55-59 Kirby Street, Rydalmere

Rezoning Ecological Assessment

Prepared for
Fife Capital

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Abbreviations

Abbreviation	Description
AoS	Assessment of Significance
APZ	Asset Protection Zone
AS	Australian Standard
BAL	Bushfire Attack Level
BOM	Bureau of Meteorology
BPA	Bushfire Protection Assessment
DPI	NSW Department of Primary Industries
ELA	Eco Logical Australia
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*

LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPWS	National Parks and Wildlife Services
NSW	New South Wales
OEH	NSW Office of Environment & Heritage
OPA	Outer Protection Area
PBP	Planning for Bush Fire Protection 2006
PCT	Plant community type
PDCP	Parramatta Development Control Plan 2011
PLEP	Parramatta Local Environmental Plan 2011
RF Act	*Rural Fires Act 2007*
SIC	Significant Impact Criteria
TEC	Threatened Ecological Community
TOB	Top of Bank
TSC	*Threatened Species Conservation Act 1995*
WM Act	*Water Management Act 2000*

Executive summary

Mecone Pty Ltd (on behalf of Fife Capital Pty Ltd) is submitting a planning proposal for the rezoning of 55-59 Kirby St Rydalmere. The intent of this process is to rezone the site from its current industrial use to allow for a mixed use/residential development and to increase the density controls applicable to the site.

Ecological Assessment

A review of relevant data and background literature was undertaken including searches of the Atlas of NSW Wildlife and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool, to determine threatened species known or considered likely to use the study area. A site inspection was undertaken which focused on validating/ refining previous vegetation community mapping, compiling a list of flora observed in the study area, identifying flora and fauna habitats, and identifying other features of conservation significance.

Field inspections identified that the vast majority of the study area supported areas of cleared land (including roads, infrastructure, buildings etc.) or planted and exotic species. One native vegetation community was identified within the study area – Coastal Enriched Sandstone Moist Forest. No threatened flora or fauna species were recorded within the subject site during the field survey. Individuals of an endangered population, *Pomaderris prunifolia*, was recorded within the study area, just outside the subject site. It is recommended that this location is taken into account for future planning and development as it may be potentially affected from future clearing. A large *Eucalyptus pilularis* was recorded in the north of the subject site and is considered to be of value due to its age and size. It is recommended that this is retained throughout future development.

Though not recorded in the subject site, the following threatened species are considered to potentially utilise the study area for foraging purposes and could potentially be affected from future clearing:

- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

Assessment of potential impacts to the above listed species, including the *Pomaderris prunifolia*, from future clearing of habitat within the study area would require Assessment of Significance (AoS) under the EP&A Act for *Threatened Species Conservation Act* 1995 (TSC Act) listed species, and assessment against Significant Impact Criteria (SIC) for Matters of National Environmental Significance (MNES) under the EPBC Act. This would be undertaken at the development stage.

Riparian Assessment

During field inspections waterfront land was identified within the study area. The field survey validated the 'top of bank' of the 1st order Subiaco Creek, the only creek within the study area. Riparian buffers required under the NSW *Water Management Act 2000* (WM Act) for the 1st order creek will need to be allowed for within future development following rezoning.

While the proposed rezoning does not represent a controlled activity within the meaning of the NSW *Water Management Act 2000* (WM Act), any subsequent works within waterfront land will require a Controlled Activity approval from the NSW Department of Primary Industries (DPI).

Bushfire Protection Assessment

The subject land is currently NOT identified as bush fire prone land by City of Parramatta Council. However, there is an area of significant vegetation to the south of the site that could sustain a bushfire. This report investigated the current bushfire risk of the study area and the appropriate combination of bushfire protection measures to mitigate this risk in support of a rezoning. Specifically, this analysis responded to the requirements of *Planning for Bush Fire Protection 2006* (PBP), and *Australian Standard AS 3959 Construction of buildings in bushfire-prone areas* (AS3959).

Future development of land and the construction of buildings will require an assessment against PBP. Therefore the provisions of this report are to be considered in the planning and design of any development following the rezoning process.

A number of strategies have been provided in the form of planning controls such that the risk from bushfire can be minimised and future rezoning or development approval processes can be streamlined. Further, it has been found that development of the anticipated land uses within the subject study area, from a bushfire planning perspective, are considered suitable.

The rezoning should been prepared based on the advice and constraints contained within this report. As the planning proposal relates to the future uses of the study area, it is considered appropriate that more detailed assessment and consideration of the relevant bushfire protection strategies is undertaken at the development application stage. This further assessment should include a more comprehensive review of the development layout, road network and subsequent planning controls, to ensure they are well designed in terms of bushfire protection outcomes.

1 Introduction

Mecone Pty Ltd commissioned Eco Logical Australia Pty Ltd (ELA) on behalf of Fife Capital Pty Ltd to prepare an ecological assessment, riparian assessment and bushfire protection assessment (BPA) for a proposed rezoning at 55-59 Kirby Street, Rydalmere. The intent of the three assessments is to assist and inform the rezoning of the subject site.

1.1 Background

The subject site is currently zoned industrial and it is proposed to rezone the land to allow for a mixed use/residential development and to increase density controls applicable to the site.

1.2 Subject site

The subject site is 55-59 Kirby Street, Rydalmere and is formally known as Lots 20 and 21 DP855339. The subject site is located in Parramatta Local Government Area (LGA) and covers 5.2 ha (**Figure 1**).

1.3 Report purpose

ELA was engaged to investigate the subject site to inform the rezoning in the context of its ecological, riparian and bushfire attributes. The study areas' south-western boundary is identified as 'biodiversity' in the Parramatta Local Environmental Plan 2011 (PLEP) and requires the planning proposal for the rezoning to consider impacts to native ecological communities, threatened species, populations or ecological communities, regionally significant species of flora and fauna habitat and habitat elements providing connectivity.

Additionally the south-western portion of the subject site is identified as 'riparian land and waterways' in the PLEP 2011. Therefore the planning proposal must also consider impacts to the water quality of receiving waters, the natural flow regime, the natural flow paths of waterways, the stability of the bed, shore and banks of waterways, and the flows, capacity and quality of groundwater systems.

The subject land is currently NOT identified as bush fire prone land by City of Parramatta Council. However, as there is an area of significant vegetation to the south of the site that could support a bushfire. For this reason a BPA is also addressed within this report to determine if there are any bushfire threats or constraints.

1.4 Key terminology

Subject site: refers to the area directly affected by the proposal.

Study area: refers to the subject site and any additional areas, which are likely to be affected by the proposal, either directly or indirectly.

Locality: the same meaning as ascribed to a local population of a species or local occurrence of an ecological community.

Plant community type (PCT): a PCT is an unambiguous master community-level classification for vegetation and consolidates two existing vegetation classifications.

Figure 1: Subject site location

2 Legislative context

The following section provides a brief description of the relevant legislation and outlines how it pertains to the study area and proposed rezoning.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national scheme for protecting the environment and conserving biodiversity values. The EPBC Act stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of National Environmental Significance (MNES).

The potential impact of development in the study area on any threatened species, populations or communities is assessed at the development application stage, and not at the rezoning stage. If the activity is likely to have a significant impact on MNES, the proponent may make a 'Referral' to the Commonwealth Department of the Environment (DotE). DotE will then determine if the action is a controlled or a non-controlled action. Controlled actions require a full assessment under Part 8 of the EPBC Act and approval under Part 9. Non controlled actions may proceed without further assessment or approval by the Commonwealth. Assessments under the EPBC Act can run concurrently with assessments under the NSW EP&A Act and NSW TSC Act.

Note that a planning proposal (i.e. rezoning) is not considered an 'action' under the EPBC Act and, therefore, does not require referral to the Commonwealth.

2.2 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning, and development assessment process. Various legislative instruments, such as the TSC Act, NSW *Water Management Act 2000* (WM Act) and NSW *Rural Fires Act 2007* (RF Act) are integrated with EP&A Act and have been reviewed below.

2.3 Threatened Species Conservation Act 1995

The NSW *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The TSC Act is integrated with the EP&A Act and requires consideration of whether a development (Part 4 of the EP&A Act) or an activity (Part 5 of the EP&A Act) is likely to significantly affect threatened species, populations and ecological communities or their habitat. Obligations placed on Councils under Part 3 of the EP&A Act when rezoning land include consideration of threatened species, populations, ecological communities and recovery plans.

The schedules of the TSC Act list species, populations and communities as endangered or vulnerable. All developments, land use changes or activities need to be assessed to determine if they will have an unacceptable impact on species, populations or communities listed on these schedules.

The potential impact of development within the study area on any threatened species, populations or communities is assessed using the Assessment of Significance under Section 5A of the EP&A Act at the development application stage, and not at the rezoning stage. If the impacts on the area are found to be

'significant', a Species Impact Statement would be required as would concurrence from the Chief Executive of the NSW Office of Environment & Heritage (OEH).

2.4 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) together with the *Water Act 1912* control the extraction of water, the use of water, the construction of works such as dams and weirs and the carrying out of activities in or near water sources in NSW. *'Water sources*' are defined very broadly and include any river, lake, estuary, or place where water occurs naturally on or below the surface and coastal waters.

If a '*controlled activity*' is proposed on '*waterfront land*', an approval is required under the WM Act. The WM Act is administered by the NSW Department of Primary Industries (DPI), who assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. '*Controlled activities*' include:

- *The construction of buildings or carrying out of works;*
- *The removal of material or vegetation from land by excavation or any other means;*
- *The deposition of material on land by landfill or otherwise; or*
- *Any activity that affects the quantity or flow of water in a water source.*

Rezoning proposals are not considered 'activities' and therefore do not trigger approval requirements under the WM Act, however subsequent development of the study area will require approval and therefore planning proposals should address issues of riparian protection that are consistent with the DPI *Guidelines for Riparian Corridors on Waterfront Land* (NOW 2012).

Stream classification in NSW is now completed according to the Strahler Stream Ordering process and riparian corridors widths are assigned based on the relevant stream order.

