1.0 Introduction

The approximately 2 hectare Site on Lot 301 DP 1000732 is within the Airds/Bradbury housing estate (Figure 1). The Site is located approximately 45 km south-west of the Sydney CBD, approximately 3 km to the south-east of Campbelltown, and approximately 1.2 km north-west of the Georges River in the Campbelltown Local Government Area (LGA).

The flora of the Site was surveyed on 23 January by Tony Rodd, Jane Rodd, Sian Wilkins and Emma Gorrod. After the completion of the assessment of the vegetation on the Site, the potential impact of a proposed development was assessed and presented in a subsequent report.

2.0 Environmental setting

2.1 Topography

The Site is part of a relatively flat landform with an elevation between 120-130 m AHD. Much of the adjoining suburb of Bradbury and Airds is of similar topographic relief (Figure 1).

Smiths Creek is approximately 250 m downslope at an elevation of 100-110 m AHD to the north-west of the Site. An approximately 1 ha dam is located about 200 m to the south-south-west of the Site at an elevation of 120-130 m AHD. There are no identified drainage lines running through the Site (Figure 1).

2.2 Climate

The Sydney area has a warm temperate climate with rainfall through the year (Division of National Mapping 1986). Average rainfall decreases from over 1200 mm near the coast to less than 800 mm on the west of the low flat Cumberland Plain (Figure 2). At the nearest meteorological station (Campbelltown swimming pool, located approximately 2 km north-west of the Site, Station No. 068081, elevation 75 m), the average annual rainfall is 830 mm and the average number of rain days per year is 107. The highest mean rainfall is 101 mm in March and the lowest mean rainfall is 34 mm in July (Bureau of Meteorology 2003).

The mean annual daily maximum temperature recorded at Campbelltown is 24°C, and the mean annual daily minimum temperature is 11°C. The highest mean daily maximum temperature recorded at Campbelltown was 28°C in January and the lowest mean minimum temperature recorded was 3°C in July (Bureau of Meteorology 2003).

The current survey was conducted in drought conditions. In the five months prior to survey, rainfall was well below average (Appendix 1):

	2002 Monthly rainfall (mm)	Long term average monthly rainfall (mm)
December	29	70.5
November	9	84.3
October	1	74.3
September	1	40.7

