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Readymix Rooty Hill

Regional Distribution Centre Flora and Fauna Impact Assessment

14 June 2005

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and Sian Wilkins

Natural & Cultural Heritage Consultants 10 Bartley St Chippendale NSW 2008

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Report for Readymix Holdings Pty Ltd

Engaged by National Environmental Consulting Services Pty Ltd

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Project no: s4184

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ABBREVIATIONS

CAV	Census of Australian Vertebrates
DEC	NSW Department of Environment and Conservation
DEH	Commonwealth Department of the Environment and Heritage
DIPNR	Department of Infrastructure, Planning and Natural Resources
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act* 1979
EPBC Act	*Environment Protection and Biodiversity Conservation Act* 1999
KTP	Key Threatening Process
LGA	Local Government Area
NPWS	NSW National Parks and Wildlife Service (now DEC)
REF	Review of Environmental Factors
ROTAP	Rare or Threatened Australian Plant as listed by Briggs and Leigh (1995)
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
TSC Act	*Threatened Species Conservation Act* 1995
sp.	species (singular)
spp.	species (plural)
ssp.	subspecies
var.	variety

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1.0 SUMMARY

Biosis Research was commissioned by National Environmental Consulting Service Pty Ltd (NECS) on behalf of Readymix Holdings Pty Ltd to undertake a flora and fauna assessment of the proposed development of the Kellogg Road Regional Distribution Centre (RDC), Rooty Hill. The development includes the construction of a rail siding, conveyor belts, concrete batching plant, storage and distribution area and associated infrastructure.

The study area comprises an area of cleared/disturbed grassland directly north of the Main Western rail line, an area of native woodland along Angus Creek, which crosses the site and a large area of cleared/disturbed land and scattered sections of native vegetation bordering the adjacent Humes industrial site. The woodland is composed of moderate and poor quality Cumberland Plain Woodland and poor quality River-flat Eucalypt Forest both listed as Endangered Ecological Communities (EEC) in Schedule 1 the *Threatened Species Conservation Act* (TSC Act) 1995.

The proposed development would remove the following areas of approximately 1.6 ha of native vegetation and a further 8.5 ha of cleared/disturbed grassland area. This includes 0.5 ha of moderate quality and 0.9 ha of poor quality Cumberland Plain Woodland and 0.2 ha of poor quality River-flat Eucalypt Forest.

Grevillea juniperina ssp. *juniperina* and the Cumberland Land Snail *Meridolum Corneovirens*, both listed as threatened species under the TSC Act. *Grevillea juniperina* ssp. *Juniperina* is listed as Vulnerable in Schedule 2 of the TSC Act and the Cumberland Land Snail is listed as endangered in Schedule 2 of the TSC Act. They were recorded during the current study, outside the development footprint. Fifteen threatened plant species, two EECs and 31 threatened and/or migratory animal species were considered under the relevant provisions of the *Threatened Species Conservation Act* (TSC Act) 1995, *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 and *Environmental Planning and Assessment Act* (EP&A Act) 1979 (as amended).

It is unlikely that the proposed development will impact on these threatened species, populations or ecological communities and a Species Impact Statement and/or Referral are therefore not required.

In order to ameliorate the impacts of the proposed development on the flora and fauna values of the study area the following mitigation measures are recommended:

- A Vegetation Management Plan (VMP), including a Weed and Waste Management Plan, be prepared and implemented;

- Revegetation of disturbed areas outside the development footprint and areas disturbed by the construction, using local endemic native plant species;
- Exclusion fencing of the native vegetation outside the development footprint;
- Implementation of appropriate sediment and erosion control measures including silt fencing;
- Protection of native hollow bearing trees;
- Provision of additional sheltering habitat for the Cumberland Plain Land Snail.

2.0 INTRODUCTION

2.1 Background

Biosis Research Pty. Ltd. was commissioned by National Environmental Consulting Services Pty. Ltd., on behalf of Readymix Holdings Pty. Ltd., to undertake a terrestrial flora and fauna assessment for the proposed development at, Kellogg Rd, Rooty Hill, NSW (the study area).

This report assesses the conservation significance of the study area in terms of the threatened species, populations (and their habitats) or ecological communities that occur, or have the potential to occur in the study area in accordance with the requirements of the *Environmental Planning and Assessment Act* 1979 (EP&A Act), *Threatened Species Conservation Act* 1995 (TSC Act) and *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).

2.1.1 Description and features of the study area

The study area lies within the Blacktown Local Government Area (LGA) in Western Sydney (Figure 1). Angus Creek, a tributary of Eastern Creek, traverses the southern section of the study area, running east from the study area through Nurragingy Reserve into Eastern Creek. The study area supports riparian vegetation along the banks of Angus Creek, with regenerating woodland vegetation existing further from the creek bank. The majority of the study area is cleared grassland. The northern section of the site contains an isolated patch of vegetation and slopes from the Humes industrial area towards the south east through an undulating area of fill from the development of the OneSteel Mini Mill. The Humes portion of the site, in the northern section of the development site, is currently used for car parking and contains scattered trees and landscape planting (Figure 2).

2.1.2 Proposed Development

Readymix proposes to construct and operate a Regional Distribution Centre (RDC) at Kellogg Road, Rooty Hill. The location of the proposed site is shown in Figure 5.1. Construction materials such as sand and aggregate would be transported by rail to the RDC from quarries outside of the Sydney Basin. These materials would be blended by equipment at the RDC as required to suit customer requirements, and distributed by road to the Sydney market. The proposed RDC would be capable of handling up to 4 million tonnes per annum (Mtpa) of product. It would commence operation handling 2 to 2.5 Mtpa increasing to a projected full capacity of about 4 Mtpa as dictated by the construction materials market. The materials are typically used for the

manufacture of Concrete and Asphalt. They also have a variety of other uses in civil and construction industries.

Readymix currently supply these materials through the company's Penrith Lakes Quarry however this resource is nearly depleted and the facility is due to wind down from 2008 with closure by 2011-2012. The location of the proposed RDC will allow the company to receive materials by rail using a siding off the Main Western Railway and to distribute the materials by road using the new M7 Motorway.

A proposed layout of the RCD is provided in Figure 2. The RDC would be developed to include:

- A regional office building which incorporates a quarry materials and concrete testing laboratory;
- A rail siding with aggregate unloading facility;
- Storage bin area and load out facilities;
- Ground storage and reclaim facilities;
- Blending plant;
- A conveyor system linking the unloading station, along the northern edge of the rail siding to the eastern corner and then north and across the site, bridging Angus Creek to the storage and truck load out facilities in the northern section of the site (Figure 2).
- Workshop, stores, and amenities facilities, truck washdown facilities, truck refuelling, weighbridges, truck and car parking;
- Concrete Batching Plant;
- Bridges at two locations over Angus Creek; and
- Realignment of North Parade.

The proposed RDC would be constructed over a two year period, with construction anticipated to begin in 2006.

2.2 Aims

The general aim of this report is to undertake a terrestrial flora and fauna assessment of the study area to determine the impact of the proposal on any matter of conservation significance.

The specific aims are to:

1. conduct a literature review and database search for the study;
2. provide an assessment of the habitat values of the subject site;
3. undertake targeted field surveys threatened terrestrial species, populations (and their habitats) or ecological communities listed under the schedules of the TSC Act and/or EPBC Act that are known or likely to occur within the study area;
4. undertake Section 5A EP&A Act assessments 'Eight Part Test' for threatened species, populations and ecological communities listed on the TSC Act and/or Assessment of Significance for threatened species, populations and ecological communities and migratory species listed on the EPBC Act that are either directly or indirectly effected by the proposal; and,
5. provide recommendations to minimise the environmental impacts of the proposed development.

3.0 METHODS

The study site was inspected on 2 March 2005. The general condition of the study area was assessed and observations made of extant plant and animal species and vegetation communities (as detailed below). During the site visit the weather was warm and sunny with moderate to high winds.

3.1 Taxonomy

The plant taxonomy (method of classification) used in this report follows Harden (1990, 1992, 1993, 2002) and subsequent advice from the National Herbarium of NSW. In the body of this report plants are referred to by their scientific names only. Common names where available have been included in the Appendices.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by Department of Environment and Heritage (DEH). In the body of this report Vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Common and scientific names are included in the Appendices.

3.2 Legislation

Federal and State Acts and Policies that apply to the study area with regard to terrestrial flora and fauna are listed include:

- *Environmental Protection and Biodiversity Conservation Act* 1999 (Commonwealth)
- *Threatened Species Conservation Act* 1995 (NSW)
- *Water Management Act* 2000 (NSW)/*Rivers and Foreshores Improvement Act* 1948 (NSW)
- *Environmental Planning and Assessment Act* 1979 (NSW)

3.3 Literature and Database Review

A list of documents used to prepare this report is located in *References*. Records of threatened species, populations and communities were obtained from the Department of Environment and Conservation (DEC) Atlas of NSW Wildlife within a 10 km radius of the study area, using the Penrith 1:100 000 map sheet. Records for threatened species, populations and communities listed on the EPBC Act were obtained from the Department of Environment and Heritage (DEH)

EPBC Protected Matters Database within a 10 km radius of the study area. Database searches were conducted in March 2005.

Records from the previous studies of the area undertaken by NECS in 2002-2003 which included field assessments flora and fauna searches were utilised in this assessment (NECS 2004).

3.4 Flora Survey

Species of plant growing in the study area were surveyed by undertaking a general habitat assessment as well as targeted searches for habitat of threatened species.

3.4.1 Flora Habitat Assessment

The condition of the vegetation was assessed according to the degree to which it resembled relatively natural, undisturbed vegetation using the following criteria:

- species composition (species richness, degree of weed invasion); and,
- vegetation structure (representation of each of the original layers of vegetation).

The three categories used to evaluate general habitat value were Good, Moderate or Poor, as detailed below:

Good: containing a high number of indigenous species; no weeds present or weed invasion restricted to edges and track margins; vegetation community contains original layers of vegetation; vegetation layers (ground, shrub, canopy etc) are intact.

Moderate: containing a moderate number of indigenous species; moderate level of weed invasion; weeds occurring in isolated patches or scattered throughout; one or more of original layers of vegetation are modified; vegetation layers (ground, shrub, canopy etc) are largely intact.

Poor: containing a low number of indigenous species; high level of weed invasion; weeds occurring in dense patches or scattered throughout; one or more of the original layers of vegetation are highly modified; one or more original vegetation layers (ground, shrub, canopy etc) are modified or missing.

3.5 Fauna Survey

Fauna species using the site were surveyed by undertaking active searching and listening, as well as recording incidental observations.

3.5.1 Fauna Habitat Assessment

The three categories used to evaluate habitat value were Good, Moderate or Poor, as detailed below:

Good: ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native fauna species.

Moderate: ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna species.

Poor: ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native fauna species.

Other habitat features such the value of the study area as a habitat corridor, the presence of remnant communities or unusual ecological vegetation community structure, were also used to assess habitat quality.

3.6 Limitations

This study was by design a brief and preliminary habitat assessment and was conducted in accordance to methodology that would be employed for an assessment in accordance with Section 5A of the EP&A Act. No trapping, spotlighting, call playback or vegetation quadrat sampling techniques were used.

4.0 RESULTS

A list of the flora and fauna species recorded during the survey is provided in Appendix 1 and Appendix 2 respectively.

4.1 Soil

The soil landscapes of the study area include Blacktown (map unit bt), described as "gently undulating rises on Wianamatta Group shales" and South Creek (map unit sc), described as "floodplains, valley flats and drainage depressions of the channels on the Cumberland Plain" (Bannerman & Hazelton 1990).

A geological assessment of the study area (DouglasPartners 2003) found that the entire study area is underlain by weathered rocks of the Bringelly Shale Formation, the upper member of the Wianamatta Group of sedimentary rocks. Clay soils were found to overlie the shale bedrock over all of the study area, with most of the clays in the southern section alluvial in origin and in the northern section residual in origin (DouglasPartners 2003).

4.2 Vegetation Communities

The vegetation within the study area has been mapped by DEC (Tozer 2003) as Sydney Coastal River-flat Forest (Alluvial Woodland) along Angus Creek, with scattered patches of Cumberland Plain Woodland (Shale Plains Woodland) (Figure 3). Cumberland Plain Woodland is listed as an Endangered Ecological Community (EEC) under Schedule 3 of the TSC Act. Cumberland Plain Woodland is also listed as an EEC under the EPBC Act. Sydney Coastal River-flat Forest was previously listed as an EEC under the TSC Act, but has since been replaced by a number of EEC listings, including River-flat Eucalypt Forest.

Three vegetation communities were recorded within the study area during the current survey: Riparian Forest, Woodland and Cleared/Disturbed Areas.

Riparian Forest (River-flat Eucalypt Forest)

Riparian Forest flanks the banks of Angus Creek in the southern section of the study area (Figure 4). The Riparian Forest was generally in poor condition, dominated by exotic species.

The canopy was dominated by the exotic species *Ligustrum lucidum* and the native species *Casuarina glauca*, with *Angophora floribunda* and *Melaleuca decora* less dominant. The midstorey was dominated by the exotic species *Ligustrum sinense* and the understorey was dominated by the exotic species *Tradescantia albiflora,* with the native species *Commelina cyanea* less frequent.

Other exotic species recorded within the Riparian Forest include the midstorey species *Arundo donax, Olea europaea* ssp. *africana, Ricinus communis* and *Solanum* spp. and the understorey species *Araujia hortorum, Asparagus* spp., *Bidens pilosa, Cyperus eragrostis* and *Juncus acutus*. Native species were less frequent, but included the midstorey species *Acacia parramattensis* and the understorey species *Dianella revoluta, Lomandra longifolia, Oplismenus aemulus, Plectranthus parviflorus* and *Pratia purpurescens.*

The Riparian Forest within the study area is consistent with the EEC River-flat Eucalypt Forest (Figure 4).

The River-flat Eucalypt Forest within the study area continues off-site to the east and west of the study area, following the banks of Angus Creek (Figure 4).

Woodland (Cumberland Plain Woodland)

In the southern section of the study area Riparian Forest grades into Woodland in better drained areas not directly influenced by the creek (Figure 4). Scattered patches of woodland also occur in the northern section of the study area and in the southern section in the vicinity of the railway.

The woodland vegetation recorded within the study area was dominated by native canopy species *Eucalyptus tereticornis* with occasional *E. molucanna;* native midstorey species *Acacia parramattensis* and *Bursaria spinosa,* with occasional *Daviesia ulicifolia*; and native understorey species *Aristida vagans, Brunoniella australis, Dianella longifolia, Eragrostis leptostachya, Glyine spp., Microlaena stipoides, Oxalis perennans, Themeda australis, Vernonia cinerea* and *Wahlenbergia gracilis.* The dominant exotic species recorded within the Woodland vegetation include the grass species *Eragrostis curvula, Pennesetum clandestinum, Paspalum dilatatum* and *Setaria gracilis.*

The woodland within the study area varied in condition from moderate to poor (see Figure 4). There were some large remnant trees within the Woodland, but most of the trees within the study area appeared to be regrowth. Moderate quality woodland occurred in the southern section of the study area to the south of Angus Creek. This area contained a high diversity of native species in the understorey despite disturbance such as weed invasion and tracks. Other woodland patches within the study area were in moderate to poor condition, with a higher incidence of weed invasion and fewer native species in the understorey. Dominant exotic species recorded in Woodland of poor condition included the grass species *Chloris gayana, Eragrostis curvula, Paspalum dilatatum, Pennisetum clandestinum* and *Setaria gracilis.*

The woodland recorded within the study area is consistent with the EEC Cumberland Plain woodland (Figure 4), meeting the criteria listed in the Final

Determination (NPWS 1997a), with 47% of the listed characteristic species recorded, including three of the listed characteristic tree species, and occurring on Wianamatta Shale.

