It should be noted, however, that Koalas in the Campbelltown LGA tend to occur in low densities, and consequently, evidence of their occurrence can be difficult to detect (S. Ward, pers. comm.). Furthermore, the study area is within the potential dispersal distances of Koalas. The area is likely to provide occasional habitat for individual animals, particularly dispersing males, and is likely to represent part of a dispersal corridor for animals moving between the Georges River area and a known colony at Kentlyn to the north of the Airds. Consequently, the area probably contributes to the Campbelltown Koala population to some extent. However, due to the size, relative isolation and degraded condition of much of the potential Koala habitat present, it is unlikely to be capable of supporting a population of the species and so is unlikely to be core Koala habitat.

The study area does not constitute Primary or Secondary Koala habitat as currently defined by the Koala Habitat Atlas for the Campbelltown LGA; however, the Atlas project was unable to determine the significance of *E. tereticornis* for the Koala population within the LGA. This tree species is considered to be of some importance to the Koala, particularly where it occurs on shale soils, but tends to occur only rarely in areas of the LGA where Koalas are still extant due to previous land clearing. Given this, and that Koalas have been recorded within and nearby the study area, those areas identified above as potential Koala habitat could also be categorised as "Unknown Koala Habitat" or "Secondary Koala Habitat" as defined by the Atlas.

4.3 Cumberland Land Snail (*Meridolum corneovirens*)

The Cumberland Land Snail was detected in vegetation unit 1 of the study area; the area of mown Cumberland Plain Woodland. Potential habitat for the species occurs in the proposed park, in the mown Cumberland Plain Woodland area and possibly in the adjacent regenerating bushland. The species' occurrence within other parts of the study area is unclear, particularly in the degraded Shale / Sandstone Transition Forest where existing threatening processes are present. The proposed Masterplan in its current form is likely to have a significant impact on this species.

5 Conclusions and Recommendations

The study site does not currently appear to support a resident population of Koalas and as such is not considered to be core Koala habitat under the provisions of SEPP 44. The site does, however, contain potential Koala habitat, is located adjacent to the Smiths Creek Reserve (categorised as Secondary Koala Habitat by the Koala Habitat Atlas) and could be categorised as "Unknown" or "Secondary" Koala habitat defined by the Koala Habitat Atlas for the Campbelltown LGA. The area is likely, at present, to provide occasional habitat for individual animals and represent part of a dispersal corridor for animals moving between the Georges River area and a known colony at Kentlyn to the north of the Airds. Consequently, the area probably contributes to the Campbelltown Koala population to some extent. On this basis it is recommended that the Smiths Creek riparian corridor be widened to include the area of potential Koala habitat to the east of the creek (i.e. that area where large *E. tereticornis* trees are still present).

The results of the flora survey and 8 part test indicate that the development of housing in some areas identified by the current proposed Masterplan will have a significant impact on areas of Cumberland Plain Woodland and Shale / Sandstone Transition Forest. The proposal would also reduce the area of bushland adjoining the proposed Park and limit the connectivity of the Park to other bushland. Accordingly, a Species Impact Statement would be required for the current proposal for these two communities.

It was not within the scope of this study to assess potential impacts of the proposed Masterplan on threatened fauna species other than the Koala; however, as the proposal would remove known and potential habitat for the Cumberland Land Snail, this species is briefly considered here. On the basis of current knowledge of the species' occurrence within the study area, the proposed Masterplan is considered likely to have a significant impact on this species and would therefore require the preparation of a Species Impact Statement.

The most significant areas for the endangered ecological communities have been identified as the area of mown Cumberland Plain Woodland and the regenerating Forest Red Gum area (units 1 and 2). These areas are also likely to be the most significant habitat for the Cumberland Land Snail within the study area (not including the proposed park), and, together with the large *E. tereticornis* to the east of the Smiths Creek riparian zone, would contain the majority of the potential Koala habitat within the study area.