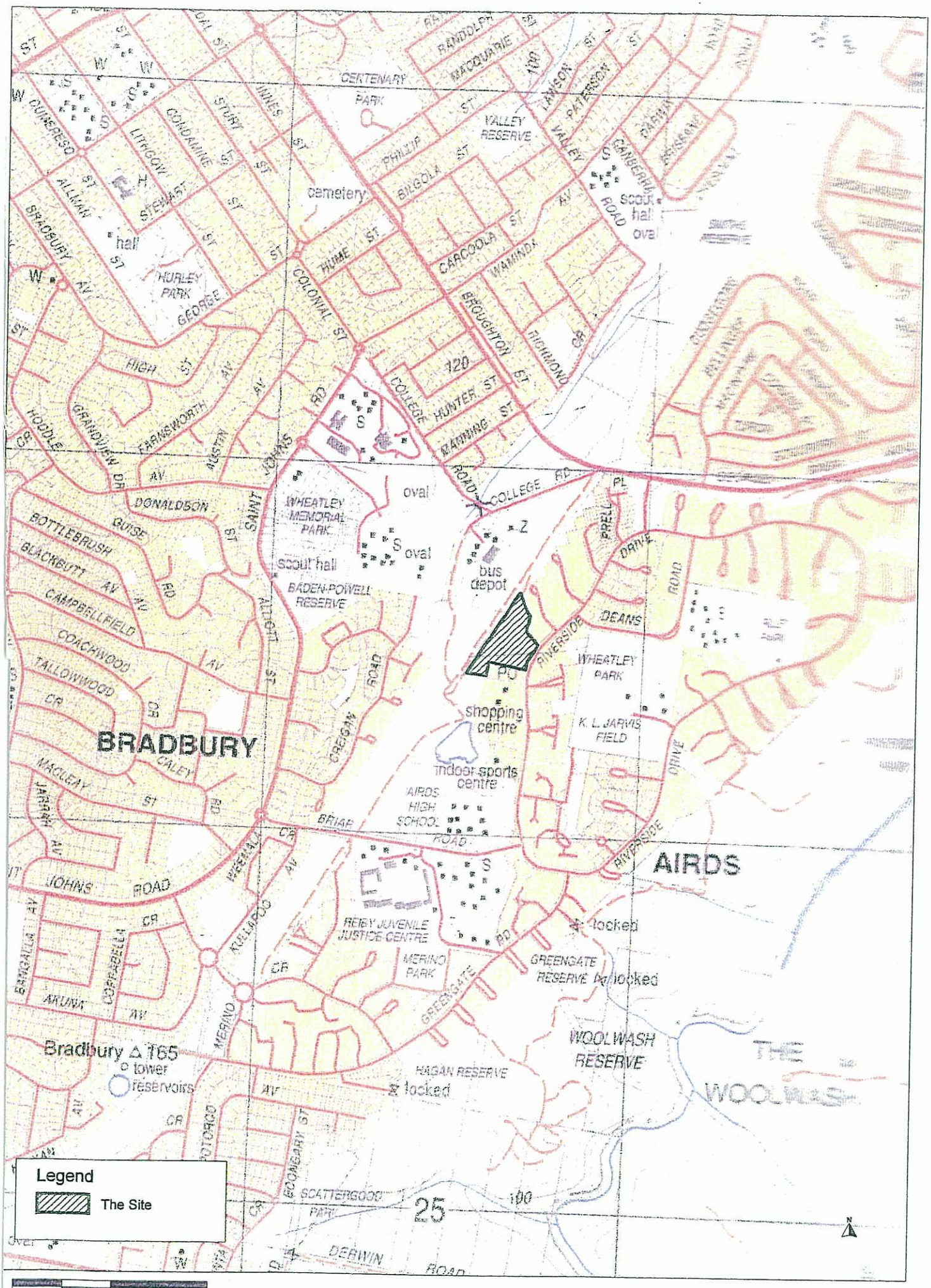


Figure 1
Location of the Site

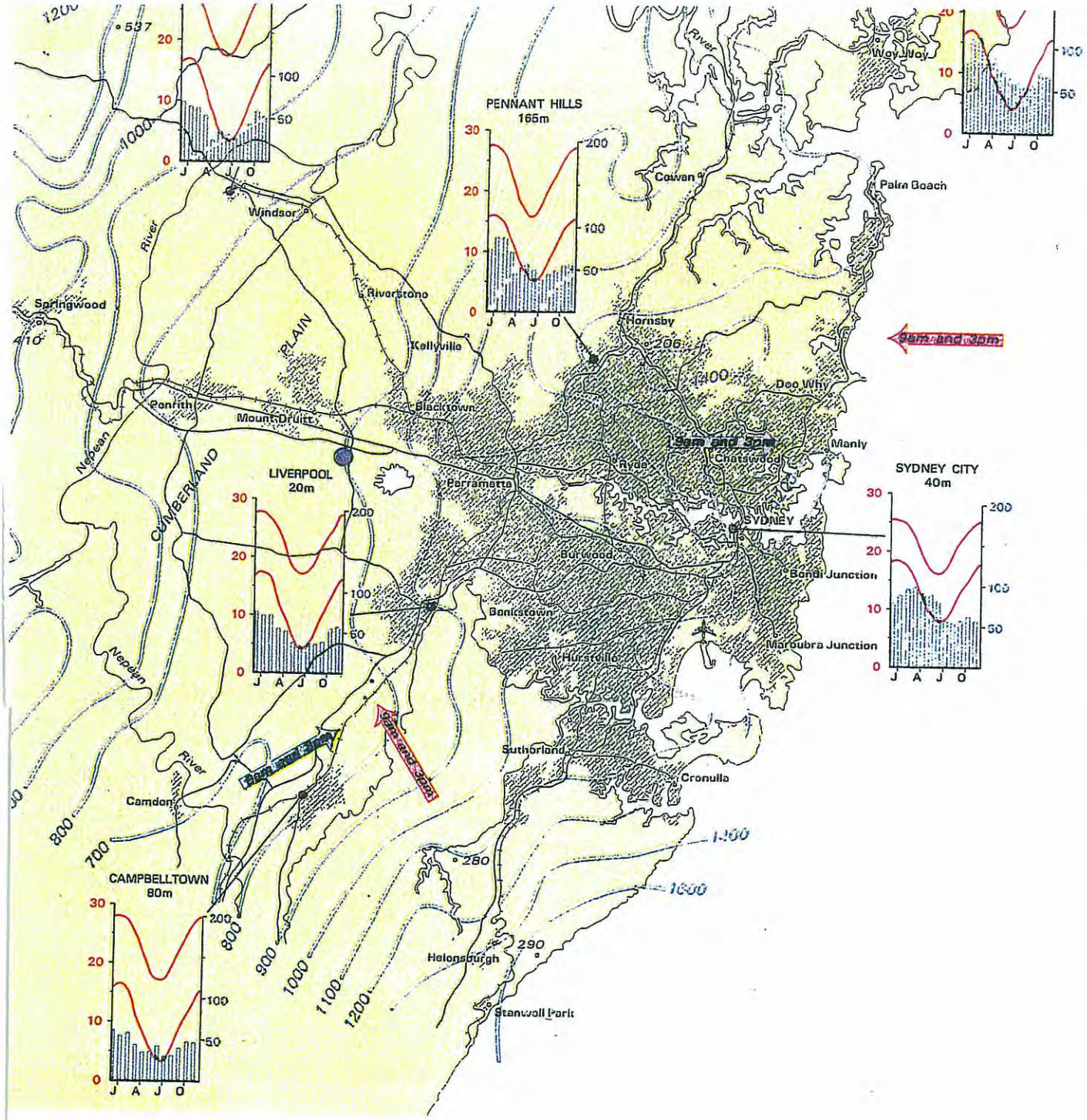


Figure 2
Rainfall of the Sydney Region

August	14	50.4

2.2 Geology and Soils

The geology of the Site has been mapped at a scale of 1:100 000 as map unit "Rwa" - Ashfield Shale (Figure 3). Ashfield Shale is part of the Wianamatta group and consists of laminite and dark-grey siltstone. The palaeoenvironment of the Ashfield Shale is marine and described as "beach and barrier bar, shallow marine grading to tidal flat" (Stroud *et al.* 1985).

The soil landscape of the Site is mapped at a scale of 1:100 000 by Hazelton *et al.* (1990) as Blacktown (map unit "bt") (Figure 4). Blacktown is a residual soil landscape. It is described as gently undulating rises on Wianamatta Group shale, with local relief to 30 m, with slopes usually <5%, broad rounded crests and ridges with gently inclined slopes, soils are shallow to moderately deep (<150 cm) and limitations moderately reactive, highly plastic subsoils, low soil fertility.

2.4 Land use

The Site (Figure 1) is bounded by:

- to the north – existing residential development
- to the east – Riverside Drive and adjoining existing residential development
- to the south – Post Office and shopping centre
- to the south west – an approximately 150 m wide vegetated area criss-crossed by vehicle tracks
- to the west – vegetated area of native tree regrowth with extensive cleared tracks, approximately 80 to 200 m in width
- to the north west – a bus depot.

Smiths Creek is located approximately 250 m to the north-west of the Site. In general, the Site is to the east of the southern part of the 80 to 200 m wide vegetated corridor that runs north-south along Smiths Creek. From aerial photograph (Figure 5) and site observations, to the south of the Site, the western section had a previously mown understorey and native tree regrowth with extensive vehicle tracks and the eastern section was asphelt carpark. Further south the vegetation was managed grass areas. There was regrowth native vegetation with slashed understorey to the west which was fragmented by a power easement and cleared tracks.

From the historical aerial photographs of the Site held by Land and Property Information (2002, 1994, 1984, 1979, 1972, 1961, 1947) (Table 1), the Site has supported scattered trees with patchy shrub layer to cleared understorey since the earliest aerial photograph.

3.0 Flora

3.1 Previous studies

Benson & Howell (1990) describe the vegetation of the Campbelltown LGA in the 1820s as:

> *To the east lay rugged Hawkesbury Sandstone country; to the north and west, the rolling hills with woodlands of Grey Box*, Eucalyptus moluccana, *Forest Red Gum*,

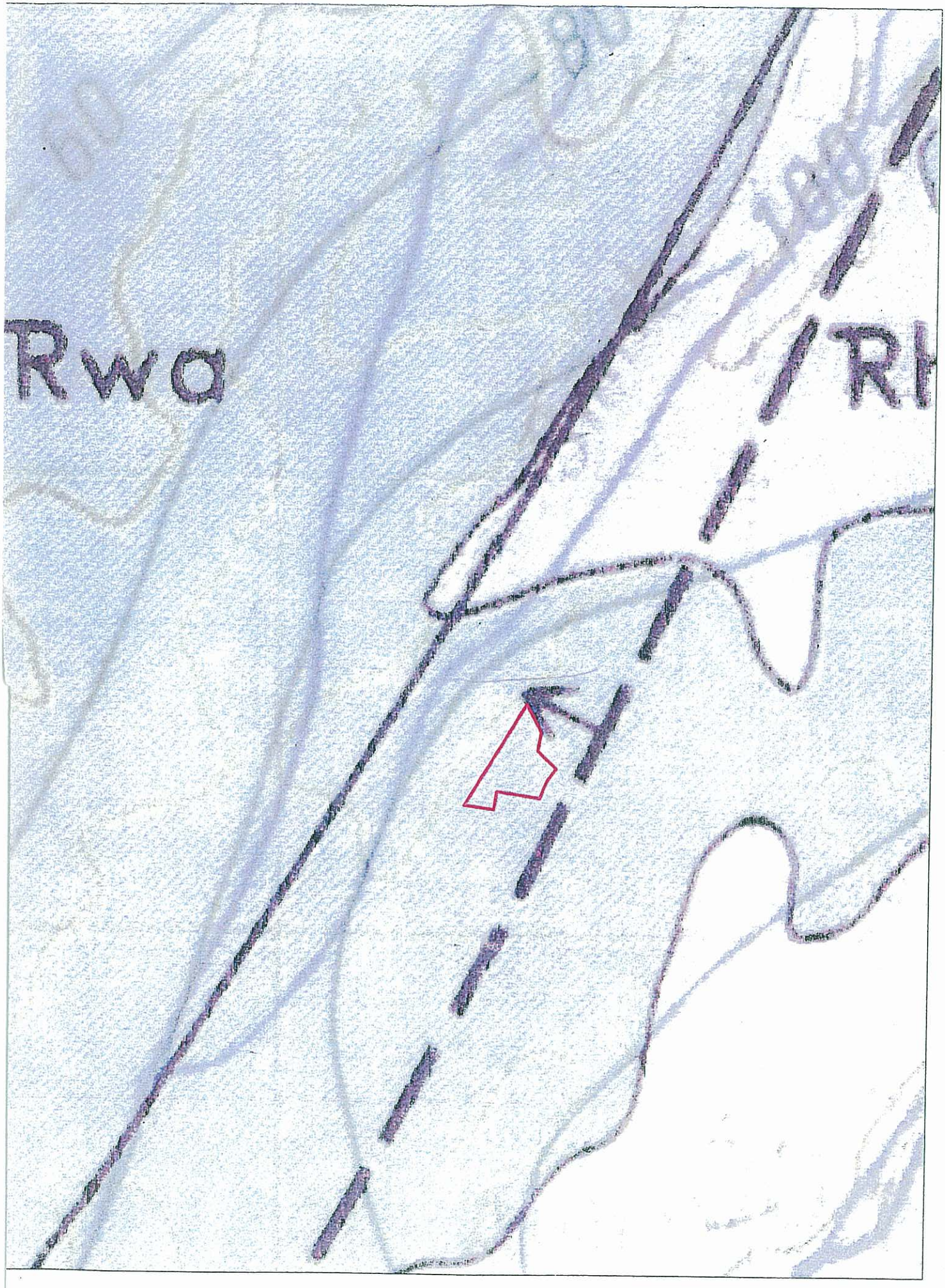


Figure 3
Geology of the Site (Stroud et al. 1985)

