for each map unit and is located in the diagnostic species table caption.*

3. *If the test plot contains the minimum number of positive diagnostic species ('pass' result) then it is a plausible match for that map unit.*

4. *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.*

5. *A 'fail' result (the test plot contains fewer diagnostic 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.*

Note that the methodology prescribed in Tozer *et al.* (2010) is the same methodology as presented in Tozer (2003).

1.3.3 Analysis of Other Evidence

Information about geology, topography, geographic location, floristics (plant species composition) and structure (height, number of vegetation layers, density of canopy) were then used to assess whether or not the vegetation on site conformed to various descriptions in the published literature.

2. FIELD SURVEY RESULTS

The vegetation of the five quadrats and indeed across the subject site consists of low woodland and heathland vegetation dominated by sclerophyllous trees and shrubs. Grasses were sparse or largely absent. For that reason the vegetation community present is typical of many sandy or sandstone landscapes in the Sydney Basin Bioregion, which are dominated by woody plants and lack soft herbaceous plants (grasses and herbs). Photographs of each of the five quadrat sites are provided in **Appendix D**.

Although Fanning *et al.* (1998) reports the frequent occurrence of herbaceous shale species such as Kangaroo Grass (*Themeda australis*) and Glycine (*Glycine clandestina*), there is no abundance data or specific location recorded for such occurrences and these readily detectable plant species were not recorded at all by Cumberland Ecology in 2011.

Vegetation condition at the time of survey was good and the majority of plant species were readily identifiable in the field. All species collected were eventually identified in the laboratory. For this reason, the resultant data matrix is regarded as reliable and appropriate for analysis of the data.

3. GENERAL DESCRIPTION OF SSTF

Shale-Sandstone Transition Forest is an ecotonal community that exists on shale clays containing a variable influence of sandstone-derived soils (NSW Scientific Committee, 1998). It is essentially a mixture of species that occur in Cumberland Plain Woodland and various sandstone communities.

The community often displays a mixed floristic characterised by a species-rich understorey of grasses and forbs, whilst maintaining a diverse shrub stratum containing typical sandstone species like proteoids and epacrids. The expression of SSTF varies considerably depending on the degree of sandstone influence in the soil, resulting in the categorisation of two main forms: High Sandstone Influence SSTF and Low Sandstone Influence SSTF (Tozer, 2003). Nevertheless, the community has been described as being essentially a shale community (Tozer, 2003).

The soils of the subject site are not of obvious shale origin or influence, and the vegetation lacks species typical of such environs.

4. GENERAL DISTRIBUTION AND GEOLOGY

An endemic community to the Sydney Basin Bioregion, the distribution of SSTF is associated with the shale/sandstone soil transitions occurring at the interface between Wianamatta Shale and Hawkesbury Sandstone parent geology and has thus been mapped at the margins of the Cumberland Plain where this transition occurs (Tozer, 2003; DEH, 2005). Neither of the Tozer (2003) or DEH (2005) vegetation mappings extend far north enough to cover the Maroota area but these do show that the most extensive occurrences of SSTF are likely to be at the southwest/southeast and north/north-west margins of the Cumberland Plain in Western Sydney at locations such as Picton, Oakdale and Campbelltown; and Kellyville, Rouse Hill and Richmond respectively (most likely whether the intergrade between shale and sandstone soils is strongest). The Maroota area, to which Dixon Sand Quarry belongs, is situated immediately north of the mapped extent of SSTF (DEH, 2005; see **Appendix E**).

Notwithstanding the above, Baulkham Hills Shire Council has mapped the occurrence of SSTF at a number of locations within the Maroota area (The Hills Shire Council, 2010). This mapping is likely to be based on the work of Lembit (2001, 2002), which covers the Hornsby Shire Local Government Area, Marramarra National Park and Muogamarra Nature Reserve. The mapped areas of SSTF in Baulkham Hills Shire appear to be a minor extension of the main distribution mapped by Tozer (2003) and DEH (2005). The Council mapping indicates that the extant vegetation on Lots 1 and 2, DP 547255 is largely High Sandstone Influence SSTF (The Hills Shire Council, 2010; refer to Map 14).

Hawkeswood (2010) argues that there is distinct lack of shale soils on the subject site and thus SSTF cannot occur there. However, as the community can still occur where there are traces of shale influence, more information was required about the geology of the Maroota area to ascertain whether there is a shale characteristic in the wider locality. Examination of the stratigraphy of the Maroota geology indicates that the Maroota Sand of the district overlies Ashfield Shales (of the Wianamatta Group) on a Hawkesbury Sandstone basement (Etheridge, 1980), demonstrating that the locality does occur over the appropriate geology described for the community. In addition to this, the lithology of the Maroota geology shows that the Maroota Sand contains clayey sand and clay lenses and that the underlying Hawkesbury Sandstone also contains shale lenses (Etheridge, 1980), providing the potential for a shale influence in the locality and for the possible occurrence of SSTF on the subject site. However, more telling is that most of the prospecting for clay and shale in the area was concentrated in the northern sectors of Maroota beyond Dixon Sand Quarry (MacRae and Ferguson, 1992), suggesting that perhaps the most abundant clay sources lie further north beyond the subject site.

It is important to note that the SSTF is generally at the interface between Cumberland Plain Woodland and sandstone vegetation. No Cumberland Plain Woodland adjoins the subject site, making it relatively unlikely that SSTF could occur.

In theory, there could be shale influence in the subject site. However, in practice, and based upon the material exposed in the quarry face, there appears to be no localised deposits of shale. The uppermost soils are sandy in nature and the array of plant species reflects this.

5. RELIABILITY OF VEGETATION MAPPING – HOW SHOULD THE PRESENCE OF SSTF BE ASSESSED?

The most comprehensive description of SSTF available is provided by the Tozer (2003) study. Despite this, Tozer (2003) explains that that the north and north-west areas of the mapped distribution of SSTF in the Sydney Basin (i.e. the areas most relevant to Dixon Sand Quarry), were under-represented during sampling. This means that the occurrences in the north western area of the distribution of SSTF were likely to have been estimated or inferred in the production of the map for that study. Thus, interpretation of Tozer's (2003) data should be made with care.

Further to this, the following claim was made in Tozer *et al.* (2010) in relation to the interpretation of threatened ecological communities:

> ***Table 6: Inferred relationships between vegetation communities described in Appendix 3 and Threatened Ecological Communities listed under NSW or Commonwealth legislation.*** *The inferred relationships are indicative only. The legal definitions of EECs are provided by the Final Determinations under the respective Acts and decisions relating to whether any particular area of vegetation constitutes a TEC should be based on field inspection and comparison with the Final Determination.*

This has been taken into consideration in the analysis below. The data collected from the vegetation of the site has been compared both to the "characteristic" SSTF species of the Final Determination and the "positive diagnostic" species for candidate SSTF-equivalent communities listed by Tozer (2003) and Tozer *et al.* (2010).

6. ANALYSIS OF DATA MATRIX AGAINST FINAL DETERMINATION

The table below compares the vegetation on the subject site against every criterion listed in the Final Determination for SSTF (NSW Scientific Committee, 1998).

This analysis consistently shows that the vegetation data collected from the subject site does not conform to SSTF. This is principally because it lacks the general species assemblage (the so called "characteristic" species) and because it generally lacks the dominant trees that comprise this community. Moreover, the soils that normally give rise to SSTF do not appear to be on the subject site.

Table 3 Comparison of the Subject Site Vegetation with the Final Determination for SSTF

Final Determination Definitions	Vegetation on the Subject Site
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	The subject site is not as described and does not occur on the margin of the Cumberland Plain. As shown in the map in **Appendix D**, it occurs well away from the margins of the Cumberland Plain and

Table 3 Comparison of the Subject Site Vegetation with the Final Determination for SSTF

Final Determination Definitions	Vegetation on the Subject Site
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.)	mapped occurrences of SSTF. It does occur in the Sydney Basin Bioregion. And it does contain geological units that could give rise to SSTF, namely Wianamatta Shale (Ashfield Shale). The subject site occurs in the Maroota locality, where, in some places, Ashfield Shales of the Wianamatta Group meets Hawkesbury Sandstone. At the subject site, Maroota Sands (which are being quarried) overly Ashfield Shales. There are occasionally shale lenses within the Maroota Sands. Hence, theoretically, the correct geology could occur on the subject site. However, the soil within the subject site appears to consist almost entirely of sand, with little if any traces of clay material that could come from shale decomposition. As described in Point 4 of this table, the vegetation on site is not typical of shale soils, but is typical of sandstone areas.
2. SSTF occurs or has occurred in the Bankstown, Baulkham Hills, Blue Mountains, Campbelltown, Hawkesbury, Liverpool, Parramatta, Penrith, and Wollondilly Local Government Areas (LGAs).	The subject site belongs to the Baulkham Hills Local Government Area.
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.	Species typical of shale environments are generally lacking and the majority of plant species are typically found upon sandstone. Woodland only occurs in the south/south-east periphery. The remainder of the site, particularly the central/north sectors lack trees and form heath vegetation.
4. SSTF is characterised by an assemblage of species as listed in [criterion 4 of the Final Determination.] *Not all these species will be present in every single stand, and the total species list from all stands of the community is considerably larger than that listed*	Although the statement in the Final Determination indicates that not all species will be present at a site, it is a reasonable assumption that a relatively high proportion will be present at a site if the SSTF is present. That is particularly so for the dominant tree and shrub species.

