

Transport for New South Wales

Flemington Station & Precinct Area

Upgrade

Flora & Fauna Impact Assessment

November 2014_v3



Alison Hunt and Associates Pty Ltd

TERRESTRIAL



MARINE



AQUATIC

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LIST OF ABBREVIATIONS

AQF	Australian Qualifications Framework
CBD	Central Business District
cm	Centimetre
DBH	Diameter at Breast Height
DECC	NSW Department of Environment and Climate Change
DoE	Department of Environment
EEC	Endangered ecological communities
EIA	Environmental Impact Assessment
EP&A Act	NSW <i>Environmental Planning and Assessment Act 1979</i>
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GST	Galvanised Steel Troughing
km	Kilometre
kV	Kilovolt
m	Metre
M	Migratory
Mar	Marine
mm	Millimetre
LGA	Local government area
NES	National Environmental Significance
OEH	NSW Office of Environment and Heritage
RoTAP	Rare or Threatened Australian Plants
SIS	Species Impact Statement
SULE	Safe Useful Life Expectancy
TfNSW	Transport for NSW
TPO	Tree Preservation Order
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>
TPZ	Tree Protection Zone
V	Vulnerable

1 INTRODUCTION

1.1 Background

Alison Hunt & Associates Pty Ltd was commissioned by Transport for NSW (TfNSW) to prepare a Flora and Fauna Impact Assessment for the Flemington Station & Precinct Upgrade (Proposal) to assess and report on the impacts to the environment, and to identify the best strategies to mitigate any potential impacts.

This assessment relates specifically to the works associated with the construction and demolition of the overbridge and upgrade to Flemington Station. The environmental impacts of these works are being assessed by TfNSW under Part 5 of NSW *Environment Planning and Assessment Act 1979* (EP&A Act). Consequently, this report will accompany the Review of Environmental Factors (REF) being prepared by TfNSW. The work associated with the Electrical Enabling Works component of the upgrade has been assessed separately in Alison Hunt & Associates Pty Ltd (2014b).

1.2 Aims

This Flora and Fauna Impact Assessment is aimed specifically at assessing the biodiversity values across the study area, especially in relation to:

- The potential presence of any endangered ecological communities, threatened populations or species and their habitat listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act);
- The potential presence of any matters of National Environmental Significance (NES) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- The potential for impacts of the Proposal on the ecology of the study area and locality; and
- Identification of any avoidance, management or mitigation options to reduce potential impacts of the Proposal.

This Flora and Fauna Impact Assessment report has considered and incorporated requirements of the Vegetation Offset Guide (TfNSW 2012), Draft Vegetation Management Guidelines (TfNSW 2012) and Sydney Trains *Acacia pubescens* Management Plan.

1.3 Brief Site Description

Flemington Station and Precinct area (the 'study area') is located on the Inner West and South Line between Homebush and Lidcombe Stations, in Homebush West within the Strathfield local government area (LGA) approximately 13 km west of the Sydney central business district (CBD) (Figure 1). The study area is situated within an urbanised and industrialised environment which has been extensively cleared and developed. The Flemington Markets is located on the northern side of the station and on the southern side is a local shopping centre along with a residential area. Towards the west of the station is the Flemington Maintenance Centre which is a storage and workshop area for City Rail.

The majority of vegetation in and around the site is composed of planted street trees along the road reserve of The Crescent, groundcover and shrubs (both native and weed species) within the rail corridor on the southern side and a mixed stand of trees dominated by *Casuarina glauca* (Swamp Oak) along Loftus Crescent (near Smallwood Avenue). These trees were planted in 1997, during the development of Sydney Olympic Park which is located approximately 1.5 km north of the site.

Whilst the site is largely set within an altered landscape providing few potential resources for threatened species, populations or endangered ecological communities, *Acacia pubescens* (Downy Wattle) is a plant species known from the area and which has been recorded in the locality within the rail corridor. It is listed as Vulnerable under both the TSC Act and EPBC Act. As a precautionary measure targeted surveys were undertaken for this species within the study area.

1.4 Overview of the Proposal

The Flemington Station Precinct Accessibility Upgrade is part of the Transport Access Program (TAP), initiative to provide accessible, modern, secure and integrated transport infrastructure where it is needed most. The proposed upgrade to this station is shown in Figure 2. The station comprises six tracks and four platforms (two Island platforms) which are currently accessed by an elevated structural steel framed concourse with stair access to each platform. This current concourse is required to be demolished as it does not comply with a number of key safety standards.

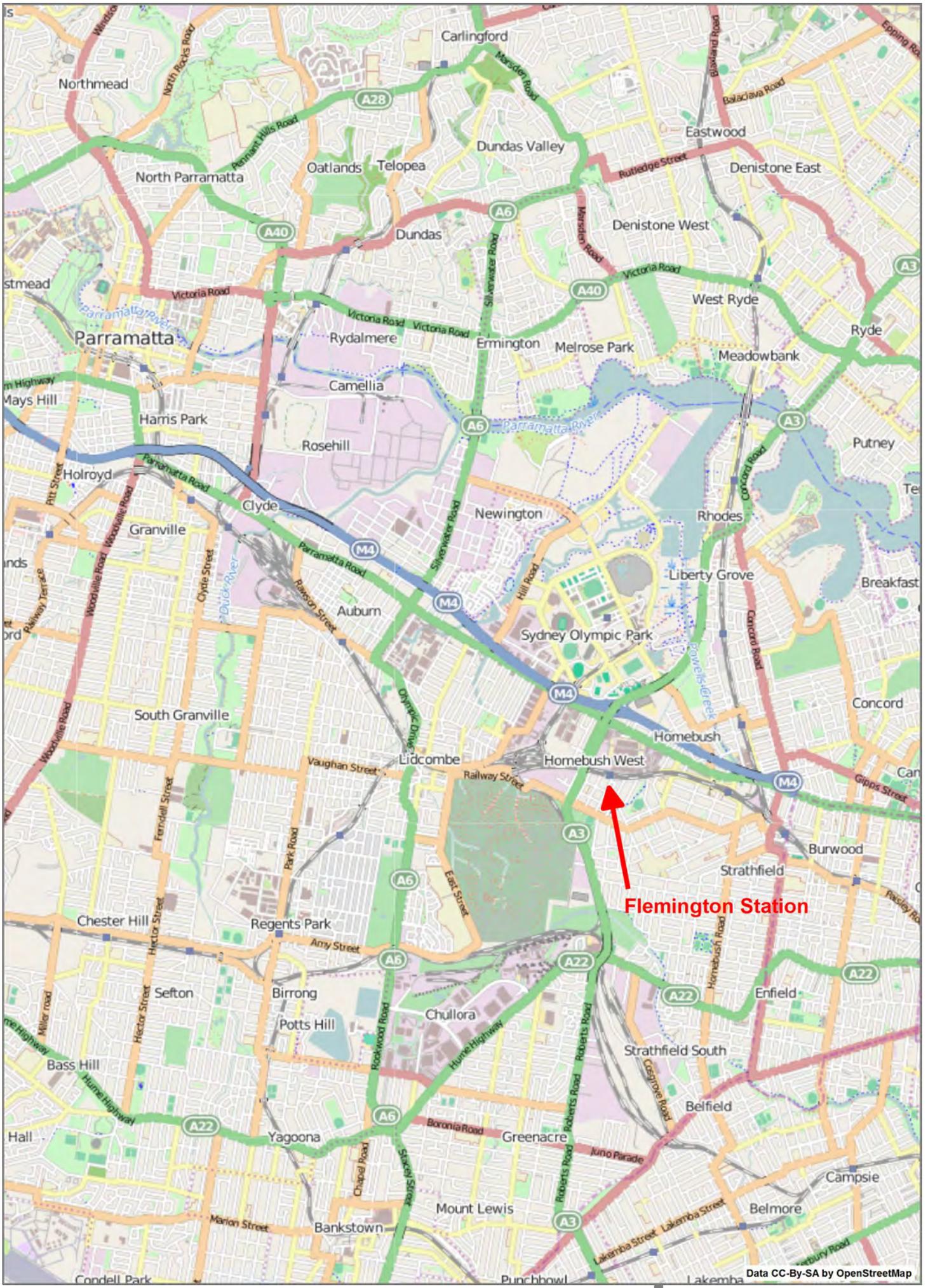
Access between the existing Flemington Station concourse and Sydney Markets is also provided via an elevated pedestrian steel footbridge approximately 150 m long, which links residential and commercial developments south of the rail corridor with Sydney Markets to the north. This footbridge currently does not comply with current engineering and BCA standards.

The objective of the Proposal is to provide improved integration and access to, within and around the Flemington Station Precinct, including to and from other transport modes. A new covered concourse footbridge will be constructed linking The Crescent and the two island platforms. New lifts and stairs will provide accessibility to the platforms from The Crescent. An uncovered link footbridge will join the new covered concourse footbridge to the existing Sydney Market footbridge at the property boundary.

The Crescent interchange is to be modified to accommodate the new covered concourse footbridge and entry points. The existing pedestrian crossing and bus stop are to be relocated closer to the new station entry. Bike racks are to be provided, an accessible drop-off zone is to be provided for taxi and kiss and ride customers. New bus and taxi canopies are also to be provided.

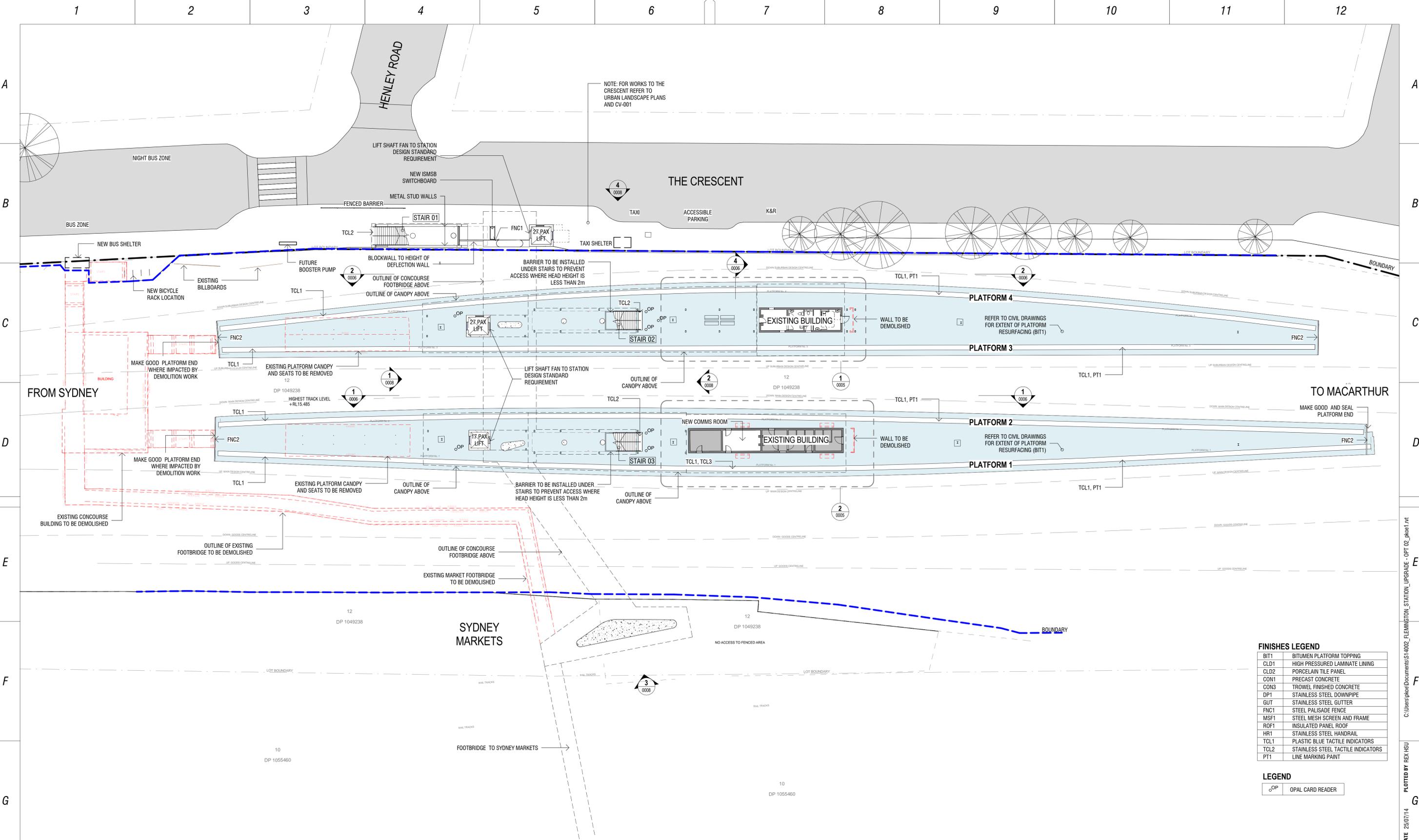
With the completion of the new station concourse and link footbridge, the existing concourse structure and pedestrian footbridge will be demolished. The existing overhead wire catenaries are attached to the existing concourse, consequently re-profiling and a new overhead wire portal structure will be constructed.

To achieve these objectives a construction laydown area is required for storage of materials and equipment during the construction phase. The construction laydown area would be located along a 50 m stretch of road reserve along The Crescent approximately 60 m to the east of the current station entrance.



Job ID: 2014-02

Figure 1 Flemington Station Location



FINISHES LEGEND

BIT1	BITUMEN PLATFORM TOPPING
CLD1	HIGH PRESSURED LAMINATE LINING
CLD2	PORCELAIN TILE PANEL
CON1	PRECAST CONCRETE
CON3	TROWEL FINISHED CONCRETE
DP1	STAINLESS STEEL DOWNPIPE
GUT	STAINLESS STEEL GUTTER
FNC1	STEEL PALISADE FENCE
MSF1	STEEL MESH SCREEN AND FRAME
ROF1	INSULATED PANEL ROOF
HR1	STAINLESS STEEL HANDRAIL
TCL1	PLASTIC BLUE TACTILE INDICATORS
TCL2	STAINLESS STEEL TACTILE INDICATORS
PT1	LINE MARKING PAINT

LEGEND

OP	OPAL CARD READER
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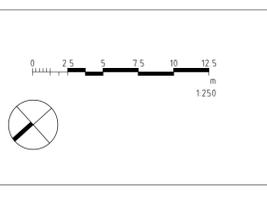
APPROVED BY AEO CCB FOR Control Gate Stage: _____
 CCAN. _____ & CMWEB No. _____

FLEMINGTON STATION
 MAIN SOUTH LINE 14.221km TO 14.421km

Figure 2 Flemington Station & Precinct Area upgrade

FILE No.	-	SHEET: 1 OF 1	A1
STATUS:	FINAL CONCEPT DESIGN		
DRG No.	TAP-2006-KBR-AR-0002	B	EDMS No.

