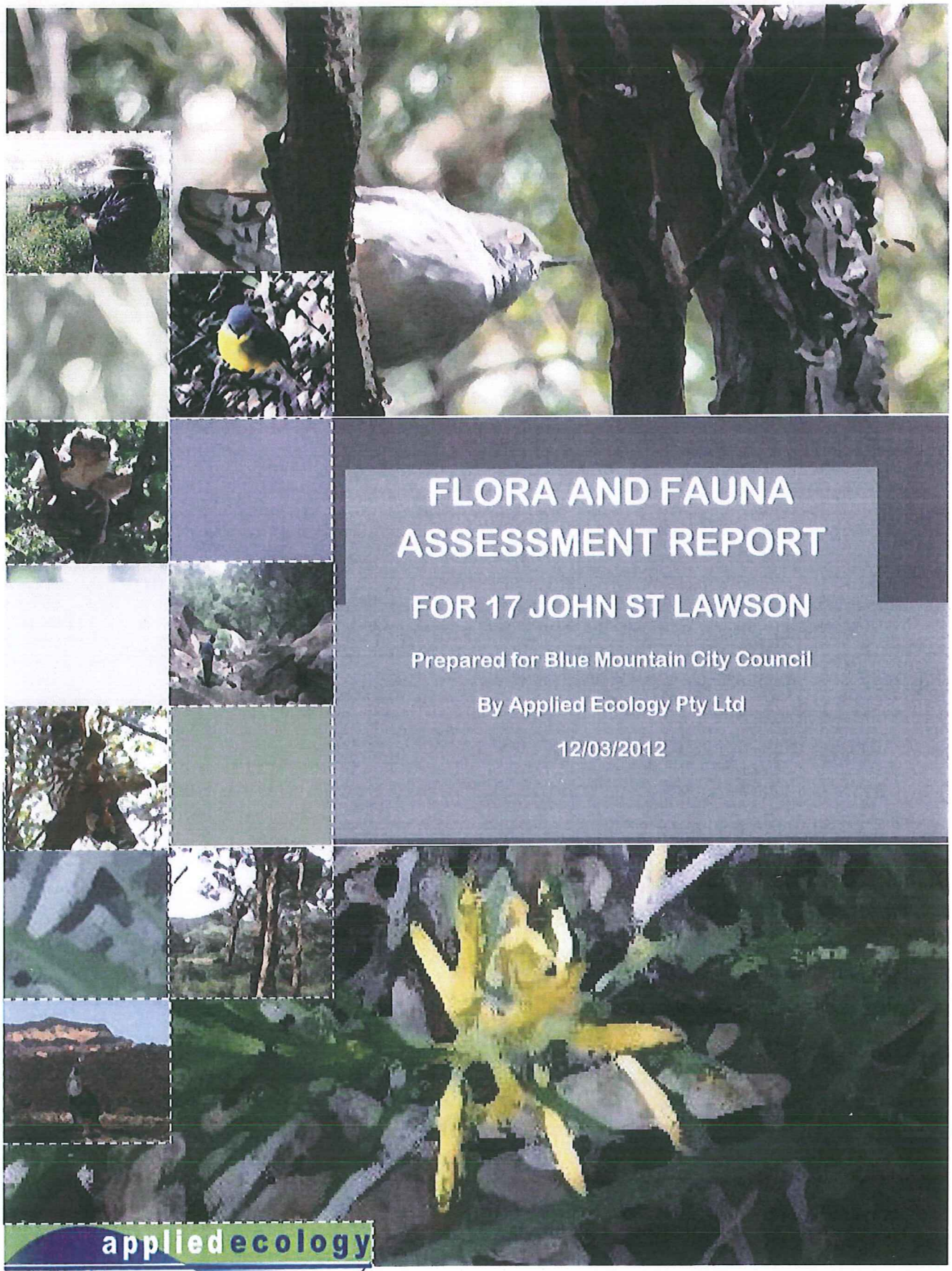
ATTACHMENT 10



FLORA AND FAUNA ASSESSMENT REPORT

FOR 17 JOHN ST LAWSON

Prepared for Blue Mountain City Council

By Applied Ecology Pty Ltd

12/03/2012

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Contents

EXECUTIVE SUMMARY

Applied Ecology Pty Limited undertook flora and fauna surveys and habitat assessment of 17 John St Lawson on the 24-26th of February 2012 to assess the suitability of the site for development as a light industrial park. The site is approximately 3 hectares in area and we have assessed 0.58 hectares of the site as unsuitable for development. The areas unsuitable for development include the waterways and riparian lands that are protected under the BMCC LEP by clause 7(c) Ecological Buffer Areas and areas on site protected under clause 7(a) Slope Constraint Area. This area also contains a threatened species – the Mossy Geebung *Persoonia acerosa.* Under the LEP, a buffer is required between any development and adjoining Environment Protection Zones, with a distance of 20m recommended. The riparian zone is approximately 20 metres in width in total on the subject site.

In addition we recommend that a further 0.23 hectares of vegetation is retained in narrow corridors across the site (north to south) and as a buffer to the slope constrained area containing the threatened species. Retaining the canopy trees, at a minimum, would assist the movements of woodland birds across the site, in particular the Varied Sitella, a threatened species observed on site that is very reluctant to move across open space. Clearing on site should occur outside the breeding season of this species. A vegetation management plan should be developed for vegetation earmarked for retention.

INTRODUCTION

PROJECT BACKGROUND

Blue Mountains City Council has commissioned a Flora and Fauna Assessment report for 17 John St Lawson prior to its potential development as a light industrial park to identify any environmental constraints that may limit its proposed use for this purpose.

The Flora and Fauna Assessment provides a comprehensive snapshot of flora and fauna recorded on site during late February, 2012. In addition, it provides a detailed analysis of the potential environmental impacts and constraints arising from the development of 17 John St Lawson for any such purposes which would be deemed permissible under the Employment –General zoning that applies to this area.

SITE DESCRIPTION

The subject site at 17 Johns St Lawson (Figure 1) is a 2.96 ha parcel of council operational land that is zoned Employment General. It is mapped as containing modified bushland (1.4ha) and non scheduled woodland (*E. piperita* and *A. costata* 11B).

It contains areas zoned as Environment Protection-Slope Constraint and Environment Protection-Ecological Buffer (Riparian). These environmental protection zones will limit the extent of the subject site that is suitable for development, as per the BMCC LEP 2005 and amendments.

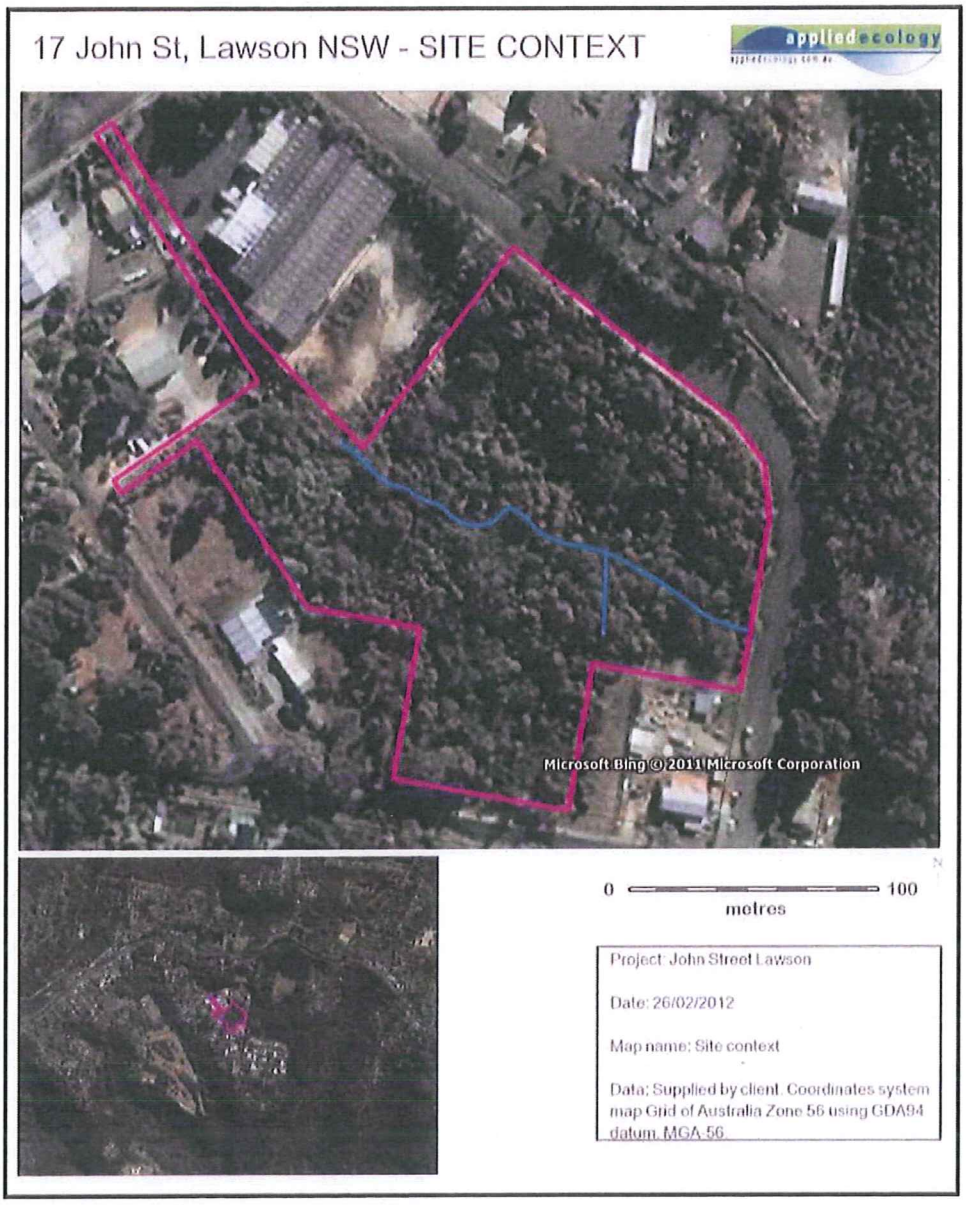

Figure 1 Site location and context

PLANNING AND LEGISLATIVE CONTEXT

LICENCES AND APPROVALS REQUIRED

Environmental Planning and Assessment Act 1979

Development is either 'permissible without consent', 'permissible with consent' or 'prohibited'. Permissible development is assessed under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Potential approval requirements

	Approval/ licence requirements	Relevance to potential works
Contaminated land Management Act		
Section 60	No approval requirement	If contaminated land is found it must be reported to the Office of Environment and Heritage if it presents "a significant risk of harm"
Heritage Act 1977		
Section 58	Approval under section 60 for works that impact on heritage items listed on the State Heritage Register	Approval to be requested if works disturb an item subject to an Interim Heritage Order or listed on the State heritage Register. No State Heritage items would be impacted by the proposal
Section 139	Excavation permit required for a relic exposed or moved as a result of construction	Permit required if works may potentially disturb a relic as defined by the Act. BMCC to notify the Heritage Council of any finds
Local Government Act 1993		
	Consultation regarding Traffic management Plans	Works must be consistent with Plans of Management for public lands. Traffic Management Plans and road closures must be endorsed by BMCC
National Parks and Wildlife Act 1974		
Section 87 (1)	Permit from OEH to excavate archaeological sites and relics	Relates to excavation
Noxious Weeds Act 1993		
	Notify relevant control authority	If listed weeds are found or imported on site
Occupational Health and Safety Act 2000 and Regulation 2001		
	A licence may be required for the handling of contaminated material if found to be present during construction	Contamination is not likely to be relevant to this proposal
Threatened Species Conservation Act 1995		
	A Species Impact Statement is required if work is likely to cause significant impact on threatened species listed under the Act	If works are likely to have a significant impact on flora and fauna species listed under the Act.
Environment Protection and Biodiversity Conservation Act 1999		
	Approval required for an action that would cause significant environmental impacts on a matter of national significance	If works are likely to have a significant impact on the environment and biodiversity conservation listed under the Act.
BMCC Local Environment Plan 2005 (and amendments)		
Part 1, Clause 9	Considerations before development consent with respect to flora and fauna protection and management	Development application must comply
Part 1, Clause 10, 11, 12	Planning principles including ecologically sustainable development and flora and fauna protection and management	Development application must comply
Part 2, Division 2	Zone objectives for flora and fauna protection and management	Development application must comply
Part 3, Clause 41, 42, 43	Site analysis - flora and fauna assessment must provide sufficient information	Development application must comply
Part 3, Clause 44(1)-44(7)	Environmental impact – flora and fauna assessment must provide sufficient information and detail	Development application must comply

Part 3, Clause 45-50	Protected areas - flora and fauna assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 51	Watercourses - flora and fauna assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 52	Significant vegetation and rare species of flora - assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 53-55	Vegetation - assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 56	Site disturbance and erosion - flora and fauna assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 57	Stormwater management - flora and fauna assessment must provide sufficient information and detail	Development application must comply
Part 3, Clause 59	Bush rock removal - flora and fauna assessment must provide sufficient information and detail	Development application must comply

FLORA SURVEYS

METHODS

Database Searches

Searches of several databases were made to identify threatened species that may potentially be found on the subject site. Endangered Ecological Communities were also identified in the area. Databases were accessed between 23rd and 25th February, 2012. These included:

- NSW Wildlife Atlas (www.bionet.nsw.gov.au/),
- PlantNet (www.rbgsyd.nsw.gov.au), and
- EPBC Act database (www.environment.gov.au/erin/ert/epbc/index.html).

Despite the move to a combined national flora list, the ROTAP coding system devised is still commonly seen in numerous scientific and general publications. Although having no legal standing, the system provides a relatively simple means of categorising the 'at risk' status of Australian plants, including many that are not currently listed in the EPBC schedule.

If a number of ROTAP listed species are present on a particular site, this increases its importance as a conservation reserve. For this reason, plant species listed under ROTAP classifications were also identified from the PlantNet database.

The ROTAP system is based on the combination of three categories:

1. **Plant Distribution Category:** A numerical value indicating how widespread the species is.
2. **Conservation Status Category:** An alphabetical code which indicates the rarity of the species.

3. **Reservation Status Category:** A supplementary code which indicates the adequacy of protection of the species within proclaimed reserves.

An outline of the coding system is given in Table 1.

Table 1. ROTAP coding system for plant species at risk.