The potential loss of the highly modified and degraded Shale / Sandstone Transition Forest north of the introduced grassland was assessed as being an insignificant impact on this vegetation community in terms of the TSC Act (but would require a referral to the Commonwealth Environment Minister under the EPBC Act). Notwithstanding this, the area provides a link between the proposed Park and the Smiths Creek Reserve, contains patches of potential Koala habitat where some native regeneration is occurring and, with regeneration work and reduction of threatening processes, could be restored to a more natural condition. If conservation purposes alone are considered, it would therefore be preferable to retain and restore this area and/or

consider possible uses other than housing. It is currently unclear whether or not this area provides habitat for the Cumberland Land Snail (*Meridolum corneovirens*); accordingly, potential impacts and (if necessary) mitigation measures and management of this species should be investigated further.

Consequently, the following recommendations are put forward for consideration:

- Retention and management of as much of the Cumberland Plain Woodland as possible. This will be important to enhance the long-term viability and biodiversity of the local occurrence of this endangered plant community. It is therefore recommended that the mown bushland zone is retained and its connection with the proposed parkland is maintained.
- The Forest Red Gum area should be retained along with its connectivity to the bushland in the proposed park.
- Extension of the Smiths Creek riparian zone to include the adjacent upslope bushland, to retain the link with the bushland in the subject area and the Smiths Creek Reserve.
- Further assessment of some threatened fauna species outside the scope of this study, as identified in AMBS 2001.