B	PK	25.07.14	FINAL CONCEPT DESIGN	TL
A	CDC	14.05.14	PRELIMINARY CONCEPT DESIGN	AQ
No	BY	DATE	DESCRIPTION	APPD.
A1 Original			Co-ordinate System: MGA Zone 56 Height Datum: A.H.D. Scale: As indicated	



CONSTRUCTOR

Kellogg Brown & Root Pty Ltd
KBR
 ABN 91 007 660 317

CLIENT

NSW GOVERNMENT
Transport for NSW

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APPROVED	ANTHONY QIAN	25/07/14

PLOT DATE: 25/07/14 6:38:45 PM
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1.5 Statutory Framework

In relation to biodiversity there are a number of statutory requirements which require consideration including those listed below.

1.5.1 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires assessment of proposed actions that are likely of causing significant impacts on matters of National Environmental Significance (NES) listed under the Act. The EPBC Act identifies seven matters of NES and these include World Heritage properties, National Heritage places, Wetlands of international importance (Ramsar Wetlands), Threatened species and ecological communities, Migratory species, Commonwealth marine areas and Nuclear actions (including uranium mining).

Those matters of NES relevant to this proposal may include threatened species and ecological communities and migratory species. If, after addressing the criteria set out in the *Administrative Guidelines* for the EPBC Act, it is concluded that a significant impact on matters of NES is likely then a referral to the Department of Environment (DoE) is required.

1.5.2 NSW *Environmental Planning and Assessment Act 1979*

Pursuant to the EP&A Act an assessment of the impacts of the proposed works on land that is critical habitat or is likely to affect threatened species, populations or ecological communities, or their habitats listed under the TSC Act, must be undertaken in the form of an Assessment of Significance. This involves assessing potential impacts of the proposal based on seven criteria that aid in assessing if the proposal is likely to have a significant impact on threatened species or their habitat or endangered ecological communities at the site or that have the potential to occur. If the Assessment of Significance concludes that a significant impact is likely then a Development Application must be accompanied by a Species Impact Statement (SIS).

1.5.3 NSW *Threatened Species Conservation Act 1995*

The NSW *Threatened Species Conservation Act 1995* (TSC Act) applies to terrestrial and aquatic flora and fauna. This Act is administered by the NSW Office of Environment and Heritage (OEH). Pursuant to the EP&A Act an assessment of the impacts of the proposed works in areas of critical habitat or is likely to affect threatened species, populations or ecological communities, or their habitats listed under the NSW TSC Act must be undertaken in the form of an Assessment of Significance. This involves assessing potential impacts of the proposal based on seven criteria that aid in assessing if the proposal is likely to have a significant impact on threatened species or their habitat or endangered ecological communities at the site or that have the potential to occur. If the Assessment of Significance concludes that a significant impact is likely then a Development Application must be accompanied by a Species Impact Statement (SIS).

2 METHODS

This assessment has been undertaken to describe the biodiversity values of Flemington Station Precinct area (the study area) in order to establish the potential impacts likely to be associated with the Proposal. These matters were considered within the framework for assessment under Part 5 of the EP&A Act, TSC Act and EPBC Act, and with reference to the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2005 & DECC 2007) and *Matters of National Environmental Significance – Significant Impact Guidelines 1.1* (Department of the Environment 2013).

The following tasks were undertaken:

- A review of available literature and databases to assist with the identification of the values of the study area and locality (i.e. 10 km radius of the study area), especially in relation to threatened species, populations and endangered ecological communities (EEC);
- Field assessments to ascertain the current condition and the presence or likely presence of threatened or protected species across the study area and locality;
- An arboricultural assessment to assess the health and landscape importance of trees within the works area;
- An impact assessment to determine the likely effects of the proposal on the ecology of the site with particular reference to threatened species, populations and / or ecological communities; and
- Preparation of recommendations to ameliorate and mitigate potential impacts which may be associated with the construction and operation of the Proposal.

2.1 Literature Review

Available literature and database records pertaining to the site and locality were reviewed. The full list of reference materials is provided in Section 7 and those of particular relevance are listed below:

- Office of Environment and Heritage (OEH): Threatened species database records (OEH; accessed May 2014); and
- Department of Environment Online protected matters search tool for Matters of National Environmental Significance (DoE; accessed May 2014).

2.2 Site Assessment

2.2.1 General

An assessment of the site was undertaken utilising aerial photograph interpretation and site assessments over three days. The survey effort and weather on each of these days is shown in Table 1.

Table 1 Survey effort and weather

Assessment Date	Period (hour)	Weather
12 May 2014	0900 – 1400	Partially overcast, dry and 22 °C
11 June 2014	1300 – 1530	Partially overcast, dry and 19 °C
18 June 2014	0930 - 1630	Mostly fine, dry and 20 °C

The general site assessment consisted of:

- Random meander transects across the study area noting plant species along with other factors including soil type and condition, the level of weed invasion and other signs of disturbance;
- A general fauna habitat assessment including an assessment of the nature and condition of habitats, specific resources and features of relevance for native fauna. In addition, indirect evidence of fauna (e.g. scats, feathers, fur, tracks, dens, nests, scratches, chew marks and owl wash) was recorded;
- The likelihood of threatened fauna and flora occurring across the study area was assessed through determining if suitable habitat was present. For plants and animals, this included several factors comprising the vegetation types present, drainage patterns, weed invasion and present land use activities; and
- The likelihood of *Rare or Threatened Australian Plants* (RoTAP) flora occurring across the study area was assessed through determining if suitable habitat was present, including comprising the vegetation types present, drainage patterns, weed invasion and present land use activities. RoTAP lists taxa that are Presumed Extinct, Endangered, Vulnerable, Rare or Poorly Known at the national level and some of these species may become listed on State and Commonwealth threatened species legislation (refer Appendix A for RoTAP explanation).

2.2.2 Targeted surveys for *Acacia pubescens*

Targeted surveys for *Acacia pubescens* (Downy Wattle) were undertaken across the site. These surveys consisted of random meanders specifically aimed at detecting plants or potential habitat for this species especially near to the rail corridor.

2.2.3 Arboricultural Tree Assessment

Mr Scott Freeman, of Horticultural Management Services, assessed the street trees within the study area to determine their health / condition and subsequent stability, both in the long and short term at the time of the assessment. The following criteria were addressed:

- Each tree provided with an identification number;
- Species identification (botanical and common);
- Height and form;
- Observations made including an evaluation of the tree's health and vigour using crown spread and cover, foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of dead wood, dieback and epicormic growth as indicators;

- Condition, using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators;
- Suitability of the tree to the site and its existing location; in consideration of damage or potential damage to services or structures, available space for future development and nuisance issues;
- Likely future amenity based on a visual assessment;
- The tree's tolerance to development impacts based on surface observations;
- Significance including specific heritage, cultural or intrinsic importance;
- Amenity value including as shade, windbreak or subjective, aesthetic values;
- Habitat value as both an individual tree and as part of an ecological community;
- Observations of soil conditions and likely root spread;
- Overall condition assessment and suitability;
- Hazard / failure potential of tree to damage property or result in death; and
- Safe Useful Life Expectancy (SULE) after Barrell (1995) with:
 - Rating 1 = Likely to be useful for > 40 years with acceptable risk and assuming reasonable maintenance;
 - Rating 2 = Likely to be useful for 15 - 40 years with acceptable risk and assuming reasonable maintenance;
 - Rating 3 = Trees that appeared to be retainable at the time of assessment for 5 - 15 years with acceptable level of risk;
 - Rating 4 = Tree to be removed within the next 5 years; and
 - Rating 5 = Tree which can be reliably moved or replaced.

Retention Value was based on the subject tree's Remaining Life Expectancy Range and Landscape Significance. The Retention Value was modified where necessary to take into consideration the subject tree's health, structure and site suitability.

Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject trees. Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the trees. This provides a relative value of the trees' Landscape Significance which may aid in determining their Retention Value.

Tree height and canopy spread were estimated only. Diameter at Breast Height (DBH) was determined by measuring the main stem at 1.4 m above ground. Photos were taken of the subject trees and subject site.

The components of tree risk assessment include the tree's failure potential or in the case of the proposed, an environment conducive to tree failure.

2.3 Limitations

This assessment was aimed at providing an overall assessment of the ecological values of the site with particular emphasis on the likely presence of threatened species through integration of data from a number of sources to allow an assessment of the impacts of the proposal. It was not designed so that all species, whether resident or transitory to the site, would be recorded so it is likely that a number of species not mentioned within this report would also utilise the resources of the site from time to time.

3 RESULTS

3.1 Environmental Setting

Homebush West is located within the Strathfield LGA in an urbanised and industrialised environment approximately 13 km west of the Sydney CBD (Figure 1). There are a number of natural areas in the locality, including Cox's Creek Bushland Reserve (approximately 4.5 km south) and the Cooks River foreshores network (approximately 2 km south), Rookwood Cemetery (approximately 1 km south-west of the site) and the Millennium Parklands / Bicentennial Park / Mason Park complex (approximately 1.5 km north of the study area). However, the vast majority of the locality is heavily built-up with residential and industrial development and outside of these areas there are few remaining natural resources.

The study area is situated on a gently undulating to level alluvial floodplain draining the Wianamatta Group Shales of the Cumberland Lowlands (Chapman & Murphy 1989). The geology of the area has been mapped as Bringelly shale and consists mainly of shale, with some carbonaceous claystone, laminate and occasional fine to medium-grained lithic sandstone. The Blacktown unit dominates the local soil landscape although areas of the proposal are located on areas mapped as 'disturbed terrain'. The soils of the Blacktown unit are described as shallow to moderately deep, with red and brown podzolics on crests, upper slopes and well-drained areas, and yellow podzolics and soloths on lower slopes and in areas of poor drainage (Chapman & Murphy 1989). Chapman & Murphy (1989) also note that vegetation across the Blacktown soil unit has been almost completely cleared of the tall open-forest (wet sclerophyll forest) and open-woodland (dry sclerophyll forest) that originally covered these areas. Erodibility of these soil landscapes is described as moderate.

3.2 Site Description

Flemington Station and Precinct Area is comprised of a ticketing office and shop located on an overbridge that spans the railway lines and which can be accessed from the south via The Crescent and from the north via an elevated steel footbridge approximately 150 m long which provides access from the Flemington Markets. Stairs lead down to the station platforms which are located to the west of the overbridge. The overbridge, stairs and associated infrastructure will be demolished and new access, overbridge, shop, ticketing office and access to the Flemington Markets constructed approximately 50 m to the west (Figure 2).

A laydown area for materials and equipment required for the construction of the new station facilities will be located along The Crescent approximately 60 m to the east of the current station entrance.

3.3 Site Vegetation

3.3.1 Communities

None of the lands associated with this proposal have been mapped as *E2 – Environmental Conservation* under the *Strathfield Local Environmental Plan 2012* and *Native Vegetation Mapping of the Cumberland Plain* failed to map any native vegetation across the site (NPWS 2002).

Ground-verification confirmed that there are no recognisable native vegetation communities across the study area as it is largely devoid of vegetation except for planted street trees and minor landscaping works.

3.3.2 Species

The street plantings across the study area are a mixture of native species and non-indigenous species trees and shrubs (Plate 1 – 4). The dominant tree species is Brush Box (*Lophostemon confertus*) with occasional occurrences of Swamp Oak (*Casuarina glauca*). Other tree species include, Peppercorn Tree (*Schinus areira*), Arizona Smooth Bark Cypress (*Cupressus glabra*) and Cabbage Palms (*Livistona australis*). Most of these trees are mature specimens around 8 m in height, the majority of which are considered to be in Good or Good-Fair condition with 36 of the 37 trees having a SULE rating of 3, indicating that at the time of assessment these trees would be retainable for 5 to 15 years with an acceptable level of risk (Horticultural Management Services) (refer Figure 3 & Table 3). Groundcover is largely absent as the area is either paved or bare ground, although in recently landscaped areas a variety of groundcover species have been planted including Spiny-headed Mat-rush (*Lomandra longifolia*) and *Canna* sp. as well as the shrub Frangipani (*Plumeria acutifolia* (shown as Tree numbers 17 & 18)). It is noted that since this assessment, substantial trimming of a number of trees along The Crescent and within the construction laydown area (i.e. Table 3: Tree numbers 1 – 11) has been undertaken by Sydney Trains as part of their maintenance works (Ms Catherine Barlow pers. comm.).