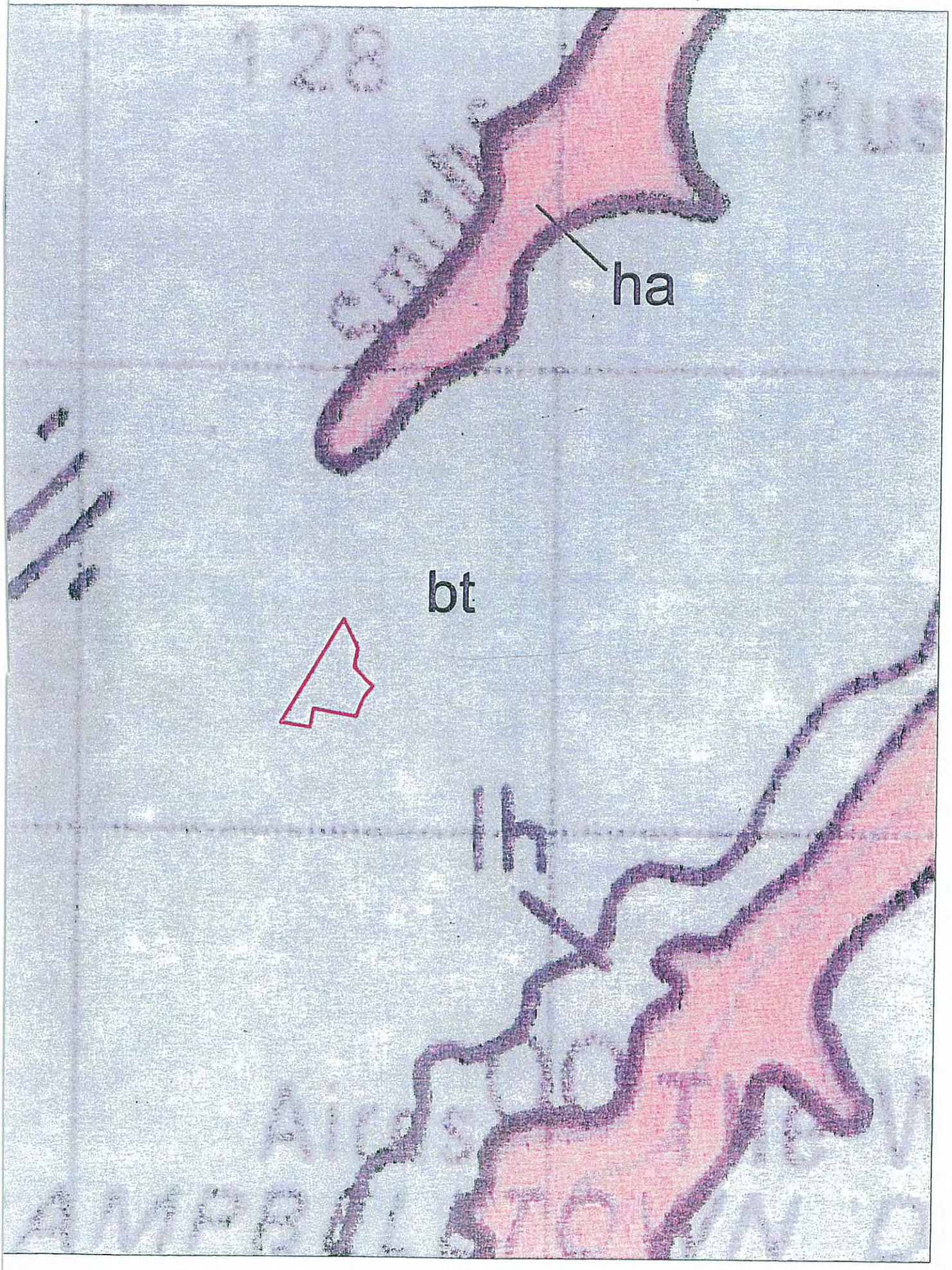


Figure 4
Soil Landscapes of the Site (Hazleton et al. 1990)

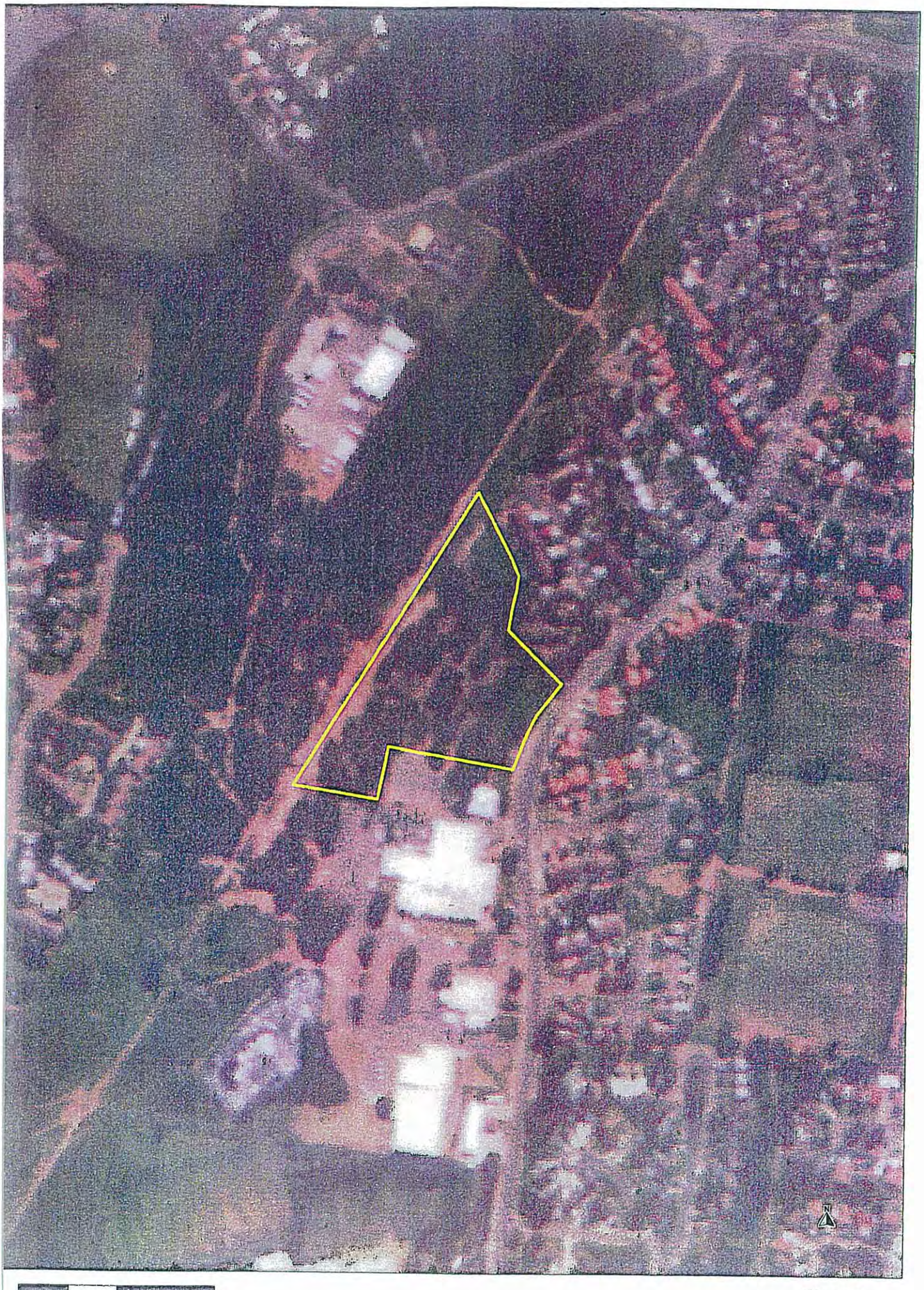


Figure 5
2002 aerial photograph of the Site

> Eucalyptus tereticornis, *and Narrow-leaved Ironbark,* Eucalyptus crebra, *on the clay soils of the Wianamatta Shale. The naturally grassy ground cover was soon being cleared to grow wheat and other cereals... However, in the 1860's wheat stem rust fungus destroyed the wheat industry here. Dairying became the major agricultural industry, together with fruit growing along the Georges River at Minto and Wedderburn.*

Nature Conservation Council (1991) mapped several patches of remnant vegetation within the Campbelltown LGA. None of these patches were on or adjacent to the Site, with the closest remnant (labelled CB(A)5) approximately 1.5 km to the south of the Site at the northern end of St Helen's Park (Figure 6). Remnant CB(A)5 is approximately 20 ha and is described as woodland, with dominant tree species of *Eucalyptus crebra, Eucalyptus fibrosa* and *Allocasuarina littoralis.*

Campbelltown City Council (1995) have not mapped the Site as open space nor environmentally sensitive land (Figure 7). The nearby mapped areas are:

- Baden Powell Reserve, to the west of Site
- Wheatley Park and K.L. Jarvis Field, east of Riverview Drive and to the east of the Site
- Smith Reserve surrounding Smiths Creek, to the north of Georges River Road and to the north of the Site.

UBBS (1997) briefly inspected the remnants west of the Georges River in the Campbelltown LGA. Plant communities listed as occuring in the Campbelltown LGA include Cumberland Plain Woodland, Sydney Sandstone Complex and Shale/Sandstone Transition Forest. Campbelltown LGA remnants were not surveyed extensively in UBBS, it is stated that:

> *the Campbelltown and Camden sections do not provide a detailed review of all major remnants of conservation significance, rather a summary of Sites surveyed during the UBBS is provided.*

None of the described remnants were close to the Site.

