MUSEUMS DISCOVERY CENTRE EXPANSION
ENVIRONMENTAL IMPACT STATEMENT

APPENDIX O
TREE REPLACEMENT STRATEGY

WSP

NSW GOVERNMENT

CREATE NSW

SEPTEMBER 2020

POWERHOUSE MUSEUM DISCOVERY CENTRE EXPANSION PROJECT

TREE REPLACEMENT STRATEGY

Question today
Imagine tomorrow
Create for the future

Powerhouse Museum Discovery Centre Expansion Project
Tree Replacement Strategy

Create NSW

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

REV	DATE	DETAILS
Rev C	21/9/2020	Final

	NAME	DATE	SIGNATURE
Prepared by:	Lukas Clews	21/9/2020	
Reviewed by:	Toby Lambert	21/9/2020	
Approved by:	Toby Lambert	21/9/2020	

This document may contain confidential and legally privileged information, neither of which are intended to be waived, and must be used only for its intended purpose. Any unauthorised copying, dissemination or use in any form or by any means other than by the addressee, is strictly prohibited. If you have received this document in error or by any means other than as authorised addressee, please notify us immediately and we will arrange for its return to us.

TABLE OF CONTENTS

1 INTRODUCTION

This report supports a State Significant Development (SSD) Application for the proposed construction and use of a new building to facilitate the expansion of the Museums Discovery Centre (MDC) site at 2 Green Road, Castle Hill (see Figure 1.1).

The primary objective of the SSD Application is to provide expanded facilities to accommodate the Powerhouse collection including spaces for storage, conservation, research and display and spaces to facilitate increased public access to the collection through education, public programs, workshops, talks, exhibitions and events. The expansion of the existing MDC facility within the site at 2 Green Road Castle Hill will integrate with the existing MDC site located at 172 Showground Road, Castle Hill and its operations on a permanent basis.

The proposal is a type of "Information and Education Facility" with a Capital Investment Value (CIV) in excess of $30 million and is classified as SSD under Schedule 1 Clause 13 of the State Environmental Planning Policy (State and Regional Development) 2011 (State and Regional Development SEPP).

Create Infrastructure is the proponent of the SSD Application.

1.1 PROJECT BACKGROUND

The MDC is owned and operated by the Museum of Applied Arts and Sciences (MAAS) and features exhibitions and displays in collaboration with Australian Museum and Sydney Living Museums, who also maintain collection storage and conservation facilities on the site. The MDC is located at 172 Showground Road, Castle Hill. There are six buildings primarily providing collection storage as well as areas for displays and education and public programs, accessible to visitors (Building E). During 2017-2018 a total of 17,481 persons visited the MDC site.

The MDC Expansion is part of the renewal of the Museum of Applied Arts and Sciences, known as the Powerhouse Program, that includes:

- Powerhouse Parramatta: A new benchmark in cultural placemaking for Greater Sydney that will be a symbol of a new approach to creative activity and engagement.
- Powerhouse Ultimo: The NSW Government recently announced that the Museum's Ultimo site will be retained, and the Museum will operate over four sites across the Greater Sydney area.
- Powerhouse Collection Relocation and Digitisation Project: The relocation of the Powerhouse collection and digitisation of around 338,000 objects, enhancing the collection's accessibility for local, national and international audiences.

The MDC expansion is an integral component of the Powerhouse Program and will provide the opportunity to increase visitation to the site, forming an important and significant cultural institution within The Hills Shire. In addition to the storage component of the proposal, the expansion will increase access to the Powerhouse collection through a range of spaces for visible storage, research and viewing of the collection, as well as flexible spaces for education and public programs, workshops, talks, exhibitions and events.

1.2 SITE DESCRIPTION

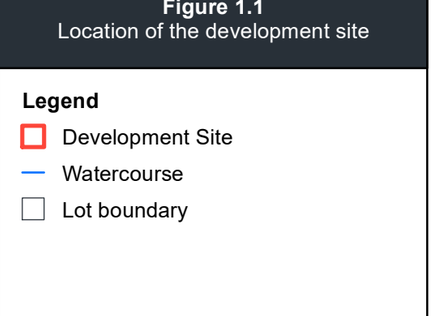
The proposed Building J site is located within the property known as 2 Green Road, Castle Hill which comprises a single lot legally described as Lot 102 DP 1130271. The site is generally square in shape with a splay corner to the intersection of Green Road and Showground Road and a total area of approximately 3.8ha. The site has a primary frontage of approximately 183m to Green Road and a secondary frontage of approximately 186m to Showground Road (see Figure 1.2.

Powerhouse Castle Hill Project

Figure 1.1
Location of the development site

Legend

- Development Site
- Watercourse
- Lot boundary



0 100 200 300 400 500 Meters

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:10,000 Date: 7/2/2020

Data sources: - DFSI, Geoscience Australia

© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.

D:\WSP O365\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS120245_Powerhouse_Castle\Mxd\03_TreeReplacementStrategy\PS120245_F001_SiteLocality_r1v1.mxd

The location of the proposed new MDC building (to be known as "Building J") is located on the western end of the site and is marked on Figure 1.2 in a dashed yellow line (referred as the Building J Site). The overall site contains large institutional buildings set within a landscaped setting featuring a high tree canopy.

The overall site is a TAFE campus that caters for approximately 400 enrolled students, and provides courses on business and financial services, hospitality, general education, community services, health, nursing, carpentry, building and retail. The site currently includes TAFE buildings, car parking and vegetated open space areas. A dam is situated in the north eastern part of the site.

The MDC site is located immediately west of the existing TAFE site at 172 Showground Road, Castle Hill. A subdivision application (included within this SSD Application) will consolidate the site of the proposed Building J with the existing MDC site. The main public vehicle access to the MDC site is via Windsor Road. There is also a vehicular access point to the MDC on Showground Road. The MDC and TAFE have a longstanding arrangement, that permits vehicle access to the MDC site from Green Road, allowing vehicles to traverse across the TAFE site to access the MDC site.