Plate 1 Street trees along The Crescent adjacent to Flemington Station

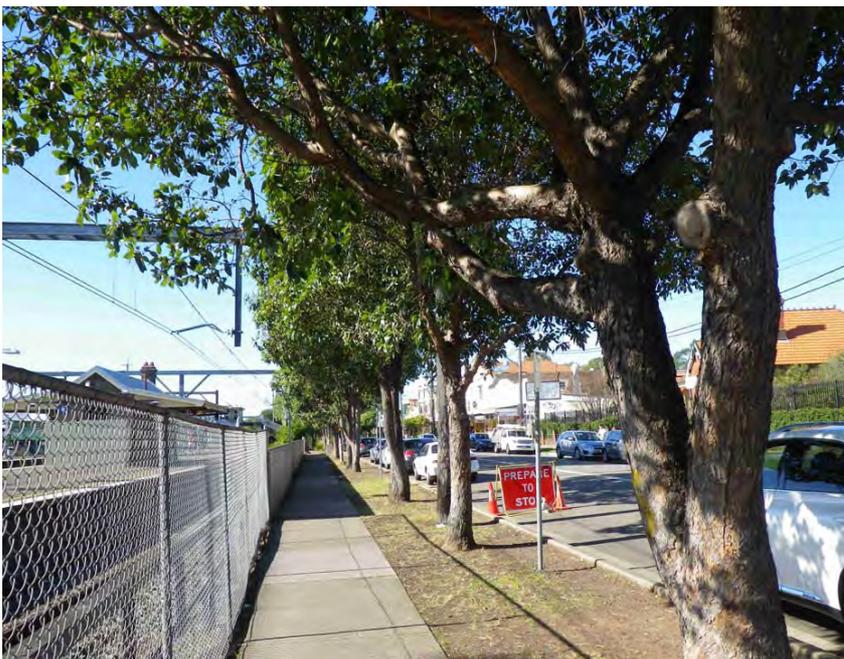


Plate 2 Flemington Station



Plate 3 Minor planted ornamental street planting

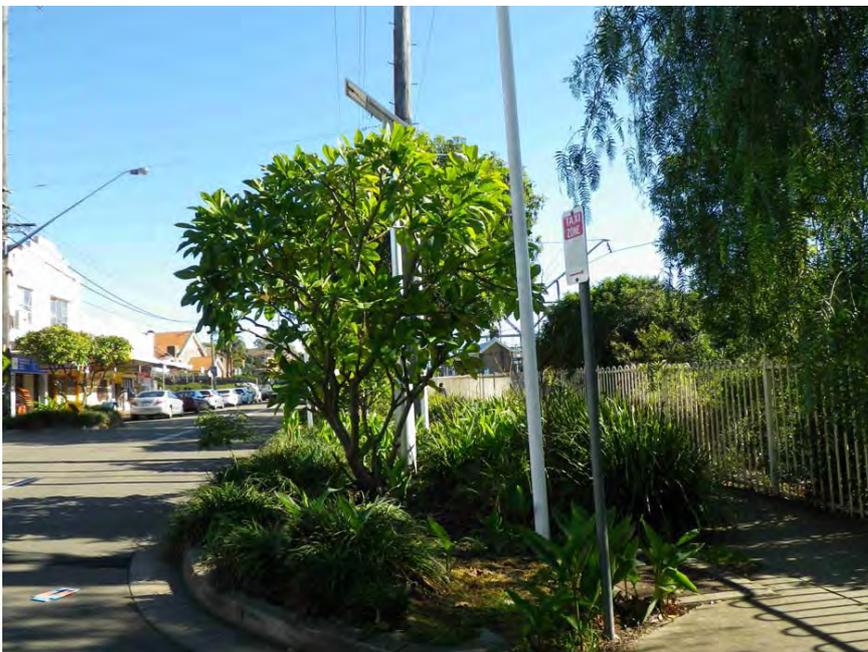
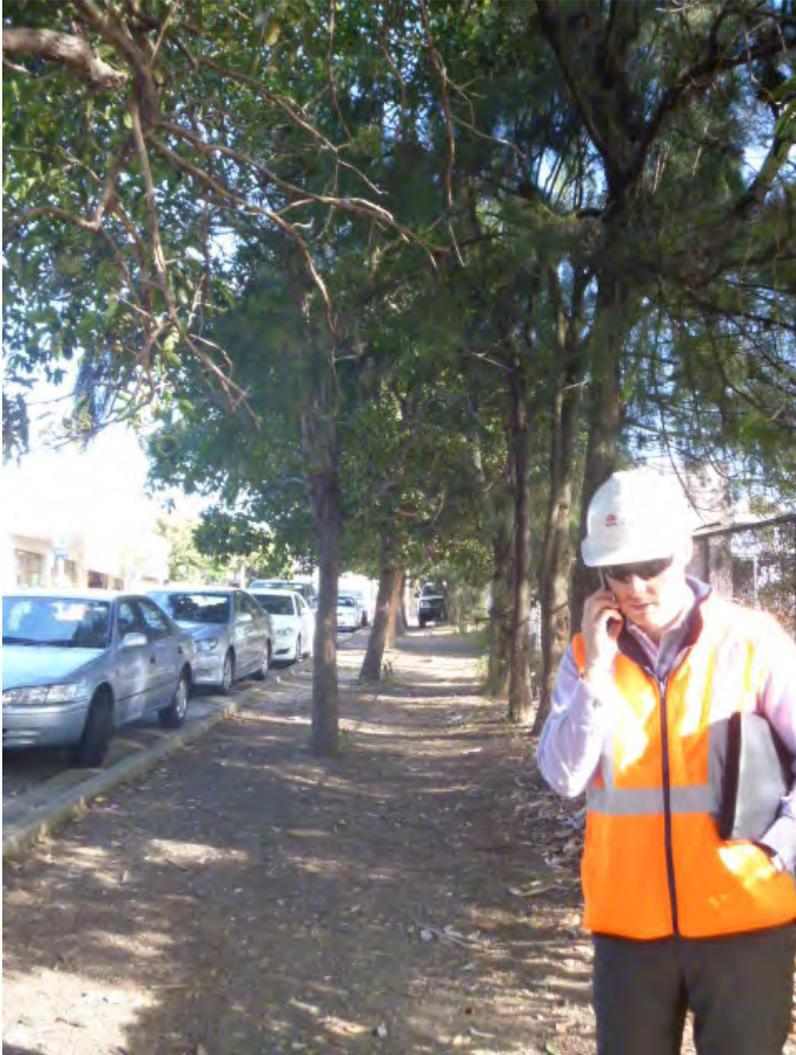


Plate 4 Construction laydown area on The Crescent



3.3.3 Noxious Weeds

All of the plants across the site have been planted and the majority of these species are not representative of species associated with the likely original vegetation communities, and many of them have been introduced from areas outside of Australia. However, none of the plant species recorded across the site of the station upgrade is listed as Noxious in the Strathfield LGA under the *Noxious Weeds Act 1994*.

3.4 Fauna Habitat

Fauna habitat across the study area is limited due to its modified nature. It has been altered through clearing, mostly paved and with mounded ballast within the rail corridor. These attributes provide limited opportunity for native ground-dwelling fauna (such as reptiles and mammals) instead it would be expected that only common introduced rodents such as the House Mouse (*Mus musculus*) and Rats (*Rattus* spp.) would be likely to occur. The study area does not support aquatic habitat resources suitable for amphibians or aquatic fauna.

The planted street trees would currently provide roosting and foraging habitat for some avifauna but do not contain obvious tree-hollows so their value for hollow-dependent fauna (e.g. arboreal mammals, birds) habitat would be limited. Microchiropteran bats may be attracted to this area to forage on insects drawn by the street and station lights. The Grey-headed Flying-fox (*Pteropus poliocephalus*) may also forage across the site on occasion as this species is regularly recorded in the area. There is a lack of roosting and breeding habitat for these species and it is likely that any bat species that forage across the study area would be most likely to roost within nearby areas supporting native vegetation (e.g. Cox's Creek Bushland Reserve, Mason Park Wetlands and the Cooks River foreshores network).

3.5 Conservation Significance

A number of features of conservation significance occur, or have the potential to occur, within the locality (i.e. 10 km radius) and those relevant to this proposal are outlined below and detailed in Appendix B.

3.5.1 Commonwealth Environment Protection and Biodiversity Conservation Act 1999

Wetlands of National & International Significance

Towra Point is a listed as a RAMSAR site. Although it occurs within 10 km of the site, it is located within Botany Bay in a different catchment, hence it has little relevance to this project.

Communities

There are four endangered vegetation communities predicted to occur within the locality and these are *Cumberland Plain Woodlands*, *Shale / Sandstone Transition Forest*, *Turpentine – Ironbark Forest in the Sydney Basin Bioregion* and *Western Sydney Dry Rainforest and Moist Woodland on Shale*. The cleared and modified nature of the study area means that these communities are not present.

Species

Predictive modelling indicates that 64 threatened species and 52 marine / migratory species listed under the EPBC Act have the potential to occur within the locality. Of these, 12 species listed as threatened under the EPBC Act have been recorded and a further 32 bird species listed as migratory and / or marine under the EPBC Act have also been recorded within the locality (Appendix B). The relatively large number of these highly mobile species is attributable to the mosaic of wetland habitat

provided by the Millennium Parklands / Bicentennial Park / Mason Park complex located around 2 km to the north of Flemington Station. It is considered that the study area is unlikely to provide any habitat suitable for these species particularly given the extent of wader habitat available along the Parramatta River and into Sydney Harbour.

There are two fauna species listed under the EPBC Act which may occur across the site on a semi-regular basis and these are the White-throated Needletail (*Hirundapus caudacutus*) which is listed as Migratory / Marine under the EPBC Act and the Grey-headed Flying-fox (*Pteropus poliocephalus*) which is listed as Vulnerable (Table 2). The White-throated Needletail rarely makes landfall as it feeds on flying insects in rising thermal currents. It has been recorded overflying Bicentennial Park to the north and it is likely that this species would also feed above the site. There are also numerous records of the Grey-headed Flying-fox within the locality and it is likely that this species would on occasion forage within the trees across the site and in adjacent areas.

Downy Wattle (*Acacia pubescens*) which is listed as Vulnerable under both the EPBC Act and TSC Act has been recorded at numerous locations within the locality. This species is sometimes associated with open, disturbed areas such as rail corridors (NPWS 2003) and it has been recorded 500 m west of Flemington Station (Sydney Trains *Acacia pubescens* Management Plan 2014). Targeted surveys for this threatened species failed to record Downy Wattle within the study area. It is unlikely that any plants would occur as the site is largely paved and vegetation is comprised of street landscaping or is weed infested.

Table 2 Threatened listed under the TSC and EPBC Acts with the potential to occur across the site

Common Name	Scientific Name	Conservation Status
Flora		
Downy Wattle	<i>Acacia pubescens</i>	V-TSC, V-EPBC
Migratory Birds (solely)		
White-throated Needletail	<i>Hirundapus caudacutus</i>	M-EPBC, Mar-EPBC
Megachiropteran Bat		
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	V-EPBC, V-TSC
Microchiropteran Bat		
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V-TSC
Eastern Bentwing-bat	<i>Miniopterus schreibersii oceanensis</i>	V-TSC
Eastern Freetail-bat	<i>Mormopterus norfolkensis</i>	V-TSC
Note: EPBC = <i>Environment Protection & Biodiversity Act 1999</i> , TSC Act = <i>Threatened Species Conservation Act 1995</i> , EEC = endangered ecological community, V = Vulnerable, E = Endangered, M = Migratory, Mar = Marine.		

3.5.2 NSW Threatened Species Conservation Act 1995

Communities

There are currently three endangered ecological communities (EEC) known to occur within the Strathfield LGA and these are *Coastal Saltmarsh in the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*, *Sydney Turpentine-Ironbark Forest* and *Cooks River / Castlereagh Ironbark Forest in the Sydney Basin Bioregion*. The cleared and modified nature of the study area means that these communities are not present.

Populations

There are three endangered populations known from the Strathfield LGA and these are *Tadgell's Bluebell in Auburn, Bankstown & Baulkham Hills LGA*, *P. prunifolia in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas* and the *White-fronted Chat population in the Sydney Metropolitan Catchment Management Area*. It is unlikely that any of these populations would be found at the site as Tadgell's Bluebell requires damp sites on Villawood soils, *P. prunifolia* occurs in Cooks River / Castlereagh Ironbark Forest and White-fronted Chat requires bare or grassy ground in wetland area. These habitats are absent from the study area.

Species

The site provides limited habitat for threatened species listed under the TSC Act due to its cleared and modified nature. Of the 26 fauna species and 11 flora species recorded within the locality (refer to Appendix B) it is considered that four fauna species and one plant species have some potential to occur across the site and these are shown in Table 2.

Downy Wattle was not recorded at the site or in adjacent areas and is unlikely to occur (refer Section 3.5.1).

Three microchiropteran bats (i.e. Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*)) have been recorded across the Millennium Parkland / Bicentennial Park / Mason Park habitat complex 2 km to the north, and Eastern Bentwing-bat has also been recorded at the Rookwood Cemetery around 1 km to the south-west of the site. It is possible that these species could on occasion forage around or over-fly the Flemington Station Precinct area.

The Grey-headed Flying-fox is also known from the Strathfield LGA and it is likely that this species would on occasion forage across the site and in adjacent areas (refer Section 3.5.1).

3.5.3 RoTAP Species

Seven *Rare or Threatened Australian Plants* (RoTAP) have been recorded in the locality of the Proposal. None of these species were recorded across the study area. All of these species are also listed as threatened under the TSC Act and hence those species for which potential habitat occurs have been considered in accordance with the *Threatened Species Assessment Guidelines: the Assessment of Significance* (DEC 2005 & DECC 2007).

3.5.4 Corridors and Connectivity

Vegetation across this site is not part of a recognised green corridor. However, the canopy species may on occasion provide stepping stone habitat for highly mobile species between areas to the south (e.g. Rookwood Cemetery and Cooks River Corridor) and the mosaic of habitat provided by the Millennium Parkland / Bicentennial Park and Mason Park approximately 2 km to the north.

4 IMPACT ASSESSMENT

The works associated with the construction and demolition of the overbridge and upgrade to Flemington Station would require the removal of 26 street trees. Fourteen of these trees will be removed to allow The Crescent interchange to be modified, to accommodate the new entry points and the relocation of the existing pedestrian crossing and bus stop, provision of bike racks and an accessible drop-off zone for taxi and kiss and ride customers. An additional 11 trees would be removed to provide a laydown area for supplies and equipment during the construction phase and this area would be located approximately 60 m to the east the current station entrance. The impact of the temporary removal of these trees has been assessed as a part of the assessment for the Electrical Enabling Works associated with the broader project (Alison Hunt & Associates Pty Ltd 2014b).

4.1 Direct Impacts

4.1.1 Vegetation Clearance

The site of the station upgrade is set within a cleared landscape and planted street trees provide the majority of vegetation. A total of 10 planted street trees (Figure 3 & Table 3: Tree Nos. 12 -16 & 19 – 23) would be permanently removed to allow for the upgrade to Flemington Station and these are detailed in Table 3 and shown in Figure 3. These include 8 x Brush Box, 1 x Arizona Smooth Bark, 1 x Peppercorn Tree. All of these trees are considered to be mature specimens in Good to Fair – Good condition with diameter at breast height (DBH) ranging from 15 – 60 cm (Horticultural Management Services). These trees are protected under the Strathfield City Council Tree Preservation Order (TPO). The loss of these landscaped street trees within an already cleared landscape would reduce the vegetation across the study area and within the locality. This loss would be offset at a ratio of 1:4 with the replanting of native species endemic to the area in accordance with the Vegetation Offset Guide (TfNSW 2012) (refer to Section 5). In addition, two Frangipani shrubs would also be removed and these are shown as 17 and 18 on Figure 3. In accordance with the Vegetation Offset Guide (TfNSW 2012) these shrubs would not require offsetting.

An additional 11 trees (Tree Nos. 1 – 11; Figure 3 & Table 3) across the construction laydown area would be removed. The loss of these trees would be temporary as this area would be replanted with native species endemic to the area in accordance with the Vegetation Offset Guide (TfNSW 2012) (refer to Section 5).

4.1.2 Loss of Fauna Habitat

Fauna habitat is generally limited to the street trees planted along The Crescent. Clearing of the street landscaping would result in the temporary loss of some foraging and roosting habitat for birds and may also result in disruption to foraging habitat for microchiropteran bats and the megachiropteran bat, Grey-headed Flying-fox.