Table 3 Comparison of the Subject Site Vegetation with the Final Determination for SSTF

Final Determination Definitions	Vegetation on the Subject Site
above. Depending on the disturbance history of a particular site a proportion of the species may be present only in the soil seed bank.	This is not the case for the subject site. A very low proportion of characteristic species is present on the subject site (**Table 5**, **Appendix F**). The quadrat data indicates that on average, there are only 12 characteristic species per quadrat, or 11.4%. This is a very low proportion. Also, as stated in the cell below, none of the quadrats contain characteristic tree species.
5. Characteristic tree species in SSTF are; Eucalyptus punctata, Eucalyptus resinifera, one of the stringybarks (Eucalyptus globoidea, Eucalyptus eugenioides, Eucalyptus sparsifolia, Eucalyptus agglomerata). One or more ironbarks (Eucalyptus fibrosa, Eucalyptus crebra, Eucalyptus paniculata, Eucalyptus beyeriana) may be locally important.	Virtually no characteristic tree species occur in this area. Of the 10 characteristic tree species (see **Table 5**; **Appendix F**), only one has been recorded (*Eucalyptus punctata*) and this was only recorded in one of the quadrats. The tree species found on site are typical of pure sand or sandstone environs.
6. SSTF has an understorey which may be either grassy and herbaceous or of a shrubby nature. In areas that have not been burnt for an extended period of time the understorey may be dense.	The understorey of much of the vegetation is shrubby and dense and is dominated by proteoid and epacrid species that are typical of sandstone or sandy environs. Little of the understorey is grassy or herbaceous. There are localised patches of exposed sandstone platforms at the centre of the site that has no tree canopy cover and low-lying shrubs.
7. Species composition varies between sites depending on geographical location and local conditions (e.g., topography, relative influence of sandstone or shale).	Not applicable to this assessment, which only deals with one site.
8. SSTF provides habitat for a number of plant species recognised as being of national, state or regional conservation significance in UBBS (1997). These include the species listed in [criterion 8 of the Final Determination.]	Of the 46 species listed, the site supports two species and potentially a third that are recognised as being of national, state or regional conservation significance (UBBS, 1997). These species are: *Eucalyptus squamosa*, *Tetratheca glandulosa* and potentially *Darwinia biflora*.
9. SSTF generally occurs on soils derived from a shallow shale or clay material overlying sandstone,	There is no evidence that there is a colluvial influence of shale or clay material on the subject site.

Table 3 Comparison of the Subject Site Vegetation with the Final Determination for SSTF

Final Determination Definitions	Vegetation on the Subject Site
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.	There is no evidence that the soil profile of the subject site comprises thin shale material overlying sandstone bedrock. Rather, the uppermost soil layers are sandy in nature.
10. SSTF occurs on plateaux and hillsides and at the margins of shale cappings over sandstone.	Quarrying has obscured the landform on which the subject site occurs but examination of the site in its wider topological context suggests that it occurs on a wide gentle ridgeline. Based upon the geological maps of the locality and the exposed geology and soils within the quarry itself, the subject site does not appear to be located at the margins of a shale capping.
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).	The subject site is indeed a small stand of vegetation and is only 24.5 m wide at its narrowest width (**Appendix A**).
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).	No Cumberland Plain Woodland is located nearby. Nearby communities mapped by Baulkham Hills Shire appear to belong to the Sydney Sandstone Complex (i.e. Sydney Sandstone Heath, Sydney Sandstone Gully Forest, Sandstone Ridgetop Woodland), consistent with the largely sandstone geology of the wider area.
13. Small areas of SSTF are presently included in only three conservation reserves, Blue Mountains National Park, Cattai National Park and Gulguer Nature Reserve.	The subject site is not part of the reserve system though it has currently been preserved specifically to protect an alleged occurrence of SSTF.
14. A large proportion of the area where SSTF occurred in the past has been cleared for agriculture	The subject site is currently preserved to protect an alleged occurrence of SSTF.

Table 3 Comparison of the Subject Site Vegetation with the Final Determination for SSTF

Final Determination Definitions	Vegetation on the Subject Site
and urban development. Remnants are small and scattered. Identified threats include: clearing, physical damage from recreational activities, rubbish dumping, grazing, mowing and weed invasion.	

7. ANALYSIS OF DATA MATRIX AGAINST TOZER *ET AL.* (2010)

The tables presented in **Appendix F** assess the diagnostics of the vegetation on the subject site using the methodology prescribed in Tozer *et al* (2010). They show that:

- Only three of the five quadrats passed the first step of the test described in Section 1.3.2 for the candidate map units considered;
- The eligible quadrats were assessed and showed that the vegetation fails the Tozer *et al.* (2010) test for Shale Sandstone Transition Forest (High sandstone influence)(**Table 6**; **Appendix F**);
- The Tozer *et al.* (2010) test also fails for Sydney Hinterland Transition Woodland except for Quadrat 1, which passes with 37 diagnostic species present (**Table 7**; **Appendix F)**; and
- The vegetation passes the test for Coastal Sandstone Ridgetop Woodland for all eligible quadrats. Quadrat 1 passes with 39 diagnostic species present.

Since there are more diagnostic species present in Quadrat 1 from Coastal Sandstone Ridgetop Woodland (compared with Sydney Hinterland Transition Woodland), we have taken this as an indication that the vegetation in Quadrat 1 is more closely matched to Coastal Sandstone Ridgetop Woodland (as per Steps 4 and 5 of the Tozer method)(**Table 8**; **Appendix F**).

A study of the characteristic vegetation structure for all three communities, whilst not required by the test, nevertheless shows that the structure of the vegetation on site (**Table 9**; **Appendix F**) is more closely aligned with that described for Coastal Sandstone Ridgetop Woodland than the other two communities.

Therefore, we conclude that the vegetation on the subject site fits best to the description of Coastal Sandstone Ridgetop Woodland and thus classify it as such.

8. CONCLUSION

The vegetation on the subject site is not SSTF as listed under the Final Determination of the TSC Act.

The vegetation on site lacks the typical geology and soils to support SSTF and the species present on site are typical of sandstone vegetation rather than SSTF. In particular, the typical tree species that dominate this community are essentially absent from the subject site.

In summary the vegetation on the subject site:

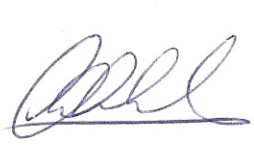
- Does not conform to the Final Determination for SSTF;
- Does not conform to or pass the test prescribed in Tozer *et al.* (2010) for SSTF;
- Does not occur on geology suitable for the development of SSTF; and
- Conforms best to non-listed sandstone dominated vegetation.

We believe that the vegetation is Coastal Sandstone Ridgetop Woodland as described in Tozer *et al.* (2010).

We believe that the analysis is unambiguous and that the zone to protect the subject site on the basis that it is SSTF is flawed and unwarranted. Furthermore we note that the vegetation in the subject site is now relatively isolated from other occurrences of native vegetation by surrounding quarrying. The long term viability of such vegetation will be difficult to maintain and the maintenance of such vegetation will not provide a substantial positive conservation outcome.

If you would like to discuss this matter further, please contact either myself or Dr David Robertson on 9868 1933.