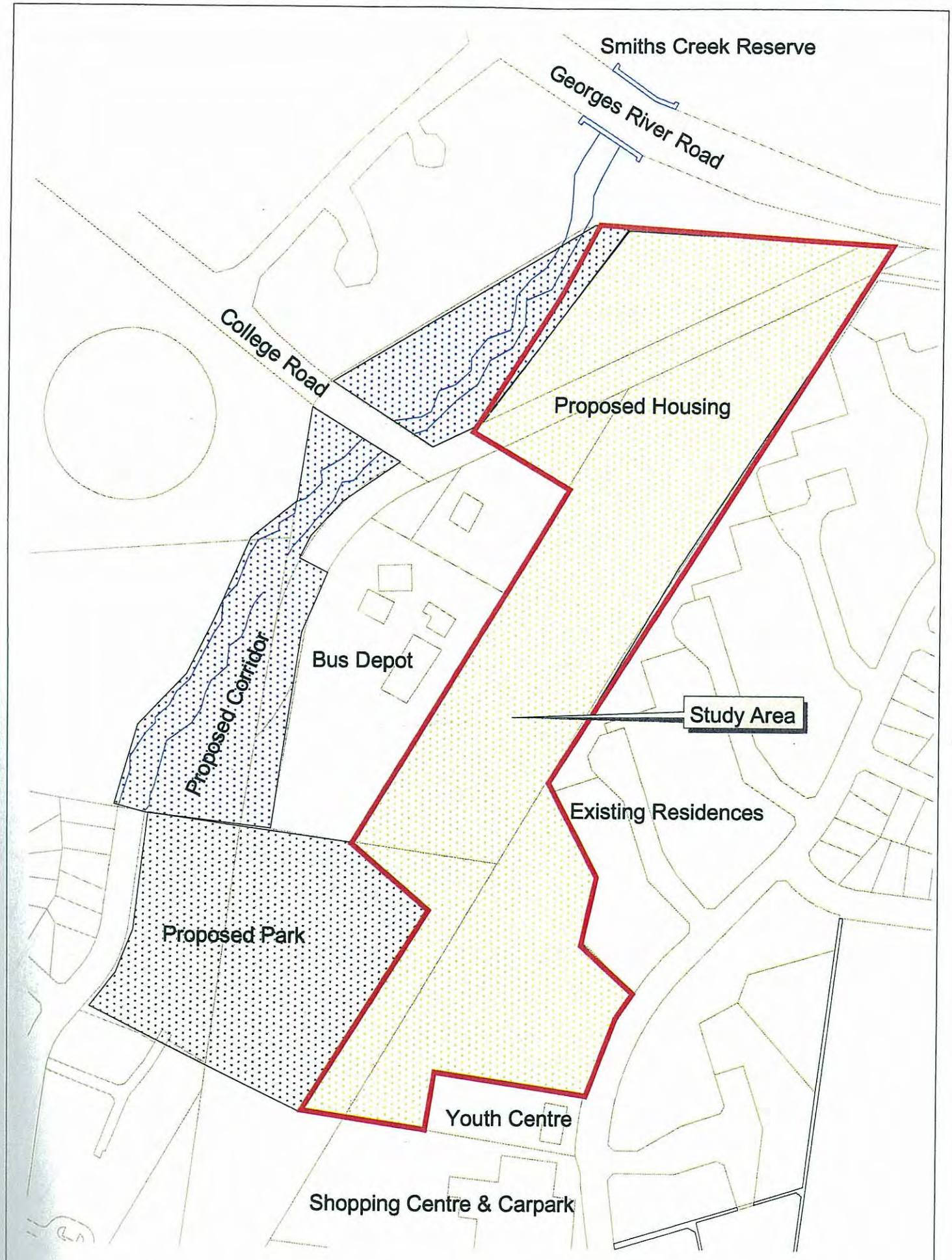

Figure 1: Study Area

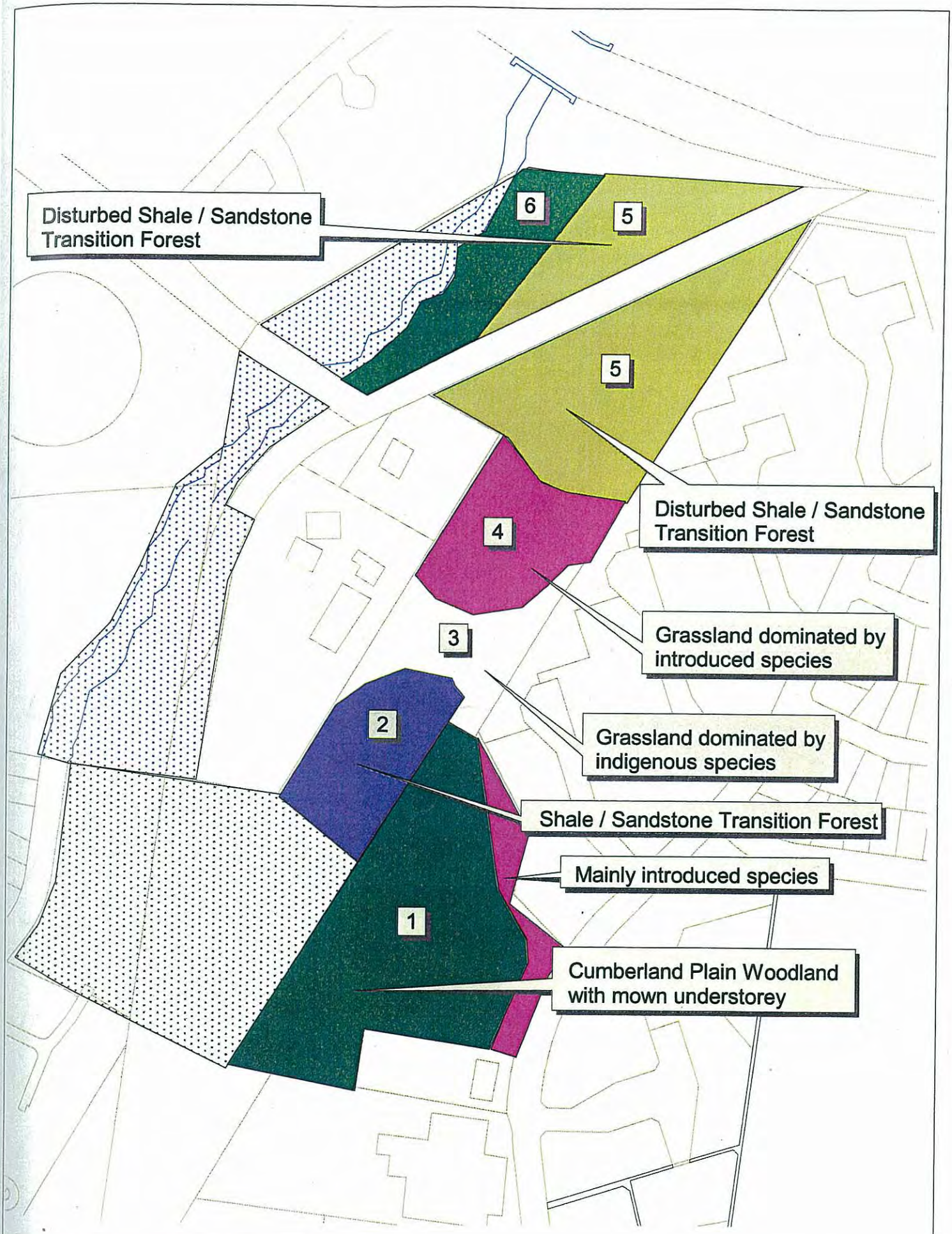

Figure 2: Vegetation Communities

Figure 3: Location of Koala Survey Sites

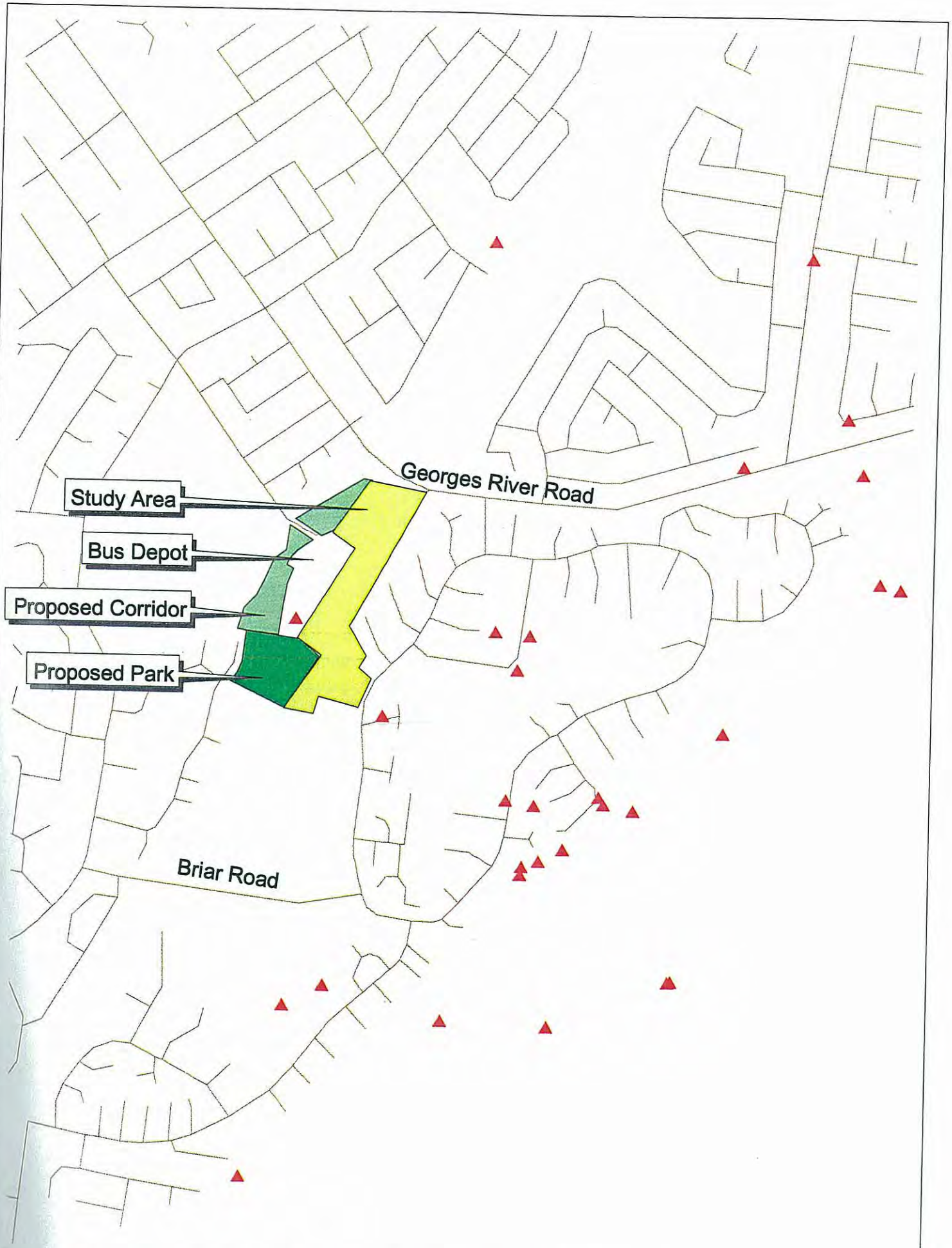

Figure 4: Recorded Koala sightings in the vicinity of the Study Area
(Feb 2000 - present)
Courtesy of University of Western Sydney Database

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Appendix A: Eight Part Tests

CONTIGUOUS CUMBERLAND PLAIN WOODLAND & SHALE / SANDSTONE TRANSITION FOREST

Part 5A of the Environmental Protection & Assessment Act, 1979 (as amended) provides an eight part test for the purpose of determining whether the likely impacts of a proposed development will be 'significant' in terms of the extant threatened species, populations or ecological communities (listed in the Threatened Species Conservation Act, 1995).

An assessment of the effect of the proposed clearing of part of the endangered ecological communities at Airds follows. Each of the points to be considered is written in italics and the assessment is given below each of these.

The subject communities are bounded by:

- An area of Cumberland Plain Woodland proposed for retention in parkland and an existing bus depot to the east
