Transport for NSW

Heathcote Station Easy Access Upgrade

Flora and Fauna Impact Assessment

December 2014

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Appendices

1. Introduction

1.1 Background

GHD has been engaged by Transport for New South Wales (TfNSW) to prepare a Flora and Fauna Impact Assessment for the proposed easy access upgrade for the Heathcote Station precinct (hereafter referred to as the proposal). This report has been prepared to accompany the Review of Environmental Factors (REF) for the proposal.

This Flora and Fauna Impact Assessment assesses the potential for impacts on ecological values at the site, with particular emphasis on threatened ecological communities, populations and species listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and *Matters of National Environmental Significance* (MNES) listed under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). Recommended mitigation measures to ameliorate potential impacts of the proposal are included in Section 6 of this report.

1.2 The proposal

The proposal would include:

- installation of a new pedestrian footbridge and railway overpass, installation of a new lift and stairs, and creation of a new forecourt area and entry to the eastern side of the station
- commuter car parking improvements including new access to eastern car park from Wilson Parade and provision for accessible parking spaces in both eastern and western car parks
- provision of improved pedestrian access to the station including new footpaths, pedestrian crossings and links to the pedestrian footbridge over the Princes Highway (due for completion by the Roads and Maritime Services (RMS) at the end of 2014)
- upgrade of the existing station building with provision for a family accessible toilet
- provision of improved interchange facilities including:
  - additional facilities such as undercover bicycle racks, relocation of existing bicycle lockers and installation of new wayfinding signage
  - kiss ‘n’ ride areas within both the eastern and western car parks and on the northbound lane of the Princes Highway
  - improvement of existing bus stop along Dillwynnia Grove with provision for upgraded shelter and seating facilities
- demolition of the existing footbridge and ramps currently providing access between Platform 1 (western platform) and Platform 2 (eastern platform).

The location of the proposal is mapped in Figure 1. The concept design for the proposal (AECOM 2013) is shown on Figure 2.

1.3 Purpose of this report

The aims of this report are to:

- Describe the existing environment of the study area in terms of its ecological values, including type and condition of vegetation communities and habitats
- Identify flora and fauna species and ecological communities within the study area that have the potential to be impacted by the proposal
- Identify trees within the study area and provide an assessment of their condition.
- Identify the presence or likely presence of threatened species, populations and ecological communities and their habitats listed under the TSC Act
- Identify the presence or likelihood of occurrence of Matters of National Environmental Significance (MNES), particularly threatened flora and fauna species and populations, migratory species and Threatened Ecological Communities (TECs) listed under the EPBC Act within the subject site and/or to be impacted by the proposal
- Identify the potential impacts of the proposal, including identification of trees and vegetation to be removed and retained on site.
- Assess the significance of impacts on threatened biota listed under the TSC Act, and to identify the requirement (or otherwise) for a Species Impact Statement (SIS).
- Assess the significance of impacts on MNES and identify whether the proposal is likely to constitute a controlled action under the EPBC Act and the likely requirement (or otherwise) for approval under the EPBC Act.
- Identify measures to minimise and mitigate potential impacts on biodiversity values within the study area.

1.4 Study area location

The study area is centred around Heathcote Station, located in the town of Heathcote in southern Sydney, approximately 36 kilometres south of the Sydney central business district. The suburb of Heathcote is surrounded by extensive tracts of vegetation within Royal National Park and Heathcote National Park. Heathcote is located within the Sutherland Shire Local Government Area (LGA), the Sydney Metro catchment management authority (CMA), and the Sydney Basin Bioregion.

1.5 Definitions

The following terms are used in this report:

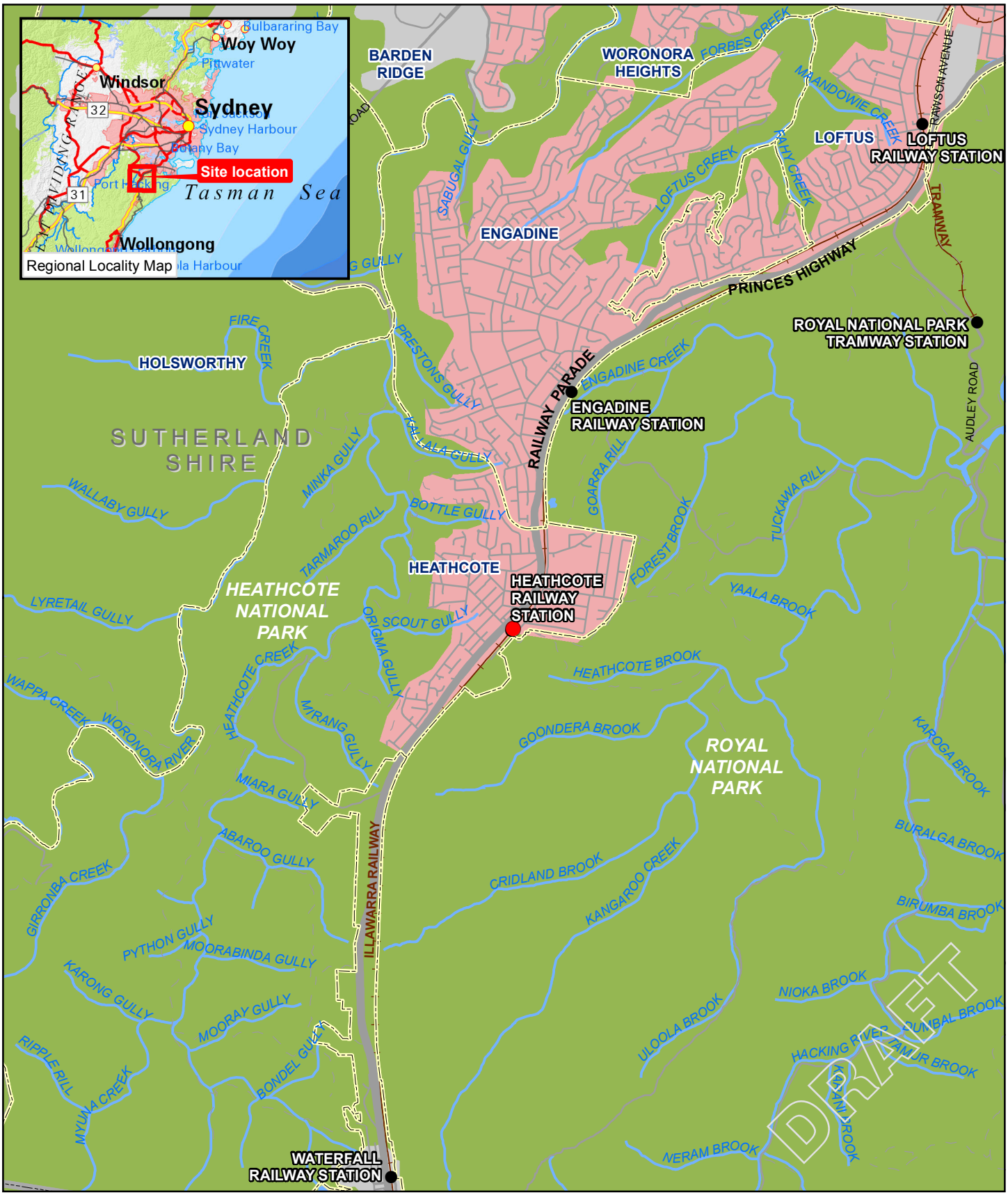
Subject site	the area that would be directly affected by the proposal
Study area	the proposal (see Figure 2) and any additional areas, which are likely to be affected by the proposal, either directly or indirectly (DEC 2004). In this study it includes the subject site and immediately adjacent areas (see Figure 1). Note that it does not include areas that would be upgraded separately by Roads and Maritime Services.
Locality	the area within a 10 kilometre buffer of the Proposal (see Figure 1).

1.6 Scope and limitations

This report: has been prepared by GHD for Transport for NSW and may only be used and relied on by Transport for NSW for the purpose agreed between GHD and the Transport for NSW as set out in section 1.2 of this report. GHD otherwise disclaims responsibility to any person other than Transport for NSW arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared. The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.4 and 3.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Transport for NSW and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.



LEGEND

- Study area
- Local Government Area
- Suburbs
- Highways
- Major Roads
- Secondary Roads
- Other Roads
- Tracks
- Railways
- Waterways
- Vegetation

Paper Size A4

0 250 500 1,000 1,500 2,000

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Transport for NSW
Heathcote Station Easy Access Upgrade

Job Number 21-24099
Revision A
Date 03 Dec 2014

Study area location

Figure 1

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Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia T 61 2 9239 7100 F 61 2 9239 7199 E sydmail@ghd.com W www.ghd.com

Data Source: NSW Department of Lands: Cadastre - Jan 2014; Geoscience Australia: 250k Data - Jan 2014; NSW Department of Primary Industry - Jan 2014; ESRI imagery Jan 2014 Google image Jan 2014. Created by: MWeerakoon

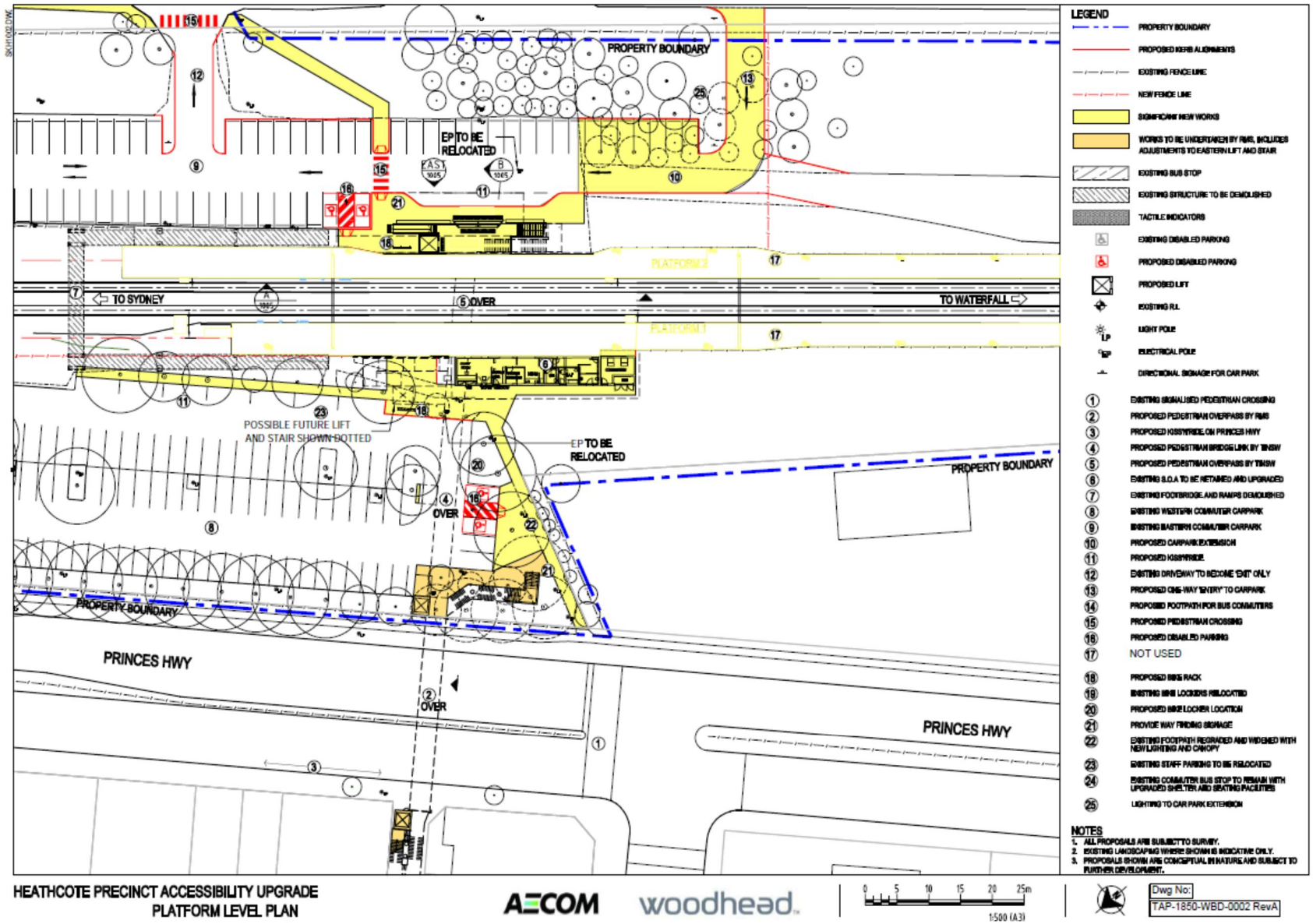

Figure 2 The proposal (concept design; subject to detailed design (AECOM, 2013))

2. Legislative context

2.1 State Legislation

2.1.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the statutory basis for planning and environmental assessment in NSW. The Minister for Planning and Environment, statutory authorities and local councils are responsible for implementing the EP&A Act. The EP&A Act provides the framework for environmental planning and development approvals and includes provisions to ensure that the potential environmental impacts of a development are assessed and considered in the decision making process.