Yours sincerely,



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Appendix A

Plan Showing Exclusion Area and Sensitive Vegetation Area

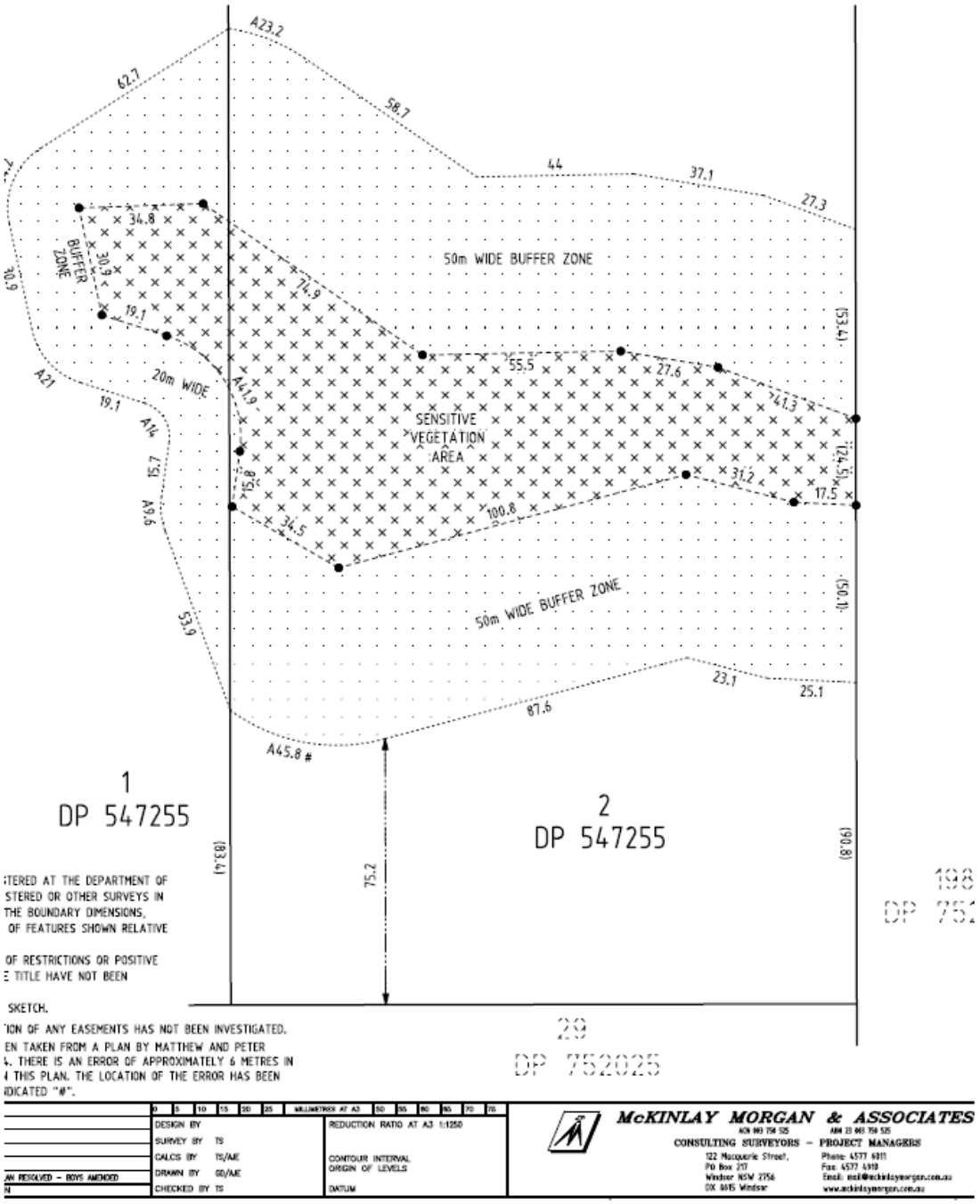


Figure 1 **Plan provided by McKinlay Morgan and Associates showing the location and configuration of the sensitive vegetation area. The sensitive vegetation area contains an occurrence of Shale-Sandstone Transition Forest as mapped by Fanning *et al.* (1998).**

Appendix B

Location of Surveys

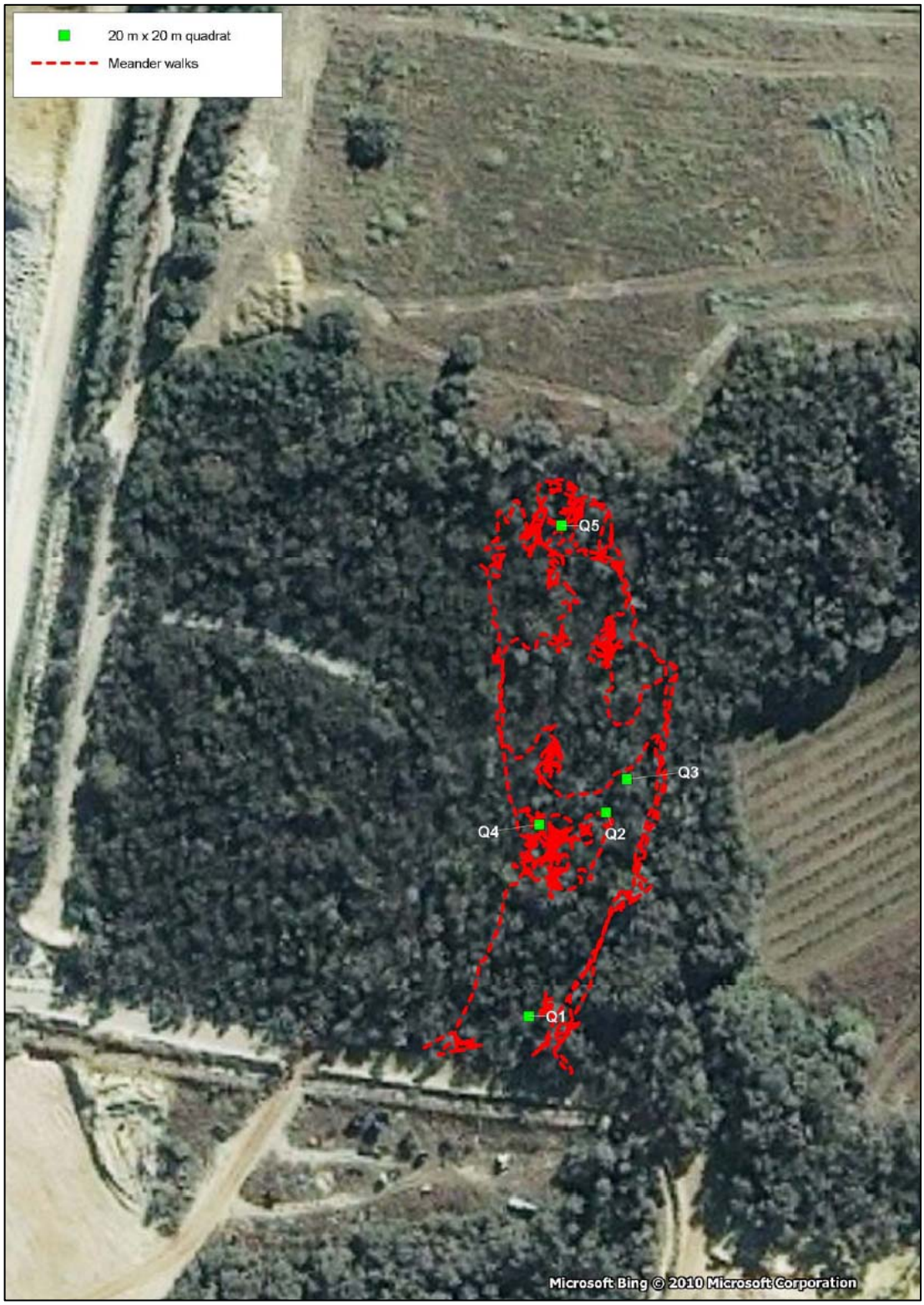


Figure 2 Location of Survey (Quadrat Sampling, Meander Walks)

Appendix C

Quadrat Data

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
Canopy Tree								
Myrtaceae	*Angophora hispida*	Dwarf Apple		2	2			
	Corymbia eximia	Yellow Bloodwood			2	5		
	Eucalyptus haemastoma	Scribbly Gum			2	2	1	5
	Eucalyptus piperita	Sydney Peppermint		2	2			
	Eucalyptus punctata	Grey Gum		5				
	Eucalyptus squamosa	Scaly Bark						3
Proteaceae	*Banksia serrata*	Old-man Banksia		5	3			
Small Tree								
Casuarinaceae	*Allocasuarina littoralis*	Black She-oak		2	3	5	2	
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple		4	3	2	1	
	Corymbia gummifera	Red Bloodwood					1	
Shrubs and Woody Dicots								
Apiaceae	*Platysace linearifolia*	-		2	2	3	2	2
Cunoniaceae	*Ceratopetalum gummiferum*	Christmas Bush		1				
Dilleniaceae	*Hibbertia bracteata / nitida*	-			2	1	1	
	Hibbertia empetrifolia	-					2	2
	Hibbertia riparia	Erect Guinea-flower						1
	Hibbertia sp.			2				

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
Ericaceae - Styphelioideae	*Brachyloma daphnoides*	Daphne Heath		3				
	Epacris pulchella	Wallum Heath		2	2	3	3	2
	Leucopogon microphyllus	-		1	2	4	3	
	Leucopogon muticus	Blunt Beard-heath		1	2			1
	Monotoca scoparia	-					2	
Fabaceae - Faboideae	*Bossiaea heterophylla*	Variable Bossiaea					2	
	Bossiaea obcordata	Spiny Bossiaea			1	2	1	
	Bossiaea scolopendria	-						1
	Daviesia mimosoides	-					1	2
	Dillwynia floribunda	-		2			3	2
	Dillwynia retorta	-		2	4	3	3	
	Gompholobium glabratum	Dainty Wedge Pea						1
	Gompholobium grandiflorum	Large Wedge Pea		2	2	3	3	
	Hovea linearis	-		1			1	
	Jacksonia scoparia			1				
	Mirbelia rubiifolia	Heathy Mirbelia					3	3
	Phyllota phylicoides	Heath Phyllota						1
	Pultenaea blakelyi	-		2				
Fabaceae - Mimosoideae	*Acacia linifolia*	White Wattle		2		2		