- existing housing and Riverside Drive, to the west
- introduced grassland and the bus depot to the north
- an existing youth centre to the south.

The areas containing highly modified, depauperate Shale / Sandstone Transition Forest and riparian vegetation to the east of the subject vegetation are not included in this eight-part test.

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable to a threatened ecological community

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

Not applicable to a threatened ecological community

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is likely to be modified or removed*

The area covered by the subject endangered ecological communities that would be removed by the proposed development is approximately two hectares.

Information in the determination for the community (NSW Scientific Committee, 1997) states that less than 6% of Cumberland Plain Woodland and 1% of Shale Sandstone Transition Forest remains. Based on this, the loss of any additional community could be potentially significant.

It is proposed that approximately one hectare of the additional, contiguous Cumberland Plain Woodland will be retained in a park.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community*

The existing habitat is contiguous with bushland that occurs in a green corridor north of Georges River Road, Airds, and an area of Cumberland Plain Woodland that is to be retained in a park at the south-western end of the subject area. Most of the remaining surrounding land has been cleared and contains residential development and scattered native and introduced trees.

The loss of bushland in the subject site would isolate remaining Cumberland Plain Woodland in the park.

(e) *whether critical habitat will be affected*

The site does not contain critical habitat as listed in the Threatened Species Conservation Act

(f) *whether a threatened species, population or ecological community or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region*

Neither Cumberland Plain Woodland nor Shale Sandstone Transition Forest is considered to be adequately conserved (NSW Scientific Committee, 1997, 1998).

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process*

The "clearing of native vegetation, leading to a loss of biodiversity" is listed in the Act as being a "Threatening Process".