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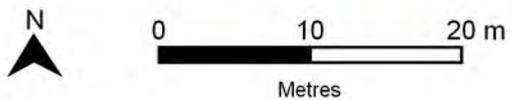


Figure 3 Street trees along The Crescent adjacent to Flemington Station

AH Ecology

Table 3 Street Trees within the Study Area along The Crescent

No.	Species	Height (m)	DBH (mm)	Tree Age *Young *Semi Mature *Mature *Over Mature	Tree Health * Good * Fair * Poor * Dead	Tree Structure * Good * Fair * Poor	SULE Rating	Ecological Significance *High *Moderate *Low *Nil	Landscape Significance *High *Moderate *Low *Nil	Retained?
1	Brush Box <i>Lophostemon confertus</i>	7	390	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
2	Swamp Oak <i>Casuarina glauca</i>	8	Multi-trunk	Mature	Good	Good	3	Low	Low – Moderate	No
3	Cabbage Palm x 2 <i>Livistona australis</i>	7	260	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
4	Brush Box <i>Lophostemon confertus</i>	7	480	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
5	Swamp Oak (clump) <i>Casuarina glauca</i>	8	Multi-trunk	Mature	Good	Good	3	Low	Low – Moderate	No
6	Brush Box <i>Lophostemon confertus</i>	7	410	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
7	Brush Box <i>Lophostemon confertus</i>	7	250	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
8	Brush Box <i>Lophostemon confertus</i>	8	240	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No

No.	Species	Height (m)	DBH (mm)	Tree Age *Young *Semi Mature *Mature *Over Mature	Tree Health * Good * Fair * Poor * Dead	Tree Structure * Good * Fair * Poor	SULE Rating	Ecological Significance *High *Moderate *Low *Nil	Landscape Significance *High *Moderate *Low *Nil	Retained?
9	Brush Box <i>Lophostemon confertus</i>	7	200	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
10	Brush Box <i>Lophostemon confertus</i>	7	300	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
11	Swamp Oak (clump) <i>Casuarina glauca</i>	8	Multi-trunk	Mature	Good	Good	3	Low	Low – Moderate	No
12	Brush Box <i>Lophostemon confertus</i>	7	480	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
13	Brush Box <i>Lophostemon confertus</i>	9	570	Mature	Good	Good	3	Low	Low – Moderate	No
14	Arizona Smooth Bark Cypress <i>Cupressus glabra</i>	8	Multi-trunk	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
15	Brush Box <i>Lophostemon confertus</i>	8	550	Mature	Good	Good	3	Low	Low – Moderate	No
16	Peppercorn tree <i>Schinus areira</i>	7	Multi-trunk	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
17	Frangipani Shrub <i>Plumeria acutifolia</i>	2	Multi-trunk	Mature	Good	Good	3	Low	Low – Moderate	Yes

No.	Species	Height (m)	DBH (mm)	Tree Age *Young *Semi Mature *Mature *Over Mature	Tree Health * Good * Fair * Poor * Dead	Tree Structure * Good * Fair * Poor	SULE Rating	Ecological Significance *High *Moderate *Low *Nil	Landscape Significance *High *Moderate *Low *Nil	Retained?
18	Frangipani Shrub <i>Plumeria acutifolia</i>	2	Multi-trunk	Mature	Good	Good	3	Low	Low – Moderate	No
19	Brush Box <i>Lophostemon confertus</i>	8	390	Mature	Good	Good	3	Low	Low – Moderate	No
20	Brush Box <i>Lophostemon confertus</i>	7	200	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	No
21	Brush Box <i>Lophostemon confertus</i>	9	350	Mature	Good	Good	3	Low	Low – Moderate	No
22	Brush Box <i>Lophostemon confertus</i>	7	370	Mature	Good	Good	3	Low	Low – Moderate	No
23	Brush Box <i>Lophostemon confertus</i>	7	340	Mature	Good	Good	3	Low	Low – Moderate	No
24	Brush Box <i>Lophostemon confertus</i>	7	200	Mature	Fair	Fair – Good	4	Low	Nil - Low	Yes
25	Brush Box <i>Lophostemon confertus</i>	7	320	Mature	Good	Good	3	Low	Low – Moderate	Yes
26	Brush Box <i>Lophostemon confertus</i>	7	250	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	Yes

No.	Species	Height (m)	DBH (mm)	Tree Age *Young *Semi Mature *Mature *Over Mature	Tree Health * Good * Fair * Poor * Dead	Tree Structure * Good * Fair * Poor	SULE Rating	Ecological Significance *High *Moderate *Low *Nil	Landscape Significance *High *Moderate *Low *Nil	Retained?
27	Brush Box <i>Lophostemon confertus</i>	8	360	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	Yes
28	Brush Box <i>Lophostemon confertus</i>	8	330	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	Yes
29	Brush Box <i>Lophostemon confertus</i>	7	400	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	Yes
30	Brush Box <i>Lophostemon confertus</i>	4	240	Mature	Good – Fair	Good – Fair	3	Low	Low – Moderate	Yes

Note: Blue = trees temporarily removed for construction laydown area, Red = trees to be removed, Green = trees to be retained. Refer to Figure 3 for location of each tree.

Source: Modified from data provided by Mr Scott Freeman, Horticultural Management Services, www.hortmanagement.com.au

4.2 Indirect Impacts

Indirect impacts on biodiversity during construction and operation are possible and these are discussed below.

4.2.1 Changes to Water Quality

The redevelopment of the Flemington Station and precinct area would involve tree clearing, moving of soil and soil stockpiling. These activities risk soils and seeds from weeds entering the stormwater system through run-off from the site. This could result in the smothering of vegetation and an increase in light attenuation which can decrease the productivity of aquatic vegetation, increase nutrients which can cause eutrophication within aquatic ecosystems and spread of weeds. An Erosion and Sediment Control Management Plan should be prepared for the proposed works and should include measures to limit the opportunities for movement of sediments into downstream waterways and habitats.

4.2.2 Disturbance of fauna

Construction activities could cause disruption through noise and vibration to fauna utilising the habitat within the study area. However, this disruption would be relatively minor and temporary and is unlikely to result in substantial long term impacts on fauna.

4.2.3 Disruption to Corridors

The street trees may on occasion provide stepping stone habitat for highly mobile species between areas to the south (e.g. Rookwood Cemetery and Cooks River Corridor) and the mosaic of habitat provided by the Millennium Parkland / Bicentennial Park and Mason Park approximately 2 km to the north. There would be relatively minor disruption to this potential stepping stone habitat as a consequence of removal although this is likely to be temporary as the vegetation would be replaced in accordance with the TfNSW Vegetation Offset Guide (2012).

4.3 Cumulative Impacts

This proposal is unlikely to cause substantial impacts to the ecology of the locality as the vegetation to be cleared consists of planted street trees which would be replanted in accordance with the TfNSW Vegetation Offset Guide (2012). This would result in a net gain in the overall number of trees in the study area. It should be noted that additional tree clearing would be undertaken as part of the Electrical Enabling Works associated with this upgrade. These impacts have been assessed in Alison Hunt & Associates Pty Ltd (2014b) and measures to mitigate these impacts are discussed in that report.

4.4 Key Threatening Processes

It is unlikely that this proposal would exacerbate any processes which would impact on Key Threatening Processes (KTP) listed under the TSC Act and EPBC Act.

4.5 Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Matters of national environmental significance (NES) that have the potential to be impacted by this proposal include two fauna (i.e. White-throated Needletail and Grey-headed Flying-fox) and one flora species (i.e. Downy Wattle). As a precautionary measure the assessment of the potential impacts of this Proposal has been undertaken using the Significant Impact Criteria detailed in *Matters of National Environmental – Significant Impact Guidelines 1.1* (Department of the Environment 2013). Details of this assessment are contained at Appendix C and the outcomes briefly outlined below.

It was concluded that with the implementation of mitigation measures and environmental management proposed to manage potential impacts that this Proposal would be unlikely to significantly impact any Commonwealth-listed matter as:

- Direct impacts on any species, population or ecological community are not expected;
- Vegetation removal would be limited to planted street trees and these would be replaced in accordance with TfNSW Vegetation Offset Guidelines (2010) resulting in the overall net gain of vegetation; and
- Potential downstream impacts on areas supporting biodiversity of conservation significance (i.e. Millennium Parkland / Bicentennial Park / Mason Park habitat complex) could be managed through implementation of an Erosion and Sediment Control Management Plan.

4.6 NSW *Environmental Planning and Assessment Act 1979*

An assessment of the impacts of the proposed upgrade to Flemington Station and precinct area on species, populations and ecological communities listed under Schedules 1, 1A and 2 of the TSC Act was undertaken in accordance with the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DEC 2005 & DECC 2007). Details of this assessment are provided at Appendix D and the outcomes briefly outlined below.

The species, populations and ecological communities addressed included:

- Downy Wattle (*Acacia pubescens*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Eastern Freetail-bat (*Mormopterus norfolkensis*).

It was concluded that with the implementation of mitigation measures and environmental management proposed to manage potential impacts that this project would be unlikely to significantly impact any matters listed under the TSC Act as:

- Direct impacts on any species, population or ecological community are not expected;
- Vegetation removal would be limited to planted street trees and these would be replaced in accordance with TfNSW Vegetation Offset Guidelines (2010) resulting in the overall net gain of vegetation; and
- Potential downstream impacts on areas supporting biodiversity of conservation significance (i.e. Millennium Parkland / Bicentennial Park / Mason Park habitat complex) could be managed through implementation of an Erosion and Sediment Control Management Plan.

5 RECOMMENDATIONS

TfNSW environmental policy includes objectives to *sustain the health, diversity and productivity of the environment for future generations* (TfNSW 2010). Central to these objectives is the hierarchy of commitment to avoid impacts, mitigate unavoidable impacts and offset any residual loss. These objectives are detailed below.

5.1 Avoid

The footprint of the Proposal has been designed to avoid impacts to native vegetation and to street trees where possible. Whilst native vegetation communities would not be impacted, a number of street trees would be removed for this Proposal and hence measures to mitigate and offset these impacts are detailed below.

5.2 Mitigate

A number of mitigation measures are recommended to protect adjacent biodiversity and biodiversity values within the locality. The performance objectives of these measures would be to:

- To minimise impacts on remaining biodiversity values of the study area; and
- Protect nearby and downstream conservation areas (e.g. Millennium Parkland / Bicentennial Park and Mason Park).

These performance objectives would be achieved through the implementation of key management measures and these are discussed below.

5.2.1 General Mitigation Measures

The principal mechanism to reduce impacts on biodiversity values within the study area would be to minimise removal of native vegetation and fauna habitat by restricting the encroachment of the works on any adjacent vegetation through the following measures:

- The Contractor would provide all workers with an environmental induction prior to commencing work on-site. This induction would include information on the ecological values of the site, protection measures to be implemented to protect biodiversity and penalties for breaches;
- The trees to be removed would be clearly demarcated on-site (where appropriate) prior to construction to avoid unnecessary vegetation removal;
- In the case where any access is required within the tree protection zones (TPZs) for building purposes, the fence would be set back 1.5 m from the construction and the soil surface would be protected by plywood sheets or strapped planking;
- Any vegetation to be removed that has not been assessed in this REF would be subject to separate approval in accordance with TfNSW's *Application for Removal or Trimming Vegetation*;
- A Site Arborist meeting Australian Qualifications Framework (AQF) Level 5 would be retained to provide advice for any potentially sensitive works in the vicinity of retained trees;

- Native trees to be removed are to be chipped and reused as leaf mulch (as per AS 4454 and AS 4419) and placed within tree protection fencing; and
- Storage of materials, mixing of materials, vehicle parking, disposal of liquids, machinery repairs and refuelling, site office and sheds, and the lighting of fires, stockpiling of soil, rubble or any debris shall not be carried out within the TPZs of existing trees to be retained. No backfilling would occur within the TPZs of existing trees (additional recommendations for tree management are provided at Appendix E).

5.2.2 Construction Environmental Management Plan

The Contractor would prepare and implement a Construction Environmental Management Plan which would include undertaking works including:

- Retention of adjoining trees;
- Site management of retained trees;
- Tree protection measures for construction process in accordance with Australian Standard AS 4970-2009 *Protection of Trees on Development Sites*;
- The trunk of trees to be retained would be armoured with 2 m lengths of 50 x100 mm hardwood timbers spaced at 150 mm centres and secured by 8 gauge wires or steel strapping at 300 mm spacing, in line with Australian Standard AS 4970-2009 *Protection of Trees on Development Sites*;
- Tree protection works would be inspected and approved by the Site Arborist prior to works commencing;
- The TPZ trunk protection would be maintained intact until the completion of all work on the site; and
- Appropriately designed, installed and maintained sediment and erosion controls during excavation works to prevent any potential sediment runoff.

5.2.3 Landscape Plan

The Contractor would prepare and implement a Landscape Plan for the Proposal which would include:

- Replanting in accordance with the requirements of in accordance with TfNSW's *Vegetation Offsets Guide* and with consideration of Sydney Train's *Revegetation Guide and Biodiversity Offsets Calculator* (as appropriate) to ensure the replacement of trees and vegetation;
- Replacement vegetation would be selected in consultation with Strathfield Council as appropriate;
- Replacement trees would be planted nearby if possible, otherwise an area for replanting would be negotiated with Council;
- Native species endemic to the area and suitable for planting in a road reserve and near to a rail corridor would be selected;

- Species would be chosen to reflect communities representative of Cumberland Dry Sclerophyll Forest and Wianamatta Shale associated vegetation and include:
 - Species of low-growing and flowering shrubs to provide habitat for small bird species, and
 - Flowering trees species to provide foraging habitat and refuge areas for the Grey-headed Flying-fox, a range of microchiropteran bats and insects.

5.3 Biodiversity Offsets

The removal of street trees would be offset in accordance with of the TfNSW Vegetation Offset Guide (2010) 5.4. *Offsets for individual trees or group of trees* and would include:

5.3.1 Offsets for Residual Loss

The 10 street trees which will be removed for construction (i.e. Trees numbers 12-16 & 19-23) are considered to be medium sized trees (i.e. DBH greater than 15cm, but less than 60cm) (Horticultural Management Services). In accordance with TfNSW Vegetation Offset Guide (2010), these trees would be replaced at a ratio of 1:4. The Landscape Plan would provide for their replacement nearby if possible, otherwise an area for replanting would be negotiated with Council. Replanting of the site would be undertaken with native species endemic to the area and suitable for planting in a road reserve and near to a rail corridor. Species chosen for planting should reflect communities representative of Cumberland Dry Sclerophyll Forest and Wianamatta shale associated vegetation (refer Appendix F).

5.3.2 Offsets for Temporary Net Loss

The removal of 11 planted street trees to provide a laydown area for materials during construction would be temporary and replaced through replanting at the end of construction. Replanting of the site would be undertaken with native species endemic to the area and suitable for planting in a road reserve and near to a rail corridor. Species chosen for planting should reflect communities representative of Cumberland Dry Sclerophyll Forest and Wianamatta shale associated vegetation (refer Appendix F).

6 CONCLUSIONS

The existing environment of the study area and much of the locality has been extensively modified over many years, through clearing, urbanisation and industrialisation, and hence existing biodiversity values are relatively low. It is unlikely that the study area would provide important habitat for any species, population or ecological community.

The proposed Flemington Station & Precinct Upgrade is unlikely to cause significant direct impacts on any remaining biodiversity. There would be no long-term net loss of vegetation as a consequence of this proposal as the removal of street trees would be offset in accordance with TfNSW Vegetation Offset Guide (2010) 5.4. *Offsets for individual trees or group of trees*. There is the potential that the civil works associated with the redevelopment could have downstream impacts on areas of conservation significance if erosion and sedimentation occur during construction. It is considered that these risks could be managed with the implementation of mitigation recommendations and environmental management.

Assessments under the NSW EP&A Act, including those species, populations and communities listed under the TSC Act, concluded that significant impacts are unlikely provided that commonly used management and mitigation measures are incorporated into the environmental management of the Proposal and that a Species Impact Statement is not required. Similarly, it was concluded that matters of NES listed under the Commonwealth EPBC Act and addressed in this report, are unlikely to be significantly impacted and hence the proposal is unlikely to constitute a controlled action.