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
	Acacia suaveolens	Sweet Wattle		2	1	2	2	2
	Acacia ulicifolia	Prickly Moses		1		1	1	
Myrtaceae	*Angophora bakeri*	Narrow-leaved Apple					1	
	Angophora hispida	Dwarf Apple					5	3
	Darwinia ?biflora / fascicularis (no flowers)	-	V (TSC)					2
	Eucalyptus squamosa	Scaly Bark						1
	Leptospermum trinervium	Flaky-barked Tea-tree		3	4	5	5	5
	Micromyrtus ciliata	Fringed Heath-myrtle					1	1
Phormiaceae	*Dianella caerulea* var. *producta*	-		1				
	Dianella prunina	-		1				
	Dianella revoluta	-		1				
Phyllanthaceae	*Phyllanthus hirtellus*	Thyme Spurge		1			2	
Proteaceae	*Banksia ericifolia*	Heath-leaved Banksia		2	3		2	3
	Banksia oblongifolia	Fern-leaved Banksia						1
	Banksia serrata	Old-man Banksia					2	
	Banksia spinulosa	Hairpin Banksia		2			2	
	Grevillea buxifolia	Grey Spider Flower		2			4	3
	Grevillea sericea	Pink Spider Flower		1	3	3	1	2
	Hakea laevipes	-						1

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
	Hakea sericea	Needlebush			2	2	2	1
	Isopogon anemonifolius	Broad-leaf Drumsticks			2		2	2
	Lambertia formosa	Mountain Devil				1		2
	Lomatia silaifolia	Crinkle Bush		1			1	
	Persoonia lanceolata						2	
	Persoonia levis	Broad-leaved Geebung		1	1	2		1
	Petrophile pulchella	Conesticks		2	2	5	2	2
Rutaceae	*Boronia pinnata*	-				1	2	2
Santalaceae	*Leptomeria acida*	Native Currant		1				
Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower		1	2		1	1
Xanthorrhoeaceae	*Xanthorrhoea media*	Grass Tree		1			1	1
Groundcover Dicots								
Asteraceae	*Actinotus minor*	Lesser Flannel Flower		1	2	3	3	2
Fabaceae - Faboideae	*Aotus ericoides*	-		1	2			
Goodeniaceae	*Dampiera stricta*	-					1	2
	Goodenia sp.	-						2
Lobeliaceae	*Lobelia* sp.	-		1				
Groundcover Monocots								
Anthericaceae	*Laxmannia gracilis*	Slender Wire Lily		1				

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
Cyperaceae	*Caustis flexuosa*	Curly Wig		2			2	2
	Cyathochaeta diandra	-					4	5
	Lepidosperma laterale	-		1			1	
	Schoenus ericetorum	Heath Bog-rush		2	3	4	1	
	Schoenus imberbus	Beardless Bog-rush					1	
Lomandraceae	*Lomandra filiformis* var. *filiformis*	Wattle Mat-rush						1
	Lomandra glauca	Pale Mat-rush		1			1	
	Lomandra longifolia	Spiny-headed Mat-rush		1	1		1	
	Lomandra multiflora	Many-flowered Mat-rush				1	1	
	Lomandra obliqua	Fish Bones Mat-rush		2			1	2
Orchidaceae	*Acianthus ?fornicatus*	Pixie Caps		2				
	Cryptostylissp.	a Tongue Orchid		2				2
	Pterostylis sp.	a Greenhood		1				
Restionaceae	*Lepyrodia scariosa*	-				3	4	3
Grasses								
Poaceae	*Anisopogon avenaceus*	Oat Speargrass		1		2		
	Austrostipa pubescens	a Spear Grass					3	2
	Entolasia stricta	Wiry Panic		2	2	2	1	2
	Eragrostis brownii	Brown's Lovegrass					1	

Table 4 Quadrat Dataset (Cover-Abundance Scores)

Family	Scientific Name	Common Name	Status	Q1	Q2	Q3	Q4	Q5
Vine, Creepers and Twiners								
Convolvulaceae	*Cuscuta* sp.	a Dodder		1		1		
Fabaceae - Faboideae	*Hardenbergia violacea*	False Sarsparilla		1				
Lauraceae	*Cassytha glabella*	-		2	2	2		2
	Cassytha pubescens	-					2	
Pittosporaceae	*Billardiera scandens*	Hairy Apple Berry		1	1		1	
Ferns and Fern Allies								
Dennstaedtiaceae	*Pteridium esculentum*	Bracken Fern		2				
Lindsaeaceae	*Lindsaea linearis*	Screw Fern		2		3	1	3
Schizaeaceae	*Schizaea bifida*	Forked Comb Fern		1				

Appendix D

Site Photographs

Photograph 1 Quadrat 1

Photograph 2 Quadrat 2

Photograph 3 Quadrat 3

Photograph 4 Quadrat 4

Photograph 5 **Quadrat 5**

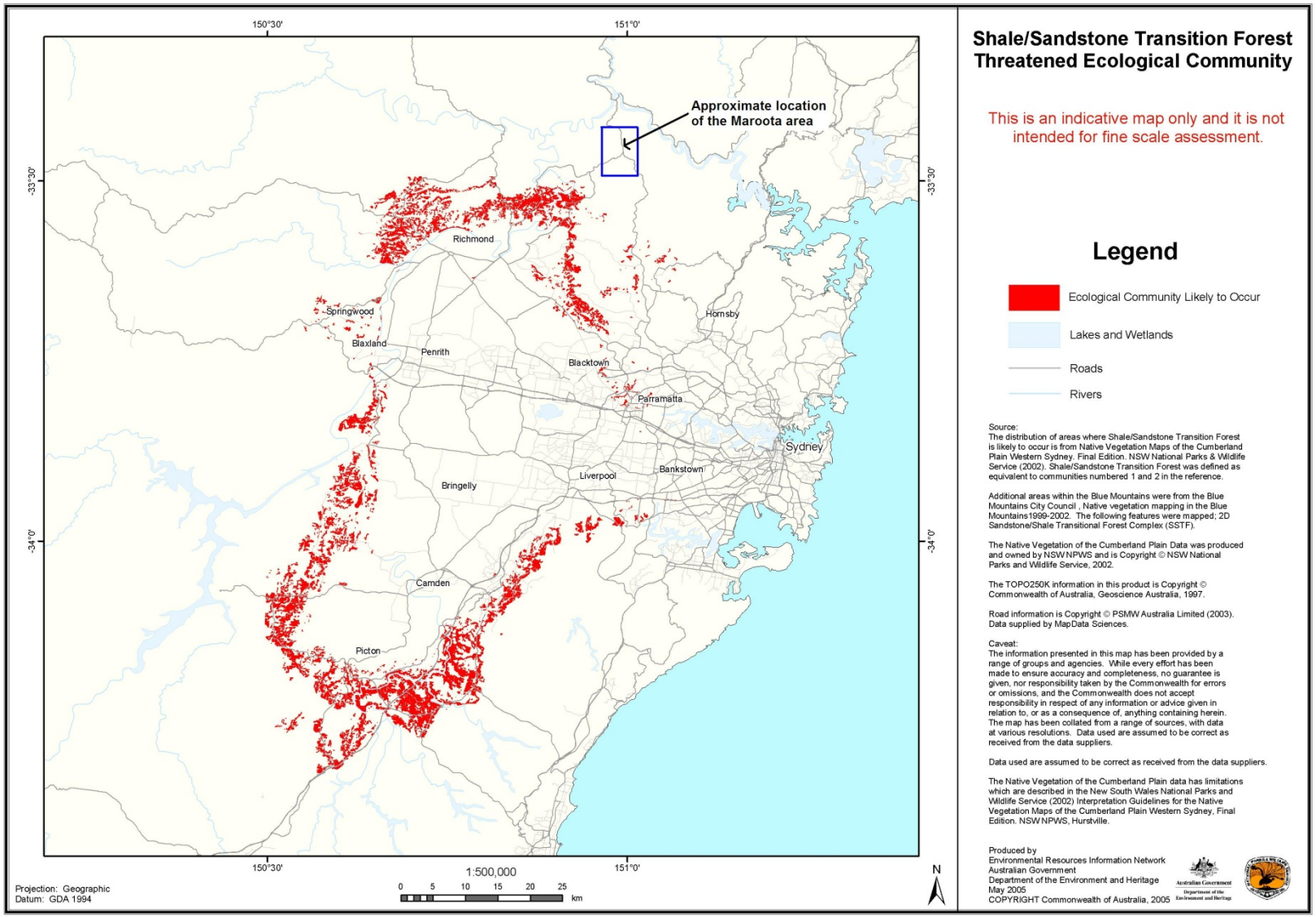
Photograph 6 **Rock outcrops, such as this example near Quadrat 4, were observed across the subject site.**

Photograph 7 **Sandy soils such as this was observed across the entire subject site.**

Photograph 8 **Exposed rock platforms lacking canopy cover and dominated by heathy shrubs (central section of subject site near Quadrat 5)**

Appendix E

DEH (2005) Map of the Extent of SSTF in the Sydney Basin Bioregion



Shale/Sandstone Transition Forest Threatened Ecological Community

This is an indicative map only and it is not intended for fine scale assessment.