The patch of Cumberland Plain Woodland to the south of Angus Creek continues off-site to the east of the study area (Figure 4).

The threatened plant species *Grevillea juniperina* ssp. *juniperina* was recorded in two locations within disturbed Cumberland Plain Woodland in the study area, to the north and south of Angus Creek (Figure 4). Both locations were within disturbed areas adjacent to a sydney water sewer pipeline route.

Cleared/Disturbed Areas

Cleared/Disturbed Areas occur over the majority of the northern section of the study area, including the buildings and car park area in Humes section (Figure 4). The dominant species recorded in the Cleared/Disturbed Areas include the exotic species *Axonopus affinis, Briza maxima, Chloris gayana, Eragrostis curvula, Paspalum dilatatum, Pennisetum clandestinum* and *Verbena spp.* Native species were also recorded within the Cleared/Disturbed Areas including the tree species *Eucalyptus tereticornis* and *Casuarina glauca,* the small tree/shrub species *Acacia parramattensis, Melaleuca decora* and *Bursaria spinosa* and the understorey species *Fimbristylis dichotoma* and *Themeda australis.*

Drainage lines occurring within the Cleared/Disturbed Areas were dominated by *Cyperus eragrostis, Eleochaeris* spp.*, Juncus acutus* and *Typha* sp.

4.3 Flora

A list of plant species recorded is provided in Appendix 1.

A total of 111 vascular plant species were recorded within the study area, comprising 66 (59%) native species and 45 (41%) exotic species.

Seven plant species recorded within the study area are listed as regionally vulnerable in western Sydney (James *et al.* 1999), namely *Acacia fimbriata, Cassinia arcuata, Chloris truncata, Convolvulus erubescens, Eleocharis gracilis, Grevillea juniperina* ssp. *juniperina* and *Oxalis perennans.*

Six plant species listed as noxious weeds in the Blacktown LGA were recorded within the study area: *Bryophyllum delagoense, Cortaderia spp., Ligustrum lucidum, Ligustrum sinense, Hypericum perforatum* and *Rubus fruticosus*.

4.3.1 Significant Flora

Twelve threatened flora species listed on the TSC Act (Figure 5) and 10 threatened flora species listed on the EPBC Act, or their habitat have been previously recorded in the local area (with a 10km radius of the study area) (DEC Atlas of NSW Wildlife and DEH Online EPBC Database). A total of 15 threatened flora species are considered in this report (Table 1).

One plant species was recorded within the study area, *Grevillea juniperina* ssp. *juniperina* (Figure 4), is listed as vulnerable in Part 1 of Schedual2 of the TSC Act (Table 1). Potential habitat for one additional threatened species, *Acacia pubescens*, was also present within the study area (Table 1), although this species was not recorded during the current survey. As such, Eight Part Tests and Assessments of Significance have been undertaken for these species (Appendix 4 and 5).

Table 1: Terrestrial flora listed on the TSC Act or EPBC Act that have the potential to occur in the local area

Species	Status			Habitat	Potential habitat in study area?
	TSC Act [1]	EPBC Act [2]	ROTAP [3]		
Acacia bynoeana	E1	V	3V	Sandstone ridgetop and Castlereagh Woodlands on sandy clay soil, often with ironstone gravels (NSW Scientific Committee 1999).	No.
Acacia pubescens	V	V	3Va	Grows in open sclerophyll forest or woodland on clay soils (Harden 1991, Robinson 1994), usually on gravelly clay containing ironstones (NPWS 1999a, Fairley & Moore 2000). This species typically occurs at the integrade between shales and sandstones in Cooks River/ Castlereagh Ironbark Forest, Shale/Gravel Transition Forest or Cumberland Plain Woodland (NPWS 2003b).	Yes.
Cynanchum elegans	E1	E	3Ei	Rainforest gullies scrub and scree slopes in Gloucester and Wollongong districts (Harden 1992)	No.
Dillwynia tenuifolia	V&EP	V	2Vi	Occurs in the Cumberland Plain and Blue Mountains to Howes Valley area where it grows in dry sclerophyll woodland on sandstone, shale or laterite (Harden 2002). Typically it forms large populations within a restricted distribution and specific habitat (Castlereagh Ironbark Forest) (Rymer *et al.* 2002).	No. No Castlereagh Ironbark Forest within the study area.
Epacris purpurascens var. *purpurascens*	V		2K	Sclerophyll forest, scrub and swamps – from Gosford and Sydney districts (Harden 1992) specifically this species is thought to require wet heath vegetation (T. James pers. comm.)	No.
Grevillea juniperina ssp. *juniperina*	V			Found on clay soils in open forest on the Cumberland Plain (Robinson 1994). Grows in moist sites, usually near creek on acidic soils (Harden 1991)	Yes. Recorded within the study area during the current survey.
Hypsela sessiliflora	E1	X	2X	Grows in damp areas on the Cumberland Plain (Harden 1992)	No.

Species	Status			Habitat	Potential habitat in study area?
	TSC Act [1]	EPBC Act [2]	ROTAP [3]		
Marsdenia viridiflora ssp. *Viridiflora*	EP			This species has a wide distribution in subcoastal and southern Queensland but has been recorded rarely in NSW and from a disjunct occurrence near Sydney where it occurs as occurs as very scattered plants in areas of remnant vegetation (NSW Scientific Committee 2003). Grows in woodland and scrub (Harden 1992) and is a characteristic species of Sydney Turpentine Ironbark Forest (NSW Scientific Committee 1998b).	No.
Micromyrtus minutiflora	E1	V	2V	Found on the Cumberland Plain within dry sclerophyll forest (Harden 1992) on old alluviums (Robinson 1994). Of the vegetation communities found on the Cumberland Plain, the species is listed as only occurring in Castlereagh Scribbly Gum Woodland in Tozer (2003).	No. Castlereagh Scribbly Gum Woodland recorded within the study area.
Persoonia nutans	E1	E	2Ei	Grows in Woodland to dry sclerophyll forest on clay soils and old alluviums on the Cumberland Plain (Harden 1991, Robinson 1994). It is restricted to Castlereagh Scribbly Gum Woodlands and in Agnes Banks Woodland (NPWS 2001).	No Castlereagh Scribbly Gum Woodland or Agnes Banks Woodland within the study area.
Pimelea curviflora var. *curviflora*	V	V		Restricted to coastal areas on sandstone (Harden 1990, Fairley & Moore 2000) and laterite where it is often found amongst dense grasses and sedges (NSW Scientific Committee 1998a).	No.
Pimelea spicata	E1	E	3Ei	In western Sydney, *P. spicata* grows in Grey Box-Ironbark Woodland with an understorey of *Bursaria spinosa* and *Themeda australis*. In the Illawarra, it grows on clay soils in grassland or open woodland (NPWS 2000c).	No. No Ironbarks recorded within the study area.
Pomaderris brunnea	V	V	2V	Open forest confined to the Colo River & upper Nepean River (Harden 1990), on clay & alluvial soils (Fairley & Moore 1995)	No.
Pterostylis saxicola	E1	E		Shallow soils over sandstone sheets often near streams – Picnic Point to Picton (Harden 1993)). Occurs where vegetation up-slope of potential habitat is shale derived – preference for shale sandstone interface (T. James pers. comm.)	No.
Pultenaea parviflora	E1	V	2E	Occurs in dry sclerophyll forest on Wianamatta shale, laterite or alluvium (Harden 1991). Restricted to the Cumberland Plain where it grows in open forest on heavy shale soils (Robinson 1994) and tertiary alluviums (James *et al.* 1999). It is known to occur in scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest (NPWS 2002d).	No. No Castlereagh Ironbark Forest or Shale Gravel Transition Forest within the study area.

Key: 1) Listed on the TSC Act as Endangered (E1), Extinct (E4) or Vulnerable (V
2) Listed on the EPBC Act as Endangered (E) or Vulnerable (V)
3) ROTAP= Rare or Threatened Australian Plant (Briggs & Leigh 1995); for description of codes see Appendix 3

4.4 Fauna Habitats

The fauna habitat types within the study area are riparian, woodland and disturbed grassland. These habitat types are described in more detail below.

4.4.1 Riparian

The riparian vegetation along the Angus Creek is dominated by exotic species, particularly *Ligustrum lucidum,* and native canopy species *Casuarina glauca*, with *Angophora floribunda* and *Melaleuca decora* and an understorey of *Ligustrum sinense* and *Bursaria spinosa*. These native tree species may supply direct (foliage, nectar and exudates) and indirect food (arthropods) for a range of bird species including Noisy Minor *Manorina melanocephalus*, Red Wattle Birds *Anthochaera carunulata*, Yellow-Faced Honeyeater *Lichenostomus chrysops* and Superb Fairy Wrens *Malurus cyaneus*. Isolated tree hollows were observed in the study area outside the development footprint in the larger *Angophora* floribunda specimens. These trees may provide nesting and roosting habitat for hollow-dwelling fauna (such as bats, possums and owls).

The groundcover within this habitat varied from fair to almost non-existent dependant upon the cover of *Liguistrum* sp. In the more open sections the ground cover consisted of fallen timber urban rubbish, leaf litter, stormwater debris and extensive vegetation. The vegetation consisted of introduced *Tradescantia albiflora* and native *Commelina cyanea,* and various grasses. This ground cover provides refuge and nesting habitat for a range of common animals. Many reptiles rely on ground litter and debris for shelter and foraging. The Eastern Water Skink *Eulamprus quoyii* was particularly common near the creek lines.

The riparian area within the study site was impacted by rubbish, exotic weeds and was considered to be in moderate to poor condition.

4.4.2 Woodland

The woodland habitat was located in small patches between the riparian areas and the grassland/clear sections to the west, and south of the creek. The canopy species were dominated by regenerating native eucalypts, particularly *Eucalyptus tereticornis* to about 15 m with occasional larger trees. Tree hollows were observed in the larger trees within the woodland zones.

The understorey, has an open native shrub layer dominated by *Acacia parramattensis* and *Bursaria spinosa*. These midstorey species provide potential foraging resources (foliage, nectar, exudates) and shelter for a range of species including small birds (eg. Fairy Wrens, Brown Thornbills *Acanthiza pusilla* and

White-browed Scrubwrens *Sericornis frontalis*. The ground cover is predominantly grass and herbs including *Dianella revoluta, Lomandra longifolia*. This area has some fallen timber, bark and rubbish which provides habitat for reptiles, small mammals and Cumberland Plain Land Snails *Meridolum corneovirens*.

This area consisted of regenerating woodland with scattered larger trees present. It was considered to be moderate-poor fauna habitat within the study site.

4.4.3 Grassland/Cleared Areas

The majority of the northern side of the site comprises a highly disturbed area dominated by exotic grasses, concrete rubble and mounds of fill from the adjacent development of the OneSteel site (NECS 2003). This area provides limited habitat for native fauna, such as Grass Skinks *Lampropholis guichenoti* and common native birds including the Australian Raven *Corvus coronoides*, but does provide habitat for introduced mammals such as the Brown Hare *Lepus capensis* and European Rabbits *Oryctolagus cuniculus* and introduced birds such as the Common Myna *Acridotheres tristis*.

This area was highly degraded and considered poor fauna habitat.

The grassland area north of the rail line contains a number of ephemeral drainage lines and associated sedges and drier areas of native and exotic grassland. This area provides habitat for frogs, skinks and snakes, and limited habitat for wetland birds such as White Faced Herons *Egretta novaehollandiae* and Lathams Snipe *Gallinago hardwickii*.

This area was considered poor to moderate fauna habitat.

4.5 Fauna

Animals using the site were surveyed by undertaking active searching and recording incidental observations. Trapping and spotlighting of terrestrial animals was not undertaken for the current assessment.

Fauna species recorded in the study site are listed in Appendix 2 and include 13 bird species (one introduced), six species of reptile, two species of invertebrate and three introduced mammals.

4.5.1 Significant Fauna

A total of twenty five threatened fauna species listed on the TSC Act (Figure 6), 12 threatened fauna species listed on the EPBC Act and 9 migratory species

listed on the EPBC Act, or their habitat have been previously recorded within a 10km radius (DEC Atlas of NSW Wildlife and DEH Online EPBC Database). A species can be listed under both acts.

Table 2: Terrestrial fauna listed on the TSC Act or EPBC Act hat may occur in the local area.

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat	8 Part Test
Amphibians						
Heleioporus australiacus	Giant Burrowing Frog	V	V	Prefers hanging swamps on sandstone shelves adjacent to perennial non-flooding creeks (Daly 1996, Recsei 1996). Can also occur within shale outcrops within sandstone formations. In the southern part of its range can occur in wet and dry forests, montane sclerophyll woodland and montane riparian woodland (Daly 1996). Individuals can be found around sandy creek banks or foraging along ridge-tops during or directly after heavy rain. Males often call from burrows located in sandy banks next to water (Barker *et al*. 1995).	No	No
Litoria aurea	Green and Golden Bell Frog	E1	V	Found in marshes, dams and stream sides, particularly those containing bullrushes or spikerushes (NPWS 1999b). Preferred habitat contains water bodies that are unshaded, are free of predatory fish, have a grassy area nearby and have diurnal sheltering sites nearby such as vegetation or rocks (White & Pyke 1996, NPWS 1999b).	No	No
Mixophyes iteratus	Giant Barred Frog	E1	E	Usually found in coastal riverine rainforest and upland areas such ass the Border Ranges (Barker *et al.* 1995).	No	No
Invertebrates						
Meridolum corneovirens	Cumberland Plain Land Snail	E1		Most likely restricted to Cumberland Plain, Castlereagh Woodlands and boundaries between River-flat Forest and Cumberland Plain Woodland. It is normally found beneath logs, debris and amongst accumulated leaf and bark particularly at the base of trees. May also use soil cracks for refuge.	Yes	Yes
Birds						
Chthonicola sagittata	Speckled Warbler	V		This species occurs in eucalypt and cypress woodlands on the hills and tablelands of the Great Dividing Range. They prefer woodlands with a grassy understorey, often on ridges or gullies (Blakers, Davies et al. 1984; NSW Scientific Committee 2003). The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds (Blakers, Davies et al. 1984; NSW Scientific Committee 2003). Home ranges vary from 6-12 hectares (NSW Scientific Committee 2003).	Yes	No
Gallinago hardwickii	Latham's Snipe		M	Typically found on wet soft ground or shallow water with good cover of tussocks. Often found in wet paddocks, seepage areas below dams (Pizzey & Knight 1997).	Yes	No
Haliaeetus leucogaster	White-bellied Sea-Eagle		M	A migratory species that is resident to Australia. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes (English & Predavec 2001).	No	No
Hirundapus caudacutus	White-throated Needletail		M	An aerial species found in feeding concentrations over cities, hilltops and timbered ranges (Pizzey 1983).	No	No
Lathamus discolor	Swift Parrot	E1	EM	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen an associated insects (Forshaw & Cooper 1981).(Forshaw & Cooper 1981) The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW (Shields &	Yes	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat	8 Part Test
				Crome 1992).(Shields & Crome 1992) This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability (Pizzey 1983).(Forshaw & Cooper 1981)		
Lophoictinia isura	Square-tailed Kite	V	M	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia (Marchant & Higgins 1993). In NSW it is often associated with ridge and gully forests dominated by Woollybutt *Eucalyptus longifloria*, spotted Gum *E. Maculata* or Peppermint Gum *E. elata*, *E. smithii* (NPWS 1999e).	Yes	No
Melithreptus gularis gularis	Black-chinned Honeyeater	V		Found mostly in open forests and woodlands dominated by box and ironbark eucalypts (Higgins *et al.* 2001). It is rarely recorded east of the Great Dividing Range (Higgins *et al.* 2001).	Yes	No
Monarcha melanopsis	Black-faced Monarch		M	A migratory species found during the breeding season in damp gullies in temperate rainforests. Disperses after breeding into more open woodland (Pizzey 1983).	No	No
Myiagra cyanoleuca	Satin Flycatcher		M	Migratory species that occurs in coastal forests, woodlands and scrubs during migration. Breeds in heavily vegetated gullies (Pizzey 1983).	Yes	No
Neophema pulchella	Turquoise Parrot	V		Occurs in open woodlands and eucalypt forests with a ground cover of grasses and understorey of low shrubs (Morris 1980). Generally found in the foothills of the Great Divide, including steep rocky ridges and gullies (Higgins 1999). Nest in hollow-bearing trees, either dead or alive; also in hollows in tree stumps. Prefer to breed in open grassy forests and woodlands, and gullies which are moist (Higgins 1999).	Yes	No
Ninox connivens	Barking Owl	V		Generally found in open forests, woodlands, swamp woodlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country (Pizzey 1983).	Yes	No
Rhipidura rufifrons	Rufous Fantail		M	Migratory species that prefers dense, moist undergrowth of tropical rainforests and scrubs. During migration it can stray into gardens and more open areas (Pizzey 1983).	No	No
Rostratula benghalensis australis	Australian Painted Snipe	E1	V	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, ephemeral or permanent, although they have been recorded in brackish waters (Marchant & Higgins 1993).	No	No
Xanthomyza phrygia	Regent Honeyeater	E1	EM	A semi-nomadic species occurring in temperate Eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forests associations and wet lowland coastal forests (Pizzey 1983, NPWS 1999d).	Yes	No
Mammals						
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Located in a variety of drier habitats, including the dry sclerophyll forests and woodlands to the east and west of the Great Dividing Range (Hoye & Dwyer 1995). Can also be found on the edges of rainforests and in wet sclerophyll forests (Churchill 1998). This species roosts in caves and mines in groups of between 3 and 37 individuals (Churchill 1998).	Yes	No
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Uses a range of habitats including sclerophyll forests and woodlands, coastal heathlands and rainforests (Dickman & Read 1992). Habitat requirements include suitable den sites, including hollow logs, rock crevices and caves, an abundance of food and an area of intact vegetation in which to forage (Edgar & Belcher 1995).	No	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Inhabit sclerophyll forests, preferring wet habitats where trees are more than 20 m high (Churchill 1998). Two observations have been made of roosts in stem holes of living eucalypts (Phillips 1995). There is debate about whether or not this species moves to lower altitudes	Yes	No