7 REFERENCE MATERIALS

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APPENDIX A

Rare or Threatened Australian Plants Coding System

Rare or Threatened Australian Plants (RoTAP) Coding System

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

Source: Association of Societies for Growing Australian Plants (ASGAP) (<http://asgap.org.au/atrisk.html>)

Example of application of codes:

Magenta Lilly Pilly (*Syzygium paniculatum*) is Vulnerable under the EPBC Act, Vulnerable under the TSC Act and has a RoTAP code of 3Vci.

3 = Has a range more than 100 km but in small populations.

V = Vulnerable – at risk over a longer period (20 – 50 years).

C = Species is known to occur within a proclaimed reserve.

i = Species is considered to be inadequately reserved. Less than 1000 plants occur within a proclaimed reserve.

APPENDIX B

Threatened communities, populations and species recorded or predicted to occur within the locality of the Flemington Station & Precinct Area Upgrade

Threatened or RoTAP Flora Recorded or with the Potential to Occur Within the Locality

Family	Scientific Name	Common Name	Conservation Ranking	Habitat & Likelihood of Occurrence
POPULATIONS				
Campanulaceae	<i>Wahlenbergia multicaulis</i>	Tadgell's Bluebell in Auburn, Bankstown & Baulkham Hills LGA	EP-TSC	Known from the Strathfield LGA. Closely aligned with Villawood Soil Series in damp sites. Known from Rookwood Cemetery approximately 1 km south-west of site. Unlikely - Soil profiles at study area severely disturbed and suitable damp sites not present.
Rhamnaceae	<i>Pomaderris prunifolia</i>	<i>P. prunifolia</i> in the Parramatta, Auburn, Strathfield and Bankstown Local Government Areas	EP-TSC	Found nearby at Rookwood Cemetery approximately 1 km south-west of site. Occurs in a small gully of degraded Cooks River / Castlereagh Ironbark Forest on shale soils. Unlikely – habitat not present.
SPECIES				
Convolvulaceae	<i>Wilsonia backhousei</i>	Narrow-leafed Wilsonia	V-TSC	A species of the margins of salt marshes and lakes. Unlikely – habitat not present.
Ericaceae	<i>Epacris purpurascens</i> var. <i>purpurascens</i>		V-TSC	Most commonly associated with soils with strong shale influence. Unlikely – soils likely to be unsuitable.
Fabaceae - faboideae	<i>Dillwynia tenuifolia</i>		V-TSC 2RCa- ROTAP	Locally abundant particularly within scrubby / dry heath areas within Castlereagh Ironbark Forest and Shale Gravel Transition Forest on tertiary alluvium or laterised

Family	Scientific Name	Common Name	Conservation Ranking	Habitat & Likelihood of Occurrence
				clays. Unlikely – native vegetation communities not present.
Fabaceae - mimosoideae	<i>Acacia pubescens</i>	Downy Wattle	V- TSC V- EPBC 3VCa-ROTAP	Open woodland and forest on alluviums, shales and at intergrade between shales and sandstones on gravelly soils, often with ironstone. Known from the locality and rail corridor at Homebush Bay West. Closest recent record approximately 500 m west of Flemington Station. Potential – a number of records within the locality.
Myrtaceae	<i>Callistemon linearifolius</i>	Netted Bottle Brush	V-TSC 2RCi- ROTAP	Grows in dry sclerophyll forest on the coast and adjacent ranges. Recorded approximately 300 m south-west of Flemington Station in 2008. Potential – a recent nearby record.
Myrtaceae	<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint	V-TSC V-EPBC 3V- ROTAP	Typically grows in dry grassy woodland, on shallow soils of slopes and ridges. Found primarily on infertile soils derived from granite or metasedimentary rock. Unlikely – native vegetation communities not present.
Myrtaceae	<i>Eucalyptus scoparia</i>	Wallangarra White Gum	E-TSC V-EPBC	Found in open eucalypt forest, woodland and heaths on well-drained granite/rhyolite hilltops, slopes and rocky outcrops, typically at high altitudes. Unlikely – native vegetation communities not present.
Myrtaceae	<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E- TSC V- EPBC 3VCi-ROTAP	Occurs on soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.

Family	Scientific Name	Common Name	Conservation Ranking	Habitat & Likelihood of Occurrence
				Unlikely – native vegetation communities not present.
Orchidaceae	<i>Genoplesium baueri</i>	Bauer's Midge Orchid	V-TSC 3RC-ROTAP	Sparse sclerophyll forest and moss gardens over sandstone. Unlikely – native vegetation communities not present.
Thymelaeaceae	<i>Pimelea curviflora</i> var. <i>curviflora</i>		V-TSC V-EPBC	Occurs on shaley/lateritic soils over sandstone and shale/sandstone transition soils on ridgetops and upper slopes amongst woodlands. Unlikely – study area not on ridgetop or upper slope amongst woodlands.
Zannichelliaceae	<i>Zannichellia palustris</i>		E-TSC 3R+-ROTAP	A submerged aquatic plant. Unlikely – no aquatic habitat present across the study area.
<p>Note: TSC Act = <i>Threatened Species Conservation Act 1995</i>; EPBC Act = <i>Environment Protection and Biodiversity Conservation Act 1999</i>, V = Vulnerable, E = Endangered, EP = Endangered Population, ROTAP = Rare or Threatened Australian Plants, refer to Appendix A for RoTAP Coding System, Source: Bold indicates those species with the potential to occur on, or directly adjacent to the site. PlantNet (2014), OEH (2012)</p>				

Threatened or Migratory Fauna Species Recorded Within the Locality or With the Potential to Occur

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
INVERTEBRATES				
<i>Meridolum corneovirens</i>	Cumberland Land Snail	E-TSC	Primarily inhabits Cumberland Plain Woodland.	Unlikely – Cumberland Plain Woodland not present.
AMPHIBIANS				
<i>Litoria aurea</i>	Green & Golden Bell Frog	E-TSC E-EPBC	Marshes, dams & stream-sides particularly those containing <i>Typha</i> or <i>Eleocharis</i> . Need waterbodies unshaded, free of predatory fish and that have a nearby grassy area. Numerous records in the Millennium Parklands / Bicentennial Park / Mason Park approximately 2 km north of the site and along the Cooks River approximately 2 km south.	Unlikely – no aquatic habitats present across the site and it is unlikely that this species would use Flemington Station as a movement corridor. More likely to move along drainage lines (e.g. Powells Creek to the east).
AVES				
<i>Ptilinopus superbus</i>	Superb Fruit-dove	V-TSC Mar-EPBC	Inhabits rainforest and closed forests where it forages on fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Unlikely – suitable vegetation communities not present.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	E-TSC	Emergent vegetation in freshwater and brackish wetlands. Forage in wetlands, tussocky wet paddocks	Unlikely. Habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
		E-EPBC	and drains. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	
<i>Circus assimilis</i>	Spotted Harrier	V-TSC	Occurs in grassy open woodland including <i>Acacia</i> and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Hieraaetus morphnoides</i>	Little Eagle	V-TSC	Occupies open eucalypt forest, woodland or open woodland. Sheoak or <i>Acacia</i> woodlands and riparian woodlands of interior NSW are also used. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Pandion cristatus</i>	Eastern Osprey	V-TSC M-EPBC Mar-EPBC	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Charadrius leschenaultii</i>	Greater Sand Plover	V-TSC M-EPBC Mar-EPBC M-EPBC	Occurs mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
<i>Rostratula australis</i>	Australian Painted Snipe	E-TSC E-EPBC M-EPBC Mar-EPBC	Prefers fringes of swamps, dams and nearby marshy areas with a cover of grasses, lignum, low scrub or open timber. Nests on the ground amongst tall vegetation. Forages nocturnally. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Calidris ferruginea</i>	Curlew Sandpiper	E-TSC M-EPBC Mar-EPBC	Summer migrant to coastal Australia where it can be found in coastal areas, inland, mudflats and often at saltworks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Calidris tenuirostris</i>	Great Knot	V-TSC M-EPBC Mar-EPBC	Occurs within sheltered, coastal habitats containing large, intertidal mudflats or sandflats, including inlets, bays, harbours, estuaries and lagoons. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Limicola falcinellus</i>	Broad-billed Sandpiper	V-TSC M-EPBC Mar-EPBC	Favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Limosa limosa</i>	Black-tailed Godwit	V-TSC M-EPBC Mar-EPBC	Usually found in sheltered bays, estuaries and lagoons with large intertidal mudflats and/or sandflats. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
<i>Xenus cinereus</i>	Terek Sandpiper	V-TSC EPBC	Favours mudbanks and sandbanks located near mangroves, but may also be observed on rocky pools and reefs, and occasionally up to 10 km inland around brackish pools. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Sternula albifrons</i>	Little Tern	E- TSC M-EPBC Mar-EPBC	Prefers sheltered coastal environments but may occur several km from the sea in harbours, inlets and rivers. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Glossopsitta pusilla</i>	Little Lorikeet	V-TSC	This species forages mostly within open eucalypt forest and woodland, but also uses Melaleuca and Angophora as food resources. It is known to forage in isolated vegetation such as roadsides, even in single trees in open areas. This species is often observed travelling in flocks of other lorikeet species. Small entrance hollows (3 cm) in smooth-barked eucalypts are often used for nesting, but also riparian species such as <i>Allocasuarina</i> . Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Potential – the study area could provide limited foraging or stepping stone habitat for this species on occasion.
<i>Lathamus discolor</i>	Swift Parrot	E-TSC E-EPBC Mar-EPBC	Swamp Mahogany, Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>). Commonly used lerp infested trees include Grey Box (<i>E. macrocarpa</i>), Grey Box (<i>E. moluccana</i>) and Blackbutt (<i>E. pilularis</i>). Recorded in Millennium Parkland / Bicentennial Park /	Unlikely – unlikely given that none of the trees on site are preferred foraging species.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
			Mason Park habitat complex to the north.	
<i>Ninox strenua</i>	Powerful Owl	V-TSC	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Recorded in Artarmon to the north.	Unlikely – given that the study area is generally cleared and is set within a cleared landscape.
<i>Tyto longimembris</i>	Eastern Grass Owl	V-TSC	Grass Owls are found in areas of tall grass, including grass tussocks in swampy areas, grassy plains, swampy heath, and cane grass, or sedges on flood plains. Recorded in Bicentennial Park to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Anthochaera phrygia</i>	Regent Honeyeater	E-TSC CE-EPBC	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak. Regent Honeyeaters inhabit woodlands with a significantly high abundance of bird species. Should have large numbers of mature trees, high canopy cover and abundance of mistletoes. Recorded at Rookwood Cemetery approximately 2 km south-west of the site.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Epthianura albifrons</i>	White-fronted Chat	V-TSC	Gregarious species, usually found foraging on bare or grassy ground in wetland areas, singly or in pairs. They are insectivorous, feeding mainly on flies and beetles caught from or close to the ground. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Epthianura albifrons</i>	White-fronted Chat population in the Sydney Metropolitan Catchment Management Area	EP-TSC	Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – study area is unlikely to provide suitable habitat.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
AVES (solely Marine or Migratory under the EPBC Act)				
<i>Actitis hypoleucos</i>	Common Sandpiper	M-EPBC Mar-EPBC	Utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Ardea ibis</i>	Cattle Egret	M-EPBC Mar-EPBC	Found in stock paddocks, pastures, croplands, garbage tips, wetlands, tidal mudflats and drains. Recorded in Bicentennial Park to the north.	Unlikely – suitable habitat not present.
<i>Arenaria interpres</i>	Ruddy Turnstone	M-EPBC Mar-EPBC	Mainly found on coastal regions with exposed rock coast lines or coral reefs. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia where it feeds in coastal areas and inland wetlands. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Calidris canutus</i>	Red Knot	M-EPBC Mar-EPBC	Mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. Occasionally seen on terrestrial saline wetlands	Unlikely – suitable habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
			near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks. Rarely use freshwater swamps. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	
<i>Calidris mauri</i>	Western Sandpiper	M-EPBC Mar-EPBC	Forages on intertidal mudflats, mainly in shallow water as the tide recedes. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Calidris melanotos</i>	Pectoral Sandpiper	M-EPBC Mar-EPBC	Found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Calidris ruficollis</i>	Red-necked Stint	M-EPBC Mar-EPBC	Found coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks. Sometimes, on protected sandy or coralline shores. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Chlidonias leucopterus</i>	White-winged Tern	M-EPBC Mar-EPBC	Frequent tidal wetlands (e.g. harbours, bays, estuaries and lagoons), and associated tidal sandflats and mudflats. Terrestrial wetlands, including swamps, lakes, billabongs, rivers,	Unlikely – study area is unlikely to provide suitable habitat.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
			floodplains, reservoirs, saltworks, sewage ponds and outfalls. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	
<i>Gallinago hardwickii</i>	Latham's Snipe	M-EPBC Mar-EPBC	Summer migrant to coastal Australia where it feeds on soft wet ground or shallow water with tussocks and woodland, saltmarshes and mangrove fringes. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	M-EPBC Mar-EPBC	Found in coastal areas, on islands, estuaries, inlets, large rivers, inland lakes and reservoirs where they forage over water. Builds huge nests of sticks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Hirundapus caudacutus</i>	White-throated Needletail	M-EPBC Mar-EPBC	Feeds on flying insects, such as termites, ants, beetles and flies. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts.	Potential - could overfly the study area.
<i>Hydroprogne caspia</i>	Caspian Tern	M-EPBC Mar-EPBC	Found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas). Sandy or muddy margins are preferred. Also occur on near-coastal or inland terrestrial wetlands (fresh or saline), especially	Unlikely – suitable habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
			lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	
<i>Limosa lapponica</i>	Bar-tailed Godwit	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia. Found in intertidal flats and sandbanks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Merops ornatus</i>	Rainbow Bee-eater	M-EPBC Mar-EPBC	Summer breeding migrant to south-east Australia. Found in open woodlands with sandy, loamy soil, sandridges, sandpits, riverbanks, cliffs, mangroves, rainforest and woodland. Recorded at Concord West to the north-east.	Unlikely – study area is unlikely to provide suitable habitat.
<i>Numenius madagascariensis</i>	Eastern Curlew	M-EPBC Mar-EPBC	Common migrant to coastal areas during summer. In estuaries, tidal mudflats, sandspits, saltmarshes, mangroves and occasionally fresh or brackish lakes, bare grasslands near water. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Numenius phaeopus</i>	Whimbrel	M-EPBC Mar-EPBC	Summer migrant to coastal Australia. Found in coastal estuaries, mudflats and mangroves. Recorded in Bicentennial Park to the north.	Unlikely – suitable habitat not present.
<i>Philomachus pugnax</i>	Ruff	M-EPBC Mar-EPBC	Found on fresh, brackish or saline wetlands with exposed mudflats at the edges. Also found in terrestrial wetlands (lakes, swamps, pools, lagoons, tidal rivers, swampy fields and	Unlikely – suitable habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
			floodlands). Occasionally seen on sheltered coasts, in harbours, estuaries, seashores and are known to visit sewage farms and saltworks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	
<i>Plegadis falcinellus</i>	Glossy Ibis	M-EPBC Mar-EPBC	Preferred foraging includes fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Pluvialis fulva</i>	Pacific Golden Plover	M-EPBC Mar-EPBC	Widespread summer migrant to coastal Australia. Found in estuaries, mudflats, saltmarshes, mangroves, rocky reefs and shallow open inland swamps, sewage ponds and paddocks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Pluvialis squatarola</i>	Grey Plover	M-EPBC Mar-EPBC	Found in coastal areas (usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats). Occasionally on rocky coasts with wave-cut platforms or reef-flats, or on reefs within muddy lagoons. Also around terrestrial wetlands (e.g. coastal lakes and swamps, or salt-lakes). Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
<i>Sterna hirundo</i>	Common Tern	M-EPBC Mar-EPBC	Observed in near-coastal waters, both on ocean beaches, platforms and headlands and in sheltered waters (bays, harbours and estuaries) with muddy, sandy or rocky shores. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Tringa brevipes</i>	Grey-tailed Tattler	M-EPBC Mar-EPBC	Found on sheltered coasts with reefs and rock platforms or with intertidal mudflats. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Tringa nebularia</i>	Common Greenshank	M-EPBC Mar-EPBC	Found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.
<i>Tringa stagnatilis</i>	Marsh Sandpiper	M-EPBC Mar-EPBC	Found in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Unlikely – suitable habitat not present.