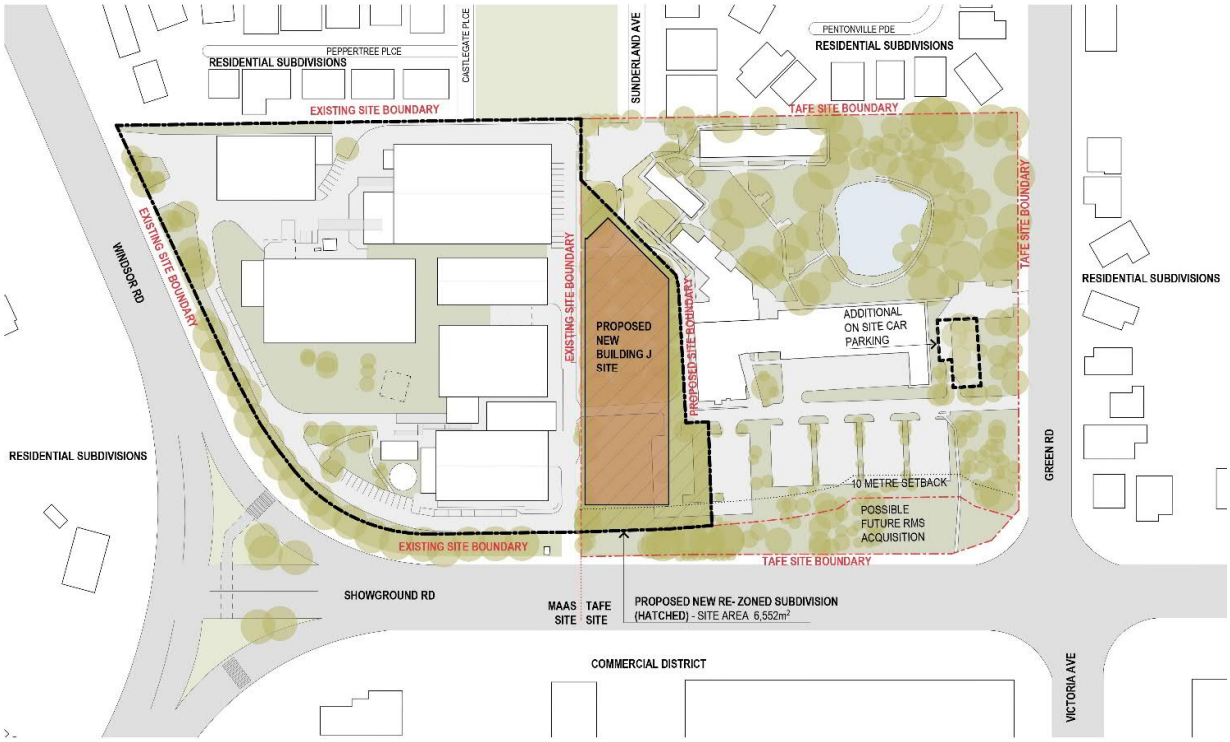


Figure 1.2 Existing site layout plan and proposed development site (Source: Lahznimmo Architects)

Development surrounding the site to the east, and north consists of established residential neighbourhoods generally comprising two storey detached dwellings. Opposite the site to the south east and south west are a mix of warehouses, industrial units, and large format bulky goods retail premises. Views into the TAFE and MDC site from the surrounding roads is obscured by dense trees and vegetation along the perimeter of the sites.

A public park and children's playground is adjacent to the north of the site that is bound by Sunderland Avenue to the east and Castlegate Place to the west. The dwellings along Sunderland Avenue and the southern side of Pentonville Parade are the nearest residential properties to the proposed Building J site

1.3 OVERVIEW OF PROPOSED DEVELOPMENT

The successful delivery of this SSD project supports a priority cultural infrastructure project and is a NSW Government 2019 election commitment (Powerhouse Precinct at Parramatta). This application will deliver a significant cultural institution for Castle Hill and The Hills Shire.

The proposed Building J will offer many opportunities for public engagement as part of a desire to increase public access to the Powerhouse collection. The renewal of the site offers a range of opportunities to increase public access including visible storage facilities, booked tours, Open Days, public and education programs, workshops, talks and other events. The facilities in Building J will serve the needs of a variety of user groups including staff, volunteers, education groups, researchers, artists, scientists, industry partners and the general public.

The SSD Application seeks consent for the delivery of the MDC expansion as a single stage, comprising:

- Site preparation works, including the termination/relocation and installation of site services and infrastructure, tree removal (337 trees in total), earthworks, and the erection of site protection hoardings and fencing.
- Demolition of existing car park and vehicle accessway along the eastern and north eastern parts of the site. A new at-grade car park is proposed to be constructed on the eastern side of the TAFE site and will accommodate 24 car parking spaces removed from the Building J site.
- Construction of the proposed new Building J. The proposed new Building J will cater for the following uses:
  - Storage for the Powerhouse collection and archives (both collected archives and institutional archives).
  - Flexibles spaces for education and public programs, workshops, talks, exhibitions and events.
  - Suites of conservation laboratories and collection work spaces.
  - Photography, digitisation and collection documentation facilities.
  - Work space for staff, researchers, industry partners and other collaborators. This will include amenities, meeting and storage rooms, collection research and study areas as well as other ancillary facilities.
  - Components of the image and research library.
  - Object and exhibition preparation, packing, quarantine and holding areas.
- Construction of new vehicle accessways to maintain connectivity to the MDC and TAFE sites.
- Subdivision of the proposed Building J site from the TAFE site including creation of right-of-carriageway easement to facilitate access over the new realigned accessway by TAFE vehicles and consolidation to form a single lot with the existing MDC site.

1.4 AIMS AND OBJECTIVES

This Tree Replacement Strategy includes the following:

- An assessment of the ecological values of the existing trees in terms of canopy cover and biodiversity value;
- Identification of sites for replacement planting within the Museum Discovery Centre and TAFE site (if land available) or suitable other sites within the LGA;
- Recommendations regarding any other planting (other than trees) that could be planted on the TAFE or Museum Discover Centre site to improve biodiversity values;
- A list of proposed species for replacement planting and recommendations on pot sizes; and
- A proposed establishment and maintenance regime.

– Assessment of the ecological values of the mature replacement trees inclusive of canopy cover and biodiversity value.

1.5 ASSESSMENT REQUIREMENTS

The Department of Planning, Industry and Environment have issued Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as outlined in Table 1.1.

Table 1.1 SEARs addressed by this report

SEAR	WHERE ADDRESSED
4. Landscaping The EIS shall:	
Include a Tree Replacement Strategy and detail any arrangements with Council for tree replanting proposed off site, including identifying possible suitable planting locations.	This report is the Tree Replacement Strategy as required by the SEARs. This report identifies potential sites for replacement planting within the Museum Discovery Centre and TAFE site (if land available) or suitable other sites within the Hills LGA. Agreements made with Council for tree planting are outlined in Section 4.

2 METHODOLOGY

The details of the methods used to categorise and measure the existing ecological values of the development site are provided here. The data collected was used to inform the species selection for the replanting site.

2.1 BACKGROUND RESEARCH AND DATA SOURCES

A background review of existing information was carried out to identify the existing environment. The review focussed on database searches, relevant ecological reports pertaining to the development site (where publicly available) and relevant GIS layers. The following regional vegetation mapping, geology and soil mapping projects were searched or viewed to develop an understanding of the vegetation, geology and soils in the locality:

- Bushland Survey - Baulkham Hills Shire (State Government of NSW and Department of Planning, Industry and Environment, 2010)
- Southeast NSW Native Vegetation Classification and Mapping – SCIVI (State Government of NSW and Department of Planning, Industry and Environment, 2010)
- Remnant Vegetation of the western Cumberland subregion, 2013 Update (State Government of NSW and Department of Planning, Industry and Environment, 2015)
- Penrith 1:100 000 Geological Sheet 9030 (Clarke and Jones, 1991)
- Soil landscapes of the Penrith 1:100,000 Sheet 9030 (Hazelton et al., 1989)
- Australian Soil Classification (ASC) Soil Type map of NSW (State Government of NSW and Department of Planning, Industry and Environment, 2012).

The Arboricultural Impact Assessment and Tree Survey prepared by Mackay Tree Management (2020) was also reviewed to obtain tree inventory and health information that was used to supplement the work carried out for this report.

The Biodiversity Development Assessment Report prepared for the project (WSP, 2020) was used to determine the biodiversity values of the vegetation to be removed from the development site. This information was used to guide plant species selection.

2.2 PLANT COMMUNITY TYPE IDENTIFICATION

The type and distribution of PCTs within the development site were identified and mapped during the field surveys. The identification of PCTs presented here in this Tree Replacement Strategy is according to the NSW PCT classification as described in the BioNet Vegetation Classification database. Each PCT was assigned to the relevant corresponding Threatened Ecological Community (TEC) where applicable. The vegetation within the development site has been assigned to a PCT as listed in the BioNet Vegetation Classification database based on the observed plant species composition, vegetation structure, landscape position, and underlying geology and soils. There is approximately 0.5 hectares of native vegetation assigned to PCTs within the development site (described and illustrated in Section 3).