The proposal is to be assessed under Part 5 of the Act and TfNSW is the 'determining authority' for the purposes of the Act. Section 111(4) of the EP&A Act provides that the determining authority (TfNSW) must consider the effect of an activity on critical habitat and threatened biota (listed under the TSC Act) and other protected fauna and flora (listed under the *National Parks and Wildlife Act 1974*).

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of a proposed activity on threatened species, populations or ecological communities (or their habitats) listed under the TSC Act. The '7-part test' is used to assist in the determination of whether a proposal is 'likely' to impose 'a significant effect' on threatened biota and thus whether a species impact statement (SIS) is required. Section 5A of the EP&A Act has been addressed as part of this assessment (Section 5.3).

2.1.2 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides the statutory framework for biota of conservation significance in NSW. The Act aims to, inter alia, 'conserve biological diversity and promote ecologically sustainable development'. It provides for:

- The listing of threatened species, populations and ecological communities, with endangered species, populations and communities listed under Schedule 1, critically endangered species and communities listed under Schedule 1A, vulnerable species and communities listed under Schedule 2.
- The listing of Key Threatening Processes (under Schedule 3).
- Preparation and implementation of Recovery Plans and Threat Abatement Plans.
- Requirements or otherwise for the preparation of Species Impact Statement (SIS).
- Listing of identification of critical habitat for threatened species.

The TSC Act has been addressed in the current assessment through:

- Desktop review to determine the threatened species or ecological communities that have been previously recorded within the locality of the site and hence could occur, subject to the habitats present
- Field surveys to assess the value of habitats for threatened species and ecological communities listed under the Act and to establish likelihood of occurrence within the subject site
- Assessment of the potential for impacts on threatened biota listed under the Act as a result of the proposal.

2.1.3 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides the statutory framework for the legal protection of conservation areas and native animals and plants in NSW. The proposal would not impact on any land managed under the NPW Act.

2.1.4 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act), provides for the declaration of noxious weeds by the Minister for Primary Industries. Noxious weeds may be considered noxious on a national, State, regional or local scale. All private landowners, occupiers, public authorities and Councils are required to control noxious weeds on their land under Part 3 Division 1 of the NW Act. Noxious weeds in the study area have been identified as part of this study and control measures recommended (see section 4.3.4 and 6.2.2).

2.2 New South Wales Policies

2.2.1 State Environmental Planning Policy 44 – Koala Habitat Protection

State Environmental Planning Policy 44 - Koala Habitat Protection (SEPP 44) aims to encourage the 'proper conservation and management of areas of natural vegetation that provide habitat for Koalas (*Phascolarctos cinereus*) to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline'. Schedule 1 of SEPP 44 lists the local government areas (LGA) to which SEPP 44 applies. The study area falls within the Sutherland LGA, which is not listed under Schedule 1.

Furthermore, SEPP 44 does not apply to Part 5 activities. Regardless, the potential for Koalas to occur in the subject site was assessed during field surveys as the species has been recorded in the locality. Potential impacts on the Koala have been considered in this report as this species is listed as threatened under both the TSC Act and the EPBC Act. Potential Koala habitat is discussed further in Section 4.4.

2.3 Commonwealth Legislation

2.3.1 Environment Protection and Biodiversity Conservation Act 1999

The purpose of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is to ensure that actions likely to cause a significant impact on matters of national environmental significance (MNES) undergo an assessment and approval process. Under the EPBC Act, an action includes a project, undertaking, development or activity. An action that 'has, will have or is likely to have a significant impact on a matter of national environmental significance' is deemed to be a 'controlled action' and may not be undertaken without prior approval from the Australian Government Minister for the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (the Minister).

The EPBC Act identifies MNES as:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas

- A water resource, in relation to coal seam gas development and large coal mining development.

MNES which have specific relevance to this report include threatened species and ecological communities, migratory species and world heritage properties.

The EPBC Act has been addressed in the current assessment through:

- Desktop review to determine the threatened species or ecological communities and migratory species that have been previously recorded within the locality of the site and hence could occur, subject to the habitats present
- Desktop review to identify other MNES that occur in the locality including World heritage properties
- Field surveys to assess the value of habitats for threatened species, ecological communities and migratory species listed under the Act and establish likelihood of occurrence within the subject site
- Assessment of the potential for impacts on MNES listed under the Act as a result of the proposal.

Potential impacts on relevant MNES must be subject to assessments of significance pursuant to the EPBC Act Significant Impact Guidelines (DotE, 2013). If a significant impact is considered likely, a referral under the EPBC Act must be submitted to the Minister for the Environment. The significance of impacts on MNES was considered in conjunction with the 7 part test provided in section 5.4. No significant impacts on MNES listed under the EPBC Act are anticipated from the proposal.

3. Methodology

3.1 Desktop assessment and literature review

The following databases and information were reviewed to generate a list of threatened ecological communities (TECs), populations and species listed under the EPBC, TSC Acts and other matters of national environmental significance (MNES) listed under the EPBC Act which have previously been recorded or are predicted to occur within the locality of the site (defined as within a 10km radius):

- The Commonwealth Department of the Environment (DotE) Protected Matters Search Tool (PMST), for all MNES online database selected for a 10 km radius of the scheme envelope (DotE 2013a)
- DotE online species profiles and threats database (DotE 2014b)
- Office of Environment and Heritage (OEH) Wildlife Atlas database (licensed) for records of threatened species, populations and threatened ecological communities listed under the TSC Act that have been recorded within the locality (OEH 2014a)
- OEH threatened biota profiles for descriptions of the distribution and habitat requirements of threatened biota (OEH 2014b)
- Department of Primary Industries (DPI) online protected species viewer for records of threatened aquatic species in the locality (DPI, 2014a)
- The NSW DPI 'Threatened Fish and Marine Vegetation – Find a Species by Geographic Region' online search tool for the Hawkesbury-Nepean CMA (DPI 2014b)
- Noxious weed declarations for the control area of Sutherland Shire Council (DPI 2014c).
- Vegetation mapping of the locality (Tozer *et al*. 2010) and descriptions of soil landscape groups (Hazelton & Tille 1990).
- Aerial photography of the locality.

3.2 Site inspection

A site inspection was undertaken by two GHD ecologists on 23 October 2014. The main focus of the survey was to assess the ecological values of the site and also identify the trees in the study area and their condition.

3.2.1 Ecological assessment

Vegetation onsite was recorded and vegetation communities and origin of trees (namely remnant versus planted) were identified during the survey. The potential for threatened species to occur through the presence of suitable habitat was also recorded. Given the lack of native vegetation present in the subject site, no detailed vegetation mapping or targeted searches for threatened flora was carried out.

An assessment of the quality of habitats present for native biota and in particular threatened fauna species was made across the study area. Habitat quality was based on the level of breeding, nesting, feeding and roosting resources available. This technique was used to compile a list of threatened biota that have the potential to occur within the study area, rather than relying solely on solitary surveys that are subject to seasonal limitations and may only represent a snapshot of the species present. Opportunistic observations of fauna species were recorded with species identified by sight or by call.

Fauna habitat assessments in the subject site included active searches for the following:

- bird nests or other potential fauna roosts
- tree hollows and evidence of use (e.g. worn edges, whitewash)
- specific food trees and evidence of foraging
- evidence of fauna activity, such as feeding scars, scratches and diggings
- distinctive scats or pellets at the base of trees.

3.2.2 Tree assessment

A visual inspection of trees was carried out by means of a walked survey. Reference was made to the Tree Protection Policy in Sutherland Shire Council's Local Environmental Plan 2006 (LEP) and Development Control Plan 2006 (DCP). Trees were assessed by conducting a ground based Visual Tree Assessment (VTA) (see Lonsdale, 2001). No diagnostic equipment was used and no aerial inspection (climbing) or tree root mapping was undertaken. In the interests of minimising harm, the trees were not tagged. In such a small area, with a small number of trees, each tree can be easily located with reference to Figure 3.

The height and crown spread of trees were measured and the diameter at breast height (DBH) measured using a Forestry DBH measuring tape. For each tree, the Safe Useful Life Expectancy (SULE) was determined based on the health and structure of the subject tree (after Barrell, 2001) and Sustainable Retention Index Value (SRIV) (see IACA, 2010) was also assessed in order to provide more detailed assessments of the survival potential of each tree. The SULE and SRIV codes are outlined in Appendix B.

The estimate of a tree's age was based on the definitions outlined by Draper and Richards (2009). Trees were considered young if they were judged to be of an age <20% of their life expectancy *in situ.* Trees of mature age are defined as trees being aged between 20 to 80% of their life expectancy *in situ*, while trees aged >80% of their life expectancy in situ were considered over-mature (Draper & Richards, 2009). The calculation of the Tree Protection Zone (TPZ) was based on the tree's DBH as outlined in *Australian Standard 4970 'Protection of Trees on Development Sites'* (SA, 2009).

3.3 Assessment of likelihood of occurrence of threatened biota

The habitat resources present within the study area (determined during the site inspection) were compared with the known habitat associations/requirements of the threatened and migratory biota highlighted by the desktop review. This was used to determine the likelihood of threatened ecological communities, endangered populations and/or threatened or migratory species occurring within the study area or being affected by the proposal. Following the field survey, the threatened biota predicted to occur based on the desktop review were refined, based on the conditions present on site. For threatened biota considered during the assessment, only records from 1980 or later were considered. Marine mammals and reptiles and pelagic birds have been omitted from the tables given suitable habitats are not present in the study area and would not be impacted by the proposal.

Table 1 provides a key to the likelihood of occurrence of threatened species. Results of this assessment are included in Appendix A.

Table 1 Key to likelihood of occurrence for threatened species

Likelihood	Definition
Likely	Species previously recorded within a 10 kilometre radius of the study area and suitable habitat occurs within the study area.
Possible	Species previously recorded within a 10 kilometre radius of the study area but only marginal suitable habitat recorded, OR Species not previously recorded within a 10 kilometre radius of the study area, but the study area is within the species known distribution and suitable habitat occurs within the study area.
Unlikely	Species previously recorded within a 10 kilometre radius of the study area and/or no suitable habitat recorded.
Nil	Species not previously recorded within a 10 kilometre radius of the study area, suitable habitat not recorded within subject, and/or study area outside species known distribution.

4. Existing environment

4.1 Landscape context

4.1.1 Geology, soils and topography

Soils of the subject site are a mix of Lucas Heights soil landscape group (SLG) on west side of the tracks and Gymea SLG on east side (Hazelton & Tille 1990). Gymea: Hawkesbury Sandstone is a medium to coarse-grained quartz sandstone with minor shale and laminate lenses which may have originally supported a low open-woodland. Lucas Heights: Mittagong Formation is interbedded shale, laminate and fine to medium quartz sandstone. It is likely that the soil on the subject site has been infilled from material excavated for the road and railway.

4.1.2 Climate

Heathcote has an average annual rainfall of 1010 mm (BOM 2014- based on Lucas Heights weather station). The highest rainfalls tend to occur during autumn. Temperatures vary from an average monthly minimum of 6.6 degrees Celsius to maximum summer temperatures averaging in the mid-twenties (BOM 2014).

4.1.3 Landuse

The subject site is currently an operating train station. Associated facilities include two carparks and pedestrian ramps adjoining two platforms. The subject site lies adjacent to a major road; the Princes Highway where many shops are situated on the stations west side.

4.2 Desktop results

4.2.1 Threatened biota and migratory species

The results of the database searches indicate the following threatened biota previously recorded or predicted to occur in the locality of the study area:

- 39 threatened ecological communities listed under the TSC Act and/or EPBC Act
- 30 threatened flora species listed under the TSC Act and/or EPBC Act
- 54 threatened fauna species listed under the TSC Act, FM Act and/or EPBC Act
- 6 migratory species listed under the EPBC Act

As discussed in Section 4.3.1, the subject site does not contain any intact native vegetation and thus none of the TECs previously recorded in the wider locality are of relevance to this report.