Legend

- Ecological Community Likely to Occur
- Lakes and Wetlands
- Roads
- Rivers

Source:
The distribution of areas where Shale/Sandstone Transition Forest is likely to occur is from Native Vegetation Maps of the Cumberland Plain Western Sydney, Final Edition, NSW National Parks & Wildlife Service (2002). Shale/Sandstone Transition Forest was defined as equivalent to communities numbered 1 and 2 in the reference.

Additional areas within the Blue Mountains were from the Blue Mountains City Council , Native vegetation mapping in the Blue Mountains1999-2002. The following features were mapped; 2D Sandstone/Shale Transitional Forest Complex (SSTF).

The Native Vegetation of the Cumberland Plain Data was produced and owned by NSW NPWS and is Copyright © NSW National Parks and Wildlife Service, 2002.

The TOPO250K information in this product is Copyright © Commonwealth of Australia, Geoscience Australia, 1997.

Road information is Copyright © PSMW Australia Limited (2003). Data supplied by MapData Sciences.

Caveat:
The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein. The map has been collated from a range of sources, with data at various resolutions. Data used are assumed to be correct as received from the data suppliers.

Data used are assumed to be correct as received from the data suppliers.

The Native Vegetation of the Cumberland Plain data has limitations which are described in the New South Wales National Parks and Wildlife Service (2002) Interpretation Guidelines for the Native Vegetation Maps of the Cumberland Plain Western Sydney, Final Edition. NSW NPWS, Hurstville.

Produced by
Environmental Resources Information Network
Australian Government
Department of the Environment and Heritage
May 2005

Appendix F

Vegetation Tests

Table 5 Comparision of Quadrat Data with Characteristic Species Listed in the Final Determination for SSTF (presence-absence scores)

Characteristic Species Listed within the Final Determination for SSTF	Q1	Q2	Q3	Q4	Q5	†Frequency (%)
Acacia brownii	0	0	0	0	0	0
Acacia decurrens	0	0	0	0	0	0
Acacia falcata	0	0	0	0	0	0
Acacia implexa	0	0	0	0	0	0
Acacia parramattensis	0	0	0	0	0	0
Acacia parvipinnula	0	0	0	0	0	0
Allocasuarina littoralis	0	0	0	0	0	0
Allocasuarina torulosa	0	0	0	0	0	0
Angophora bakeri	1	1	1	1	0	80
Angophora costata	0	0	0	0	0	0
Angophora floribunda	0	0	0	0	0	0
Aristida vagans	0	0	0	0	0	0
Arthropodium milleflorum	0	0	0	0	0	0
Astrotricha latifolia	0	0	0	0	0	0
Banksia spinulosa	1	0	0	1	0	40
Bossiaea obcordata	0	1	1	1	0	60
Bossiaea prostrata	0	0	0	0	0	0
Bracteata bracteantha	0	0	0	0	0	0
Breynia oblongifolia	0	0	0	0	0	0
Bursaria spinosa	0	0	0	0	0	0
Calotis cuneifolia	0	0	0	0	0	0
Cheilanthes sieberi	0	0	0	0	0	0
Chenopodium carinatum	0	0	0	0	0	0
Corymbia eximia	0	1	1	0	0	40
Corymbia gummifera	0	0	0	1	0	20
Corymbia maculata	0	0	0	0	0	0
Cryptandra amara	0	0	0	0	0	0
Cymbopogon refractus	0	0	0	0	0	0
Danthonia tenuior	0	0	0	0	0	0
Daviesia ulicifolia	0	0	0	0	0	0
Dianella prunina	1	0	0	0	0	20
Dodonaea triquetra	0	0	0	0	0	0
Einadia hastata	0	0	0	0	0	0

Table 5 Comparision of Quadrat Data with Characteristic Species Listed in the Final Determination for SSTF (presence-absence scores)

Characteristic Species Listed within the Final Determination for SSTF	Q1	Q2	Q3	Q4	Q5	†Frequency (%)
Entolasia stricta	1	1	1	1	1	100
Eragrostis brownii	0	0	0	1	0	20
Eremophila debilis	0	0	0	0	0	0
Eucalyptus agglomerata^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus beyeriana^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus crebra^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus eugenioides^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus fibrosa^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus globoidea^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus haemastoma	0	1	1	1	1	80
Eucalyptus moluccana	0	0	0	0	0	0
Eucalyptus notabilis	0	0	0	0	0	0
Eucalyptus oblonga	0	0	0	0	0	0
Eucalyptus paniculata^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus pilularis	0	0	0	0	0	0
Eucalyptus punctata^	**1**	**0**	**0**	**0**	**0**	**20**
Eucalyptus resinifera^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus sclerophylla	0	0	0	0	0	0
Eucalyptus siderophloia	0	0	0	0	0	0
Eucalyptus sparsifolia^	**0**	**0**	**0**	**0**	**0**	**0**
Eucalyptus squamosa	0	0	0	0	1	20
Eucalyptus tereticornis	0	0	0	0	0	0
Euchiton sphaericus	0	0	0	0	0	0
Exocarpos cuppressiformis	0	0	0	0	0	0
Exocarpos strictus	0	0	0	0	0	0
Glycine clandestina	0	0	0	0	0	0
Gompholobium grandiflorum	1	1	1	1	0	80
Goodenia hederacea	0	0	0	0	0	0
Grevillea mucronulata	0	0	0	0	0	0
Hakea dactyloides	0	0	0	0	0	0
Hakea sericea	0	1	1	1	1	80
Hardenbergia violacea	1	0	0	0	0	20
Hibbertia aspera	0	0	0	0	0	0

Table 5 Comparision of Quadrat Data with Characteristic Species Listed in the Final Determination for SSTF (presence-absence scores)

Characteristic Species Listed within the Final Determination for SSTF	Q1	Q2	Q3	Q4	Q5	†Frequency (%)
Hibbertia diffusa	0	0	0	0	0	0
Hypericum gramineum	0	0	0	0	0	0
Indigofera australis	0	0	0	0	0	0
Kunzea ambigua	0	0	0	0	0	0
Lasiopetalum parviflorum	0	0	0	0	0	0
Lepidosperma laterale	1	0	0	1	0	40
Leptospermum trinervium	1	1	1	1	1	100
Leucopogon juniperinus	0	0	0	0	0	0
Leucopogon lanceolatus	0	0	0	0	0	0
Leucopogon microphyllus	1	1	1	1	0	80
Leucopogon muticus	1	1	0	0	1	60
Lomandra filiformis	0	0	0	0	1	20
Lomandra longifolia	1	1	0	1	0	60
Lomatia silaifolia	1	0	0	1	0	40
Melaleuca thymifolia	0	0	0	0	0	0
Microlaeana stipoides	0	0	0	0	0	0
Olearia microphylla	0	0	0	0	0	0
Ozothamnus diosmifolius	0	0	0	0	0	0
Persoonia linearis	0	0	0	0	0	0
Phyllanthus gasstroemii	0	0	0	0	0	0
Phyllanthus hirtellus	1	0	0	1	0	40
Pimelea linifolia	1	1	0	1	1	80
Platylobium formosum	0	0	0	0	0	0
Poa labillardieri	0	0	0	0	0	0
Poa sieberiana	0	0	0	0	0	0
Pomax umbellata	0	0	0	0	0	0
Pratia purpurascens	0	0	0	0	0	0
Pultenaea flexilis	0	0	0	0	0	0
Pultenaea villosa	0	0	0	0	0	0
Siegesbeckia orientalis	0	0	0	0	0	0
Solanum prinophyllum	0	0	0	0	0	0
Sporobolus creber	0	0	0	0	0	0
Stackhousia muricata	0	0	0	0	0	0

Table 5 Comparision of Quadrat Data with Characteristic Species Listed in the Final Determination for SSTF (presence-absence scores)

Characteristic Species Listed within the Final Determination for SSTF	Q1	Q2	Q3	Q4	Q5	†Frequency (%)
Stellaria flaccida	0	0	0	0	0	0
Styphelia laeta	0	0	0	0	0	0
Syncarpia glomulifera	0	0	0	0	0	0
Themeda australis	0	0	0	0	0	0
Vernonia cinerea	0	0	0	0	0	0
Wahlenbergia gracilis	0	0	0	0	0	0
Σ no. of characteristic species recorded	**15**	**12**	**9**	**16**	**8**	
% of characteristic species recorded	**14.3**	**11.4**	**8.6**	**15.2**	**7.6**	
Av. no. species recorded / sample						**12**
Av. % of characteristic species / sample						**11.4**

†*Where freq (%) is the number of samples the species was recorded in divided by the total number of samples, expressed as a percentage*