Category	Coding	Definition
Plant Distribution	1	Known only from the type* collection
	2	Restricted distribution - range extending over less than 100km
	3	Range more than 100km but in small populations
Conservation Status	X	Presumed extinct - not collected for 50 years or the only known populations destroyed
	E	Endangered - at serious risk in the short term (one or two decades) **
	V	Vulnerable - at risk over a longer period (20-50 years) **
	R	Rare but with no current identifiable threat
	K	Poorly known species suspected of being at risk
Reservation Status	C	Species is known to occur within a proclaimed reserve
	a	Species is considered to be adequately reserved. 1000 or more plants occur within a proclaimed reserve
	i	Species is considered to be inadequately reserved. Less than 1000 plants occur within a proclaimed reserve
	-	Species is recorded from a reserve but the population size is unknown
	t	Total known species population is within a reserve
	Px	Western Australian Department of Conservation and Land Management (CALM) Priority Flora Code. Range from P1 (highest priority) to P4 (lowest priority).
	+	Species also occurs outside of Australia
* The "type" is the plant specimen used to originally describe a species. ** Species considered to be either Endangered or Vulnerable are classified as "Threatened".		

Field Surveys

Areas of different vegetation communities were delineated prior to field work from aerial photos, and these were traversed and inspected using the random meander method described by Cropper (1993). Community boundaries were recorded with a hand held GPS unit at appropriate intervals determined on site and downloaded into Applied Ecology's GIS system. Flora and fungi species present, vegetation type and quality, and special features and values were identified and recorded.

Additional patch characteristics recorded during the survey included clearing, encroachment, observable fire history, weed invasion, proximity to housing or other developments, and connectivity.

From this, Applied Ecology staff have built an inventory of plant species recorded on site by ground truthing the extent of each vegetation community. Threatened, rare and regionally significant species were targeted. Surveys were conducted on 23rd and 25th February, 2012, totalling 12 hours.

The following information was recorded for each vegetation community type identified:

- dominant vascular plant species in each stratum (layer);
- typical range in the height of the tree or upper canopy layer and stem count;
- typical range in the projective foliage cover of the tree or upper canopy layer;
- typical % cover for dominant species in each stratum;
- topography;
- soil type;
- general condition of the community including evidence of fire, disturbance, presence and abundance of weeds; and
- any other factor relevant to the vegetation community.

A description of vegetation communities was prepared according to the structure of the plant community, as is outlined in Specht et al (1995). Structural classes were then further divided into plant communities on the basis of data collected during general traverses of the study area. The observed communities were named in line with community descriptions outlined in "Native vegetation mapping of Geographic Planning Areas 1 to 5, Blue Mountains City LGA, 2002".

DESKTOP SURVEY RESULTS

Searches of NSW Wildlife Atlas (www.bionet.nsw.gov.au/), PlantNet (www.rbgsyd.nsw.gov.au), and EPBC Act database (www.environment.gov.au/erin/ert/epbc/index.html) revealed the following rare plants recorded in the John St, Lawson area or within 5km of the study site. A total of 35 species of flora were reported for this area (Table 2). Nine of these species are listed under the NSW Threatened Species Conservation Act 1995, and these will be examined further in a seven part test, presented in a later section of this report.

Table 2. Threatened (shaded) and ROTAP listed flora species recorded within 5km of 17 John St, Lawson.

FAMILY	SPECIES NAME	EPBC Act	TSC Act	ROTAP
Apiaceae	*Xanthosia scopulicola*		V	
Asteraceae	*Ozothamnus adnatus*			3KC-
Blechnaceae	*Blechnum gregsonii*			2RCa
Cunoniaceae	*Acrophyllum australe*	V	V	2VCi
Cyperaceae	*Lepidosperma evansianum*		V	
Ericaceae	*Lissanthe sapida*			3RCa
	Rupicola sprengelioides			2RC-t
	Sprengelia monticola			2RC-t
Fabaceae - Faboideae	*Almaleea incurvata*			2RC-t
	Dillwynia tenuifolia		V	
	Pultenaea glabra	V	V	
Fabaceae - Mimosoideae	*Acacia asparagoides*			2R

	Acacia baueri subsp. *aspera*		V	2RC-
	Acacia bynoeana	V	E1	Y
	Acacia gordonii	E	E1	
	Acacia pubescens	V	V	
Goodeniaceae	*Goodenia rostrivalvis*			2RCa
Haloragaceae	*Haloragodendron lucasii*	E		
Loranthaceae	*Atkinsonia ligustrina*			2RCa
Myrtaceae	*Darwinia biflora*		V	
	Eucalyptus copulans		E1	2E
	Eucalyptus cunninghamii			2RCa
	Eucalyptus luehmanniana			2RCa
	Leptospermum rupicola			3RC-
	Melaleuca deanei	V		
Orchidaceae	*Cryptostylis hunteriana*	V		
	Rhizanthella slateri	E		
Poaceae	*Notochloe microdon*			2RC-
Podocarpaceae	*Pherosphaera fitzgeraldii*		E1	2ECi
Proteaceae	*Grevillea longifolia*			2RC-
	Hakea constablei			2RCa
	Persoonia acerosa		V	2VC-
Rutaceae	*Asterolasia buxifolia*		E1	
	Asterolasia elegans	E		
Santalaceae	*Thesium austral*		V	3VCi

FIELD SURVEY RESULTS

A number of zones were identified on the ground and were used for the purposes of recording characteristics of vegetation communities such as composition and condition. These included the following zones:

1) **Riparian 1**, including 10m buffer around eastern section of the creek
2) **Riparian 2**, including 10m buffer around western section of the creek
3) **South 1**, including non-riparian land at the eastern end of the site
4) **South 2**, including non-riparian land at the southern end of the site
5) **South 3**, including non-riparian land at the western end of the creek
6) **North 1**, including non-riparian land at the northern end of the site
7) **North 2**, including non-riparian land immediately north of the creek

Location of these zones are shown in Figure 5. Note that the extent of clearly delineated riparian vegetation, as described in the following section, may not conform to the standard buffer allocation outlined in BMCC LEP 2005.

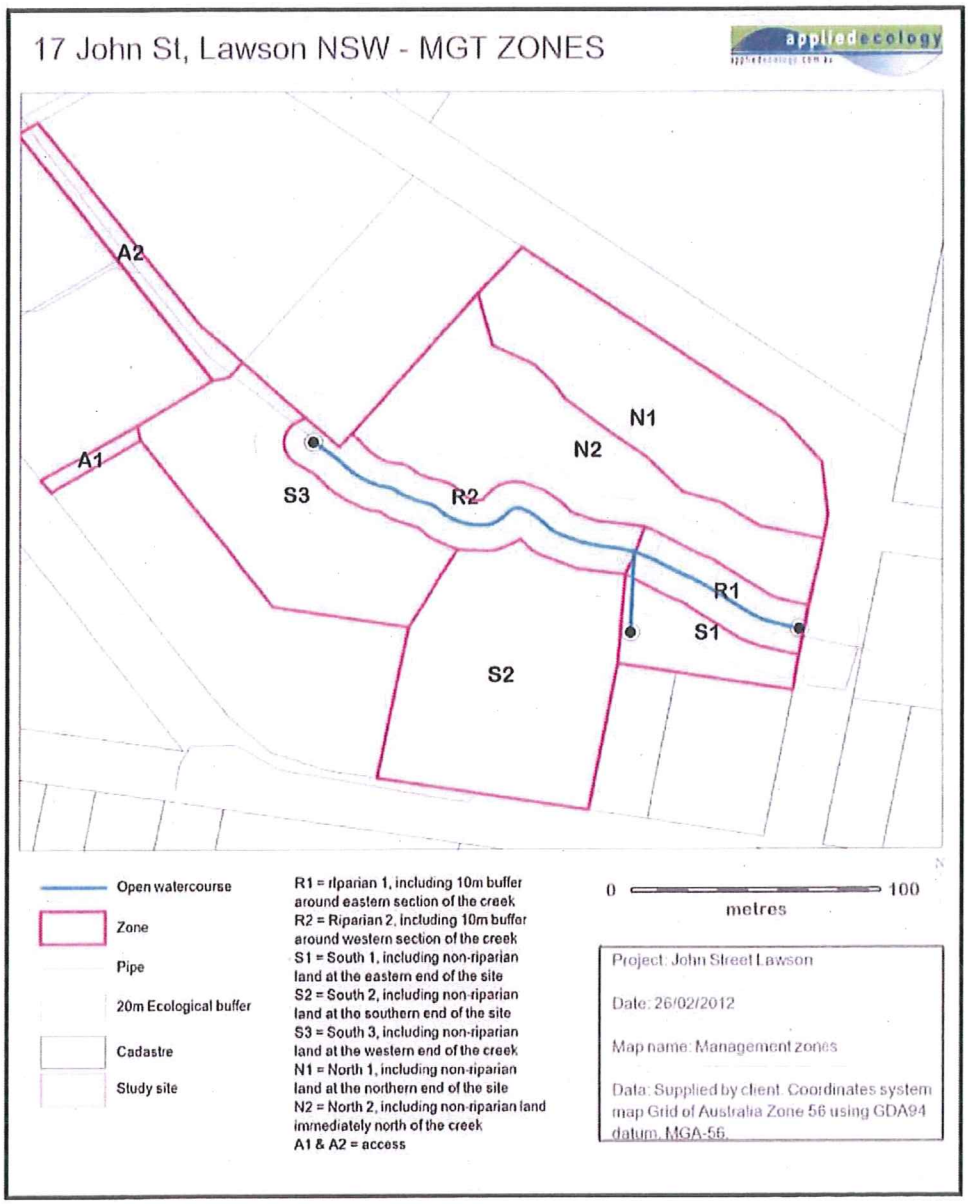

Figure 2 Location of vegetation zones identified during field surveys.

A total of 110 species of native plants were recorded on the subject site, including one threatened species (*Persoonia acerosa*); no ROTAP listed species were recorded during this survey. In addition, A 52 exotic species were recorded, including a number of plants listed as noxious weeds in the Blue Mountains City LGA. Distribution of individual species is summarised in the following sections.

Under the Noxious Weeds Act 1993, specific control levels apply to the various classes of noxious weeds recorded on site, which include:

Class 3: The plant must be fully and continuously suppressed and destroyed.

- *Salix cinerea* (Grey Sallow/Pussy Willow)
- *Cortaderia selloana* (Pampas Grass)

Class 4: The growth of the plant must be managed in a manner that reduces its numbers spread and incidence and continuously inhibits its reproduction and the plant must not be sold propagated or knowingly distributed.

- *Asparagus aethiopicus* (Asparagus Fern)
- *Crocosmia x crocosmiiflora* (Montbretia)
- *Cytisus scoparius* (Scotch Broom)
- *Ligustrum lucidum* (Large-leaf Privet)
- *Ligustrum sinense* (Small-leaf Privet)
- *Rubus fruticosus* species aggregate (Blackberry)

Class 5: The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with.

- *Salix fragilis var fragilis* (Crack Willow including hybrids)

Zones R1-R2: Riparian lands

Vegetation in zones R1 and R2 (riparian lands) included 31 species of native plants (Table 3) and 26 exotic species (Table 4). There were no threatened species and no ROTAP listed species, but 7 species of noxious weed were recorded.

Table 3 Native flora species recorded in Zones R1 and R2 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	RIPARIAN 1 (22 sp)	RIPARIAN 2 (18 sp)
Acacia decurrens	Sydney Green Wattle		y
Banksia marginata	Silver Banksia	y	
Banksia serrata	Old Man Banksia	y	
Baumea rubiginosa	Soft Twig-rush	y	
Blechnum cartilagineum	Gristle Fern	y	y
Blechnum nudum	Fishbone Water Fern	y	y
Calochlaena dubia	Soft Bracken	y	y
Dianella longifolia			y
Dicksonia antarctica	Soft Tree Fern	y	y
Entolasia marginata	Bordered Panic		y
Entolasia stricta	Wiry Panic	y	y
Epacris pulchella	Coral Heath	y	
Euchiton gymnocephalus	Cudweed	y	
Gleichenia microphylla	Coral Fern	y	y
Hakea dactyloides	Broad-leaved Hakea	y	
Hakea gibbosa	Needle Bush	y	
Hakea salicifolia	Willow-leaved Hakea	y	
Hypolesis muelleri			y
Joycea pallida	Wallaby Grass		

Kunzea ambigua	Tick Bush	y	y
Leptospermum juniperinum	Prickly Tea-tree	y	
Leptospermum polygalifolium	Yellow Tea-tree/Tantoon	y	y
Lomandra longifolia	Spiny Matt-rush	y	
Microlaena stipoides	Weeping Meadow-grass	y	y
Persoonia mollis	Soft Geebung		y
Pittosporum undulatum	Sweet Pittosporum	y	y
Polyscias sambuccafolia	Elderberry Panax	y	
Pratia purpurescens	White Root	y	
Pteridium esculentum	Hard Bracken		y
Smilax glyciphylla			y
Sticherus lobatus			y

Table 4 Exotic flora species recorded in Zones R1 and R2 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	RIPARIAN 1 (22 sp)	RIPARIAN 2 (14 sp)
Acacia baileyana	Cootamundra Wattle	y	
Cirsium vulgare	Spear Thistle	y	
Conyza sp	Fleabane	y	
Coreopsis lanceolata	Coreopsis	y	
Cortaderia selloana	Pampas Grass		y
Cotoneaster glaucophyllus	Cotoneaster		y
Crocosmia x crocosmiiflora	Montbretia	y	y
Eragrostis curvula	African Lovegrass	y	
Erica lusitanica	Spanish Heath		y
Hedera helix	English Ivy	y	y
Hedychium gardneranum	Ginger Lily	y	y
Holcus lanatus	Yorkshire Fog	y	
Hypochaeris radicata	Catsear/Flatweed	y	
Lemna sp	Duckweed	y	y
Ligustrum lucidum	Large leaved Privet	y	
Ligustrum sinense	Small leaved Privet	y	y
Lilium formosanum	Formosan Lily	y	y
Lonicera japonica	Japanese Honeysuckle	y	y
Monstera deliciosa	Monsteria		y
Pinus radiata	Radiata Pine	y	
Ranunculus repens	Creeping Buttercup	y	
Rubus fruticosus aggregate species	Blackberry	y	y
Salix cinerea	Grey Sallow/Pussy Willow	y	y
Salix fragilis var fragilis	Crack Willow	y	
Sonchus oleraceus	Milk Thistle	y	
Tradescantia albiflora	Wandering Creeper	y	y

Zones S1-S3: Disturbed Bushland, southern side

Vegetation in zones S1, S2 and S3 (southern lands) included 50 species of native plants (Table 5) and 41 exotic species (Table 6). There were no threatened species and no ROTAP listed species, but 7 species of noxious weed were recorded.