Scientific Name	Common Name	Conservation Rating	Habitat Requirements	Likelihood of Occurrence
MAMMALS				
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	V-TSC	Roosting – caves, derelict mines, stormwater tunnels, buildings. Foraging - forested areas. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north and Rookwood Cemetery to the south-west.	Potential - may occasionally forage across the study area.
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	V-TSC	Forages - dry sclerophylla forest & woodland. Roosts - hollows & under bark or man-made structures. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Potential - may occasionally forage across the study area.
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheathtail-bat	V-TSC	Roosts in hollow-bearing trees and buildings. Will use mammal burrows. Forages in most habitats across areas with and without trees. Appears to defend an aerial territory. Recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.	Potential - may occasionally forage across the study area.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	V-TSC V-EPBC	Subtropical & temperate rainforests, tall sclerophylla forests & woodlands, heaths & swamps. Recorded widely in Strathfield LGA.	Potential - May occasionally forage across the study area.
<p>Note: TSC Act = <i>Threatened Species Conservation Act 1995</i>; EPBC Act = <i>Environment Protection and Biodiversity Conservation Act 1999</i>, V = Vulnerable, E = Endangered, M = Migratory, Mar = Marine. Bold indicates those species with the potential to occur on, or directly adjacent to the site. Sources: OEH (2012), SPRAT Profiles (DoE 2013).</p>				

APPENDIX C

STATUTORY ASSESSMENT UNDER THE EPBC ACT

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The criteria detailed in the *Matters of National Environmental Significance. Significant Impact Guidelines 1.1* (Department of the Environment 2013) were used to assess the significance of likely impacts on matters listed under the EPBC Act as a consequence of the proposal and this assessment is detailed below.

Grey-headed Flying Fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is listed as vulnerable under the TSC Act and EPBC Act. It roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (OEH 2012).

Assessment

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- i) *Lead to a long-term decrease in the size of an important population of a species;*

The Grey-headed Flying-fox may potentially forage across this site. It is unlikely that this Proposal would significantly impact on any population of this species as this site and adjacent area does not support a camp site of this species. Instead it would provide marginal foraging habitat from time to time. The current vegetation across the site would be replaced with landscaping more appropriate to the locality and would therefore continue to provide foraging habitat into the future.

- ii) *Reduce the area of occupancy of an important population;*

It is unlikely that removal of vegetation from the site would substantially reduce the area of occupancy for this species. The current vegetation across the site would be replaced with landscaping more appropriate to the locality and would therefore continue to provide foraging habitat into the future.

- iii) *Fragment an existing population into two or more populations;*

This proposal is unlikely to fragment existing populations as this species is highly mobile and the site relatively insignificant in relation to better quality habitat available within the locality.

- iv) *Adversely affect habitat critical to the survival of a species;*

Potential habitat on the site or within adjacent areas has not been identified as critical habitat within the recovery plan for this species or listed on the Register of Critical Habitat maintained

by the Minister under the EPBC Act and so is unlikely to provide habitat critical to survival of this species.

v) *Disrupt the breeding cycle of an important population;*

This site does not support a Grey-headed Flying-fox camp and one is not known from adjacent habitat. Foraging habitat for this species is unlikely to be disturbed to the extent that the breeding cycle of this species would be disrupted.

vi) *Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

This proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat as this site is relatively insignificant in relation to higher quality habitat available within the locality. However, the removal of street trees would be offset in accordance with 5.4. *Offsets for individual trees or group of trees* of the TfNSW Vegetation Offset Guide (2010) which will result in an overall net gain in vegetation and consequently will improve the outcomes for native fauna and flora within the area.

vii) *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;*

As a result of this proposal, invasive weed species would be removed from site and the site would be landscaped with native species as a part of the redevelopment of the Flemington Station.

viii) *Introduce disease that may cause the species to decline; or*

The Proposal is not of the type that would introduce disease that may cause the species to decline.

ix) *Interfere with the recovery of the species.*

This proposal would not pose a threat to the recovery of the Grey-headed Flying-fox as recognised threats would not be exacerbated.

Conclusion

It is unlikely that this proposal would significantly impact this species as:

- A camp site is not present across the site or in adjacent areas;
- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- The replanting would result in a net gain of vegetation across the site and in adjacent areas as offsets would be undertaken in accordance with TfNSW Vegetation Offset Guide (2010).

Downy Wattle (*Acacia pubescens*)

Downy Wattle is listed as Vulnerable under the EPBC Act and TSC Act. Suitable habitat for this species is open woodland and forest on alluviums, shales and at the intergrade between shales and sandstones on gravelly soils, often with ironstone. Most recorded occurrences of this species are within Cooks River / Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland (NSW NPWS 2003). Stands of *A. pubescens* have also been recorded in open, disturbed areas, surrounded by exotic species (NSW NPWS 2003). This species is known from the rail corridor at Homebush Bay West with the closest recent record to Flemington Station being along the rail corridor approximately 500 m to the west.

Assessment

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- i) *Lead to a long-term decrease in the size of an important population of a species;*

This species was not recorded across the site although is known from records nearby. There are unlikely to be direct impacts on this species.

- ii) *Reduce the area of occupancy of an important population;*

The vegetation which would be removed consists of street trees and a minor landscaped garden bed and hence there is currently no habitat across the site that is suitable for this species.

- iii) *Fragment an existing population into two or more populations;*

The nearest recent record of this species is 500 m to the west of Flemington Station. Removal of the street landscaping would not fragment this population.

- iv) *Adversely affect habitat critical to the survival of a species;*

Potential habitat on the site or within adjacent areas has not been identified as critical habitat within the recovery plan for this species or listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act and so is unlikely to provide habitat critical to survival of this species.

- v) *Disrupt the breeding cycle of an important population;*

The implementation of mitigation measures would protect nearby occurrences of the Downy Wattle and hence the breeding cycle of this species is unlikely to be affected.

- vi) *Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;*

This Proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat as mitigation measures are proposed that would protect off-site occurrences of this species (e.g. Construction Environmental Management Plan and Erosion and Sediment Control Management Plan).

- vii) *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;*

As a result of this proposal street trees would be replaced in accordance with TfNSW Vegetation Offset Guide (2010) using native species endemic to the area. These measures

would assist with increasing the representation of endemic species in the area and reduce the non-native species currently represented along The Crescent.

viii) *Introduce disease that may cause the species to decline; or*

The proposal is not of the type that would introduce disease that may cause the species to decline.

ix) *Interfere with the recovery of the species.*

This proposal would not pose a threat to the recovery of the Downy Wattle as recognised threats would not be exacerbated.

Conclusion

It is unlikely that this proposal would significantly impact this species as:

- Direct impacts on this species are not anticipated;
- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- Off-site occurrences of this species would be protected through the implementation of mitigation measures, including Construction Environmental Management Plan and Erosion and Sediment Control Management Plan.

White-throated Needletail (*Hirundapus caudacutus*)

The White-throated Needletail is listed as Migratory and Marine under the EPBC Act. In Australia, this species is almost exclusively aerial, from heights of < 1 m up to > 1,000 m above the ground. They occur over most types of habitat although most often above wooded areas, including open forest and rainforest and heathland, but less commonly over treeless areas. They feed on flying insects, such as termites, ants, beetles and flies. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts.

Assessment

An action is likely to have a significant impact on a migratory or marine species if there is a real chance or possibility that it will:

i) *Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;*

It is unlikely that the street landscaping along The Crescent would provide important habitat for this species. Potential off-site impacts on areas supporting habitat more suitable for this species (i.e. Rookwood Cemetery and the Millennium Parkland / Bicentennial Park / Mason Park habitat complex) would be managed through implementation of a Construction Environmental Management Plan. Consequently, it is unlikely that this proposal would modify, destroy or isolate area of important habitat for migratory bird populations.

- ii) *Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species; or*

Weed management will be addressed in the Construction Environmental Management Plan and Operational Environmental Management Plan so as to minimise the risk of invasive species establishment.

- iii) *Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.*

Potential off-site impacts on areas supporting habitat more suitable for this species (i.e. Rookwood Cemetery and the Millennium Parkland / Bicentennial Park / Mason Park habitat complex) would be managed through implementation of a Construction Environmental Management Plan. Consequently, it is unlikely that this proposal would modify, destroy or isolate area of important habitat for migratory bird populations.

Conclusion

It is unlikely that this species would be significantly impacted by this proposal as:

- Direct impacts on this species are not anticipated;
- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- More suitable off-site habitat for this species would be protected through the implementation of mitigation measures, including Construction Environmental Management Plan and Erosion and Sediment Control Management Plan.

APPENDIX D

ASSESSMENT OF SIGNIFICANCE UNDER THE EP&A ACT

Assessment of Significance

Background

An assessment of the significance of impacts of the proposed redevelopment of Flemington Station and Precinct Area on species listed under *the TSC Act* has been prepared in accordance with the *Threatened Species Assessment Guidelines: The Assessment of Significance* (DECC 2007). Assessments have been undertaken for guilds of species which have similar habitat requirements where appropriate.

Species addressed include:

Flora

- Downy Wattle (*Acacia pubescens*);

Megachiropteran Bat

- Grey-headed Flying-fox (*Pteropus poliocephalus*);

Microchiropteran Bats

- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*); and
- Eastern Freetail-bat (*Mormopterus norfolkensis*).

Downy Wattle (*Acacia pubescens*)

Downy Wattle is listed as Vulnerable under the EPBC Act and TSC Act. Suitable habitat for this species is open woodland and forest on alluviums, shales and at the intergrade between shales and sandstones on gravelly soils, often with ironstone. Most recorded occurrences of this species are within Cooks River / Castlereagh Ironbark Forest, Shale Gravel Transition Forest or Shale Plains Woodland (NSW NPWS 2003). Stands of *A. pubescens* have also been recorded in open, disturbed areas, surrounded by exotic species (NSW NPWS 2003). This species is known from the rail corridor at Homebush Bay West with the closest recent record to Flemington Station being along the rail corridor approximately 500 m to the west.

- 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.*

This species was not recorded across the site although it is known from records nearby. Direct impacts on this species are not anticipated. Potential off-site impacts would be managed through mitigation measures that would protect off-site occurrences of this species (e.g. Construction Environmental Management Plan and Erosion and Sediment Control Management Plan).

- 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.*

Not an endangered population.

- 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.*

Not an endangered ecological community.

- 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.*

This proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat for this species. The removal of street trees would be offset in accordance with 5.4. *Offsets for individual trees or group of trees* of the TfNSW Vegetation Offset Guide (2010) which will result in a net gain in vegetation and consequently is likely to improve the overall outcomes for native fauna and flora within the area.

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

Critical habitat has not been declared for this species.

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

A recovery plan has been prepared for Downy Wattle (NSW NPWS 2003). The objectives for this plan are to ensure that a representative sample of *A. pubescens* populations occurring on public and private lands are protected from habitat loss and managed for conservation. This proposal would not result in direct impacts on any known occurrence of Downy Wattle and potential indirect impacts would be managed through mitigation measures that would protect off-site occurrences of this species (e.g. Construction Environmental Management Plan and Erosion and Sediment Control Management Plan).

- 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.*

There are two key threatening processes identified as a risk to Downy Wattle and these are:

Clearing of native vegetation: Vegetation removal would be largely confined to street plantings and this would be offset in accordance with the TfNSW Vegetation Offset Guide (2010) which will result in a net gain in vegetation and consequently is likely to improve the overall outcomes for native fauna and flora within the area.

High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition: A Fire and Life Safety Final Concept Design Study forms part of the REF assessment and would assist with the minimisation of the potential for fire in the area.

Conclusion

It is unlikely that this proposal would significantly impact this species as:

- Direct impacts on this species are not anticipated;
- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- Off-site occurrences of this species would be protected through the implementation of mitigation measures, including Construction Environmental Management Plan and Erosion and Sediment Control Management Plan.

Grey-headed Flying-fox (*Pteropus poliocephalus*)

The Grey-headed Flying-fox is listed as vulnerable under the TSC Act and EPBC Act. It roosts in camps generally located within 20 km of a regular food source and are commonly found in gullies, close to water and in vegetation with a dense canopy. This species feeds on the nectar and pollen of native trees, in particular *Eucalyptus*, *Melaleuca* and *Banksia*, and fruits of rainforest trees and vines in areas supporting subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops (OEH 2012). It is likely that this species would forage across the site on occasion.

- 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 site largely provides non-native foraging habitat for the Grey-headed Flying-fox but does not contain a camp site. It is unlikely that this proposal would adversely affect the life cycle of this species as it does not contain breeding or roosting habitat. The Grey-headed Flying-fox is

highly mobile, the area of vegetation to be cleared is small and would not result in isolation of habitat. Adjacent foraging habitat from indirect impacts associated with the construction of this Proposal.

- 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.*

Not an endangered population.

- 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.*

Not an endangered ecological community.

- 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.*

This proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat as this site is relatively insignificant in relation to higher quality habitat available within the locality. However, the removal of street trees would be offset in accordance with 5.4. *Offsets for individual trees or group of trees* of the TfNSW Vegetation Offset Guide (2010) which will result in a net gain in vegetation and consequently is likely to improve the outcomes for native fauna and flora within the area.

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

Critical habitat has not been declared for this species.

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

OEH has not prepared a recovery plan or threat abatement plan for this species. However, 10 PAS have been developed (OEH 2012). Of particular relevance to this proposal is the retention of foraging resources over the species' range. Whilst this proposal would remove a small amount of foraging habitat it is unlikely to significantly impact the recovery of this species as

this will be replaced in accordance with TfNSW Vegetation Offset Guide (2010). Consequently, this proposal is unlikely to impede the implementation of any of these priority actions.