2.5 Fisheries Management Act (1994)

The NSW *Fisheries Management Act* 1994 (FM Act) replicates the protections of the TSC Act for aquatic (freshwater and marine) species, including fish, insects, molluscs, crustaceans, echinoderms and polychaetes but does not include whales, mammals, reptiles, birds, amphibians or species specifically excluded. Field and desktop survey work have not identified any species within the study area or surrounding area that are protected under the FM Act, however, any activity proposed that would block or interfere with fish passage will require a permit under this Act, at the development application stage.

2.6 Rural Fires Act (1997)

Bushfire issues are regulated by the NSW *Rural Fires Act 1997* (RF Act). Both the EP&A Act and the RF Act were modified by the *Rural Fires and Environmental Assessment Legislation Amendment Act* in 2002 to enhance bushfire protection through the development assessment process (NSW RFS 2006b). Key requirements of the RF Act include:

- The need for a bushfire safety authority to be issued by the RFS under section 100B of the RF Act for any development applications for subdivision (therefore, considered integrated development); and
- All landowners to exercise a duty of care to prevent bushfire from spreading on or from their land under section 63 of the RF Act. This relates to the appropriate provision and maintenance of Asset Protection Zones (APZs), landscaping and any retained vegetation when developing land (NSW RFS 2006b).

The rezoning of land also requires consultation with the NSW RFS as the lead agency for managing bushfire issues. As such, rezoning aims to satisfy the requirements of *Planning for Bushfire Protection* (NSW RFS, 2006) guideline. Bushfire considerations and / or requirements in relation to the proposal are being considered within this report, however, the subject site is NOT considered to be 'bushfire prone' under the PLEP 2011.

2.6.1 Direction 4.4 Planning for Bush Fire Protection

Direction 4.4 Planning for Bushfire Protection identifies matters for consideration for planning proposals that will affect, or are in proximity to land mapped as bush fire prone. In particular a planning proposal where development is proposed must:

- have regard to *Planning for Bush Fire Protection 2006* (PBP)
- provide an Asset Protection Zone (APZ) incorporating at a minimum:
    - an Inner Protection Area (IPA) bounded by a perimeter road or reserve which circumscribes the hazard side of the land intended for development and has a building line consistent with the incorporation of an APZ, within the property, and
    - an Outer Protection Area (OPA) managed for hazard reduction and located on the bushland side of the perimeter road
- for infill development (that is development within an already subdivided area), where an appropriate APZ cannot be achieved, provide for an appropriate performance standard, in consultation with the NSW Rural Fire Service (RFS). If the provisions of the planning proposal permit Special Fire Protection Purposes (as defined under section 100B of the RF Act), the APZ provisions must be complied with
- contain provisions for two-way access roads which links to perimeter roads and/or to fire trail networks
- contain provisions for adequate water supply for fire fighting purposes
- minimise the perimeter of the area of land interfacing the hazard which may be developed
- introduce controls on the placement of combustible materials in the Inner Protection Area.

Consideration must also be given to NSW RFS *Practice Note 2/12 Planning Instruments and Policies*. It is expected that the RFS, in its assessment of the proposal will consider the requirements of this Practice Note.

2.6.2 Planning for Bush Fire Protection 2006

Rezoning proposals require consultation with the NSW RFS as the lead agency for managing bushfire. As such the requirements of *Planning for Bush Fire Protection* (NSW RFS, 2006) are to be addressed. This includes having regard to the following planning principles of PBP:

- provision of a perimeter road with adequate two way access which delineates the extent of the intended development
- provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing
- specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads
- minimising the perimeter of the area of land, interfacing the hazard, which may be developed
- introduction of controls which avoid placing inappropriate developments in hazardous areas
- introduction of controls on the placement of combustible materials in asset protection zones.

2.7 Local Planning Instruments

2.7.1 Parramatta Local Environmental Plan 2011

The PLEP 2011 is the principle planning instrument for the Parramatta LGA. The LEP sets out the planning framework and establishes the requirements for the use and development of land in the LGA. The LEP provides broad direction with regard to what types of development are permitted within specific land use zones.

2.7.2 Parramatta Development Control Plan 2011

The Parramatta Development Control Plan 2011 (PDCP) aims to make detailed local provisions for all land within the LGA. Specifically, the DCP provides detailed construction, building and environmental controls for the types permitted land use described in the PLEP. Environmental controls address issues such as biodiversity, bushfire prone land, trees and vegetation.

3 Methods

3.1 Data and literature review

Data records and relevant literature pertaining to the ecology of the study area and surrounding areas were reviewed. The material reviewed included:

- NSW BioNet, Atlas of NSW Wildlife database search (10 km) (Accessed 30 June 2016)
- EPBC Act Protected Matters Search tool (10 km) (Accessed 27 June 2016)
- OEH threatened species profile database (OEH 2016)
- NSW DPI threatened and protected species records viewer
- NSW NPWS western Sydney vegetation mapping (NPWS 2002)
- NSW NPWS mapping (NPWS 2004)
- vegetation mapping of the Sydney Metropolitan Catchment Management Authority (OEH 2013)
- relevant legislative documents
- aerial photography.

Aerial photography (SIXmaps) of the study area and surrounds were also used to investigate the extent of vegetation cover and landscape features. In addition, relevant GIS datasets (soil, geology, drainage) were reviewed to guide the field survey component.

Species from the NSW Atlas, NSW Fisheries mapping/profiles and EPBC Act search tool were combined to produce a list of threatened species that may occur within the study area ("subject species") (**Appendix A**). Likelihood of occurrences for threatened species, endangered populations and communities in the study area were then made based on location of database records, the likely presence or absence of suitable habitat on the subject site, and knowledge of the species' ecology. A list of potentially "affected species" was then identified (those that were defined as "yes", "likely" or having "potential" to occur in the study area).

Five terms for the likelihood of occurrence of species are used in this report, defined as follows:

- "yes" = the species was or has been observed in the study area
- "likely" = a medium to high probability that a species uses the study area
- "potential" = suitable habitat for a species occurs in the study area, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the study area, and
- "no" = habitat in the study area and in its vicinity is unsuitable for the species.

Note, that assessments for the likelihood of occurrence were made both prior to field survey and following field survey. The pre-survey assessments were performed to determine which species were "affected species", and hence determine which sorts of habitat to look for during field survey. The post-survey assessments to determine final "affected species" were made after observing the available habitat in the study area.

3.2 Field inspection

3.2.1 Terrestrial biodiversity

The site inspection for the biodiversity assessment was conducted on 7 July 2016 by Meredith Henderson and Alex Gorey over 5 hours. The site inspection was conducted to:

- validate existing vegetation mapping and determine the condition of vegetation communities present and / or presence of any endangered ecological communities
- determine the presence of any threatened flora and fauna species
- identify habitat features for potential threatened flora and fauna species within the study area
- identify potential ecological constraints within the study area
- record the recovery potential of the vegetation within the study area and map connectivity in the landscape.

A random meander method (Cropper 1993) was used to confirm the boundaries of vegetation communities and species assemblages within the study area. Where the boundaries of vegetation communities differed from existing vegetation mapping, these were modified on hard copy maps. No biometric plots / transects or full floristic plots were undertaken for the project.

Several traverses of the native and exotic vegetation communities were undertaken to identify threatened flora species or suitable habitat for threatened flora or fauna species in accordance with the survey guidelines (DEC 2004). A habitat assessment of the suitability of the habitat features to support threatened species was undertaken concurrently. The locations of all important habitat features (e.g. rock outcrops, significant logs and location of all winter flowering eucalypts) observed were not recorded, but rather a qualitative assessment for each feature was conducted. Opportunistic sightings of all fauna present within the study area were recorded. No targeted fauna surveys were conducted nor were they deemed suitable for the study area.

Temperatures were moderate, with the temperatures ranging from 12.6°C and 17.2°C (recordings taken from the nearest weather station at Olympic Park no. 066212; BOM 2016). A total of 8.0 mm of rain fell on the day of the field survey.

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3.2.2 Riparian assessment

A site inspection for the riparian assessment was undertaken on 7 July 2016 by Ian Dixon over 5 hours. Subiaco Creek was the only watercourse within the subject site and was assessed through a rapid appraisal of hydrology, physical form, streamside vegetation, water quality and aquatic habitat. Top of Bank (TOB) mapping was also undertaken using a differential GPS (accuracy <1 m) to assist in determining suitable riparian buffers based on the Strahler stream order classification system, and to ascertain if the creek meets NOW's definition of a creek/river. The inspection was conducted to:

- indicate riparian buffers that may be required, and commentary on potential further requirements under the WM Act
- water quality of receiving waters
- natural flow regime
- natural flow paths
- stability of the bed and banks of the waterway.

Temperatures were moderate, with the temperatures ranging from 12.6°C and 17.2°C (recordings taken from the nearest weather station at Olympic Park no. 066212; BOM 2016). A total of 8.0 mm of rain fell on the day of the field survey.

3.2.3 Bushfire Protection Assessment

The site assessment conducted during both the ecological assessment and the riparian assessment collected sufficient detail to enable assessment of the nature of the bushfire hazard present and potential risk implication and constraints for the site. The hazard assessment was undertaken in accordance with the methodologies outlined within *AS3959-2009 Construction of buildings in bushfire prone areas* (in terms of Bushfire Attack Level rating framework) and the NSW Rural Fire Service (RFS) document *Planning for Bushfire Protection*.

3.3 Ecological assessment

3.3.1 Vegetation condition

Vegetation condition categories (good, moderate and poor) were assigned to the native vegetation communities validated in the field. Using a combination of the vegetation mapping (NPWS 2002, OEH 2013), aerial photograph interpretation and site validation, each patch of vegetation with a canopy cover was assigned a condition category based on its condition, density of canopy and area (ha).

3.3.2 Ecological constraints

Following the literature review, field survey and assessment of vegetation condition, ecological constraints were assigned to vegetation patches and habitat features within the study area. Depending on the site characteristics, ecological constraints were ranked as high, moderate and low. The criteria for each of these levels was determined during the project and identified in **Section 9.1.3**.