An assessment of the likely occurrence in the study area of threatened and migratory species that have been previously recorded or are predicted to occur in the locality is provided in Appendix A.

It is important to note that the study area is in close proximity to extensive tracts of native vegetation within the Royal National Park, and that the majority of threatened species records for the locality are associated with the National Park, rather than the urbanised and developed areas of the township of Heathcote. This is further discussed in Section 4.4.1.

4.2.2 Other EPBC Act MNES

The Towra Point Nature Reserve is a Wetland of International Significance occurring within the locality (at Kurnell) to the north of the study area. The Towra Point Nature Reserve would not be impacted by the proposal as it does not occur within or adjoining the study area and is separated by residential areas

The Royal National Park and Garawarra State Conservation Area also occurs within the locality and is bordered by the Princes Highway in the west and extends to the coast between Port Hacking and Helensburgh. The Royal National Park and Garawarra State Conservation Area would not be impacted by the proposal as it does not occur within or adjoining the study area and is separated by residential areas.

4.2.3 Vegetation mapping

Vegetation mapping in the locality by Tozer *et al*. (2010) identifies Coastal Sandstone Ridgetop Woodland in close proximity to the proposal. Coastal Sandstone Ridgetop Woodland does not correspond to any listed threatened ecological communities (TECs) under the TSC Act and EPBC Act.

No vegetation types mapped by Tozer *et al*. (2010) occur within the study area due to the high level of disturbance in the area.

4.3 Vegetation and flora

4.3.1 Vegetation types

A shelter belt of vegetation adjacent to Wilson Parade is present on the eastern side of the subject site. This belt appears to have been planted, although some native (as well as exotic) species have self-recruited. Native and local canopy species include Forest Red Gum (*Eucalyptus tereticornis),* Sydney Blue Gum hybrid *(Eucalyptus saligna/ E. botryoides* hybrid) and Blackbutt (*Eucalyptus pilularis).* The mid-storey is dominated by Sweet Pittosporum *(Pittosporum undulatum)* but also includes Bleeding Heart *(Homalanthus populifolius),* Black She-oak *(Allocasuarina littoralis), Babingtonia virgata,* Tick Bush *(Kunzea ambigua),* Black Wattle *(Acacia decurrens),* and Sydney Golden Wattle *(Acacia longifolia subsp. longifolia).* The understorey is sparse to absent with patches of Blady Grass *(Imperata cylindica* var. *major)* present on the edge of the shelter belt. The age of most of the vegetation in the shelter belt and car park entrance is mostly <20 years. Two species including Brushbox *(Lophostemon confertus)* and Narrow-leaved Black Peppermint *(Eucalyptus nicholii)* also occur in this patch of vegetation and while native to Australia (northern New South Wales), their natural distribution does not extend into the Sutherland Shire. Exotic species such as Small-leaved Privet *(Ligustrum sinense), Polygala virgata,* Crofton Weed *(Ageratina adenophora), Senna pendula* var. *glabrata* and St John's Wort (*Hypericum perforatum)* are also present in this area of the subject site.

On the western side of the subject site, vegetation is present around carpark areas and along pedestrian footpaths. Canopy species are dominated by Tallowwood (*Eucalyptus microcorys)* but also include Bangalay (*Eucalyptus botryoides),* Sydney Blue Gum hybrid *(Eucalyptus saligna)*, and Wallangarra White Gum *(Eucalyptus scoparia).* Tallowwood and Wallangarra White Gum are native to northern Australia but are not indigenous to the LGA. The trees are mostly 25-30 years old. Most of these trees have been planted in broad beds. The sealed areas are asphalt; therefore the root systems of these trees are reasonably unrestricted. The trees are generally in good health and form. The tree beds have recently been mulched with wood chip, probably from several Tallowwoods which have recently been removed from the construction area. The midstorey within some tree beds is predominately native with shrub species including

Narrow-leaved Bottlebrush (*Callistemon linearis),* Weeping Bottlebrush *(Callistemon viminalis),* Hillock Bush *(Melaleuca hypericifolia),* Tantoon *(Leptospermum polygalifolium),* Lemon-scented Teatree *(Leptospermum petersonii), Agonis flexuosa,* and White Sally Wattle (*Acacia floribunda).* Groundcover is sparse to absent.

Eighteen trees were identified within the subject site during the survey. This includes four Bangalay, three Tallowwood, three Blue Gum hybrids, two Blackbutt and one stag, Narrow-leaved Ironbark (*Eucalyptus crebra*), Brush Daphne, Black Wattle, Black She-oak and Forest Red Gum (*Eucalyptus tereticornis*). Refer to Figure 3 for the approximate location of these trees.

4.3.2 Threatened flora

No threatened flora species were identified during the field survey. Narrow-leaved Black Peppermint and Wallangarra White Gum are listed as vulnerable and endangered respectively under the TSC Act and two trees were recorded on the subject site. However, since their occurrence on the site is outside their natural distribution and the trees are planted specimens, they are as such not considered further in this assessment.

No threatened flora species native to the locality were recorded within the study area. Based on the results of the desktop review and field survey, no threatened flora species previously recorded or predicted to occur in the locality (Appendix A) are likely to occur in the study area given the lack of intact native vegetation and the highly modified state of the environment.

4.3.3 Tree condition

The majority of trees were in moderate to good health with only one tree recorded as dead (Tree 1). The canopy height of trees generally reached ~20 m, with two trees growing to 22 metres high (Tree 9 &15). The age class of the trees observed within the subject site ranged from early mature to mature. Three trees in the subject site are compromised as a result of the pavement being located within their structural root zone (SRZ) (Tree 9, 10 &11).

Trees 9-14 have restricted canopies and root areas, as a result of their location. The garden bed in which they are growing is narrow with compacted soil. The canopy extends towards the existing access ramp and occasional pruning operations are evident. There are necrotic branches in all six trees, which may occasionally fall.

Access to Trees 15 to 17 was restricted because of ongoing work in this area. Of these three Tallowwoods, Tree 17 is the least vigorous.

Appendix B provides further details to the condition of trees within the subject site.

Paper Size A3

0 4.75 9.5 19 28.5 38

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

LEGEND

- Study area
- Cadastre
- Railways
- Vegetation to be retained (where possible)
- Vegetation to be removed
- Identified trees

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Approximate location of identified trees in the study area

Job Number	21-24099
Revision	A
Date	03 Dec 2014

Figure 3

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Data Source: NSW Department of Lands: Cadastre - Jan 2014; Geoscience Australia: 250k Data - Jan 2014; NSW Department of Primary Industry - Jan 2014; Google image Jan 2014. Created by: MWeerakoon

Level 15, 133 Castlereagh Street Sydney NSW 2000 Australia **T** 61 2 9239 7100 **F** 61 2 9239 7199 **E** sydmail@ghd.com **W** www.ghd.com

4.3.4 Noxious weeds

Three noxious weeds were identified within the study area. These species and, and their control class and requirements within the LGA are shown in Table 3. One noxious weed, Lantana (*Lantana camara*), is also listed as a Weed of National Significance (WoNS). All three noxious weed species occur in the vegetated shelterbelt on the eastern side of the study area.

Table 2 Noxious weeds recorded within the study area

Scientific Name	Common Name	Control Class	Control Requirements
Lantana sp.	Lantana	4	The growth of the plant must be managed in a manner that reduces its ability to spread. Has been identified in the Noxious Weed strategy as part of a larger thicket between the rail corridor between Waterfall and Como (Sutherland Shire Council)
Ligustrum sinsense	Small-leaved Privet	4	The growth of the plant must be managed in a manner that reduces its ability to spread. Has been identified in the Noxious Weed strategy as part of a larger thicket between the rail corridor between Waterfall and Como (Sutherland Shire Council)
Hypericum perforatum	St John's Wort	4	The growth of the plant must be managed in a manner that reduces its ability to spread and the plant must not be sold, propagated or knowingly distributed

4.4 Fauna and fauna habitats

The vegetation within the study area is composed of weedy shelter belt vegetation, linear canopy plantings and lawns which provide limited habitat complexity for native fauna. Shelterbelt, garden and lawn habitat is subject to regular disturbance by human traffic entering and exiting the subject site. Regular train movement also contribute to habitat disturbance within the site. Native species recorded during the survey included the Eastern Spinebill (*Acanthorhynchus tenuirostris*), Noisy Miner (*Manorina melanocephala*), Eastern Koel (*Eudynamys orientalis*), Rainbow Lorikeet (*Trichoglossus haematodus*) and Spotted Pardalote (*Pardalotus punctatus*). Introduced species observed were the Common Myna (*Acridotheres tristis*) and the European Rabbit (*Oryctolagus cuniculus*).

The linear plantings of canopy species within the carpark on the western side of the subject site represent an isolated patch of vegetation in this area. Common nectarivorous bird species such as the Noisy Miner (*Manorina melanocephala*), Crimson Rosella (*Platycercus elegans*) and New Holland Honeyeater (*Phylidonyris novaehollandiae*) would utilise the canopy of these trees when foraging for flowers and nectar. They may also provide roosting or breeding habitat for a number of other common bird species such as the Pied Currawong (*Strepera graculina*) and Australian Magpie (*Gymnorhina tibicen*) even though no nests were observed in the subject site. The linear plantings may provide limited foraging habitat for the Common Ringtail Possum (*Pseudocheirus peregrinus*) and Common Brushtail Possum (*Trichosurus vulpecula*) however the lack of any mid-storey or understorey in some areas of where the plantings occur, could inhibit such use. Small fissures in the bark of these species may provide marginal refuge habitat for microchiropteran bats which may also forage in the canopy, however this is unlikely due to the presence of street lights in the local area. Overall, these canopy plantings provide limited structural, floristic diversity and habitat value for local fauna.

The shelterbelt vegetation may provide some refuge and foraging habitat for common insectivorous bird species such as the Grey Fantail (*Rhipidura albiscapa*), and Fairy-wrens (*Malurus* spp.). The density of the vegetation in this habitat type could provide some nesting habitat for the ringtail possum although no dreys were observed throughout the site.

Lawns may provide foraging habitat for granivorous bird species such as the Galah (*Elophus roseicapilla*), and Willie Wagtail (*Rhipidura leucophrys*). Reptile such as small garden skinks may also utilise this area for basking.

One hollow bearing tree (Tree 14) was observed within the study area and an Eastern-striped Skink (*Ctenotus robustus*) was observed basking outside a small longitudinal hollow. This tree is anticipated to be removed by the proposal.

Distinctive scats or pellets were not recorded within the subject site and it is unlikely that arboreal mammals would use the identified trees within the subject site for either foraging or nesting.

The subject site is surrounded by extensive tracts of native vegetation which include Royal National Park. This national park provides a range of habitat for fauna species and is comprises mostly native and unmodified vegetation. The subject site may represent edge habitat for many species utilising natural and remnant vegetation in the locality.

4.4.1 Threatened fauna

No threatened fauna were identified within the study area during the field survey.

There is very limited potential habitat for threatened fauna species within the study area, given the lack of a substantial stand of vegetation in any one area and the highly modified nature of the study area. Threatened fauna previously recorded in the locality are not reliant on habitat resources present within the subject site (refer to Appendix A). Threatened species within the locality are concentrated within extensive tracts of intact native vegetation with an abundance of habitat resources and a diverse range of habitats such as in the surrounding Royal National Park.

The resources that do exist within the study area are restricted to native canopy vegetation which may provide some limited foraging resources for highly mobile threatened fauna such as microbats, flying-foxes and forest owls on an occasional basis (see Appendix A). It is very unlikely that threatened fauna use the study area for nesting or roosting purposes, given the presence of only one hollow-bearing tree with a very small hollow, ongoing disturbance and noise and light associated with the existing station precinct. The subject site contains food trees for the Koala such as Tallowwood and Forest Red Gum under Schedule 2 of SEPP 44.

The study area is in close proximity to extensive tracts of native vegetation within the Royal National Park and Heathcote National Park. Threatened species are more likely to be resident in the high quality of habitats located in these areas, than the urbanised and developed areas of the township of Heathcote. The vegetation present in the study area would not provide any important foraging resources for any threatened fauna, and no threatened fauna species would rely on habitats present for their ongoing survival in the locality.

4.4.2 Migratory fauna

No migratory fauna listed under the EPBC Act were identified during surveys. Two migratory species, the Satin Flycatcher (*Myiagra cynaoleuca*) and Rufous Fantail (*Rhipidura rufifrons*) identified during the desktop review (see Appendix A) could possibly occur aerially within the study area on an occasional or transient basis; however the habitat present does not constitute important habitat and would not support an ecologically significant proportion of any such species as defined under the EPBC Act (DotE, 2013).

There is greater potential for migratory species to occur in the extensive tracts of native vegetation with high quality potential habitat in the nearby Royal National Park and Heathcote National Park.

4.4.3 Towra Point Nature Reserve

The Towra Point Nature Reserve is a Wetland of International Significance and supports the largest wetland of its type in the greater Sydney region. A significant proportion of saltmarsh and mangrove communities within the Sydney region occur at Towra Point Nature Reserve.

4.4.4 Royal National Park and Garrawarra State Conservation Area

The Royal National Park and Garawarra State Conservation Area provides a diverse habitat within Hawkesbury sandstone environments for a suite of biota. The Royal National Park and Garawarra State Conservation Area has important heritage values because of its importance in the course and pattern of Australia's natural and cultural history.

5. Potential impacts

5.1 Construction

5.1.1 Direct impacts

Several native planted *Babingtonia virgata* (Heath Myrtle), Tick Bush, Golden Wattle and Sweet Pittosporum within the weedy shelterbelt would be removed for the proposed works. Proportionally more exotic species such as Small-leaved Privet and Lantana would also be removed, given the level of weed infestation in this area. A dead tree (Tree 1) in close proximity to the proposed kerb alignment would be removed if required.

Tree 3, 4 and 5 which lie adjacent to Wilson Parade, may also require removal if it appears that more than 10% of their Tree Protection Zone (TPZ) would be affected by proposed works.

A row of planted eucalypts comprising a mix of six Bangalay and Sydney Blue Gum hybrids would also be removed in the western side of the subject site (Trees 9-14). Tree 17 (Tallowwood adjacent to the Princes Highway) would also require removal, with adjacent trees to be removed only if required (Tree 15 & 16).

Trees 15 and 16 may lose proportions of their Structural Root Zones (SRZ) during the ongoing works.

Note that heritage trees along Dillwynia Grove that are listed on the Sutherland Shire Local Environment Plan (LEP) heritage schedule would not be removed or impacted as part of the bus stop upgrade works.

The removal of planted trees would have a negligible impact on common fauna species in the subject site. Common birds may experience a loss of minor perching and limited foraging habitat within the subject site. The mortality of some garden skinks may also occur from the removal of these trees.

The proposal would not have an adverse impact on threatened biota or associated habitats. The subject site is a highly modified urban environment and does not contain any endangered ecological communities or habitat for threatened flora and fauna species listed under the TSC or EPBC Acts. The identified trees within the subject site do not constitute habitat of importance for the persistence of any threatened or migratory fauna species known to occur in the wider locality.

5.1.2 Indirect impacts

Sedimentation and erosion

Environments downslope of the study area (such as a drainage line in bushland to the southwest and perpendicular to Wilson Parade) could potentially be impacted if there is erosion of exposed soil surfaces on the subject site during construction. Sediment-laden runoff could affect water quality and aquatic ecosystems through the smothering of macro invertebrate organisms in the waterway, filling gaps of riffle habitat and reducing water clarity and therefore photosynthetic efficiency of water plants. Mitigation measures to reduce the potential for erosion and sedimentation are described in Section 6.2.

Introduction and spread of weeds

The proposal has the potential to increase the introduction and spread of exotic plants and pathogens through increased visitation, fragmentation of vegetation and disturbance of soil. Increased weed invasion can lead to decreased diversity of native flora, compromised structural

integrity of native vegetation communities and a decrease in habitat quality for native fauna. Weed invasion is present on the eastern side of the subject site in the shelterbelt. Weed invasion in the western side of the subject site is currently being controlled through the presence of mulch in the garden beds. Mitigation measures to reduce the potential for the introduction or spread of weeds are recommended in Section 6.2.2.

Noise and vibration

The subject site is currently exposed to regular noise disturbance from trains, and vehicular traffic (particularly along the Princes Highway). The proposal would temporarily increase noise and vibration through the construction and demolition of buildings with plant, machinery and earth moving operations. Impacts from noise and vibration are not expected to affect native fauna.

5.2 Key threatening processes

A key threatening process (KTP) is defined in the TSC Act as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities; and
- Could cause species, populations or ecological communities that are not currently threatened, to become threatened.

KTPs are listed under the TSC Act, the FM Act and also under the EPBC Act. A number of KTPs are listed under more than one Act.

Those potentially relevant to this proposal are listed in Table 3 below. Mitigation measures to limit the impacts of these KTPs are discussed in Section 6.2.

Table 3 Key Threatening Processes

KTP	Status	Comment
Clearing of hollow-bearing trees	TSC Act	One hollow-bearing tree would be removed. Mitigation measures are recommended to limit impacts on fauna and their habitats during construction where removal of hollow-bearing trees cannot be avoided (see Section 6.2).
Invasion of plant communities by perennial grasses	TSC Act	Perennial grasses already established in urbanised areas of the locality. The proposal is unlikely to result in the invasion of native plant communities by perennial grasses. Mitigation measures are recommended, however, to limit any further spread of weeds as a result of the proposal (see Section 6.2)
Invasion, establishment and spread of *Lantana camara*	TSC Act	Lantana is present in the subject site. The proposal is unlikely to result in the invasion of native plant communities by Lantana. Mitigation measures are recommended, however, to limit any further spread of weeds as a result of the proposal (see Section 6.2)

5.3 Impacts on threatened biota

5.3.1 Threatened ecological communities

The proposal would not have an adverse impact on any TECs listed under the TSC or EPBC Acts. The subject site is a highly modified urban environment and does not contain native vegetation communities and there are no TECs downslope of the subject site that could be indirectly impacted.

5.3.2 Threatened species

The study area has limited biodiversity values due to its highly modified nature, absence of intact native vegetation and very limited habitat complexity. The vegetation on the subject site does not constitute habitat of importance for the persistence of any threatened fauna species listed under the TSC or EPBC Acts known to occur in the wider locality. However, the Grey-headed Flying Fox, large forest owls and other threatened microbat species may occasionally utilise the native canopy vegetation as potential foraging habitat

Where trees can be retained, protection measures would be implemented to reduce the potential for impacts on these trees during and post construction.

5.3.3 Migratory species

The study area is not considered important habitat for migratory species predicted to occur in the locality as defined in the migratory species significant impact criteria (DotE, 2014). This is due to the fact that small area of exotic vegetation in the study area would not support an ecologically significant proportion of the population of these species, is not of critical importance to these species at particular life-cycle stages, is not at the limit of these species ranges, and is not within an area where these species are declining. Based on the above considerations the proposal is unlikely to impose a significant effect on any of the listed migratory fauna species predicted to occur within the locality.

5.4 Significance of impacts

5.4.1 Threatened biota

No threatened fauna species were recorded during the field survey of the subject site and there is limited suitable habitat present within the subject site.

Whilst no impacts on threatened fauna species are likely to result from the proposal, a generic assessment of significance has been prepared pursuant to Section 5A of the EP&A Act for completeness and is presented below.

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

The proposal is not likely to have an adverse effect on the life cycle of any threatened fauna such that a viable local population of the species is likely to be placed at risk of extinction, because:

- The subject site contains no intact native vegetation communities,
- Planted exotic trees and shrubs are limited in extent and would not provide habitat resources of importance for threatened species previously recorded or predicted to occur in the locality

- Planted trees to be retained would be protected from construction activities to maintain any existing habitat values.
- The proposal would not permanently isolate any individuals or habitat or otherwise interfere with the life cycles of any populations.

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

The proposal would not directly or indirectly affect any endangered populations.

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

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

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

The proposal would not directly or indirectly affect any endangered ecological communities.

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

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

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

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

The proposal is located in a highly modified area, surrounded by cleared land with planted native vegetation present. The proposal would remove a small number of planted trees and shrubs within gardens and a weedy shelterbelt that does not constitute habitat relevance for threatened fauna. The proposal would not fragment or isolate any habitat for threatened biota. Canopy trees may provide a stepping stone for mobile species and retained trees on the subject site would continue to serve this purpose. The exotic vegetation to be removed does not constitute important habitat for the long-term survival of any local populations of threatened fauna.

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

The proposal would not have an adverse effect on any critical habitat (either directly or indirectly).

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

The proposal is not inconsistent with the objectives of recovery and threat abatement plans as no known habitat for threatened fauna species would be removed or disturbed as a result of the proposal.

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

The proposal would constitute the key threatening process clearing of hollow-bearing trees, invasion of plant communities by perennial grasses and the invasion and establishment of

Lantana camara and may result in the operation of, or increase the impact of these key threatening processes.

Based on the consideration of the above criteria, the proposal would not be likely to have a significant impact on any threatened species, population or ecological community or their habitats, listed under the TSC Act.

Given the conclusions of the above test of significance and with consideration of the criteria contained in the EPBC Act assessment of significance guidelines (DoE 2013), the proposal would similarly be unlikely to have a significant impact on any threatened biota listed under the EPBC Act.

5.4.2 Migratory fauna

No migratory bird species were observed during the field survey and no suitable habitat is present within the subject site.

Based on a consideration of the criteria contained in the EPBC Act MNES significance guidelines (DoE 2013), the proposal would not be likely to have a significant impact on any migratory species, given that it would not:

- substantially modify, destroy or isolate an area of important habitat for a migratory species
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species
- seriously disrupt the lifecycle of an ecologically significant proportion of the population of a migratory species.

6. Mitigation and recommendations

The mitigation of impacts arising from the proposal is presented below according to the hierarchy of avoidance, mitigation and offsetting of impacts.

6.1 Avoidance of impacts

The proposal is an upgrade of an existing station and so its location is fundamentally limited by the location of the station and associated infrastructure. The proposal footprint falls within land which has been previously modified by clearing. Impacts on native flora and fauna are substantially less than would be associated with an undisturbed 'green field' site. The opportunity to alter the location of the proposed works is limited by the location of existing infrastructure, for example the car park and station. As such, there is limited opportunity to further avoid impacts as part of the proposal. Trees would be retained in the study area where possible within the construction envelope.

6.2 Mitigation of impacts

Mitigation measures should focus on ensuring no adverse impacts on adjoining or downstream habitats of higher biodiversity values. The following control measures should be inclusive of the Construction Environment Management Plan (CEMP) which would be developed prior to the commencement of works.

6.2.1 Sedimentation and erosion control

Recommended sedimentation and erosion control measures include:

- installation of appropriate measures (ie silt fences) around the proposal site to limit the spread of sediment into adjacent waterways and vegetation
- regular inspection of these measures, particularly after rain events, to ensure ongoing functionality
- applying water to stockpiles during windy conditions
- appropriate bunding of stockpiles to avoid potential for run-off into waterways

6.2.2 Weed control

Weed control measures include:

- storage of all weed material in plastic bags and disposed of at an appropriate waste facility
- noxious weed control, as per the NSW Department of Primary Industries and Sutherland Shire Council guidelines for the LGA
- removal of weeds in a manner that ensures native vegetation is not destroyed
- stabilisation and rehabilitation of areas where weed control has occurred
- planting of non-invasive endemic species in any landscaping or revegetation work post-construction.

6.2.3 Tree protection measures

The Tree Protection Zone (TPZ) intends to protect the trees identified for retention from development impacts and to maintain their health and vigour during and after development.

The calculation for the TPZ radius is as follows:

- TPZ radius = DBH x 12 where:
- DBH = Diameter at Breast height (in metres).

It is recommended that TPZs be demarcated around trees that would be retained as part of the proposed works. Fencing around trees may contain chain wire mesh panels with shade cloth (if required) attached and held in place with concrete feet. Alternative plywood or wooden paling fence panels can also be used.

The TPZs are not to be used as a storage facility and should to be kept free at any time. As a guide, the following activities should be excluded unless otherwise stated:

- storage of materials, plants or equipment
- installation of site sheds or portable toilets
- excavations, trenching, ripping or cultivation of soils
- modification of existing soil level or addition of fill materials
- disposal of waste materials and chemicals (both solid or liquid)
- mechanical removal of vegetation
- pedestrian or vehicular movement.

If more than 10% of a subject tree's TPZ would be affected by proposed works, they would need to be removed.

An arborist should inspect the site after completion of construction, to ascertain the percentage loss of SRZ of trees in close proximity to the works, recommend removal of the tree for safety reasons, or for remedial treatment, to assist in their recovery and survival.

Remedial work may include:

- pruning of canopy where damage from construction has occurred
- pruning of dead limbs (dead-wooding)
- corrective pruning, including removal of one co-dominant leader
- thinning of crown
- weight reduction of heavy branches
- removal of diseased branches or poorly attached branches
- irrigation of SRZs of trees
- application of fertilizer, especially with the aim of encouraging new root growth.

Tree removal, maintenance and protection work are specialised tasks. To ensure the works carried out are not detrimental to the survival of a tree being retained, or to assist in the safe removal of any tree, the work should be undertaken by a qualified arboriculturist with appropriate competencies recognised within the Australian Qualification Framework, with a minimum of five years of continual experience within the industry of operational amenity arboriculture, and covered by appropriate and current types of insurance to undertake such works.

6.2.4 Protection of fauna habitat and species

An experienced, licenced wildlife carer or ecologist would be present to supervise vegetation clearing and capture then relocate fauna if required. This would include a search for active nests in the canopy of trees prior to clearing and inspection of the hollow in Tree 14. Any injured native fauna should be transferred to the care of the Wildlife Rescue and Information Service (WIRES).

6.3 Offsetting

TfNSW has prepared a *Vegetation Offset Guide* (TfNSW 2013) to provide a framework for a consistent approach to offset impacts to vegetation on applicable TfNSW projects and to meeting their biodiversity target (P5.2) which requires the 'replacement or offset of 100 percent of any native vegetation cleared'. The guide also allows for appropriate offsets to be applied for one tree or a group of trees that don't form part of a vegetation community, regardless of whether they are native or not (TfNSW 2013).

As discussed above, the proposal has limited opportunity to avoid impacts on trees, due to existing constraints such as the location of the car park and station. Mitigation measures have been provided to minimize the impacts of construction as far as possible.

As detailed in section 4.3.1, trees and shrubs in the study area are not commensurate with a native vegetation type. Primary and secondary offsets as defined in TfNSW (2013) are therefore not required. As planted trees would be removed, TfNSW (2013) requires additional trees to be planted to replace those lost. The preference with offsetting single trees or groups of trees is to select native species endemic to the area and for planting to occur on or near the impacted site. Where replanting on or near the proposal site is not practicable TfNSW would need to identify an alternative location in consultation with Sutherland Shire Council. Seven trees would require removal for the proposal. The offset requirements for different tree sizes, the number of trees in each category being removed, and the total number of trees that are required to be replanted are detailed in Table 4. Any additional trees that are found to require removal during construction would also need to be offset according to the table below. A minimum of 30 trees are required to be planted to meet TfNSW's offset guide.

Table 4 Offsetting for individual tree removal

Tree size	Offset requirement	Number being removed	Total required to be planted
Large tree (DBH greater than 60cm)	Plant minimum 8 trees	1	8
Medium tree (DBH greater than 15cm, but less than 60cm)	Plant minimum 4 trees	5	20
Small young tree (DBH less than 15cm)	Plant minimum 2 trees	1	2

7. Conclusion

A Flora and Fauna Impact Assessment has been carried out by GHD for the proposal. The subject site is a highly modified site occurring between two major roads (the Princes Highway and Wilson Parade). The subject site contains predominantly planted native vegetation occurring as canopy trees adjacent to the car park to the west of the study area but also contains a weedy shelterbelt and scattered trees on its eastern side. The vegetation present does not contain potential habitat for threatened plants or constitute a TEC listed under the TSC or EPBC Acts and lacks the habitat complexity required for threatened and or migratory species known or predicted to occur in more extensive tracts of intact native vegetation in surrounding national parks. Vegetation present on the subject site does provide habitat for some native fauna typical of urban parks and gardens.

The proposal would involve the removal of seven planted native canopy trees. Most of these trees are in relatively good condition with a moderate Safe Useful Life Expectancy (SULE). No heritage trees would be removed.

The proposal would have minimal impact on common native fauna and would not remove habitat of importance for threatened or migratory fauna species. These trees provide may provide limited habitat for threatened microbat species and the Grey-headed Flying Fox. These species would forage in these trees on a transient basis only, and would not rely on the resources present for their continued survival in the locality. Threatened biota are likely to utilise habitat with higher quality canopy vegetation locally available in nearby national parks.

Based on the results of the desktop review and field survey, the proposal would not result in a significant impact on threatened species, populations or ecological communities listed under the TSC Act. As such, a Species Impact Statement is not required for the proposal. Similarly, the proposal would not have a significant impact on threatened biota or migratory species listed under the EPBC Act and Referral of the proposal to the Commonwealth Minister for the Environment is therefore not required.

Mitigation measures have been recommended to minimise impacts on retained canopy trees and adjoining or downstream environments during construction. A minimum of 30 trees would need to be planted to offset the loss of 7 canopy trees on site in accordance with TfNSW's *Vegetation Offset Guide* (TfNSW, 2013).

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Appendices

Appendix A – Likelihood of Occurrence of Threatened Biota

Likelihood of occurrence for threatened flora to occur at the subject site

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Astrotricha crassifolia	Thick-leaf Star-hair	V	V	Occurs near Patonga (Gosford LGA), and in Royal NP and on the Woronora Plateau (Sutherland and Campbelltown LGAs). There is also a record from near Glen Davis (Lithgow LGA). Grows on dry ridgetops to 300 m altitude, associated with very rich heath, or dry sclerophyll woodland on sandstone.	53 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Allocasuarina diminuta subsp. mimica	*Allocasuarina diminuta* subsp. *mimica* L.A.S.Johnson population in the Sutherland and Liverpool local government areas	E		Occurs only in NSW, from the Nabiac area, north-west Forster to Byron Bay, NSW. Grows mainly in tall heath on sand but can also occur on clay soils/sandstone (OEH 2012)	21 records within 10km (OEH 2014a)	Nil. No suitable habitat within the subject site	Nil
Allocasuarina glareicola		E	E	Primarily restricted to small populations in and around Castlereagh NR (NW Cumberland Plain), but with an outlier population at Voyager Point, Liverpool. Also reported from Holsworthy Military Area. Grows on tertiary alluvial gravels, with yellow clayey subsoil and lateritic soil. Occurs in Castlereagh open woodland.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Hibbertia stricta subsp. furcatula		E		2 known populations: one either side of the Woronora River gorge including the Menai-Bangor, Alfords Point and Illawong areas in the north and Maandowie Reserve, Loftus on the southern side; and west and southwest of Nowra. Occurs in dry sclerophyll forest and woodland. Northern metapopulation occurs on upper slopes and above the Woronora escarpment, at or near the interface of Hawkesbury sandstone and the Lucas Heights soil landscape. Southern population appears to occur in sandy soils on sandstone, with one record from gravelly clay soil.	10 records within 10km (OEH 2014a)	Nil. No suitable habitat within the subject site	Nil
Epacris purpurascens var. purpurascens		V		Occurs from Gosford in the north, Narrabeen in the east, Silverdale in the west and Avon Dam vicinity in the South. Grows in a range of sclerophyll forest, scrubs and swamps, most of which have a strong shale soil influence.	5 records within 10km (OEH 2014a)	Nil. No suitable habitat within the subject site	Nil
Leucopogon exolasius	Woronora Beard-heath	V	V	Occurs along the upper Georges River and in Heathcote NP, Royal NP and is also known from the Blue Mountains along the Grose River. Grows in woodland on sandstone and prefers rocky hillsides along creek banks up to 100 m altitude. Associated species include *Eucalyptus piperita* and *E. sieberi* and *Pultenaea flexilis*, *Leptospermum trinervium* and *Dillwynia retorta*.	4 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Pultenaea aristata	Prickly Bush-pea	V	V	Restricted to the Woronora Plateau, a small area between Helensburgh, south of Sydney, and Mt Kiera above Wollongong (OEH 2012). Occurs in either dry sclerophyll woodland or wet heath on sandstone.	1027 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Acacia bynoeana	Bynoe's Wattle	E	V	Endemic to central eastern NSW, currently known from only 34 locations, many of only 1-5 plants. Grows mainly in heath/ dry sclerophyll forest on sandy soils, prefers open, sometimes slightly disturbed sites such as trail margins, road edges, and in recently burnt open patches. Flowers September to March, and fruit matures in November.	3 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Acacia pubescens	Downy Wattle	V	V	Occurs mainly in Bankstown-Fairfield-Rookwood and Pitt Town areas, with outliers at Barden Ridge, Oakdale and Mountain Lagoon. Grows on alluviums, shales and shale/sandstone intergrades. Soils characteristically gravely, often with ironstone. Occurs in open woodland and forest, in communities including Cooks River/ Castlereagh Ironbark Forest, Shale/ Gravel Transition Forest and Cumberland Plain Woodland. Flowers August to October.	9 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Pelargonium sp. Striatellum	Omeo's Storkbill	E	E	Omeo Storksbill *Pelargonium* sp. (G.W. Carr 10345), syn. *P. striatellum*, is a tufted perennial forb known from only 3 locations in NSW, with two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. It has a narrow habitat that is usually just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the wetland or aquatic communities.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Prostanthera densa	Villous Mint-bush	V	V	This species has been recorded from the Currarong area in Jervis Bay, Royal National Park, Cronulla, Garie Beach and Port Stephens (Gan Gan Hill, Nelson Bay). Also recorded in Bass and Flinders Point in Cronulla (Oeh 2012). Generally grows in sclerophyll forest and shrubland on coastal headlands and near coastal ranges, chiefly on sandstone, and rocky slopes near the sea (OEH 2012)	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Prostanthera marifolia	Seaforth Mintbush	E	CE	Only known from a 2 x 2 km area in Seaforth, N Sydney. Associated with the endangered Duffys Forest ecological community. Grows on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	1 record within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Prostanthera saxicola	*Prostanthera saxicola* population in Sutherland and Liverpool local government areas	E		Only known from a 2 x 2 km area in Seaforth, N Sydney. Associated with the endangered Duffys Forest ecological community. Grows on deeply weathered clay-loam soils associated with ironstone and scattered shale lenses.	2 records within 10km, last recorded 1990 (OEH 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Streblus pendulinus	Siah's Backbone, Sia's Backbone, Isaac Wood		E	Siah's Backbone occurs from Cape York Peninsula to Milton, south-east New South Wales (NSW), as well as Norfolk Island (ATRP 2010; Jessup 2003; The Royal Botanic Gardens and Domain Trust 2011). Siah's Backbone is found in warmer rainforests, chiefly along watercourses. The species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest (ATRP 2010).	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site which is comprised of planted garden and exotic scrub	Nil
Callistemon linearifolius	Netted Bottle Brush	V		Recorded from the Georges to Hawkesbury Rivers in Sydney, and north to Nelson Bay. There is also a recent record from the northern Illawarra. In Sydney, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. Grows in dry sclerophyll forest on the coast and adjacent ranges.	1 record within 10km (OEH 2014a)	Nil. No suitable habitat within the subject site	Nil
Eucalyptus camfieldii	Camfield's Stringybark	V	V	Occurs from Raymond Terrace to Waterfall, with populations known from Norah Head (Tuggerah Lakes), Peats Ridge, Mt Colah, Elvina Bay Trail (West Head), Terrey Hills, Killara, North Head, Menai and the Royal NP. Occurs in exposed situations on sandstone plateaus, ridges and slopes near the coast, often on the boundary of tall coastal heaths or low open woodland. It grows in shallow sandy soils overlying Hawkesbury sandstone.	21 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Melaleuca biconvexa	Biconvex Paperbark	V	V	Scattered, disjunct populations in coastal areas from Jervis Bay to Port Macquarie, with most populations in the Gosford-Wyong areas. Grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Melaleuca deanei	Deane's Paperbark	V	V	Occurs from Nowra- St Albans and west to the Blue Mountains, with most records in Ku-ring-gai / Berowra and Holsworthy/Wedderburn areas. Mostly grows on broad flat ridgetops, dry ridges and slopes and strongly associated with low nutrient sandy loam soils, sometimes with ironstone. Grows in heath- open forest, often in sandstone ridgetop woodland communities.	24 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Syzygium paniculatum	Magenta Lilly Pilly	E	V	Occurs in narrow coastal strip from Bulahdelah to Conjola State Forest. Grows in rainforest on sandy soils or stabilised Quaternary sand dunes at low altitudes in coastal areas, often in remnant littoral or gallery rainforests.	1 record within 10km, last recorded 1990 (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Caladenia tessellata		E	V	Occurs from Central Coast NSW to southern VIC. Mostly coastal but extends inland to Braidwood in southern NSW. In NSW grows in grassy dry sclerophyll woodland on clay loam or sandy soils, and less commonly in heathland on sandy loam soils (Duncan 2010).	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V	Occurs in coastal areas from East Gippsland to southern Queensland. Habitat preferences not well defined. Grows mostly in coastal heathlands, margins of coastal swamps and sedgelands, coastal forest, dry woodland, and lowland forest. Prefers open areas in the understorey and is often found in association with *Cryptostylis subulata* and the *Cryptostylis erecta*. Soils include moist sands, moist to dry clay loam and occasionally in accumulated eucalypt leaves. Flowers November-February.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Genoplesium baueri	Bauer's Midge Orchid	E	E	Occurs from Ulladulla to Port Stephens, with only 13 known extant populations. Grows in sparse sclerophyll forest and moss gardens over sandstone	1 record within 10km (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Pterostylis saxicola	Sydney Plains Greenhood	E	E	Occurs in western Sydney between Picton and Freemans Reach. Grows in small pockets of shallow soil in depressions on sandstone rock shelves above cliff lines. Associated vegetation above these rock shelves is sclerophyll forest or woodland on shale or shale/sandstone transition soils.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Thelymitra kangaloonica	Kangaloon Sun Orchid		CE	Only known from three locations near Robertson in the Southern Highlands. Grows in seasonally swampy sedgeland on grey silty clay loam at 600–700 m above sea level. Flowers in late October and early November.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site which is comprised of planted garden and exotic scrub	

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
Grevillea parviflora subsp. parviflora	Small-flower Grevillea	V	V	Occurs between Moss Vale/Bargo and lower Hunter Valley, with most occurrences in Appin, Wedderburn, Picton and Bargo. Broad habitat range including heath, shrubby woodland and open forest on light clay or sandy soils, and often in disturbed areas such as on the fringes of tracks.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Persoonia hirsuta	Hairy Geebung	E	E	Occurs within the Blue Mountains, Southern Highlands and Sydney coastal regions from Hilltop to Glen Davis and Royal NP to Gosford. Population within the Hills Shire particularly important due to high density of plants. Grows on sandy soils in dry sclerophyll open forest, woodland and heath on sandstone up to 600m above sea level.	3 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Persoonia nutans	Nodding Geebung	E	E	Occurs from Richmond to Macquarie Fields on the Cumberland Plain. Grows only on aeolian and alluvial sediments in sclerophyll forest and woodland vegetation communities. Largest populations occur in Agnes Banks Woodland or Castlereagh Scribbly Gum Woodland.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Asterolasia elegans		E	E	Occurs north of Sydney, in the Baulkham Hills, Hawkesbury and Hornsby LGAs, may also occur in the western part of Gosford LGA. 7 known populations. Occurs on Hawkesbury sandstone, commonly amongst rocky outcrops and boulders in sheltered forests on mid- to lower slopes and valleys.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil
Thesium australe	Austral Toadflax	V	V	Found in small, scattered populations along the east coast, northern and southern tablelands. Occurs in grassland or grassy woodland, and is often found in association with Kangaroo Grass (*Themeda australis*).	Species or species' habitat may occur within 10km (DotE 2014a)	Unlikely. An associated species (*Themeda australis*) observed within rail corridor	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within the subject site	Likelihood of impact
						which is heavily disturbed	
Pimelea curviflora var. curviflora		V	V	Confined to area between north Sydney in the south and Maroota in the north-west. Former range extended to Parramatta River including Five Dock, Bellevue Hill and Manly. Grows on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Often grows amongst dense grasses and sedges. Flowers October to May.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. No suitable habitat within the subject site	Nil

Likelihood of occurrence for threatened fauna within 10km of the subject site

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Botaurus poiciloptilus	Australasian Bittern	E	E	Widespread but uncommon over most NSW except the northwest. Favours permanent freshwater wetlands with tall dense reedbeds particularly *Typha* spp. and *Eleocharis* spp., with adjacent shallow, open water for foraging. Roosts during the day amongst dense reeds or rushes and feeds mainly at night on frogs, fish, yabbies, spiders, insects and snails.	Species or species' habitat known to occur within 10km (DotE 2014a)	Nil. Wetland habitat is not present within subject site	Nil
Ixobrychus flavicollis	Black Bittern	V		Occurs from southern NSW to Cape York and the Kimberley, and southwest WA. Inhabits terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. May occur in flooded grassland, forest, woodland, rainforest and mangroves as long as there is permanent water. Roosts by day in trees or within reeds on the ground. Nests in branches overhanging water and breeds from December to March.	1 record within 10km (OEH 2014a)	Nil. Wetland habitat is not present within subject site	Nil
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		Most common on the inland slopes and plains. Inhabits eucalypt woodlands and dry open forest, usually dominated by stringybarks or rough-barked species with open grassy understorey. Fallen timber is important foraging habitat. Nests in hollows in standing trees or stumps.	1 record within 10km (OEH 2014a)	Nil. No woodland habitat present.	Nil
Dasyornis brachypterus	Eastern Bristlebird	E	E	Occurs in three disjunct areas of south-eastern Australia including the Illawarra Region. Illawarra population comprises an estimated 1600 birds, mainly from Barren Grounds Nature Reserve, Budderoo National Park and the Jervis Bay area. Habitat characterised by dense, low vegetation including heath and open woodland with a heathy understorey. The fire history of habitat is important, and the	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Outside species known distribution.	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
				Illawarra and southern populations reach maximum densities in habitat that have not been burnt for over 15 years.			
Tyto longimembris	Eastern Grass Owl	V		Most common in N and NE Australia, but recorded in all mainland states. In NSW most likely to be resident in the NE. Inhabit areas of tall grass, including grass tussocks, in swampy areas, grassy plains, swampy heath, and in cane grass or sedges on flood plains. Nests on the ground in trodden grass, and are often accessed by tunnels through vegetation.	1 record within 10km (OEH 2014a)	Nil. Suitable habitat is absent within subject site	Nil
Pezoporus wallicus wallicus	Eastern Ground Parrot	V		Occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover). Ground Parrots can re-colonise burnt habitat after 1-2 years and reach maximum densities after 15-20 years without fire. Nests are well hidden under overhanging tall, coarse grass, sedge or low, heathy shrubs.	1 record within 10km (OEH 2014a)	Nil. Heathland habitat is absent within subject site	Nil
Pandion cristatus	Eastern Osprey	V		Favours coastal areas, especially the mouths of large rivers, lagoons and lakes. They feed on fish over clear, open water. Breeding takes place from July to September in NSW, with nests being built high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea, though there are a handful of records from inland areas.	1 record within 10km, last recorded 1991 (OEH 2014a)	Nil. Foraging habitat is absent within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Petroica phoenicea	Flame Robin	V		Breeds in upland moist eucalypt forests and woodlands, often on ridges and slopes, in areas of open understorey. Migrates in winter to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains. Forages from low perches, feeding on invertebrates taken from the ground, tree trunks, logs and other coarse woody debris. Fallen logs and coarse woody debris are important habitat components. Open cup nest of plant fibres and cobweb is often built near the ground in a sheltered niche, ledge or shallow cavity in a tree, stump or bank.	1 record within 10km (OEH 2014a)	Nil. Important component of habitats (logs and woody debris) is absent within subject site	Nil
Callocephalon fimbriatum	Gang-gang Cockatoo	V		Restricted to the south-eastern coast and highlands, from the lower Hunter and northern Blue Mountains to the Southwestern Slopes, south to and contiguous with the Victorian population. Inhabits eucalypt open forests and woodlands with an acacia understorey. In summer it lives in moist highland forest types, and in winter it moves to more open types at lower elevations. The Gang-Gang Cockatoo nests in hollows in the trunks, limbs or dead spouts of tall living trees, especially eucalypts, often near water. The Gang-gang Cockatoo feeds on seeds obtained in trees and shrubs, mostly from eucalypts and wattles.	6 records within 10km (OEH 2014a)	Unlikely. Limited foraging habitat present within subject site	Nil
Calyptorhynchus lathami	Glossy Black-Cockatoo	V		Widespread but uncommon from coast to southern tablelands and central western plains. Feeds almost exclusively on the seeds of Allocasuarina species. Prefers woodland and open forests, rarely away from Allocasuarina. Roost in leafy canopy trees, preferably eucalypts, usually <1km from feeding site. Nests in large (approx. 20cm) hollows in trees, stumps or limbs, usually in	1 record within 10km, last recorded 1990 (OEH 2014a)	Unlikely. Limited foraging habitat present within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
				Eucalypts (Higgins 1999).			
Hieraaetus morphnoides	Little Eagle	V		Occurs throughout NSW except most densely forested parts of the Dividing Range escarpment. Occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring.	6 records within 10km (OEH 2014a)	Unlikely. Limited foraging habitat present within subject site	Nil
Glossopsitta pusilla	Little Lorikeet	V		Occurs from coast to western slopes of the Great Dividing Range. Inhabits dry, open eucalypt forests and woodlands. Occurrence is positively associated with patch size, and with components of habitat complexity including canopy cover, shrub cover, ground cover, logs, fallen branches and litter. Feed primarily on profusely-flowering eucalypts and a variety of other species including melaleucas and mistletoes.. Mostly nests in small hollows in living, smooth-barked eucalypts.	2 records within 10km (OEH 2014a)	Unlikely. Suitable habitat absent from subject site	Nil
Tyto novaehollandiae	Masked Owl	V		Occurs across NSW except NW corner. Most common on the coast. Inhabits dry eucalypt woodlands from sea level to 1100 m. Roosts and breeds in large (>40cm) hollows and sometime caves in moist eucalypt forested gullies. Hunts along the edges of forests and roadsides. Home range between 500 ha and 1000 ha. Prey mostly terrestrial mammals but arboreal species may also be taken.	26 records within 10km (OEH 2014a)	Unlikely. Suitable forest habitat absent from subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Neophema chrysogaster	Orange-bellied Parrot	CE	CE	Occurs over tropical and subtropical seas and islands around northern NSW. Occasionally seen along coastal NSW, especially after cyclones. Breeds in sand or coral scrapes on offshore islands and cays including Lord Howe and Norfolk Islands.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil
Ninox strenua	Powerful Owl	V		Occurs from the coast to the western slopes. Solitary and sedentary species. Inhabits a range of habitats from woodland and open sclerophyll forest to tall open wet forest and rainforest. Prefers large tracts of vegetation. Nests in large tree hollows (> 0.5 m deep), in large eucalypts (dbh 80-240 cm) that are at least 150 years old. Pairs have high fidelity to a small number of hollow-bearing nest trees and defend a large home range of 400 - 1,450 ha. Forages within open and closed woodlands as well as open areas.	916 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed.
Haematopus longirostris	Pied Oystercatcher	E		Scattered along NSW coast. Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide. Nests mostly on coastal or estuarine beaches; occasionally saltmarsh or grassy areas.	3 records within 10km (OEH 2014a)	Nil. Intertidal flat habitat is absent within subject site	Nil.
Petroica rodinogaster	Pink Robin	V		In NSW occurs mainly in the South Coast and Southern Tablelands regions. It is vagrant in the Sydney and Illawarra areas, with generally only individual birds recorded in these areas. It prefers a dense shrub layer in damp or wet forests or rainforests. It generally breeds in wet gullies. It forages for insects on the ground or in low undergrowth. It may be partly migratory or dispersive in autumn and winter. It is generally seen in pairs, occasionally small flocks.	1 record within 10km, last recorded 1987 (OEH 2014a)	Nil. Damp/wet forest habitat is absent within subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Glossopsitta porphyrocephala	Purple-crowned Lorikeet	V		Found from northern Queensland to the North West Slopes of NSW - extending down to Liverpool Plains and Dubbo. Very rare in southern parts of their range (OEH 2013). Prefers sandy areas, usually close to water in grassy woodlands and plains. Nests on the ground (OEH 2013).	1 record within 10km, last recorded 1990 (OEH 2014a)	Nil. Suitable habitat is absent within subject site	Nil.
Anthochaera phrygia	Regent Honeyeater	E	E	In NSW confined to two known breeding areas: the Capertee Valley and Bundarra-Barraba region. Non-breeding flocks occasionally seen in coastal areas foraging in flowering Spotted Gum and Swamp Mahogany forests, presumably in response to drought. Inhabits dry open forest and woodlands, particularly Box-Ironbark woodland and riparian forests of River Sheoak, with an abundance of mature trees, high canopy cover and abundance of mistletoes.	1 record within 10km, last recorded 1991 (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. Foraging canopy species are absent from subject site	Nil.
Ptilinopus regina	Rose-crowned Fruit-Dove	V		Occurs from Newcastle north to Cape York, with vagrants occasionally as far south as Victoria. Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful. Thought to be locally nomadic in response to fruit availability.	1 record within 10km, last recorded 1982 (OEH 2014a)	Nil. Rainforest habitat is absent within subject site	Nil.
Petroica boodang	Scarlet Robin	V		In NSW occurs from coast to inland slopes. Breeds in drier eucalypt forests and temperate woodlands, often on ridges and slopes, within open understorey of shrubs and grasses and sometimes in open areas. In autumn and winter it migrates to more open habitats such as grassy open woodland or paddocks with scattered trees. Abundant logs and coarse woody debris are important habitat components.	5 records within 10km (OEH 2014a)	Nil. Important component of habitats (logs and woody debris) is absent within subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Tyto tenebricosa	Sooty Owl	V		Occurs in the coastal, escarpment and tablelands regions of NSW. More common in the north and absent from the western tablelands and further west. Inhabits tall, moist eucalypt forests and rainforests, and are strongly associated with sheltered gullies, particularly those with tall rainforest understorey. Roosts in tree hollows, amongst dense foliage in gullies or in caves, recesses or ledges of cliffs or banks. Nest in large (>40cm wide, 100cm deep) tree hollows in unlogged/unburnt gullies within 100m of streams or in caves.	76 records within 10km (OEH 2014a)	Unlikely. Suitable wet forest habitat absent from subject site	Nil.
Haematopus fuliginosus	Sooty Oystercatcher	V		Evenly distributed along NSW coast, including offshore islands. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds almost exclusively on offshore islands, and occasionally on isolated promontories.	2 records within 10km (OEH 2014a)	Nil. Rocky headland and estuary habitat is absent within subject site	Nil.
Chthonicola sagittata	Speckled Warbler	V		Within NSW most frequently reported from the hills and tablelands of the Great Dividing Range, rarely from the coast. Inhabits a wide range of *Eucalyptus*-dominated communities with a grassy understorey, a sparse shrub layer, often on rocky ridges or in gullies. Sedentary and requires large, relatively undisturbed remnants to persist in an area. Forages on the ground for seeds and insects, and nests in a slight hollow in the ground or at the base of a low dense plant.	1 record within 10km (OEH 2014a)	Unlikely. No grassy understorey or undisturbed remnant present within subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Circus assimilis	Spotted Harrier	V		Occurs throughout Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Inhabits grassy open woodland including acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe (e.g. chenopods). Most commonly in native grassland, but also in agricultural land, foraging over open habitats including edges of inland wetlands.	1 record within 10km, last recorded 1985 (OEH 2014a)	Unlikely. No grassy woodland native grassland present within subject site	Nil.
Lophoictinia isura	Square-tailed Kite	V		Occurs across NSW, resident in North, northeast and along west-flowing rivers. Summer breeding migrant to southeast of state. Inhabits a variety of habitats including woodlands and open forests, with preference for timbered watercourses. Favours productive forests on the coastal plain, box-ironbark-gum woodlands on the inland slopes, and Coolibah/River Red Gum on the inland plains. In Sydney area nests in mature living trees within 100m of ephemeral/permanent watercourse. Large home range > 100 km2.	3 records within 10km (OEH 2014a)	Unlikely. Limited foraging habitat present within subject site	Nil.
Ptilinopus superbus	Superb Fruit-Dove	V		Occurs mainly north from NE NSW, much less common further south and largely confined to pockets of habitat south to Moruya. Vagrants occur south to VIC and TAS. Inhabits rainforest and closed forests, may also forage in eucalypt or acacia woodland with fruit-bearing trees. Nests 5-30 m above ground in rainforest/rainforest edge tree and shrub species. Part of the population migratory/nomadic.	1 record within 10km (OEH 2014a)	Nil. Rainforest habitat is absent within subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Lathamus discolor	Swift Parrot	E	E	Migratory, travelling to the mainland from March to October. Breeds in Tasmania from September to January. On the mainland, it mostly occurs in the southeast foraging on winter flowering eucalypts and lerps, with records of the species between Adelaide and Brisbane. Principal over-winter habitat is box-ironbark communities on the inland slopes and plains. *Eucalyptus robusta, Corymbia maculata* and *C. gummifera* dominated coastal forests are also important habitat.	3 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Unlikely. Suitable habitat absent within subject site	Nil.
Daphoenositta chrysoptera	Varied Sittella	V		Sedentary, occurs across NSW from the coast to the far west. Inhabits eucalypt forests and woodlands, especially rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sensitive to habitat isolation and loss of structural complexity, and adversely affected by dominance of Noisy Miners. Cleared agricultural land is potentially a barrier to movement. Builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years.	19 records within 10km (OEH 2014a)	Unlikely. Sensitive to habitat isolation and loss of habitat structural complexity which is present within subject site	Nil.
Mammals							
Petrogale penicillata	Brush-tailed Rock Wallaby	E	V	Occurs from the Shoalhaven north to the Queensland border. Now mostly extinct west of the Great Dividing Range, except in the Warrumbungles and Mt Kaputar. Occurs on rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. Diet consists of vegetation in adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil.

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Cercartetus nanus	Eastern Pygmy-possum	V		Inhabits range of habitats from coastal heath and woodland though open and closed forests, subalpine heath and rainforest (Tulloch and Dickman 1995). Inhabits rainforest, sclerophyll forests and heath. *Banksia* spp. and myrtaceous shrubs and trees are favoured food sources and nesting subject sites in drier habitats. Diet mostly pollen and nectar from *Banksia* spp., *Eucalyptus* spp., *Callistemon* spp. and insects (Ward and Turner 2008). Nests in hollows in trees, under the bark of Eucalypts, forks of tea-trees, abandoned bird nests and *Xanthorrhoea* bases (Ward and Turner 2008, Tulloch and Dickman 2006).	122 records within 10km (OEH 2014a)	Unlikely. Suitable habitat absent within subject site	Nil.
Phascolarctos cinereus	Koala	V	V	Occurs from coast to inland slopes and plains. Restricted to areas of preferred feed trees in eucalypt woodlands and forests. Home range varies depending on habitat quality, from < 2 to several hundred hectares.	80 records within 10km (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Pseudomys novaehollandiae	New Holland Mouse		V	Occurs in disjunct, coastal populations from Tasmania to Queensland. In NSW inhabits a variety of coastal habitats including heathland, woodland, dry sclerophyll forest with a dense shrub layer and vegetated sand dunes (Wilson and Bradtke 1999). Populations may recolonise/ increase in size in regenerating native vegetation after wildfire, clearing and sandmining. Presence strongly correlated with understorey vegetation density, and high floristic diversity in regenerating heath (Lock and Wilson 1999).	76 records within 10km (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Nil. Suitable foraging habitat is absent within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E	Occurs in coastal areas in northern NSW and Queensland. Previously common north of Port Stephens but now uncommon and only known north of Taree. Largest known population is at Port Macquarie. Occurs on coastal dunes.	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Suitable foraging habitat is absent within subject site	Nil
Dasyurus maculatus	Spotted-tailed Quoll	V	E	Inhabits a range of environments including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Den sites are in hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces. Females occupy home ranges of up to 750 ha and males up to 3,500 ha, usually traversed along densely vegetated creek lines.	2 records within 10km (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. Suitable habitat absent within subject site	Nil
Petaurus australis	Yellow-bellied Glider	V		Occurs along the east coast to the western slopes of the Great Dividing Range. Inhabits a variety of forest types but prefers tall mature eucalypt forest with high rainfall and rich soils. Relies on large hollow-bearing trees for shelter and nesting, with family groups of 2-6 typically denning together. In southern NSW its preferred habitat at low altitudes is moist gullies and creek flats in mature coastal forests. Mostly feeds on sap, nectar and honeydew.	1 record within 10km (OEH 2014a)	Unlikely. Absence of suitable foraging habitat due to isolation of canopy habitat within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	Roosts in camps within 20 km of a regular food source, typically in gullies, close to water and in vegetation with a dense canopy. Forages in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths, swamps and street trees, particularly in eucalypts, melaleucas and banksias. Highly mobile with movements largely determined by food availability (Eby and Law 2008). Would also forage in urban gardens and cultivated fruit crops.	96 records within 10km (OEH 2014a); Foraging and species behaviour known to occur within 10km (DotE 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V		Generally occurs east of the Great Dividing Range along NSW coast (Churchill 2008). Inhabits various habitats from open grasslands to woodlands, wet and dry sclerophyll forests and rainforest. Essentially a cave bat but may also roost in road culverts, stormwater tunnels and other man-made structures. Only 4 known maternity caves in NSW, near Wee Jasper, Bungonia, Kempsey and Texas. Females may travel hundreds of kilometres to the nearest maternal colony (Churchill 2008).	26 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V		Occurs on southeast coast and ranges. Prefers tall (>20m) and wet forest with dense understorey. Absent from small remnants, preferring continuous forest but can move through cleared landscapes and may forage in open areas. Roosts in hollow trunks of Eucalypts, underneath bark or in buildings. Forages in gaps and spaces within forest, with large foraging range (12km foraging movements recorded) (Churchill 2008, Law et al 2008).	7 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Mormopterus norfolkensis	Eastern Freetail-bat	V		Occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. Forages in natural and artificial openings in vegetation, typically within a few kilometres of its roost. Roosts primarily in tree hollows but also recorded from man-made structures or under bark (Churchill 2008).	2 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Scoteanax rueppellii	Greater Broad-nosed Bat	V		Occurs on the east coast and Great Dividing Range. Inhabits a variety of habitats from woodland to wet and dry sclerophyll forests and rainforest, also remnant paddock trees and timber-lined creeks, typically below 500m asl. Forages in relatively uncluttered areas, using natural or man-made openings in denser habitats. Usually roosts in tree hollows or fissures but also under exfoliating bark or in the roofs of old buildings. Females congregate in maternal roosts in suitable hollow trees (Hoye and Richards 2008, Churchill 2008).	6 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Chalinolobus dwyeri	Large-eared Pied Bat	V	V	Occurs from the coast to the western slopes of the divide. Largest numbers of records from sandstone escarpment country in the Sydney Basin and Hunter Valley (Hoye and Schulz 2008). Roosts in caves and mines and most commonly recorded from dry sclerophyll forests and woodlands. An insectivorous species that flies over the canopy or along creek beds (Churchill 2008). In southern Sydney appears to be largely restricted to the interface between sandstone escarpments and fertile valleys.	12 records within 10km (OEH 2014a); Species or species' habitat known to occur within 10km (DotE 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Myotis macropus	Large-footed Myotis	V		Mainly coastal but may occur inland along large river systems. Usually associated with permanent waterways at low elevations in flat/undulating country, usually in vegetated areas. Forages over streams and watercourses feeding on fish and insects from the water surface. Roosts in a variety of habitats including caves, mine shafts, hollow-bearing trees, stormwater channels, buildings, under bridges and in dense foliage, typically in close proximity to water (Campbell 2011). Breeds November or December (Churchill 2008)	25 records within 10km (OEH 2014a)	Nil. Waterway foraging habitat is absent within subject site	Nil
Miniopterus australis	Little Bentwing-bat	V		Occurs from Cape York to Sydney. Inhabits rainforests, wet and dry sclerophyll forests, paperbark swamps and vine thickets. Only one maternity cave known in NSW, shared with Eastern Bentwing-bats at Willi Willi, near Kempsey. Outside breeding season roosts in caves, tunnels and mines and has been recorded in a tree hollow on one occasion. Forages for insects beneath the canopy of well-timbered habitats (Churchill 2008, Hoye and Hall 2008).	5 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V		Migrates from tropics to SE Aus in summer. Forages across a range of habitats including those with and without trees, from wet and dry sclerophyll forest, open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts communally in large tree hollows and buildings (Churchill 2008).	2 records within 10km (OEH 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed
Reptiles							

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Hoplocephalus bungaroides	Broad-headed Snake	E	V	Nocturnal, sheltering in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter, and spring, moving to shelters in hollows of large trees within 200m of escarpments in summer. Feeds mostly on geckos and small skinks, and occasionally on frogs and small mammals.	51 records within 10km (OEH 2014a) ; Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Suitable sandstone habitat absent from subject site	Nil
Varanus rosenbergi	Rosenberg's Goanna	V		In NSW mainly occurs on the mid coast region from Wollemi NP to Nowra; the ACT and Goulburn regions and the South-west Slopes. Inhabits coastal heathlands, wet and dry sclerophyll forests, woodlands and mallee communities. Termite mounds are an important habitat feature: eggs are laid in the mounds in summer and incubate till spring, when the young dig themselves out. Young may return to the mound as a refuge for some months, while adults shelter in burrows dug under rocks or logs, or in rock crevices, hollow logs or even rabbit burrows (Sass 2008).	27 records within 10km (OEH 2014a)	Unlikely. Important habitat features (termite mounds) are absent within subject site	Nil
Frogs							
Litoria aurea	Green and Golden Bell Frog	E	V	Formerly occurred from Brunswick Heads to Victoria, but >80% populations now extinct. Inhabits marshes, natural and artificial freshwater to brackish wetlands, dams and in stream wetlands. Prefers sites containing cumbungi (Typha spp.) or spike rushes (Eleocharis spp.), which are unshaded and have a grassy area and/or rubble as shelter/refuge habitat nearby. Gambusia holbrooki is a key threat as they feed on green and Golden Bell Frog eggs and tadpoles.	1 record within 10km, last recorded 1980 (OEH 2014a); Species or species' habitat may occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Heleioporus australiacus	Giant Burrowing Frog	V	V	Occurs along the coast and eastern slopes of the Great Dividing Range south from Wollemi National Park. Appears to exist as 2 populations with a 100km gap in records between Jervis Bay and Eden. Northern population occurs on sandy soils supporting heath, woodland or open forest. Breeds in ephemeral to intermittent streams with persistent pools. Only infrequently moves to breeding sites, most commonly found on ridges away from creeks, several hundred metres from water.	54 records within 10km (OEH 2014a); Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil
Litoria littlejohni	Littlejohns Tree Frog	V	V	Occurs on plateaus and eastern slopes of the Great Dividing Range south from Watagan State Forest. Occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops, hunting either in shrubs or on the ground.	Species or species' habitat may occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil
Pseudophryne australis	Red-crowned Toadlet	V		Restricted to Sydney Basin, from Nowra to Pokolbin and west to Mt Victoria. Inhabits heathland and open woodland on Hawkesbury and Narrabeen Sandstones, within 100m of ridgelines. Breeds in ephemeral feeder creeks or flooded depressions, requiring unpolluted water between 5.5 and 6.5 pH. Shelters under rocks, amongst masses of dense vegetation or leaf litter. Populations restricted to immediate vicinity of breeding areas.	92 records within 10km (OEH 2014a)	Nil. Suitable habitat is absent within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence within subject site	Likelihood of impact
Mixophyes balbus	Stuttering Frog	E	V	Occurs along the east coast of Australia. Has undergone a massive range reduction particularly in the south of its range: within the Sydney Basin, White (2008a) located only 3 populations south of Sydney (Macquarie Pass and Mt Werong) and Daly et al. (2002, in White 2008a) found only 2 extant populations between Macquarie Pass and Victoria. Inhabits rainforest and wet, tall, open forest. Shelter in deep leaf litter and thick understorey vegetation on the forest floor. Feeds on insects and smaller frogs, breeding in streams during summer after heavy rain. The species does not occur in areas where the riparian vegetation has been disturbed or where there have been significant upstream human impacts (Mahony et al 1997).	Species or species' habitat likely to occur within 10km (DotE 2014a)	Nil. Suitable habitat is absent within subject site	Nil
Invertebrates							
Meridolum corneovirens	Cumberland Plain Land Snail	E		Occurs within a small area of the Cumberland Plain, from Richmond and Windsor to Picton. Found primarily under litter of bark, leaves and logs, or in loose soil around grass clumps within Cumberland Plain Woodland. Has also been found under rubbish. Feeds on fungus. During periods of drought can burrow into the soil to escape the dry conditions.	1 record within 10km (OEH 2014a)	Nil. Suitable habitat is absent within subject site	Nil

Notes: Pelagic birds, fish, sharks and turtles have been excluded.

Likelihood of occurrence for migratory fauna to occur in the subject site

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence in the subject site	Likelihood of impact
Haliaeetus leucogaster	White-bellied Sea-eagle		Migratory	Primarily coastal but may extend inland over major river systems. Breeds close to water, mainly in tall open forest/woodland but also in dense forest, rainforest, closed scrub or remnant trees. Usually forages over large expanses of open water, but also over open terrestrial habitats (e.g. grasslands).	Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. No suitable habitat present within subject site	Nil
Hirundapus caudacutus	White-throated Needletail		Migratory	Recorded along NSW coast to the western slopes and occasionally from the inland plains. Breeds in northern hemisphere. Almost exclusively aerial while in Australia. Occur above most habitat types, but are more frequently recorded above more densely vegetated habitats (rainforest, open forest and heathland) than over woodland or treeless areas.	Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. No suitable habitat present within subject site	Nil
Merops ornatus	Rainbow Bee-eater		Migratory	Distributed across much of mainland Australia, and several near-shore islands. Occurs in a range of habitats, including open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia Nests are made in burrows in sandy banks.	Species or species' habitat may occur within 10km (DotE 2014a)	Unlikely. No suitable habitat present within subject site	Nil

Scientific name	Common name	TSC Status	EPBC Status	Habitat description	Source	Likelihood of occurrence in the subject site	Likelihood of impact
Monarcha melanopsis	Black-faced Monarch		Migratory	Found along the coast of eastern Australia, becoming less common further south. Found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. Resident in the north of its range, but is a summer breeding migrant to coastal south-eastern Australia, arriving in September and returning northwards in March. It may also migrate to Papua New Guinea in autumn and winter.	Species or species' habitat known to occur within 10km (DotE 2014a)	Unlikely. Limited suitable habitat present within subject site	Nil
Myiagra cyanoleuca	Satin Flycatcher		Migratory	In NSW widespread on and east of the Great Divide, sparsely scattered on the western slopes, very occasional records on the western plains. Inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, often near wetlands and watercourses. On migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests. Generally not in rainforests.	Breeding known to occur within 10km (DotE 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed.
Rhipidura rufifrons	Rufous Fantail		Migratory	Occurs in coastal and near coastal districts of northern and eastern Australia. The species mainly inhabits wet sclerophyll forests, often in gullies dominated and usually with a dense shrubby understorey, often including ferns. They also occur in subtropical and temperate rainforests. They occasionally occur in secondary regrowth, following logging or disturbance in forests or rainforests. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, often with a shrubby or heath understorey.	Species or species' habitat known to occur within 10km (DotE 2014a)	Possible. Limited foraging habitat present within subject site	Low. Negligible area of potential foraging habitat would be removed.

Appendix B – Trees assessed within the subject site

Trees assessed within the subject site

Tree No	Species	Common Name	Height (m)	Spread (m)	DBH (m)	Age Class	Health	Structure	SULE **	TPZ radius (m)	Comments
1	Dead										Remove if required
2	*Eucalyptus crebra*	Narrow-leaved Ironbark	12	5	0.39	M	M	F	3A	4.5	Extreme bias to west. Retain
3	*Pittosporum undulatum*	Brush Daphne	5	3	0.11	EM	G	G	2A	2	Portion of SRZ be affected by excavation for path. Remove, if it appears that more than 10% of their TPZ would be affected by proposed works.
4	*Acacia decurrens*	Early Green wattle	6	3	0.12	M	G	G	3A	2	Short-lived species. Remove, if it appears that more than 10% of their TPZ would be affected by proposed works.
5	*Eucalyptus pilularis*	Blackbutt	14	4	0.27	EM	G	G	1A	3.5	Portion of SRZ be affected by excavation for path. Retain if possible
6	*Eucalyptus saligna/E. botryoides* hybrid	Bluegum hybrid	16	4	0.28	M	G	G	1A	3.5	Retain
7	*Allocasuarina littoralis*	Black Oak	4	5	0.13	M	G	M	2A	2	Appears to have been trimmed to restrict growth towards wires. Retain.
8	*Eucalyptus tereticornis*	Forest Redgum	18	6	0.57	M	G	G	1A	7	Seedlings have self-recruited within patch. Retain
9	*Eucalyptus botryoides*	Bangalay	22	6	0.61	M	M	M	2A	7	Restricted platform and SRZ. Removal required

Tree No	Species	Common Name	Height (m)	Spread (m)	DBH (m)	Age Class	Health	Structure	SULE **	TPZ radius (m)	Comments
10	*Eucalyptus botryoides*	Bangalay	21	6	0.52	M	M	M	2A	7	Restricted platform and SRZ. Removal required
11	*Eucalyptus botryoides*	Bangalay	21	7	0.51	M	M	M	2A	7	Restricted platform and SRZ. Removal required
12	*Eucalyptus saligna x botryoides hybrid*	Bluegum Hybrid	13	3	0.14	EM	M	M	2A	2	Suppressed growth. Removal required
13	*Eucalyptus saligna x botryoides hybrid*	Bluegum Hybrid	12	4	3 x 0.20	EM (regrowth)	M	F	3A	3	Unstable lignotuberous regrowth. Removal required
14	*Eucalyptus botryoides*	Bangalay	21	6	0.56	M	M	M	2A	7	Small hollow present. Removal required
15	**Eucalyptus microcorys*	Tallowwood	22	8	0.48	M	G	G	1A	6	Retain if possible
16	**Eucalyptus microcorys*	Tallowwood	21	7	0.45	M	G	G	1A	6	Retain if possible
17	**Eucalyptus microcorys*	Tallowwood	19	6	0.35	M	M	G	1A	5	Removal required
18	*Eucalyptus pilularis*	Blackbutt	13	3	0.13	EM	M	G	1A	2	Etiolated growth. Retain

LEGEND:

*Tree species not indigenous to Sutherland Shire LGA
*** See SULE and SRIV Matrices in Appendix B.*

1. Age Class: EM=early mature, M=mature, OM=Over-mature

2. Health: G=good, M=moderate, F=fair

3. Structure: G=good, M=moderate, F=fair

Appendix C – Safe Useful Life Expectancy (SULE) and Sustainable Retention Index value (SRIV) Matrices

Safe Useful Life Expectancy

The SULE value generated by the below matrix gives an indication of the time a tree is expected to be usefully retained: Adapted from Barrell (2001).

	1 Long SULE	2 Medium SULE	3 Short SULE	4 Removal	5 Move or Replace
A	Trees that appear to be retainable at the time of assessment for >40 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees that appear to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees that appear to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees which should be removed within the next 5 years.	Trees which can be readily moved or replaced.
B	Structurally sound trees located in positions that can accommodate for future growth.	Trees that may only live for 15-40 years.	Trees that may only live for another 5-15 years.	Dead, dying, suppressed or declining trees.	Small trees <5 (m) in height.
C	Trees that could be made suitable for retention in the long term by remedial tree care.	Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.	Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.	Dangerous trees because of instability or loss of adjacent trees.	Young trees less than 15 years old but over 5m in height.
D	Trees of special significance that would warrant extraordinary efforts to secure their long term retention.	Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide for new planting.	Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.	Dangerous trees because of structural defects.	
E		Trees that could be made suitable for retention in the medium term by remedial tree care.	Trees that require substantial remedial tree care and are only suitable for retention in the short term.	Damaged trees not safe to retain.	
F				Trees that could live for more than 5 years but may be removed to prevent interference with more	

	1 Long SULE	2 Medium SULE	3 Short SULE	4 Removal	5 Move or Replace
				suitable individuals or to provide for a new planting.	
G				Trees that are damaging or may cause damage to existing structures within 5 years.	

www.ghd.com

GHD

133 Castlereagh St Sydney NSW 2000

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T: +61 2 9239 7100 F: +61 2 9239 7199 E: sydmail@ghd.com.au

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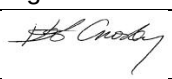
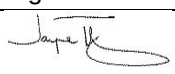
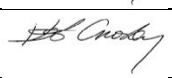
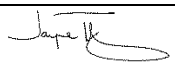
0	G. Leonard M. Weerakoon	K. Crosby		J. Tipping		04/11/14
1	M. Weerakoon	K. Crosby		J. Tipping		3/12/14