NPWS (2000a) mapped the Site (Figure 8), based on the 1997 and 1998 aerial photographs and limited field survey, as:

- Shale/Sandstone Transition Forest (Low Sandstone Influence) with >10% crown cover and greater than 0.5 ha
- cleared

NPWS did not map any part of the Site as Cumberland Plain Woodland. Areas approximately 300 m to the west of the Site are mapped as Cumberland Plain Woodland (Shale Hills Woodland).

To the south-west of the Site is an area mapped as both Shale/Sandstone Transition Forest (Low Sandstone Influence) with >10% crown cover and greater than 0.5 ha, and Shale/Sandstone Transition Forest (High Sandstone Influence) with <10% crown cover over urban areas. This land has now been developed as a shopping centre and carpark.

AMBS (2001) surveyed the Site as part of a broader study area from Georges River Road to Greengate Road. The Site is located within Zone C, which was sampled by one

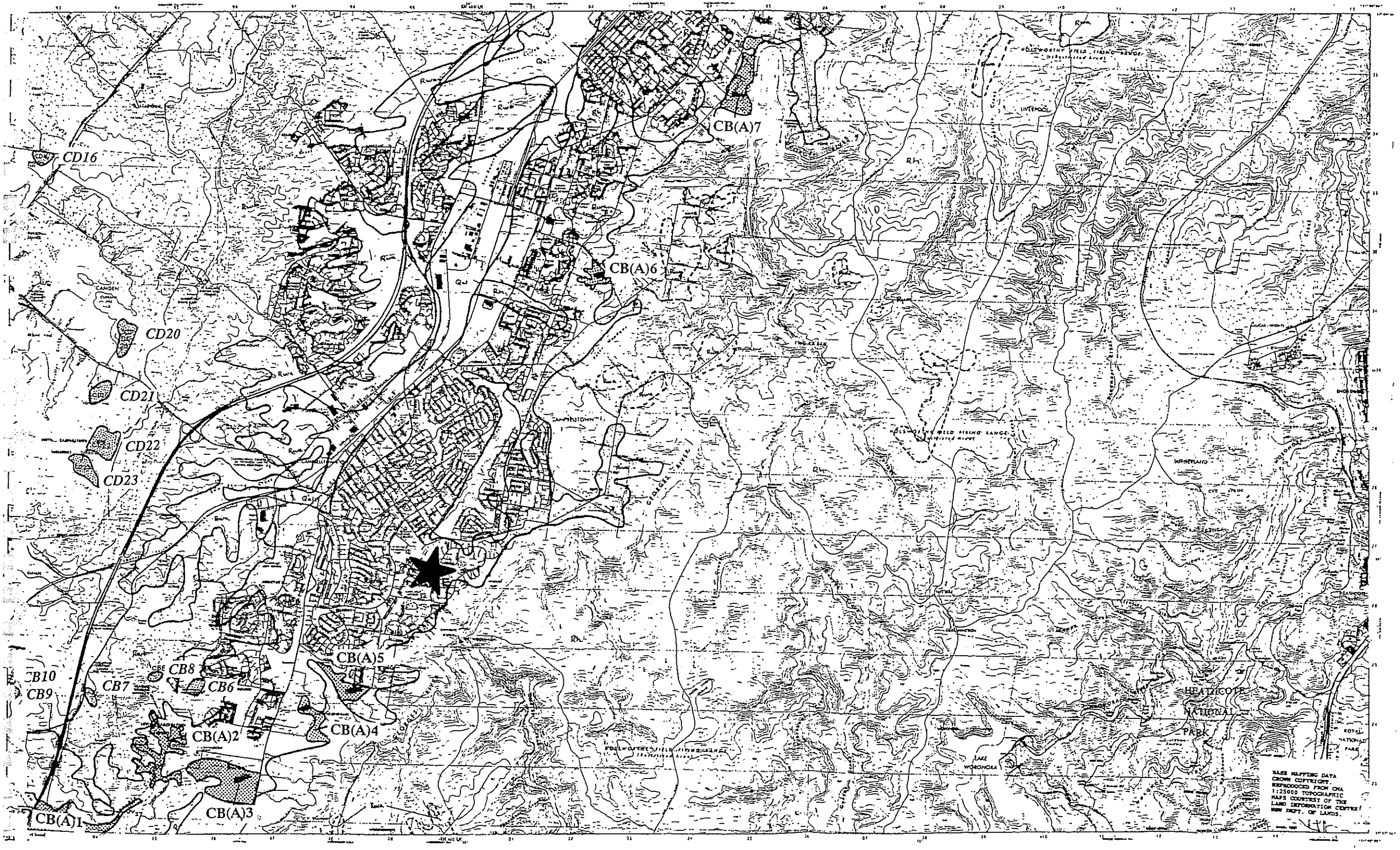
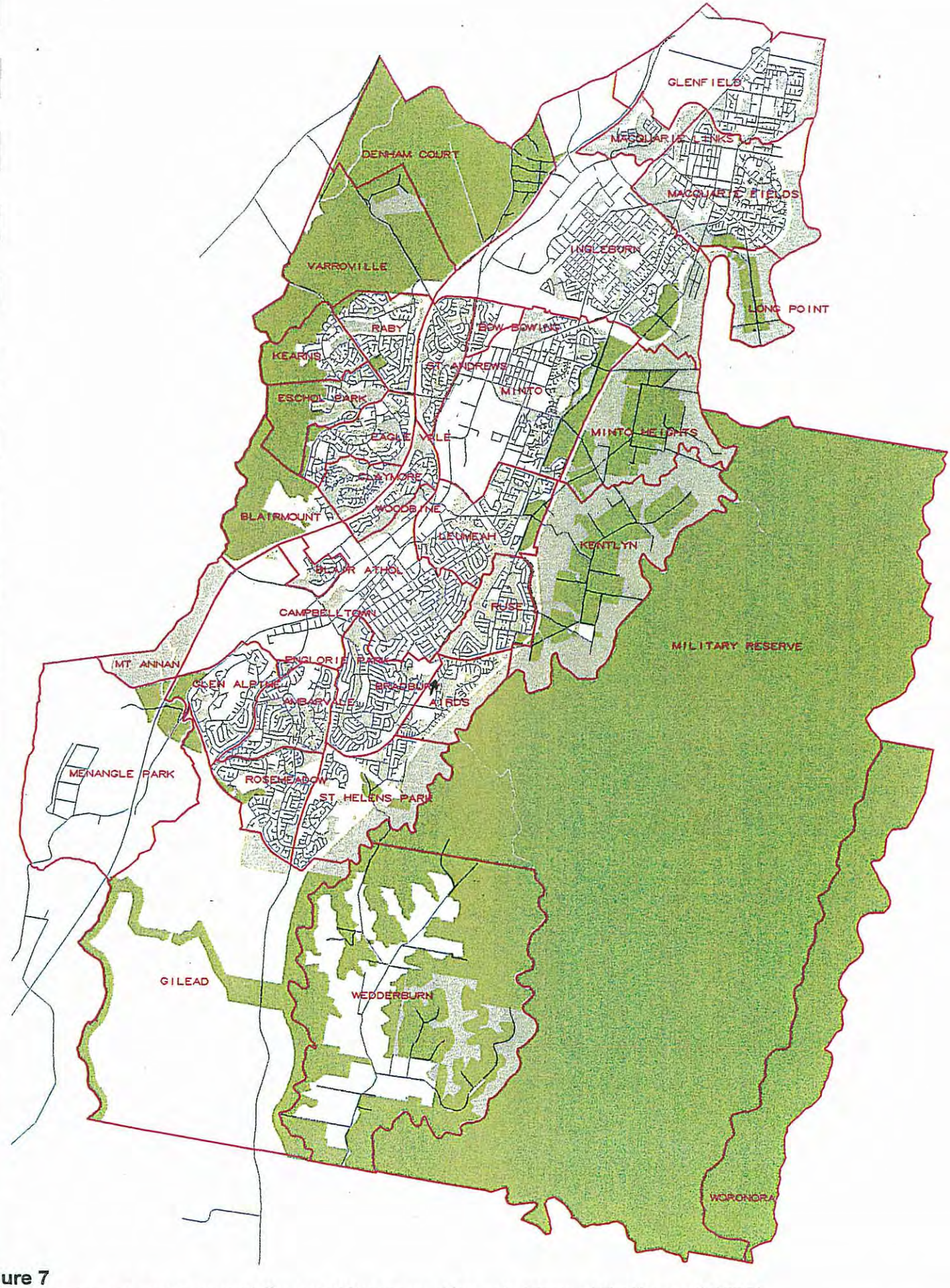