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

Of the 31 key threatening processes identified in NSW none are considered to be of relevance to this proposal.

Conclusion

It is unlikely that this proposal would significantly impact this species as:

- A camp site is not present across the site or in adjacent areas;
- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- The replanting would result in a net gain of vegetation across the site and in adjacent areas as offsets would be in accordance with TfNSW Vegetation Offset Guide (2010).

Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*) is listed as Vulnerable under the TSC Act. It roosts singly or in groups of up to six, in hollow-bearing trees and buildings but will also use mammal burrows. It forages in most habitats across areas with and without trees and appears to defend an aerial territory. This species has been recorded in Millennium Parkland / Bicentennial Park / Mason Park habitat.

Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) is listed as Vulnerable under the TSC Act. This species has been recorded across the Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north and Rookwood Cemetery to the south-west. It has the potential to forage across the area for moths and other flying insects above the tree tops and to roost in nearby structures such as storm-water tunnels, buildings and other man-made structures. However, the site and adjacent areas are unlikely to provide habitat suitable for maternity roost sites as these require specific temperature and humidity requirements.

Eastern Freetail-bat (*Mormopterus norfolkensis*) is listed as Vulnerable under the TSC Act. It forages across dry sclerophylla forest and woodland and is known to roost in tree hollows and under bark or man-made structures. It has been recorded in the Millennium Parkland / Bicentennial Park / Mason Park habitat complex to the north.

- 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.*

Redevelopment of Flemington Station may result in the temporary disturbance of foraging habitat for these species. The removal of street trees would be offset in accordance with the TfNSW Vegetation Offset Guide (2010) which will result in a net gain in vegetation and consequently is likely to improve the outcomes for native fauna and flora within the area.

Therefore, this Proposal would be unlikely to result in a viable local population of these species being placed at risk of extinction.

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

Not an endangered population.

- 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.*

Not an endangered ecological community.

- 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 removal of vegetation which could form some marginal foraging habitat for this species may reduce the amount of foraging habitat available. However, this is unlikely to substantially impact foraging resources for these species as more important resources occur within the area (e.g. Millennium Parkland / Bicentennial Park / Mason Park habitat complex). It is unlikely that habitat connectivity for these species of microchiropteran bat would be disturbed as these species are highly mobile.

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

Critical habitat has not been declared for these species.

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

There is currently no recovery plans or threat abatements plans which have been prepared for any of these bat species. However, 25 priority actions have been identified to help recover these species (OEH 2012). This proposal would not be contrary to any of the priority actions for this species as it would result in the net gain of foraging habitat as a consequence of revegetation in accordance with the TfNSW Vegetation Offset Guide (2010).

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

Of the 31 key threatening processes identified in NSW none are considered to be of relevance to this proposal.

Conclusion

It is unlikely that this proposal would significantly impact these species as:

- The current street landscaping would be replaced with species associated with original native vegetation communities; and
- The replanting would result in a net gain of vegetation across the site and in adjacent areas as offsets would be undertaken in accordance with TfNSW Vegetation Offset Guide (2010).

APPENDIX E

Recommendations for Tree Management Across the Study Area

**Mr Scott Freeman
Horticultural Management Services
www.hortmanagement.com.au**

14.0 RETENTION OF ADJOINING TREES (General Conditions)

The following points may be considered for the long term retention of trees as listed in Section 12.0 Assessment of Existing Trees Identified on Site, not affected by this proposed development under this application.

- Avoid large changes to the surface structure due to modification of the trees moisture / surface feeding roots,
- A Qualified Arborist/Horticulturalist undertakes all Arboricultural works,
- All trenching near the trees as required is to be hand dug to ensure minimal disturbance to additional surface feeding roots,
- Any tree roots discovered are cut cleanly with root pruning devices,
- Vertical deep watering points for stressed mature trees if or as required,
- Air-knife treatments, to alleviate soil compaction where trees are suffering stress, and to inspect tree root structures and growth patterns,
- Any proposed work located near the trunk or outer canopy of the trees drip line, where services are known to be in the vicinity, any excavation for services should be hand dug to ensure minimal impact to the trees surface feeding and support roots,
- Any tree roots that are exposed will be removed by approved Arboricultural techniques and have a root hormone i.e. Formula 20® or equivalent applied at the manufactures specification,
- Any trenches undertaken near tree drip zones will be backfilled and compacted with an approved Australian Standard orchid mix 60/40 containing washed river sand and peat moss to a minimum depth of 700mm, the remaining soil profile is to be filled with an approved topsoil to meet the existing soil surface,
- No building waste is to be disposed of/or stored near the tree trunk or drip zone,
- In order to ameliorate impact of any development, advanced plants may be used in the Landscape Master Plan,
- Plantings should take into consideration the high priority of the streetscape and visual amenity,
- Any vegetation removed during the development not be mulched and used in landscaping due to the high levels of weed infestation on the site and the likelihood that seeds and viable cuttings may be spread throughout the development,
- In order to ameliorate impact of any development, standard erosion and sediment controls are recommended,
- The trees drip line/zone is to be mulched to the Horticultural standard of 75mm,
- Regular watering is to be undertaken in hot dry periods to alleviate any short-term stress or loss of available water,
- Erection of a chain mesh safety fence be installed to ensure the protection of Trees Critical Root Zone as per Annexure B,
- A qualified Arborist should monitor these trees over a twelve (12) month period to evaluate the trees recovery and provide technical information to Council as required.

14.1 SENSITIVE CONSTRUCTION APPROACH FOR SITE TREES

Where works are unavoidable within the Tree Protection Zone (TPZ) and or Structural Root Zone (SRZ) of trees to be retained, the following should be considered, but not limited to;

- Minimise the direct and indirect impacts to tree roots and soil such as root severance or damage, soil excavation, compaction and contamination,
- Allow for the free movement of water and oxygen within the soil of the TPZ,
- Allow for future rooting area adjacent to the TPZ,

Where the placement of footings within the SRZ cannot be avoided, root sensitive footing systems should be considered i.e. Terrabond®, Rocla Tri hex® paver or Eco paver® series would be sufficient to allow surface moisture and air into both trees surface feeding zone. These footings systems are minimal in their need for excavation by comparison to strip footings.

Footing systems such as pier and beam, screw pile, waffle slab or cantilevered have the potential to reduce the impact on trees by retaining sections of soil and roots between the piers.

To achieve the most benefit from this type of construction, the following is recommended:-

- Discontinuous footings should be used within the SRZ of the subject tree. (standard footing design could be used outside this area),
- All beams should be above the natural soil grade/surface,
- The footing design should allow for the greatest achievable span between Piers (as per engineers specifications/advice),
- Piers should not be placed within the Root Plate Radius of the subject tree,
- Foundations for the proposed piers should be initially hand dug to a depth of 500mm or to rock. If any roots are found that are greater than 40mmø, the pier position should be relocated, subject to engineer's advice,
- The proposed excavations should not result in the severance of roots greater than 40mmø,
- Care should be taken to avoid soil compaction between piers and any drilling machinery should remain outside the Tree Protection Zone. If access within the Tree Protection Zone by machinery cannot be avoided, appropriate compaction control methods should be used,
- Consider the type of equipment that will be used to drill holes for the piers and the clearance/tolerance requirement under the subject tree's canopy,
- These construction methods may require the implementation of post-construction maintenance such as irrigation and mulching. This would assist in minimising the potential impacts on tree health by providing favourable environment conditions for continued root growth and development.

Where achievable, pedestrian / vehicular access ways should be constructed of a semipermeable material (as listed above) and placed above grade to minimize the need for excavation. The strength of the pavement shall be selected to reduce the reliance on sub-base for strength.

Where appropriate, hand excavation and root pruning should be undertaken along the length of excavations adjacent to SRZs prior to any machine construction work. Major roots (greater than 40mmø) should not be severed or damaged. Minor roots (less than 40mmø) to be pruned should be cleanly severed.

15.0 PRE-CONSTRUCTION TREE PROTECTION MEASURES

15.1 APPOINTMENT OF SITE ARBORIST

A Site Arborist shall be appointed prior the commencement of all works on- site.

The Site Arborist shall monitor the trees to be retained and supervise the tree protection measures. The Site Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 5 or above in Arboriculture. An allowance of Five-(5) working days' notice to allow inspections to be undertaken at the following stages would be considered standard practice.

INSPECTION/HOLD POINT	INSPECTION PERSONNEL
Identification of retained trees and installation of tree protection zone including protection fencing, silt fencing and appropriate signage.	Site Arborist to undertake with Site Supervisor.
Modification of the Tree Protection Zone if or as required.	Site Arborist to undertake with Site Supervisor.
Works within the Tree Protection Zone if or as required.	Site Arborist to undertake with Site Supervisor.
Completion of the construction works (Post Construction) and final inspection/sign off.	Site Arborist to undertake with Site Supervisor.

15.2 EDUCATION

The project development applicant, contractors and site workers shall receive a copy of the final/Council approved Arborist Assessment and specifications with a minimum of 3 working days prior to commencing work on-site.

Contractors and site workers undertaking works within the Tree Protection Zones shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

15.3 SITE WORKS TREE PROTECTION ZONES

The trees identified to be retained shall be protected prior to and during the construction process from activities that may result in an adverse effect on its health, structure or longevity.

The area within the Tree Protection Zone shall exclude the following activities, unless otherwise stated and or approved by Council/Consent Authority;

Modification of existing soil levels,
Excavations and trenching,
Cultivation of the soil,
Mechanical removal of vegetation,
Soil disturbance,
Movement of natural rock,
Storage of materials, plant or equipment,
Erection of site sheds,

Affixing of signage or hoarding to the tree,
Preparation of building materials,
Disposal of waste materials and chemicals,
Movement of pedestrian or vehicular traffic,
Temporary or permanent location of services,

15.4 TREE PROTECTION FENCING

Tree Protection Fencing shall be installed at the perimeter of the Tree Protection Zone as specified.

As a minimum, the Tree Protection Fence shall consist of 1.8m high temporary chain wire panels supported by steel poles/stakes. They shall be fastened together and supported to prevent sideways movement. The fence must have a lockable opening for access. The tree's woody roots shall not be damaged during the installation of the Tree Protection Fencing.

Shade cloth material shall be attached to the outer surface of the Tree Protection Fence. The shade cloth material shall be transparent to provide visibility into the Tree Protection Zone.

The Tree Protection Fence shall be erected prior to the commencement of works on-site and shall be maintained in good condition for the duration of the development period.

The Tree Protection Fence shall only be removed, altered, or relocated with the authorization from the Site Arborist in consultation with the Site Supervisor.

15.5 SIGNAGE

Tree Protection Signage shall be attached to the Tree Protection Zone and displayed in a prominent position on each tree protection fencing.

The signs shall be repeated at 10m intervals or closer where the fence changes direction. The signage shall be installed prior to the commencement of works on-site and shall be maintained in good condition for the duration of the development period.

The lettering for each sign shall be a minimum 72 point font size. The signs shall be a minimum size of 600 x 500mm. The lettering on the sign should comply with AS 1319. Each sign shall advise the following details;



- This fence has been installed to prevent damage to the tree and its natural environment. **Access is restricted.**
- If access, encroachment or incursion into this Tree Protection Zone is required, prior authorisation is required by the Site Arborist.
- Name, address, and telephone number of the firm.

Source AS 4970-2009 Protection of trees on development sites

15.6 SILT FENCING, SEDIMENT CONTROL AND SOIL EROSION

In order to protect the sites habitat from soil erosion, an approved sedimentation control fence should be erected prior to the construction process.

The purpose of the silt fencing and sediment control is to ensure that no soil material (erosion) enters or leaves the building site into Tree Protection Zones or any nearby dams or creeks etc. Silt fence shall be installed parallel to the contours in the area immediately above the Tree Protection Zone. The silt fence shall be installed by securing geo-fabric to secure post fencing.

The post pickets shall be placed at 200mm below existing soil surface. Any sedimentation barrier used is to remain in place for a minimum of 12 weeks after practical completion and can be removed after this time provided, plant growth, health, density and condition have been noted by the Site Arborist.

A hay/straw bale shall be placed up slope from the silt fence and secured with timber stakes. The bottom of the geo-fabric shall be folded underneath the hay/straw bale.

To allow for the maintenance of both the Tree Protection Fence and the silt fence, the two- (2) fences shall be constructed separately and stand independently of each other. The silt fence shall be erected prior to the commencement of works on-site and shall be maintained in good condition for the duration of the development period.

It should be noted that the installation of silt fences as part of this Tree Protection Plan are not erosion and sediment control measures for the development.

The method and type of barrier is to be directed by Council and or as identified in EPA Guidelines, which covers the recently revised document "**Managing Urban Storm water: Soil and Construction Vol.1 (4th Edition)**" (also referred to as the "**Blue Book**"). The Blue Book covers a range of technical and management issues relating to erosion and sediment control in urban development (including standard drawings).

In addition contractors must refrain from including but not limited to doing any of the following activities within or adjoining the tree protection zones.

- Stockpiling of soils, rubble, or other materials,
- Placement of a site office or shed,
- Mixing materials,
- Parking of construction machinery or other vehicles,
- Repairing machinery and or re-fuelling,
- Lighting of fires,

The Site should be left in a clean and tidy manner ensuring suitable mulch cover is applied within the trees drip zone prior to the sedimentation barrier removed.

16.0 SITE MANAGEMENT OF RETAINED TREES

16.1 MATERIALS STORAGE

No materials shall be stored or located within the specified Tree Protection Zone.

A silt fence shall be installed down slope of any storage points. Storage points (where applicable) shall be covered when not in use. An appropriate Environmental spill kit shall be on site at all times for any unlikely spillages.

16.1.1 TRENCHING

Trenching may cause damage, die-back, structural integrity issues, collapse of the structure or even death to a tree over a period of time due to long term modifications to the site and the trees natural topography on campus trees that are valuable to the Universities visual landscape amenity.

16.1.2 TRENCHLESS TECHNIQUE (BORING)

Trenchless techniques provide an alternative option for the safe retention and protection of a valuable natural asset for required service infrastructure. Consideration of directional boring, pipe jacking, impact moling and boring will reduce the potential impact to a trees natural environment and retain the site visual amenity.

These options mentioned are reliable and have been long used to ensure the retention of significant existing vegetation.

Areas of landscape or grass disturbed during these works will be reinstated with the same variety of plants or lawn removed to a condition that would meet Horticultural current best practices.