Latin Name	Common Name	TSC Act	EPBC Act	Habitat	Potential habitat	8 Part Test
				during winter, or whether they remain sedentary but enter torpor (Menkhorst & Lumsden 1995). This species also appears to be highly mobile and records showing movements of up to 12 km between roosting and foraging sites (Menkhorst & Lumsden 1995).		
Miniopterus schreibersii	Eastern Bent-wing Bat	V	C	Uses a broad range of habitats including rainforests, wet and dry sclerophyll forests, open woodlands and open grasslands (Churchill 1998). Roosts in caves, but can also use manmade structures such as mines and road culverts (Dwyer 1995, Churchill 1998). Specific caves are used as nursery caves, containing a large number of individuals, which can be used year after year (Dwyer 1995, Churchill 1998).	Yes	No
Mormopterus norfolkensis	Eastern Freetail Bat	V		Most records are from dry eucalypt forests and woodlands to the east of the Great Dividing Range. Appears to roost in trees, but little is known of this species habits (Allison & Hoye 1995, Churchill 1998).	Yes	No
Myotis adversus	Large-footed Myotis	V		Occurs in most habitat types as long as they are near permanent water bodies, including streams, lakes and reservoirs. Commonly roost in caves, but can also roost in tree hollows, under bridges and in mines (Richards 1995, Churchill 1998).	Yes	No
Petrogale penicillata	Brush-tailed Rock-wallaby	V	V	Found in rocky areas in a wide variety of habitats including rainforest gullies, wet and dry sclerophyll forest, open woodland and rocky outcrops in semi-arid country. Commonly sites have a northerly aspect with numerous ledges, caves and crevices (Eldridge & Close 1995).	No	No
Phascolarctos cinereus	Koala	V		Inhabits eucalypt forests and woodlands. The suitability of these forests for habitation depends on the size and species of trees present, soil nutrients, climate and rainfall (Reed & Lunney 1990, Reed *et al.* 1990).	Yes	Yes
Potorous tridactylus	Long-nosed Potoroo	V	V	Inhabits coastal heath and wet and dry sclerophyll forests. Generally found in areas with rainfall greater than 760 mm. Requires relatively thick ground cover where the soil is light and sandy (Johnston 1995).	No	No
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	This species is a canopy-feeding frugivore and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. Bats commute daily to foraging areas, usually within 15 km of the day roost (Tidemann 1995) although some individuals may travel up to 70 km (Augee & Ford 1999).	Yes	No
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	V		Restricted to tall mature forests in regions of high rainfall. Preferred habitats are productive, tall open sclerophyll forests where mature trees provide shelter and nesting hollows. Critical elements of habitat include sap-site trees, winter flowering eucalypts, mature trees suitable for den sites and a mosaic of different forest types (NPWS 1999f).	Yes	No
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Prefer moist gullies in mature coastal forests and rainforests, between the Great Dividing Range and the coast. They are only found at low altitudes below 500 m (Churchill 1998)In dense environments they utilise natural and human-made opening in the forest for flight paths. Creeks and small rivers are favoured foraging habitat (Hoye & Richards 1995). This species roosts in hollow tree trunks and branches (Churchill 1998).	Yes	No
Reptile						
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	Mainly occurs in association with communities occurring on Triassic sandstone within the Sydney Basin. Typically found among exposed sandstone outcrops with vegetation types ranging from woodland to heath. Within these habitat they generally use rock crevices and exfoliating rock during the cooler months and tree hollows during summer (Webb 1996, Webb & Shine 1998).	No	No

Key: 1) Listed on the TSC Act as Endangered (E), Vulnerable (V)

2) Listed on the EPBC Act as Endangered (E) or Vulnerable (V) or Conservation dependent (C) or covered under migratory provisions (M) on the EPBC Act

One threatened species, the Cumberland Plain Land Snail, and one migratory species, Latham's Snipe *Gallinago hardwickii*, were recorded during the current survey. Cumberland Plain Land Snails were previously recorded in the study area by(NECS 2004) The study area contains potential habitat for 12 threatened species listed on the TSC Act and four threatened species listed on the EPBC Act and five migratory species listed on the EPBC Act (Table 2).

There are 19 species listed on the TSC or EPBC Act with potential habitat within the study area. However the proposed development would only impact upon limiting habitat for two of these species.

4.5.2 Significant Habitat

The woodland habitat the study area is potential habitat for the Koala *Phascolarctos cinereus*. *Eucalyptus tereticornis* (Forest Red Gum) and is the dominant species in the study area and is a primary Koala feed tree species in the central coast of NSW (NPWS 2003c). *E. molucana* is also found on the site and is considered to be a secondary feed tree species (NPWS 2003c). Koalas, or indirect evidence of them, were not observed during the current surveys and there are no records of this species on site. The nearest record of a Koala is from 1990, approximately 8km to the west (DEC Atlas of NSW Wildlife). Koalas are listed as threatened under the TSC Act and the woodland provides a potential habitat that requires further assessment (See Section 5.1 and Appendix 4).

5.0 IMPACT ASSESSMENT

The Eight Part Test is a statutory mechanism under Section 5A of the *EP&A Act* which prescribes criteria to assess whether a proposed development activity may have a significant impact on threatened species, populations or ecological communities or their habitats. The results of this test are used to determine if a Species Impact Statement is required for each species potentially occurring within the study area in accordance with Part 6 Division 2 of the *TSC Act*. Furthermore, under the *EPBC Act*, if the proposed development has the potential to have an adverse impact on a threatened species, population or ecological community listed on the Act as determined by an Assessment of Significance, the proposal must be referred to the Federal Minister for the Environment for further consideration.

5.1 TSC Act: Eight Part Test Assessment

When a threatened species known to occur within the vicinity of a study area is not recorded during a survey, the presence of potential habitat for this species is used to determine the need to undertake an Eight Part Test. Where there is no potential habitat in the study area for threatened species, there is unlikely to be any impact on these species and therefore Eight Part Tests are not required for these species.

Flora

The study area contains Cumberland Plain Woodland and River-flat Eucalypt Forest, which are listed as Endangered Ecological Communities under the TSC Act. Eight Part Tests has been prepared for these communities (see Appendix 4).

One threatened plant species was recorded within the study area, *Grevillea juniperina* ssp. *juniperina.* In addition the study area also supported potential habitat for another threatened plant species, *Acacia pubescens*. As such, Eight Part Tests have been prepared for these species (see Appendix 4).

No threatened plant populations were recorded within the study area.

Fauna

One threatened fauna species the Cumberland Plain Land Snail was observed during this study and has previously been recorded in the study area (NECS 2003). In addition the study area supports potential habitat for 18 threatened or migratory species. Where there is potential habitat (foraging or breeding

resources) for a threatened species in the study area, further consideration must be given to the potential impact of the proposed development on these species.

The proposed development may significantly impact threatened species by causing any of the following situations to arise:

- death or injury of individuals;
- loss or disturbance of limiting foraging resources; and
- loss or disturbance of limiting breeding or roosting resources.

Limiting resources are specialised habitat components that species are dependent on for their ongoing survival. Such limiting resources are predominantly associated with specialised breeding habitats (such as tree hollows or suitable nest/maternity roost sites) that occur at low densities, with high levels of competition from a range of species. However for some species, limiting resources include specialised foraging habitats that have a restricted distribution (such as Koalas feeding only on specific tree species).

The study area contains limiting habitat for the Cumberland Plain Land Snail which has been located in a small patch of Cumberland Plain Woodland that will be retained under the proposed development. Therefore an Eight part test has been prepared for this species. Primary and secondary feed trees for the Koala are found on the site, disturbance of this habitat may result in a loss or disturbance of a limiting foraging resources potential habitat for the Koala. Therefore an Eight Part Test has been prepared for the Koala (Appendix 4). Potential habitat for the remaining threatened species recorded from the local area does not occur on this site or is not limiting, and therefore Eight Part Tests are not required for these species (Table 2 and 3).

Table 3 Potential impacts for threatened fauna species

Threatened Species	Potential impacts on the study site			Eight Part Test Required
	Individual death or injury	Loss or disturbance of limiting foraging resources	Loss or disturbance of limiting breeding resources	
Invertebrates				
Cumberland Plain Land Snail	No	Yes	Yes	Yes
Birds				
Barking Owl	No	No	No	No
Square-tailed Kite	No	No	No	No
Black-chinned Honeyeater	No	No	No	No
Speckled Warbler	No	No	No	No
Swift Parrot	No	No	No	No
Regent Honeyeater	No	No	No	No
Turquoise parrot	No	No	No	No
Mammals				
Greater Broad-nosed Bat	No	No	No	No
Eastern Bent-wing Bat	No	No	No	No
Eastern False Pipistrelle	No	No	No	No
Greater Broad-nosed Bat	No	No	No	No
Grey-headed Flying-fox	No	No	No	No
Koala	No	Yes	No	Yes
Large-eared Pied Bat	No	No	No	No
Eastern Freetail Bat	No	No	No	No
Large-footed Myotis	No	No	No	No

5.2 EPBC Act: Assessment of Significance

5.2.1 Significance Guidelines

Under the *EPBC Act*, if the proposed development has the potential to have an adverse impact on a threatened species, population or ecological community listed on the Act, the proposal must be referred to the Federal Minister for the Environment for further consideration.

Threatened species

For threatened species, an action, will have, or is likely to have a significant impact if it does, will or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing habitat critical to the survival of the species, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle, or

- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species habitat, or
- interferes substantially with the recovery of the species.

For the assessment criteria, an important population is defined as one that is necessary for a species long-term survival and recovery, including populations that are:

- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range

Flora

The study area contains Cumberland Plain Woodland, which is listed as an EEC under the EPBC Act. An Assessment of Significance has been prepared for this community (Appendix 5).

Ten threatened plant species listed on the EPBC Act have been recorded within 10 km of the study area (DEH online database). The study area supported potential habitat for the threatened plant species *Acacia pubescens,* therefore this species is required to be considered under the EPBC guidelines of significance.

Fauna

One migratory species was recorded during the current study. Potential habitat occurs within the study site for five migratory species listed under the EPBC Act (Table 2). DEH guidelines for Assessment of Significance have been applied to these species (Appendix 5). All threatened (Vulnerable or Endangered) species listed on the EPBC Act, with potential habitat in the study area are also listed on the TSC Act (see Table 2). Therefore, the same assessment of limiting habitat can be applied to the DEH Assessment of Significance as was applied to the TSC listed species, and as such, no assessments for threatened species are required (Table 3).

It is possible that both threatened and migratory species with potential habitat in the study area may use areas and resources within the study area on a temporary basis. However, these species are considered to be highly mobile and are unlikely to be solely dependent on the resources within the study area. Therefore it is unlikely that the proposal would have a significant impact on these species Appendix 5.

6.0 RECOMMENDATIONS

The proposed development would remove approximately 0.5 ha of moderate quality and 0.9 ha of poor quality Cumberland Plain Woodland which relates to 33% of the Cumberland Plain Woodland vegetation type on the site. The conveyor and road crossing of the creek would remove approximately 0.2 ha or 5.5% of poor quality River-flat Eucalypt Forest available on the site. There were no hollow bearing trees located within the development footprint in this area. The main area of the development will cover 8.2 ha of the highly disturbed cleared area to the north of the block and remove a smaller area of 0.3 ha of the cleared grassland area near the rail line.

In order to reduce the impact of the proposed development on the flora and fauna within and surrounding the study area, it is recommended that:

- A Vegetation Management Plan (VMP), outlining the preservation and rehabilitation of the vegetation on the site prior to, and during the construction period and through the operation of the distribution plant, be prepared. The VMP is to be implemented by suitably qualified bush regenerators and include management of weeds, revegetation, erosion control and monitoring.

- Cleared/Disturbed Areas outside the development footprint should be revegetated using local endemic native species. Any collection of propagation material should be undertaken under the Florabank Guidelines (Mortlock 1998). A local native plant nursery or bush regeneration company should be engaged to carry out this work.

- Recovery of the threatened species *Grevillea juniperina* ssp. *juniperina* should be incorporated into the management of the on-site conservation areas. The VMP should detail methods of protection, conservation and monitoring of the *G. juniperina* ssp. *juniperina* plants in the study area. A 20 m vegetated buffer around the *G. juniperina ssp. juniperina* is required to limit disturbance to the on-site population and allow the population to expand. Consideration should also be given to growing tubestock from propagation material collected on-site, undertaken by a provenance native plant nursery, to be planted within the on-site conservation area to enhance the local population of the species.

- Exclusion fencing should be erected around remnant patches of vegetation to protect these areas from disturbance during construction.

- Appropriate sedimentation and erosion control measures should be put in place, including sediment fencing, erected prior to construction and

maintained during construction, to ensure that sediment from the building site does not enter the bushland areas, particularly the creekline.

- Protection of all hollow bearing trees outside the development footprint.
- Provision of some native logs and bark to be placed within the retained areas of Cumberland Plain Woodland, during regeneration and revegetation, to providing additional sheltering habitat for the Cumberland Plain Land Snail, as well as other ground dwelling fauna.
- A Part 3A permit under the *Rivers and Foreshores Act* (RF Act) will be required for work within 40m of the creek and the creek crossings.