Figure 6
Location of remnant CBA(5) (Nature Conservation Council 1991)

OPEN SPACE & ENVIRONMENTALLY SENSITIVE LAND



igure 7
pen Space and environmentally sensitive areas (Campbelltown City Council 1995)

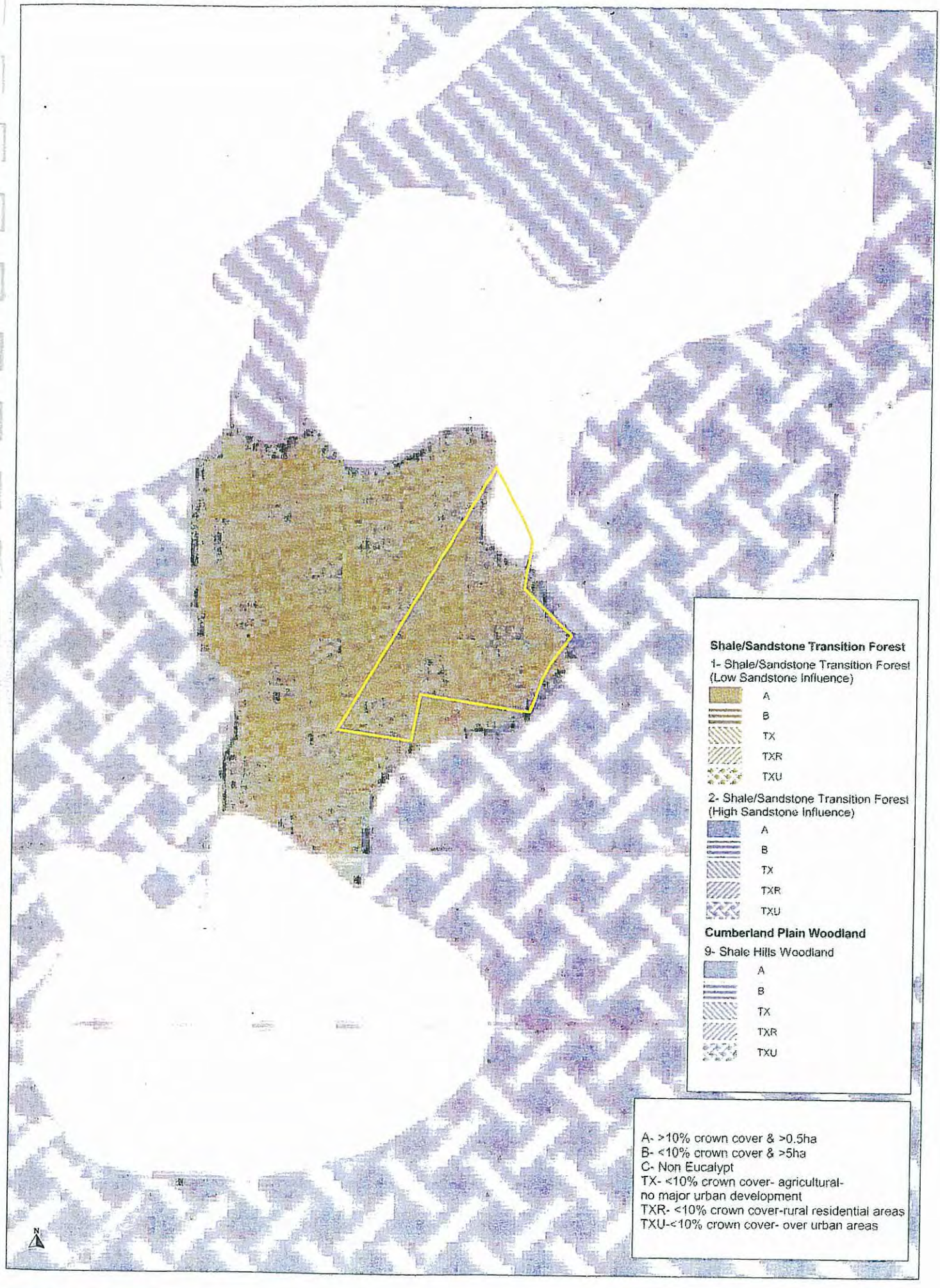


Figure 8
Vegetation mapping (NPWS 2000a)

20 m x 20 m quadrat. The exact location of the quadrat was not provided. The species recorded were provided with the disclaimer: "This list is not comprehensive".

The vegetation of zone C (including the Site) was described as containing:

> *Scattered old remnant trees and younger bushland regrowth. The bushland is partially disturbed by pedestrian and vehicular paths, rubbish dumping and frequent burning. The vegetation community comprised regrowth of Cumberland Plain Woodland which covered most of this zone.*

It is stated:

> *Despite the presence of weeds in many locations, much of the bushland was considered to be viable and in the process of developing a more widespread shrub stratum.*

Cumberland Plain Woodland is listed as an endangered ecological community under the NSW TSC Act. The data collected was not compared with the Final Determinations for these ecological communities, and therefore it is not clear whether the vegetation is Cumberland Plain Woodland as defined in the legislation. A figure for the distribution of Cumberland Plain Woodland across zone C was not provided, nor was the proportion of the Site covered by Cumberland Plain Woodland given.

AMBS (2002) utilised the information of AMBS (2001), and an additional three 20 m x 20 m quadrats, to assess the flora and fauna in the area from Georges River Road south to the Site. The locations of the three additional quadrats are within unit 1, 2 and 5. Quadrat 1 was adjacent to the bus depot to the south-west of the Site. The vegetation of the Site was classified as unit 1 – Cumberland Plain Woodland with a mown understorey (Figure 9). The methods used to classify the vegetation as Cumberland Plain Woodland were not specified.

It is concluded that the area of mown Cumberland Plain Woodland was significant in terms of enhancing the long-term viability and biodiversity of the local occurrence of this endangered plant community. It was recommended that the mown bushland zone be retained, and its connection with the proposed parkland to the west be maintained.

As the potential loss of the mown Cumberland Plain Woodland was assessed as being significant, it was concluded that "a Species Impact Statement would be required".

NPWS (2002) in their revised mapping of the native vegetation of the Cumberland Plain mapped the Site as containing (Figure 10):

Vegetation type	Cover	Approximate location
Cumberland Plain Woodland (Shale Plains Woodland)	>10%	Majority of the Site (southern section)
Cumberland Plain Woodland (Shale Plains Woodland)	<10%	North-eastern corner of the Site
Shale Sandstone Transition Forest	>10%	western boundary of the Site
No native vegetation overstorey	-	North-west of the Site

3.2 Current Study

The current survey concentrated on the areas with native species present. The land adjoining the residential development in the north of the Site and adjoining Riverside Drive