3.4 Survey limitations

The field survey was conducted in winter, and may be outside of the optimal survey period for some flora and fauna species. Thus, it is possible that flora and fauna species that may occur in the study area were not recorded due to the life cycle and behaviour of species or seasonal considerations. Targeted surveys would require repeating over a number of seasons to more adequately capture the diversity of flora and fauna that could be present in the study area. Since this was not possible, habitat assessments were undertaken to predict the likely presence of species. In addition, considering the habitat available on site, the condition of the vegetation and the proposed impacts, the survey effort was deemed satisfactory for the purposes of this report.

A conservative approach was also taken in assuming the presence of species that could potentially occur in the study area (that is, species were assessed to have the potential to be present even if the potential for this was low).

4 Ecological values

4.1 Desktop review

4.1.1 Landscape context and land use

The majority of the subject site is currently covered by buildings and concrete, hardstand surfaces. The subject site is operational as a pharmaceuticals warehouse. The subject site is 5.2 ha and adjoins the following:

- Upjohn Park to the north
- Silverwater Road and residential dwellings to the east
- Subiaco Creek to the south
- Kirby Street and residential dwellings to the west.

The vegetation within the grounds of the warehouse appear as maintained, landscaped plantings. To the south, along Subiaco Creek, the vegetation is dense and maintains some connectivity along the biodiversity corridor maintained by the creek. Subiaco Creek runs in an east west direction across the study areas southern extent and drains into Parramatta River. More broadly, the subject site is surrounded by residential properties with occasional relief in the urban landscape provided by parks.

4.1.2 Threatened ecological communities

A desktop review of the protected matters search identified nine TECs listed under the TSC/EPBC Acts which have potential to occur within a 10 km radius of the study area (**Appendix A**). These include:

- Blue Gum High Forest of the Sydney Basin Bioregion
- Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion
- Coastal Upland Swamp in the Sydney Basin Bioregion
- Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion
- Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest
- Shale/Sandstone Transition Forest
- Subtropical and Temperate Coastal Saltmarsh
- Turpentine-Ironbark Forest in the Sydney Basin Bioregion
- Western Sydney Dry Rainforest and Moist Woodland on Shale.

Two vegetation communities are mapped within the study area by OEH (2013). These being:

- Sydney Turpentine-Ironbark Forest
- Urban Native and Exotic Cover.

4.1.3 Threatened flora species

The desktop analysis identified a total of 28 threatened flora species listed under the TSC or EPBC Acts, which have been recorded or are likely to occur within a 10 km radius of the study area. An assessment of the likelihood of occurrence of threatened flora species within the impact assessment area is available in **Appendix A** and was used to guide the field survey methodology. The following threatened flora species that were identified as having a potential, likely or known occurrence in the study area:

- *Darwinia biflora*

- *Pomaderris prunifolia* – Endangered Population in the Parramatta, Auburn, Strathfield and Bankstown LGAs.

4.1.4 Threatened fauna species

The desktop analysis identified a total of 64 threatened or migratory species listed under the TSC or EPBC Acts, which may have the potential to occur within a 10 km radius of the study area (locality). An assessment of the likelihood of occurrence of threatened flora species within the impact assessment area is available in **Appendix A** and was used to guide the field survey methodology. Based on desktop review of the aerial photos and previous Bionet Atlas of NSW wildlife search the following threatened fauna species that were identified as having a potential, likely or known occurrence in the study area:

- Gang-gang Cockatoo (*Callocephalon fimbriatum*)
- Little Lorikeet (*Glossopsitta pusilla*)
- Little Eagle (*Hieraaetus morphnoides*)
- Green and Golden Bell Frog (*Litoria aurea*)
- Rainbow Bee-eater (*Merops ornatus*)
- Satin Flycatcher (*Myiagra cyanoleuca*)
- Southern Myotis (*Myotis macropus*)
- Barking Owl (*Ninox connivens*)
- Powerful Owl (*Ninox strenua*)
- Scarlet Robin (*Petroica boodang*)
- Red-crowned Toadlet (*Pseudophryne australis*)
- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

4.1.5 Waterways

One waterway depicted on the 1:25,000 topographic map runs in an eastern direction through the southern portion of the site (**Figure 2**). It is classed as a 1st order stream using the Strahler system. Review of aerial photography suggests the creek is likely to be a densely vegetated creek.

Figure 2: Site drainage

4.2 Field survey results

4.2.1 Vegetation communities

All vegetation communities across the site were identified as having been subjected to moderate to high levels of disturbance including vegetation clearing/thinning, rubbish dumping, urban runoff, infestation of exotic species and modification of landform and soil profiles.

The field inspection indicated that there were two vegetation types:

- Coastal Enriched Sandstone Moist Forest
- Planted and exotic vegetation.

Sydney Turpentine-Ironbark Forest as mapped by OEH (2013) was not considered likely as the species present had greater affinities with Coastal Enriched Sandstone Moist Forest (**Figure 3**).

Coastal Enriched Sandstone Moist Forest

Coastal Enriched Sandstone Moist Forest is a tall open eucalypt forest with a distinctive mesic shrub and small tree layer. The canopy may be dominated by various combinations of eucalypts although *Angophora costata* (Smooth-barked Apple) is invariably present. On the north shore and inner harbours *Syncarpia glomulifera* (Turpentine), *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus saligna* (Sydney Blue Gum) are dominant trees while on the Warringah and Pittwater escarpments *Eucalyptus botryoides* (Bangalay) and *Eucalyptus umbra/scias* (Mahoganies) are more prevalent. Elsewhere, *Eucalyptus piperita* (Sydney Peppermint) may dominate. A tall stand of *Allocasuarina torulosa* (Forest Oak) is often present below the eucalypt canopy. Tall small trees tend to be rainforest plants such as *Ceratopetalum apetalum* (Coachwood), *Elaeocarpus reticulatus* (Blueberry Ash) and occasionally *Livistona australis* (Cabbage Tree Palms). The forest floor is covered by a sparse to dense cover of ferns and twiners.

Coastal Enriched Sandstone Moist Forest occurred as a linear patch running along the southern boundary of the study area. It was present along the banks of a small waterway. A total of approximately 0.7 ha of this vegetation was identified within the subject site. This community was dominated be a canopy of *Syncarpia glomulifera*, *Eucalyptus pilularis*, *Eucalyptus punctata*, *Angophora costata* and the exotic *Cinnamomum camphora* (Camphor Laurel). The midstorey was disturbed and largely dominated by exotic species such as *Lantana camara*, *Ligustrum lucidum* (Large-leaved Privet) and *Ligustrum sinense* (Small-leaved Privet). However there were a few individuals of *Pittosporum undulatum* and *P. revolutum*. The groundcover was sparse and exotic species were frequent. The exotics included *Ochna serrulata* (Mickey Mouse Bush), *Ligustrum lucidum*, *Tradescantia fluminensis* (Trad), *Asparagus aethiopicus* (Asparagus Fern) and *Ehrharta erecta* (Panic Veldt Grass). Native species were few but included *Blechnum* sp. (a fern), *Oplimenus imbecillis* (Basket Grass), *Dichondra repens* (Kidney Weed), *Lomandra filiformis* and *Dianella longifolia*.

Planted and Exotic

With the exception of the Coastal Enriched Sandstone Moist Forest, the rest of the vegetation within the subject site consists of either planted or exotic assemblages. Plantings present within the study area included *Eucalyptus saligna*, *Corymbia maculata* (Spotted Gum), *Grevillea robusta* (Silky Oak), *Eucalyptus microcorys* (Tallowood), *Angophora bakeri* (Rough Barked Apple), *Casuarina cunninghamiana* (River Oak) and *Macadamia* sp. Areas of exotic vegetation included *Ligustrum lucidum*, *Ligustrum sinense*, *Olea europaea* subsp. *cuspidata* (African Olive), *Senna pendula*, *Psoralea* sp., *Ageratina adenophora* (Crofton Weed), *Nephrolepis cordifolia* (Fishbone Fern) and *Araujia sericifera* (Moth Vine). An area of approximately 0.7 ha of planted and exotic was mapped within the study area.

4.2.2 Threatened ecological communities

No threatened ecological communities were recorded within the subject site, therefore, threatened ecological communities are unlikely to constrain future development of the site.

4.2.3 Flora species

A total of 55 flora species were identified within the subject site. A species list is included in **Appendix B**. The majority of these species (63%) were exotic, either introduced as plantings within landscaped areas of the site, or are invasive weeds.

One large *Eucalyptus pilularis* is located in the north of the subject site (**Figure 3**). It is considered important due to its size and presence of hollows.

4.2.4 Threatened flora species

No threatened flora species were identified within the subject site. However, an endangered population of *Pomaderris prunifolia* (Parramatta, Auburn, Strathfield and Bankstown LGA endangered population) was identified outside the western boundary of the subject site, within the study area (**Figure 3**). As this population was recorded outside of the subject site it is not likely that future development within the property will directly impact the species, however, it is recommended that its location is taken into account during future planning of any development. The *Pomaderris prunifolia* is the only potentially affected flora species.

Assessment of potential impacts to threatened flora from future clearing of habitat within the study area would require Assessment of Significance (AoS) under the EP&A Act for TSC Act listed species. This would be undertaken at the development application stage.

4.2.5 Threatened fauna species

No threatened fauna species were identified within the study area. While there is potential for some highly mobile threatened fauna groups to utilise the study area for foraging purposes, it is unlikely that local populations of these species would be dependent upon the very limited foraging resources within the study area. Accordingly, threatened fauna species are unlikely to constrain future development of the site. The following highly mobile species are considered as potentially affected fauna species under anticipated development:

- *Pteropus poliocephalus* (Grey-headed Flying-fox)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat).

Assessment of potential impacts to threatened fauna species from future clearing of habitat within the study area would require Assessment of Significance (AoS) under the EP&A Act for TSC Act listed species and assessment SIC for MNES under the EPBC Act. This would be undertaken at the development application stage.

Figure 3: Survey results and vegetation communities

4.2.6 Fauna species and habitats

While much of the vegetation within the study area showed moderate to high levels of disturbance, including invasion by exotic species and modified vegetation structure, there were a number of habitat elements present within the study area for flora and fauna:

- areas with an intact canopy layer
- areas with a dense mid-story or tall shrub layer
- leaf litter
- one drainage line
- woody debris (fallen logs and branches)
- small areas of outcropping and surface rock.