7.0 CONCLUSION

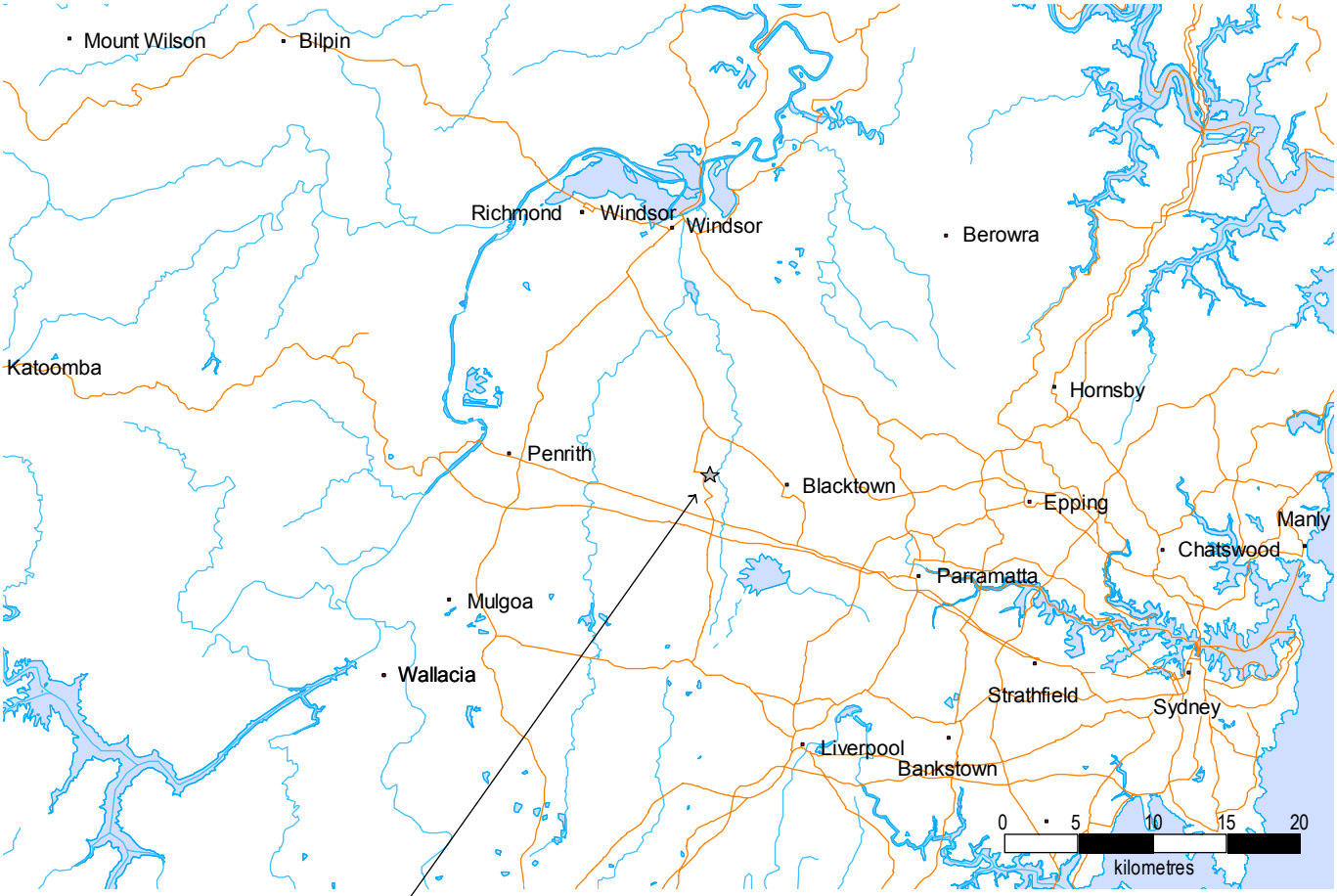
One threatened flora species listed under the TSC and EPBC Acts, one threatened fauna species listed under the TSC Act and one Migratory species listed under the EPBC Act were recorded during this study. The vegetation communities identified in the study area include two endangered ecological communities. The study area also provides potential habitat for one other threatened plant species listed under the EPBC and TSC Acts and limiting potential habitat for one threatened fauna species listed under the TSC Act.

Assessments for threatened flora and fauna species, migratory species and endangered ecological communities, with potential habitat in the study area in accordance with relevant legislation concluded that the proposal was unlikely to have a significant impact on any threatened species.

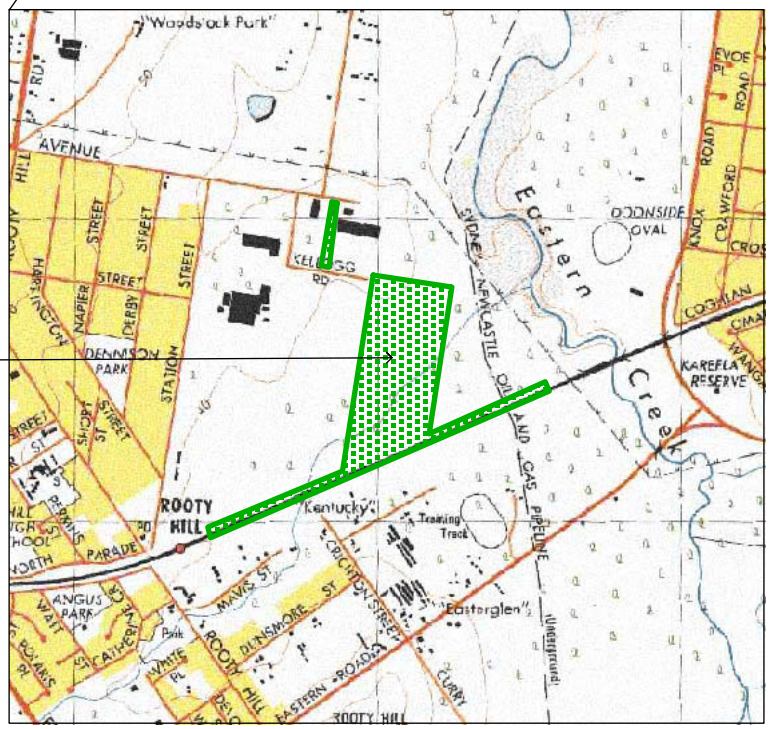
In order to minimise the impact of the proposed development on the indigenous flora and fauna of the area the following mitigation measures are recommended:

- a Vegetation Management Plan (VMP) be prepared and implemented;
- revegetation of Cleared/Disturbed Areas outside the development footprint and areas disturbed by the construction, using locally endemic native species;
- a 20m woodland buffer zone to be established around the *G. juniperina ssp. juniperina* site;
- fencing of the native vegetation outside the development footprint;
- implementation of appropriate sediment control including silt fencing;
- protection of native hollow bearing trees;
- provision of additional sheltering habitat for the Cumberland Plain Land Snail, in the Cumberland Plain Woodland areas.

FIGURES



Study area



Acknowledgement: Geoscience Australia (1:250000 - SI/56 - 5) and Lands and Property Information (1:25000 - 9030 - 2N)

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Figure 1: Location of the study area in a regional context.

DATE: 18 April 2005

Checked by: SEW | File number: S4184

Location:... \projects\4000\4100s\4184\Mapping\S4184 Fig 1.wor

Scale: 0 250 500 750 1000 metres

N W E S

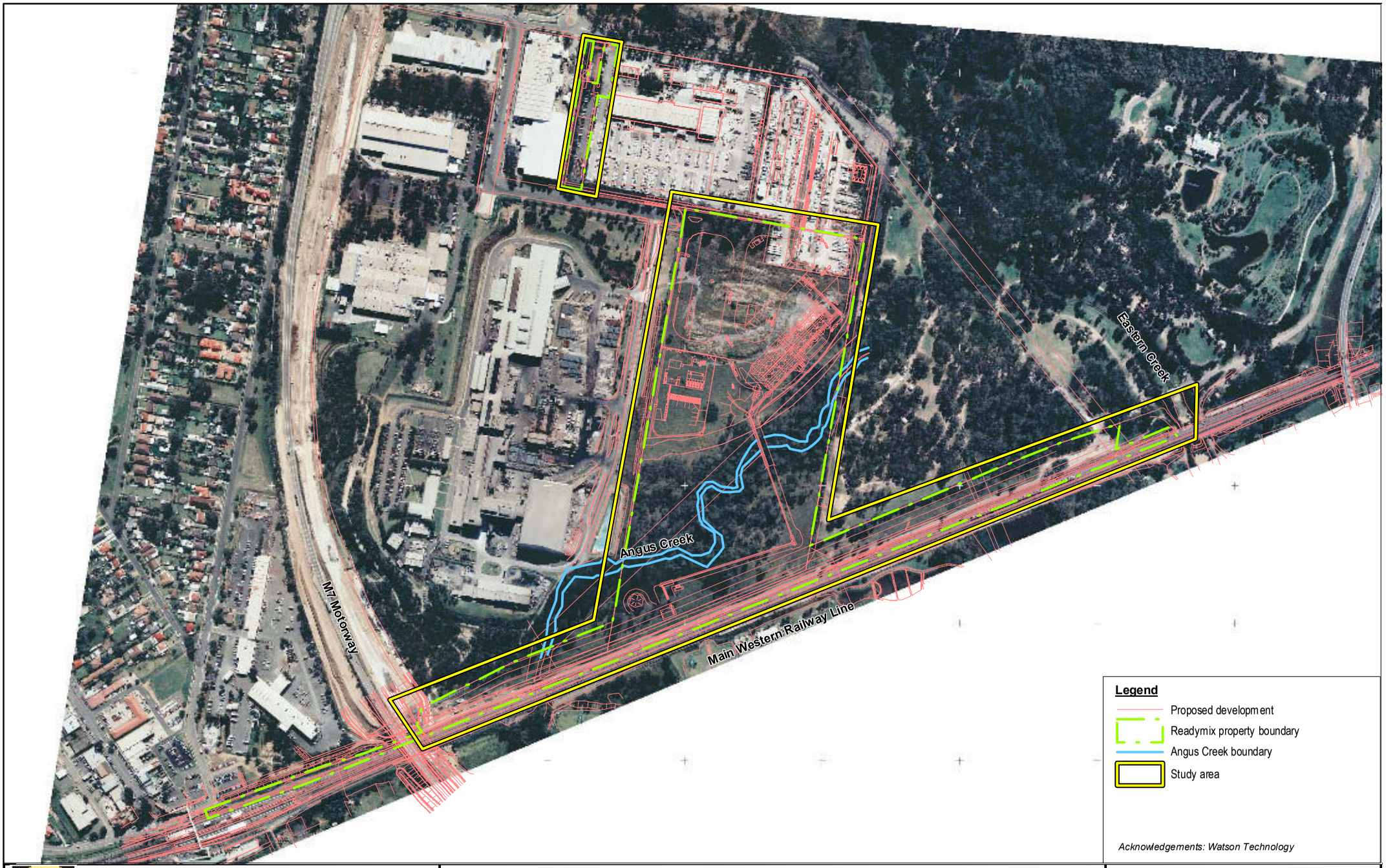

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Figure 2: Plan of proposed development

DATE: 16 June 2005
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Scale: 0 50 100 150 200 250 metres

N W E S

Figure 2: Plan of proposed development

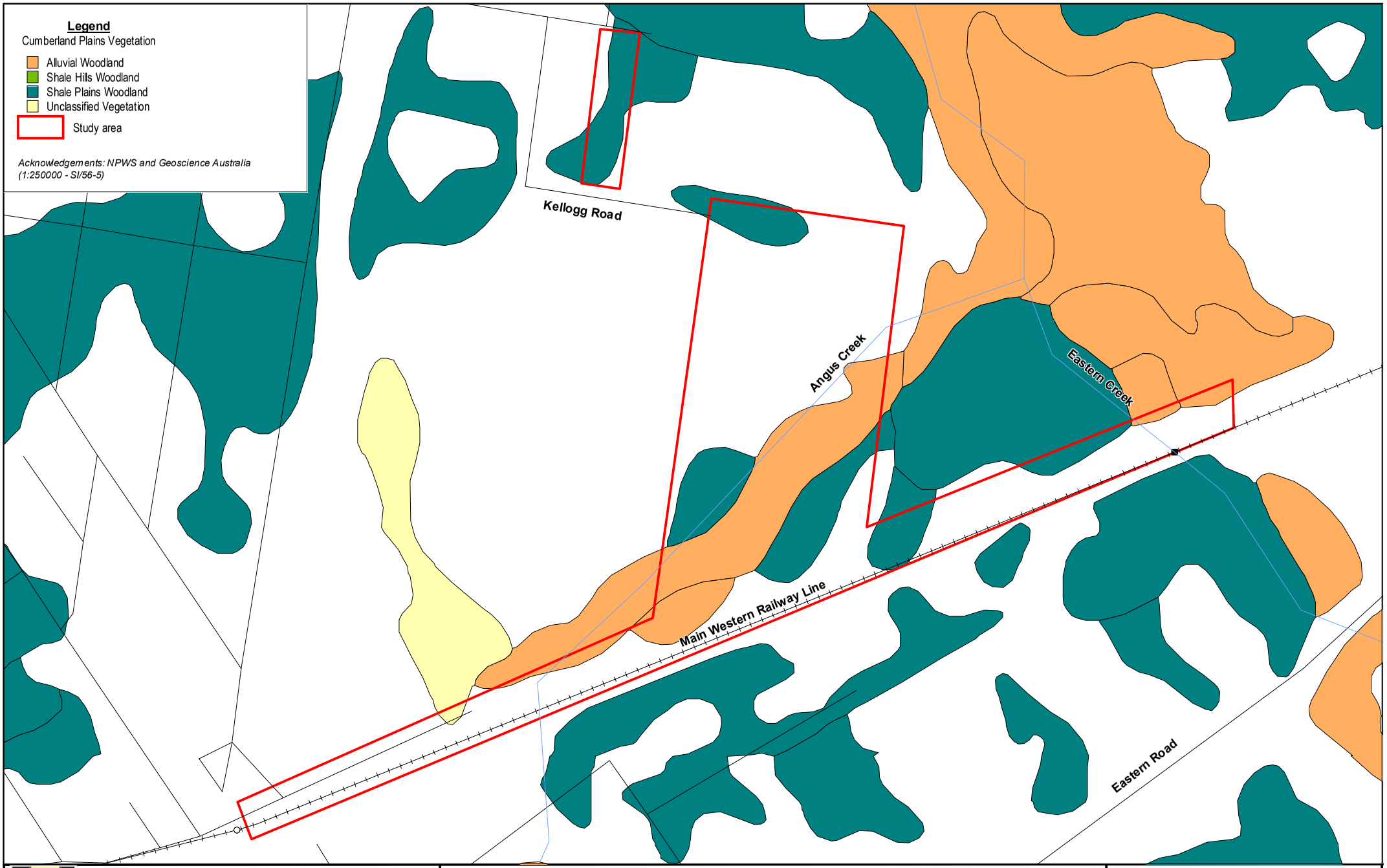

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Figure 3: NPWS vegetation mapping of the study area (NPWS 2002c)

DATE: 4 May 2005
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File number: S4184
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Scale: 0 50 100 150 200 250 metres

Figure 3: NPWS vegetation mapping of the study area (NPWS 2002c)