The loss of the subject bushland is likely to result in the local extinction of some species and restrict genetic exchange within and beyond the bushland by the reduction of area and isolation of the local community. This would have the potential to reduce the viability of the remaining threatened plant community.

The use of fire at high frequency is also listed as being a threatening process. This is not proposed by the subject development, however it is currently occurring in the local area as acts of vandalism.

The reduction of the area of bushland is likely to result in the concentration of fire in the remaining relatively small area of Cumberland Plain Woodland and result in its loss of viability. If a larger area of bushland is retained, it may mean that the illegal burning will have less impact on the viability of the remnant. It will be important to reduce the incidence of fire, whatever area of bushland is finally retained.

(h) *whether any threatened species, population or ecological community is at the limit of its known distribution*

Cumberland Plain Woodland is not at a limit of its geographical distribution. It extends east to Parramatta, south to near Tahmoor, west to the foot of the Blue Mountains and north to Ebenezer (NPWS, 2000; Benson, 1992).

Shale / Sandstone Transition Forest is not at a limit of its geographical distribution. It extends east to Parramatta, south to near Tahmoor, west to the lower Blue Mountains and Nattai district, and north to near Ebenezer (NPWS, 2000).

Conclusion

Owing to the:
- size of area of community that is likely to be affected (c. 2 ha)
- small size of remaining Cumberland Plain Woodland following the proposed clearing
- increased potential impact of fire and associated environmental weeds on the remaining community of the community following the proposed clearing
- loss of connectivity of the remaining community with other bushland

it is considered that the impact of the development will be significant in terms of the Environmental Planning & Assessment Act and Threatened Species Conservation Act.

It is also likely to be significant in terms of the (Commonwealth) Environmental Protection & Biodiversity Conservation act, 1999.

SHALE / SANDSTONE TRANSITION FOREST

Part 5A of the Environmental Impact & Assessment Act, 1979 (as amended) provides an eight-part test aimed at helping to determine whether the likely impacts of a proposed development will be significant in terms of the extant threatened species, populations or ecological communities (listed in the Threatened Species Conservation Act, 1995).

An assessment of the effect of the proposed clearing of part of the endangered ecological communities at Airds follows. Each of the points to be considered is written in italics and the assessment is given below each of these.

The subject community is bounded by:
- Georges River Road to the north.
- introduced grassland and the bus depot to the south
- existing housing west of Riverside Drive, to the east
- approximately 40 m east of Smiths Creek riparian zone to the west.

The areas containing Cumberland Plain Woodland south of the subject area, and an area of *Eucalyptus tereticornis* Shale / Sandstone Transition Forest are not included in this eight-part test.

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable to a threatened ecological community

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

Not applicable to a threatened ecological community

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is likely to be modified or removed*

The area covered by the subject endangered ecological communities that would be removed by the proposed development is approximately one hectare.

Information in the determination for the community (NSW Scientific Committee, 1997) states that less than 1% of Shale Sandstone Transition Forest remains. Based on this, the loss of any additional community could be potentially significant.

The conservation value of the vegetation is considered to be much lower than the nominal value owing to its poor condition because of the occurrence of high concentrations of environmental weeds and frequent burning.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community*

The existing habitat is contiguous with highly modified bushland that occurs downslope. Most of the remaining surrounding land has been cleared and contains residential development and scattered native and introduced trees.

The loss of bushland in the subject site would not isolate remaining Shale / Sandstone Transition Forest.

(e) *whether critical habitat will be affected*

The site does not contain critical habitat as listed in the Threatened Species Conservation Act

(f) *whether a threatened species, population or ecological community or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region*

Shale / Sandstone Transition Forest is not considered to be adequately conserved (NSW Scientific Committee, 1998).

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process*

The "clearing of native vegetation, leading to a loss of biodiversity" is listed in the Act as being a "Threatening Process".

The loss of the subject bushland is likely to result in the local extinction of one common and widespread species (*Jacksonia scoparia*).