^*Characteristic canopy species for SSTF as listed in criteria 5 of the TSC Act Final Determination (NSW Scientific Committee, 1998)*

Table 6 Tozer Comparison of Data with Diagnostic Species: Shale Sandstone Transition Forest (High Sandstone Influence) (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Acacia binervata	0	0	0	0	0
Acacia decurrens	0	0	0	0	0
Acacia falcata	0	0	0	0	0
Allocasuarina littoralis	1	1	1	1	0
Angophora bakeri	1	1	1	1	0
Aristida vagans	0	0	0	0	0
Astroloma humifusum	0	0	0	0	0
Austrostipa pubescens	0	0	0	1	1
Billardiera scandens	1	1	0	1	0
Calotis dentex	0	0	0	0	0

Table 6 Tozer Comparison of Data with Diagnostic Species: Shale Sandstone Transition Forest (High Sandstone Influence) (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Cheilanthes sieberi	0	0	0	0	0
Corymbia maculata	0	0	0	0	0
Dampiera purpurea	0	0	0	0	0
Desmodium rhytidophyllum	0	0	0	0	0
Dianella revoluta var revoluta	1	0	0	0	0
Digitaria ramularis	0	0	0	0	0
Echinopogon caepitosus var. caespitosus	0	0	0	0	0
Entolasia stricta	1	1	1	1	1
Eragrostis brownii	0	0	0	1	0
Eucalyptus crebra	0	0	0	0	0
Eucalyptus fibrosa	0	0	0	0	0
Eucalyptus punctata	1	0	0	0	0
Exocarpos cuppressiformis	0	0	0	0	0
Exocarpos strictus	0	0	0	0	0
Gahnia aspera	0	0	0	0	0
Glycine clandestina	0	0	0	0	0
Gonocarpus tetragynus	0	0	0	0	0
Hardenbergia violacea	1	0	0	0	0
Hibbertia aspera	0	0	0	0	0
Hibbertia diffusa	0	0	0	0	0
Jacksonia scoparia	1	0	0	0	0
Kunzea ambigua	0	0	0	0	0
Laegenifera gracilis	0	0	0	0	0
Laxmannia gracilis	1	0	0	0	0
Lepidosperma laterale	1	0	0	1	0
Leucopogon juniperinus	0	0	0	0	0
Leucopogon muticus	1	1	0	0	1
Lomandra filiformis	0	0	0	0	1
Lomandra multiflora	0	0	1	1	0
Notelaea longifolia	0	0	0	0	0
Notodanthonia longifolia	0	0	0	0	0
Olearia microphylla	0	0	0	0	0

Table 6 Tozer Comparison of Data with Diagnostic Species: Shale Sandstone Transition Forest (High Sandstone Influence) (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Opercularia diphylla	0	0	0	0	0
Ozothamnus diosmifolius	0	0	0	0	0
Panicum simile	0	0	0	0	0
Persoonia linearis	0	0	0	0	0
Phyllanthus hirtellus	1	0	0	1	0
Pimelea linifolia	1	1	0	1	1
Poa labillardieri	0	0	0	0	0
Pomaderris lanigera	0	0	0	0	0
Pomax umbellata	0	0	0	0	0
Pratia purpurascens	0	0	0	0	0
Pterostylis coccina	0	0	0	0	0
Solanum prinophyllum	0	0	0	0	0
Stypandra glauca	0	0	0	0	0
Themeda australis	0	0	0	0	0
Veronica plebeia	0	0	0	0	0
Min. required native spp. to be eligible for test	40	40	40	40	40
Total No. of native Species in Quadrat	59	31	30	56	45
Min. No. Diagnostic spp. required to pass test	20	20	20	20	20
Total No. Diagnostic spp. in Quadrat	13	6	4	10	5
Pass/Fail	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Acacia brownii	0	0	0	0	0
Acacia falcata	0	0	0	0	0
Acacia hispidula	0	0	0	0	0

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Acacia linifolia	1	0	1	0	0
Acacia longifolia	0	0	0	0	0
Acacia myrtifolia	0	0	0	0	0
Acacia parramattensis	0	0	0	0	0
Acacia parvipinnula	0	0	0	0	0
Acacia suaveolens	1	1	1	1	1
Acacia terminalis	0	0	0	0	0
Acacia trinervia	0	0	0	0	0
Acacia ulicifolia	1	0	1	1	0
Acianthus fornicatus	1	0	0	0	0
Actinotus helianthi	0	0	0	0	0
Allocasuarina littoralis	1	1	1	1	0
Allocasuarina torulosa	0	0	0	0	0
Angophora bakeri	1	1	1	1	0
Angophora costata	0	0	0	0	0
Anisopogon avenaceus	0	0	0	0	0
Aristida benthamii	0	0	0	0	0
Aristida vagans	0	0	0	0	0
Aristida warburgii	0	0	0	0	0
Astroloma humifusum	0	0	0	0	0
Astroloma pinifolium	0	0	0	0	0
Austrodanthonia fulva	0	0	0	0	0
Austrodanthonia tenuior	0	0	0	0	0
Austrostipa pubescens	0	0	0	1	1
Banksia spinulosa	1	0	0	1	0
Billardiera scandens	1	1	0	1	0
Bossiaea lenticularis	0	0	0	0	0
Bossiaea obcordata	0	1	1	1	0
Bossiaea rhombifolia	0	0	0	0	0
Brunoniella pumilo	0	0	0	0	0
Caesia parviflora	0	0	0	0	0
Callistemon linearis	0	0	0	0	0

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Callistemon rigidus	0	0	0	0	0
Cassytha glabella	1	1	1	0	1
Cassytha pubescens	0	0	0	1	0
Caustis flexuosa	1	0	0	1	1
Cheilanthes sieberi	0	0	0	0	0
Corymbia eximia	0	1	1	0	0
Corymbia gummifera	0	0	0	1	0
Cyathochaeta diandra	0	0	0	1	1
Daviesia acicularis	0	0	0	0	0
Daviesia corymbosa	0	0	0	0	0
Daviesia genistifolia	0	0	0	0	0
Daviesia squarrosa	0	0	0	0	0
Dianella caerulea	0	1	0	0	0
Dianella prunina	1	0	0	0	0
Dianella revoluta var revoluta	1	0	0	0	0
Dillwynia acicularis	0	0	0	0	0
Dillwynia parviflora	0	0	0	0	0
Dillwynia retorta	1	1	1	1	0
Dodonaea pinnata	0	0	0	0	0
Dodonaea triquetra	0	0	0	0	0
Drosera auriculata	0	0	0	0	0
Echinopogon caepitosus var. caespitosus	0	0	0	0	0
Entolasia stricta	1	1	1	1	1
Entolasia whiteana	0	0	0	0	0
Epacris pulchella	1	1	1	1	1
Epacris purpurascens var purpurascens	0	0	0	0	0
Eragrostis benthamii	0	0	0	0	0
Eragrostis brownii	0	0	0	1	0
Eriostemon australasius	0	0	0	0	0
Eucalyptus beyeriana	0	0	0	0	0
Eucalyptus crebra	0	0	0	0	0
Eucalyptus eugenioides	0	0	0	0	0

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Eucalyptus notabilis	0	0	0	0	0
Eucalyptus oblonga	0	0	0	0	0
Eucalyptus pilularis	0	0	0	0	0
Eucalyptus punctata	1	0	0	0	0
Eucalyptus resinifera	0	0	0	0	0
Eucalyptus scias	0	0	0	0	0
Eucalyptus sclerophylla	0	0	0	0	0
Eucalyptus sparsifolia	0	0	0	0	0
Eucalyptus squamosa	0	0	0	0	1
Exocarpos strictus	0	0	0	0	0
Glycine clandestina	0	0	0	0	0
Glycine tabacina	0	0	0	0	0
Gompholobium glabratum	0	0	0	0	1
Gompholobium grandiflorum	1	1	1	1	0
Gompholobium inconspicuum	0	0	0	0	0
Gompholobium minus	0	0	0	0	0
Gompholobium pinnatum	0	0	0	0	0
Gompholobium uncinatum	0	0	0	0	0
Gonocarpus tetragynus	0	0	0	0	0
Goodenia bellidifolia	0	0	0	0	0
Goodenia hederacea	0	0	0	0	0
Goodenia heterophylla	0	0	0	0	0
Grevillea buxifolia	1	0	0	1	1
Grevillea diffusa	0	0	0	0	0
Grevillea longifolia	0	0	0	0	0
Grevillea mucronulata	0	0	0	0	0
Grevillea parviflora	0	0	0	0	0
Grevillea phylicoides	0	0	0	0	0
Grevillea sericea	1	1	1	1	1
Grevillea sphacelata	0	0	0	0	0
Haemodorum planifolium	0	0	0	0	0
Hakea dactyloides	0	0	0	0	0