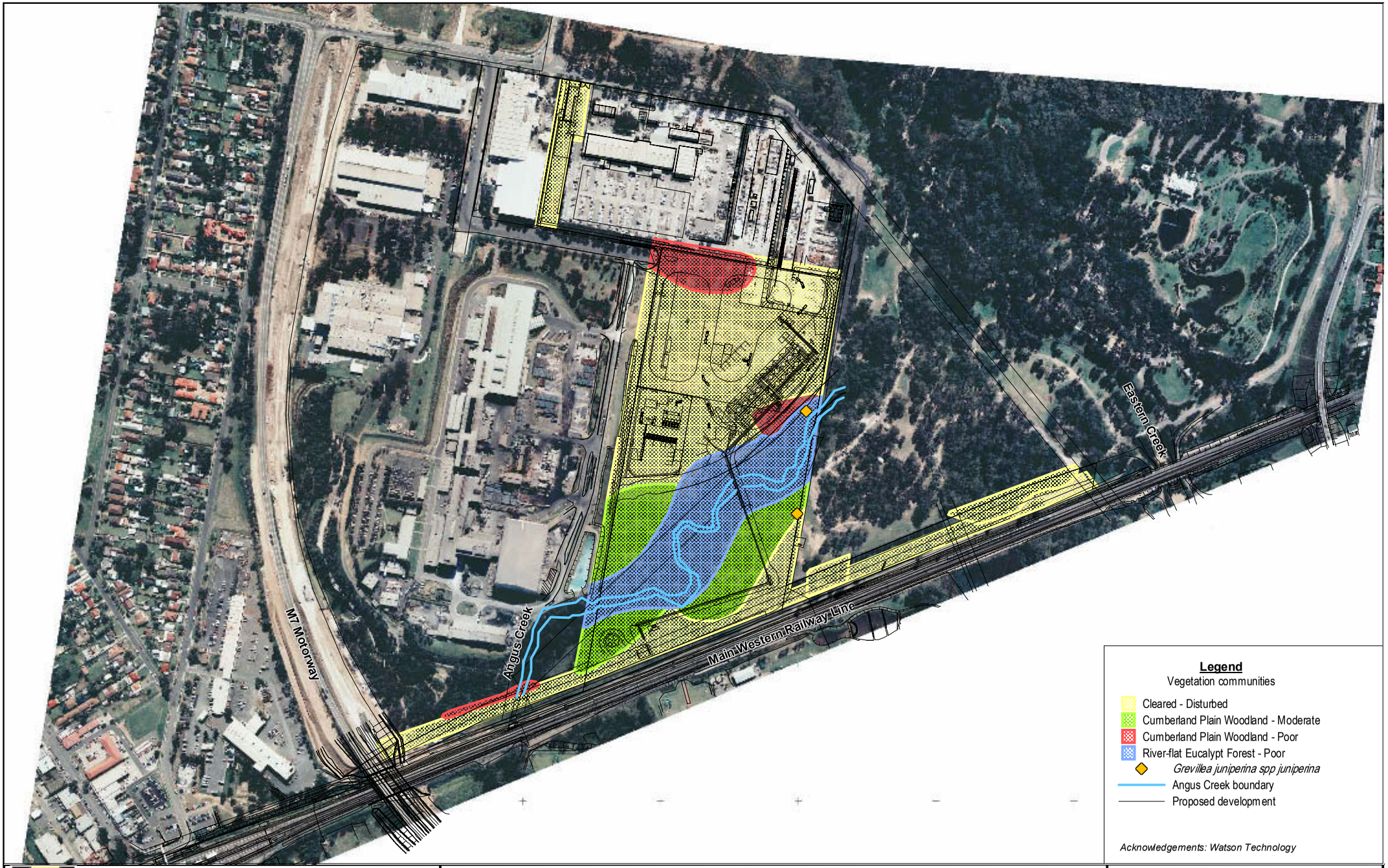

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Figure 4: Vegetation mapping of the current study

DATE: 16 June 2005
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Scale: 0 50 100 150 200 250 metres

Figure 4: Vegetation mapping of the current study

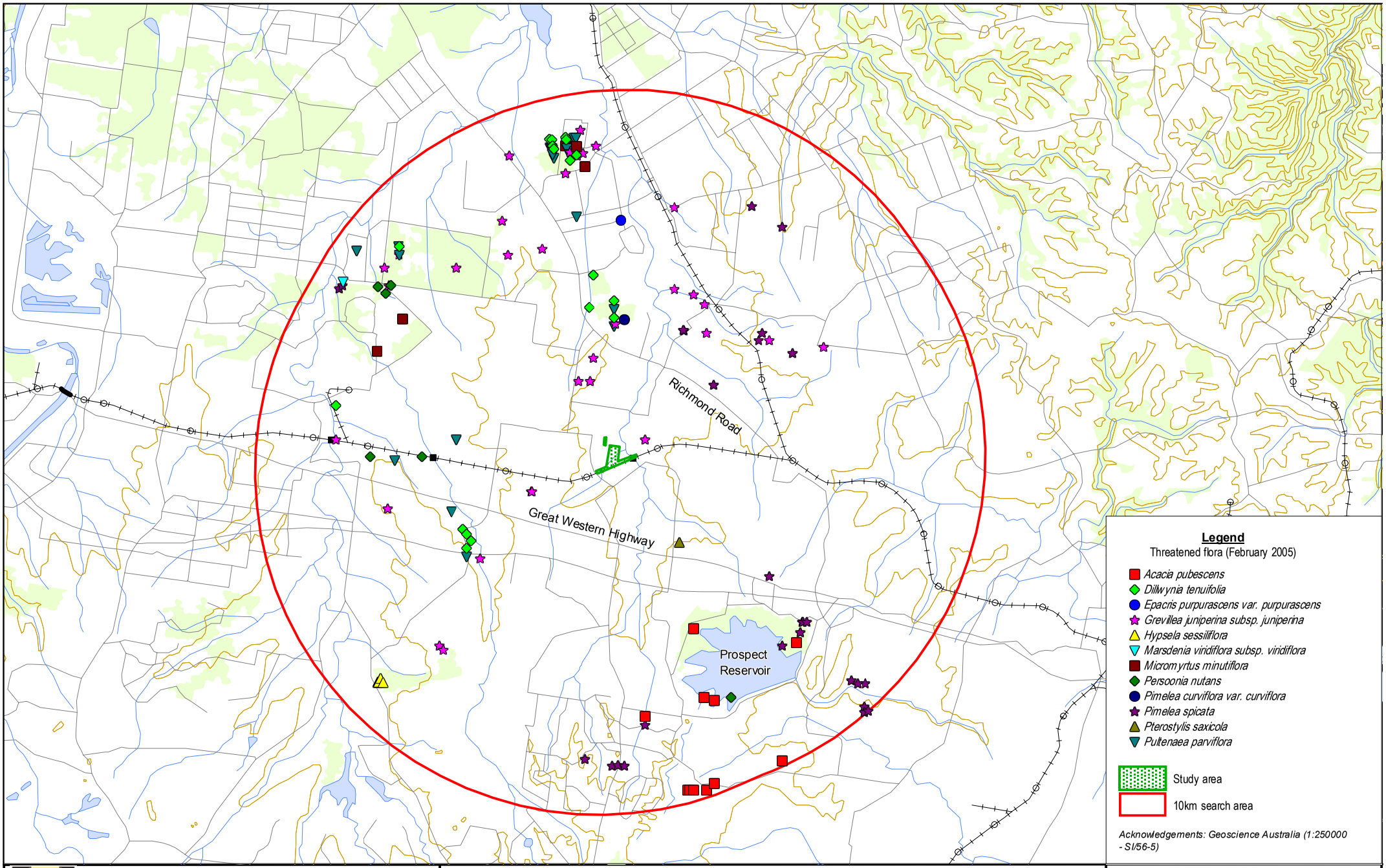

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Figure 5: Threatened flora listed on the TSC Act recorded within 10km of the study area

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Scale: 1 0 1 2 3 4 kilometres

N W E S

Figure 5: Threatened flora listed on the TSC Act, within 10km of the study area

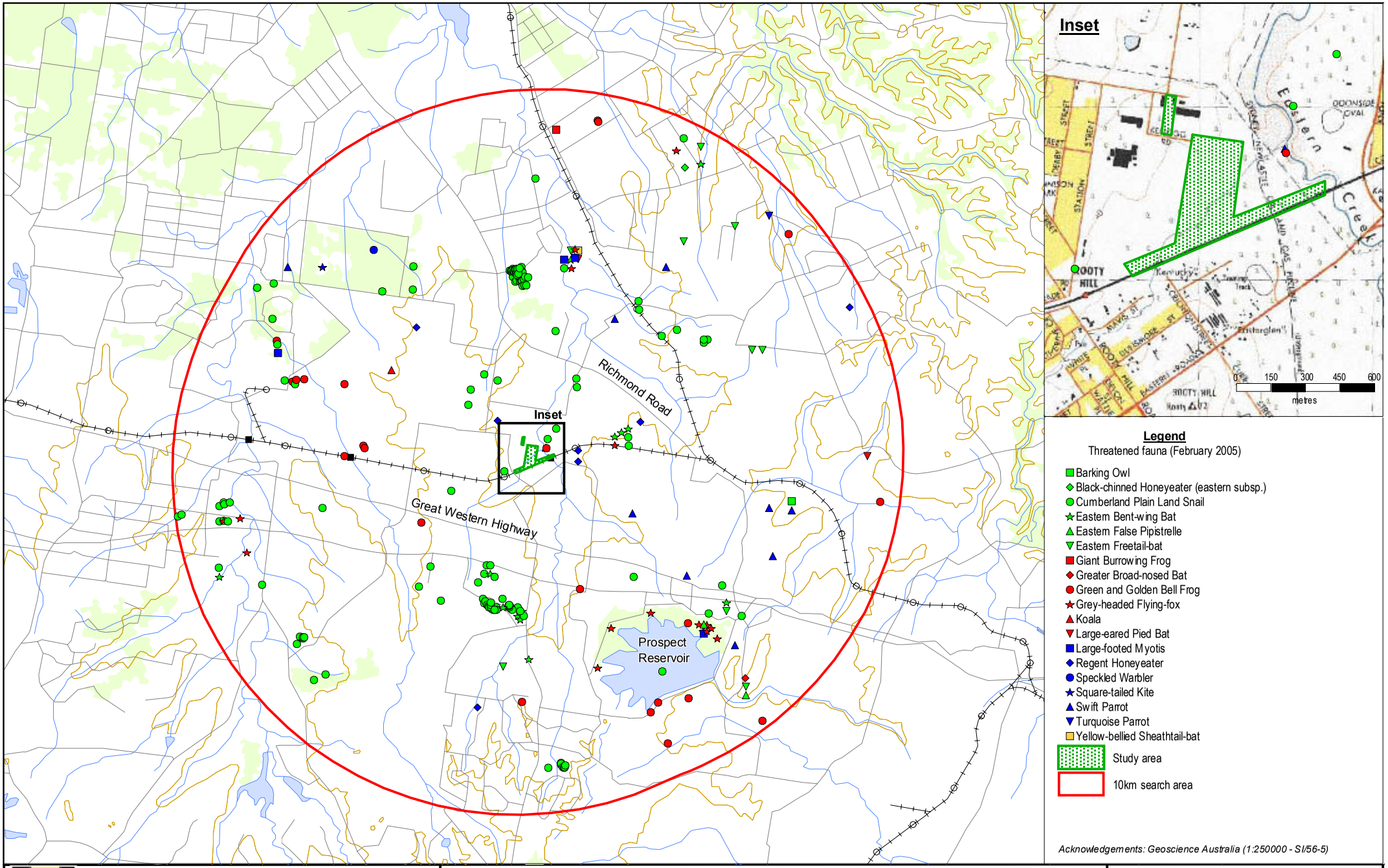

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Figure 6: Threatened fauna listed on the TSC Act recorded within 10km of the study area

DATE: 18 April 2005
Checked by: SEW
File number: S4184
Location: ...\projects\4000\4100s\4184\Mapping\S4184 Fig 6.wor

Scale: 1 0 1 2 3 4 kilometres

N W E S

Figure 6: Threatened fauna listed on the TSC Act, within 10km of the study area

PLATES

Plate 1: Cumberland Plain Woodland north-west of Angus Creek

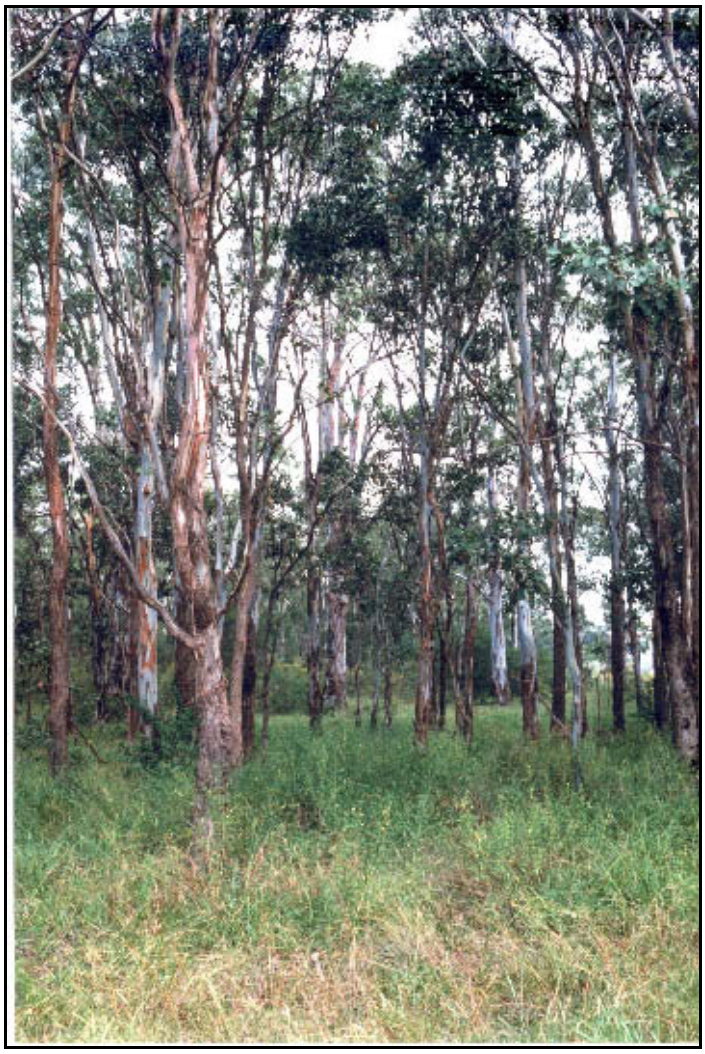

Plate 2: Cleared/disturbed area in foreground with River-flat Eucalypt Forest in background