The use of fire at high frequency is also listed as being a threatening process. This is not proposed by the subject development, however it is currently occurring in the local area as acts of vandalism.

The reduction of the area of bushland is likely to result in the concentration of fire in the remaining relatively small area of Cumberland Plain Woodland and result in its loss of viability. If a larger area of bushland is retained, it may mean that the illegal burning will have less impact on the viability of the remnant.

It will be important to reduce the incidence of fire, whatever area of bushland is finally retained.

(h) *whether any threatened species, population or ecological community is at the limit of its known distribution*

Shale / Sandstone Transition Forest is not at a limit of its geographical distribution. It extends east to Parramatta, south to near Tahmoor, west to the lower Blue Mountains and Nattai district, and north to near Ebenezer (NPWS, 2000).

Conclusion

Owing to the:

- relatively small size of area of community that is likely to be affected (less than one hectare)
- existing poor condition
- high fire frequency and likely inability to prevent this continuing
- lack of connectivity of the community with other bushland
- it is considered that the impact of the development will be insignificant in terms of the Environmental Planning & Assessment Act and Threatened Species Conservation Act.

It is likely to be insignificant in terms of the (Commonwealth) Environmental Protection & Biodiversity Conservation act, 1999.

SHALE SANDSTONE TRANSITION FOREST
(Flora and Fauna Corridor)

Part 5A of the Environmental Impact & Assessment Act, 1979 (as amended) provides an eight-part test aimed at helping to determine whether the likely impacts of a proposed development will be significant in terms of the extant threatened species,

populations or ecological communities (listed in the Threatened Species Conservation Act, 1995).

An assessment of the effect of the proposed clearing of part of the endangered ecological communities at Airds follows. Each of the points to be considered is written in italics and the assessment is given below each of these.

The subject community is the Smiths Creek riparian zone and adjoining 30 metre-wide largely indigenous grassland corridor approximately 10-40 upslope of Smiths Creek. This zone connects the Cumberland Plain Woodland in the proposed park with the Smiths Creek green corridor north of Georges River Road (Map).

(a) *in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction*

Not applicable to a threatened ecological community

(b) *in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised*

Not applicable to a threatened ecological community

(c) *in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is likely to be modified or removed*

The area covered by the subject endangered ecological communities that would be removed by the proposed development is approximately one hectare.

Information in the determination for the community (NSW Scientific Committee, 1997) states that less than 1% of Shale Sandstone Transition Forest remains. Based on this, the loss of any additional community could be potentially significant.

The conservation value of the vegetation upslope of the riparian zone has been reduced by previous clearing and land uses. These have resulted in loss of much of the tree canopy and shrub stratum. The vegetation in the riparian zone is considered to be much lower than the nominal value owing to its very poor condition because of the dominance of environmental weeds in the understorey.

(d) *whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community*

The existing habitat is contiguous with highly modified bushland that occurs on the opposite side of Georges River Road. Most of the remaining surrounding district has been cleared and contains residential development and scattered native and introduced trees.

The loss of bushland in the subject site would isolate remaining Cumberland Plain Woodland and Shale Sandstone Transition Forest.

(e) *whether critical habitat will be affected*

The site does not contain critical habitat as listed in the Threatened Species Conservation Act

(f) *whether a threatened species, population or ecological community or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region*

Shale Sandstone Transition Forest is not considered to be adequately conserved (NSW Scientific Committee, 1998).

(g) *whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process*

The "clearing of native vegetation, leading to a loss of biodiversity" is listed in the Act as being a "Threatening Process".

The loss of the subject bushland is unlikely to directly result in the local extinction of any species. The loss of connectivity is likely to have an adverse impact on the dissemination of seeds and on genetic flows. These could cause loss of species viability in the remaining isolated bushland.

The use of fire at high frequency is also listed as being a threatening process.

This is not proposed by the subject development, however it is currently occurring in the local area as acts of vandalism.