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Hakea sericea	0	1	1	1	1
Hardenbergia violacea	1	0	0	0	0
Hibbertia aspera	0	0	0	0	0
Hibbertia bracteata	0	1	1	1	0
Hibbertia diffusa	0	0	0	0	0
Hibbertia serpyllifolia	0	0	0	0	0
Hovea linearis	1	0	0	1	0
Hybanthus monopetalus	0	0	0	0	0
Imperata cylindrica var. major	0	0	0	0	0
Isopogan anemonifolius	0	1	0	1	1
Jacksonia scoparia	1	0	0	0	0
Kunzea ambigua	0	0	0	0	0
Laegenifera gracilis	0	0	0	0	0
Lambertia formosa	0	0	1	0	1
Lasiopetalum ferrugineum	0	0	0	0	0
Lasiopetalum rufum	0	0	0	0	0
Laxmannia gracilis	1	0	0	0	0
Lepidosperma latens	0	0	0	0	0
Lepidosperma laterale	1	0	0	1	0
Leptomeria acida	0	0	0	0	0
Leptospermum parvifolium	0	0	0	0	0
Leptospermum trinervium	1	1	1	1	1
Leucopogon muticus	1	1	0	0	1
Leucopogon virgatus	0	0	0	0	0
Lindsaea microphylla	0	0	0	0	0
Lissanthe sapida	0	0	0	0	0
Lissanthe strigosa	0	0	0	0	0
Lobelia gracilis	1	0	0	0	0
Logania pusilla	0	0	0	0	0
Lomandra confertifolia	0	0	0	0	0
Lomandra cylindrica	0	0	0	0	0
Lomandra filiformis	0	0	0	0	1

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Lomandra glauca	1	0	0	1	0
Lomandra gracilis	0	0	0	0	0
Lomandra multiflora	0	0	1	1	0
Lomandra obliqua	1	0	0	1	1
Lomatia silaifolia	1	0	0	1	0
Macrozamia spiralis	0	0	0	0	0
Melaleuca nodosa	0	0	0	0	0
Micrantheum ericoides	0	0	0	0	0
Mirbelia rubiifolia	0	0	0	1	1
Monotoca scoparia	0	0	0	1	0
Olearia microphylla	0	0	0	0	0
Opercularia diphylla	0	0	0	0	0
Opercularia varia	0	0	0	0	0
Ozothamnus diosmifolius	0	0	0	0	0
Panicum simile	0	0	0	0	0
Patersonia glabrata	0	0	0	0	0
Patersonia longifolia	0	0	0	0	0
Patersonia sericea	0	0	0	0	0
Persoonia hirsuta	0	0	0	0	0
Persoonia lanceolata	0	0	0	1	0
Persoonia laurina	0	0	0	0	0
Persoonia levis	1	1	1	0	1
Persoonia linearis	0	0	0	0	0
Persoonia oblongata	0	0	0	0	0
Persoonia pinifolia	0	0	0	0	0
Petrophile pulchella	1	1	1	1	1
Petrophile sessilis	0	0	0	0	0
Philotheca hispidula	0	0	0	0	0
Phyllanthus hirtellus	1	0	0	1	0
Pimelea curviflora	0	0	0	0	0
Pimelea linifolia	1	1	0	1	1
Platysace ericoides	0	0	0	0	0

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Platysace linearifolia	1	1	1	1	1
Podolobium scandens	0	0	0	0	0
Pomax umbellata	0	0	0	0	0
Pratia purpurascens	0	0	0	0	0
Prostanthera howelliae	0	0	0	0	0
Pterostylis acuminata	0	0	0	0	0
Pterostylis longifolia	0	0	0	0	0
Pultenaea ferruginea	0	0	0	0	0
Pultenaea polifolia	0	0	0	0	0
Pultenaea scabra	0	0	0	0	0
Pultenaea tuberculata	0	0	0	0	0
Pultenaea villosa	0	0	0	0	0
Scaevola ramosissima	0	0	0	0	0
Schizaea bifida	1	0	0	0	0
Schoenus imberbus	0	0	0	1	0
Styphelia laeta	0	0	0	0	0
Syncarpia glomulifera	0	0	0	0	0
Thelymitra pauciflora	0	0	0	0	0
Themeda australis	0	0	0	0	0
Thysanotus tuberosus	0	0	0	0	0
Trachymene incisa	0	0	0	0	0
Tricoryne simplex	0	0	0	0	0
Xanthorrhea minor	0	0	0	0	0
Xanthorrhoea concava	0	0	0	0	0
Xanthorrhoea media	1	0	0	1	1
Xanthorrhoea resinifera	0	0	0	0	0
Xanthosia pilosa	0	0	0	0	0
Xanthosia tridentata	0	0	0	0	0
Xylomelum pyriforme	0	0	0	0	0
Min. required native spp. to be eligible for test	42	42	42	42	42
Total No. of native Species in Quadrat	59	31	30	56	45

Table 7 Tozer Comparison of Data with Diagnostic Species: Sydney Hinterland Transition Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Min. No. Diagnostic spp. required to pass test	31	31	31	31	31
Total No. Diagnostic spp. in Quadrat	37	22	21	38	24
Pass/Fail	**Pass**	**Fail**	**Fail**	**Fail**	**Fail**

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Acacia echinula	0	0	0	0	0
Acacia gordonii	0	0	0	0	0
Acacia hispidula	0	0	0	0	0
Acacia linifolia	1	0	1	0	0
Acacia myrtifolia	0	0	0	0	0
Acacia oxycedrus	0	0	0	0	0
Acacia suaveolens	1	1	1	1	1
Acacia terminalis	0	0	0	0	0
Acacia ulicifolia	1	0	1	1	0
Actinotus helianthi	0	0	0	0	0
Actinotus minor	1	1	1	1	1
Allocasuarina distyla	0	0	0	0	0
Angophora costata	0	0	0	0	0
Angophora hispida	1	1	0	1	1
Anisopogon avenaceus	1	0	1	0	0
Aotus ericoides	1	1	0	0	0
Austrostipa pubescens	0	0	0	1	1
Babingtonia densifolia	0	0	0	0	0
Baeckea brevifolia	0	0	0	0	0
Baeckea diosmifolia	0	0	0	0	0
Baeckea imbricata	0	0	0	0	0
Banksia ericifolia	1	1	0	1	1

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Banksia marginata	0	0	0	0	0
Banksia oblongifolia	0	0	0	0	1
Banksia serrata	1	1	0	1	0
Banksia spinulosa	1	0	0	1	0
Bauera rubioides	0	0	0	0	0
Boronia floribunda	0	0	0	0	0
Boronia fraseri	0	0	0	0	0
Boronia ledifolia	0	0	0	0	0
Boronia pinnata	0	0	1	1	1
Boronia serrulata	0	0	0	0	0
Bossiaea ensata	0	0	0	0	0
Bossiaea heterophylla	0	0	0	1	0
Bossiaea lenticularis	0	0	0	0	0
Bossiaea obcordata	0	1	1	1	0
Bossiaea rhombifolia	0	0	0	0	0
Bossiaea scolopendria	0	0	0	0	1
Bossiaea stephensonii	0	0	0	0	0
Brachyloma daphnoides	1	0	0	0	0
Callitris muelleri	0	0	0	0	0
Calytrix tetragona	0	0	0	0	0
Cassytha glabella	1	1	1	0	1
Cassytha pubescens	0	0	0	1	0
Caustis flexuosa	1	0	0	1	1
Caustis pentandra	0	0	0	0	0
Caustis recurvata	0	0	0	0	0
Ceratopetalum gummiferum	1	0	0	0	0
Chloanthes stoechadis	0	0	0	0	0
Comesperma ericinum	0	0	0	0	0
Conospermum longifolium	0	0	0	0	0
Conospermum taxifolium	0	0	0	0	0
Conospermum tenuifolium	0	0	0	0	0
Corymbia eximia	0	1	1	0	0

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Corymbia gummifera	0	0	0	1	0
Crowea saligna	0	0	0	0	0
Cryptandra amara	0	0	0	0	0
Cryptandra ericoides	0	0	0	0	0
Cyathochaeta diandra	0	0	0	1	1
Dampiera scottiana	0	0	0	0	0
Dampiera stricta	0	0	0	1	1
Darwinia biflora	0	0	0	0	1
Darwinia diminuta	0	0	0	0	0
Darwinia fascicularis	0	0	0	0	0
Darwinia grandiflora	0	0	0	0	0
Daviesia corymbosa	0	0	0	0	0
Dianella prunina	1	0	0	0	0
Dillwynia acicularis	0	0	0	0	0
Dillwynia elegans	0	0	0	0	0
Dillwynia floribunda	1	0	0	1	1
Dillwynia retorta	1	1	1	1	0
Dillwynia sericea	0	0	0	0	0
Dodenaea camfieldii	0	0	0	0	0
Doryanthes excelsa	0	0	0	0	0
Drosera peltata	0	0	0	0	0
Entolasia stricta	1	1	1	1	1
Epacris crassifolia	0	0	0	0	0
Epacris longifolia	0	0	0	0	0
Epacris microphylla	0	0	0	0	0
Epacris pulchella	1	1	1	1	1
Eriostemon australasius	0	0	0	0	0
Eucalyptus burgessiana	0	0	0	0	0
Eucalyptus camfieldii	0	0	0	0	0
Eucalyptus haemastoma	0	1	1	1	1
Eucalyptus luehmanniana	0	0	0	0	0
Eucalyptus multicaulis	0	0	0	0	0