Plate 3: Rubble and fill in the Cleared/Disturbed area

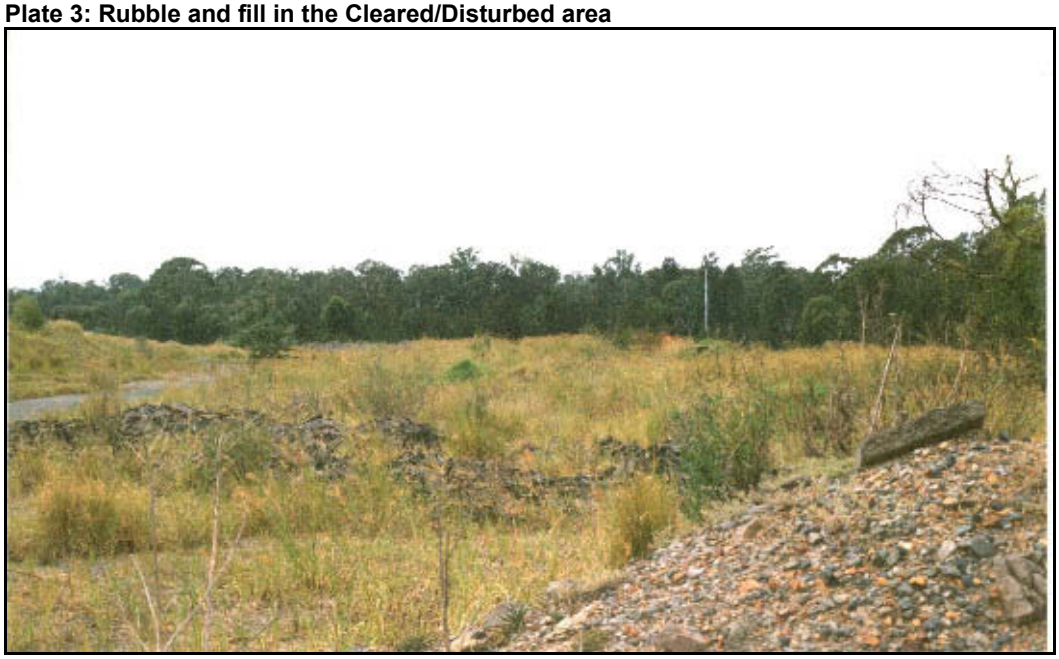

Plate 4: *Grevillea juniperina* ssp. *juniperina* in the fire affected area south east of Angus Creek

APPENDICES

APPENDIX 1
Flora Results

	Scientific Name	Common Name	Woodland	Riparian Forest	Cleared areas
	Ferns and Fern-like Plants				
	Adiantaceae				
	Cheilanthes sieberi ssp. *sieberi*	Narrow Rock-fern	X	X	
Monocotyledons					
	Anthericaceae				
	Tricoryne elatior	Yellow Autumn-lily	X		X
	Asparagaceae				
*	*Asparagus asparagoides*	Bridal Creeper	X	X	X
*	*Asparagus officinalis*	Asparagus	X	X	
	Commelinaceae				
	Commelina cyanea	Native Wandering Jew	X	X	X
*	*Tradescantia fluminensis*	Wandering Jew		X	
	Cyperaceae				
*	*Cyperus eragrostis*	Umbrella Sedge	X	X	X
	Cyperus gracilis		X		
	Cyperus sp.			X	X
	Eleocharis gracilis				X
	Fimbristylis dichotoma	Common Fringe-sedge	X		X
	Juncaceae				
*	*Juncus acutus*			X	X
	Lomandraceae				
	Lomandra longifolia	Spiny-headed Mat-rush	X	X	
	Phormiaceae				
	Dianella longifolia var. *longifolia*	Pale Flax-lily	X		
	Dianella revoluta var. *revoluta*			X	
	Poaceae				
	Aristida ramosa var. *ramosa*		X		
	Aristida vagans	Threeawn Speargrass	X		
*	*Arundo donax*	Giant Reed		X	
	Austrodanthonia tenuior	Purplish Wallaby-grass	X		
	Austrostipa pubescens		X		
*	*Axonopus affinis*	Narrow-leaved Carpet Grass	X	X	X
	Bothriochloa spp.		X		
*	*Briza maxima*	Quaking Grass			X
*	*Chloris gayana*	Rhodes Grass	X		X
	Chloris truncata	Windmill Grass	X		X
*	*Cortaderia selloana*	Pampas Grass			X
	Cymbopogon refractus	Barbed Wire Grass	X		
	Cynodon dactylon	Common Couch	X		X
	Eragrostis brownii	Brown's Lovegrass	X	X	X
*	*Eragrostis curvula*	African Lovegrass	X		X
	Eragrostis leptostachya	Paddock Lovegrass	X		
	Imperata cylindrica var. *major*	Blady Grass	X		
	Microlaena stipoides var. *stipoides*	Weeping Grass	X	X	
	Oplismenus aemulus		X	X	
	Panicum effusum	Poison or Hairy Panic	X		

	Scientific Name	Common Name	Woodland	Riparian Forest	Cleared areas
	Paspalidium distans		X		
*	*Paspalum dilatatum*	Paspalum	X	X	X
*	*Pennisetum clandestinum*	Kikuyu Grass	X		X
	Phragmites australis	Common Reed			X
*	*Setaria gracilis*	Slender Pigeon Grass	X	X	X
	Sporobolus creber	Slender Rat's Tail Grass	X		
*	*Sporobolus indicus*	Parramatta Grass	X		
	Themeda australis	Kangaroo Grass	X		X
	Typhaceae				
	Typha sp.				X
Dicotyledons					
	Acanthaceae				
	Brunoniella australis	Blue Trumpet	X		X
	Apiaceae				
	Centella asiatica	Pennywort	X		X
*	*Foeniculum vulgare*	Fennel			X
	Asclepiadaceae				
*	*Araujia hortorum*			X	
	Asteraceae				
*	*Bidens pilosa*	Cobbler's Pegs	X	X	
	Calotis cuneata var. *cuneata*		X		
	Cassinia arcuata	Sifton Bush	X		
*	*Cirsium vulgare*	Spear Thistle	X	X	X
*	*Conyza bonariensis*	Flaxleaf Fleabane		X	X
*	*Hypochaeris radicata*	Catsear	X		X
*	*Osteospermum ecklonis*			X	
*	*Senecio madagascariensis*	Fireweed	X	X	X
*	*Sonchus oleraceus*	Common Sowthistle		X	
	Vernonia cinerea var. *cinerea*		X		
	Basellaceae				
*	*Anredera cordifolia*	Madeira Vine			X
	Campanulaceae				
	Wahlenbergia gracilis	Sprawling or Australian Bluebell	X		
	Casuarinaceae				
	Casuarina glauca	Swamp Oak		X	X
	Clusiaceae				
*	*Hypericum perforatum*	St. Johns Wort			X
	Convolvulaceae				
	Convolvulus erubescens		X	X	X
	Dichondra repens	Kidney Weed	X	X	X
	Crassulaceae				
*	*Bryophyllum delagoense*	Mother of millions	X		
	Euphorbiaceae				
*	*Ricinus communis*	Castor Oil Plant		X	
	Fabaceae (Mimosoideae)				
	Acacia falcata		X		
	Acacia fimbriata	Fringed Wattle	X		
	Acacia floribunda	White Sally	X		
	Acacia parramattensis	Parramatta Wattle	X	X	X

	Scientific Name	Common Name	Woodland	Riparian Forest	Cleared areas
	Acacia spp.		X		
	Fabaceae (Faboideae)				
	Daviesia ulicifolia ssp. *stenophylla*		X		
	Glycine clandestina	Twining Glycine	X	X	
	Glycine tabacina	Variable Glycine	X		
	Hardenbergia violacea	False Sarsaparilla			X
	Indigofera australis	Austral Indigo	X		
	Fabaceae (Caesalpinioideae)				
*	*Senna pendula* var. *glabrata*			X	
	Fabaceae (Faboideae)				
*	*Trifolium repens*	White Clover			X
	Goodeniaceae				
	Goodenia hederacea ssp. *hederacea*	Ivy Goodenia	X		
	Lamiaceae				
	Plectranthus parviflorus	Cockspur Flower		X	
	Lobeliaceae				
	Pratia purpurascens	Whiteroot		X	
	Malvaceae				
*	*Sida rhombifolia*	Paddy's Lucerne	X	X	X
	Myrtaceae				
	Angophora floribunda	Rough-barked Apple	X	X	
	Callistemon spp.				X
	Eucalyptus eugenioides	Thin-leaved Stringybark	?		
	Eucalyptus moluccana	Grey Box	X		X
	Eucalyptus spp.		X		X
	Eucalyptus tereticornis	Forest Red Gum	X	X	X
	Melaleuca sp.				X
	Melaleuca decora			X	X
	Oleaceae				
*	*Ligustrum lucidum*	Large-leaved Privet	X	X	
*	*Ligustrum sinense*	Small-leaved Privet	X	X	
*	*Olea europaea* ssp. *africana*			X	
	Oxalidaceae				
	Oxalis perennans	Grassland Wood-sorrel	X	X	
	Pittosporaceae				
	Bursaria spinosa ssp. *spinosa*	Sweet Bursaria	X	X	X
	Plantaginaceae				
*	*Plantago lanceolata*	Lamb's Tongues	X	X	X
	Polygonaceae				
	Persicaria spp.	Persicaria 9685			X
*	*Rumex crispus*	Curled Dock		X	
	Proteaceae				
	Grevillea juniperina ssp. *juniperina*				X
	Hakea sericea	Bushy Needlewood			X
	Ranunculaceae				
*	*Ranunculus repens*	Creeping Buttercup		X	
	Rosaceae				
*	*Rosa rubiginosa*	Sweet Briar		X	X
*	*Rosa* spp.				X

	Scientific Name	Common Name	Woodland	Riparian Forest	Cleared areas
*	*Rubus fruiticosus*	Blackberry complex			X
	Rubiaceae				
	Opercularia diphylla		X		
	Solanaceae				
*	*Solanum mauritianum*	Wild Tobacco Bush		X	
*	*Solanum nigrum*	Black-berry Nightshade		X	
	Solanum prinophyllum	Forest Nightshade	X		
*	*Solanum pseudocapsicum*	Madeira Winter Cherry		X	
	Verbenaceae				
*	*Verbena bonariensis*	Purpletop		X	X
*	*Verbena rigida*	Veined Verbena	X		X

Note: * signifies exotic species

APPENDIX 2

Fauna Results

Family Name	Scientific Name	Common Name	Type of Record
Invertebrates			
Camaenidae	*Meridolum corneovirens*	Cumberland Plain Land Snail	O
Reptiles			
Agamidae	*Physignathus lesueurii*	Eastern Water Dragon	O
Chelidae	*Chelodina longicollis*	Eastern Long-necked Tortoise	O
Elapidae	*Pseudechis porphyriacus*	Red-bellied Black Snake	O
Scincidae	*Eulamprus quoyii*	Eastern Water Skink	O
Scincidae	*Lampropholis guichenoti*	Garden Skink	O
Scincidae	*Lampropholis delicata*	Grass Skink	O
Native Birds			
Anatidae	*Anas superciliosa*	Pacific Black Duck	O
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	O
Corvidae	*Corvus coronoides*	Australian Raven	O/H
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	H
Maluridae	*Malurus cyaneus*	Superb Fairy-wren	O
Meliphagidae	*Manorina melanocephala*	Noisy Miner	O
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	O
Meliphagidae	*Lichenostomus chrysops*	Yellow-faced Honeyeater	O
Pardalotidae	*Acanthiza pusilla*	Brown Thornbill	H
Pardalotidae	*Sericornis frontalis*	White-browed Scrubwren	O
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican	O
Psittacidae	*Platycercus eximius*	Eastern Rosella	O
Psittacidae	*Trichoglossus haematodus*	Rainbow Lorikeet	H/O
Scolopacidae	*Gallinago hardwickii*	Latham's Snipe	O
Introduced Birds			
Sturnidae	*Acridotheres tristis*	Common Myna	O
Introduced Mammals			
Leporidae	*Lepus capensis*	Brown Hare	O
Leporidae	*Oryctolagus cuniculus*	Rabbit	S
Muridae	*Mus musculus*	House Mouse	O

Key- O= Observed, H = Heard, S = Sign or scat

APPENDIX 3

Conservation Rating According to Briggs and Leigh (1996)

Conservation Rating According to Briggs and Leigh (1996)

Briggs and Leigh (1996) list over 5,031 species, subspecies and varieties of plants (5% of native vascular flora of Australia) that have been ranked according to their conservation status. While many of these species are contained within the schedules of various state and federal threatened species legislation (eg. TSC Act and *EPBC* Act), and are subject to legislative provisions under those acts, a great many more do not and as a such are extraneous to statutory assessment processes.

The modified list below presents the range of codes that are, in various combinations, applied to each listed plant species.

- **1** Species only known from one collection
- **2** Species with a geographic range of less than 100km in Australia
- **3** Species with a geographic range of more than 100km in Australia
- **X** Species presumed extinct; no new collections for at least 50 years
- **E** Endangered species at risk of disappearing from the wild state if present land use and other causal factors continue to operate
- **V** Vulnerable species at risk of long-term disappearance through continued depletion.
- **R** Rare, but not currently considered to be endangered.
- **K** Poorly known species that are suspected to be threatened.
- **C** Known to be represented within a conserved area.
- **a** At least 1,000 plants are known to occur within a conservation reserve(s).
- **i** Less than 1,000 plants are known to occur within a conservation reserve(s).
- **-** The reserved population size is unknown.
- **t** The total known population is reserved.
- + The species has a natural occurrence overseas.

APPENDIX 4

Eight Part Tests

Vegetation Communities

Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) is an Endangered Ecological Community listed on Schedule 1 (Part 3) of the TSC Act.

CPW was recorded within the study area in varying condition (Figure 4). Approximately 4.2 ha of CPW occurs within the study area, approximately 1.4 ha of which will be cleared as part of the proposed development, including approximately 0.9 ha of CPW in poor condition.

(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

NA

(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

NA

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

The region under consideration is the Cumberland Plain, within Sydney Basin bioregion. NPWS (2002b) has mapped approximately 5209 ha of CPW within 10 km of the study area. The total mapped area of CPW within the Sydney Basin Bioregion is approximately 11,096 ha (NPWS 2002b).

The proposed development will result in the removal of 1.4 ha of CPW. This equates to 0.01% of the total distribution of the community. Given the regional and local distribution of the community, this is not considered to be a significant area of known habitat.

Furthermore, recommended mitigative measures are likely to improve the quality of the remaining CPW within the study area.

(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 proposal will fragment CPW within the study area, with an approximately 15 m wide road/ conveyor belt traversing an area of CPW (Figure 4). This fragmentation will not result in isolation of the fragments of CPW, as dispersal of propagules and pollinators is likely to still occur across this area.

(e) Whether critical habitat will be affected.

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this community (DEC Threatened Species Unit).

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

CPW exists in Scheyville National Park, Windsor Downs Nature Reserve, Leacock Regional Park and Mulgoa Nature Reserve (NPWS 1997a). CPW is also known to occur within Nurragingy Reserve (NPWS 1997b), which borders the study area to the east.

The JANIS nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system for forests in Australia suggests that 15% of the pre-European distribution should be a minimum target, unless the ecosystem is recognised as vulnerable in which case at least 60% should be reserved.

It is considered likely that this community is not adequately represented in conservation reserves.

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

Key Threatening Processes (KTP) are listed on Schedule 3 of the TSC Act. The proposed development will involve Clearing of Native Vegetation, which is a recognised KTP.

Other threats to this community include weed invasion, increased soil nutrients, rubbish dumping and frequent fire (NPWS 2004a). Weeds listed as a major threat to the community include *Asparagus asparagoides, Chloris gayana*, *Eragrostis*

curvula and *Olea europaea* ssp. *africana* (NPWS 2004a), and all of which were recorded within the study area (Appendix 1). Recommended mitigation measures will reduce the impact of weeds on the CPW within the study area with the implementation of a Weed Management Plan.

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

The extent of CPW is bounded by Schyville in the north, Penrith in the west, Parramatta in the east and Thirlmere in the south. The study area is not at or near the limit of distribution of this community.

Conclusion

It is considered unlikely that the proposed action will have a significant impact on this community. A Species Impact Statement is not recommended.

River-flat Eucalypt Forest

River-flat Eucalypt Forest (RFEF) is an Endangered Ecological Community listed on Schedule 1 (Part 3) of the TSC Act.

RFEF was recorded within the study area in poor condition (Figure 4). Approximately 3.8 ha of RFEF occurs within the study area, approximately 0.2 ha of which will be cleared as part of the proposed development under the conveyor route. The areas directly impacted by the proposed development are in poor condition.

(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

NA

(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

NA

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

The region under consideration is the Cumberland Plain within the Sydney Basin bioregion. NPWS (2002b) has mapped approximately 1136 ha of Sydney Coastal River-flat Forest (SCRFF) within 10 km of the study area. The total mapped area of SCRFF within the Cumberland Plain is 5716.3 ha (NPWS 2002b). RFEF is equivalent to parts of Alluvial Woodland, a sub-community of SCRFF, that are dominated by eucalypts in the NPWS (2002b) Cumberland Plain vegetation mapping (NPWS 2004b).

The proposed development will result in the removal of approximately 0.2 ha of RFEF, which is in poor condition. Given the regional and local distribution of the community, this is not considered to be a significant area of known habitat.

(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 proposal will result in the fragmentation of degraded RFEF within the study area, with a 15 m wide bridge traversing the community. The construction of the bridge will remain within disturbed areas and avoid clearing canopy trees where practicable. This fragmentation is not likely to result in isolation of proximate areas of habitat for the community.

(e) Whether critical habitat will be affected.

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this community (DEC Threatened Species Unit).

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

RFEF exists in Blue Mountains, Cattai, Dharug, Georges River, Marramarra, Morton, Deua and Wadbilliga National Parks, and Gulguer and Mulgoa Nature Reserves, and these are unevenly distributed throughout the range and unlikely to represent the full diversity of the community (NPWS 2004b). SCRFF is also known to occur in Nurragingy Reserve (NPWS 1997b), which borders the study area to the east.

The JANIS nationally agreed criteria for the establishment of a comprehensive, adequate and representative reserve system for forests in Australia suggests that 15% of the pre-European distribution should be a minimum target, unless the ecosystem is recognised as vulnerable in which case at least 60% should be reserved.

It is considered likely that this community is not adequately represented in conservation reserves.

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

Key Threatening Processes (KTP) are listed on Schedule 3 of the TSC Act. The proposed development will involve Clearing of Native Vegetation, which is a recognised KTP. Other KTPs that are listed as potentially impacting RFEF include Alteration to the natural flow regimes of rivers, streams, floodplains and

wetlands; Invasion of native plant communities by exotic perennial grasses; Predation, habitat destruction, competition and disease transmission by feral pigs; Anthropogenic climate change; High frequency fire; and Removal of dead wood and dead trees (NPWS 2004b). The proposal is not likely to introduce any of these additional KTP to the RFEF in the study area.

Other threats to this community include continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood, rubbish dumping, anthropogenic climate change and frequent burning (NPWS 2004b).

Mitigation measures recommended as part of the proposed development will aim to reduce the threat of weed invasion and rubbish dumping on the RFEF within the study area.

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

RFEF occurs in the Local Government Areas of Port Stephens, Maitland, Singleton, Cessnock, Lake Macquarie, Wyong, Gosford, Hawkesbury, Baulkham Hills, Blacktown, Parramatta, Penrith, Blue Mountains, Fairfield, Holroyd, Liverpool, Bankstown, Wollondilly, Camden, Campbelltown, Sutherland, Wollongong, Shellharbour, Kiama, Shoalhaven, Eastern Capital City Regional, Eurobodalla and Bega Valley. The study area is not at or near the limit of distribution of this community.

Conclusion

It is considered unlikely that the proposed action will have a significant impact on this community. A Species Impact Statement is not recommended.

Flora

Grevillea juniperina ssp. *juniperina*

Grevillea juniperina ssp. *juniperina* is listed as Vulnerable on the TSC Act.

G. juniperina ssp. *juniperina* is a broadly spreading to erect shrub mostly 0.5 to 1.5 m high and to 3 m wide (NPWS 2002a). This species is found on reddish clay to sandy soils in Cumberland Plain Woodland, Castlereagh Ironbark Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest from an area bounded by Blacktown, Erskine Park, Londonderry and Windsor in the Sydney Basin Bioregion (NPWS 2002a). Within the study area, habitat for *G. juniperina* ssp. *juniperina* occurs in Cumberland Plain Woodland.

G. juniperina ssp. *juniperina* appear to thrive in relatively open conditions and has a tendency to colonise mechanically disturbed areas (NPWS 2002a). The *G. juniperina* ssp. *juniperina* within the study area were located along a gas pipeline route.

A total of four individuals of *G. juniperina* ssp. *juniperina* were recorded in the study area within disturbed Cumberland Plain Woodland (Figure 4). A number of dead plants were also observed within close proximity to the live plant found south of the creek. It was evident that a fire had recently burnt through this section of the study area and may have resulted in the death of the *G. juniperina* ssp. *juniperina* plants as it is known to be a fire sensitive species (NPWS 2002a).

The proposed development will not involve the direct removal of any individuals, but will involve the removal of approximately 1.4 ha potential habitat from a total of 4.2 ha of potential habitat within the study area.

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

The distribution of *G. juniperina* ssp. *juniperina* extends from Blacktown to Windsor, Londonderry and Erskine Park. The DEC Atlas of NSW Wildlife (accessed 4 March 2005) shows the distribution of *G. juniperina* ssp. *juniperina* to be confined to western Sydney, with 51 recordings, approximately 29 of which are within 10 km of the study area (Figure 5).

The total number of individuals in the population within the study area is estimated to be four. The proposed development will not result in the removal of any individuals of *G. juniperina* ssp. *juniperina*, but will result in the removal of approximately 1.4 ha of potential habitat.

The proposed development is not likely to disrupt the life cycle of the species to the extent that a viable population of the species is likely to be placed at risk of extinction.

(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.

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the Act.

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

G. juniperina ssp. *juniperina* occurs within an area bounded by Blacktown, Londonderry, Windsor and Erskine Park (NPWS 2002a). The study area is in Rooty Hill, approximately 6 km from the eastern limit of the species (Blacktown). The majority of the previous recordings of the species on the NPWS Atlas of Wildlife are in the Blacktown area. NPWS Wildlife Atlas shows 29 recordings of *G. juniperina* ssp. *juniperina* within a 10 km radius of the study area (Figure 5).

Known habitat for this species occurs in Cumberland Plain Woodland, Castlereagh Scribbly Gum Woodland and Shale/Gravel Transition Forest (NPWS 2002a). Known and potential habitat for this species is relatively widespread in the locality (within 10 km of the study area) and region, with approximately 10,721 ha of potential habitat for *G. juniperina* ssp. *juniperina* within the known range of the species (Blacktown, Hawkesbury, Liverpool, Parramatta and Penrith (NPWS 2000b) and approximately 6347 ha of potential habitat within 10 km of the study area (Table 4).

Table 4. Vegetation communities within the known range of *G. juniperina* ssp. *juniperina* in which the species potentially occurs (from NPWS (2002b)

Vegetation Community	Area mapped within known range* (ha)	Area mapped within 10km of the study area (ha)
Cumberland Plain Woodland	6866.5 ha	5209.3 ha

Vegetation Community	Area mapped within known range* (ha)	Area mapped within 10km of the study area (ha)
Castlereagh Scribbly gum Woodland	3083.4 ha	16.6 ha
Shale/Gravel Transition Forest	770.8 ha	1120.9 ha
Total	10,720.7 ha	6346.8 ha

* known range: Blacktown, Hawkesbury, Liverpool, Parramatta and Penrith LGA's (NPWS 2000b).

The proposed development would remove approximately 1.4 ha of potential habitat within the study area. This is a small proportion of potential habitat in the region.

The removal of approximately 1.4 ha of potential habitat is not considered to be a significant area in relation to the regional distribution of potential habitat.

(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.

Currently Angus Creek fragments the population of *G. juniperina* ssp. *juniperina* within the study area. The proposed development would not further fragment the population of the species within the study area. CPW, potential habitat for the species, will be fragmented, with a 15 m wide road traversing the community, but is unlikely to increase isolation or disrupt pollinator movements or propagule dispersal.

The proposed development would not fragment the population of *G. juniperina* ssp. *juniperina* from other populations in the region. Previous recordings of *G. juniperina* ssp. *juniperina* in the vicinity of the study area are approximately 500 m to the east, 1.5 km to the north and 2 km to the south-west of the study area (Figure 5). It is considered unlikely that proposed development would significantly increase genetic isolation of the population within and surrounding the study area, as it is generally restricted to already cleared areas.

(e) Whether critical habitat will be affected.

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species (DEC Threatened Species Unit).

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

G. juniperina ssp. *juniperina* is known to occur in two conservation reserves: Castlereagh Nature Reserve and Windsor Downs Nature Reserve (NPWS (2000b) (2002a)). *G. juniperina* ssp. *juniperina* is therefore not considered to be adequately represented in conservation reserves in the region.

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

Key Threatening Processes are defined under Schedule 3 of the TSC Act. The proposed development will include Clearing of Native Vegetation, which is listed as a Key Threatening Process.

Clearing of Native Vegetation is recognised as a Key Threatening Process under Schedule 3 of the TSC Act. The proposed development would require the clearing of approximately 1.4 ha of vegetation that is considered to be potential habitat of *G. juniperina* ssp. *juniperina*.

Other threats to this species include clearance for urban and industrial development, road upgrading, inappropriate fire regimes, weed invasion, rubbish dumping, trampling and vehicular damage (NPWS 2000b).

Mitigative measures to minimise the impact of these threats on the potential and known habitat for *G. juniperina* ssp. *juniperina* within the study area would be implemented as part of the proposal (see section 5), with protective fencing and a the implementation of a VMP to control weed invasion.

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

G. juniperina ssp. *juniperina* is known to occur from Blacktown to Windsor, Londonderry and Erskine Park (NPWS 2002a). The study area occurs in Rooty Hill, approximately 6 km west of Blacktown, and therefore not considered to be at the limit of distribution for this species.

Conclusion

It is considered unlikely that the proposed development will have a significant impact on *G. juniperina* ssp. *juniperina.* A Species Impact Statement is not required.

Acacia pubescens

Acacia pubescens is listed as Vulnerable on the TSC Act and has a conservation ranking of 3Va (Briggs and Leigh 1996, see code description in (Appendix 3).

A. pubescens is a spreading shrub 1-4 m high (NPWS 2003b). This species is found in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland (NPWS 2003b).

A. pubescens was not recorded within the study area, although potential habitat for *A. pubescens* does occur within the study area, in Cumberland Plain Woodland that is in moderate to poor condition (Figure 4).

Approximately 4.2 ha of potential habitat for *A. pubescens* occurs in the study area. The proposed development involves clearing of 1.4 ha of vegetation that is potential habitat for *A. pubescens.*

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

The lifecycle of *A. pubescens* is not well understood, although one factor known to influence the life cycle of the species is fire, with increased fire frequency resulting in declines in population numbers (NPWS 2000a).

The proposed development is not likely to increase the fire frequency within the study area.

A. pubescens was not recorded within the study area, therefore the proposed development is not likely to place a viable population at risk of extinction.

The total area of potential habitat within the study area is estimated to be 4.2 ha, approximately 1.4 ha of which will be removed as part of the proposed development.

The proposed development is not likely to disrupt the life cycle of the species to the extent that a viable population of the species is likely to be placed at risk of extinction.

(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.

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the Act.

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

The distribution of *A. pubescens* is concentrated around the Bankstown, Fairfield and Rookwood area, with outliers occurring at Barden Ridge, Pitt Town, Oakdale and Mountain Lagoon. *A. pubescens* occurs at 151 known sites, in 14 local government areas including Auburn, Bankstown, Baulkham Hills, Blacktown, Canterbury, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Rockdale, Strathfield, Sutherland and Wollondilly (NPWS 2003b).

There are approximately 11 recordings of *A. pubescens* within 10 km of the study area, concentrated around Prospect Reservoir (Figure 5).

Known habitat for this species in the study area and adjacent land occurs in Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland (NPWS 2003b). Known and potential habitat for this species is relatively widespread in the locality (within 10 km of the study area) and region, with approximately 9403 ha of potential habitat for *A. pubescens* within the known distribution of the species and approximately 6563 ha of potential habitat within 10 km of the study area.

Table 5. Vegetation communities in which *A. pubescens* potentially occurs (from NPWS (2002c).

Vegetation Community	Area mapped within known range (ha)	Area mapped within 10km of the study area (ha)
Cooks River/Castlereagh Ironbark Forest	524.6 ha	232.5 ha
Shale/Gravel Transition Forest	1418.1 ha	1121 ha
Cumberland Plain Woodland	7460.7 ha	5209 ha
Total	9403.4 ha	6562.5 ha

* known range: Auburn, Bankstown, Baulkham Hills, Blacktown, Canterbury, Fairfield, Hawkesbury, Holroyd, Liverpool, Parramatta, Rockdale, Strathfield, Sutherland and Wollondilly LGAs

The proposed development would remove approximately 1.4 ha of potential habitat within the study area. This is a small proportion of potential habitat in the region.

The removal of 1.4 ha of potential habitat is not considered to be a significant area in relation to the regional distribution of potential habitat.

(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 proposed development will fragment the potential habitat of *A. pubescens* within the study area, with a road/conveyor belt of a maximum width of approximately 15 m where it crosses Cumberland Plain Woodland. This fragmentation is unlikely to significantly impact pollinators and some dispersal is likely to still occur across this area. It is considered unlikely that proposed development would significantly increase genetic isolation of the potential habitat within and surrounding the study area.

The proposed development will result in further fragmentation of potential habitat for *A. pubescens*, but would not isolate any currently interconnecting areas of potential habitat.

(e) Whether critical habitat will be affected.

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species (DEC Threatened Species Unit).

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

Five known areas of habitat for *A. pubescens* occur within two conservation reserves, Scheyville National Park and Windsor Downs Nature Reserve (NPWS 2003a). *A. pubescens* is therefore not considered to be adequately represented in conservation reserves in the region.

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

Key Threatening Processes are defined under Schedule 3 of the TSC Act. The proposed development will include ‘clearing of native vegetation’, which is listed

as a Key Threatening Process. Approximately 1.4 ha of potential habitat for *A. pubescens* will be cleared as a result of the proposal.

Another listed Key Threatening Process listed that is relevant to *A. pubescens* is 'high frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' (NPWS 2003a). The proposal is unlikely to result in an increase in fire frequency.

Other threats to this species include habitat loss, hybridisation with other bipinnate Acacias and habitat degradation through weed invasion, mechanical damage, rubbish dumping, illegal track creation and arson (NPWS 2000a). Mitigation measures recommended as part of this proposal would reduce many of the listed potential impacts, with protective fencing preventing illegal track creation, rubbish dumping and mechanical damage and a VMP to control weed invasion.

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

The known distribution of *A. pubescens* extends from Mountain Lagoon in the north, Menai in the south, Bardwell Valley in the east and Woodford in the west (NPWS 2000a). The study area is therefore not considered to be at the limit of distribution for this species.

Conclusion

It is considered unlikely that the proposed development will have a significant impact on *A. pubescens*. A Species Impact Statement is not required.

Fauna

Meridolum corneovirens Cumberland Plain Land Snail

Meridolum corneovirens is listed as Endangered on Schedule 1 of the *TSC Act*. This species shelters beneath bark logs and other structures and often buries into soft sediment and is restricted to Cumberland Plain Woodland. It is mainly nocturnal and is a fungivore.

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

The current known habitat of *Meridolum corneovirens* is restricted to CPW of western Sydney.

Random, targeted searches for *M. corneovirens* record the species within the study area in a small patch of Cumberland Plain Woodland to the north west of Angus Creek. Previous surveys have also located *M. corneovirens* in this area (NECS 2003). This area of the habitat will not be impacted by the proposed development.

Approximately 1.4 ha or 30% of moderate -poor quality CPW will be cleared from the southern side of Angus creek and a small patch of poor quality woodland in the northern corner of the development site. These areas contain potential habitat for *M. corneovirens,* however, despite intensive searching *M. corneovirens* was not recorded in these areas (NECS 2004). It is unlikely that the area impacted will disrupt a viable population.