The reduction of the area of bushland is likely to result in the incremental concentration of fire in the remaining relatively small area of Cumberland Plain Woodland and result in its loss of viability. If a larger area of bushland is retained, it may mean that the illegal burning will have less impact on the viability of the remnant.

It will be important to reduce the incidence of fire, whatever area of bushland is finally retained.

(h) *whether any threatened species, population or ecological community is at the limit of its known distribution*

Shale Sandstone Transition Forest is not at a limit of its geographical distribution. It extends east to Parramatta, south to near Tahmoor, west to the lower Blue Mountains and Nattai district, and north to near Ebenezer (NPWS, 2000).

Conclusion

Owing to the:

- importance of the link this vegetation maintains with endangered ecological communities to the north and south
- extension of bushland obtained in the local area, where total bushland is very limited
- importance of this area to reduce the fire frequency on other local areas of bushland

it is considered that the impact of the development will be insignificant in terms of the Environmental Planning & Assessment Act and Threatened Species Conservation Act.

It is likely to be significant in terms of the (Commonwealth) Environmental Protection & Biodiversity Conservation act, 1999 for the same reasons as stated above.

Euphorbiaceae	*Poranthera microphylla*		1	1	2
Fabaceae	*Desmodium varians*	Tick Trefoil		2	1
	**Trifolium arvensis*				3
	**T. sp.*	Clover	2		3
Goodeniaceae	*Goodenia hederacea*			2	
Haloragaceae	*Gonocarpus teucrioides*				2
Lamiaceae	*Ajuga australis*	Austral Bugle		1	
Malvaceae	**Sida rhombifolia*	Paddy's Lucerne			1
Oxalidaceae	*Oxalis exilis*		2		
	**O. sp.*		2		
Plantaginaceae	**Plantago lanceolata*	Lamb's Tongue		3	2
Polygonaceae	*Persicaria decipiens*				#
Primulaceae	**Anagallis arvensis*	Scarlet Pimpernel	1		1
Rubiaceae	*Opercularia diphylla*			3	
Verbenaceae	**Verbena officinalis*	Small-flowered Purpletop			2
Herbs – Monocots					
Agavaceae	**Aloe vera*	Aloe vera			1
Anthericaceae	*Tricoryne elatior*		1	2	1
Cyperaceae	*Lepidosperma laterale*	Broad Sword-sedge		adj	
Lomandraceae	*Lomandra filiformis*				
	ssp. Filiformis			2	
	L. multiflora	Many-flowered Mat-rush	adj	4a	
Phormiaceae	*Stypandra glauca*				#
Poaceae	*Aristida ramosa*	Three-awned Grass		2	1
	A. vagans	Three-awned Grass	3	2	1
	Cymbopogon refracta	Barb-wire Grass	2		3
	**Cynodon dactylon*	Couch Grass			4b
	Danthonia sp.	Wallaby Grass		4a	2
	Dichelachne micrantha	Plume Grass	2		1
	Echinopgon caespitosus	Hedgehog Grass	3		
	Entolasia marginata	Margined Panic		1	
	Eragrostis leptostachya			3	1
	Hemarthria uncinata				#
	Microlaena stipoides	Weeping Grass	5	4b	4b
	Panicum effusum		1		1
	**Paspalum dilatatum*	Paspalum		1	1
	**Pennisetum clandestinum*	Kikuyu	1		
	**Setaria gracilis*	Slender Pigeon Grass	1		3
	Sporobolus elongatus	Rat's Tail Grass			#
	Themeda australis	Kangaroo Grass	4b	4b	4b
Vines					
Fabaceae	*Glycine microphylla*		1		
	G. tabacina		3	2	2
	Hardenbergia violacea	Purple Coral Pea	adj	3	
	Kennedia rubicunda	Dusky Coral Pea			#
Lauraceae	*Cassytha pubescens*	Devil's Twine			#
Asparagaceae	**Myrsiphyllum asparagoides*	Bridal Veil Creeper	2		