16.1.3 UNDERBORING

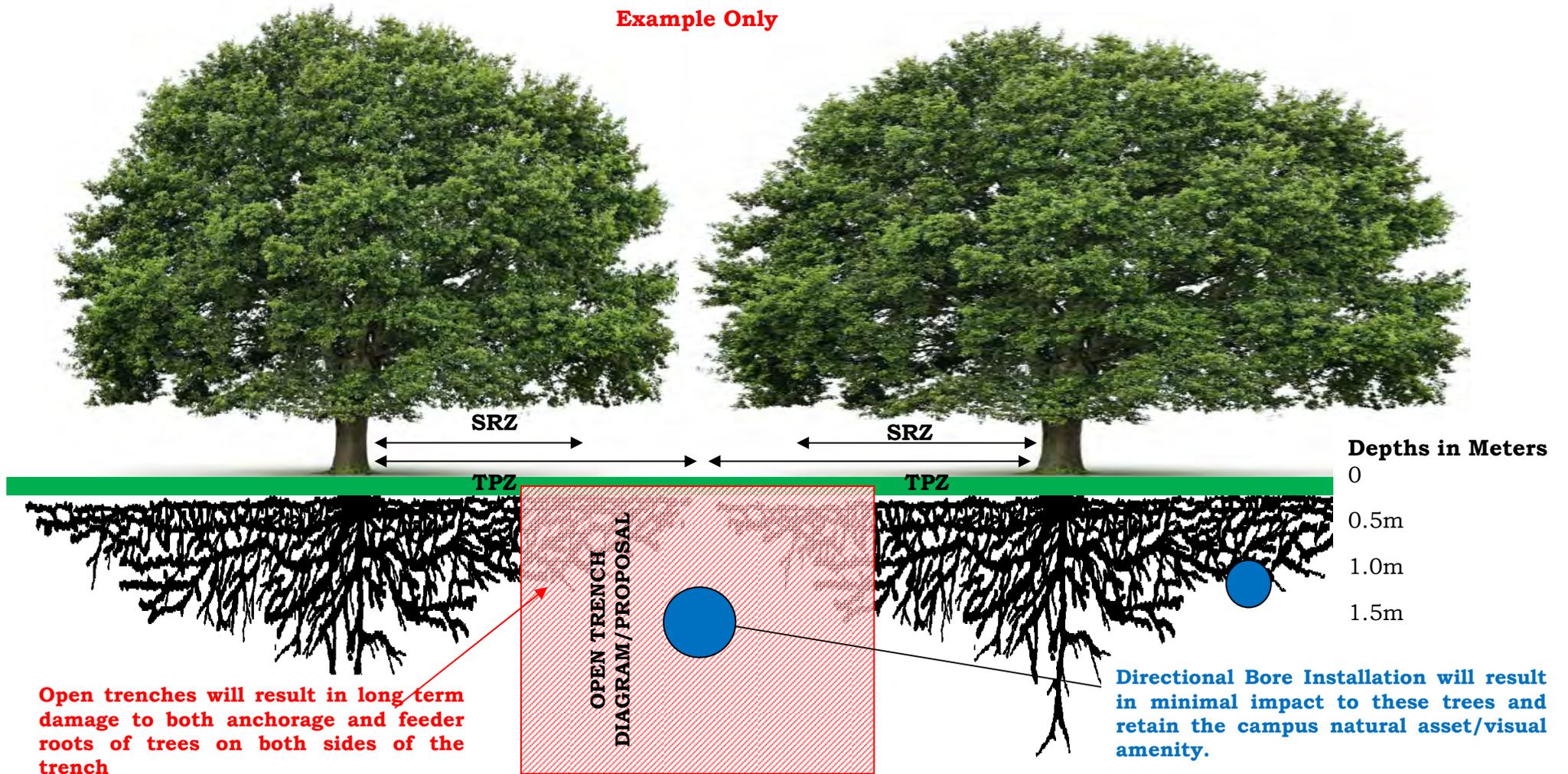
Where underboring will pass within a trees root structure consideration of the trees Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) is required. The minimum depth for boring is considered to be around 800mm which is the depth from the existing soil level that the majority of anchorage and feeder root will be encountered.

Where underboring or trenching is adjacent to or within a trees TPZ the site/project Arborist is to be contacted at least three-(3) days prior to any works commencing to arrange and undertake a site inspection with recommendations for tree retention and protection.

Underboring is considered the preferred option for installation of services within close proximity to signification trees. Manual hand digging or the use of high pressure water and vacuum truck may be required if works are within the SRZ to ensure the trees anchorage system and overall health is not compromised.

16.1.4 TYPICAL DIAGRAM OF TRENCHING VERSUS UNDERBORING FOR TREE RETENTION AND PIPE LOCATION

Example Only



There is a misconception about the location of tree roots, most absorbing (feeder) roots are in the upper few inches of soil (as shown). The root systems of trees are quite shallow and they spread well beyond the drip line when unrestricted. It is a myth that a tree's root system is an underground mirror of the crown and based on the above diagram one can see the direct and indirect impacts of open trenching versus the use of directional boring.

16.2 WASTE STORAGE

Waste storage shall not be located within the specified Tree Protection Zone.

A silt fence box style collection point shall be installed down slope from any waste/rubbish collection point. All rubbish shall be stored to prevent material loss caused by wind and or water. Skip bins shall be covered when not in use.

All debris collected should be removed from the site and disposed of in an authorized waste management facility. Natural debris such as logs and rocks may be left as wildlife habitat provided it does not present a safety hazard or become an obstruction. In such cases it should be appropriately re-arranged and or secured.

Site sheds shall not be located within the specified Tree Protection Zone for any reason.

17.0 TREE PROTECTION MEASURES FOR CONSTRUCTION PROCESS

17.1 SITE ACCESS

Pedestrian and vehicular movement shall not occur within any section of the specified Tree Protection Zone.

17.2 TEMPORARY SERVICES

Temporary services i.e. water, electricity, sewer shall not be located within any section of the Tree Protection Zone, for any purpose.

17.3 WORKS WITHIN THE TREE PROTECTION ZONE

The Tree Protection Zone may need to be modified during the construction process to allow access between the tree to be retained and the construction works.

The Tree Protection Zone shall remain intact as specified and approved by Council until these works are to project completion. If access, encroachment or incursion into the Tree Protection Zone is deemed essential, prior authorization is required by the Site Arborist.

The modification of the Tree Protection Zones may necessitate the dismantling of sections of the Tree Protection Fencing in the short term as part of the construction process. The Tree Protection Fence shall only be removed, altered, or relocated with the authorization of the Site Arborist in writing.

17.3.1 TREE TRUNK PROTECTION WORKS

Where deemed necessary by the Site Arborist, trunk protection shall be provided. Trunk protection may vary subject to the scope of works, trees age, height and environmental conditions. For semi mature to mature trees shall be installed by wrapping around two-(2) layers of carpet underlay or similar around the trunk to a minimum height of 2m or were the lower scaffold branches allow.

The trunk shall further be protected with 2m lengths of timbers (75 x 50 x 200mm) spaced at 100mm centres, secured by wire rope. The wire rope shall not be fixed to the tree in any way.

17.3.2 TREE BRANCH PROTECTION WORKS

Where deemed necessary by the Site Arborist, branch protection shall be provided. Branch protection shall be installed by wrapping around two-(2) layers of carpet underlay or similar around the branch, secured by wire rope.

The wire rope shall not be fixed to the tree in any way.

17.3.3 ROOT PRUNING AND EXCAVATION WORKS

Minor roots (less than 40mm in diameter) to be pruned shall be cleanly severed with sharp, sterilised pruning implements. Hessian material shall be placed over the face of the excavation. Exposed roots shall be kept in a moist condition during the construction phase.

The main area for surface feeding roots to occur is from the tree trunk to the outer canopy known as the drip zone. These fibrous roots are less likely to occur under or near other buildings, as there is little surface moisture or soil air presence for root survival. These fibrous roots are those that take up water and nutrients.

While some tree roots will deeply penetrate the soil profile, in search of available water, most will occupy the first 60-70cm of the soil, as to obtain the needed sustenance. At times it will not be possible to retain the optimum TPZ around each tree and any activities proposed within this area must be carefully analysed to minimise any effects on its health and/or stability.

The actual spread of the root system is largely dependent on the particular species involved, and their localised environment. Any work carried out within the Tree Protection Zone should be reviewed and supervised by the engaged Site Arborist.

Construction works proposed to be undertaken around the trees if not correctly assessed may modify the natural water table and reduce the amount of soil air and moisture present/available to the trees and their longevity may be greatly diminished.

If under the course of construction the tree roots are damaged or adversely affected, their demise will cause drought stress; poor uptake of water and nutrients, slower dispersal of gums and resins and could, in the long term, have an effect on the movement of certain compounds which make up the structure of the tree. Where major roots (greater than 40mm \varnothing) are encountered during excavations, further advice from the Site Arborist shall be sought prior to any pruning. Certain instances may require hand digging to ensure the trees health and overall stability.

17.3.4 TREE DAMAGE DURING WORKS

In the event of the tree that is to be retained becoming damaged during the development period, the Site Arborist shall be informed to inspect and provide advice on remedial action if or as required.

17.3.5 COMPLETION OF WORKS WITHIN TREE PROTECTION ZONE

Upon completion of the works within the Tree Protection Zone, the Tree Protection Fencing shall be shall erected until site machinery, sheds, storage facilities are removed.

Where the construction of new structures does not provide sufficient area for the specified Tree Protection Zone, the Tree Protection Zone shall be modified by the Site Arborist prior to any works commencing and be documented.

17.3.6 MONITORING

The Site Arborist shall monitor the site fortnightly throughout the development period to ensure these specifications are maintained.

A site log shall record the details of the site inspections for review by the Principal Certifying Authority prior to the release of the Compliance/Occupation Certificate.

Any changes to the proposed design or through development on site will require additional arboricultural assessment.

The applicant/contractor shall complete all works tabled in this Arborist Assessment in accordance with this program as agreed with, any variations are to be formally submitted to the Site Arborist and or Certifying Authority for approval.

The work shall be deemed 'practically complete' when all works have been completed to the satisfaction of the Contractor and Certifying Authority.

17.4 SOIL PROTECTION WORKS

Where deemed necessary by the Site Arborist, the ground surface within the Tree Protection Zone shall be protected by laying geo-textile over the existing mulch cover.

Large diameter (up to 70mm) recycled railway ballast (basalt) shall be placed over the geo-textile material to a depth of 100mm.

The soil layers shall not be inverted during the excavation works and topsoil shall be stockpiled on site for use in the landscape works. However, it is expected that stringent controls are imposed and implemented to minimise adverse impacts on the soil. These should be site specific and are beyond the scope of this report.

17.5 PEST AND DISEASE MONITORING

All plants should be monitored for pest and disease every two weeks as part of the programmed site inspections. Insecticide is not recommended for native plant species unless the problem becomes severe.

Most native plants will re-shoot after insect predation has past.

18.0 POST CONSTRUCTION MAINTENAINCE PROCESS

Upon the completion of construction works, a final assessment of the tree(s) shall be undertaken by the Site Arborist in consultation with the Site Supervisor. Items to be inspected and addressed shall include but not limited to;

- Tree Protection Zone measures, (*where they adequate*)
- Any damage to the tree's root system, (*if applicable*)
- Any visible damage to the tree's trunk, branches or canopy, (*if applicable*)
- Any changes in levels, soil structure, erosion, or loss of organic matter, (*if applicable*)
- Changes to wind loading in the crown through pruning requirement and effects of new structures, (*if applicable*)
- Pest and disease infestation, (*if observed*)
- Drought stress,
- Requirement for decompaction works, (*if applicable*)
- Requirement for further pruning works, (*if required*)
- Requirement for ongoing maintenance such as watering, mulching.

APPENDIX F

Cumberland Dry Sclerophyll Forests Vegetation Community Information



[Home](#) > [Threatened species](#) > [Search for threatened species](#)

Cumberland Dry Sclerophyll Forests

Structure

Open, dry, eucalypt woodland, typically with an abundance of ironbark eucalypts and an open subcanopy of paperbarks. The trees may grow to 30 m tall, although on poorly drained clay soils they may scarcely reach 10 m tall. The understorey has a prominent stratum of sclerophyll shrubs and a semi-continuous grassy groundcover.

Trees

Eucalyptus fibrosa (red ironbark) is common throughout with *Melaleuca decora* in the subcanopy, while *E. crebra* (narrow-leaved ironbark), *E. eugenioides* (narrow-leaved stringybark) and *E. longifolia* (woollybutt) may be common within localised areas, and *Eucalyptus moluccana* (grey box) and *E. tereticornis* (forest red gum) may occur on shale-gravel transitions.

Shrubs

Acacia falcata, *A. pubescens* (downy wattle), *Bursaria spinosa* (blackthorn), *Daviesia ulicifolia* (gorse bitter pea), *Dillwynia tenuifolia* (egg and bacon pea), *Dodonaea falcata* (thread-leaf hopbush), *Grevillea juniperina* subsp. *juniperina* (prickly spider-flower), *Lissanthe strigosa* (peach heath), *Melaleuca nodosa*, *Olearia microphylla*, *Ozothamnus diosmifolius* (white dogwood), *Pultenaea parviflora* and *P. villosa*.

Forbs

Calotis cuneifolia (purple burr-daisy), *Dianella revoluta* var. *revoluta* (blue flax lily), *Dichondra repens* (kidney weed), *Goodenia hederacea* var. *hederacea* (forest goodenia), *Lagenifera stipitata* (blue bottle-daisy), *Laxmannia gracilis*, *Opercularia diphylla*, *Pomax umbellata*, *Pratia purpurascens* (white root), *Thysanotus tuberosus* subsp. *tuberosus* (common fringe-lily), *Vernonia cinerea*, *Cheilanthes sieberi* subsp. *sieberi* (poison rock fern), plume grass), *Echinopogon ovatus* (forest hedgehog grass), *Entolasia stricta* (wiry panic), *Lepidosperma laterale*, *Lomandra multiflora* subsp. *multiflora* (many-flowered matrush), *Microlaena stipoides* var. *stipoides* (weeping grass), *Panicum simile* (two coloured panic), *Paspalidium distans*, *Schoenus apogon* (common bog-rush), *Themeda australis* (kangaroo grass).

Habitat

Islands of gravelly clay soils of moderate to low fertility on flat to undulating terrain within extensive shale plains, forming a rain shadow zone that receives 800-960 mm per annum.

Distribution

Restricted to the Cumberland plain in western Sydney, but with related vegetation in the lower Hunter valley and Illawarra plain. Unique to New South Wales.

Notes

Grades into Hinterland Sandflats Dry Sclerophyll Forests on sandier soils and Coastal Rainshadow Grassy Woodlands on more fertile shale substrates. Fragmented by rural-residential and urban development.

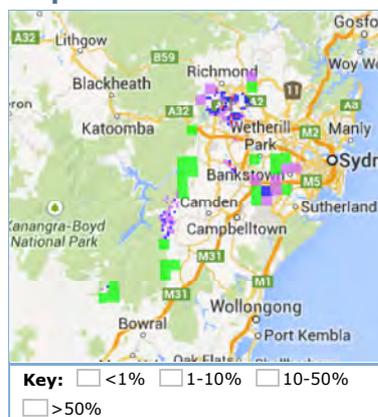
Sources

Benson & Howell (1990); Benson (1992); Tozer (2003)

See all threatened species associated with this vegetation class

See a [list of species, populations and ecological communities](#) associated with the Cumberland Dry Sclerophyll Forests vegetation class.

Vegetation class map



Estimated percentage landcover for vegetation class



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