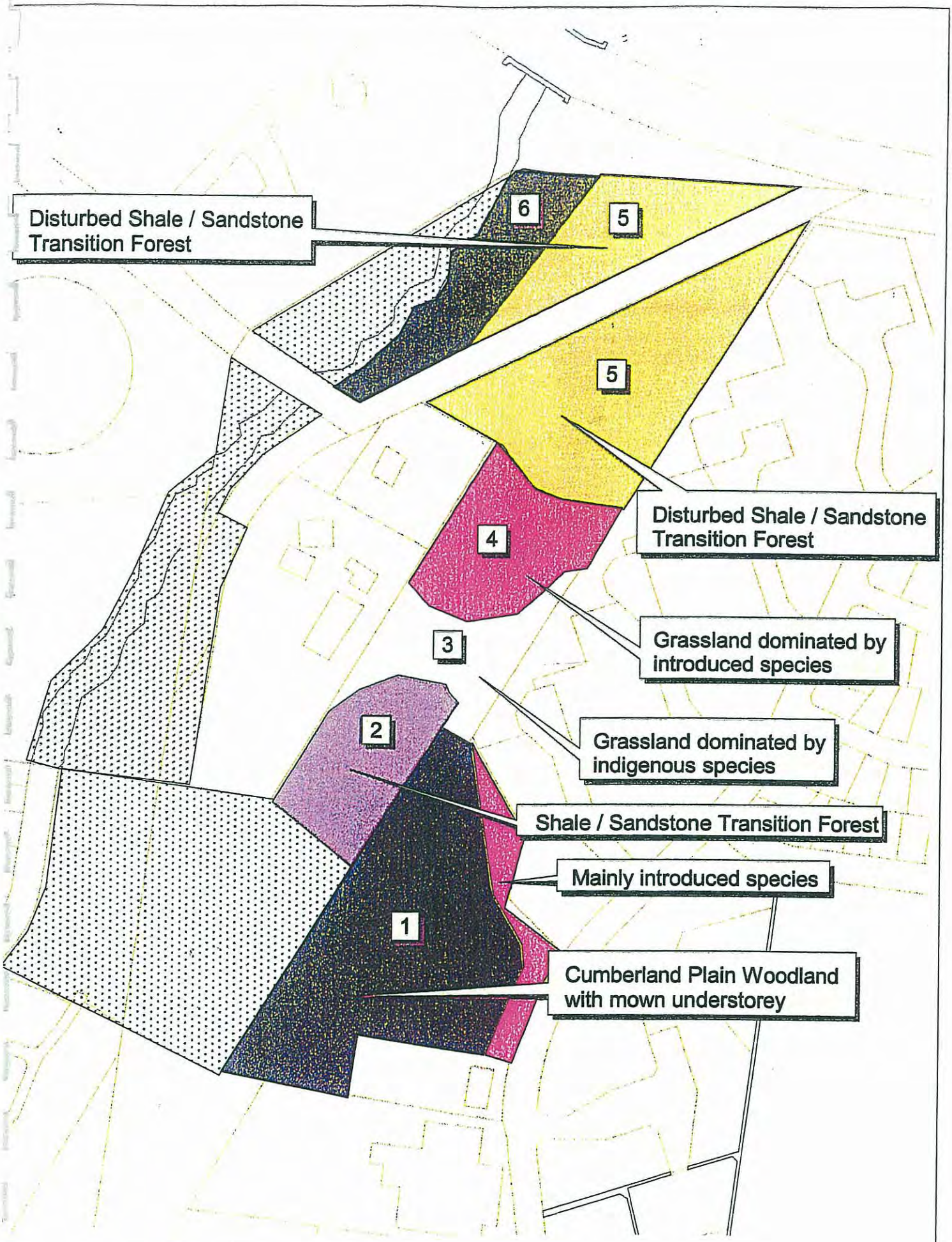
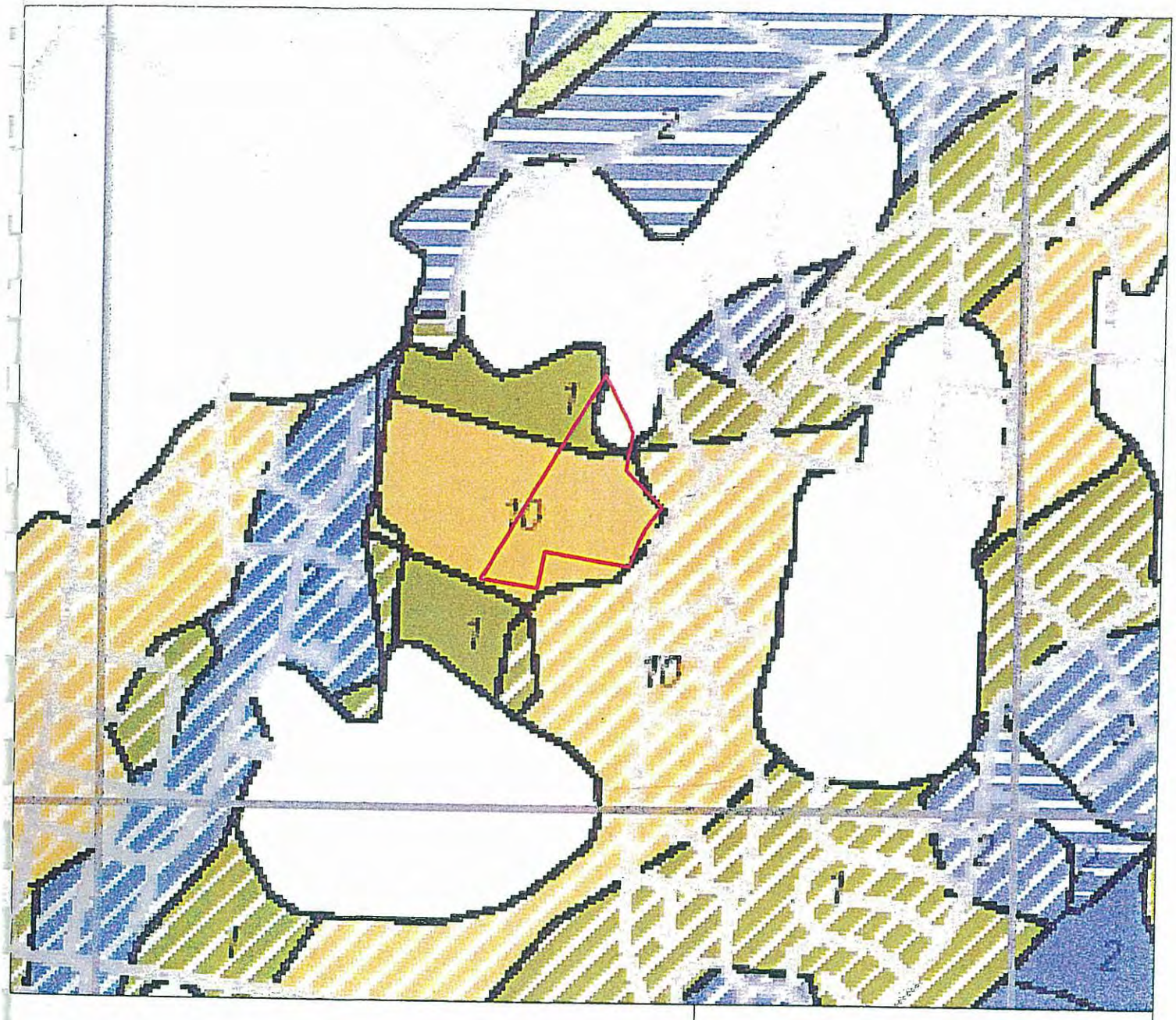


Figure 9
Vegetation mapping (AMBS 2002)



Legend

Endangered ecological communities listed under the Threatened Species Conservation Act 1995 as of 1 June 2002

Shale/Sandstone Transition Forest

1 - Shale/Sandstone Transition Forest (Low Sandstone Influence)

2 - Shale/Sandstone Transition Forest (High Sandstone Influence)

Cumberland Plain Woodland

10 - Shale Plains Woodland

Vegetation Condition Classes

Canopy Cover > 10% (Unless Remnant > 5ha, Where Canopy Cover > 5%) (Areas mapped as classes: A, B, C, SA)

Canopy Cover < 10% (Areas mapped as classes: Cmin, Tx, Txn)

Canopy Cover < 10% (Urban Areas) (Areas mapped as class: Txu)

Note: Condition classes are shown as a shading over the ecological community color code.
Example shown is for:
1 - Shale/Sandstone Transition Forest (Low Sandstone Influence)

Boundary of Site

N

0 130 260

metres

Figure 10
Vegetation mapping (NPWS 2002)

has been mapped by AMBS (2002) as mainly introduced species. The lack of local native species in these areas was consistent with the aerial photograph and site inspection.

The Site was surveyed by Tony Rodd, Jane Rodd, Sian Wilkins and Emma Gorrod on 23 January 2003 in a time of drought, with little rain having been recorded in the five months prior to survey (Appendix 1). A total of 75 species (53 natives and 22 exotics) were recorded from seven transects (T1 – T7) and four Spot locations (A to D) (Tables 2 and 3).

3.2.3 Methods

The transects (T1-T7) (Figure 11) consisted of three contiguous 10 m x 10 m quadrats. The relative frequency of plant species was assessed by recording the presence/absence of each species in three quadrats with presence/absence of herb and shrub species recorded in 5 m x 5 m sub-quadrats (Table 3). In each 10 m x 10 m quadrat, the number of individuals and heights of all tree species were recorded (Table 4).

Supplementary data from Spot location A (Figure 11, Table 3) consisted of recording species present in a 10 m radius. Spot locations B-D recorded species not frequently occurring in the transects.

A selection of sampling locations were photographed at the time of inspection (Appendix 2).

Nomenclature is consistent with Harden (1990-1993, 2002), Harden and Murray (2000) and subsequent taxonomic changes as published in *Telopea*, the Sydney Royal Botanic Gardens' journal of systematic botany, and in other Australian taxonomic literature.

3.2.2 Observations

The vegetation on the Site was disturbed by mowing, rubbish dumping, previous clearings and edge effects from adjoining developments. The Site was criss-crossed by walking tracks and vehicle tracks and a powerline easement adjoined the western boundary of the Site.