The habitat elements available across the study area provide sheltering, foraging, and limited roosting habitat for a range of fauna groups. Intact canopy and shrub layers provide foraging habitat for birds and bats. Leaf litter and woody debris provides foraging and sheltering habitat for ground dwelling mammals, frogs and reptiles. Standing and flowing water provides marginal foraging habitat for frog species and marginal foraging habitat for bat species, however, *Gambusia holbrooki* (Mosquito Fish) were recorded within flowing water. Mosquito Fish are known to exclude natives through dominating habitat with aggressive behaviour towards other fish species or amphibians, and their eggs – their presence generally indicates a reduction and possible exclusion of native fish species.

The habitat elements within the subject site do not represent known habitat for any threatened species. The habitat elements represent potential foraging/roosting habitat for threatened fauna species, although due to the limited habitat and level of disturbance and isolation, only highly mobile fauna groups including birds and bats are considered to have potential to utilise the study area.

4.2.7 Riparian corridors

Subiaco Creek is a 1st order tributary of Parramatta River. Its residential catchment is piped until 300 m upstream of Silverwater Road, where it forms a natural waterway with aquatic habitat and riparian vegetation. Downstream of Silverwater Road, Subiaco Creek flows along the southern boundary of 55 Kirby St, then a further 2 km to Parramatta River.

The creek is in moderate condition, with symptoms common to urban waterways. Defining features include:

- in-stream structures, including twin box culverts beneath Silverwater Road, aqueduct pylons and bridge footings beneath Kirby Road
- stormwater outlets with localised erosion gullies
- incised channel due to rapid flows off an impervious catchment
- slumped banks on outer bends due to powerful flows and lack of large deep-rooted trees that would support the bank
- exposed roots along the bank due to rapid floodwaters
- weedy layers of riparian vegetation, dominated by *Ligustrum lucidum* (Large-leaf Privet), *Lantana camara* (Lantana) and *Tradescantia fluminensis* (Wandering Jew)
- lack of native tree recruitment due to competition with midstorey and understorey weeds
- Turbid water and potentially poor water quality from urban runoff.

The channel was flowing steadily during the site visit due to recent rain. Aquatic habitat within the site is a mix of narrow pools (15% of reach), narrow runs (75% of reach) and boulder/bedrock riffles (10% of reach). Substrate is mostly bedrock and boulder, with small gravel/sand bars. The upper bank in the

riparian corridor is compacted sands. One natural barrier to fish passage occurs under the aqueduct, where subterranean flows occur beneath the bedrock for the full channel width. Coarse woody debris and overhanging vegetation is abundant. Trailing vegetation occurs occasionally, but may not reach the water during low flows. Rubbish is abundant.

While the proposed rezoning is not a controlled activity within the meaning of the WM Act, any subsequent works within waterfront land will require a Controlled Activity approval from DPI. Under the DPI Water guidelines for riparian corridors, a 1st order stream requires a 10 m riparian corridor width, measured form the top of bank, as shown in **Figure 4**. The DPI Water *Guidelines for riparian corridors on waterfront land* advises that:

- riparian corridors should be maintained or rehabilitated with fully structured native vegetation
- vegetation Riparian Zones are to be fully vegetation in accordance with riparian corridor matrix rules
- any removal or development of the riparian zone will be deemed a controlled activity under the WM Act and an approval will be required under Section 91 (2) of the WM Act.

Figure 4: Riparian corridor measured from Top of Bank

5 Bushfire protection

An assessment of the bushfire hazard was necessary to determine the application of bushfire protection measures such as asset protection zone location and dimension. This section provides a detailed account of the vegetation communities (bushfire fuels) and the topography (effective slope) that combine to create the bushfire hazard that may affect bushfire behaviour at the study area.

The concept of bushfire risk as influenced by fire history and current and past bushfire issues has little bearing on the determination of bushfire protection strategies for rezoning and future development within the study area. This is due to the fact that PBP assesses bushfire protection based purely on vegetation and slope (i.e. hazard and not risk), making the assumption that a fire may occur in any patch of bushland at a worst-case scenario (based on a set design fire).

5.1 Vegetation types

In accordance with PBP the predominant vegetation class has been calculated for a distance of at least 140 m of the proposed development and the slope class 'most significantly affecting fire behaviour' has been determined for a distance of at least 100 m in all directions. The predominant vegetation and effective slope assessments are shown in **Table 1**.

The vegetation that would be considered a potential bushfire hazard occurs within and adjoining the subject land to the south as shown in **Figure 3**. This vegetation is a predominantly Coastal Enriched Sandstone Moist Forest along Subiaco Creek with weeds and exotic vegetation occurring at the interface with existing development. Taking into consideration the narrow width of the riparian corridor (less than 50 m) and fragmentation within backyards of residential properties, the resulting short fire run means the vegetation is considered a 'low hazard' in accordance with PBP. Low hazard vegetation uses 'rainforest' setbacks and construction levels as a surrogate for the reduced fire behaviour expected from small and/or narrow areas of vegetation

In all other directions is managed land in the form of residential development, sporting fields and infrastructure.

5.2 Effective slope

In accord with PBP, the slope that would most significantly influence fire behaviour was determined over a distance of 100 m from the boundary of the proposed development where the vegetation was found. This assessment was made from a desktop analysis of 2 m contours. The land slopes down towards Subiaco Creek for a short distance before rising up towards development along Patterson Street. As a result the slope influencing behaviour is the longer upslope run on the opposite side of Subiaco Creek falling within the PBP slope class of 'all upslopes and flat land.

6 Asset protection zones

Table A2.4 of PBP has been used to indicate the required APZ dimensions for future residential development within the subject land using the vegetation and slope data identified in **Section 5**. The APZ calculation is tabulated below and shown in **Figure 5**.

It is best practice to provide an APZ dimension that achieves a building construction standard under *AS 3959-2009 Construction of buildings in bushfire-prone areas* (Standards Australia 2009) of Bushfire Attack Level (BAL)-29 for residential development to ensure future home owners are not impacted by the additional costs associated with construction of a dwelling at BAL-40. **Table 1** lists the current minimum APZ and best practice APZ related to BAL-29. APZ dimensions shown in **Figure 5** are based on BAL-29 APZ.

Table 1: Threat assessment, APZ and category of bushfire attack

Direction from development	Slope[1]	Vegetation[2]	PBP required APZ[3]	AS3959 BAL-29 APZ
South	Upslope	Low hazard (rainforest)	10 m	11 m
All other directions	Managed lands			

[1] Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

[2] Predominant vegetation is identified, according to PBP and *"Where a mix of vegetation types exist the type providing the greater hazard is said to be predominate"*.

[3] Assessment according to Table A2.4 of PBP

6.1 APZ maintenance

The required APZs are partially in place with further clearing expected to be undertaken as part of the bulk earthworks associated with the future development following rezoning. Any landscaping should give consideration to the following performance requirements of an Inner Protection Area (IPA) as described by PBP:

- No tree or tree canopy is to occur within 2 m of the dwelling roofline.
- The presence of a few shrubs or trees in the APZ is acceptable provided that they:
  - are well spread out and do not form a continuous canopy
  - are not species that retain dead material or deposit excessive quantities of ground fuel in a short period or in a danger period
  - are located far enough away from the building so that they will not ignite the building by direct flame contact or radiant heat emission.
- Any landscaping or plantings should preferably be local endemic mesic species or other low flammability species.

Figure 5: Asset Protection Zone

7 Utilities and access

7.1 Water supply

Future development will be serviced by reticulated water infrastructure suitable for fire fighting purposes. The furthest point from any future development to a hydrant is to be less than 90 m (with a tanker parked in-line) in accordance with Australian Standard 2419.1 – 2005 Fire Hydrant Installations - System Design, Installation and Commissioning (Standards Australia 2005). The reticulated water supply is to comply with the following acceptable solutions within Section 4.1.3 of PBP:

- reticulated water supply to use a ring main system for areas with perimeter roads
- fire hydrant spacing, sizing and pressures comply with AS 2419.1 – 2005
- hydrants are not located within any road carriageway
- all above ground water and gas service pipes external to the building are metal, including and up to any taps
- the PBP provisions of parking on public roads are met.

7.2 Gas and electrical supplies

In accordance with PBP, electricity should be underground wherever practicable. Where overhead electrical transmission lines are installed:

- lines are to be installed with short pole spacing, unless crossing gullies
- no part of a tree should be closer to a powerline than the distance specified in the *ISSC 3 Guideline for Managing Vegetation Near Power Lines* (Industry Safety Steering Committee, 2005).

Any gas services are to be installed and maintained in accordance with *Australian Standard AS/NZS 1596 'The storage and handling of LP Gas'* (Standards Australia 2014).

7.3 Access

7.3.1 Public roads

All bushfire prone areas should have an alternate access or egress option. This is usually achieved by providing more than one public road into and out of a precinct. The need for an alternative road and its location depends on the bushfire risk, the density of the development, and the chances of the road being cut by fire. The study area is surrounded by a network of public roads with potential to link into the existing system at multiple points.

Future access arrangements within the study area are to be in accordance with the intent and principles of PBP regarding the provision of safe access and egress for both residents and fire fighters.

7.3.2 Safe access and egress

All bushfire prone areas should have an alternate access or egress option. An internal road system supporting future development is to comply with Section 4.1.3 (1) of PBP.

7.3.3 Road design and construction

Depending on the bushfire risk, all bushland interface areas containing an APZ for a significant bushfire hazard should feature a perimeter public road within the APZ. It is acceptable for some areas not to have a perimeter road or have a perimeter trail instead. These include areas of lower bushfire risk (such as

grassland or low hazard remnants or areas where it may not be feasible to provide a continuous road due to the shape of the interface or the terrain). These areas should have some other access strategy such as regular access points and good access to a hydrant network.

Provision of a simple layout with perimeter roads and frequent direct access to the internal road system will provide sufficient access/egress in the case of an emergency. Public roads should provide safe operational access to structures and water supply. Perimeter roads are required at APZ bushland interface locations where a significant bushfire hazard exists. Given the low risk posed by the pocket of vegetation to the north it is not anticipated that a perimeter road will be required.

The design details (PBP acceptable solutions) of public roads are shown in **Table 2**.

Table 2: Performance criteria for proposed public roads

Intent may be achieved where:	Acceptable solutions
• firefighters are provided with safe all weather access to structures (thus allowing more efficient use of firefighting resources)	• public roads are two-wheel drive, all weather roads
• public road widths and design that allows safe access for firefighters while residents are evacuating an area	• urban perimeter roads are two-way, that is, at least two traffic lane widths (carriageway 8 metres minimum kerb to kerb), allowing traffic to pass in opposite directions. Non perimeter roads comply with Table 4.1 – Road widths for Category 1 Tanker (Medium Rigid Vehicle) • the perimeter road is linked to the internal road system at an interval of no greater than 500 metres in urban areas • traffic management devices are constructed to facilitate access by emergency services vehicles • public roads have a cross fall not exceeding 3 degrees • public roads are through roads. Dead end roads are not recommended, but if unavoidable, dead ends are not more than 200 metres in length, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end and direct traffic away from the hazard • curves of roads (other than perimeter roads) are a minimum inner radius of six metres • maximum grades for sealed roads do not exceed 15 degrees and an average grade of not more than 10 degrees or other gradient specified by road design standards, whichever is the lesser gradient • there is a minimum vertical clearance to a height of four metres above the road at all times • the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles (approximately 15 tonnes for areas with reticulated water, 28 tonnes or 9 tonnes per axle for all other areas). Bridges clearly indicated load rating
• the capacity of road surfaces and bridges is sufficient to carry fully loaded firefighting vehicles	• public roads greater than 6.5 metres wide to locate hydrants outside of parking reserves to ensure accessibility to reticulated water for fire suppression
• roads that are clearly sign posted (with easy distinguishable names) and buildings / properties that are clearly numbered	• public roads between 6.5 metres and 8 metres wide are No Parking on one side with the services (hydrants) located on this side to ensure accessibility to reticulated water for fire suppression • public roads up to 6.5 metres wide provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression
• there is clear access to reticulated water supply	• one way only public access roads are no less than 3.5 metres wide and provide parking within parking bays and located services outside of the parking bays to ensure accessibility to reticulated water for fire suppression • parking bays are a minimum of 2.6 metres wide from kerb to kerb edge to road pavement . No services or hydrants are located within the parking bays
• parking does not obstruct the minimum paved width	• public roads directly interfacing the bush fire hazard vegetation provide roll top kerbing to the hazard side of the road

8 Construction standard

The application of building construction standards for bushfire protection under *AS 3959-2009 Construction of buildings in bushfire-prone areas* (Standards Australia 2009) is to be considered at the development application stage for individual dwellings and buildings. An assessment under AS 3959-2009 is not required at the rezoning or subdivision stages. The following is a brief introduction on AS 3959-2009.

AS 3959-2009 contains six Bushfire Attack Levels (BAL), each with a prescribed suite of design and construction specifications aimed at preventing ignition during the passing of a bushfire front. The BALs are outlined below:

- BAL-Low: The threat does not warrant application of construction standards. Developments with BAL-Low are generally not within bushfire prone land (greater than 100 m from bushland)
- BAL-12.5: Addresses background radiant heat at lower levels and ember attack
- BAL-19: Addresses mid-range radiant heat and ember attack
- BAL-29: Addresses high range radiant heat and ember attack
- BAL-40: Addresses extreme range of radiant heat and potential flame contact and ember attack
- BAL-FZ: Addresses construction within the flame zone. New subdivided lots are not permitted within the flame zone in NSW.

NSW has a minor variation to AS 3959-2009 which requires consideration in future development applications. The variation is contained within the document '*PBP Appendix 3 Addendum'* (RFS 2010).

9 Analysis of biodiversity values

9.1.1 Vegetation condition

The native vegetation community Coastal Enriched Sandstone Moist Forest was recorded in a generally 'poor' condition. This condition assignment is based on the cover and density of weeds present within the vegetation, in particular *Ligustrum lucidum* (Large-leaf Privet), *Lantana camara* (Lantana) and *Tradescantia fluminensis* (Wandering Jew) which are likely to be outcompeting natives in the midstorey and understorey. Disturbance to the flow regime of the creek which flows through this vegetation has resulted in incising of the channel and slumping of the banks. This has compromised the health of vegetation here through exposing and undercutting the roots of bank stabilising plants.

9.1.2 Wildlife corridor

Within fragmented landscapes, connectivity between relatively natural areas increases the ability of these natural areas to provide habitat for native flora and fauna. The retention and or restoration of linkages within an urbanised area is an important consideration in the conservation of biodiversity.

The areas of native vegetation associated with the riparian corridor within the subject site are currently acting as a wildlife corridor in an east-west direction. This corridor is considered to provide linkages for some fauna groups, specifically those highly mobile and disturbance tolerant species, which may utilise the vegetation as a stepping stone between other habitats.

Proposed development within the study area which retains the riparian corridor vegetation would be unlikely to reduce the ability of the subject site to function as a biodiversity linkage.

9.1.3 Ecological constraints

Vegetation condition and recovery potential values have been used to rank the study area in terms of high, moderate and low ecological constraint (**Table 3**). Future development within the subject site should seek to avoid or minimise impacts to areas of high and moderate ecological constraint. Areas of low ecological constraint have the least biodiversity value.

Areas of 'high' ecological constraint are comprised of the riparian corridors along the southern boundary of the site, APZ areas which extend from the riparian corridor, the endangered population of *Pomaderris prunifolia* outside the western boundary of the site, and the large *Eucalyptus pilularis* in the northern portion of the site. Areas of 'moderate' ecological constraint are the areas of native forest (Coastal Enriched Sandstone Moist Forest) within the southern portion of the site that are not located within the riparian corridor. The remaining vegetated areas consist of planted and exotic species and are considered 'low' constraints to future development. The results of the constraints assessment are displayed in **Figure 6**.

The areas mapped as 'moderate' and 'low' constraints are considered preferable locations for the development envelope. ELA recommends avoiding areas mapped as 'high' constraint.

Table 3: Classification of ecological constraint

Ecological constraint	Vegetation patches within the study area	Constraint components
High	Coastal Enriched Sandstone Moist Forest	Known habitat for threatened flora species Large *Eucalyptus pilularis* 10m riparian corridor 11m Asset Protection Zone
Moderate	Coastal Enriched Sandstone Moist Forest	Native vegetation community Vegetation with limited / broken connectivity No known habitat for threatened flora species Potential foraging habitat for threatened fauna species
Low	Planted and exotics	Panted and exotic vegetation Cleared land

Figure 6: Constraints assessment

10 Assessment of proposed land uses

The subject site is proposed for rezoning for residential purposes. The land usage is anticipated to change from its current use as a small industrial precinct to a more suitable residential land use. The site is surrounded by residential development. Residential development of the subject site would be in keeping with the character of the area. An indicative layout plan is provided in **Figure 7**. However, the planning proposal is still examining layout options, ranging from using multistorey towers only, to a development more similar to the single house allotments surrounding the subject site.

Figure 7: Indicative layout plan

11 Recommendations

The following recommendations are provided to guide the rezoning and future development of the land to assist in maintaining the biodiversity and riparian integrity of the study area.

11.1 Vegetation communities, flora and fauna

The majority of the vegetated areas of the site consist of planted and exotic species and are of low constraint. No threatened vegetation communities are located within the site.

Individuals of the endangered population *Pomaderris prunifolia* were recorded within the study area, just outside the subject site. It is recommended that this location is taken into account for future planning and development as it may be potentially affected from future clearing.

A large *Eucalyptus pilularis* is considered to be of value due to its age and size. It is recommended that this is retained throughout future development.

No threatened fauna species were recorded during the survey. The following species are considered to potentially utilise the study area for foraging purposes and could potentially be affected from future clearing:

- Grey-headed Flying-fox (*Pteropus poliocephalus*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*).

Assessment of potential impacts to the potentially affected species from future clearing of habitat within the study area would require AoS under the EP&A Act for TSC listed species, and assessment against SIC for MNES under the EPBC Act. This would be undertaken at the development stage.

11.2 Riparian

While the proposed rezoning does not represent a controlled activity within the meaning of the WM Act, any subsequent works within waterfront land will require a Controlled Activity approval from DPI. Under the DPI Water guidelines for riparian corridors, a 1st order stream requires a 10 m riparian corridor width, measured form the top of bank.

11.3 Bushfire

Bushfire hazard has been assessed across the subject study area and found to be acceptable based on the ability to provide compliant APZ within the subject site. On the basis of this assessment, indicative asset protection zone requirements have been mapped across the study area. The APZ extends outward from the riparian corridor for 11 m, which is to be accounted for in future development planning.

A number of strategies have been provided in the form of planning controls such that the risk from bushfire can be minimised and future rezoning or development approval processes can be streamlined. Further, it has been found that development of the anticipated land uses within the subject study area, from a bushfire planning perspective, are considered suitable.

A number of strategies have been provided in this report to mitigate bushfire risk including:

- ensuring adequate setback from bushfire prone vegetation (APZs)

- integrating non-combustible infrastructure within APZs such as roads, easements and parking areas. An emphasis is placed on APZs within perimeter roads and front yard setbacks
- ensuring adequate access and egress from the study area through a well-designed road system
- considering the adequacy of water supply and the delivery of other services (gas and electricity)
- providing temporary APZs during any staged development
- providing for effective and ongoing management of APZs
- considering construction standards (AS3959) implications for future developments depending on development type.

The rezoning has been prepared based on the advice and constraints contained within this report. As the planning proposal relates to the future uses of the study area, it is considered appropriate that more detailed assessment and consideration of the relevant bushfire protection strategies is undertaken at the development application stage. This further assessment should include a more comprehensive review of the development layout, road network and subsequent planning controls, to ensure they are well designed in terms of bushfire protection outcomes.

11.3.1 Statement of capability

This bushfire assessment demonstrates that the subject land is capable of accommodating future development and associated land use with the appropriate bushfire protection measures and bushfire planning requirements prescribed by s.117 (2) Direction 4.4 – '*Planning for Bush Fire Protection*' and PBP.

If you have any questions or concerns in respect to this Bushfire Protection Assessment within this report, please contact Danielle Meggos on (02) 8539 8605.

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Appendix A Likelihood of occurrence

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
ECOLOGICAL COMMUNITIES						
Blue Gum High Forest of the Sydney Basin Bioregion		CE	CE	The Blue Gum High Forest ecological community listed under the EPBC Act is limited to the Ku-ring-gai, Hornsby and Baulkham Hills local government areas. Occurs mainly in areas with deep clay soil derived from shale, generally at altitudes greater than 100 m above sea level, and that have an annual rainfall of more than 1050 mm. Also known to occur in isolated valleys on soils associated with localised volcanic intrusions.	Unlikely	No
Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion		V	E	Occurs within the local government areas of Bankstown, Blacktown, Campbelltown, Hawkesbury, Liverpool and Penrith. Mainly found in the Castlereagh area of the Cumberland Plain, with small patches occurring at Kemps Creek and Longneck Lagoon; also present around Holsworthy. Occurs almost exclusively on soils derived from Tertiary alluvium, or on sites located on adjoining shale or Holocene alluvium. Often adjacent to and on slightly higher ground than Castlereagh Ironbark Forest or Shale Gravel Transition Forest in the Sydney Basin Bioregion.	No	No
Coastal Upland Swamp in the Sydney Basin Bioregion		E	E	Endemic to NSW and confined to the Sydney Basin Bioregion. It occurs in the eastern Sydney Basin from the Somersby district in the north (Somersby-Hornsby plateaux) to the Robertson district in the south (n the Woronora plateau). Occur primarily on impermeable sandstone plateaux with shallow groundwater aquifers in the headwaters and impeded drainage lines of streams, and on sandstone benches with abundant seepage moisture. Generally associated with acidic soils."	Potential	No
Cooks River/Castlereagh		E	CE	Occurs in western Sydney, with the most extensive stands occurring in the Castlereagh and Holsworthy areas. Smaller remnants occur in	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
Ironbark Forest in the Sydney Basin Bioregion				the Kemps Creek area and in the eastern section of the Cumberland Plain. Mainly occurs on clay soils derived from the deposits of ancient river systems (alluvium), or on shale soils of the Wianamatta Shales.		
Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest		CE	CE	Endemic to the shale hills and plains of the Sydney Basin Bioregion in NSW, occurring primarily in, but not limited to, the Cumberland Sub-region.Flat to undulating or hilly terrain, at elevations up to approximately 350 metres above sea level. Predominantly associated with clay soils, that are derived from Wianamatta Shale geology. Minor occurrences may be present on other soil groups, notably Holocene Alluvium and soils derived from the Mittagong Formation.	Potential	No
Shale/Sandstone Transition Forest		E	CE	Occurs at the edges of the Cumberland Plain in western Sydney, most now occurs in the Hawkesbury, Baulkham Hills, Liverpool, Parramatta, Penrith, Campbelltown and Wollondilly local government areas.	Potenial	No
Subtropical and Temperate Coastal Saltmarsh			V	Within a relatively narrow margin of the Australian coastline, within the subtropical and temperate climatic zones south of the South-east Queensland IBRA bioregion.	No	No
Turpentine-Ironbark Forest in the Sydney Basin Bioregion		E	CE	Cumberland Lowlands, with remnants also occurring to the west on shale-capped ridges in the Blue Mountains.	Unlikely	No
Western Sydney Dry Rainforest		E	CE	Cumberland Plain Sub-region of the Sydney Basin Bioregion. It generally occurs in rugged terrain and other patches may occur on	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
and Moist Woodland on Shale				undulating terrain, with dry rainforest patches typically occupying steep lower slopes and gullies, and moist woodland patches typically occupying upper sections of the slope Occurs almost exclusively on clay soils derived from Wiannamatta Group shales.		
FAUNA						
Anthochaera phrygia	Regent Honeyeater	E4A	CE	Inland slopes of south-east Australia, and less frequently in coastal areas. In NSW, most records are from the North-West Plains, North-West and South-West Slopes, Northern Tablelands, Central Tablelands and Southern Tablelands regions; also recorded in the Central Coast and Hunter Valley regions. Eucalypt woodland and open forest, wooded farmland and urban areas with mature eucalypts, and riparian forests of Casuarina cunninghamiana (River Oak).	No	No
Apus pacificus	Fork-tailed Swift		C,J,K, Mar	Recorded in all regions of NSW. Riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and inland and coastal sand-dunes.	No	No
Ardea alba	Great Egret		C, J, Mar	Widespread, occurring across all states/territories. Also a vagrant on Lord Howe and Norfolk Island. Swamps and marshes, grasslands, margins of rivers and lakes, salt pans, estuarine mudflats and other wetland habitats.	No	No
Ardea ibis	Cattle Egret		C,J, Mar	Widespread and common across NSW. Grasslands, wooded lands and terrestrial wetlands.	No	No
Arenaria interpres	Ruddy Turnstone		C,J,K	Summer migrant to most coastal regions, with occasional records inland, including in NSW. Tidal reefs and pools; pebbly, shelly and sandy shores; mudflats; inland shallow waters; sewage ponds, saltfields; ploughed ground.	No	No

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Botaurus poiciloptilus	Australasian Bittern	E1	E	Found over most of NSW except for the far north-west. Permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. (bullrushes) and Eleocharis spp. (spikerushes).	No	No
Calidris acuminata	Sharp-tailed Sandpiper		C,J,K	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. Shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	No	No
Calidris canutus	Red Knot		E, C,J,K	Summer migrant to Australia. In NSW, widespread in suitable habitat along the coast. Occasionally recorded inland in all regions. Intertidal mudflats, sandflats sheltered sandy beaches, estuaries, bays, inlets, lagoons, harbours, sandy ocean beaches, rock platforms, coral reefs, terrestrial saline wetlands near the coast, sewage ponds and saltworks. Rarely inland lakes or swamps.	No	No
Calidris ferruginea	Curlew Sandpiper	E1	CE, C,J,K	Occurs along the entire coast of NSW, and sometimes in freshwater wetlands in the Murray-Darling Basin. Littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	No	No
Calidris melanotos	Pectoral Sandpiper		J,K	Summer migrant to Australia. Widespread but scattered in NSW. East of the Great Divide, recorded from Casino and Ballina, south to Ulladulla. West of the Great Divide, widespread in the Riverina and Lower Western regions. Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No	No

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Calidris ruficollis	Red-necked Stint		C,J,K	Summer migrant to Australia, widespread coastal and inland NSW. Tidal mudflats, saltmarshes, sandy and shelly beaches, saline and freshwater wetlands, saltfields, sewage ponds.	No	No
Calidris tenuirostris	Great Knot	V	CE, C,J,K	In NSW, recorded at scattered sites along the coast down to about Narooma. It has also been observed inland at Tullakool, Armidale, Gilgandra and Griffith. Intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons.	No	No
Callocephalon fimbriatum	Gang-gang Cockatoo	V		In NSW, distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. Isolated records known from as far north as Coffs Harbour and as far west as Mudgee. Tall mountain forests and woodlands in summer; in winter, may occur at lower altitudes in open eucalypt forests and woodlands, and urban areas.	Potential	No
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		In NSW, widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. Open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur.	No	No
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Recorded from Rockhampton in Qld south to Ulladulla in NSW. Largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. Wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	No	No
Circus assimilis	Spotted Harrier	V		Found throughout the Australian mainland, except in densely forested or wooded habitats, and rarely in Tasmania. Grassy open	No	No

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				woodland, inland riparian woodland, grassland, shrub steppe, agricultural land and edges of inland wetlands.		
Dasyornis brachypterus	Eastern Bristlebird	E1	E	There are three main populations: Northern - southern Qld/northern NSW, Central - Barren Ground NR, Budderoo NR, Woronora Plateau, Jervis Bay NP, Booderee NP and Beecroft Peninsula and Southern - Nadgee NR and Croajingalong NP in the vicinity of the NSW/Victorian border. Central and southern populations inhabit heath and open woodland with a heathy understorey. In northern NSW, habitat comprises open forest with dense tussocky grass understorey.	No	No
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Qld. Rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline.	No	No
Epthianura albifrons	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	E2		Two isolated sub-populations known from the Sydney Metropolitan Catchment Management Authority area; one at Newington Nature Reserve on the Parramatta River and one at Towra Point Nature Reserve in Botany Bay. Saltmarsh of Newington Nature Reserve and in grassland on the northern bank of the Parramatta River. Saltmarsh and on the sandy shoreline of a small island of Towra Point Nature Reserve.	No	No
Epthianura albifrons	White-fronted Chat	V		Occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Saltmarsh vegetation, open grasslands and sometimes low shrubs bordering wetland areas.	No	No
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		South-east coast and ranges of Australia, from southern Qld to Victoria and Tasmania. In NSW, records extend to the western	No	No

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				slopes of the Great Dividing Range. Tall (greater than 20m) moist habitats.		
Gallinago hardwickii	Latham's Snipe		C,J,R, Mar	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually freshwater swamps, flooded grasslands or heathlands.	No	No
Glossopsitta pusilla	Little Lorikeet	V		In NSW, found from the coast westward as far as Dubbo and Albury. Dry, open eucalypt forests and woodlands, including remnant woodland patches and roadside vegetation.	Potential	No
Grantiella picta	Painted Honeyeater	V	V	Widely distributed in NSW, predominantly on the inland side of the Great Dividing Range but avoiding arid areas. Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	No	No
Haliaeetus leucogaster	White-bellied Sea-Eagle		C	Distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. Freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	No	No
Heleioporus australiacus	Giant Burrowing Frog	V	V	South eastern NSW and Victoria, in two distinct populations: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	No	No
Hieraaetus morphnoides	Little Eagle	V		Throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. Open	Potential	No

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				eucalypt forest, woodland or open woodland, including sheoak or Acacia woodlands and riparian woodlands of interior NSW.		
Hirundapus caudacutus	White-throated Needletail		C,J,K	All coastal regions of NSW, inland to the western slopes and inland plains of the Great Divide. Occur most often over open forest and rainforest, as well as heathland, and remnant vegetation in farmland.	No	No
Hoplocephalus bungaroides	Broad-headed Snake	E1	V	Largely confined to Triassic and Permian sandstones within the coast and ranges in an area within approximately 250 km of Sydney. Dry and wet sclerophyll forests, riverine forests, coastal heath swamps, rocky outcrops, heaths, grassy woodlands.	No	No
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	E1	E	Found in south-eastern NSW, east of the Great Dividing Range south from the Hawkesbury River. Heath or open forest with a heathy understorey on sandy or friable soils.	No	No
Lathamus discolor	Swift Parrot	E1	CE	Migrates from Tasmania to mainland in Autumn-Winter. In NSW, the species mostly occurs on the coast and south west slopes. Box-ironbark forests and woodlands.	Unlikely	No
Limosa lapponica	Bar-tailed Godwit		V, C,J,K	Summer migrant to Australia. Widespread along the coast of NSW, including the offshore islands. Also numerous scattered inland records. Intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, bays, seagrass beds, saltmarsh, sewage farms and saltworks, saltlakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. Rarely inland wetlands, paddocks and airstrips.	No	No
Limosa limosa	Black-tailed Godwit	V	C,J,K	Arrives in August and leaves in March. In NSW, most frequently recorded at Kooragang Island, with occasional records elsewhere along the coast, and inland in the Murray-Darling Basin, on the	No	No

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				western slopes of the Northern Tablelands and in the far north-western corner of the state. Usually sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Further inland, it can also be found around muddy lakes and swamps.		
Litoria aurea	Green and Golden Bell Frog	E1	V	Since 1990, recorded from ~50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region. Marshes, dams and stream-sides, particularly those containing Typha spp. (bullrushes) or Eleocharis spp. (spikerushes). Some populations occur in highly disturbed areas.	Potential	No
Litoria littlejohni	Littlejohn's Tree Frog	V	V	Plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria. The species has not been recorded in southern NSW within the last decade. Breeding habitat is the upper reaches of permanent streams and perched swamps. Non-breeding habitat is heath-based forests and woodlands	No	No
Litoria raniformis	Southern Bell Frog	E1	V	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. Permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. Also found in irrigated rice crops.	No	No
Merops ornatus	Rainbow Bee-eater		J	Distributed across much of mainland Australia, including NSW. Open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	Potential	No

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Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. Rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland.	No	No
Mixophyes balbus	Stuttering Frog	E1	V	Along the east coast of Australia from southern Qld to north-eastern Victoria. Rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	No	No
Monarcha melanopsis	Black-faced Monarch		Bonn, Mar	In NSW, occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park and Wombeyan Caves. It is rarely recorded farther inland. Rainforest, open eucalypt forests, dry sclerophyll forests and woodlands, gullies in mountain areas or coastal foothills, Brigalow scrub, coastal scrub, mangroves, parks and gardens.	No	No
Monarcha trivirgatus	Spectacled Monarch		Bonn, Mar	Coastal eastern Australia south to Port Stephens in NSW. Mountain/lowland rainforest, wooded gullies, riparian vegetation including mangroves.	No	No
Mormopterus norfolkensis	Eastern Freetail-bat	V		Found along the east coast from south Qld to southern NSW. Dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range.	Unlikely	No
Motacilla flava	Yellow Wagtail		C,J,K	Regular summer migrant to mostly coastal Australia. In NSW recorded Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. Swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land, lawns.	No	No
Myiagra cyanoleuca	Satin Flycatcher		Bonn, Mar	In NSW, widespread on and east of the Great Divide and sparsely scattered on the western slopes, with very occasional records on	Potential	No

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				the western plains. Eucalypt-dominated forests, especially near wetlands, watercourses, and heavily-vegetated gullies.		
Myotis macropus	Southern Myotis	V		In NSW, found in the coastal band. It is rarely found more than 100 km inland, except along major rivers. Foraging habitat is waterbodies (including streams, or lakes or reservoirs) and fringing areas of vegetation up to 20m.	Potential	No
Ninox connivens	Barking Owl	V		Wide but sparse distribution in NSW, avoiding the most central arid regions. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests. Woodland and open forest, including fragmented remnants and partly cleared farmland, wetland and riverine forest.	Potential	No
Ninox strenua	Powerful Owl	V		In NSW, it is widely distributed throughout the eastern forests from the coast inland to tablelands, with scattered records on the western slopes and plains. Woodland, open sclerophyll forest, tall open wet forest and rainforest.	Potential	No
Numenius madagascariensis	Eastern Curlew		CE, C,J,K	Summer migrant to Australia. Primarily coastal distribution in NSW, with some scattered inland records. Estuaries, bays, harbours, inlets and coastal lagoons, intertidal mudflats or sandflats, ocean beaches, coral reefs, rock platforms, saltmarsh, mangroves, freshwater/brackish lakes, saltworks and sewage farms.	No	No
Numenius minutus	Little Curlew		C,J,K	Summer migrant to Australia. In NSW, most records scattered east of the Great Dividing Range, from Casino, south to Greenwell Point with a few scattered records west of the Great Dividing Range. Dry grasslands, open woodlands, floodplains, margins of drying swamps, tidal mudflats, airfields, playing fields, crops, saltfields, sewage ponds.	No	No

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Petrogale penicillata	Brush-tailed Rock-wallaby	E1	V	In NSW they occur from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. Rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges.	No	No
Petroica boodang	Scarlet Robin	V		In NSW, it occurs from the coast to the inland slopes. Dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	Potential	No
Philomachus pugnax	Ruff		C,J,K	Regular but rare summer migrant to Australia. In NSW, recorded at Kurnell, Tomki, Casino, Ballina, Kooragang Island, Broadwater Lagoon and Little Cattai Creek. Also found around the Riverina, including Windouran Swamp, Wanganella, Fivebough Swamo and the Tullakool Saltworks. Terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands. Occasionally harbours, estuaries, seashores, sewage farms and saltworks.	No	No
Pluvialis fulva	Pacific Golden Plover		C,J,K	Regular widespread summer migrant to Australia, including coastal NSW, Lord Howe and Norfolk Island. Estuaries, mudflats, saltmarshes, mangroves, rocky reefs, inland swamps, ocean shores, paddocks, sewage ponds, ploughed land, airfields, playing fields.	No	No
Pseudomys novaehollandiae	New Holland Mouse		V	Fragmented distribution across eastern NSW. Open heathlands, woodlands and forests with a heathland understorey, vegetated sand dunes.	No	No
Pseudophryne australis	Red-crowned Toadlet	V		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.	Potential	No

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				Open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or cappings.		
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Along the eastern coast of Australia, from Bundaberg in Qld to Melbourne in Victoria. Subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops.	Potential	Yes
Rhipidura rufifrons	Rufous Fantail		Bonn, Mar	Coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. Wet sclerophyll forests, subtropical and temperate rainforests. Sometimes drier sclerophyll forests and woodlands.	No	No
Rostratula australis	Australian Painted Snipe	E1	E, Mar	In NSW most records are from the Murray-Darling Basin. Other recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Swamps, dams and nearby marshy areas.	No	No
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		There are scattered records of this species across the New England Tablelands and North West Slopes. Rare visitor in late summer and autumn to south-western NSW. Almost all habitats, including wet and dry sclerophyll forest, open woodland, open country, mallee, rainforests, heathland and waterbodies.	Potential	Yes
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Both sides of the great divide, from the Atherton Tableland in Qld to north-eastern Victoria, mainly along river systems and gullies. In NSW it is widespread on the New England Tablelands. Woodland, moist and dry eucalypt forest and rainforest.	Unlikely	No

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Sternula albifrons	Little Tern	E1	C,J,K	In NSW, it arrives from September to November, occurring mainly north of Sydney, with smaller numbers found south to Victoria. Sheltered coastal environments, harbours, inlets and rivers.	No	No
Tringa nebularia	Common Greenshank		C,J,K	Summer migrant to Australia. Recorded in most coastal regions of NSW; also widespread west of the Great Dividing Range, especially between the Lachlan and Murray Rivers and the Darling River drainage basin, including the Macquarie Marshes, and north-west regions. Terrestrial wetlands (swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans, saltflats, sewage farms and saltworks dams, inundated rice crops and bores) and sheltered coastal habitats (mudflats, saltmarsh, mangroves, embayments, harbours, river estuaries, deltas, lagoons, tidal pools, rock-flats and rock platforms).	No	No
Tringa stagnatilis	Marsh Sandpiper		C,J,K	Summer migrant to Australia. Recorded in all regions of NSW but especially the central and south coasts and (inland) on the western slopes of Great Divide and western plains. Swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, pools on inundated floodplains, intertidal mudflats, sewage farms and saltworks, reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes.	No	No
Xenus cinereus	Terek Sandpiper	V	C,J,K	A rare migrant to the eastern and southern Australian coasts. The two main sites in NSW are the Richmond River estuary and the Hunter River estuary. Mudbanks and sandbanks near mangroves, rocky pools and reefs, and occasionally up to 10 km inland around brackish pools.	No	No
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Acacia bynoeana	Bynoe's Wattle	E1	V	Found in central eastern NSW, from the Hunter District (Morisset) south to the Southern Highlands and west to the Blue Mountains. Heath or dry sclerophyll forest on sandy soils.	Unlikley	No
Acacia clunies-rossiae	Kanangra Wattle	V		In NSW, occurs in Kowmung and Coxs River areas entirely within Kanangra-Boyd and Blue Mountains National Parks.	No	No
Acacia pubescens	Downy Wattle	V	V	Restricted to the Sydney region around the Bankstown-Fairfield-Rookwood and Pitt Town area, with outliers occurring at Barden Ridge, Oakdale and Mountain Lagoon. Open woodland and forest, including Cooks River/Castlereagh Ironbark Forest, Shale/Gravel Transition Forest and Cumberland Plain Woodland. Occurs on alluviums, shales and at the intergrade between shales and sandstones.	No	No
Allocasuarina glareicola		E1	E	Primarily restricted to the Richmond (NW Cumberland Plain) district, but with an outlier population found at Voyager Point, Liverpool. Castlereagh woodland on lateritic soil. Found in open woodland with Eucalyptus parramattensis, Eucalyptus fibrosa, Angophora bakeri, Eucalyptus sclerophylla and Melaleuca decora.	No	No
Asterolasia elegans		E1	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby local government areas. Also likely to occur in the western part of Gosford local government area. Hawkesbury sandstone. Found in sheltered forests on mid- to lower slopes and valleys.	No	No
Caladenia tessellata	Thick Lip Spider Orchid	E1	V	Currently known from two disjunct areas; one population near Braidwood on the Southern Tablelands and three populations in the Wyong area on the Central Coast. Grassy sclerophyll woodland on clay loam or sandy soils, or low woodland with stony soil.	No	No