Table 5 Native flora species recorded in Zones S1, S2 and S3 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	SOUTH 1 (22 sp)	SOUTH 2 (41 sp)	SOUTH 3 (15 sp)
Acacia decurrens				y
Acacia longifolia	Sydney Golden Wattle	y	y	
Acacia terminalis	Sunshine Wattle	y	y	
Baumea rubiginosa	Soft Twig-rush			y
Billardiera scandens	Hairy Apple Berry		y	
Centella asiatica	Scurvy Weed	y	y	
Dianella caerulea	Paroo Lily		y	
Echinopogon caespitosus	Hedgehog Grass	y	y	
Entolasia marginata	Bordered Panic	y	y	y
Entolasia stricta	Wiry Panic	y		
Epacris pulchella	Coral Heath	y	y	
Eucalyptus piperita	Sydney Peppermint	y	y	
Eucalyptus sieberi	Silvertop Ash		y	
Gahnia sieberiana	Red-fruited Saw-sedge		y	
Geranium homeanum	Native Cranesbill			y
Gleichenia microphylla	Coral Fern	y		y
Hakea dactyloides	Broad-leaved Hakea		y	y
Hakea salicifolia	Willow-leaved Hakea	y	y	y
Helichrysum collinum	Sunray Paper Daisy		y	
Hydrocotyle peduncularis			y	
Hypericum gramineum			y	
Hypolesis muelleri			y	
Kunzea ambigua	Tick Bush	y	y	
Leptospermum juniperinum	Prickly Tea-tree	y		
Leptospermum polygalifolium	Yellow Tea-tree/Tantoon	y	y	y
Leptospermum trinervium	Flaky Tea-tree		y	
Leucopogon lanceolatus var lanceolatus	Lance-leaf Beard-heath		y	
Lindsaea microphylla	Lacy Wedge Fern		y	
Lomandra filiformis			y	
Lomandra longifolia	Spiny Matt-rush		y	y
Lomandra obliqua	Fish Bones		y	
Microlaena stipoides	Weeping Meadow-grass	y	y	y
Monotoca scoparia	Prickly Broom-heath		y	
Opercularia aspera	Common Stinkweed		y	
Ozothamnus adnatus	Dogwood	y		

Passiflora herbertiana	Native Passionfruit		y	
Patersonia glabrata	Leafy Purple Flag		y	
Persoonia mollis	Soft Geebung	y	y	y
Pittosporum revolutum	Yellow Pittosporum		y	
Pittosporum undulatum	Sweet Pittosporum	y	y	y
Platysace linearifolia	Narrow-leaf Platysace		y	
Poa sieberiana	Snow Grass		y	
Polyscias sambuccafolia	Elderberry Panax	y	y	y
Pomax umbellata			y	
Pratia purpurescens	White Root			y
Pteridium esculentum	Hard Bracken	y	y	y
Pultenaea retusa	Bush Pea		y	
Stackhousia viminea	Slender Stackhousia		y	
Viola hederacea	Native Violet	y		
Xanthosia pilosa	Common Xanthosia		y	

Table 6 Exotic flora species recorded in Zones S1, S2 and S3 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	SOUTH 1 (20 sp)	SOUTH 2 (34 sp)	SOUTH 3 (15 sp)
Acacia baileyana	Cootamundra Wattle	y		y
Acetosa sagittata	Turkey Rhubarb		y	y
Agrostis capillaris	Creeping Bent		y	
Anagalis arvensis	Scarlet Pimpernel		y	
Anthoxanthum odoratum	Sweet Vernal		y	
Asparagus aethiopicus	Asparagus fern		y	
Briza major	Blowfly Grass/Quaking Grass	y	y	
Bromus catharticus	Prairie Grass		y	
Cerastium glomeratum	Mouse-eared Chickweed		y	
Chenopodium album	Fat Hen		y	
Conyza sp	Fleabane	y	y	
Coreopsis lanceolata	Coreopsis	y	y	
Cotoneaster glaucophyllus	Cotoneaster	y	y	y
Crataegus monogyna	Common Hawthorn			y
Crocosmia x crocosmiiflora	Montbretia	y	y	
Cyclospermum leptophyllum	Slender Celery		y	
Cynodon dactylon	Common Couch	y	y	
Cytisus scoparius	Scotch Broom		y	
Erica lusitanica	Spanish Heath	y		y
Euphorbia peplus	Petty Spurge		y	
Hedera helix	English Ivy	y	y	
Hedychium gardneranum	Ginger Lily	y	y	
Holcus lanatus	Yorkshire Fog		y	y
Hypochaeris radicata	Catsear/Flatweed		y	
Ilex aquifolium	Holly		y	y

Ligustrum lucidum	Large leaved Privet		y	
Ligustrum sinense	Small leaved Privet	y	y	y
Lilium formosanum	Formosan Lily	y	y	y
Lonicera japonica	Japanese Honeysuckle	y	y	y
Ochna serrulata	Mickey Mouse Bush		y	
Oxalis pes-caprae	Soursob		y	
Pinus radiata	Radiata Pine		y	
Plantago lanceolata	Plantain	y	y	
Ranunculus repens	Creeping Buttercup			y
Rubus fruticosus aggregate species	Blackberry	y	y	y
Salix cinerea	Pussy Willow	y		y
Senecio madagascariensis	Fireweed		y	
Solanum nigrum	Blackberry Nightshade	y		
Taraxicum sp	Dandelion	y	y	
Trifolium repens	White Clover	y	y	
Verbena bonariensis	Purple Top	y		
TOTAL	52 SPECIES	20	34	13

Zones N1-N2: Good Bush and Disturbed Bushland, northern side

Vegetation in zones N1 and N2 (northern lands) included 96 species of native plants (Table 7) and 27 exotic species (Table 8). One species, *Persoonia acerosa*, listed as vulnerable under NSW Threatened Species Conservation Act 1995 was recorded. There were no ROTAP listed species, but 2 species of noxious weed were recorded.

Table 7 Native flora species recorded in Zones N1 and N2 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	NORTH 1 (94 sp)	NORTH 2 (34 sp)
Acacia decurrens		y	y
Acacia longifolia	Sydney Golden Wattle	y	
Acacia myrtifolia		y	
Acacia obtusifolia		y	
Acacia sauveolens		y	
Acacia terminalis	Sunshine Wattle	y	y
Acacia ulicifolia	Prickly Moses	y	
Actinotus minor		y	
Allocasuarina sp		y	
Amperea xiphoclada	Broom Spurge	y	
Angophora costata	Smooth-barked Apple	y	
Arthropodium milleflorum	Vanilla Lily	y	
Asplenium flabellifolium		y	
Austrostipa pubescens		y	
Banksia marginata	Silver Banksia	y	
Banksia serrata	Old Man Banksia	y	
Billardiera scandens	Hairy Apple Berry	y	y

Bossaeia heterophylla		y	
Calochlaena dubia	Soft Bracken	y	y
Cassytha pubescens		y	y
Caustis flexuosa		y	
Ceratopetalum apetalum	Christmas Bush	y	
Cryptostylis erecta	Tartan Tongue or Bonnet Orchid	y	
Cryptostylis leptochila	Small Tongue Orchid	y	
Cryptostylis subulata	Large Tongue Orchid	y	
Dampiera purpurea		y	
Daviesia mimosoides		y	
Dianella caerulea	Paroo Lily	y	y
Dianella longifolia		y	y
Dianella prunina		y	
Dichelachne rara		y	
Dicksonia antarctica	Soft Tree Fern	y	y
Dillwynia retorta		y	
Dodonea triquetra		y	
Echinopogon caespitosus	Hedgehog Grass	y	y
Empodisma minus		y	
Entolasia marginata	Bordered Panic	y	y
Entolasia stricta	Wiry Panic	y	y
Epacris pulchella	Coral Heath	y	y
Eragrostis brownei		y	
Eucalyptus piperita	Sydney Peppermint	y	y
Eucalyptus sieberi	Silvertop Ash	y	y
Eucalyptus sparsifolia		y	
Gahnia sieberiana	Red-fruited Saw-sedge	y	y
Gleichenia microphylla	Coral Fern	y	
Gompholobium grandiflorum		y	
Goodenia bellidifolia		y	
Grevillea linearifolia		y	
Hakea dactyloides	Broad-leaved Hakea	y	
Hakea salicifolia	Willow-leaved Hakea	y	y
Hibbertia bracteata		y	y
Hypolesis muelleri			y
Joycea pallida	Wallaby Grass	y	
Kunzea ambigua	Tick Bush	y	y
Lepidosperma laterale		y	y
Lepidosperma lineare		y	
Leptospermum juniperinum	Prickly Tea-tree		y
Leptospermum polygalifolium	Yellow Tea-tree/Tantoon	y	y
Leptospermum trinervium	Flaky Tea-tree	y	y
Leucopogon ericoides		y	
Leucopogon lanceolatus var	Lance-leaf Beard-heath	y	y

lanceolatus			
Lindsaea microphylla	Lacy Wedge Fern	y	
Lomandra filiformis		y	
Lomandra longifolia	Spiny Matt-rush	y	y
Lomandra multiflora		y	
Lomandra obliqua	Fish Bones	y	
Lomatia silaifolia		y	
Lycopodium deuterodensum	Mountain Clubmoss	y	
Microlaena stipoides	Weeping Meadow-grass	y	y
Mirbelia rubiifolia		y	
Monotoca scoparia	Prickly Broom-heath	y	
Olearia eliptica		y	
Opercularia aspera	Common Stinkweed	y	
Patersonia glabrata	Leafy Purple Flag	y	y
Persoonia acerosa		y	
Persoonia levis	Geebung	y	
Persoonia mollis	Soft Geebung	y	y
Petrophile sessilis		y	
Philotheca hispidulus (x myoporoides?)	Wax Flower	y	
Pittosporum undulatum	Sweet Pittosporum	y	y
Platysace linearifolia	Narrow-leaf Platysace	y	y
Poa sieberiana	Snow Grass	y	
Polyscias sambuccafolia	Elderberry Panax	y	y
Pomax umbellata		y	
Pratia purpurescens	White Root	y	y
Pteridium esculentum	Hard Bracken	y	y
Pultenaea retusa	Bush Pea	y	
Pultenaea tuberculata	Wreath Bush-pea	y	
Scaevola ramossisima		y	y
Sellaginella uliginosa		y	
Smilax glyciphylla		y	y
Viola hederacea	Native Violet	y	
Wahlenbergia gracilis	Australian Bluebell	y	
Xanthorrhoea media	Grass Tree	y	
Xanthosia pilosa	Common Xanthosia	y	y
Xanthosia tridentata	Rock Xanthosia	y	

Table 8 Exotic flora species recorded in Zones N1 and N2 at John St, Lawson during surveys in late February, 2012.

SPECIES NAME	COMMON NAME	NORTH 1 (11 sp)	NORTH 2 (26 sp)
Acacia baileyana	Cootamundra Wattle		y
Acacia podalyriifolia	Queensland Silver Wattle	y	y
Acetosa sagittata	Turkey Rhubarb	y	

Bidens pilosa	Cobblers Pegs		y
Briza major	Blowfly Grass/Quaking Grass		y
Chloris gayana	Rhodes Grass	y	y
Conyza sp	Fleabane		y
Coreopsis lanceolata	Coreopsis	y	y
Cotoneaster glaucophyllus	Cotoneaster	y	y
Eragrostis curvula	African Lovegrass		y
Erica lusitanica	Spanish Heath		y
Hedera helix	English Ivy	y	y
Hedychium gardneranum	Ginger Lily	y	y
Holcus lanatus	Yorkshire Fog		y
Hypochaeris radicata	Catsear/Flatweed	y	y
Ilex aquifolium	Holly	y	y
Ligustrum sinense	Small leaved Privet	y	y
Lilium formosanum	Formosan Lily		y
Lonicera japonica	Japanese Honeysuckle	y	y
Pinus radiata	Radiata Pine	y	y
Plantago lanceolata	Plantain		y
Rubus fruticosus aggregate species	Blackberry		y
Senecio madagascariensis	Fireweed		y
Sonchus oleraceus	Milk Thistle	y	y
Taraxicum sp	Dandelion		y
Tradescantia albiflora	Wandering Creeper		y
Verbena bonariensis	Purple Top		y

Overall condition of the vegetation communities recorded in these zones is presented in a later section, along with an assessment of their conservation value. Threats to these conservation values are identified and measures to mitigate these threats are proposed.

FAUNA SURVEYS

METHODS

Database Searches

Searches of several databases were made to identify threatened species that may potentially be found on the subject site. Databases were accessed between 23rd and 25th February, 2012. These included:

- NSW Wildlife Atlas (www.bionet.nsw.gov.au/),
- EPBC Act database (www.environment.gov.au/erin/ert/epbc/index.html).

Field Surveys

Applied Ecology has opted for passive techniques that involve no handling of animals or using traps (such as Elliot and harp traps) that can be prone to tampering and theft in urbanised areas, endangering any animals in the traps and resulting in damage or loss of equipment.

Field surveys were conducted on 23rd and 25th February, 2012. Weather was warm and sunny, and followed several days of showers and storms, including overnight. Day surveys were timed to include dawn chorus for birds, as well as alternating traverses and quiet listening, searching of logs, rocks and leaf litter piles for frogs and reptiles. Night surveys were timed to include evening chorus for frogs, stag watching at suitable trees, and spotlighting in each identified vegetation zone. In all, fauna surveys totalled 15 hours.

Spotlighting Survey

Spotlighting was undertaken over two nights for all terrestrial and arboreal mammals, amphibians and nocturnal birds within the study area. Spotlighting random meanders were traversed by two observers on foot using 100 Watt hand-held spotlights. All fauna heard or observed during spotlighting transects was recorded. Spotlighting was undertaken in all vegetation communities in the study area. Stags located within the study area were watched at dusk for two nights.

Optimal conditions for spotlighting are calm weather and the new moon phase. Windy nights and bright moonlight were avoided during the survey. Optimal conditions for detecting frog species can be warm nights following rain events. The field surveys were be scheduled in response to the availability of optimal conditions.

Call Playback

Threatened owl species calls were played after spotlighting. Listening was undertaken throughout the spotlighting surveys, and calls were played for a total of five minutes for the targeted species (Powerful Owl) followed by a fifteen minute listening period. Poor weather conditions, particularly strong wind and rain will be avoided during the survey.

Bat ultrasonic (Anabat) call recording

The method requires the recording and identification of high frequency, echolocation calls made by bats, which, except for one or two species, are ultrasonic, and thus inaudible to humans. The recording equipment consists of an Anabat SDII® detector housed within a Tupperware box for weather protection. Two Anabats were set to commence detection at dusk. Anabat detection was conducted in different locations within the study site to maximise the areas sampled. Anabat recordings were transferred onto computer and sent to an expert in this field for analysis. Identification was designated as either: definite, probable or possible, following the methodology of Parnaby (1992).

Diurnal Bird Census

Bird surveys were both targeted and opportunistic. Systematic surveys designed to capture peak activity (dawn chorus and prior to 10 am) were undertaken on two mornings. Any birds sighted or heard calling during other survey activities were recorded.

Herpetofauna Search

Reptiles and amphibians were surveyed within the study area by diurnal searches in suitable areas. Rocks, logs, debris and other material which provides suitable cover for herpetofauna were investigated and any species observed recorded.

DESKTOP SURVEY RESULTS

Searches of NSW Wildlife Atlas (www.bionet.nsw.gov.au/), and EPBC Act database (www.environment.gov.au/erin/ert/epbc/index.html) revealed the following threatened animal species recorded in the Lawson area or within 5km of the study site. A total of 18 species of threatened fauna were reported for this area, and 12 migratory bird species (Table 9).

Table 9. Threatened fauna species listed under the EPBC Act recorded within 5km of 17 John St, Lawson.

BIRDS			
COMMON NAME	SPECIES NAME	EPBC STATUS	TYPE OF PRESENCE
Regent Honeyeater	*Anthochaera phrygia*	E	Species or species habitat likely to occur within area
Eastern Bristlebird	*Dasyornis brachypterus*	E	Species or species habitat may occur within area
Swift Parrot	*Lathamus discolor*	E	Species or species habitat may occur within area
Australian Painted Snipe	*Rostratula australis*	V	Species or species habitat may occur within area
FISH			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Macquarie Perch	*Macquaria australasica*	E	Species or species habitat may occur within area
Australian Grayling	*Prototroctes maraena*	V	Species or species habitat may occur within area
FROGS			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Giant Burrowing Frog	*Heleioporus australiacus*	V	Species or species habitat likely to occur within area
Littlejohn's Tree Frog, Heath Frog	*Litoria littlejohni*	V	Species or species habitat may occur within area
Stuttering Frog, Southern Barred Frog	*Mixophyes balbus*	V	Species or species habitat likely to occur within area
MAMMALS			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Large-eared Pied Bat, Large Pied Bat	*Chalinolobus dwyeri*	V	Species or species habitat may occur within area
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	*Dasyurus maculatus maculatus* (SE mainland population)	E	Species or species habitat may occur within area
Southern Brown Bandicoot	*Isoodon obesulus obesulus*	E	Species or species habitat may to occur within area
Brush-tailed Rock-wallaby	*Petrogale penicillata*	V	Species or species habitat likely to occur within area
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	V	Species or species habitat may occur within area

New Holland Mouse	*Pseudomys novaehollandiae*	V	Species or species habitat likely to occur within area
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	Foraging, feeding or related behaviour known to occur within area
REPTILES			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Blue Mountains Water Skink	*Eulamprus leuraensis*	E	Species or species habitat likely to occur within area
Broad-headed Snake	*Hoplocephalus bungaroides*	V	Species or species habitat likely to occur within area
MIGRATORY MARINE BIRD SPECIES			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Fork-tailed Swift	*Apus pacificus*		Species or species habitat may occur within area
Great Egret, White Egret	*Ardea alba*		Species or species habitat may occur within area
Cattle Egret	*Ardea ibis*		Species or species habitat may occur within area
MIGRATORY TERRESTRIAL BIRD SPECIES			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
White-bellied Sea-Eagle	*Haliaeetus leucogaster*		Species or species habitat likely to occur within area
White-throated Needletail	*Hirundapus caudacutus*		Species or species habitat may occur within area
Rainbow Bee-eater	*Merops ornatus*		Species or species habitat may occur within area
Black-faced Monarch	*Monarcha melanopsis*		Breeding may occur within area
Satin Flycatcher	*Myiagra cyanoleuca*		Breeding likely to occur within area
Rufous Fantail	*Rhipidura rufifrons*		Breeding may occur within area
Regent Honeyeater	*Xanthomyza phrygia*	E	Breeding likely to occur within area
MIGRATORY WETLAND BIRD SPECIES			
COMMON NAME	SPECIES NAME	STATUS	TYPE OF PRESENCE
Great Egret, White Egret	*Ardea alba*		Species or species habitat may occur within area
Cattle Egret	*Ardea ibis*		Species or species habitat may occur within area
Latham's Snipe, Japanese Snipe	*Gallinago hardwickii*		Species or species habitat may occur within area
Painted Snipe	*Rostratula benghalensis s. lat.*	V	Species or species habitat may occur within area

A slightly different suite of threatened fauna species (Table 10) is reported within the 5km radius on BioNet (NSW Wildlife Atlas). This list of threatened species will be examined in the seven part test, presented in a later section of this report.

Table 10. Threatened fauna listed under NSW Threatened Species Conservation Act 1995, and recorded within a 5km radius of John St, Lawson.

CLASS	SPECIES NAME	COMMON NAME	NSW TSC STATUS
Amphibia	*Heleioporus australiacus*	Giant Burrowing Frog	V
	Pseudophryne australis	Red-crowned Toadlet	V
	Litoria littlejohni	Littlejohn's Tree Frog	V
Reptilia	*Eulamprus leuraensis*	Blue Mountains Water skink	E1
	Hoplocephalus bungaroides	Broad-headed Snake	E1
Aves	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V
	Calyptorhynchus lathami	Glossy Black-Cockatoo	V
	Glossopsitta pusilla	Little Lorikeet	V
	Ninox strenua	Powerful Owl	V
	Tyto tenebricosa	Sooty Owl	V
	Daphoenositta chrysoptera	Varied Sittella	V
Mammalia	*Dasyurus maculatus*	Spotted-tailed Quoll	V
	Pteropus poliocephalus	Grey-headed Flying-fox	V
	Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V
	Falsistrellus tasmaniensis	Eastern False Pipistrelle	V
	Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V
	Scoteanax rueppellii	Greater Broad-nosed Bat	V
Insecta	*Petalura gigantea*	Giant Dragonfly	E1

FIELD SURVEY RESULTS

A total of 13 bird species were recorded in fauna surveys at the subject site in John St, Lawson (Table 11). This included one threatened species, the Varied Sittella, and numerous small bush birds. Numerous common ringtail possums were also recorded on site, with five animals seen in one tree. One frog species was heard calling, and no reptiles were sighted. Several large specimens of the spiny crayfish were observed during day and night surveys. One species of microbat identified through ultrasonic calls recorded by the Anabat detector (Table 11).

Table 11 Fauna species recorded during surveys in February, 2012 around 17 John St, Lawson.

BIRDS	
COMMON NAME	SPECIES NAME
Striated Thornbill	*Acanthiza lineata*
King Parrot	*Alisterus scapularis*
Restless Flycatcher	*Myiagra inquieta*
Eastern Spinebill	*Acanthorhynchus tenuirostris*
Grey Fantail	*Rhipidura albiscapa*
White-throated Treecreeper	*Cormobates leucophaeus*
Jacky Winter	*Microeca fascinans*

Golden Whistler	*Pachycephala pectoralis*
Red-browed Finch	*Neochmia temporalis*
Crimson Rosella	*Platycercus elegans*
Satin Bowerbird	*Ptilonorhynchus violaceus*
Pale Yellow Robin	*Tregellasia capito*
Yellow-tailed Black Cockatoo	*Calyptorhynchus funereus*
Varied Sittella	*Daphoenositta chrysoptera*
OTHER ANIMALS	
Common Ringtail Possum	*Pseudocheirus peregrinus*
Giant Spiny Crayfish	*Euastacus spinifer*
Common Eastern Froglet	*Crinia signifera*
Large Forest Bat	*Vespadelus darlingtoni*

IMPACT ON THREATENED SPECIES (7-PART TEST)

As identified in Section 5(A) of the EP&A Act, 1979 the following matters need to be addressed to determine whether or not a significant effect on threatened species, populations or ecological communities or their habitats is likely to result from the proposed development. A review of the availability of habitat and an assessment of the actual recordings of flora, fauna and EECs present is provided elsewhere in this report.

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

FLORA

It is considered that there is suitable habitat present for a number of species listed under the Threatened Species Conservation Act, 1995, or under the EP&BC Act, or under the Rare or Threatened Australian Plants (ROTAP) list developed by the CSIRO. This system is based on a coding system which provides a means of ranking the plants according to the level of risk they face in the wild. Endangered Ecological Communities recorded in the Blue Mountains City LGA were also assessed for potential impacts from the proposed works.

Acacia baueri subsp. aspera

A low growing, well-branched shrub mostly 0.1 - 1 m high with hairy and warty branches. The phyllodes (leaves) are crowded, scattered or in irregular whorls, cylindrical and warty. Flowerheads consisting of 10 - 20 golden yellow flowers occur in the angle between the phyllode and stem. Fruit is a slightly curved pod 1 - 2 cm long. Occurs in low, damp heathlands, often on exposed rocky outcrops over a wide range of climatic and topographical conditions. Appears to prefer open conditions; rarely observed where there is any shrub or tree canopy development.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Acacia bynoeana (Bynoe's Wattle, Tiny Wattle)

Bynoe's Wattle, or Tiny Wattle, is an erect or spreading shrub growing to 0.2-1 m high. It can also form a low prostrate shrub to 50 cm across (Tame 1992; Benson & McDougall 1996). It has light cream to golden yellow globular flower heads (Harden 1991; Orchard & Wilson 2001a). The species is scattered from around Morisset, in the Hunter District, S to Berrima and Mittagong in the Southern Highlands (NSW NPWS 1999ah; Orchard & Wilson 2001a). The stronghold is the Blue Mts (Wimming 1992 in NSW NPWS 1999ah). This species grows in heath and dry sclerophyll forest (Orchard & Wilson 2001a). The substrate is typically sand and sandy clay, often with ironstone gravels and is usually very infertile and well-drained (NSW NPWS 1999ah). The species often grows among rock platforms (NSW NPWS 1999ak). Sites are found at 0-1000 m asl, and receive more than 600 mm annual rainfall (Benson & McDougall 1996).

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Acacia gordonii

An erect or spreading shrub, 0.5 - 1.5 m high, with smooth grey bark. Branchlets and leaves (phyllodes) are usually hairy. Phyllodes are alternate or sometimes whorled or clustered, straight or almost sickle-shaped, 5 - 15 mm long, about 1 mm wide, with a pointed tip. Flower heads are golden yellow arising singly in the angle between phyllodes and the stem on a hairy peduncle (stalk) that is 8 - 12 mm long. The seed pod is 25 - 55 mm long, 9 - 14 mm wide, and glaucous (dull blue-green in colour with a whitish bloom). Restricted to the north-west of Sydney, it has a disjunct distribution occurring in the lower Blue Mountains in the west. •Grows in dry sclerophyll forest and heathlands amongst or within rock platforms on sandstone outcrops.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Acrophyllum australe

A hairless, small shrub 1 - 2 m high. Leaves are in whorls of three or sometimes four or opposite, ovate to lanceolate, mostly 3 - 10 cm long, 10 - 45 mm wide, margins regularly toothed, upper surface green and hairless, lower surface more or less dull blue-green, often with a reddish tinge and sparsely hairy, strongly veined; more or less sessile; stipules about 5 mm long. Flowers heads more or less sessile. Petals 3 - 4 mm long, white tinged with pink. Capsule about 3 mm long. Flowers from November to December.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Asterolasia elegans

A tall, thin shrub to 3 m high. Leaves are lance-shaped, 4 - 13 cm long, with rusty, star-shaped hairs on both surfaces. Flowers (in spring) are large and prominent, having white petals 8 - 14 mm long with dense, white, star-shaped hairs on the outside surface. Occurs on Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys, e.g. in or adjacent to gullies which support sheltered forest. The canopy at known sites includes Turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), Smooth-barked Apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), Forest Oak (*Allocasuarina torulosa*) and Christmas Bush (*Ceratopetalum gummiferum*).

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Cryptostylis hunteriana

As its name implies, the Leafless Tongue Orchid has no leaf. It produces an upright flower-stem to 45 cm tall, bearing five to 10 flowers between November and February. It has small narrow green sepals and petals to 22 mm long, but is dominated by an erect narrow very hairy 'tongue' (the labellum). This is up to 33 mm long, maroon along the margins and at the widened tip, and with a black central band. All other tongue orchids have leaves; most have a downward pointing labellum. Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp-heath and woodland. The larger populations typically occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*); appears to prefer open areas in the understorey of this community and is often found in association with the Large Tongue Orchid (*C. subulata*) and the Tartan Tongue Orchid (*C. erecta*), both of which were recorded on site.

This species was not observed during surveys of the proposed development site, although it is very difficult to locate unless actually flowering. It is considered that the development of the area for a light industrial park has potential to have an adverse effect on the life cycle of the species such that a viable local population of the species, if present, is likely to be placed at risk of extinction.

Dillwynia tenuifolia

A low spreading pea-flower shrub to a metre high. Its leaves are small and narrow. The wide orange-yellow and red pea-flowers are usually single, at or near the tips of the branches. Both the single orange flowers and the stem hairs distinguish it from the similar and commoner yellow-flowered *Dillwynia glaberrima* and *D. floribunda*. Disjunct localities include: the Bulga Mountains at Yengo in the north, Kurrajong Heights and Woodford in the Lower Blue Mountains. May be locally abundant particularly within scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised clays.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Eucalyptus copulans

An often multi-trunked tree to 10 m tall, with smooth, grey-green bark, shedding in ribbons. Juvenile leaves are a dull grey-green and narrow. Adult leaves are 6-12 cm long, 1-1.8 cm wide and have a 'satiny' sheen. Fruit is round and 4-6 mm long. *E. copulans* is considered to be a stabilised hybrid between *E. stellulata* and *E. moorei* and *E. copulans* is intermediate in many characteristics between these two species.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Lepidosperma evansianum (Evans Sedge)

A tufted perennial herb 20-55 cm high, with a short rhizome. The leaves are slightly shorter and 0.7-1.5 mm wide. The narrow, erect flower stem is oblong to ovate in outline, 5-7 cm long, and about 1 cm diameter. The spikelets are more or less numerous and densely clustered, 4-6 mm long. Currently known from 3 locations (at Blackheath and Wentworth Falls). All known sites occur within Blue Mountains National Park, although they are near the boundary of the reserve.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Melaleuca deanei

Deane's Paperbark is a shrub to 3 m high with fibrous, flaky bark. New stems are furry and white, though the mature stems are hairless. The smooth leaves are not paired. They are narrow, to 25 mm long and 6 mm wide, with pointed tips. The many white flowers form spikes to 6 cm long, on a furry stem. The five petals are less than 5 mm long; each is paired with a bundle of 17 - 28 stamens. The woody fruits are barrel-shaped, to 7 mm in diameter. There are isolated occurrences at Springwood in the Blue Mountains. The species grows in heath on sandstone.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Persoonia acerosa (Needle Geebung)

The Needle Geebung is a small, erect to spreading shrub 1 - 2 m tall. Its bright green, pine-like foliage is very distinctive. The small, needle-like leaves are channelled on the upper surface. Flower clusters are produced along leafy shoots, not at the branch tips, as in related species. The yellow tubular flowers are up to 1 cm long and most frequently appear in summer. Fruits are pear-shaped, yellowish-green with brownish-red markings, to 14 mm long and 10 mm in diameter. It has been recorded only on the central coast and in the Blue Mountains, from Mt Tomah in the north to as far south as Hill Top where it is now believed to be extinct. Mainly in the Katoomba, Wentworth Falls, Springwood area.

Two specimens of this species were observed during surveys of the proposed development site. The species is recorded from nearby reserves where the local population is adequately conserved. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pherosphaera fitzgeraldii (Dwarf Mountain Pine)

The Dwarf Mountain Pine is an erect shrub up to 1 m high and 2 m in diameter, with drooping, or sometimes straggling, branches (Harden 1990). The species is found in six or seven locations along 8 km of cliffline between Wentworth Falls and Katoomba in the Blue Mountains.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the

life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Pultenaea glabra (Smooth Bush-pea, Swamp,Bush-pea)

An erect shrub to 1.5 m tall with smooth hairless stems and leaves. Leaves are alternate, narrow, concave, to 20mm x 2mm, with a pointed tip. The yellow/orange pea-like flowers are borne in dense subterminal or apparently terminal inflorescences. Fruit is a swollen pod to 5 mm long. The Pultenaea glabra species complex is the subject of ongoing research. Restricted to the higher Blue Mountains and has been recorded from the Katoomba-Hazelbrook and Mount Victoria areas, with unconfirmed sightings in the Mount Wilson and Mount Irvine areas. All known populations occur within the Blue Mountains Local Government Area.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Rhizanthella slateri (Eastern Underground Orchid)

An Underground Orchid with a whitish, fleshy underground stem to 15 cm long and 15 mm diameter. The flowering heads mature below the soil surface or may extend to 2 cm above the ground. Each flower head has up to 30, tubular, purplish flowers. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Thesium austral (Austral Toadflax, Toadflax)

Austral Toadflax is a small, straggling herb to 40 cm tall. Leaves are pale green to yellow-green, somewhat succulent, 1 - 4 cm long and 0.5 - 1.5 mm wide. Flowers are minute and white, emerging where the leaves meet the stems and appearing in spring. The fruit is small and nut-like, developing in summer. This species is often hidden amongst grasses and herbs.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Xanthosia scopulicola

Xanthosia scopulicola is a recently described small compact shrub to 20 cm tall with a grey woolly appearance and flaking outer bark on older stems. Leaves are grey-green above with star shaped hairs, and white dense hairs below. It is known only from scattered locations between Kings Tableland (Wentworth Falls) and Boars Head rock (west of Katoomba) in the Blue Mountains. Most

populations are within Blue Mountains National Park, though only near the boundary of the reserve. Grows in cracks and crevices of sandstone cliff faces or on rocky outcrops above the cliffs.

This species was not observed during surveys of the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

FAUNA

In relation to threatened species with suitable habitat present at the proposed development site, the following assessments are provided:

Amphibia

Heleioporus australiacus (Giant Burrowing Frog)

The Giant Burrowing Frog is a large, squat, slow-moving frog that grows to about 10 cm long. It has prominent, large eyes and has dark chocolate-brown upperparts with white or yellow spots on the side. The species is found in heath, woodland and open forest with sandy soils. It occurs from the NSW Central Coast to eastern Victoria, but is most common on the Sydney sandstone. It has been found from the coast to the Great Dividing Range.

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Pseudophryne australis (Red-Crowned Toadlet)

Pseudophryne australis (Gray 1835) the Red-crowned Toadlet is a brown to black frog with a bright red or orange triangle on the head and a red or orange coccygeal stripe (Cogger 2000). Individuals attain a length of approximately 30mm. The Red-crowned Toadlet shows considerable ecological specialisation. Suitable habitat follows the interface of Hawkesbury Sandstone and shale e.g. the Wianamatta and Narrabeen Shales, with individuals found below sandstone ridges, generally where shale lenses are weathering at the base of cliff lines. The species deposits eggs in terrestrial nests beneath rocks and logs or in leaf litter. The Toadlet relies on rainfall to wash the partially developed tadpoles into ephemeral creeks for completion of the reproductive cycle (Thumm and Mahony 1999).

Within the subject site there is some suitable breeding habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Litoria littlejohni (Littlejohn's Tree Frog, Heath Frog)

This frog inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings. It occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones, and is generally confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains.

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Aves

Cacatuidae

Callocephalon fimbriatum (Gang-gang Cockatoo)

In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in urban areas. In NSW the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes.

Within the subject there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Calyptorhynchus lathami (Glossy Black-Cockatoo)

The Glossy Black-cockatoo is a dusky brown to black cockatoo with a massive, bulbous bill and a broad, red band through the tail. The red in the tail is barred black and edged with yellow. The female usually has irregular pale-yellow markings on the head and neck and yellow flecks on the underparts and underwing. They are usually seen in pairs or small groups feeding quietly in she-oaks. They are smaller than other black-cockatoos (about 50 cm in length), with a smaller crest.

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Neosittidae

Daphoenositta chrysoptera (Varied Sittella)

The Varied Sittella is a small (10 cm) songbird with a sharp, slightly upturned bill, short tail, barred undertail, and yellow eyes and feet. In flight the orange wing-bar and white rump are prominent. In NSW most individuals have a grey head and are streaked with dark brown, but in the extreme north-east they have a white head, and in the extreme south-west a black cap. Varied Sittellas are more active and acrobatic among branches than the larger treecreepers. They fly into the heads of trees, typically working their way down branches and trunk with constant motion. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Feeds on arthropods gleaned from crevices in rough or decorticating bark, dead branches, standing dead trees and small branches and twigs in the tree canopy. The Varied Sittella is sedentary.

Within the subject site there is some suitable foraging habitat for this species, and it was observed during recent surveys. However there are large areas of conserved bushland near the subject site

which provide alternative and adequate habitat for this species. It is considered that the development of the area for a light industrial park will have a negative impact on the family group observed it is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Psittacidae

Glossopsitta pusilla (Little Lorikeet)

This swift flying species gives a fleeting glimpse of yellowish green underwing linings, while its widely fanned tail reveals orange-red colour that is usually hidden. It uses forest and woodland, favouring open country with trees along watercourses and paddock trees. The species occurs mainly along the coast and ranges from northern Queensland through NSW, Victoria and into the southeastern corner of South Australia.

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Strigidae

Ninox connivens (Barking Owl)

This large owl inhabits eucalypt woodland, open forest, swamp woodlands and, especially in inland areas, timber along watercourses. More dense vegetation is used occasionally for roosting. During the day they roost along creek lines, usually in tall understorey trees with dense foliage such as *Acacia* and *Casuarina* species, or the dense clumps of canopy leaves in large *Eucalypts*. It is only rarely recorded from coastal and escarpment forests.

Within the subject site there is some suitable foraging habitat for this species, however it was not directly observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Ninox strenua (Powerful owl)

This species breeds in open or closed, wet or dry sclerophyll forests and woodlands. It nests in hollows in large old trees, usually living eucalypts within or below the canopy. Powerful Owls are sedentary with a home range around 1000 hectares where they feed mainly on medium sized species of arboreal marsupials that are most readily available (Reid et al, 2004).

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Tytonidae

Tyto novaehollandiae (Masked Owl)

This owl lives in dry eucalypt forests and woodlands from sea level to 1100 m. It is generally a forest owl, but often hunts along the edges of forests, including roadsides. Distribution extends from the coast where it is most abundant to the western plains.

Within the subject site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Tyto tenebricosa (Sooty Owl)

This species occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. It roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals. The species occurs on the NSW coast, coastal escarpment and eastern tablelands.

Within the 25 metre buffer zone there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Mammalia

Pteropus poliocephalus (Grey headed flying fox)

This species inhabits a wide range of habitats including rainforest, mangroves, paperbark swamps, wet and dry sclerophyll forests and cultivated areas. Several species that form the diet of this flying fox were present nearby to the site, including eucalypts and angophoras.

The site provides some suitable foraging habitat for this species; it was observed flying overhead during surveys for most of the works sites. Suitable and extensive habitat is located nearby, and would provide the majority of the local habitat and food sources for this species. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Dasyurus maculatus (Spotted-tail Quoll)

The Spotted-tailed Quoll is about the size of a domestic cat, from which it differs most obviously in its shorter legs and pointed face. It has rich-rust to dark-brown fur above, with irregular white spots on the back and tail, and a pale belly. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Distribution range is north to Mt Warning, south to Eden.

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Falsistrellus tasmaniensis (Eastern False Pipistrelle)

The Eastern False Pipistrelle is relatively large with a head-body length of about 65 mm. It weighs up to 28 grams. It is dark to reddish-brown above and paler grey on its underside. It has long slender ears set well back on the head and some sparse hair on the nose. It prefers moist habitats, with trees taller than 20 m. These bats generally roost in eucalypt hollows, but has also been found under loose bark on trees or in buildings. The species is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria.

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Miniopterus schreibersii oceanensis (Eastern bentwing bat)

This species forages above and below the canopy within open forests and woodlands, feeding on small insects. It roosts in caves, old mines, old buildings, stormwater drains and under bridges. Breeding centres around maternity caves which must have suitable temperature, humidity and size to permit breeding (Churchill, 1998).

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Saccolaimus flaviventris (Yellow-bellied Sheathtail-bat)

The Yellow-bellied Sheathtail-bat is a very distinctive, large, insectivorous bat up to 87 mm long. It has long, narrow wings, a glossy, jet-black back, and a white to yellow belly extending to the shoulders and just behind the ear. Characteristically, it has a flattened head and a sharply-pointed muzzle. The tail is covered with an extremely elastic sheath that allows variation in the tail-membrane area. Males have a prominent throat pouch; females have a patch of bare skin in the same place. Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country.

Within the proposed development site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Scoteanax rueppellii (Greater broad-nosed bat)

The Greater Broad-nosed Bat is a large powerful bat, up to 95 mm long, with a broad head and a short square muzzle. It is dark reddish-brown to mid-brown above and slightly paler below. It is distinguished from other broad-nosed bats by its greater size. This species inhabits open forests and woodlands, where is forages around the canopy and along creeks and small rivers. It roosts in tree hollows and sometimes in old buildings (Hoye, 1995).

Within the proposed development site there is some suitable foraging habitat for this species, however it was not observed during recent surveys. It is considered that the development of the

area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Reptilia

Hoplocephalus bungaroides *(Broad-headed Snake)*

The Broad-headed Snake is restricted to the sandstone ranges in the Sydney Basin and within a radius of approximately 200 km of Sydney (Cogger et al. 1993; NSW NPWS 2001). The Broad-headed Snake is generally black above with yellow spots forming narrow, irregular cross-bands. Other yellow scales may link these cross-bands laterally to form a straight or zigzagged stripe along the body. These cross-bands help distinguish it from the similar-looking but harmless juvenile Diamond Python. Its head is flattened on top and distinct from the body. The belly is grey or greyish-black. The average length is about 60 cm, with a maximum of around 150 cm. The Broad-headed Snake is often found in rocky outcrops and adjacent sclerophyll forest and woodland (Cogger et al. 1993; NSW NPWS 2001). The most suitable sites occur in sandstone ridgetops (Cogger et al. 1993).

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Eulamprus leuraensis *(Blue Mountains Water Skink)*

The Blue Mountains Water Skink is a medium-sized lizard with a snout-vent length of about 8 cm (LeBreton 1996). The body of the Blue Mountains Water Skink is much darker than the other species of *Eulamprus* found in the Blue Mountains. Across its back it is very dark brown to black with narrow yellow/bronze to white stripes along its length to the beginning of the tail and continuing along the tail as a series of spots. This gives the appearance of a distinctive dark dorsal stripe bordered by yellow lines. The limbs and sides are also dark brown to black with yellow to bronze streaks and small blotches. The head is brown to bronze with black flecks and its underside is cream to golden yellow with small dark blotches. The limbs are well developed and all have five digits (Cogger 2000; NSW NPWS 2001e). It is restricted to an isolated and naturally fragmented habitat of sedge and shrub swamps that have boggy soils and appear to be permanently wet. The vegetation in these swamps typically takes the form of a sedgeland interspersed with shrubs, but may occur as a dense shrub thicket.

Within the proposed development site there is little suitable habitat for this species and it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Insecta

Petalura gigantea (Giant Dragonfly)

This species lives in permanent swamps and bogs with some free water and open vegetation. Adults are short-lived and spend most of their time settled on low vegetation on or adjacent to the swamp. The species does not utilise areas of standing water wetland, although it may utilise suitable boggy areas adjacent to open water wetlands. Larvae dig long branching burrows under the swamp, and leave their burrows at night and feed on insects and other invertebrates on the surface and also use

underwater entrances to hunt for food in the aquatic vegetation. Larvae are slow growing and the larval stage may last up to 10 years. Found along the east coast of NSW from the Victorian border to northern NSW.

Within the proposed development site there is no suitable habitat for this species, and it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

FUNGI

Hygrocybe aurantipes

A small brightly coloured gilled fungus. Cap 20 - 40 mm, changes over time from cone shaped expanding over time to more or less flat. Colour from dark olive-brown to greenish yellow tints as the cap expands and often orange when old; smooth, dry and non-splitting edges which are lighter when young. The gills fused to under surface of cap with thick veins. One set of short gills yellowish cream - to yellowish orange, margins of same colour. Stem 30 - 60 mm x 3.5 - 7 mm, cylindrical but often flattened, stem base may be either inflated or slightly tapered; smooth, dry, pale yellow - orange to apricot pink tints, more pale above, base may be the same colour or white or more yellowish, hollow.

Type locality, Lane cove Bushland Park, Lane Cove Local Government Area. Other records from Blue Mountains National Park (Mt Wilson) and Hazelbrook. Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species to the extent that a viable local population of the species is likely to be placed at risk of extinction.

Hygrocybe reesiae

A small, lilac coloured gilled fungus. Cap 10 - 20 mm, convex but with a dip at the centre to almost with a small hallow at top of stem when mature, smooth, dry, margins even and not splitting, pale lilac to lilac grey but fading to buff when old. Gills deeply formed down stem, distant, thick, 1 or 2 sets of short gills, deep lilac to near violet, margins of the same colour. Stem 16 - 30 mm x 3 - 4mm, dry, smooth, cylindrical pallid lilac but darker to the top, becoming buff, hollow.

Type locality, Lane cove Bushland Park, Lane Cove Local Government Area. Also recorded from Blue Mountains National Park in the Hazelbrook area. Occurs in gallery warm temperate forests dominated by Lilly Pilly (*Acmena smithii*), Grey Myrtle (*Backhousia myrtifolia*), Cheese Tree (*Glochidion ferdinandi*) and Sweet Pittosporum (*Pittosporum undulatum*). Associated with alluvial sandy soils of the Hawkesbury Soil Landscapes with naturally low fertility and erodible. Occur as individuals or in groups, terrestrial rarely on wood and only if extremely rotten; substrates include

soil, humus, or moss. Does not produce above ground fruiting bodies (fungus) all year round. Fruiting bodies begin appearing mid May to mid July sometimes to August.

Within the proposed development site there is some suitable habitat for this species, however it was not observed during recent surveys. It is considered that the development of the area for a light industrial park may have an adverse effect on the life cycle of the species to the extent that a viable local population of the species, if present, is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations were recorded on the works site. It is considered that development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of the species that constitutes any endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) In the case of a critically endangered or endangered ecological community, whether the action proposed:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

There are no critically endangered ecological communities present on the proposed works site. It is considered that the development of the area for a light industrial park is not likely to substantially and adversely modify the composition of an EEC such that its local occurrence is likely to be placed at risk of extinction.

Due to the presence of suitable habitat and indicator species, it is considered that one Endangered Ecological Community (EPBC Act) identified for the area may be present. This is Temperate Highland Peat Swamps on Sandstone. Listing at state level is as Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions. A community with considerable overlap - Blue Mountains Swamps in the Sydney Basin Bioregion - is a vulnerable ecological community in Part 2 of Schedule 2 of the TSC Act.

Temperate Highland Peat Swamps on Sandstone

The Temperate Highland Peat Swamps on Sandstone ecological community is comprised of temporary or permanent swamps with a substrate of peat over sandstone, and vegetation characterised by the presence of sedges, graminoids (grass-like plants) and forbs (herbaceous non-grass or grass-like plants) with or without shrubs (Threatened Species Scientific Committee 2005aThe swamps generally occur at altitudes from around 600 m to 1200 m above sea level and are restricted to the South Eastern Highlands and Sydney Basin Interim Biogeographic Regionalisation of Australia (IBRA) regions in New South Wales. In the Blue Mountains area, swamps on steep valley sides/hill sides, called hanging swamps, often occur where groundwater seeps along the top of impermeable claystone layers in the sandstone and reaches the surface where the

claystone protrudes (Keith and Benson 1988; Holland et al. 1992; Blue Mountains City Council 2005). The structure of Temperate Highland Peat Swamps on Sandstone vegetation includes sedgeland, closed sedgeland, open-rushland, open-heath, closed-heath, tussock grassland, closed-tussock grassland, tall closed-grassland, open-scrub and tall shrubland. The vegetation is usually less than 3 m in height, although taller shrubs may be present. Emergent trees may occur on swamp margins, and the vegetation here tends to open woodland.

Dominant sedge species include the spikerushes *Eleocharis* spp. (mainly *E. acuta* (Common Spikerush), *E. gracilis* (Spikerush) and *E. sphacelata* (Tall Spikerush)), *Empodisma minus* (Spreading Rope Rush), *Gahnia sieberiana* (Red-fruit Saw-sedge), *Gymnoschoenus sphaerocephalus* (Button Grass), the rushes *Juncus* spp (including *J. alexandri, J. continuus, J. gregiflorus, J. laeviusculus* subsp. *illawarrensis, J. planifolius* and *J. prismatocarpus*), *Lepidosperma* spp (including *L. filiforme, L. limicola* (Razor Sedge) and *L. tortuosum*), *Lepyrodia* spp (including *L. anarthria, L. gracilis* and *L. scariosa* (Scale Rush), *Ptilothrix deusta* (Fluke Bogrush) and the cord-rushes *Baloskion australe* and *B. longipes* (previously called *Restio australis* and *R. longipes* respectively) and *Eurochorda complanata* (previously called *Restio complanatus*)

No endangered ecological communities were recorded on the proposed development site. It is considered that the development of the area for a light industrial park is not likely to have an adverse effect on the life cycle of an endangered ecological community such that a viable local population of the community is likely to be placed at risk of extinction.

ii. It is likely to substantially and adversely modify the composition such that its local occurrence is likely to be placed at risk of extinction.

It is considered that the development of the area for a light industrial park is not likely to substantially and adversely modify the composition of Temperate Highland Peat Swamps on Sandstone such that its local occurrence is likely to be placed at risk of extinction.

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

Considerable clearing of weeds is recommended throughout the subject site. The area for development will be cleared completely, and will be restricted to degraded bushland areas not conserved in areas zoned as Environment Protection-Slope Constraint and Environment Protection-Ecological Buffer (Riparian). Any removal of native trees, shrubs and groundcover should be compensated with extensive bush regeneration (weed control and supplementary planting for stabilisation) throughout the rest of the site.

SUMMARY OF WORKS:

The subject site is proposed for development in line with conditions for lands zoned Employment General. This includes "industrial and other compatible development which incorporates controls on potential impacts on the amenity of residents in adjoining residential areas". This is deemed to include "a wide range of employment generating land uses and facilities including industry, advanced technology, wholesale sales, storage, distribution, servicing, research and ancillary administrative uses, where these incorporate measures to conserve the sensitive environment of the Blue Mountains" (BMCC LEP Part 2, amended May 2009). The areas for development will be completely cleared and will require appropriate stormwater management and other controls to minimise impacts on the local natural environment (outside the scope of this report).

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

No additional fragmentation or isolation is anticipated by the development of the area for a light industrial park. Rehabilitation planting where required, and an ongoing weed control plan associated with this project will ameliorate the adverse impact on existing habitat.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community.

Recommended associated site management activities include weed removal and management of runoff. The habitat value of the area to be disturbed is considered to be limited as it has already been considerably degraded. As long as development is limited to the parts of the site identified in this report, no adverse long term ecological impacts as it relates to connectivity or composition are anticipated by the development.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No direct or indirect impact is likely for critical habitat from the proposed works.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No existing applicable recovery or threat abatement plan is relevant for the proposed development of the area for a light industrial park. Recommendations in this report address mitigation of identified threats for each of the threatened species potentially affected by the development.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Of the thirty two key threatening processes described in Schedule 3 of the Threatened Species Conservation Act 1995, three are potentially applicable to the proposed development of the area for a light industrial park. These are threats associated with the accidental transfer of seed propagules and pathogens from affected areas to unaffected areas in mud carried on cars and trucks, and boots of workers and include:

- Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis;
- Infection of native plants by Phytophthora cinnamomi;
- Invasion of native plant communities by exotic perennial grasses

Table 12. Threatened Species Conservation Act 1995 Schedule 3- Key Threatening Processes Assessment.

Threatened Species Conservation Act 1995 **Schedule 3 Key threatening processes**	**Applicable to proposed works**
• Alteration of habitat following subsidence due to longwall mining	No
• Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands (as described in the final determination of the Scientific Committee to list the threatening process)	No
• Anthropogenic Climate Change	No
• Bushrock removal (as described in the final determination of the Scientific Committee to list the threatening process)	No
• Clearing of native vegetation (as defined and described in the final determination of the Scientific Committee to list the key threatening process)	No
• Competition and grazing by the feral European Rabbit, *Oryctolagus cuniculus (L.)*	No
• Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758	No
• Competition from feral honey bees, *Apis mellifera* L.	No
• Death or injury to marine species following capture in shark control programs on ocean beaches (as described in the final determination of the Scientific Committee to list the key threatening process)	No
• Entanglement in or ingestion of anthropogenic debris in marine and estuarine environments (as described in the final determination of the Scientific Committee to list the key threatening process)	No
• Herbivory and environmental degradation caused by feral deer	No
• High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition	No
• Importation of Red Imported Fire Ants *Solenopsis invicta* Buren 1972	No
• Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations	No
• Infection of frogs by amphibian chytrid fungus causing the disease chytridiomycosis	Potential
• Infection of native plants by *Phytophthora cinnamomi*	Potential
• Introduction of the Large Earth Bumblebee *Bombus terrestris* (L.)	No
• Invasion and establishment of exotic vines and scramblers	No
• Invasion and establishment of Scotch Broom (*Cytisus scoparius*)	No

• Invasion and establishment of the Cane Toad (*Bufo marinus*)	No
• Invasion, establishment and spread of Lantana (*Lantana camara* L. *sens. lat*)	No
• Invasion of native plant communities by *Chrysanthemoides monilifera*	No
• Invasion of native plant communities by exotic perennial grasses	Potential
• Invasion of the Yellow Crazy Ant, *Anoplolepis gracilipes* (Fr. Smith) into NSW	No
• Loss of hollow-bearing trees	No
• Loss or degradation (or both) of sites used for hill-topping by butterflies	No
• Predation by *Gambusia holbrooki* Girard, 1859 (Plague Minnow or Mosquito Fish) (as described in the final determination of the Scientific Committee to list the threatening process)	No
• Predation by the European Red Fox *Vulpes Vulpes* (Linnaeus, 1758)	No
• Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)	No
• Predation by the Ship Rat *Rattus rattus* on Lord Howe Island	No
• Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758	No
• Removal of dead wood and dead trees	No

HABITAT ASSESSMENT AND CONSERVATION VALUE

FLORA AND VEGETATION COMMUNITIES

The site at 17 John St, Lawson is traversed by an established natural creekline, which effectively divides the subject site into halves. The results of flora surveys were recorded for a series of floristic zones which reflected species composition and level of modification, determined as replacement of native species with exotic species. The current condition of each set of zones is discussed in the following sections.

RIPARIAN ZONES

Vegetation in these zones has been described as "Modified Bushland" in the Native vegetation mapping of Geographic Planning Areas 1 to 5 Blue Mountains City local government area, 2002. Total numbers of native and exotic species for each zone is summarised in Table 13. Diversity is not consistent across the whole of the riparian zone, with more native species and more exotic species recorded in the upper section of the creek.

Table 13 Summary of species richness for each zone.

ZONE	NATIVE	THREATENED	EXOTIC	NOXIOUS
R1	22	0	22	6
R2	18	0	14	5

Figure 3 Degraded vegetation in zone R1 (left) and better vegetation in zone R2 (right)

Level of modification is summarised as percentage cover of native and exotic flora for each layer of vegetation in the zone (Table 14). In both zones, the canopy is dominated by native species. Considerable work has been done to control the *Salix cinerea* along the creek, which have been treated using the stem injection method. Unfortunately some plants have not been successfully killed, especially in the upper part of the creek (Zone R2). *Ligustrum sinense* dominates the shrub layer in Zone R1, and exotic species dominate the groundcover in both zones.

Table 14 Percentage cover of native and exotic flora in vegetation layers for each of Zones R1 and R2.

ZONE	LAYER	PERCENT COVER	PERCENT NATIVE	PERCENT EXOTIC
Riparian 1	Canopy	30	85	15
	Mid-storey	50	10	90
	Groundcover	100	1	99

Riparian 2	Canopy	40	85	15
	Mid-storey	40	60	40
	Groundcover	100	30	70

SOUTH ZONES

Vegetation in these zones has been described as "Modified Bushland" in the Native vegetation mapping of Geographic Planning Areas 1 to 5 Blue Mountains City local government area, 2002. Total numbers of native and exotic species for each zone is summarised in Table 15. Diversity is not consistent throughout the southern section of bushland. The central area, Zone S2, has more native species than the other two southern zones, but this may be due to its larger size, rather than better condition. This may also explain the greater number of weed species present here. One significant habitat tree was recorded in this zone.

Figure 4 Exotic species dominate the mid-storey and groundcover layers in the southern zones

In contrast, Zone S1 is smaller and highly degraded, while Zone S3 is of medium size but has a lower floristic diversity.

Table 15 Summary of species richness for each of Zones S1-S3.

ZONE	NATIVE	THREATENED	EXOTIC	NOXIOUS
S1	22	0	20	4
S2	41	0	34	6
S3	15	0	15	3

Level of modification is summarised as percentage cover of native and exotic flora for each layer of vegetation in the zone (Table 16). Exotic species dominate vegetation cover in all layers for Zone S1 except the mid-storey layer, where an equal proportion of natives and weeds was recorded. Native species dominate the canopy in zones S2 and S3, but exotics dominate in groundcover and mid-storey layers for each of these zones.

Table 16 Percentage cover of native and exotic flora in vegetation layers for each of Zones S1-S3.

ZONE	LAYER	PERCENT COVER	PERCENT NATIVE	PERCENT EXOTIC
South 1	Canopy	30	25	75
	Mid-storey	50	50	50
	Groundcover	100	1	99
South 2	Canopy	40	95	5
	Mid-storey	25	20	80

	Groundcover	80	5	95
South 3	Canopy	30	90	10
	Mid-storey	40	55	45
	Groundcover	90	10	90

NORTH ZONES

Vegetation in Zone N1 has been described as Non scheduled Woodland (*E. piperita* and *A. costata* 11B), while Zone N2 has been assessed as "Modified Bushland" in the Native vegetation mapping of Geographic Planning Areas 1 to 5 Blue Mountains City local government area, 2002. Total numbers of native and exotic species for each zone is summarised in Table 17. One threatened species was recorded on the subject site from Zone N1. Overall the condition of both zones on the northern side of the creek was better than elsewhere on the site. The lower native diversity recorded in zone N2 is a legacy of weed invasion, but it is consistent with better bushland on the southern side of the creek.

Table 17 Summary of species richness for each of Zones N1 and N2.

ZONE	NATIVE	THREATENED	EXOTIC	NOXIOUS
N1	94	1	13	1
N2	34	0	26	2

Figure 5 Vegetation in zone N1 is characterised by a high floristic diversity, and very few weeds

Level of modification is summarised as percentage cover of native and exotic flora for each layer of vegetation in the zone (Table 18). In general, native species dominate all vegetation layers for both northern vegetation zones, although the proportion of natives is lower for the mid-storey and groundcover layers in zone N2.

Table 18 Percentage cover of native and exotic flora in vegetation layers for each of Zones N1 and N2.

ZONE	LAYER	PERCENT COVER	PERCENT NATIVE	PERCENT EXOTIC
North 1	Canopy	40	98	2
	Mid-storey	55	99	1
	Groundcover	100	98	2
North 2	Canopy	35	90	10
	Mid-storey	50	60	40
	Groundcover	100	60	40

Zone N1 has a very high flora species diversity (94 species) in a comparatively small area. At this point in time there is a low level of impact from exotic species, although this will change very quickly. Numerous seedlings of Small-leaf Privet are present, with Holly and English Ivy seedlings also recorded. All of these species have the capacity to quickly colonise and dominate bushland.

Figure 6 *Persoonia acerosa* in zone N1

While it has been mapped as Non Scheduled Woodland (*E. piperita* and *A. costata* 11B), there are several other important canopy species present, including *E. sparsifolia* and *E. sieberi*. The presence of a eucalypts with a range of bark types increases the food resources for a range of birds and animals.

Persoonia acerosa was recorded in this part of the subject site. It is listed as vulnerable under NSW Threatened Species Conservation Act 1995. Two plants were recorded, and others may be present. One of these is located on the road edge, and was surrounded by dumped household rubbish and garden waste.

Figure 8 *Cryptostylis subulata* in zone N1

Three species of *Cryptostylis* orchid were recorded in zone N1. Of the five species known in Australia, one is found in WA, one is listed as endangered on the NSW coast and into the nearby ranges, and the three species recorded on the subject site. *Cryptostylis*

Figure 7 Cryptostylis leptochila (left) and C. erecta (right) in zone N1

hunteriana is known from a variety of habitats, with a key characteristic that it invariably co-occurs with *C. erecta* and *C. subulata*, both of which are present on site. Known as the Leafless Tongue Orchid, *C. hunteriana* is difficult to detect unless it is in flower, which generally occurs between November and February. Even when flowering it can be missed or confused with other *Cryptostylis* species.

FAUNA AND HABITAT

Nine species of small birds were recorded on the subject site during this survey, including a family group of 6-8 Varied Sittellas. The site provides excellent small bird habitat, with dense and varied shrub vegetation, and cohesive canopy across the non riparian areas. Predation of small birds by domestic or feral cats does not appear to be an issue, and human access to the area has been significantly limited.

Figure 9 Varied Sittella *(Daphoenositta chrysoptera)* in a family group foraging in zone N1

The Varied Sittella is a cooperative breeding and sedentary species, with family groups inhabiting a single area. They have been recorded at densities of 0.2-0.3 and 0.46 ha^{-1} near Armidale (Ford et al. 1985) with Marchant (1984) and Noske (1998) recording similar densities in SE and NE NSW. Typical family groups consist of 4-6 birds (Noske 1998). The family group observed potentially defends a territory of 13 -20ha with territory size dependent on the abundance and density of their preferred foraging trees which are rough barked eucalypts. Fragmentation of bushland inhibits the movements of small woodland birds across the landscape as they will avoid crossing open space if possible.

Several large specimens of the Giant Spiny Crayfish (*Euastacus spinifer*) were observed in the creek, and numerous crayfish burrows were apparent nearby. *Euastacus* species are found only in permanent waters at medium to high altitudes in the southeastern part of Australia. While the species is generally widespread and common, its presence is interesting because it provides evidence of a lower level of disturbance to the creek and riparian environments in recent times.

Figure 11 Giant Spiny Crayfish (*Euastacus spinifer*) in zone R2

During daylight surveys, numerous possum dreys were observed at the lower end of the subject site. At night, these were noted to be ringtail possums, present in high numbers. Ringtail possums are an important part of the diet for a number of large nocturnal carnivorous birds, including the Powerful Owl and other owl species. Anecdotal reports suggest that the Barking Owl regularly uses the site, particularly the area of better bushland (zones N1 and N2). Calls were heard on site which support this observation, but were not verified.

Figure 10 Bower constructed by Satin Bowerbird in zone S2

Several sets of small mammal tracks were noted in wet sand around the creek, which may have been echidna and bush rats. Truffle-like fungi were observed in eroding sandy creek banks, some of which showed signs of small mammal feeding activity. Elsewhere digging and scratching indicates the presence of small ground dwelling mammals but these were not directly observed. The comparative safety of the ground habitat was also indicated by the presence of a Satin Bowerbird bower, with a rejected purple peg nearby.

Several medium-large habitat trees were noted in zone N1, and one large old *E. piperita* specimen in S2. These were stag watched at dusk to identify whether they are being used by gliders or other arboreal marsupials, but none were noted. Additional habitat opportunities are provided by the site with regular water available from the creek, dense mid-storey vegetation around the creek, and changing through to drier woodland up the slopes on both sides. A mosaic of understorey vegetation was recorded, including small grass-dominated patches, large patches of ferns, and mixed herbs and low shrubs with a variety of grasses elsewhere. Fallen logs are rotting, providing substrate for mosses and lichens, and numerous species of fungi were present from a range of fungal groups, including gill, spore, jelly, bracket

Figure 12 Fallen logs provide a range of habitat niches (N1)

and truffle-like fungi. The mossy substrate is known habitat for several threatened species of fungi, recorded primarily from Lane Cove but also from a number of locations in the mid mountains. Thus there is potential for these species to be present. Fungi can generally only be readily detected if they are producing fruiting bodies, such as the caps, which normally occurs after steady rain.

Figure 13 Bioluminescent fungi *Omphalotus nidiformis* in zone N1 (left) and jelly fungus (right) in zone N2

Figure 14 Bracket fungi in zone N2 and truffle-like fungi in zone R2 are part of the food resources on site

DEVELOPMENT ASSESSMENT AND RECOMMENDATIONS

DEVELOPMENT OPPORTUNITIES AND CONSTRAINTS (LEP 2005)

The vegetation recorded in the riparian zones has many similarities with that described for Blue Mountains Riparian Complex (6), including ferns and waterlogged soil tolerant shrubs with an absence of Eucalyptus species. As such, the vegetation associated with the creekline would be better classified as a degraded form of this community. The vegetation in Zone N1 is mapped as Non-Scheduled Forest and Woodland - *Eucalyptus piperita - Angophora costata* but is better described as Non-Scheduled Forest and Woodland - *Eucalyptus sieberi- Eucalyptus piperita* . The vegetation in zone N2 has not been classified or mapped and should be described as Non-Scheduled Forest and Woodland - *Eucalyptus sieberi -Eucalyptus piperita.* Vegetation mapped as "modified bushland" on the southern side of the site is best described as a degraded form of Non-Scheduled Forest and Woodland - *Eucalyptus sieberi Eucalyptus piperita.* These revised vegetation classifications are illustrated in Figure 17.

Waterways and riparian lands are protected under the BMCC LEP by clause 7(c) Ecological Buffer Areas, and this includes all of the R1 and R2 zones, and additional land outside of these zones.

Additional land on site is protected under clause 7(a) Slope Constraint Area. Under the LEP, a buffer is required between any development and adjoining Environment Protection Zones, with a distance of 20m recommended. These zones and the location of threatened species observed on site are shown in Figure 15. The location of the watercourse as mapped in LEP 2005 is incorrect. The ground truthed location of the watercourse is illustrated in Figure 16.

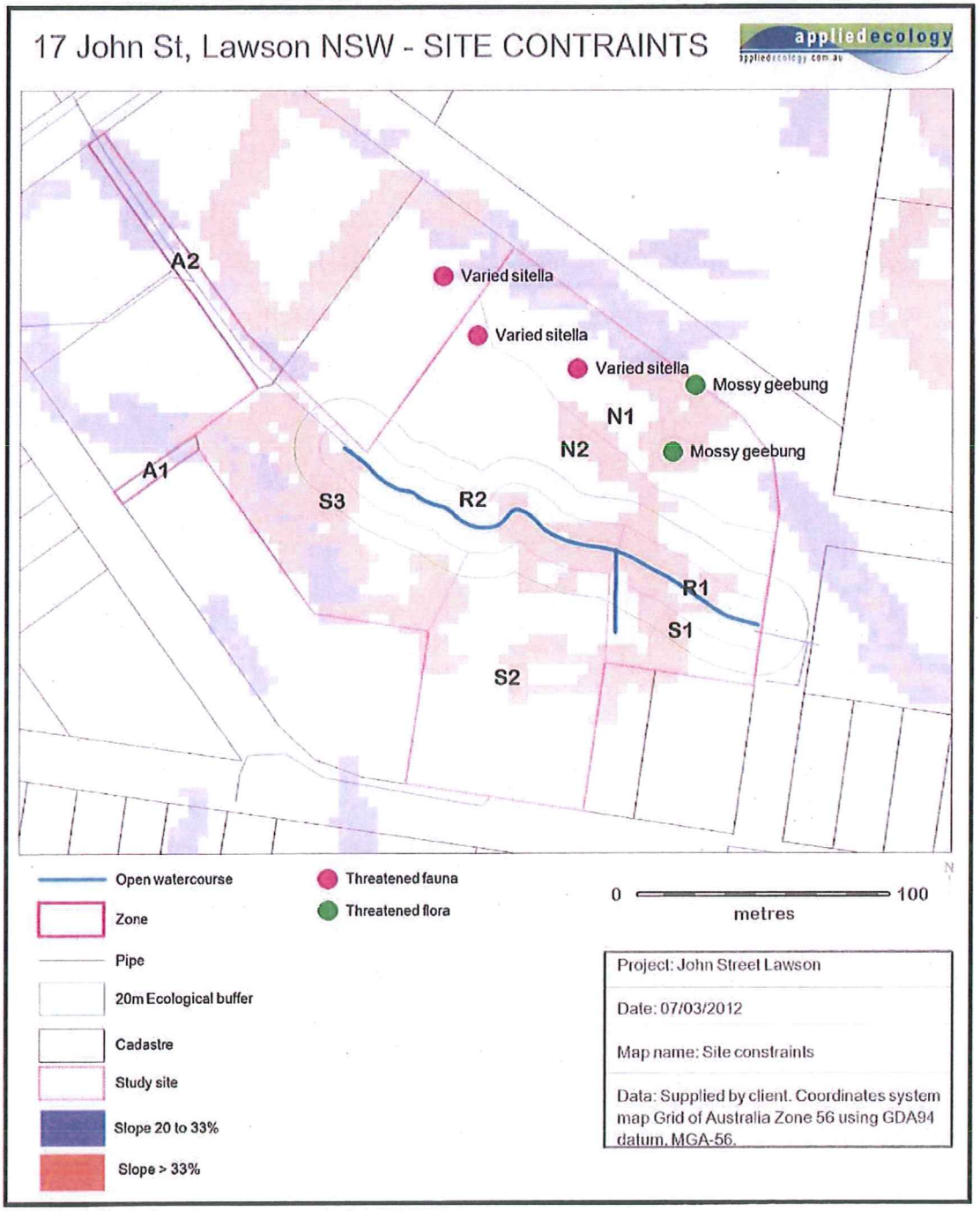

Figure 15 Site constraints

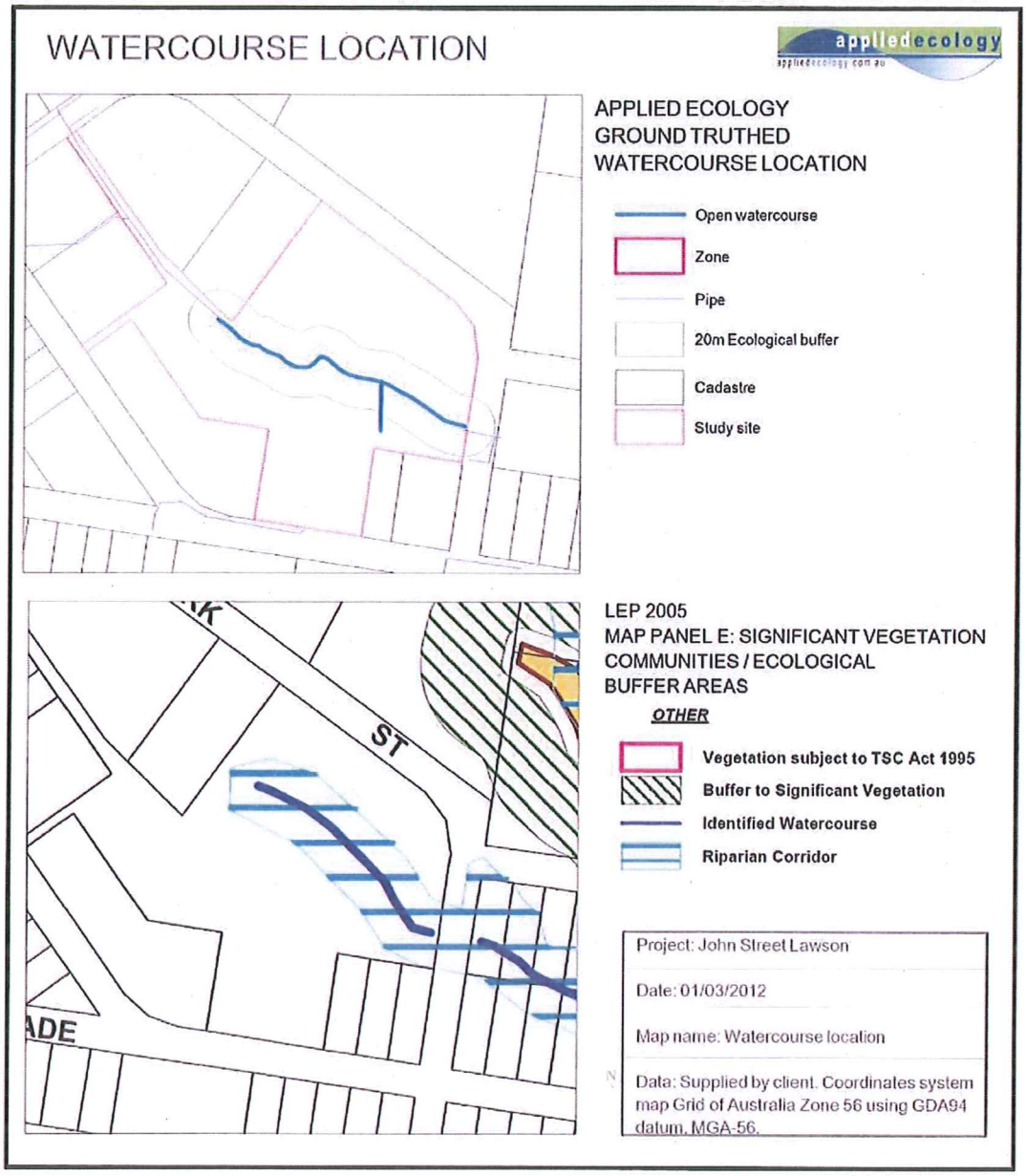

Figure 16 Watercourse location

Areas with few constraints include most of zone S2, some of S3, and potential to develop S1 as an extension to the adjoining developed lot. S3 is currently mapped as slope > 33% although this should be reassessed as observations during field surveys did not support this slope category. Applied Ecology recommends that no development is allowed in zones R1 and R2. There are some development constraints in N1 and N2 (slope and the presence of threatened species). There are fewer constraints at the western end of N1 and N2 with the "best bush" occurring at the eastern end of N1 and N2.

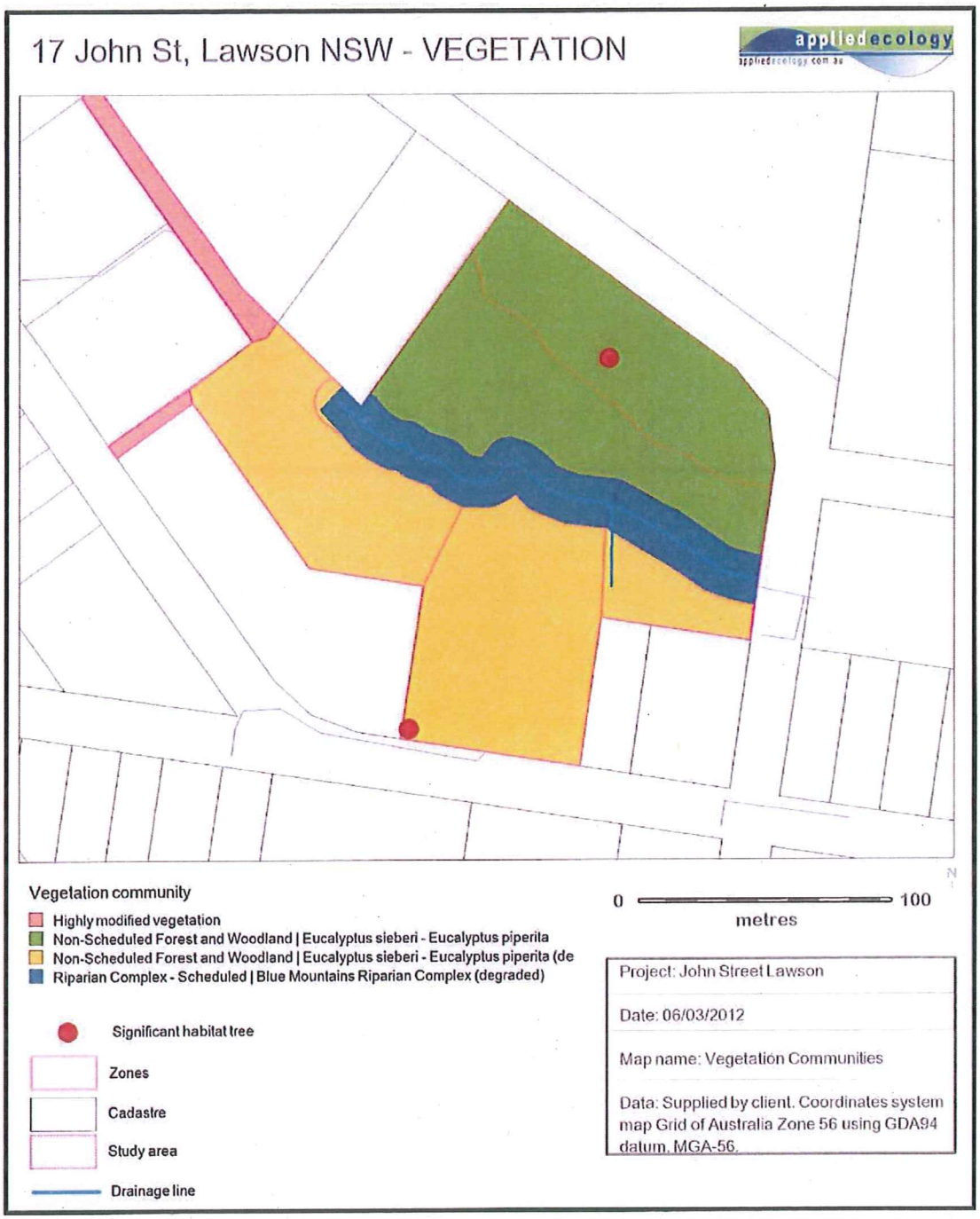

Figure 17 Revised vegetation communities of the study area

The Mossy Geebung *Persoonia acerosa* can be removed with no threat to the viability of the local population however they occur on slope constrained areas of the site and Applied Ecology recommends that extant vegetation should be retained and managed in this slope constrained area in addition to a 10m buffer to the watercourse. Additional vegetation should be retained to provide connectivity across the site. Creation of minor corridors and retention of vegetation on the slope

constrained areas of zone N1 will also assist in ameliorating the impacts on the other threatened species observed on site- the Varied Sitella *Daphoenositta chrysoptera.* Indicative areas where Applied Ecology recommends the retention of natural vegetation is considered are illustrated in Figure 18. This total area (including the buffer to the watercourse) amounts to 0.8 of a hectare.

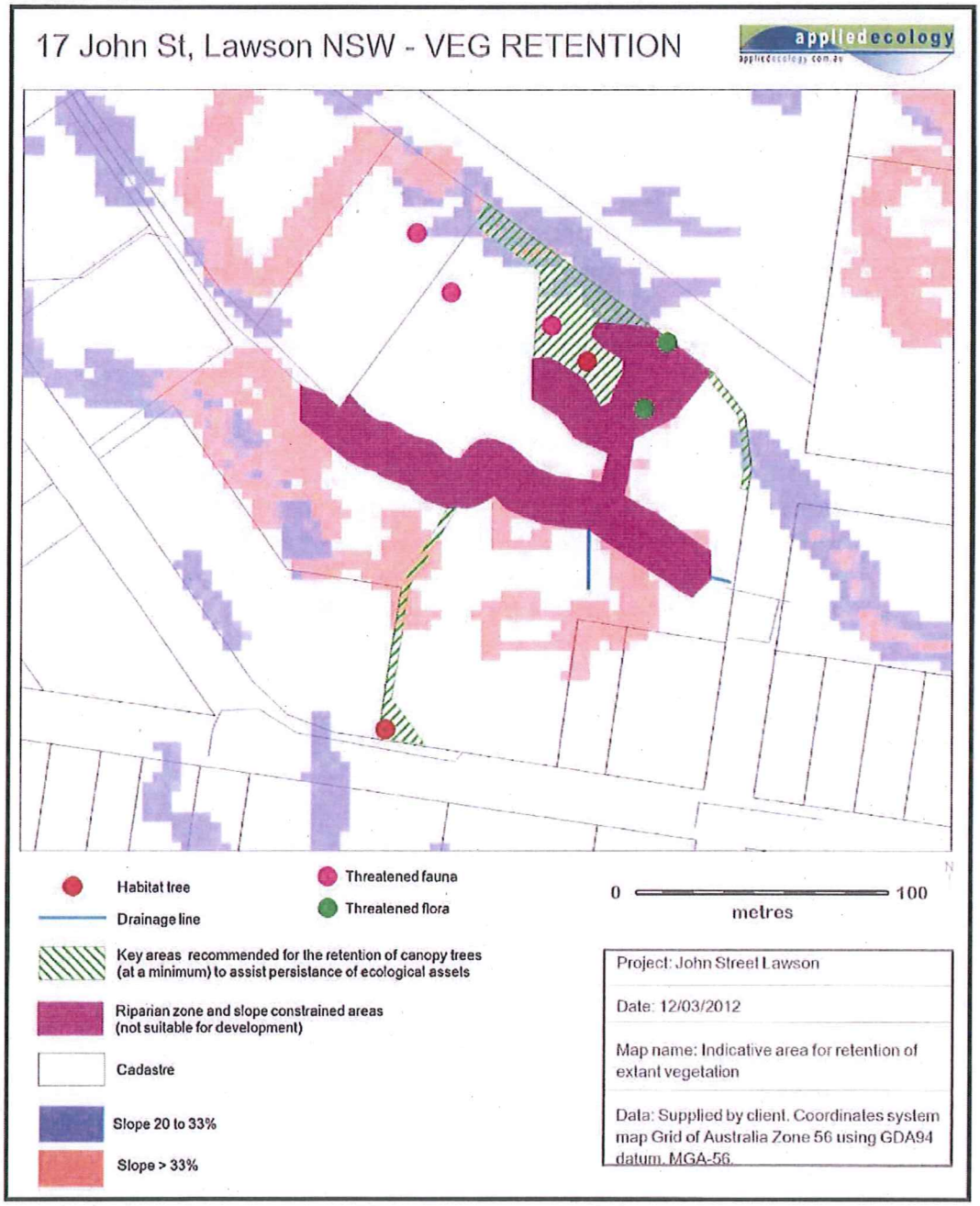

Figure 18 Indicative area for retention of extant vegetation

IDENTIFICATION OF THREATS

Although the proposed activities are not likely to have an adverse effect on the life cycle of any threatened species to the extent that a viable local population of the species is likely to be placed at risk of extinction the following broad and specific threats have been identified to ecological assets on the study site:

- Reduction in floristic diversity in potential Blue Mountains Riparian Complex (6) in the area by clearing or changing conditions in surrounding areas
- Reduction in extent of good quality vegetation in Non Scheduled Woodland (*E. piperita* and *A. costata* 11B) through invasion of weed species
- Reduction in condition of Non Scheduled Woodland (*E. piperita* and *A. costata* 11B) through runoff from proposed development site
- Reduction in condition of Non Scheduled Woodland (*E. piperita* and *A. costata* 11B) through sediment deposition during building on proposed development site.
- Reduction in population health and extent for *Persoonia acerosa* through the introduction of soil pathogens such as Phytophthora cinnamomi. *Persoonia* species have been identified as particularly vulnerable to disease associated with this pathogen. Further impacts on this species include disturbance during road maintenance. Both of these processes have been identified as key threats for this species.
- Reduction in quality of potential habitat for *Cryptostylis hunteriana* through clearing and/or degradation of bushland known to have critical habitat elements present (presence of other *Cryptostylis* species). Along with pressure from clearing associated with continuing development, this has been identified as a key threat for this species.
- Reduction in quality of potential habitat for threatened species of Hygrocybe fungi through low level exposure to industrial and domestic pollutants, weed encroachment, dumping of rubbish and garden wastes, trampling and inappropriate bush regeneration techniques such as the use of imported mulch and overuse of herbicides. These have been identified as key threats for Hygrocybe fungi.
- Reduction in habitat extent and quality for Varied Sittellas through large and small scale clearing, resulting in habitat isolation and simplification, and leading to barriers to movement. This has been identified as a key threat for this species.
- Reduction in food resources for Grey-headed Flying Foxes by reducing the quality and/or extent of bushland in the area. This has been identified as a key threatening process for this species.
- Reduction in food resources for local species of Owls by affecting numbers of ringtail possums, or reducing feeding, roosting and breeding habitat for ringtail possums. This has been identified as a key threat for these species.

RECOMMENDATIONS FOR MITIGATION ACTIONS

- Any clearing on the site should occur in late autumn and winter to avoid the extended nesting and nestling phase of the life cycle of the Varied Sitella. The breeding period in NSW has been recorded from August to January (Noske 1998) .
- Choice of suitable plant species for landscaping clearly outlined as part of the development approval

- Ongoing weed management as part of a comprehensive bush regeneration plan for the conservation zone
- Management of soil stability on slopes and along the creekline by staged weed removal, stabilisation and revegetation as required
- Staged removal of shrub layer weeds to retain habitat elements
- Offset weeds that provide food for small birds and possums by planting suitable native species
- Provide supplementary nesting sites (eg nest boxes) for possums to ensure ongoing food supplies for Owls
- Management of runoff from development site to reduce impacts from changed water quality and quantity
- Supplementary flora survey in spring/summer to confirm presence/absence of threatened orchid species
- Supplementary fungi survey in autumn to confirm presence/absence of threatened fungal species

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Appendix A Project Senior Staff

Project Manager– Dr. Meredith Brainwood

Dr. Meredith Brainwood carried out field work and report writing. Meredith holds a Bachelor of Applied Science (Environmental Science), a Master of Science (Honours) and completed a PhD in Ecohydromorphology.

After completing Cert II in Bushland Restoration at Wentworth Falls TAFE in 1998, Meredith has lived and worked in the Blue Mountains for many years and is familiar with the study area and surrounding environs. Meredith has extensive experience in preparing plans of management, aquatic and terrestrial flora and fauna surveys, and the development of rigorous scientific methodologies. She held contract roles with companies such as A&S Bushcare Services, National Trust Bushland Management Services, Good Bush People and NSW National Parks and Wildlife Service. Meredith worked as a senior environmental scientist with Australian Wetlands before joining Applied Ecology Pty Ltd.

Senior Consultant- Anne Carey

Anne undertook the mapping for the project and assisted with report writing and refinement. Anne has a Degree in Science (Conservation Biology) and is currently completing a Masters Degree in Wildlife Habitat Management and has over 20 years industry experience. A local resident and keen bushwalker Anne brings additional local understanding to the project. Prior to Applied Ecology, Anne worked as the Operations Manager at Australian Wetlands (Sydney Design group), as an Environmental Manager for PSP- an alliance of private companies delivering infrastructure projects for Sydney water, as field ecologist, undertaking fauna and flora assessments and vegetation mapping, for various companies including NSW National Parks and Wildlife Service.