The majority of the vegetation (Transects 2-7 and Spot locations A-D) had a mown understorey, with scattered remnant native trees/native tree regrowth. There was a small area in the southern corner of the Site which had not been subject to recent mowing events (Transect 1, Figure 11).

The canopy trees recorded on the Site were *Eucalyptus crebra* (Narrow-leaved Ironbark), *E. fibrosa* (Broad-leaved Red Ironbark), *E. moluccana* (Grey Box) and *E. tereticornis* (Forest Red Gum). The maximum height was approximately 18 m and the density of the trees varied from 0 to 4 trees per 10 m x 10 m sampling area (mean of 1.6 trees per 10 m x 10 m sampling area). No exotic canopy tree species were recorded.

There were infrequent patches of shrubs up to 10 m x 10 m in area. The native shrub species recorded included *Acacia decurrens* (Black Wattle), *A. implexa* (Lightwood), *A. parramattensis* (Sydney Green Wattle), *Breynia oblongifolia* (Coffee Bush) *Bursaria spinosa* var. *spinosa* (Australian Boxthorn), *Exocarpus cupresiformis* (Cherry Ballart), *Indigofera australis* (Native Indigo) and *Notelaea longifolia* (Mock-olive). Of the shrubs > 2 m height, the density varied from 0 to 25 shrubs per 10 m x 10 m sampling area. In Transect 2, there were two quadrats with 25 and 17 shrubs recorded per 10 m x 10 m.

Figure 11
Sampling locations of the current study

Transect 6 had no shrubs recorded and Transects 3, 4, 5, 7 had one shrub species recorded with densities of one individual per 10 m x 10 m sampling area. There were infrequent occurrences of *Lantana camara* (Lantana) (Spot location D), *Ligustrum lucidum* (Large-leaved Privet) (Transect 3), *L. sinense* (Small-leaved Privet) (Transect 5) and *Olea europaea* subsp. *africana* (African Olive) (Transects 4, 5 and Spot location A).

The understorey contained a high proportion of native species, including *Aristida vagans* (Wiregrass), *Brunoniella australis* (Blue Trumpet), *Cymbopogon refractus* (Barbed-wire Grass), *Dianella revoluta* (Blue Flax-lily), *Dichondra repens* (Kidney Weed), *Einadia nutans* (Climbing Saltbush), *Einadia trigonos* subsp. *trigonos* (Fishweed), *Glycine clandestina* (Twining Glycine), *Hardenbergia violacea* (False Sarsaparilla), *Lomandra filiformis* subsp. *filiformis* (Wattle Mat-rush), *Microlaena stipoides* (Weeping Grass), *Paspalidium distans* and *Themeda australis* (Kangarro Grass). There were *Eucalypt* seedlings recorded in the understorey (Transects 1, 3, 6).

Exotic species recorded included *Paspalum dilatatum* (Paspalum), *Plantago lanceolata* (Common Plantain) and *Sida rhombifolia* (Paddy's Lucerne). The weeds on the Site were localised occurrences at the time of survey, although many of the weeds recorded, such as *Lantana camara*, *Ligustrum* species and *Olea europaea* subsp. *africana*, have the potential to cause major infestations in the future if they are not controlled.

In terms of the frequency of exotic to native species, the percentage of exotic to total species recorded in the Transects and Spot location A varied from 13% to 39% with:

Sampling locations	T1	T2	T3	T4	T5	T6	T7	A	B	C	D
Native	16	21	17	20	19	17	14	13	1	1	4
Exotic	4	7	4	3	5	3	9	4	0	0	4
% exotic to total	20%	25%	19%	13%	21%	15%	39%	24%	-	-	-
Total	20	28	21	23	24	20	23	17	1	1	8

Paspalum dilatatum and *Plantago lanceolata* were recorded in all eight sampling locations (Transects 1-7 and Spot location A), *Sida rhombifolia* in 4 of the 8 sampling locations and *Olea europaea* subsp. *africana* in 3 of 8 sampling areas. The remaining 18 exotics were recorded in one or two sampling locations. The pasture grass species, *Paspalum dilatatum,* was widespread over the Site, indicating a previous history of grazing.

3.2.3 Canopy Cover

Of the tree canopy, the number of individual trees greater than a maximum height of 12 m recorded in the 10 m x 10 m quadrats (Table 4) were:

	Number of individuals per quadrat		
Transect 1	3	0	2
Transect 2	4	0	1
Transect 3	2	0	1
Transect 4	1	1	2
Transect 5	1	1	0
Transect 6	2	1	4
Transect 7	4	1	1

The density of canopy trees ranges from 0 to 4 individuals per 100 m^2, with:

- 62% of the quadrats having 0 or 1 individual
- 81% of the quadrats having $\leq$ 2 individuals

The patchy nature of the vegetation observed on the 2002 aerial photograph (Figure 5) is consistent with the data collected in the current study. This is not consistent with the NPWS (2002) mapping of intact vegetation with >10% canopy cover.

4.0 Conservation significance

The conservation significance of the communities and species recorded on the Site were assessed at:

- a National level against the schedules of the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EP&BC Act),
- a State level against the schedules of the Threatened Species Conservation Act 1995 (TSC Act), and
- a Regional level (species only) against James *et al.* (1999)

4.1 Communities

4.1.1 National

The Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EP&BC Act) lists two ecological communities of national significance that occur within a 10 km radius of the Site, namely:

Community	Habitat	Likely to occur on Site?
Cumberland Plain Woodland	Occurs on soils derived from shale on the Cumberland Plain (Commonwealth Listing Advice on Cumberland Plain Woodlands 16 July 2000)	Yes
Shale/Sandstone Transition Forest	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. (Commonwealth Listing Advice on Shale/Sandstone Transition Forest 4 April 2001)	No. Site is to the south of the Shale / Sandstone transition

The vegetation recorded on the Site will therefore be tested against the Commonwealth listing advice for Cumberland Plain Woodlands.

4.1.1.1 Cumberland Plain Woodland

The endangered ecological community Cumberland Plain Woodland is listed as a matter of national environmental significance. Cumberland Plain Woodland occurs in Western Sydney on well structured clay soils derived from Wianamatta Shale (NPWS 2000c). The Commonwealth Listing describes Cumberland Plain Woodlands as (Appendix 3):

- *occurs on soils derived from shale on the Cumberland Plain*

Yes. The soil landscape of the Site is mapped as Blacktown and the geology of the Site is mapped as Ashfield Shale. The Site is on the Cumberland Plain.

- *is characteristically of woodland structure.*

Specht *et al.* (1995) identifies woodland structure as trees reaching a height of between 10-30 m with a canopy cover of between 10-30%.

The vegetation of the Site consisted of remnant trees reaching a maximum height of 18 m and a canopy cover within the range of 10-30%, with a mown understorey. The vegetation on the Site was of woodland structure, although it was highly modified by long term mowing.

- *Canopy is dominated by* Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus eugenioides *and* Eucalyptus (now Corymbia) maculata.

Of the four dominant canopy trees listed, two were recorded on the Site, namely *Eucalyptus tereticornis* and *Eucalyptus crebra*.

- *The understorey is generally grassy to herbaceous with patches of shrubs, or if disturbed, contains components of the indigenous native species sufficient to re-establish the characteristic native understorey. The Cumberland Plain Woodlands ecological community includes regrowth that is likely to achieve a near natural structure or is a seral stage towards that structure.*

The understorey of the Site was mown. Despite this, most of the species recorded in the understorey were native. There were many mown native grasses, such as *Aristida* species, *Austrodanthonia* species and *Themeda australis*, and other native understorey species included *Brunoniella australis*, *Dichondra repens*, *Einadia trigonos* subsp. *trigonos*, *Glycine clandestina* and *Hardenbergia violacea*.

Native shrubs, such as *Acacia implexa*, *Bursaria spinosa* subsp. *spinosa* and *Indigofera australis* were recorded on the Site. There were Eucalypt seedlings recorded in the understorey (Transects 1, 3 and 6). It is considered likely that if the understorey was not mown it may regenerate to a natural structure.

- *The Cumberland Plain Woodland is characterised by the following assemblage of plant species* (Appendix 3).

Of the 56 species listed as characterising this vegetation community (Appendix 3), 26 (46%) were recorded on the Site.

- *A detailed description of the ecological community is provided in Benson D. (1992) The natural vegetation of Penrith. Cunninghamia. 2(4):541-596:*

    - Benson (1992) p. 556–7 is a discussion of map unit 9b: Spotted Gum Forest, which describes the community's distribution and floristic composition. It is an open forest of *Eucalyptus maculata* (now *Corymbia maculata*) and *E. moluccana*, occurring on

hilly country at Hoxton Park and Cecil Park west of Liverpool, and from Werombi southward to The Oaks.