2.3 FLORISTIC SURVEY AND VEGETATION INTEGRITY PLOTS

A detailed plot-based floristic vegetation survey as described in section 5.2 of the Biodiversity Assessment Method (BAM) was carried out where the vegetation was of sufficient size and shape to allow for plots to be completed. In other areas, rapid plotless vegetation assessments were carried out where natural vegetation did not occur to identify street trees and habitats. The field survey was carried out over one day in June 2020.

Using existing vegetation mapping, survey sites (plots/midlines) were established within each area of mapped vegetation to provide a representative assessment of the vegetation prior to the field survey. Plots were also positioned to provide a wide spatial coverage of the development site. Once the identification of PCTs had been finalised, each PCT was then divided into vegetation zones (an area of native vegetation that is the same PCT and has a similar broad condition state).

A plot-based full floristic survey and Vegetation Integrity Assessment was carried out according to the BAM using a series of 20 x 20 metre plots (or equivalent 400 square metre area) nested inside a 20 x 50 metre plot (or equivalent 1,000 square metre area).

2.4 CANOPY COVER MEASUREMENT

An estimate of percentage foliage cover for each species was completed during the floristic vegetation survey. However, this method does not provide an overall measurement of canopy cover as individual species are assigned a percentage foliage cover score and results can exceed 100% cover. To provide a more accurate and detailed assessment of tree canopy cover for the purposes of this Tree Replacement Strategy, and to remove bias, we measured crown cover (the vertical projection of the periphery of tree crowns within a designated area) along a 50 metre transect using the line intercept method. Canopy cover is measured as the proportion of a fixed area of the ground (in this case 50 metre transect) covered by tree crowns.

2.5 THREATENED SPECIES ASSESSMENT

A detailed assessment of habitat for threatened species is provided in the Biodiversity Development Assessment Report (BDAR) that has been prepared for the project (see WSP, 2020). Once the development site had been assessed for landscape context, and the PCTs present and vegetation integrity known, the list of candidate threatened species for assessment was developed using the Biodiversity Assessment Method Credit Calculator to derive the list of candidate species.

The results of the BioNet search and the PMST search were also used to inform development of the candidate species list. Some species returned from the database searches (i.e. BioNet and the PMST) were removed from the assessment due to the absence of suitable habitat in the development site. The development site is highly urbanised and lacks high quality natural habitats. Species that are known to no longer occur in the Sydney urban area were removed from the assessment based on the lack of suitable habitat types or degradation of habitat. Vagrant species were also removed from the assessment.

After the candidate species list had been developed, threatened species surveys were undertaken where possible. Transects were walked through the habitats within the development site at 10 metre spacing in an attempt to locate any threatened plant species. Targeted threatened species surveys were not undertaken for animals. The habitat assessment identified that there is limited habitat in the development site for most threatened species. However, where suitable habitat for a threatened species was found to be present, the species was assumed to be present. The survey was undertaken in June 2020.

3 EXISTING ECOLOGICAL VALUES

3.1 LANDSCAPE VALUE

The development site is located in the Sydney Basin bioregion within the Cumberland subregion (Thackway and Cresswell, 1995). The development site is located on the Cumberland Plain Mitchell Landscape as mapped by the NSW National Parks and Wildlife Service (NPWS) (2002).

There are no rivers, streams or wetlands within or adjacent to the development site. The nearest waterway is Cattai Creek which is located more than 600 metres to the east of the development site.

The habitat within the development site has a low degree of connectivity to other areas of habitat due to the impacts of urbanisation. The habitats that do remain immediately adjacent to the development site are generally small isolated fragments or individual street trees within the urban matrix of residential, commercial and industrial development. Continuous physical connectivity in an easterly direction to Fred Caterson Reserve and the Cattai Creek riparian corridor has been broken by urban development. There is some limited 'stepping stone' connectivity with Strangers Creek to the west through street trees and small remnants and planted vegetation on the Golf Course. The patchwork of planted trees and gardens surrounding the development site allows for some landscape permeability for mobile species such as bats and birds that can exploit the resources available in urban areas. However, overall habitat connectivity is low.

Vegetation extent in the locality was examined in the BDAR (see WSP, 2020) and the per cent native vegetation cover in the landscape is estimated at approximately 17 per cent. Landscape features are illustrated in Figure 3.1.

3.2 VEGETATION DESCRIPTION

Given the landscape within which the development site is situated, and the classification of nearby vegetation provided in regional vegetation mapping projects, it is not possible to predict with complete accuracy what the original vegetation within the development site would have been. The naturally occurring vegetation has been cleared and the development site now contains trees that formed part of a plantation by the Museum as an exercise in researching essential oils.

The plantation is dominated by *Corymbia citriodora* which is not a species native to NSW. The plantation also contains some *Corymbia maculata* plants and a number of other tree species that are either remnant or have been planted including *Eucalyptus tereticornis, Eucalyptus punctata, Eucalyptus resinifera, Eucalyptus sideroxylon, Eucalyptus bosistoana, Eucalyptus baueriana, Eucalyptus microcorys, Acacia decurrens, Grevillea robusta, Brachychiton acerifolius, Acmena smithii* and *Melia azedarach.* The crown cover of the canopy (the vertical projection of the periphery of tree crowns within a designated area) is dense and measured at 84% cover using the line intercept method.

Amongst the plantation trees there are a number of scattered native shrubs including *Melaleuca styphelioides, Melaleuca alternifolia* (a small stand that was planted for oil production), *Acacia falcata, Bursaria spinosa,* and *Syzygium australe* that have been planted, self-seeded, or have germinated from the soil stored seedbank. The groundcover is sparse and dominated by leaf litter due to the dense eucalypt canopy but there are some native species including *Lomandra longifolia, Lomandra multiflora, Paspalidium distans, Dianella longifolia, Dichondra repens* and *Glycine tabacina.*

The vegetation is best described as plantings with some native species regrowth but can be matched to PCT 849 (Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion) and a single vegetation zone (condition class) (see WSP, 2020). The location of the vegetation is illustrated in Figure 3.2. The vegetation is in very poor condition as reflected by the vegetation integrity score of 1.9 out of 100 (WSP, 2020). This low score is due to the low composition score caused by low native species richness, a lack of vegetation structure due to the canopy of the vegetation being dominated by exotic species (*Corymbia citriodora*) and very sparse mid storey and ground layer, and absence of function attributes such as large trees (over the 50 cm large tree threshold), hollow-bearing trees, and coarse woody debris. Photos of the vegetation within the development site are shown in Photo 3.1 to 3.6.

Powerhouse Castle Hill Project

Figure 3.1
Landscape features

Legend

- Development Site
- Main areas of habitat connectivity
- 1500m Buffer
- Watercourse (SO)
- Native vegetation cover %
- Riparian Corridor
- Threatened species or communities (BV Map)
- IBRA Subregion Boundary
- Lot boundary

0 100 200 300 400 500 Meters

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:12,500 Date: 2020-07-21

Data sources: - DFSI, Geoscience Australia

© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.

wsp

Powerhouse Castle Hill Project

Figure 3.2
Map of plant community types and vegetation zones

Legend

- Development Site
- Vegetation Zones
- Lot boundary

0 10 20 30 40 50 Meters

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:1,000 Date: 7/2/2020

Data sources: - DFSI, Geoscience Australia

© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.

D:\WSP O365\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS120245_Powerhouse_Castle\Mxd\02_BiodiversityDevelopmentAssessmentReport\PS120245_F005_VegZones_r1v1.mxd

Photo 3.1 The cleared grassed area in the south of the new building J site

Photo 3.2 Planted trees near the pedestrian accessway from the TAFE site to the MAAS site

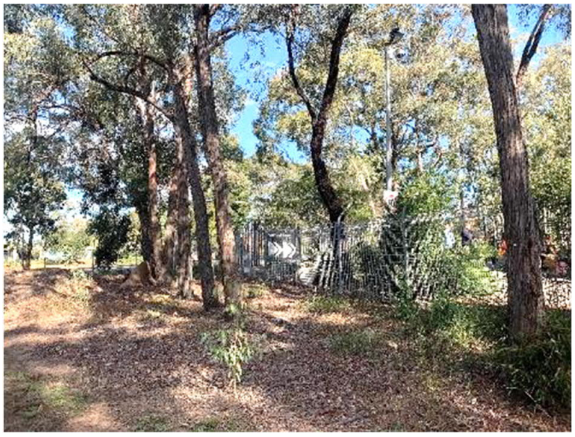


Photo 3.3 Planted trees adjacent to the cleared grass area in the south of the new building J site

Photo 3.4 The *Corymbia citriodora* plantation in the centre of the new building J site

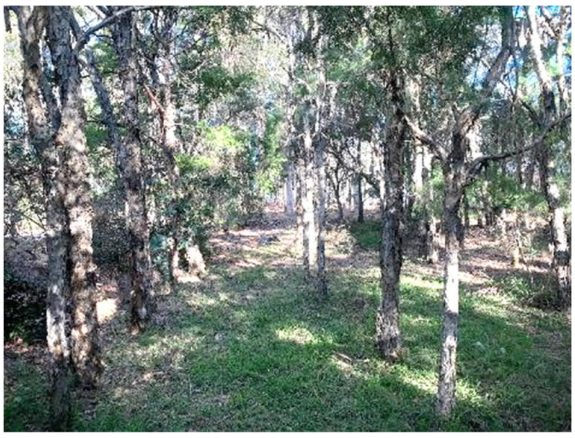


Photo 3.5 The paperbark plantation in the north of the new building J site

Photo 3.6 The *Corymbia citriodora* plantation in the proposed new area of on-site car parking to the east of the TAFE building

3.3 THREATENED ECOLOGICAL COMMUNITIES

There is one Threatened Ecological Community (TEC) listed under the BC Act that occurs in the development site: Cumberland Plain Woodland in the Sydney Basin Bioregion which is listed as critically endangered. This TEC corresponds to PCT 849 and the TEC is in poor condition and is represented by regrowth trees, shrubs and groundcovers amongst trees that were established for a eucalyptus oil plantation.

There are no condition thresholds placed on threatened ecological communities that are listed under the BC Act. As the regrowth is on the Cumberland Plain and the native species that are present are characteristic of this community and are likely regrowth from the soil seedbank, the Cumberland Plain Woodland in the Sydney Basin Bioregion community as listed under the BC Act is considered to be present.

The vegetation does not however conform to the condition criteria specified for the EPBC Act listed Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest TEC (see WSP, 2020).

3.4 HABITAT VALUE FOR THREATENED SPECIES

No threatened plant species were found in the development site during the surveys undertaken for the BDAR (see WSP, 2020). For most threatened plant species, the habitat considered to be substantially degraded to the point that the species is unlikely to be present on the development site. The subject land has been considerably disturbed and the ground layer has been almost completely removed.

The development site contains some marginal foraging habitat for a range of threatened animal species (see WSP, 2020). The habitats within the development site are unlikely to be used for breeding and important features such as large hollow-bearing trees, large woody debris, and diverse vegetation structure are absent. Combined with the human disturbance and edge effects that the habitat is subject to, only marginal foraging habitat is expected to be present.

Photo 3.7 The stand of *Corymbia citriodora* in the proposed site of new on-site car parking to the east of the TAFE building showing young trees with absent shrub layer and sparse ground layer with dense leaf litter cover. This habitat would only provide marginal foraging habitat for some mobile species and lacks breeding habitat

4 IDENTIFICATION OF SITES FOR REPLACEMENT PLANTING

4.1 MUSEUM DISCOVERY CENTRE SITE

The Museum Discovery Centre site has several perimeter garden beds that already contain a number of large and medium sized trees. There is an existing very dense planting of trees and shrubs along the northern boundary of the Museum Discovery Centre site north of Building I. Consequently, the potential for planting any further trees at this site is low as sufficient space does not exist. There is however some opportunity for planting of shrub and groundcover species underneath existing plantings.

The perimeter tree plantings along the edge of Windsor Road and Showground Road generally lack a shrub layer and the ground layer is generally composed of leaf litter (see Photo 4.2, 4.4 and 4.5). There are some smaller areas that may also benefit from planting of shrubs and ground covers including a small triangular garden bed to the east of Building A (see Photo 4.1), and the garden beds to the west of Building E (see Photo 4.3). These areas are the most suitable for underplanting and there is potential to establish a variable shrub and ground layer composed of native species.

It should be noted that any additional plantings in this area should be assessed from a bushfire protection perspective to ensure bushfire threat to the building complex is not increased to an unacceptable level.

The areas on the Museum Discovery Centre site that would be suitable for shrub and groundcover planting are illustrated in Figure 4.1.

4.2 TAFE SITE

Similar to the Museum Discovery Centre site, the TAFE site already contains a considerable number of large and medium sized trees and the potential for planting any further trees at this site is low as sufficient space does not exist. As with the Museum Discovery Centre site, there is opportunity for planting of shrub and groundcover species underneath existing plantings.

The perimeter planting along the edge of Showground Road south of the existing car parking area and the plantings north and south of the entry gate (see Photo 4.6) have areas that lack a shrub layer. There are some grassed areas at the edge Showground Road that may also be suitable for planting. The area proposed for new landscaping to the south of New Building J would also be suitable. These areas are the most suitable for underplanting and there is potential to establish a variable shrub and ground layer composed of native species.

It should be noted that any additional plantings in this area should be assessed from a bushfire protection perspective to ensure bushfire threat to the building complex is not increased to an unacceptable level.

The areas on the TAFE site that would be suitable for shrub and groundcover planting are illustrated in Figure 4.1.

4.3 SYDNEY GREEN GRID

The Sydney Green Grid is a green infrastructure, design-led strategy that includes the full range of open spaces. The Sydney Green Grid will provide hydrological, ecological and recreation services to the growing city, allowing sustainable growth. The Caddies Creek Corridor, and the Cattai Creek Corridor, are identified as Green Grid Project Opportunities for the West Central District. Potential planting sites in the Caddies Creek and Cattai Creek corridors are identified below in Section 4.4. There may also be opportunities to plant in other areas of Caddies Creek, or the Cattai Creek Corridor, depending on Council's future plans for these areas.

Photo 4.1 The small triangular garden bed east of Building A could be planted with ground covers

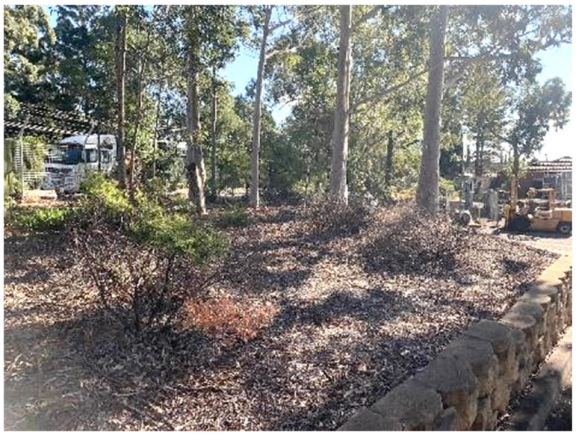


Photo 4.2 The shrubs adjacent to the Windsor Road access west of Building A are in poor condition and need replacing

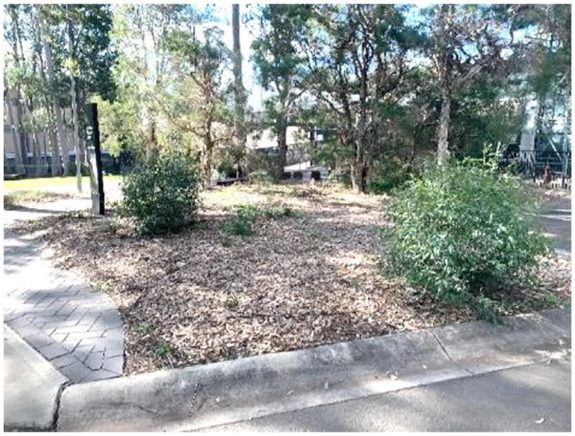


Photo 4.3 The small garden bed to the west of Building E could be planted out more densely

Photo 4.4 Bare areas such as this along the Windsor Road edge at the MAAS site could be planted out

Photo 4.5 Shrubs and ground covers could be planted beneath the tree along the Windsor Road edge at the MAAS site

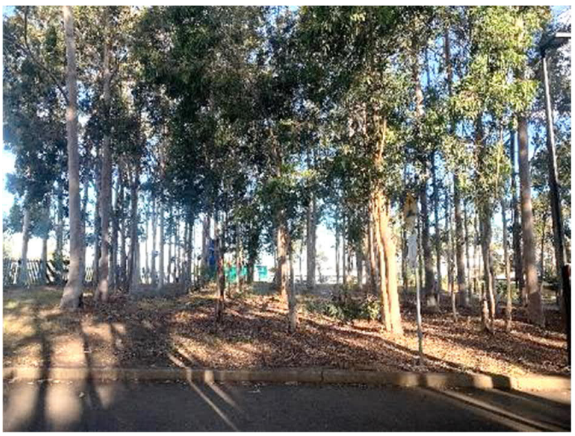


Photo 4.6 Shrubs and ground covers could be planted in the remaining *Corymbia citriodora* plantation in the proposed new area of on-site car parking to the east of the TAFE building

Powerhouse Castle Hill Project

Figure 4.1
Location of the proposed planting sites on the MAAS and TAFE sites

Legend

- Development Site
- Potential planting sites
- Lot boundary

0 25 50 75 100 Meters

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:2,000 Date: 7/2/2020

Data sources: - DFSI, Geoscience Australia

© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.

D:\WSP O365\WSP O365\AU-WKG - Geospatial - AIS - Projects\PS120245_Powerhouse_Castle\Mxd\03_TreeReplacementStrategy\PS120245_F002_ProposedPlantings_r1v1.mxd

4.4 OPTIONS FOR PLANTING ON COUNCIL LAND

The SEARs include making arrangements with Council for tree replanting proposed off site, including identifying possible suitable planting locations. There is a possibility of creating a revegetation site on Council land. Negotiations with Council to identify a suitable site are ongoing.

Ideally, the replacement planting site would be a park or council bushland site on the Cumberland Plain adjacent to an existing remnant of Cumberland Plain Woodland or other Threatened Ecological Community. Some potential planting locations within the LGA are shown in Figure 4.2. Due to the small size of many of the potential planting areas multiple sites are likely to be needed to receive the 674 trees at a reasonable density.

The aim of the planting would be to complement Council's revegetation efforts and to create a buffer zone of trees at the edge of the bushland remnant to buffer it from edge effects, to increase the canopy cover of the landscape, provide linkages between bushland remnants, and to provide supplementary foraging habitat for fauna species. The trees removed from the MDC site contribute to the tree canopy of the Hills LGA and provide valuable pollution removal, urban cooling, water retention, shade and carbon sequestration services. The trees to be removed would be replaced at a 2:1 ratio on the chosen site which results in 674 trees to be planted in the Hills LGA The suggested species for planting in a Cumberland Plain Woodland style planting are outlined in Appendix A.

The potential Council sites that have been identified are discussed below. These sites are identified as natural areas by the Hills Shire Council. Many of the sites suggested below are adjacent to housing and any plantings should be assessed from a bushfire protection perspective to ensure that any Asset Protection Zones are maintained and to ensure that bushfire threat to buildings is not increased to an unacceptable level.

4.4.1 WILLIAM HARVEY RESERVE

William Harvey Reserve is located on Greensborough Avenue in Rouse Hill. This reserve is to the west of Caddies Creek and is connected to Caddies Creek Park. This reserve may be a suitable site for the replacement planting associated with the MDC site. The remnant vegetation along Caddies Creek is Cumberland Riverflat Forest. Other vegetation mapped in this reserve includes Cumberland Plain Woodland and Shale / Sandstone Transition Forest. William Harvey Reserve is located on Wianamatta Shale on the Cumberland Plain and is likely to be the most suitable site for planting of Cumberland Plain Woodland species.

There are open grassed areas of Mile End Road and Sandalwood Close that may be suitable for planting. There is opportunity in these areas to plant out the edges of the existing bushland and to fill in gaps in the tree canopy. This reserve is not large enough to be the only tree planting site but is an option for consideration if multiple tree planting areas are to be used given the limited space within the Hills LGA for tree planting.

The Caddies Creek Corridor is identified as Green Grid Project Opportunities for the West Central District. There is opportunity for the replacement planting associated with the MDC site to contribute to urban greening in this part of the Sydney Green Grid.

The underlying soils are likely to be clay or alluvium and the Cumberland Plain Woodland tree species outlined in Appendix A would be suitable for planting at this site. Some areas may be more sandy clay or clayey sand these areas should be planted with trees more suited to the shale / sandstone transition such as *Syncarpia glomulifera, Eucalyptus punctata, Eucalyptus pilularis, Eucalyptus paniculata, Corymbia gummifera, Angophora costata* and *Eucalyptus resinifera* would be appropriate (see shale / sandstone transition tree species mix in Appendix A).

4.4.2 CADDIES CREEK PARK

Caddies Creek Park is located off Radisson Place and Paramount Crescent in Kellyville and may be a suitable site for the replacement planting associated with the MDC site depending on Council's future plans for the park. The remnant vegetation along Caddies Creek is the Cumberland Riverflat Forest. Caddies Creek Park is located near the Shale /

Sandstone boundary of the Cumberland Plain and may be suitable for planting of Cumberland Plain Woodland species depending on the underlying soils and geology.

There is an area of grassland adjacent to Radisson Place and Paramount Crescent that could be potentially planted out with Cumberland Plain Woodland species. This reserve is not large enough to be the only tree planting site but is an option for consideration if multiple tree planting areas are to be used given the limited space within the Hills LGA for tree planting. There may also be other areas along Caddies Creek, Strangers Creek, Elizabeth Macarthur Creek, or Cattai Creek that could be suitable as a tree planting site depending on advice from Council.

The Caddies Creek Corridor is identified as Green Grid Project Opportunities for the West Central District. There is opportunity for the replacement planting associated with the MDC site to contribute to urban greening in this part of the Sydney Green Grid.

If the underlying soils are clay or alluvium the Cumberland Plain Woodland tree species outlined in Appendix A would be suitable for planting at this site. If the underlying soils are more sandy clay or clayey sand then trees more suited to the shale / sandstone transition such as *Syncarpia glomulifera, Eucalyptus punctata, Eucalyptus pilularis, Eucalyptus paniculata, Corymbia gummifera, Angophora costata* and *Eucalyptus resinifera* would be appropriate (see shale / sandstone transition tree species mix in Appendix A).

4.4.3 BELLAMY FARM RESERVE

Bellamy Farm Reserve is a small Council reserve located on Isobell Avenue in West Pennant Hills. Bellamy Farm Reserve contains a small remnant of the Critically Endangered Blue Gum High Forest ecological community. Together with Currawong Reserve, Bellamy Farm Reserve provides 'stepping stone' habitat connectivity within West Pennant Hills between Cumberland State Forest and Bidjigal Reserve.

Bellamy Farm Reserve contains small grassed areas at the north east, south east and south west corners of the bushland which could be used as a planting site. This reserve is not large enough to be the only tree planting site but is an option for consideration if multiple tree planting areas are to be used given the limited space within the Hills LGA for tree planting.

Bellamy Farm Reserve would need to be planted with tree species from the Blue Gum High Forest community, not Cumberland Plain Woodland, so species including *Eucalyptus saligna, Eucalyptus pilularis, Syncarpia glomulifera, Eucalyptus paniculata, Angophora costata,* and *Angophora floribunda* would be most suitable for this site (see Blue Gum High Forest tree species mix in Appendix A).

4.4.4 CASTLE HILL HERITAGE PARK

Castle Hill Heritage Park, located on Heritage Drive in Castle Hill, is a site that has been used for native species planting days in the past by the Hills Shire Council and may be a suitable site for the replacement planting associated with the MDC site. Castle Hill Heritage Park is mapped as containing remnants of Blue Gum High Forest, Sydney Turpentine-Ironbark Forest, and Western Sydney Dry Rainforest, all of which are threatened ecological communities.

There are large areas of Castle Hill Heritage Park that could be suitable as a tree planting site depending on Council's future plans for the site. Castle Hill Heritage Park may be large enough to plant the entire 674 trees that are required or may be used as part of a multiple site planting strategy.

Castle Hill Heritage Park would need to be planted with trees from the Blue Gum High Forest, Sydney Turpentine-Ironbark Forest, or Western Sydney Dry Rainforest community as appropriate depending on the adjacent vegetation type. The Cumberland Plain Woodland tree species outlined in Appendix A would be suitable for Western Sydney Dry Rainforest, with the addition of *Backhousia myrtifolia,* but species including *Eucalyptus saligna, Eucalyptus pilularis, Syncarpia glomulifera, Eucalyptus paniculata, Angophora costata* and *Angophora floribunda* would be most suitable for planting adjacent to Blue Gum High Forest and Sydney Turpentine-Ironbark Forest (see Blue Gum High Forest and Sydney Turpentine-Ironbark Forest tree species mix in Appendix A).

4.4.5 FRED CATERSON RESERVE

Fred Caterson Reserve is located approximately 600 metres to the east of the MDC site on Gilbert Road in Castle Hill. Fred Caterson Reserve is a large area of bushland and sports fields and has been used in the past for planting events including National Tree Day and may be a suitable site for the replacement planting associated with the MDC site. Fred Caterson Reserve does not contain remnants of Cumberland Plain Woodland, it mapped as containing a number of sandstone and shale / sandstone transition communities including Shale-Sandstone Transition Forest (dominated by *Eucalyptus punctata, Corymbia gummifera* and Ironbarks), a scribbly gum community, and sandstone riparian scrub along Cattai Creek.

Fred Caterson Reserve is highly vegetated but there may be areas that could be suitable as a tree planting site depending on Council's future plans for the site. This reserve is an option for consideration if multiple tree planting areas are to be used given the limited space within the Hills LGA for tree planting.

The Cattai Creek Corridor is identified as Green Grid Project Opportunities for the West Central District. There is opportunity for the replacement planting associated with the MDC site to contribute to urban greening in this part of the Sydney Green Grid.

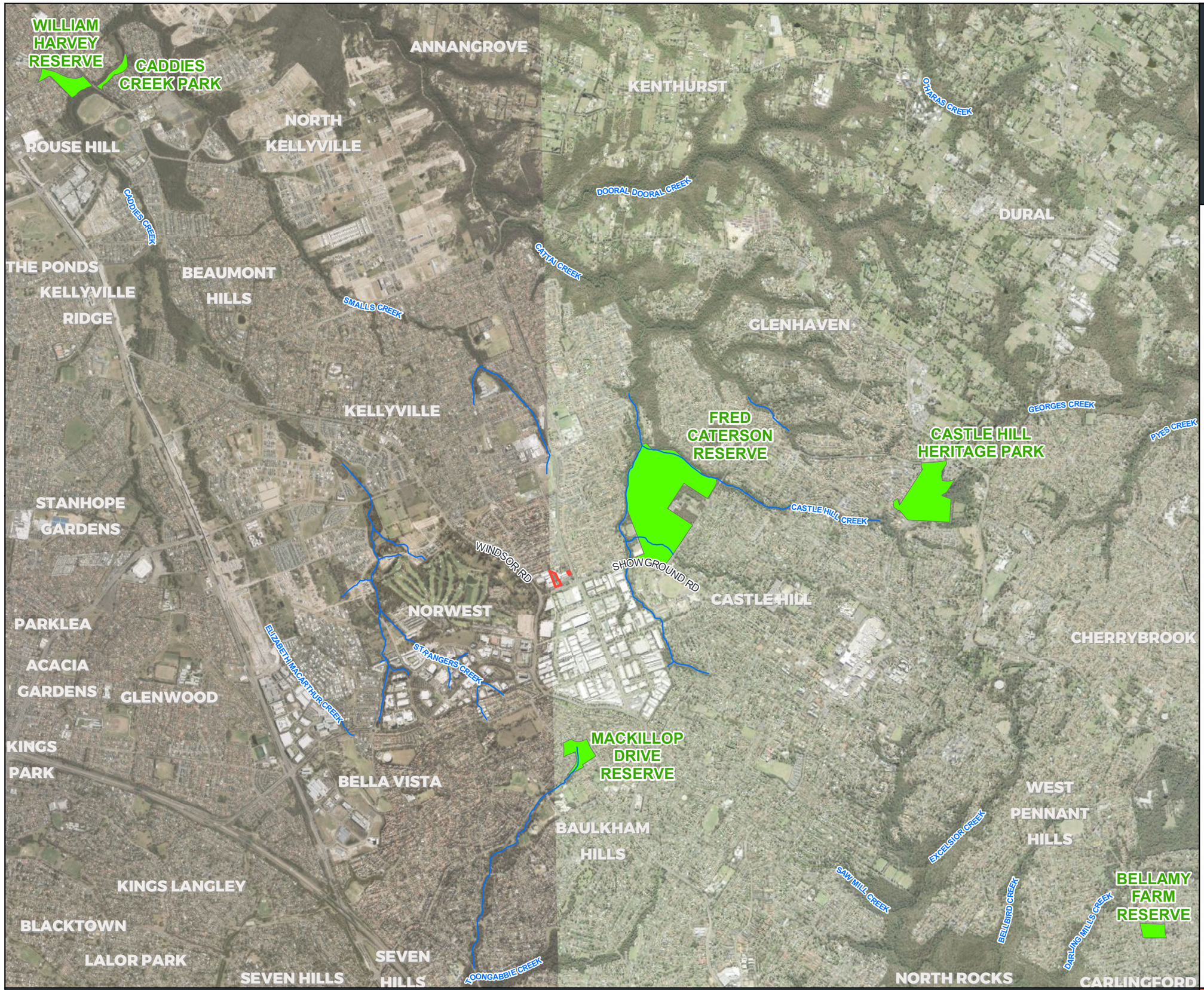
Given the sandstone influence at Fred Caterson Reserve, the Cumberland Plain Woodland tree species outlined in Appendix A will not be suitable for planting at this site. Species including *Syncarpia glomulifera, Eucalyptus punctata, Eucalyptus pilularis, Eucalyptus paniculata, Corymbia gummifera, Angophora costata* and *Eucalyptus resinifera* (among others) would be appropriate (see sandstone and shale / sandstone transition tree species mix in Appendix A).

4.4.6 MACKILLOP DRIVE RESERVE

Mackillop Drive Reserve is located on Mackillop Drive in Baulkham Hills. This reserve has been used in the past for planting events including National Tree Day and may be a suitable site for the replacement planting associated with the MDC site. The remnant vegetation at Mackillop Drive Reserve is mapped as Sydney Turpentine-Ironbark Forest, a threatened ecological community.

There are areas of grassland adjacent to remnant vegetation that may be suitable for planting depending on Councils future plans for the site. This reserve is not large enough to be the only tree planting site but is an option for consideration if multiple tree planting areas are to be used given the limited space within the Hills LGA for tree planting.

Given the vegetation at Mackillop Drive Reserve is mapped as Sydney Turpentine-Ironbark Forest, the Cumberland Plain Woodland tree species outlined in Appendix A will not be suitable for planting at this site. Species including *Syncarpia glomulifera, Eucalyptus punctata, Eucalyptus pilularis,* and *Eucalyptus paniculata* would be appropriate (see Sydney Turpentine-Ironbark Forest tree species mix in Appendix A).



wsp

Powerhouse Castle Hill Project

Figure 4.2
Location of the potential tree planting sites within the Hills LGA

Legend

- Development Site
- Watercourse
- Tree planting options

0 1 2 Km

Coordinate system: GDA 1994 MGA Zone 56

Scale ratio correct when printed at A3

1:35,000 Date: 2020-07-22

Data sources: - DFSI, Geoscience Australia

© WSP Australia Pty Ltd ("WSP") Copyright in the drawings, information and data recorded ("the information") is the property of WSP. This document and the information are solely for the use of the authorised recipient and this document may not be used, copied or reproduced in whole or part for any purpose other than that which it was supplied by WSP. WSP makes no representation, undertakes no duty and accepts no responsibility to any third party who may use or rely upon this document or the information. NCSI Certified Quality System to ISO 9001. © APPROVED FOR AND ON BEHALF OF WSP Australia Pty Ltd.

5 PROPOSED SPECIES FOR REPLACEMENT PLANTING

5.1 PLANT SPECIES SELECTION AND PLANTING DENSITY

This section outlines suitable plant species for planting and recommended planting densities. The species outlined in this section and Appendix A have been selected based on those species that would have occurred naturally on site in the Cumberland Plain Woodland community. In general, the principles behind the selection of plant species to be used in revegetation at the site is to establish plants that:

- suit the site characteristics
- are native to the area and vegetation community that is being enhanced
- occur together naturally
- do not display any signs of pests of diseases.

Selection criteria for plant species to be used in the revegetation are provided below.

The canopy trees on the MAAS site and TAFE site are well established and the only opportunity for revegetation is to establish a shrub layer and groundcover layer beneath the trees. As such, the species selection has been limited to shrubs and ground cover species. Using a balanced mix of species from the majority of plant families that are found in naturally occurring examples of the Cumberland Plain Woodland community will maximise the biodiversity value of the plantings.

Appendix A identifies the species that are appropriate for planting on the MAAS site and the TAFE site from a biodiversity perspective. Suggested planting densities are also provided. The dimensions of the mature plants and the natural densities of each species should guide the final planting densities on site. Plants should not be planted at densities beyond the long-term site capabilities apart from an additional 10% in each stratum (i.e. tree, shrub, groundcover) to account for mortality. This will avoid the loss of plants through density dependent mortality, encourage faster establishment and growth of plants, and reduce the need for replacement planting or thinning. The planting densities provided in Appendix A should be used as a guide only as it should be noted that mature native canopy and some shrub species currently exist in suggested planting areas.

Appendix A also contains a list of Cumberland Plain Woodland tree species that are suggested for the Council tree replacement site. If a Blue Gum High Forest, Turpentine Ironbark Forest, sandstone, or shale / sandstone transition site is chosen then tree species will need to be adjusted as appropriate (see Appendix A).

5.2 PLANT SIZE

The shrubs and groundcovers planted at the MAAS site and TAFE site should be tubestock size (seedlings in small plastic forestry tubes). Tubestock in 50 mm forestry tubes will be the most appropriate size for shrubs while the most appropriate size for groundcovers is the smaller hiko cell tubes.

Planting of tubestock has several advantages. The use of tubestock may reduce the lag period between the completion of construction and the establishment of native vegetation as tubestock plants are larger and more mature in the early stages of revegetation compared to plants produced by Hiko cells. The growing of tubestock is also likely to produce a larger number of plants from available seed resources and allows plants to be produced from cuttings. Tubestock planting results is reliable and an immediate impact is made on the planting area. The positioning and placement of plants is also able to be controlled.

For the Council tree replacement site, tubestock is also the preferred plant size.

6 PLANT ESTABLISHMENT AND MAINTENANCE

6.1 PLANTING

Tubestock, grown in small square plastic forestry tubes, is the preferred method of revegetation for shrub and groundcover species. Planting of tubestock will be carried out using hand tree planting tools and should be conducted in the following method:

- dig a hole slightly larger than the root-ball of the seedling
- place the plant in the hole with the potting mix just below the soil surface
- backfill soil around the seedling ensuring firm contact with the root-ball not leaving any air gaps
- a slight depression should be left around the base of the seedling to hold water
- the seedling should then be watered in and fertilised
- place a light cover of native mulch in a 0.5 m radius around the plantings stem
- specialist planting tools such as the Hamilton tree planter is recommended for use due to likely soil compaction.

6.1.1 INITIAL WATERING

Initial watering of planting areas should be undertaken to ensure that sufficient soil moisture is present to enable plant survival and establishment until the first round of maintenance watering. If conditions are dry at the time of planting, heavy initial watering of the planting areas will be required prior to planting.

6.1.2 PLANT PROTECTION

To aid in identification of plantings, a wooden stake should be placed next to all plants to prevent incidental damage to the plantings during maintenance activities. Tree guards should also be placed around planting if there is any herbivore damage noted. This will provide protection from grazing animals during the plant establishment period.

6.1.3 PREVENTING THE INTRODUCTION PATHOGENS AND WEEDS

Phytophthora cinnamomi is a microscopic soil borne water mould which causes root rot of susceptible plant species. *Phytophthora cinnamomi* has been recorded in Sydney and dieback associated with the water mould is evident in many areas. Myrtle rust is an exotic fungus (*Uredo rangelii*) that infects the foliage of Myrtaceae species in the form of powdery rust that causes leaf deformity and death. Myrtle rust is dispersed by wind along with insect and animal movements. *Phytophthora cinnamomi* and Myrtle Rust prevention measures should be implemented during the planting.