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Eucalyptus oblonga	0	0	0	0	0
Eucalyptus piperta	0	0	0	0	0
Eucalyptus racemosa	0	0	0	0	0
Eucalyptus sclerophylla	0	0	0	0	0
Eucalyptus sieberi	0	0	0	0	0
Eucalyptus sparsifolia	0	0	0	0	0
Eucalyptus squamosa	0	0	0	0	1
Eucalyptus umbra	0	0	0	0	0
Euryomyrtus ramosissima	0	0	0	0	0
Gahnia erythrocarpa	0	0	0	0	0
Gompholobium glabratum	0	0	0	0	1
Gompholobium grandiflorum	1	1	1	1	0
Gompholobium latifolium	0	0	0	0	0
Gompholobium virgatum	0	0	0	0	0
Goodenia bellidifolia	0	0	0	0	0
Goodenia decurrens	0	0	0	0	0
Goodenia heterophylla	0	0	0	0	0
Grevillea buxifolia	1	0	0	1	1
Grevillea capitellata	0	0	0	0	0
Grevillea diffusa	0	0	0	0	0
Grevillea mucronulata	0	0	0	0	0
Grevillea oleoides	0	0	0	0	0
Grevillea phylicoides	0	0	0	0	0
Grevillea sericea	1	1	1	1	1
Grevillea speciosa	0	0	0	0	0
Grevillea sphacelata	0	0	0	0	0
Grevillea triternata	0	0	0	0	0
Guringalia dimorpha	0	0	0	0	0
Hakea bakeriana	0	0	0	0	0
Hakea dactyloides	0	0	0	0	0
Hakea gibbosa	0	0	0	0	0
Hakea propinqua	0	0	0	0	0

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Hakea sericea	0	1	1	1	1
Hakea teretifolia	0	0	0	0	0
Hemigenia purpurea	0	0	0	0	0
Hibbertia acicularis	0	0	0	0	0
Hibbertia aspera	0	0	0	0	0
Hibbertia bracteata	0	1	1	1	0
Hibbertia cistiflora	0	0	0	0	0
Hibbertia fasciculata	0	0	0	0	0
Hibbertia linearis	0	0	0	0	0
Hibbertia monogyna	0	0	0	0	0
Hibbertia nitida	0	0	0	0	0
Hibbertia riparia	0	0	0	0	1
Hibbertia rufa	0	0	0	0	0
Hovea linearis	1	0	0	1	0
Hybanthus monopetalus	0	0	0	0	0
Hypolaena fastigiata	0	0	0	0	0
Isopogan anemonifolius	0	1	0	1	1
Isopogon anethifolius	0	0	0	0	0
Kunzea capitata	0	0	0	0	0
Lambertia formosa	0	0	1	0	1
Lasiopetalum ferrugineum	0	0	0	0	0
Lasiopetalum parviflorum	0	0	0	0	0
Lasiopetalum rufum	0	0	0	0	0
Laxmannia gracilis	1	0	0	0	0
Lepidosperma concavum	0	0	0	0	0
Lepidosperma filiforme	0	0	0	0	0
Leptomeria acida	0	0	0	0	0
Leptospermum arachnoides	0	0	0	0	0
Leptospermum parvifolium	0	0	0	0	0
Leptospermum polygalifolium	0	0	0	0	0
Leptospermum squarrosum	0	0	0	0	0
Leptospermum trinervium	1	1	1	1	1

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Lepyrodia scariosa	0	0	1	1	1
Leucopogon amplexicaulis	0	0	0	0	0
Leucopogon appressus	0	0	0	0	0
Leucopogon ericoides	0	0	0	0	0
Leucopogon esquamatus	0	0	0	0	0
Leucopogon microphyllus	1	1	1	1	0
Leucopogon muticus	1	1	0	0	1
Leucopogon setiger	0	0	0	0	0
Lindsaea linearis	1	0	1	1	1
Lomandra brevis	0	0	0	0	0
Lomandra cylindrica	0	0	0	0	0
Lomandra filiformis	0	0	0	0	1
Lomandra glauca	1	0	0	1	0
Lomandra gracilis	0	0	0	0	0
Lomandra obliqua	1	0	0	1	1
Lomatia silaifolia	1	0	0	1	0
Lycopodium deuterodensum	0	0	0	0	0
Melaleuca deanei	0	0	0	0	0
Micrantheum ericoides	0	0	0	0	0
Micromyrtus blakelyi	0	0	0	0	0
Micromyrtus ciliata	0	0	0	0	0
Mirbelia rubiifolia	0	0	0	1	1
Mirbelia speciosa	0	0	0	0	0
Mitrasacme pilosa	0	0	0	0	0
Mitrasacme polymorpha	0	0	0	0	0
Monotaxis linifolia	0	0	0	0	0
Monotoca scoparia	0	0	0	1	0
Olax stricta	0	0	0	0	0
Patersonia glabrata	0	0	0	0	0
Patersonia longifolia	0	0	0	0	0
Patersonia sericea	0	0	0	0	0
Persoonia lanceolata	0	0	0	1	0

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Persoonia levis	1	1	1	0	1
Persoonia mollis	0	0	0	0	0
Persoonia oblongata	0	0	0	0	0
Persoonia pinifolia	0	0	0	0	0
Petrophile pedunculata	0	0	0	0	0
Petrophile pulchella	1	1	1	1	1
Petrophile sessilis	0	0	0	0	0
Phebalium squamulosum	0	0	0	0	0
Philotheca hispidula	0	0	0	0	0
Philotheca salsolifolia	0	0	0	0	0
Philotheca scabra	0	0	0	0	0
Phyllanthus hirtellus	1	0	0	1	0
Phyllota grandiflora	0	0	0	0	0
Phyllota phylicoides	0	0	0	0	1
Pimelea linifolia	1	1	0	1	1
Platysace ericoides	0	0	0	0	0
Platysace linearifolia	1	1	1	1	1
Poranthera corymbosa	0	0	0	0	0
Poranthera ericifolia	0	0	0	0	0
Prostanthera howelliae	0	0	0	0	0
Ptilothrix deusta	0	0	0	0	0
Pultenaea ferruginea	0	0	0	0	0
Pultenaea linophylla	0	0	0	0	0
Pultenaea stipularis	0	0	0	0	0
Pultenaea tuberculata	0	0	0	0	0
Ricinocarpos pinifolius	0	0	0	0	0
Scaevola ramosissima	0	0	0	0	0
Schizaea bifida	1	0	0	0	0
Schizaea dichotoma	0	0	0	0	0
Schoenus ericetorum	1	1	1	1	0
Schoenus imberbus	0	0	0	1	0
Schoenus turbinatus	0	0	0	0	0

Table 8 Tozer Comparison of Data with Diagnostic Species: Coastal Sandstone Ridgetop Woodland (presence-absence scores)

Positive Diagnostic Species	Q1	Q2	Q3	Q4	Q5
Selaginella uliginosa	0	0	0	0	0
Stylidium lineare	0	0	0	0	0
Stylidium productum	0	0	0	0	0
Styphelia tubiflora	0	0	0	0	0
Telopea speciosissima	0	0	0	0	0
Tetratheca ericifolia	0	0	0	0	0
Tetratheca glandulosa	0	0	0	0	0
Tetratheca neglecta	0	0	0	0	0
Tetratheca rupicola	0	0	0	0	0
Tetratheca shiressii	0	0	0	0	0
Tricostularia pauciflora	0	0	0	0	0
Woollsia pungens	0	0	0	0	0
Xanthorrhea arborea	0	0	0	0	0
Xanthorrhoea media	1	0	0	1	1
Xanthorrhoea resinifera	0	0	0	0	0
Xanthosia pilosa	0	0	0	0	0
Xanthosia tridentata	0	0	0	0	0
Xylomelum pyriforme	0	0	0	0	0
Xyris bracteata	0	0	0	0	0
Xyris complanata	0	0	0	0	0
Zieria laevigata	0	0	0	0	0
Zieria pilosa	0	0	0	0	0
Min. required native spp. to be eligible for test	41	41	41	41	41
Total No. of native Species in Quadrat	59	31	30	56	45
Min. No. Diagnostic spp. required to pass test	31	31	31	31	31
Total No. Diagnostic spp. in Quadrat	39	26	26	45	38
Pass/Fail	**Pass**	**Fail**	**Fail**	**Pass**	**Pass**

Table 9 Average Vegetation Structure of the Subject Site

Growth Form	Mean Height (m)	Mean pfc (%)
Canopy	10	5
Small tree	7	5
Shrub	3	55
Ground	0.3	10