- Benson (1992) p. 558 is a discussion of map unit 9d: Shale/gravel Transition Forest, which occurs on the transitional zone between Wianamatta Shale and Tertiary alluvium, mainly between Penrith and Windsor, and is composed of a mixture of species found on these areas, with dominant canopy species *Eucalyptus fibrosa* (Broad-leaved Red Ironbark) and *Eucalyptus moluccana*. Other tree species are *E. eugeniodes* and *E. sclerophylla*.

- Benson (1992) p.566-575 is a discussion of map units 10c: Grey Box Woodland and 10d: Grey Box–Ironbark Woodland. Grey Box Woodland (10c) is described as occurring "on the flat to gently undulating country that makes up much of the dry central Cumberland Plain core, between Parramatta and Penrith". Grey Box – Ironbark Woodland (10d) is similar to map unit 10c, but it occurs on more hilly Wianamatta Shale country with *Eucalyptus crebra* as a co-dominant.

The vegetation recorded on the Site best fits the Benson (1992) description of Grey Box Woodland (map unit 10c). The dominant tree species recorded on the Site was *Eucalyptus moluccana*.

In conclusion, 1.4 ha of the approximately 2 ha Site supports vegetation that appears to meet the criteria for Cumberland Plain Woodland (Figure 12), as specified by the Commonwealth listing advice, in terms of location, geology, structure and species present with 46% of the characteristic species recorded on the Site.

The current mowing regime on the Site is not appropriate for management of Cumberland Plain Woodland. However, the mowing may be required for bushfire management, especially in the north of the Site adjoining residential development.

This patch has little or no connectivity with other remnant patches of Cumberland Plain Woodland.

4.1.2 State

Four endangered ecological communities listed under the NSW TSC Act have previously been recorded as occurring in the Campbelltown Council (NPWS 2000b), namely:

Figure 12
Vegetation mapping of the Site

Communities	Habitat	Likely to occur on the Site?
Cumberland Plain Woodland	Occurs on soils derived from shale on the Cumberland Plain.	Yes.
O'Hares Creek Shale Forest	Occurs on deep, well drained red loam on small outcrops of Hawkesbury Shale in the Darkes Forest area on the Woronora Plateau within Campbelltown, Wollondilly and Wollongong Council areas. It occurs on flat ridgetops and adjacent slopes.	No. The Site is not underlain by Hawkesbury Shale.
Shale Sandstone Transition Forest	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. SSTF occurs on plateaux and hillsides and at the margins of shale cappings over sandstone.	No. The Site is to the south of the Shale / Sandstone transition.
Sydney Coastal River Flat Forest	Typically associated with rivers and creeks and occurs in the riparian zone and on associated floodplains, terraces and flats on alluvial soils, that is, sand silt and clay of fluvial origin. Its main areas of occurrence are associated with the Hawkesbury-Nepean, Georges and Woronora Rivers and their tributaries.	No. There are no rivers or creeks on the Site.

The vegetation on the Site will therefore be tested against the TSC Act Final Determination for Cumberland Plain Woodland.

4.1.2.1 Cumberland Plain Woodland

In the Final Determination (Appendix 4), gazetted on the 13 June 1997, the NSW Scientific Committee has found that:

1. The Cumberland Plain Woodland is the accepted name for the plant community that occurs on soils derived from shale on the Cumberland Plain.

Yes. The Site is on the Cumberland Plain with a soil landscape mapped as Blacktown and geology mapped as Ashfield Shale.

2. The Cumberland Plain Woodland is characterised by the following assemblage of plant species... (Appendix 4).

Of the 57 species (*Dianella longifolia* is additional to the EP&BC Act listing which has 56 species) listed as characterising this vegetation community (Appendix 4), 27 (47%) were recorded on the Site.

3. *The total list of plant species which occur in the community is much larger, with many species occurring in one or few sites, or in very low abundance. Not all species listed above occur in every single stand of the Community.*

No additional comments.

4. The Cumberland Plain Woodland sites are characteristically of woodland structure, but may include both more open and more dense areas, and the canopy is dominated by species including one or more of the following: Eucalyptus moluccana, Eucalyptus tereticornis, Eucalyptus crebra, Eucalyptus eugenioides *and* Eucalyptus maculata.

Specht *et al.* (1995) identify woodland structure as trees reaching a height of between 10-30 m with a canopy cover of between 10-30%.

The vegetation of the Site consisted of remnant trees reaching a maximum height of 18 m and a canopy cover within the range of 10-30%, with a mown understorey. The vegetation on the Site was of woodland structure, although it was highly modified by long term mowing.

Three of the listed tree species were recorded on the Site, including *Eucalyptus moluccana, Eucalyptus tereticornis* and *Eucalyptus crebra.*

5. *The understorey is generally grassy to herbaceous with patches of shrubs, or if disturbed, contains components of indigenous native species sufficient to re-establish the characteristic native understorey.*

The understorey on the Site was of mown grasses, herbs and shrubs. The understorey contained a high proportion of the listed characteristic native midstorey and understorey species. It is likely that the characteristic understorey would re-establish if mowing ceased.

6. The Cumberland Plain Woodland includes regrowth which is likely to achieve a near natural structure or is a seral stage towards that structure.

There were many Eucalypt seedlings in the understorey. The mown areas also contained a number of native shrubs of *Bursaria spinosa* subsp. *spinosa* and grasses, such as *Aristida* species and *Themeda australis.* It is likely that the vegetation on the Site would regenerate if mowing ceased. However, the area is small, highly disturbed, and contains numerous exotic species, therefore regeneration would require a change of management.

7. The Community has been reported as occurring in the local government areas of Auburn, Bankstown, Baulkham Hills, Blacktown, Camden, Campbelltown, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Penrith and Wollondilly.

The Site is in the Campbelltown LGA.

8. *The Scientific Committee noted that a more detailed description of the community is provided in*

> **Benson (1992) The natural vegetation of the Penrith 1:100,000 map sheet. See particularly p. 556–7, p. 558, p. 566–575.*

See section 4.1.1.1 above.

9. *In addition, general information on the Cumberland Plain Woodland is also provided in:*

**Benson, D. & Howell, J. 1990. 'Taken for Granted – The Bushland of Sydney and its Suburbs'. Kangaroo Press, Kenthurst*

**Benson, D., Howell, J. and McDougall, L. 1996, Mountain Devil to Mangrove: a guide to the natural vegetation in Hawkesbury-Nepean Catchment. Royal Botanic Gardens, Sydney*

Benson and Howell (1990) p. 19–21 is a description of the Cumberland Plain Woodlands. The Cumberland Plain comprises the dry, gently undulating area from west of Parramatta to the Nepean-Hawkesbury River, stretching south to Campbelltown and Camden and north to Richmond and Windsor. The most common and widespread species of the Cumberland Plain are *E. moluccana* and *E. tereticornis*, which may be accompanied by Ironbarks (*E. crebra, E. fibrosa*) on hilly country. The understorey may be shrubby or grassy depending on past disturbance or grazing; variations in floristic composition have presumably been caused by soil and drainage conditions, along with exotic infestation, particularly by *O. europaea* subsp. *africana.*

In Benson *et al.* (1996) p. 16–17 the description of Cumberland Plain Woodland is essentially the same as that given in Benson and Howell (1990).

The vegetation recorded on the Site matches Benson and Howell's description of Cumberland Plain Woodland, with:

- the Site occuring in Campbelltown LGA,
- all listed tree species recorded on the Site,
- grassy, although mown, understorey.

In conclusion, the Site supports approximately 1.4 ha of vegetation that appears to meet the criteria for Cumberland Plain Woodland (Figure 12), in terms of location, substrate, structure and species present, with 47% of the characteristic species and three (of the five) dominant tree species recorded on the Site. The vegetation on the Site is degraded by mowing, rubbish dumping and vehicle and pedestrian traffic.

This patch has little or no connectivity to other areas of bushland, with:

- to the east and north, no bushland connectivity,
- to the south, mainly sealed car park with scatter trees and mown understorey to the south-west,
- to the west, vehicle tracks and a powerline easement up to 60 m total width with degraded vegetation further west.

The current mowing regime on the Site is not appropriate management of Cumberland Plain Woodland. However, the mowing may be required for bush fire management especially in the north of the site adjoining residential development.

4.2 Species

4.2.1 National

The *Environment Protection and Biodiversity Conservation Act 1999* lists threatened ecological communities and species and is a Commonwealth assessment and approval system for: