TRANSPORT FOR NSW

WARRAWEE STATION UPGRADE

BIODIVERSITY ASSESSMENT REPORT

MARCH 2019

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Warrawee Station Upgrade
Biodiversity Assessment Report

Transport for NSW

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GLOSSARY

*	Denotes exotic species
BAM	Biodiversity Assessment Methodology 2017 that supports the *Biodiversity Conservation Act 2016* (BC Act).
Biodiversity	The biological diversity of life is commonly regarded as being made up of the following three components: — Genetic diversity — the variety of genes (or units of heredity) in any population. — Species diversity — the variety of species. — Ecosystem diversity — the variety of communities or ecosystems.
Bioregion (region)	A bioregion defined in a national system of bioregionalisation. The site is in the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).
Candidate species	Species assessed as having a moderate to high likelihood of occurrence within the study area.
Critical habitat	The whole or any part or parts of an area or areas of land comprising the habitat of an Endangered species, an Endangered population or an Endangered Ecological Community that is critical to the survival of the species, population or ecological community (Department of Environment and Conservation 2004). Critical habitat is listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) with the Secretary (Department of the Environment and Energy) maintaining a register of this habitat. Capitalisation of the term 'Critical Habitat' in this report refers to the habitat listed specifically under Commonwealth legislation.
Cryptic species	An inconspicuous species which can be difficult to identify
Department of Environment and Energy	The department develops and implements national policy, programs and legislation to protect and conserve Australia's natural environment and cultural heritage and administers the EPBC Act. The Commonwealth Department of the Environment was previously known as: — Department of Sustainability, Environment, Water, Population and Communities (SEWPAC) — Department of the Environment, Water, Heritage and the Arts (DEWHA). — Department of Environment and Heritage (DEH). — Department of the Environment and Water Resources (DEWR).
Ecological community	An assemblage of species occupying a particular area.
Environmental weed	Any plant that is not native to a local area that has invaded native vegetation.
Exotic	Introduced from outside the area (Stralberg, Jongsomjit et al. 2009). Used in the context of this report to refer to species introduced from overseas.
GPS	Global Positioning System – a navigational tool which uses radio receivers to pick up signals from four or more special satellites to provide precise determination of location.

Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic components.
High Threat Weed	Vascular plants not native to Australia that if not controlled will invade and outcompete native species. A list of high threat weeds is available as part of the BAM Calculator (https://www.lmbc.nsw.gov.au/bamcalc)
Indigenous	Native to the area: not introduced (Stralberg, Jongsomjit et al. 2009).
Introduced	Not native to the area: not indigenous (Stralberg, Jongsomjit et al. 2009). Refers to both exotic and non-indigenous Australian native species of plants and animals.
Key threatening processes	A process that threatens, or could threaten, the survival, abundance or evolutionary development of native species, populations or ecological communities (Department of Environment and Conservation 2004). Key threatening processes are listed under the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act) and the EPBC Act. Capitalisation of the term 'Key Threatening Processes' in this report refers to those processes listed specifically under the relevant state and Commonwealth legislation.
Likely	Taken to be a real chance or possibility (Department of Environment and Conservation 2004).
Local population	The population that occurs within the site, unless the existence of contiguous or proximal occupied habitat and the movement of individuals or exchange of genetic material across the boundary can be demonstrated as defined by Department of Environment and Climate Change (2007).
Locality	The area within a 10 kilometre radius of the study area.
Migratory species	Species listed as Migratory under the EPBC Act relating to international agreements to which Australia is a signatory. These include Japan-Australia Migratory Bird Agreement, China-Australia Migratory Bird Agreement, Republic of Korea-Australia Migratory Bird Agreement and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Capitalisation of the term 'Migratory' in this report refers to those species listed as Migratory under the EPBC Act.
NSW	New South Wales
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.
Priorities action statements (PAS)	Priorities action statements outline the broad strategies and detailed priority actions to be undertaken in NSW to promote the recovery of Threatened species, population and ecological communities and manage key threatening processes (Department of Environment and Climate Change 2007).
Priority Weeds	An introduced species listed under the *Biosecurity Act 2015*. Under the Act, priority weeds have specific control measures for each region.
Proposal	The proposed works as described in detail in Section 1.2.

Protected species	Those species defined as protected under the *National Parks and Wildlife Act 1974*. Includes all native animals, as well as all native plants listed on Schedule 13 of the *National Parks and Wildlife Act 1974* (repealed).
Region	A bioregion defined in a national system of bioregionalisation. The Proposal is located within the Sydney Basin Bioregion as defined in the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995).
Significant	Important, weighty or more than ordinary
Species richness	Species richness is simply the number of species present in a sample, community, or taxonomic group. Species richness is one component of the concept of species diversity, which also incorporates evenness, that is, the relative abundance of species (Matteson and Langellotto 2010).
Threatened biodiversity	Threatened species, populations or ecological communities as listed under the BC Act, FM Act or the EPBC Act.
Threatened species, populations and ecological communities	Species, populations and ecological communities listed as Vulnerable, Endangered or Critically Endangered (collectively referred to as threatened) under the TSC Act, FM Act or the EPBC Act. Capitalisation of the terms 'Vulnerable', 'Endangered' or 'Critically Endangered' in this report refers to listing under the relevant state and/or Commonwealth legislation.
Viable local population	A population that has the capacity to live, develop and reproduce under normal conditions, unless the contrary can be conclusively demonstrated through analysis of records and references (Department of Environment and Climate Change 2007).
Weed	A plant growing out of place or where it is not wanted: often characterised by high seed production and the ability to colonise disturbed ground quickly (Stralberg, Jongsomjit et al. 2009). Weeds include both exotic and Australian native species of plant naturalised outside of their natural range.

ABBREVIATIONS

BAM	Biodiversity Assessment Methodology (2017)
BC Act	NSW *Biodiversity Conservation Act 2016*
CAMBA	China Australia Migratory Bird Agreement
EEC	Endangered Ecological Community
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
FM Act	NSW *Fisheries Management Act 1994*
HA	Hectares
JAMBA	Japan Australia Migratory Bird Agreement
LEP	Local Environmental Plan
MENS	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
RoKAMBA	Republic of Korea Australia Migratory Bird Agreement
TSC Act	NSW *Threatened Species Conservation Act 1995.*

1 PROPOSAL BACKGROUND

1.1 PURPOSE OF THIS REPORT

Transport for NSW (TfNSW) has identified the need to undertake a Biodiversity Assessment Report to inform the Review Environmental Factors (REF) for the Warrawee Station Upgrade (the Proposal).

This Biodiversity Assessment Report has been prepared to test if the proposed activity is likely to significantly affect threatened species in accordance with Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act). This report will also determine if a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) must accompany the environmental assessment (REF) under Part 5 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The key aims of this Biodiversity Assessment Report are to:

- present the results of desk-based and field-based investigations on biodiversity values within the study area
- provide a description of the biodiversity values and conservation significance within the study area
- undertake an evaluation of any impacts associated with the proposal (in the study area) including associated works implementing vegetation management actions
- undertake assessments of significance within the study area (five-part tests) as prescribed under Section 7.3 of the BC Act
- determine if a Species Impact Statement or Biodiversity Development Assessment must accompany the environmental assessment under Section 7.8 of the BC Act
- recommend relevant mitigation and management measures to minimise any impacts on biodiversity values within the study area.

1.2 LOCATION OF THE PROPOSAL

Warrawee Station is located on the North Shore line (T1 service), about 22 kilometres by rail from Central Station. It is within the Ku-ring-gai local government area (LGA) in Sydney's north. The suburb of Warrawee consists of predominantly low density residential housing with no commercial activity surrounding the station.

The Proposal study area is generally bounded by Warrawee Avenue to the east and Heydon Avenue to the west as well as low density residential properties. Knox Grammar School is located approximately 50 metres to the west.

The Proposal is mostly located within the station itself, and a small section of kerb, footpath and road on Warrawee Avenue and Heydon Avenue.

The location of the Proposal in the regional context is shown in Figure 1.1.

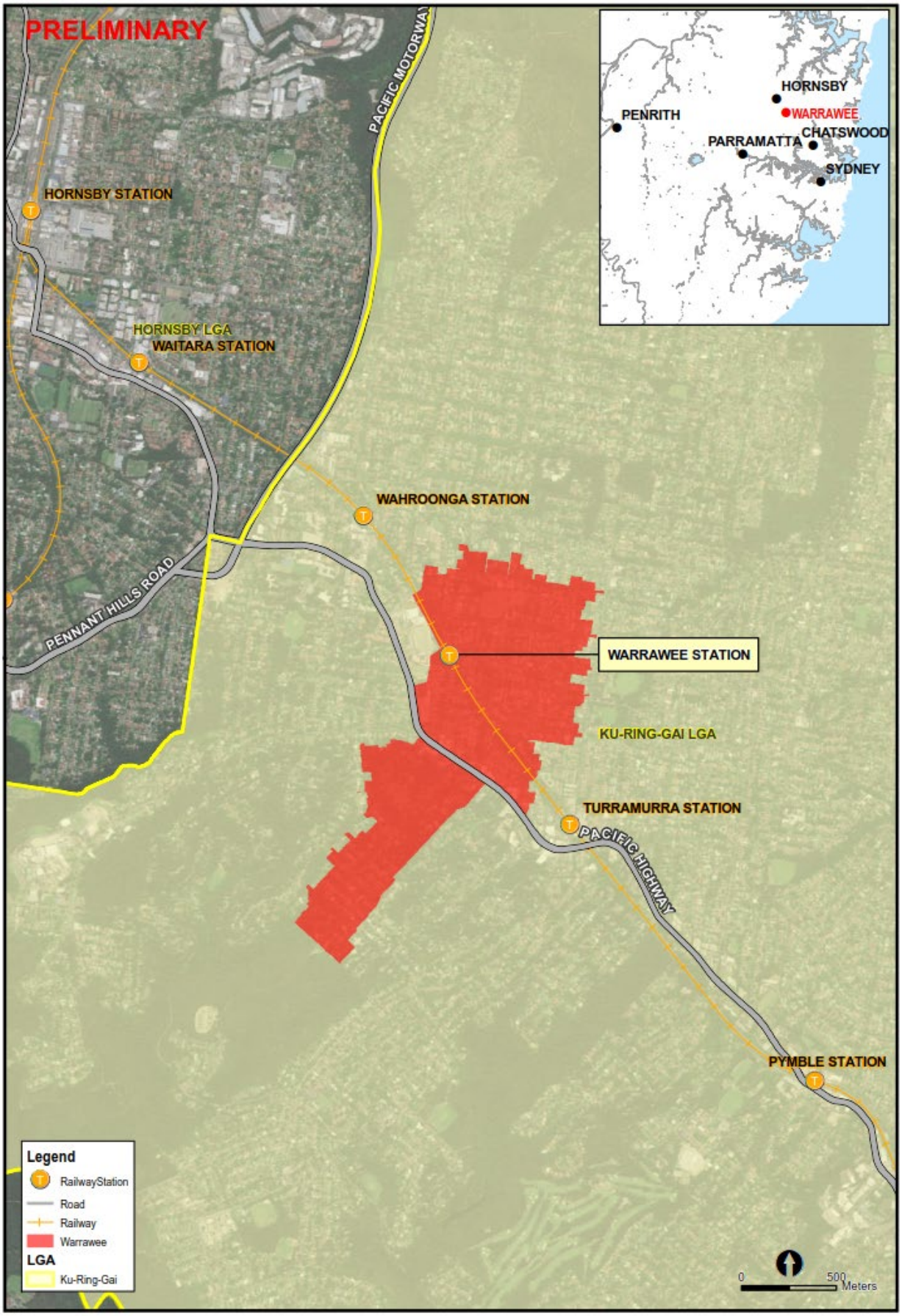

Figure 1.1 Location of the Proposal

1.3 DESCRIPTION OF THE PROPOSAL

The Proposal involves an upgrade of Warrawee Station as part of the Transport Access Program which would improve accessibility and amenities for customers.

The Proposal would include the following key elements:

- construction of a new lift and landing to provide access between the existing pedestrian bridge and the platforms
- upgrade of the existing stairs to include new compliant handrails, TGSIs and nosing
- construction of a new platform canopy from the lift to the existing canopy
- internal station building works including:
  - reconfiguration of the existing male and female toilets within the station building to accommodate:
    - a new family accessible toilet
    - a new unisex ambulant toilet
  - other minor building modifications required to accommodate new electrical equipment including a main switchboard, and new or upgraded station communications equipment
- parking, kiss and ride, and pedestrian works including:
  - provision of two new accessible car parking spaces along Heydon Avenue
  - provision of three new kiss and ride bays along Warrawee Avenue
  - construction of a widened footpath and associated kerb works at both the Heydon Avenue and Warrawee Avenue entrances
  - removal of existing bollards and replacement of a single bollard at the Warrawee Avenue entrance
- upgrade of the existing platform surfaces (re-grading/re-surfacing) at locations across platforms to provide compliant accessible paths and ramps to station amenities
- landscaping/planting within the station precinct
- ancillary works including adjustments to lighting, electrical upgrades, electronic ticketing, relocation or replacement of existing customer facilities (drinking fountain, vending machine, seating and telephone booth), improvement to station communications systems (including CCTV cameras), hearing loops, wayfinding signage and installation of yellow lines and tactile ground surface indicators along the platform edges (TGSIs).

Subject to approval, construction is expected to commence in mid to late-2019 and take around 12 months to complete.

Figure 1.2 shows the general layout of key elements for the Proposal.

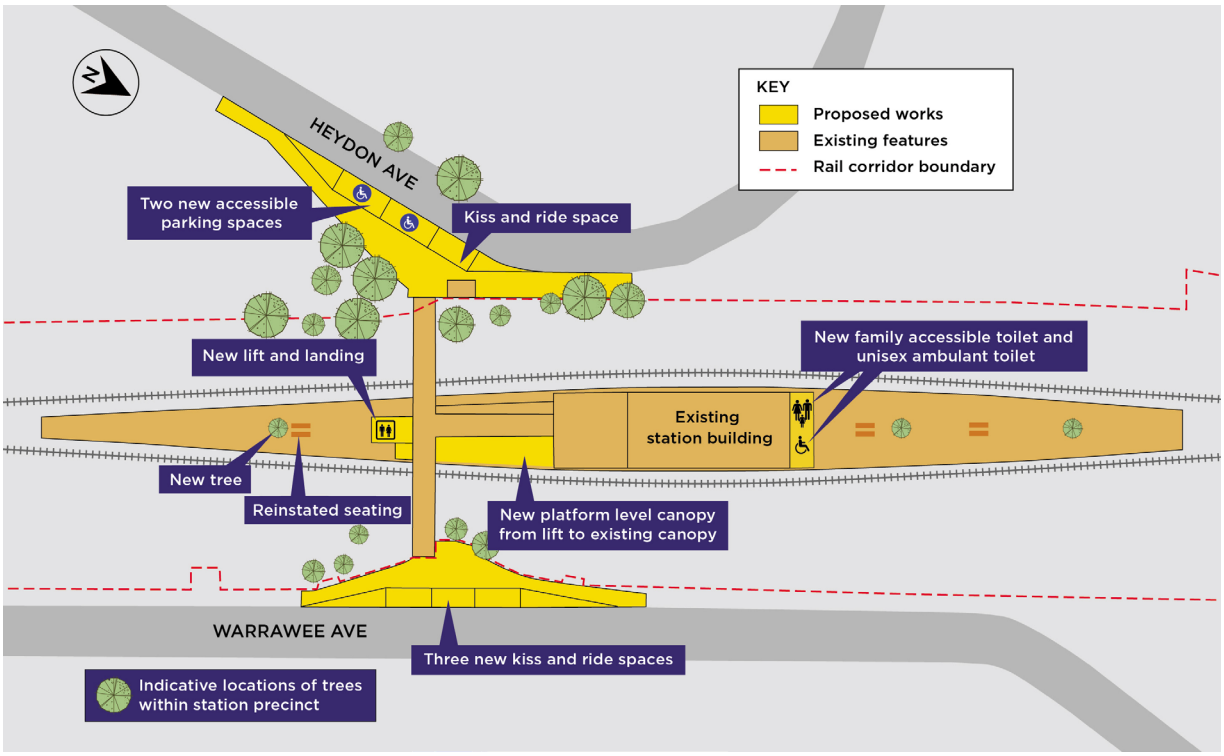

Figure 1.2 Overview of proposed upgrades

2 LEGISLATIVE CONTEXT

Local Government, State and Commonwealth legislation and planning controls relevant to the protection of biodiversity and this Proposal are outlined briefly in this section. These statutory instruments provide conditions, matters for consideration and requirements to seek authorisation (licenses and approvals) to undertake various actions and activities.

2.1 STATE LEGISLATION

2.1.1 BIODIVERSITY CONSERVATION ACT 2016

The NSW BC Act came into effect on the 25 August 2017. This Act repealed the *Threatened Species and Conservation Act 1995* (TSC Act), *Native Vegetation Act 2003* and parts of the *National Parks and Wildlife Act 1974*. All threatened entities previously listed under the TSC Act have now been listed under the schedules of the BC Act.

The BC Act outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme. The Biodiversity Offsets Scheme creates a transparent, consistent and scientifically based approach to biodiversity assessment and offsetting for all types of development that are likely to have a significant impact on biodiversity (Office of Environment and Heritage 2017).

2.2 COMMONWEALTH LEGISLATION

2.2.1 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

Under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), any action that has, would have, or is likely to have a significant impact on a Matter of National Environmental Significance (MNES) or on Commonwealth land, triggers the Act and may require assessment and approval from the Commonwealth Minister for the Environment.

The nine matters of national environmental significance protected under the EPBC Act are:

- listed threatened species and ecological communities
- listed migratory species
- wetlands of international importance (listed under the Ramsar Convention)
- commonwealth marine areas
- world heritage properties
- national heritage places
- the Great Barrier Reef Marine Park
- nuclear actions (including uranium mines)
- a water resource, in relation to coal seam gas development and large coal mining development.

3 METHODOLOGY

3.1 DEFINITIONS

For this report the following definitions apply:

- study area: defined as the area in which the Proposal is to occur
- Proposal locality: is a 10-kilometre radius from the study area.
- bioregion: for this study, the bioregion is the Sydney Basin as defined in the Interim Biogeographic Regionalisation for Australia (Thackway and Cresswell 1995).

All other definitions are provided in the glossary at the start of this document. The Proposal locality and study area are shown in Figure 1.1.

3.2 PERSONNEL

The contributors to the preparation of this report, their qualifications and roles are listed in Table 3.1.

Table 3.1 Contributors and their roles

NAME	QUALIFICATION	ROLE
Troy Jennings	Bachelor of Biodiversity and Conservation Masters of Wildlife Management	Ecologist – report preparation
Mark Stables	Bachelor of Science (Hons) BAM accredited assessor	Principal Ecologist – survey and report preparation.
Alex Cockerill	Bachelor of Science (Hons) BAM accredited assessor	Ecology National Team Executive – Technical review
Jarryd Barton	Bachelor of Planning (Hons) Certified Environmental Practitioner (CEnvP)	Quality control and review

All work was carried out under the appropriate licences, including a scientific licence as required under Part 2 of the NSW BC Act (License Number: SL100630), and an Animal Research Authority issued by the Department of Primary Industries (Agriculture).

3.3 NOMENCLATURE

Names of vegetation communities used in this report are based on the Plant Community Types (PCTs) used in the BioNet Vegetation Classification (Office of Environment & Heritage 2018).

These names are cross-referenced with those used for threatened ecological communities listed under the BC Act and/or the EPBC Act. They are also cross-referenced with existing vegetation mapping using dominant species and structure of the communities in Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands (Tozer, Turner et al. 2010).

Names of plants used in this document follow PlantNet Royal Botanic Gardens (Royal Botanic Gardens 2018) for recent taxonomic changes. Scientific names are used in this report for species of plant. Scientific and common names (where available) are provided in plant lists in appendices. The names of introduced species are denoted with an asterisk (*).

For threatened species of plants, the names used in the OEH Threatened Species Website (Office of Environment & Heritage 2019c) are also provided in the tabulated data in appendices where these differ from the names used by PlantNet database.

Names of vertebrate fauna follow the Australian Faunal Directory maintained by the Department of the Environment (Department of Environment and Energy 2019). Common names are used in the report for species of animal. Scientific names are included in species lists found in appendices.

3.4 DESKTOP ASSESSMENT

A desktop study was conducted to identify:

- the likely distribution of vegetation communities, based on previous mapping and aerial photograph interpretation, for targeted field verification
- a list of threatened species and populations of plants to consider during vegetation surveys and habitat assessment
- a list of threatened species and populations of animals and migratory animals to consider during field-based habitat assessment
- local landscape-scale features of potential significance to biodiversity; e.g. riparian zones and potential wildlife movement corridors
- evaluate baseline information and determine whether additional surveys, mapping and reporting is required to progress to a rezoning application.

The desktop study included analysis of the following information sources:

- topographic map and aerial photographs
- priority weeds in the Greater Sydney region (Department of Primary Industries 2019)
- previous vegetation mapping, ecological studies and other relevant studies of the study area:- Warrawee Station
- Scoping design report (Stantec, 2018)
- *The Native Vegetation of the Sydney Metropolitan Area* (Office of Environment and Heritage 2016).
- *Native vegetation of Southeast NSW: A Revised Classification and Map for the Coast and Eastern Tablelands* (Tozer, Turner et al. 2010).

In addition to the literature listed above database searches of threatened species, populations and communities were conducted in the locality and are summarised below in Table 3.2.

Table 3.2 Database searches

DATABASE	SEARCH DATE	AREA SEARCHES	REFERENCE
PlantNet Database	07/01/19	10 km radius centred on the study area	(Royal Botanic Gardens 2018)
OEH BioNet Atlas of NSW Wildlife	07/01/19	10 km x 10 km centred on the study area	(Office of Environment & Heritage 2018)
EPBC Protected Matters Search Tool	07/01/19	10 km x 10 km centred on the study area	(Department of the Environment and Energy 2018)
NSW Department of Primary Industries (Fishing and Aquaculture) threatened Aquatic Fauna Database	07/01/19	Relevant catchment (Sydney Metro)	(Department of Primary Industries 2018)

3.4.1 DESKTOP ANALYSIS OF VEGETATION

Preliminary mapping of vegetation community boundaries was undertaken through analysis of existing vegetation mapping and aerial photograph interpretation. Analysis of the aerial photographs was used to identify areas of disturbance (e.g. buildings, vehicle tracks, dams and power lines), vegetation structure and likely native versus exotic species composition throughout the study area. This provided an initial definition of vegetation communities into simple structural and disturbance classifications for verification during field surveys.

3.5 FIELD SURVEY

A field survey was undertaken on the 10 January 2019 by Principal ecologist, Mark Stables. This survey sought primarily to assess the extent and condition of vegetation and fauna habitat, especially for threatened species and ecological communities. The vegetation inspection was used to identify variations in vegetation condition that were not apparent in existing vegetation mapping and refine vegetation community boundaries.

The field surveys undertaken are described in sections 3.5.1 to section 3.7.

3.5.1 FLORA SURVEY

The floristic diversity and possible presence of threatened species was assessed undertaking a random meander survey (Cropper 1993).

3.5.1.1 FIELD VERIFICATION OF EXISTING VEGETATION

Vegetation within the study area and locality has been mapped at the regional scale in '*Native vegetation of the Southeast NSW: Revised Classification and Map for the Coast and Eastern Tablelands'* (Tozer, Turner et al. 2010).

Data on geology, dominant canopy species, native diversity, vegetation structure and condition was collected across the study area to validate and refine this existing vegetation classification to determine their associated PCT in accordance with the BioNet Vegetation Classification (Office of Environment and Heritage 2017).

3.5.1.2 MAPPING OF VEGETATION ZONES

Field validation (ground-truthing) of the existing vegetation classifications undertaken by regional vegetation mapping and previous ecological surveys of the study area was completed to confirm the vegetation structure, dominant canopy species, native diversity, condition and presence of threatened ecological communities. This was based on floristic sampling and vegetation integrity plots as described below.

Vegetation zones and conditions were identified and mapped following the Biodiversity Assessment Method (BAM) (Office of Environment & Heritage 2017). This was based on field verification of the PCT, class and formation as outlined in BioNet Vegetation Classification (Office for Environment & Heritage 2018).

3.5.1.3 RANDOM MEANDER SURVEYS

Random meander surveys are a variation of the transect type survey and were completed in accordance with the technique described by Cropper (1993), whereby the recorder walks in a random meander throughout the study area recording dominant and key plant species (e.g. threatened species, priority weeds), boundaries between various vegetation communities and condition of vegetation. The time spent in each vegetation community was generally proportional to the size of the community and its species richness.

3.5.2 FAUNA SURVEY

3.5.2.1 FAUNA HABITAT ASSESSMENT

Fauna habitat assessments were undertaken to assess the likelihood of threatened species of animal (those species known or predicted to occur within the locality from the literature and database review) occurring within the study area. Fauna habitat assessments were the primary assessment tool in assessing whether a threatened species is likely to occur within the study area.