(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.

An endangered population is defined under the TSC Act as 'a population specified in Part 2 of Schedule 1'. At the present time, there are no endangered populations of this species listed under the Act. 2

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

The region under consideration is the Sydney Basin bioregion. *Meridolum corneovirens* is found in scattered locations across a wide area of western Sydney.

There is over 10,000 ha of CPW within the Sydney Basin Bioregion, which is only 5% of the area, pre-European settlement (NPWS 2002b). The proposal relates to a very small proportion of this area and is not considered to be significant in a regional context.

(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 local CPW remnants from which this species is known and other areas where it is likely to occur are to some degree already isolated, with, in some cases, habitat links restricted to narrow bands of variably disturbed bushland along creeklines (which may not provide suitable micro-habitat opportunities for the species). While the proposed works could restrict or isolate potential (sub-optimal) habitat components of this species in the short-term, it is highly unlikely that an extant population or known habitat of this species would be isolated from interconnecting or proximate areas of habitat.

(e) Whether critical habitat will be affected.

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species (DEC Threatened Species Unit).

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

Meridolum corneovirens has been located in a number of conservation reserves including Scheyville National Park, Agnes Banks Nature Reserve, Castlereagh Nature Reserve, Windsor Downs Nature Reserve and Gulguer Nature Reserve. However, this species is not considered to be adequately represented in conservation reserves.

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

Key Threatening Processes (KTP) are listed on Schedule 3 of the TSC Act. The proposed development will involve Clearing of Native Vegetation which is a recognised KTP. The proposed development will result in the removal of approximately 1.4 ha of poor–moderate CPW which relates to 30 % of this vegetation class on the site. No *M. corneovirens* were recorded in the areas of

CPW that will be removed under this proposal. The impact of this removal will be mitigated by the regeneration of cleared and disturbed area with CPW.

Other threats to this species include introduction of weed and inappropriate fire regimes and competition by exotic snails, which are present on the site.

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

The study site is near the centre of their known distribution. *Meridolum corneovirens* is found in western Sydney between Campbelltown and Windsor and given this small range, any area in the range could be considered near limit of distribution of this species.

Conclusion:

Although *M. corneovirens* has been recorded in the study area, the patch of CPW that it inhabits will not be impacted by the development. Targeted searches of other areas of impacted potential habitat have failed to record the species. Therefore, the proposed development is unlikely to have a significant impact on *M. corneovirens*. A Species Impact Statement is not recommended.

Koala

The Koala is listed as vulnerable under the TSC Act and is widely distributed throughout eastern Australia and on either side of the Great Dividing Range. It is most abundant in forest remnants and eucalypt woodland to the south and east (Strahan 1995). The Koala is an arboreal folivore feeding almost exclusively on the leaves of eucalypt species (Strahan, 1995), in NSW the preferred trees (feed trees) are Grey Gum, Forest Red Gum, Tallowwood, Monkey Gum and Ribbon Gum (NPWS 1999c).

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

The Koala was not detected during this study. The species was recorded in1990 approximately 8km to the west (Figure 6) The study site contains 8 ha of potential habitat for the Koala which is dominated by a primary feed tree (Forest Red Gum) and also contains a secondary feed tree (Grey Gum) (NPWS 2003c). The proposed works will remove 1.5 ha of this vegetation. It is unlikely that this area would support a viable population of Koala due to its small size.

It is therefore considered that the lifecycle of this species will not be disrupted such that a viable population of this species is likely to be placed at risk of extinction.

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.

An endangered population is defined under the TSC Act as ‘a population specified in Part 2 of Schedule 1. At the present time there are no endangered populations of Koala listed under the TSC Act within this area. No endangered populations will therefore be affected by the proposal.

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

One species of primary and one secondary species of Koala feed-trees, have been recorded in the study area. There is little connecting habitat between the study area and nearby known Koala record which are approximately 8 km away, although potential habitat exists widely in the vicinity of the study area. The proposed works remove 1.5 ha of potential koala habitat and it is not considered

to be significant. It is unlikely that the proposed development will result in the modification or removal of a significant area of known habitat for this species.

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 proposed development is in a small area of habitat surrounded by urban industrial and recreational land use and is isolated from other potential areas of Koala habitat It is unlikely that the proposed activity would isolate any areas of known Koala habitat.

e) Whether critical habitat will be affected.

Under the TSC Act, the Director-General maintains a Register of Critical Habitat. To date, no critical habitat has been declared for this species (DEC Threatened Species Unit).

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

Koalas have been recorded in a number of conservation reserves along the east coast and slopes of the Great Dividing Range. It is not known if these populations and their preferred habitats are adequately represented therein. Individuals are likely to move widely throughout their home range (in addition to this dispersing young adults will form new and separate home-ranges), which would include movement within and out of these reserves.

g) Whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process.

Threatening processes are defined under Schedule 3 of the TSC Act. The proposed development will include the clearing of native vegetation that is listed as a key threatening process.

h) Whether any threatened species, population or ecological community is at the limit of its known distribution.

The Koala has a fragmented distribution throughout eastern and southern Australia, extending from north-east Queensland to the Eyre Peninsula in South Australia and west of the Dividing Range. The species is associated with native forest and woodland throughout its range. Local populations of this species would not, therefore, be at the limit of its known distribution.

Conclusion

Although the study site contains recognised feed trees it is unlikely that the proposed development would have a significant effect on this species. A Species Impact Statement is not recommended.

APPENDIX 5

EPBC Assessment of Significance

Vegetation Community

Cumberland Plain Woodland

Cumberland Plain Woodland (CPW) listed as an Endangered Ecological Community on the EPBC Act. It is also listed on the TSC Act.

Approximately 4.2 ha of CPW was recorded within the study area (Figure 4). The proposed development will result in the removal of approximately 1.4 ha of CPW within the study area.

Is the action likely to lead to a long-term adverse affect on an ecological community?

A total of 11,096 ha of CPW is mapped within the Sydney Basin Bioregion (NPWS 2002c), which represents approximately 9 per cent of the original extent of the community (NPWS 2004a). A total of 5209 ha is mapped as occurring within 10 km of the study area (NPWS 2002c).

The removal of 1.4 ha of CPW within the study area as a result of the proposal, which represents 0.01 per cent of the current distribution of the community, is not considered likely to have a long-term adverse impact on the ecological community considering the regional and local extent of the community.

Is the action likely to reduce the extent of a community?

The extent of CPW is bounded by Scheyville in the north, Penrith in the west, Parramatta in the east and Thirlmere in the south. The study area is within Rooty Hill, which is approximately 6 km west of Blacktown and not at the limit of the known distribution of the community.

The removal of 1.4 ha of CPW at Rooty Hill will not reduce the extent of the community.

Is the action likely to fragment an occurrence of the community?

The proposal will result in the fragmentation of CPW within the study area. An approximately 15 m wide conveyor belt/road will traverse CPW, but is unlikely to prevent pollinator movements or propagule dispersal.

Is the action likely to adversely affect habitat critical to the survival of an ecological community?

DEH contains a register of Critical Habitat. The identification of critical habitat for the Register of Critical Habitat, including location and extent information, is a matter of ecological judgment, and is based on the most up-to-date scientific information available to the Threatened Species Scientific Committee and the Minister for the Environment and Heritage at the time the habitat was being considered (www.deh.gov.au).

To date there is not critical habitat listed for CPW. Therefore, the proposal will not adversely affect habitat critical to the survival of the ecological community.

Is the action likely to modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for the community's survival?

The proposal has been designed taking into account the following environmental factors (NECS 2004):

- Physical constraints, including the location of Angus Creek and the slope of the site;
- Environmental constraints, in particular the location of sensitive vegetation communities;
- The need to minimise disturbance to Angus Creek;
- The proximity of Nurragingy Reserve.

The impact to the abiotic factors necessary for the community's survival will be restricted to the 1.4 ha of CPW to be cleared as a result of the proposal. Indirect impacts to adjoining areas will be minimised by the recommended mitigation measures such as the VMP and installation of sediment fencing.

Is the action likely to result in invasive species that are harmful to the critically endangered or endangered community becoming established in an occurrence of the community?

Currently the CPW within the study area is relatively degraded. As part of the recommended mitigation measures for the proposal, a VMP, is to be implemented to manage the current weed infestation within the study area.

The implementation of the mitigation measures as part of the proposal is likely to reduce the impact of invasive weeds on the CPW within the study area.

Is the action likely to interfere with the recovery of an ecological community?

To date, no recovery plan has been written for CPW. The proposal will not interfere with the recovery of the ecological community.

Conclusion

Based on the above assessment, CPW is unlikely to be significantly impacted by the activities and as such a referral under the provisions of the EPBC Act is not required for this ecological community. However, based on the local interest in this ecological community and discussions with DIPNR, a referral the minister may be warranted.

Acacia pubescens

A. pubescens is listed as Vulnerable under the EBPC Act.

A. pubescens is a spreading shrub 1-4 m high (NPWS 2003b). This species is found in open woodland and forest, in a variety of plant communities, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland (NPWS 2003b).

A. pubescens was not recorded within the study area, although potential habitat for *A. pubescens* does occur within the study area, in Cumberland Plain Woodland that is moderate to poor condition.

Approximately 4.2 ha of potential habitat for *A. pubescens* occurs in the study area. The proposed development involves clearing of 1.4 ha of vegetation that is potential habitat for *A. pubescens.*

The potential habitat within the study area does not support an important population:

- It is unlikely to be a key source population either for breeding or dispersal;
- It is unlikely to be necessary for maintaining genetic diversity; and,
- The study site is not at or near the limit of the species range.

Is the action likely to lead to a long-term decrease in the size of an important population of a species?

The potential habitat within the study area does not support an important population. The potential habitat for *A. pubescens* within the study area is moderate to poor condition.

There is approximately 6562.5 ha of potential habitat for *A. pubescens* is mapped as occurring within 10 km of the study area (NPWS 2002c). The removal of approximately 1.4 ha of potential habitat for *A. pubescens* will not lead to a long term decrease in the size of an important population of the species.

Is the action likely to reduce the area of occupancy of an important population?

The potential habitat for *A. pubescens* within the study area does not support an important population and therefore will not reduce the area of occupancy of an important population.

The proposed development will remove approximately 1.4 ha of potential habitat for *A. pubescens.* The reduction in area of occupancy of the population of *A. pubescens* as a result of the proposed development is not considered to be significant given the regional distribution of habitat (Table 5), with over 6562 ha of potential habitat within 10 km of the study area. In the long term the area of potential habitat for *A. pubescens* may increase through the regeneration of degraded vegetation as part of the recommended mitigation measures.

Is the action likely to fragment an existing important population into two or more populations?

The potential habitat for *A. pubescens* in the study area does not support an important population. The potential habitat for *A. pubescens* in the study area is currently fragmented by tracks and previously cleared areas. The proposed development will fragment the potential habitat of *A. pubescens*, with an approximately 15 m wide conveyor belt/road traversing the community.

It is considered unlikely that this fragmentation would disrupt pollinator movements or propagule dispersal such that the viability of the potential habitat for the species would decline. Furthermore, works associated with the implementation of the VMP are likely to increase the quality of the potential habitat within the study area.

Is the action likely to adversely affect habitat critical to the survival of a species?

The Commonwealth Environment Minister may identify and list habitat critical to the survival of a listed threatened species or ecological community. Details of this identified habitat will be recorded in a Register of Critical Habitat. To date no critical habitat has been listed for *A. pubescens.*

The proposed development will directly impact approximately 1.4 ha of potential habitat for *A. pubescens.*

The impacts of the proposal on potential habitat for *A. pubescens* adjacent to the development area would be minimised through recommended mitigation measures such as the works associated with the implementation of the VMP. Given the regional distribution of potential habitat for the species, the area of potential habitat that will be affected by the proposal is not critical to the survival of the species.

Is the action likely to disrupt the breeding cycle of an important population?

The potential habitat for *A. pubescens* in the study area does not support an important population. The proposal would not disrupt the breeding cycle of an important population of *A. pubescens*.

Is the action likely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Land Clearance is the only Key Threatening Processes (KTP) listed under the EPBC Act relevant to the proposed development. Approximately 1.4 ha of potential habitat for *A. pubescens* will be cleared as a result of the proposed development. This is unlikely to cause the species to decline given the regional distribution of potential habitat (Table 5), with over 6500 ha of potential habitat within 10 km of the study area and over 9400 ha of potential habitat within the known distribution for the species.

The proposed development will not isolate the potential habitat from other areas of potential habitat as the distance between the habitat areas will be widened by approximately 15 m, which is unlikely to disrupt pollinator movements or propagule dispersal.

The proposal would modify potential habitat for *A. pubescens* through increased edge effects. However, implementation of works associated with the VMP is likely to improve the quality of potential habitat for *A. pubescens* in and adjacent to the study area.

Is the action likely to result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

Currently the vegetation within the study area supporting potential habitat for *A. pubescens* is in moderate to poor condition. The development and implementation of a Weed Management Plan would reduce the current weed infestation and minimise the further establishment of invasive species in the Cumberland Plain Woodland that is potential habitat for *A. pubescens* within the study area.

Is the action likely to interfere substantially with the recovery of the species?

The Australian Government Minister for the Environment and Heritage may make or adopt and implement recovery plans for threatened fauna, threatened flora (other than conservation dependent species) and threatened ecological communities listed under the EPBC Act.

A recovery plan for *A. pubescens* has been adopted by the Australian Government Minister for the Environment and Heritage (NPWS 2003a).

The recovery plan (NPWS 2003a) lists management issues as loss of habitat, degradation of habitat, including weed invasion, mechanical damage, rubbish dumping, illegal track creation, arson, horses and hybridisation. Mitigation measures recommended as part of the proposal will reduce may of the listed management issues such as weed invasion, rubbish dumping, mechanical damage

and illegal track creation. The proposal will not result in the loss of any area of known habitat for *A. pubescens.*

'Recovery' in the context of the recovery plan for *A. pubescens* (NPWS 2003a) is targeted towards maintaining the current vulnerable status of the species and preventing it from becoming endangered.

The proposal is unlikely to interfere substantially with the recovery of *A. pubescens* since the proposal will not result in the removal of any known habitat for the species.

Conclusion

The proposal is unlikely to have a significant impact on *A. pubescens*. Referral to the Minister is not required.

Fauna

Migratory species

Potential habitat occurs within the study area for 4 migratory species listed on the EPBC Act (Table 2).

- Latham's Snipe
- Square Tailed Kite'
- Satin Flycatcher
- Swift Parrot
- Regent Honeyeater

One of these species, Latham's Snipe was recorded within the study area during the current survey.

For the purposes of the Act, an area of important habitat for migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilised by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

The study area is not considered to contain an area of important habitat for any of these species as the study area is not considered to be at the limit of their distribution and the potential habitat is unlikely to support an ecologically significant proportion of the population of these species.

Is the action likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species?

The study area is not considered to contain an area of important habitat for migratory species. Therefore, it is unlikely that the proposed action would substantially modify, destroy or isolate area of important habitat for any of the migratory species with potential habitat in the study area.

Is the action likely to result in invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species?

The study area is not considered to contain an area of important habitat for any of the migratory species.

Is the action likely to seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species?

The proposed action is unlikely to disrupt the breeding cycle of an ecologically significant proportion of the population of these species. The potential habitat within the study area is not considered to be important habitat.

Conclusion

Based on the above assessment, migratory species with potential habitat within the study area are unlikely to be significantly impacted by the activities and as such a Referral under the provisions of the EPBC Act is not recommended for these species.

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