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Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	In NSW, recorded mainly on coastal and near coastal ranges north from Victoria to near Forster, with two isolated occurrences inland north-west of Grafton. Coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest.	Unlikely	No
Darwinia biflora		V	V	Recorded in Ku-ring-gai, Hornsby, Baulkham Hills and Ryde local government areas, in an area bounded by Maroota, North Ryde, Cowan and Kellyville. Woodland, open forest or scrub-heath on the edges of weathered shale-capped ridges, where these intergrade with Hawkesbury Sandstone.	Potential	No
Deyeuxia appressa		E1	E	NSW endemic known only from two pre-1942 records in the Sydney area: Herne Bay south of Bankstown and Killara, near Hornsby. Moist conditions.	Unlikely	No
Dillwynia tenuifolia		V		Mainly on the Cumberland Plain, but also Bulga Mountains at Yengo in the north, and Kurrajong Heights and Woodford in the Lower Blue Mountains. Scrubby/dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest, transitional areas where these communities adjoin Castlereagh Scribbly Gum Woodland, and disturbed escarpment woodland on Narrabeen sandstone.	No	No
Epacris purpurascens var. purpurascens		V		Recorded from Gosford in the north, to Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Sclerophyll forest, scrubs and swamps. Most habitats have a strong shale soil influence.	Unlikely	No
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Narrow band from the Raymond Terrace area south to Waterfall. Coastal heath on shallow sandy soils overlying Hawkesbury sandstone, mostly on exposed sandy ridges.	No	No

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Genoplesium baueri	Bauer's Midge Orchid	E1	E	Has been recorded from locations between Nowra and Pittwater and may occur as far north as Port Stephens. Dry sclerophyll forest and moss gardens over sandstone.	No	No
Hibbertia superans		E1		From Baulkham Hills to South Maroota in the northern outskirts of Sydney, and at one locality at Mount Boss, inland from Kempsey. Open woodland and heathland, and appears to prefer open disturbed areas.	No	No
Leptospermum deanei		V	V	Hornsby, Warringah, Ku-ring-gai and Ryde LGAs in the Sydney region. Woodland, riparian scrub and open forest on lower hill slopes or near creeks, on sand or sandy alluvial soil.	No	No
Melaleuca biconvexa	Biconvex Paperbark	V	V	Only found in NSW, populations found in the Jervis Bay area in the south and the Gosford-Wyong area in the north. Damp places, often near streams or low-lying areas on alluvial soils.	No	No
Melaleuca deanei	Deane's Paperbark	V	V	Ku-ring-gai/Berowra area, Holsworthy/Wedderburn area, Springwood (in the Blue Mountains), Wollemi National Park, Yalwal (west of Nowra) and Central Coast (Hawkesbury River) areas. Heath on sandstone.	Unlikley	No
Persoonia mollis subsp. maxima		E1	E	Restricted to the Hornsby Heights-Mt Colah area north of Sydney. Dry to wet sclerophyll forest, in deep sheltered gullies or steep upper hillsides on Hawkesbury Sandstone.	No	No
Persoonia nutans	Nodding Geebung	E1	E	Restricted to the Cumberland Plain in western Sydney, between Richmond in the north and Macquarie Fields in the south. Northern populations: sclerophyll forest and woodland (Agnes Banks Woodland, Castlereagh Scribbly Gum Woodland and Cooks River / Castlereagh Ironbark Forest) on aeolian and alluvial sediments.	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
				Southern populations: tertiary alluvium, shale sandstone transition communities and Cooks River / Castlereagh Ironbark Forest.		
Pimelea curviflora var. curviflora		V	V	Confined to the coastal area of the Sydney and Illawarra regions between northern Sydney and Maroota in the north-west and Croom Reserve near Albion Park in the south. Woodland, mostly on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes.	No	No
Pimelea spicata	Spiked Rice-flower	E1	E	Two disjunct areas; the Cumberland Plain (Marayong and Prospect Reservoir south to Narellan and Douglas Park) and the Illawarra (Landsdowne to Shellharbour to northern Kiama). Well-structured clay soils. Eucalyptus moluccana (Grey Box) communities and in areas of ironbark on the Cumberland Plain. Coast Banksia open woodland or coastal grassland in the Illawarra.	No	No
Pomaderris prunifolia	Parramatta, Auburn, Strathfield and Bankstown LGA's	E2		Population is known from only three sites: at Rydalmere, within Rookwood Cemetery and at The Crest of Bankstown. At Rydalmere it occurs among grass species on sandstone near a creek. At Rookwood Cemetery it occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils.	Known	Yes
Pterostylis saxicola	Sydney Plains Greenhood	E1	E	Restricted to western Sydney between Freemans Reach in the north and Picton in the south. Small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines, adjacent to sclerophyll forest or woodland on shale/sandstone transition soils or shale soils.	No	No
Syzygium paniculatum	Magenta Lilly Pilly	E1	V	Only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest.	No	No

Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Distribution and Habitat	Likelihood of Occurrence	Impact Assessment Required
Tetratheca glandulosa		V		Found from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Pittwater LGA) and the western limit is at East Kurrajong (Wollemi NP). Heath, scrub, woodlands and open forest on upper-slopes and mid-slope sandstone benches. Soils generally shallow, consisting of a yellow, clayey/sandy loam.	No	No
Thesium australe	Austral Toadflax	V	V	In eastern NSW it is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. Grassland on coastal headlands or grassland and grassy woodland away from the coast.	No	No
Wilsonia backhousei	Narrow-leafed Wilsonia	V		In NSW, found on the coast between Mimosa Rocks National Park and Wamberal north of Sydney (Nelson's Lake, Potato Point, Sussex Inlet, Wowly Gully, Parramatta River at Ermington, Clovelly, Voyager Point, Wollongong and Royal National Park). Margins of salt marshes and lakes.	No	No
Zannichellia palustris		E1		In NSW, known from the lower Hunter and in Sydney Olympic Park. Fresh or slightly saline stationary or slowly flowing water.	Unlikely	No

Key:

EPBC Act: E = Endangered, V = Vulnerable, CE = Critically Endangered, C, J, K = CAMBA, JAMBA RoKAMBA, Bonn Mar = Bonn Convention

TSC Act: E1 = Endangered, E2 = Endangered Population, V = Vulnerable, E4A = Critically Endangered.

Appendix B Species list

Scientific Name	Common Name	Native / Exotic	Location (59 Kirby St, 55 Kirby St)
Acacia linifolia	White Wattle	N	59
Acacia longissima	Long-leaf Wattle	N	55
Acacia sp.		N	55
Acmena smithii	Lilly Pilly	N	55
Ageratina adenophora	Crofton Weed	E	55
Allocasuarina littoralis	Black She-oak	M	55*
Angophora bakeri	Narrow-leaved Apple	N	55*
Angophora costata	Smooth-barked Apple	N	55
Araujia sericifera	Moth Vine	E	55
Asparagus aethiopicus	Asparagus fern	E	55, 59
Asparagus plumosus	Climbing Asparagus Fern	E	55
Azalea sp.			59
Blechnum sp.			55
Cardiospermum grandiflorum	Balloon Vine	E	55
Casuarina cunninghamiana	River Oak	N	55
Cinnamomum camphora	Camphor Laurel	E	59
Corymbia citriodora	Lemon-scented Gum	N	59
Corymbia maculata	Spotted Gum	N	55*
Dianella longifolia	Blueberry Lily	N	55, 59
Dichondra repens	Kidney Weed	N	55, 59
Ehrharta erecta	Panic Veldt Grass	E	55, 59
Eucalyptus eugenioides	Thin-leaved Stringybark	N	55*
Eucalyptus microcorys	Tallowwood	N	55, 59
Eucalyptus pilularis	Blackbutt	N	55, 59
Eucalyptus punctata	Grey Gum	N	55
Eucalyptus resinifera	Red Mahogany	N	55
Eucalyptus saligna	Sydney Blue Gum	N	55*
Eustrephus latifolius	Wombat Berry	N	55
Glycine tabacina		N	55

Scientific Name	Common Name	Native / Exotic	Location (59 Kirby St, 55 Kirby St)
Grevillea robusta	Silky Oak	N	59
Hedera helix	English Ivy	E	55
Jacaranda mimosifolia	Jacaranda	E	55*
Lantana camara	Lantana	E	55
Ligustrum lucidum	Large-leaved Privet	E	55, 59
Ligustrum sinense	Small-leaved Privet	E	55
Lomandra filiformis	Wattle Mat-rush	N	55
Lomandra longifolia	Spiny-headed Mat-rush	N	55, 59
Macadamia integrifolia	Queensland Nut	N	55*
Melaleuca armillaris	Bracelet Honey-myrtle	N	59
Monstera deliciosa+	Fruit Salad Plant	E	55*
Nephrolepis cordifolia	Fishbone Fern	N	55
Ochna serrulata	Mickey Mouse Plant	N	55, 59
Olea europaea subsp. *cuspidata*	African Olive	E	55, 59
Oplismenus imbecillis	Creeping Beard Grass	N	55
Pandorea pandorana	Wonga Wonga Vine	N	55
Passiflora sp.			55
Pittosporum revolutum	Wild Yellow Jasmine	N	55
Pittosporum undulatum	Native Daphne	N	55, 59
Psoralea pinnata	African Scurf-pea	E	55
Robinia sp.			59
Senna pendula		E	55
Syagrus romanzoffiana	Cocos Palm	E	55
Syncarpia glomulifera	Turpentine	N	55, 59
Tradescantia fluminensis	Wandering Jew	E	55
Trisetum flavescens	Golden Oat Grass	E	55

*Key: * = Planted, + = Endangered species*

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