Fauna habitat characteristics assessed included:

- structure and floristics of the canopy, understorey and ground vegetation, including the presence of flowering and fruiting trees providing potential foraging resources
- presence of hollow-bearing trees providing roosting and breeding habitat for arboreal mammals, birds and reptiles
- presence of the ground cover vegetation, leaf litter, rock outcrops and fallen timber and potential to provide protection for ground-dwelling mammals, reptiles and amphibians
- presence of waterways (ephemeral or permanent) and water bodies.

The following criteria were used to evaluate the condition of habitat values:

- **Good**: A full range of fauna habitat components are usually present (for example, old growth trees, fallen timber, feeding and roosting resources) and habitat linkages to other remnant ecosystems in the landscape are intact
- **Moderate**: Some fauna habitat components are missing or greatly reduced (for example, old-growth trees and fallen timber), although linkages with other remnant habitats in the landscape are usually intact, but sometimes degraded
- **Poor**: Many fauna habitat elements in low quality remnants have been lost, including old growth trees (for example, due to past timber harvesting or land clearing) and fallen timber, and tree canopies are often highly fragmented. Habitat linkages with other remnant ecosystems in the landscape have usually been severely compromised by extensive clearing in the past.

3.5.2.2 OPPORTUNISTIC RECORDING

Opportunistic sightings of animals were recorded including diurnal birds and reptiles. Evidence of animal activity, such as scats, diggings, scratch marks, nests/dreys, burrows etc., was also noted. This provided indirect information on animal presence and activity.

During these surveys, a hand-held GPS was used to record the locations of:

- hollow-bearing trees
- aquatic habitat
- rock outcrops.

3.6 LIKELIHOOD OF OCCURRENCE ASSESSMENT

The likelihood of threatened and migratory and threatened species populations occurring within the subject site was assessed against the criteria outlined in Table 3.3.

Species subject to likelihood of occurrence assessments were those identified during the desktop and field-based investigations and any additional species considered having the potential to occur in the professional opinion of contributors to this assessment.

Table 3.3 Likelihood of occurrence

LIKELIHOOD OF OCCURRENCE	CRITERIA
Known	The species was observed in the subject site either during the current survey or during another recent survey.
High	A species has a high likelihood of occurrence if: — the subject site contains or forms part of a large area of high quality suitable habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are abundant within the subject site — the species has been recorded recently in similar habitat in the locality — the subject site is likely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration.
Moderate	A species has a moderate likelihood of occurrence if: — the subject site contains or forms part of a small area of high quality suitable habitat — the subject site contains or forms part of a large area of marginal habitat — important habitat elements (i.e. for breeding or important life cycle periods such as winter foraging periods) are sparse or absent within the subject site — the subject site is unlikely to support a resident populations or to contain habitat that is visited by the species during regular seasonal movements or migration but is likely to be used occasionally during seasonal movements and/or dispersal.
Low	A species has a low likelihood of occurrence if: — potentially suitable habitat exists but the species has not been recorded recently (previous 10 years) in the locality despite intensive survey (i.e. the species is considered to be locally extinct) — the species is considered to be a rare vagrant, likely only to visit the subject site very rarely; e.g. during juvenile dispersal or exceptional climatic conditions (e.g. extreme drought conditions in typical habitat of inland birds).
None	Potentially suitable habitat is absent from the subject site.

3.7 LIMITATIONS

Even where field surveys are undertaken, no sampling technique can totally eliminate the possibility that a species is present on a site. For example, some species of plant may be present in the soil seed bank and some fauna species use habitats on a sporadic or seasonal basis and may not be present on site during surveys. Where surveys were conducted outside the optimal time for detecting a particular species, or field surveys were of limited scope, a precautionary approach was taken and it was assumed that the species was present if suitable habitat was observed. Similarly, for areas of vegetation that were not accessible for field verification, vegetation was presumed to be of the community shown in what was considered to be the most accurate available pre-existing vegetation mapping.

The conclusions in this report are based upon the limited data acquired from the site during environmental field surveys and desktop assessment and are, therefore, merely indicative of the environmental condition of the site at the time of preparing the report, including the presence or otherwise of species and the distribution of vegetation types. Also, it should be recognised that site conditions, including the presence of threatened species, can change with time.

4 EXISTING ENVIRONMENT

4.1 VEGETATION COMMUNITIES

Two vegetation communities were recorded within or adjacent to the study area during field survey and comprise of one native vegetation type and one non-native vegetation type. A description of each vegetation community is provided below.

4.1.1 PCT 1237 SYDNEY BLUE GUM - BLACKBUTT - SMOOTH-BARKED APPLE MOIST SHRUBBY OPEN FOREST ON SHALE RIDGES OF THE HORNSBY PLATEAU, SYDNEY BASIN BIOREGION

This native vegetation community was recorded to occur adjacent to the study area to the west of Warrawee station and primarily occurs as a remnant treed canopy with a highly modified or removed middle and lower stratum. This plant community type is summarised in Table 4.1 and shown in Photo 4.1 to Photo 4.3 below.

Table 4.1 Summary of PCT 1237 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion

1237 - SYDNEY BLUE GUM - BLACKBUTT - SMOOTH-BARKED APPLE MOIST SHRUBBY OPEN FOREST ON SHALE RIDGES OF THE HORNSBY PLATEAU, SYDNEY BASIN BIOREGION	
Description	
PCT justification	Based on floristic, geographic and geological characteristics, this vegetation type is considered consistent with the scientific description and distribution information outlined for PCT 1237 within BioNet Vegetation Classification (Office of Environment and Heritage 2017).
PCT reference	S_WSF01 Blue Gum High Forest (Tozer, Turner et al. 2010)
Conservation status	This vegetation type is commensurate with the threatened ecological community listing under the BC Act for Blue Gum High Forest in the Sydney Basin Bioregion. This vegetation type is listed as Critically Endangered under the BC Act and EPBC Act although the vegetation recorded within the study area does not meet condition thresholds under the EPBC Act and as such only meets BC Act listing.
Bioregion %	SYD Sydney Basin – 90% cleared
IBRA subregion	SYB07 Pittwater
Extent	about 0.5 hectares
Condition	This community is mostly comprised of remnant forest scale trees and exhibits a canopy only with the ground and mid strata vegetation being heavily disturbed or absent due to historic clearing for residential, road, rail and footpath construction. The ground stratum is mostly comprised of opportunistic exotic weed species although some minor remnant native grass and forb species were observed.
Distribution	This community occurs to the west of Warrawee Station and is bisected by Heydon Avenue and Borambil Street. This community is bound by the Northern Rail Line to the east, Knox Grammar to the north and residential properties to the west and south. All works associated with the Proposal are positioned outside of this community in existing cleared areas and will not result in any direct or indirect impacts.

1237 - SYDNEY BLUE GUM - BLACKBUTT - SMOOTH-BARKED APPLE MOIST SHRUBBY OPEN FOREST ON SHALE RIDGES OF THE HORNSBY PLATEAU, SYDNEY BASIN BIOREGION			
Strata	**Height range and average**	**Percentage Foliage Cover**	**Dominant Species**
Canopy	26 – 30 m (26)	25-35% (30)	*Eucalyptus pilularis* (Blackbutt), *Eucalyptus paniculata* subsp. *paniculata* (Grey Ironbark), *Eucalyptus saligna* (Sydney Blue Gum) *Angophora floribunda* (Rough-barked Apple), *Syncarpia glomulifera* (Turpentine)
Shrub stratum	0.5-4.5 m (3)	1-10% (3)	*Pittosporum undulatum* (Sweet Pittosporum), *Acacia decurrens* (Green Wattle), *Exocarpos cupressiformis* (Cherry Ballart),
Ground layer	0.1-1.2 m (0.5)	5-60% (25)	*Ehrharta erecta** (Panic Veldt Grass), *Cynodon dactylon* (Common Couch), *Lomandra longifolia* (Spiked-headed Mat-rush), *Bidens pilosa** (Cobbler's Peg), *Sporobolus africanus** (Parramatta Grass), *Asparagus aethiopicus** (Asparagus Fern), *Entolasia marginata* (Bordered Panic), *Dichondra repens* (Kidney Weed), *Pseuderanthemum variabile* (Pastel Flower)

Photo 4.1 PCT 1237 trees adjacent to Heydon Avenue opposite the Proposal works area

Photo 4.2 PCT 1237 treed canopy lining either side of Heydon Avenue

Photo 4.3 PCT 1237 treed canopy to the west of Warrawee Station

4.1.2 HIGHLY DISTURBED AREAS WITH NO OR LIMITED NATIVE VEGETATION

This non-native vegetation community occurs over the entire study area with all works associated with the Proposal being located wholly within this vegetation type. The vegetation comprises of ornamental landscape plantings, opportunistic regrowth and environmental weeds (Photo 4.4 to Photo 4.7).

Planted ornamental garden specimens occurring within the station platform consist of *Fraxinus griffithii** (Evergreen Ash) with an understorey planting of *Dietes bicolor** (African Iris).

The rail line batter slopes exhibit a mixture of exotic environmental weeds and opportunistic native regrowth that includes *Acacia elata* (Cedar Wattle), *Cissus antarctica* (Water Vine), *Ehrharta erecta** (Panic Veldtgrass), *Eucalyptus paniculata* subsp. *paniculata* (Grey Ironbark), *Hedera helix** (Ivy), *Imperata cylindrica* var. *major* (Blady Grass), *Jacaranda mimosifolia** (Jacaranda), Ligustrum lucidum* (Large-leaved Privet, *Olea europaea* subsp. *cuspidata** (African Olive), *Pteridium esculentum* (Bracken) and *Ulmus parvifolia** (Chinese Elm)

Exotic species dominate the area of proposed works on the eastern side of the station adjacent to Warrawee Avenue with species including *Ulmus parvifolia** (Chinese Elm), *Robinia pseudoacacia** (Black Locust), *Olea europaea* subsp. *cuspidata**, *Jacaranda mimosifolia** (Jacaranda) along with many exotic perennial grass and forb species. Native plantings along the western side of Warrawee Avenue include *Callistemon* sp. (Cultivar)* (Bottlebrush), *Dodonaea triquetra* (Large-leaf Hop-bush) and *Hakea sericea* (Needlebush).

Photo 4.4 *Fraxinus griffithii** (Evergreen Ash)

Photo 4.5 Exotic grass and forb species near the backup isolation transformer

Photo 4.6 Highly disturbed area with limited or no native vegetation flanking the western rail line batter

Photo 4.7 Exotic tree species *Ulmus parvifolia** (Chinese Elm) and *Robinia pseudoacacia** (Black Locust)

4.2 FAUNA HABITATS

The fauna habitat within the study area is limited, with majority of vegetation in the form of planted ornamental native and exotic trees and shrubs. Much of the original vegetation within the study area has been cleared for rail infrastructure and urban development and what remains is landscape gardens, plantings and minor native regrowth. The habitat and vegetation within the study area provides limited resources and lacks important features such as hollow bearing trees, rocky outcrops, dense litter layer or fallen woody debris.

The study area does not provide any significant habitat for fauna and species likely to utilise resources are those that are well adapted to urban environments or those species that are highly mobile (i.e. birds and bats). The surrounding trees (both native and introduced) provide some foraging habitat (i.e. fruits and blossom) for mobile species (i.e. birds and bats). It is unlikely that these resources are heavily utilise or relied upon by majority of fauna but instead are intermittently used whilst foraging within the greater locality.

It is noted that the vegetation recorded to adjoin the study area, PCT 1237 Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion, provides potential periodic foraging habitat for locally recorded threatened fauna species including Gang-gang Cockatoo, Powerful Owl, Grey-headed Flying-fox and threatened microchiropteran bats. There is potential for these species to occur irregularly within this adjacent habitat, however, it is unlikely that threatened species would utilise the habitat within the study area due to its disturbed nature.

4.3 WEEDS

No Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region were identified in the Proposal work areas.

5 THREATENED BIODIVERSITY

5.1 THREATENED ECOLOGICAL COMMUNITIES

One threatened ecological communities listed under the BC Act has been recorded to occur adjacent to the study area. This community is:

- Blue Gum High Forest in the Sydney Basin Bioregion – Critically Endangered Ecological Community (BC Act)

No patches of native vegetation recorded meet condition thresholds for any EPBC Act threatened ecological community listings.

A discussion of BC Act and EPBC Act threatened ecological communities is provided below.

5.1.1 BLUE GUM HIGH FOREST IN THE SYDNEY BASIN BIOREGION

NSW BC ACT

Blue Gum High Forest in the Sydney Basin Bioregion ecological community is listed as Critically Endangered under the Schedule 2, Part 2 of the BC Act.

PCT 1237 recorded adjacent to the study area meets floristic, geographic and geological characteristics listed under the paragraphs of the NSW Scientific Committee Final Determination (NSW Scientific Committee, 2011a) for this Critically Endangered community. Blue Gum High Forest in the Sydney Basin Bioregion has been recorded to occur west of Warrawee Station and outside the proposal work areas.

COMMONWEALTH EPBC ACT

Blue Gum High Forest in the Sydney Basin Bioregion ecological community is listed as Critically Endangered under the EPBC Act.

EPBC Act conservation advice for Blue Gum High Forest in the Sydney Basin Bioregion ecological community sets outline condition thresholds to determine if remnants or patches form part of the threatened ecological listing. For occurrences of the Blue Gum High Forest in the Sydney Basin Bioregion to be considered under the EPBC Act patches must be greater than one hectare, and:

- have a canopy cover greater than 10%, or
- have a canopy cover less than 10% and occur in areas of native vegetation in excess of five hectares

Occurring adjacent to the study area, PCT 1237 does not meet EPBC Act condition thresholds for Blue Gum High Forest in the Sydney Basin Bioregion as the patch size is less than one hectare.

5.2 THREATENED FLORA

No threatened flora were identified during site inspections. Background investigations identified 45 threatened flora species listed under the BC Act and/or EPBC Act that were considered to have the potential to occur within the locality of the study area (Appendix A).

Following field surveys, it is considered that the study area is unlikely to provide habitat to threatened flora species.

No specific assessment of significance for any threatened flora species listed under either the BC Act or EPBC Act are considered warranted to assess the impacts of the Proposal.

5.3 THREATENED FAUNA

No threatened fauna species were identified during site inspections. Background investigations identified 94 threatened fauna species listed under the BC Act and/or EPBC Act that have been previously recorded or have the potential to occur within the locality (Appendix B). The likelihood of these species occurring within the study area was determined based on field investigations and fauna habitat available. Based on available habitat and the potential impacts of the Proposal, it is considered unlikely that any threatened fauna have a moderate to high likelihood of occurrence or utilisation of the available habitat within the study area.

5.4 MIGRATORY SPECIES

Migratory species are protected under international agreements, to which Australia is a signatory, including JAMBA, CAMBA, RoKAMBA and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered MNES and are protected under the EPBC Act.

A total of 40 species listed as migratory under the EPBC Act were identified during background investigations that have been previously recorded or have the potential to occur within the locality (Appendix B). Of these, no species are considered likely to utilise the habitat present within the study area.

The habitats within the study area are unlikely to constitute important habitat for any of the listed species. The habitat present is unlikely to support significant proportions of the population of any migratory species, nor are the habitats critical to any life stage of these species. Due to their mobile nature, the mentioned species are likely to utilise higher quality habitat within the greater locality and where more extensive tracts of native vegetation occur.

6 POTENTIAL IMPACTS

Potential impacts to biodiversity resulting from the construction and operation phases of the Proposal have been considered below.

6.1 IMPACTS DURING CONSTRUCTIONS

6.1.1 DIRECT IMPACTS

Direct impacts to biodiversity as a result of the Proposal are considered negligible due to the existing disturbed nature of the available habitat and the nature of the construction works to be undertaken. Vegetation clearing would be minimal and only require the removal of five planted ornamental trees, being *Fraxinus griffithii* (Evergreen Ash), *Ulmus parvifolia** (Chinese Elm) and *Acacia elata* (Cedar Wattle) along with a small amount of landscape plantings and exotic environmental weed species. No impacts to remnant native vegetation (including a recorded patch of the threatened ecological community listed as Blue Gum High Forest) or high quality fauna habitat are predicted because of the Proposal.

Direct mortality or trauma to fauna is also expected to be minimal as habitat to be removed is of low quality (i.e. planted native trees and landscape gardens).

6.1.2 IMPACTS TO THREATENED ECOLOGICAL COMMUNITIES

One threatened ecological community, Blue Gum High Forest, was recorded to occur near the Proposal on the western side of Warrawee Station. The Proposal would result in the construction of two new disabled car parking bays and one kiss and ride bay on Heydon Avenue (Figure 1.1). These works are wholly located on the eastern side of the avenue, adjacent to the station entrance. Remnant trees associated with the Blue Gum High Forest community, *Eucalyptus pilularis* (Blackbutt) and *Eucalyptus paniculata* subsp. *paniculata* (Grey Ironbark), occur on the opposite side of the avenue (western side) and would not be impacted by the proposed works (Photo 4.1). No other works are proposed near this threatened ecological community.

Based on an inspection of the study area and review of the Proposal site plan there would be no direct or indirect impact likely to occur on the Blue Gum High Forest threatened ecological community.

6.1.3 IMPACTS TO THREATENED FAUNA

No threatened fauna are likely to be significantly impacted by the Proposal. It is unlikely that any threatened fauna identified within the locality would have a moderate to higher likelihood to utilise the habitat to impacted by the Proposal, nor are any threatened fauna likely to be reliant on the habitat to be removed or impacted. The mitigation measures outlined below in Section 7 would ensure that any possible indirect impacts would be minimised.

6.1.4 REMOVAL OF VEGETATION

The removal/disturbance of five planted ornamental trees, being *Fraxinus griffithii* (Evergreen Ash), *Ulmus parvifolia** (Chinese Elm) and *Acacia elata* (Cedar Wattle) along with some associated landscape garden plantings and environmental weeds would be undertaken as part of the Proposal (refer to *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, February 2019). This tree is located within the existing station platform and is not naturally occurring vegetation. The impact of this vegetation is unlikely to constitute important biodiversity value.

The vegetation identified within the study area does not contain important habitat features (i.e. hollows for breeding) for any potential threatened species known or predicted to occur within the locality. Given this, the Proposal is considered unlikely to significantly affect threatened species or ecological communities, or their habitats.

6.1.5 POTENTIAL ENVIRONMENTAL IMPACT OF NOISE, LIGHT AND VIBRATIONS ON WILDLIFE

Many animals detect and depend on sound to communicate, navigate, evade danger and find food, but human-made noise can alter the behaviour of animals or interfere with their normal functioning In some cases it can harm their health, reproduction, survivorship, habitat use, distribution, abundance, or genetic composition (Forman, Sperling et al. 2000). However, variation in ambient noise, such as from wind or other animals, is part of the natural environment and many animals display behavioural adaptations to this variation. For example, certain species of frogs avoid vocalising during loud calling by cicadas or other frogs and some species will time their calls during brief periods of silence (Schwartz and Henderson 1991).

It is likely that noise from the existing rail corridor and arterial roads would already impact background levels of noise in the study area. However, construction and operation phases of the Proposal (along with its ancillary activities) may cause disturbance to animals. The impacts from noise emissions are likely to be localised close to the project and are not likely to have a significant long-term impact on wildlife populations, given that populations are already exposed to noise associated with the existing rail corridor. Furthermore, it is likely that most animal species would habituate to periodic noise disturbance from regular maintenance activities (Forman, Sperling et al. 2000, Larkin 2005).

6.1.6 WEEDS

The Proposal is unlikely to impact any Priority Weeds listed under the *Biosecurity Act 2015* for the Greater Sydney Region such that they would pose a risk to any areas of native vegetation.

6.2 IMPACTS DURING OPERATION

The operation of the Proposal is not anticipated to result in any further impacts to biodiversity.

7 AVOID, MINIMISE AND MITIGATE

Construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline*, TfNSW's *Fauna Management Guideline* and TfNSW's Biodiversity Offsets Calculator. Specifically, the following measures will be undertaken:

- all workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity
- disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, January 2019) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below
- where the loss of trees is unable to be mitigated, Transport for NSW would replace trees removed as a result of the project in accordance with the TfNSW's *Vegetation Offset Guide* (2016). In accordance with Section 5 of the guideline it is expected that around 16 trees would be required to meet this offset requirement
- Tree Protection Zones (TPZs) would be established around trees to be retained, as nominated in the *Arboricultural Impact Assessment Report* (Earthscape Horticultural Services, January 2019). Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs
- in the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible
- should the detailed design or onsite works determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete *TfNSW's Removal or Trimming Vegetation Application* Form and submit it to TfNSW for approval
- no stockpiling of materials or storage of machinery is to be undertaken within non-paved grass areas within the Blue Gum High Forest adjacent to Heydon Avenue. These areas would be marked on the project Environmental Controls Map as no impact zones.
- for new landscaping works, mulching and watering would be undertaken until plants are established. New plantings shall be maintained for a minimum period of twelve (12) months from the date of installation to ensure successful establishment. The maintenance regime shall include regular watering, replenishment of mulch, weed control, adjustment of any stakes or ties used for temporary support and monitoring of the general health and condition of the trees. Any of the trees that fail within the first 12 months shall be replaced with new tree stock of equivalent species. Replacement trees shall be maintained for a further 12 months from planting to ensure successful establishment.
- weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline,* would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the Proposal. This would include the management and disposal of weeds in accordance with the *Noxious Weeds Act 1993.*

8 CONCLUSION

This Biodiversity Assessment Report has been prepared to inform a Review Environmental Factors (REF) for the Warrawee Station Upgrade. The findings from desktop assessment and field investigations have identified minimal impacts to native vegetation and fauna habitat. Due to the activity occurring within an urban precinct the biodiversity value of the existing environment is low.

A total of two vegetation communities were recorded within or adjacent to the study area during field survey and comprise of one native vegetation type and one non-native vegetation type, being:

- PCT 1237 - Sydney Blue Gum - Blackbutt - Smooth-barked Apple moist shrubby open forest on shale ridges of the Hornsby Plateau, Sydney Basin Bioregion;
- Highly disturbed areas with no or limited native vegetation

All works associated with the Proposal are positioned outside of PCT 1237 in existing cleared areas and will not result in any direct or indirect impacts on existing remnant native vegetation.

Vegetation clearing would be minimal and limited to direct impacts to highly disturbed areas with no or limited native vegetation. Clearing would be limited to the removal of five planted ornamental trees, being *Fraxinus griffithii* (Evergreen Ash), *Ulmus parvifolia** (Chinese Elm) and *Acacia elata* (Cedar Wattle) along with a small amount of landscape plantings and exotic environmental weed species. The impact of this vegetation loss is unlikely to constitute an impact to important biodiversity value.

One threatened ecological community listed under the BC Act, Blue Gum High Forest was recorded to occur immediately adjacent to the study area to the west of Warrawee station and is bisected by Heydon Avenue and Borambil Street. The Proposal would not result in any direct or indirect impacts to this community. These areas would be marked on the project Environmental Controls Map as no impact zones.

No threatened flora species or their habitat were recorded within the study area. The Proposal is considered unlikely to lead to a significant impact on any threatened flora listed under the BC Act or EPBC Act.

Threatened fauna species identified within the locality would likely intermittently utilise the planted vegetation as foraging habitat, however, the habitat is considered low in quality and unlikely to play an important role in the lifecycle of these species.

The Proposal would not involve any impact to native vegetation, threatened terrestrial or aquatic species, endangered ecological communities or their habitat. The proposed activity is deemed unlikely to significantly affect threatened species in accordance with Section 7.3 of the BC Act. Given this, a Species Impact Statement or Biodiversity Development Assessment Report (refer Section 7.8 (3) of the BC Act) is not required to accompany the REF. The Proposal is also unlikely to significantly affect Matters of National Environmental Significance and as such a referral of this activity is not deemed required under the EPBC Act.

The impacts to native biodiversity are predicted to be negligible and any residual or indirect impacts will be mitigated by undertaking works in accordance with TfNSW's Vegetation Management (Protection and Removal) Guideline, TfNSW's Vegetation Offset Guide and TfNSW's Fauna Management Guideline.

The mitigation measures outlined in Section 7 would ensure any potential impact to native biodiversity would have no significant impact to biodiversity.

9 LIMITATIONS

9.1 SCOPE OF SERVICES

This report has been prepared in accordance with the scope of services set out in the contract, or as otherwise agreed, between the client and WSP (scope of services). In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

9.2 RELIANCE ON DATA

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the client and other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

9.3 ENVIRONMENTAL CONCLUSIONS

In accordance with the scope of services, WSP has relied upon the data provided for the preparation of the report. Within the limitations imposed by the scope of services, the surveys and preparation of this report have been undertaken and performed in a professional manner, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by reputable environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

9.4 REPORT FOR BENEFIT OF CLIENT

The report has been prepared for the benefit of the client (and no other party). WSP assumes no responsibility and will not be liable to any other person or organisation for or in relation to any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report (including without limitation matters arising from any negligent act or omission of WSP or for any loss or damage suffered by any other party relying upon the matters dealt with or conclusions expressed in the report). Except as provided below parties other than the client should not rely upon the report or the accuracy or completeness of any conclusions and should make their own enquiries and obtain independent advice in relation to such matters.

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