The following measures should be implemented to minimise the risk of the introduction pathogens and weeds:

- all soil, mulch, seed and tubestock imported to the site must be guaranteed by the supplier to be weed-free and free of material containing spores of *Uredo rangelii* and *Phytophthora cinnamomi*
- all plant and equipment used on the site, including clothing, must be entirely free of encrusting mud and other material that may harbour the spores of pathogens and weed seeds.

6.2 MAINTENANCE OF PLANTINGS

Once plants are installed at the site, the plantings will require regular maintenance for period of one year to ensure survival. Maintenance activities may include the following:

- watering/irrigation at a frequency tailored to prevailing rainfall conditions to ensure vegetation survival
- weed control
- maintenance of plant stakes/markings and plant protection
- plant replacement if necessary.

6.2.1 WATERING

Watering of plants will be necessary in the initial weeks after planting and will need to be tailored to prevailing rainfall conditions to ensure vegetation survival. More watering will be required in hot dry conditions. Conversely, if it has rained then the plantings may not need watering. The watering regime will need to be adaptable.

6.2.2 WEED CONTROL

Weed control is the most important feature of any maintenance program and is often a major factor in the success or failure of a revegetation project. A weed free area of at least 1 m in diameter should be maintained around the planting at all times to reduce competition for resources and encourage establishment. Localised mulching of plantings will assist. Spot herbicide application with a contact herbicide such as Glyphosate or non-chemical methods such as hand removal can also be used. Regular maintenance weed control is required, as weed will inevitably re-establish due to dispersal and the soil seed bank which will continue to be a source of exotic seed.

Successful weed control is important to ensure the natural regeneration of native vegetation and successful establishment, rapid early growth and establishment of plantings. Failure to achieve appropriate weed control prior to planting is likely to result in competition by weed species which will severely affect the survival and growth rate of establishing vegetation. Weed free conditions should be provided adjacent to the plantings and this is best achieved before planting begins. Revegetation areas should be treated for weeds at least two months before planting begins to decrease the weed soil seedbank and provide conditions suitable for planting native species.

6.2.3 PLANT PROTECTION

Plant markings and plant protection must be maintained during the initial stages of plant establishment. Grazing prevention is important for the successful establishment of plants in the revegetation areas if herbivores are present. Tree guards are the preferred method to avoid seedling death due to grazing and can the plastic bag type. Once plants have established, the tree guards must be removed.

6.2.4 REPLACEMENT PLANTING

Replacement planting may be required where seedlings do not successfully establish in the revegetation area. This will most likely occur within the first year of planting. Additional planting should be undertaken to replace dead plants and fill gaps.

7 ECOLOGICAL VALUE OF REPLACEMENT PLANTINGS

7.1 CANOPY COVER

Vegetation extent in the locality was examined in the BDAR (see WSP, 2020) and the per cent native vegetation cover in the landscape is estimated at approximately 17 per cent. This is a very low proportion of canopy cover and reflects the level of development that has occurred. Consequently, further loss of tree canopy may be detrimental to the landscape. The replacement of the 337 trees at a 2:1 ratio would result in a net positive impact to landscape canopy cover.

The crown cover of the canopy (the vertical projection of the periphery of tree crowns within a designated area) within the development site is dense and measured at 84% cover. The community condition benchmark for tree cover in PCT 849 is 53%. The plantation within the development site is more dense than a naturally occurring stand of vegetation that would have once occurred at that location. The replacement planting site should therefore aim to achieve a canopy cover of near to the benchmark for PCT 849.

7.2 BIODIVERSITY VALUE

The vegetation within the development site is in very poor condition as reflected by the vegetation integrity score of 1.9 out of 100 (see WSP, 2020). This low score is due to the low composition score caused by low native species richness, a lack of vegetation structure due to the canopy of the vegetation being dominated by exotic species (*Corymbia citriodora*) and very sparse mid storey and ground layer, and absence of function attributes such as large trees (over the 50 cm large tree threshold), hollow-bearing trees, and coarse woody debris. The trees within the development site do provide some marginal foraging habitat for a range of threatened animal species (see WSP, 2020), but the habitats within the development site are unlikely to be used for breeding as important features such as large hollow-bearing trees, large woody debris, and diverse vegetation structure are absent. Combined with the human disturbance and edge effects that the habitat is subject to, only marginal foraging habitat is expected to be present. The replacement planting site will be a better performing example of the vegetation community as the canopy would be composed of native species. As such the species composition score and structure scores of the replacement planting site will greatly exceed that of the development site. There would however be a lag in habitat establishment as the trees will take time to grow to a size suitable for foraging.

The habitat within the development site has a low degree of connectivity to other areas of habitat due to the impacts of urbanisation. The habitats that do remain immediately adjacent to the development site are generally small isolated fragments or individual street trees within the urban matrix of residential, commercial and industrial development. The replacement planting site should be located in an area of the Hills LGA that will reinforce or reinstate a level of landscape connectivity, even if the connectivity isn't physical. If a site cannot be chosen that directly links two areas of existing bushland, the replacement planting site should be located in an area preferably within 100 metres of an existing vegetation remnant in order to provide functional connectivity.

7.3 CONTRIBUTION TO THE SYDNEY GREEN GRID

The Sydney Green Grid will play a key role in the management of water quality, treatment of stormwater and flood risk, protect and connect existing ecological communities, and improve the ability to adapt to and mitigate the impacts of heat, noise and air pollution while improving landscape and urban quality. Planting of trees at locations within the Caddies Creek Corridor and the Cattai Creek Corridor will contribute to achieving the outcomes specified for the Green Grids West Central District.

8 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (*WSP*) for Create NSW (*Client*) in response to specific instructions from the Client and in accordance with WSP's proposal dated 8 May 2020 and agreement with the Client dated 28 May 2020 (*Agreement*).

8.1 PERMITTED PURPOSE

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (*Permitted Purpose*).

8.2 QUALIFICATIONS AND ASSUMPTIONS

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (*Conclusions*) are based in whole or in part on information provided by the Client and other parties identified in the report (*Information)*, those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

8.3 USE AND RELIANCE

This Report should be read in its entirety and must not be copied, distributed or referred to in part only. The Report must not be reproduced without the written approval of WSP. WSP will not be responsible for interpretations or conclusions drawn by the reader. This Report (or sections of the Report) should not be used as part of a specification for a project or for incorporation into any other document without the prior agreement of WSP.

WSP is not (and will not be) obliged to provide an update of this Report to include any event, circumstance, revised Information or any matter coming to WSP's attention after the date of this Report. Data reported and Conclusions drawn are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

This Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose. The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) any Conclusions contained within the Report and implement them in an appropriate, suitable and timely manner.

In the absence of express written consent of WSP, no responsibility is accepted by WSP for the use of the Report in whole or in part by any party other than the Client for any purpose whatsoever. Without the express written consent of WSP, any use which a third party makes of this Report or any reliance on (or decisions to be made) based on this Report is at the sole risk of those third parties without recourse to WSP. Third parties should make their own enquiries and obtain independent advice in relation to any matter dealt with or Conclusions expressed in the Report.

8.4 DISCLAIMER

No warranty, undertaking or guarantee whether expressed or implied, is made with respect to the data reported or the Conclusions drawn. To the fullest extent permitted at law, WSP, its related bodies corporate and its officers, employees and agents assumes no responsibility and will not be liable to any third party for, or in relation to any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of profit, loss of revenue, loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, site depredation costs, business interruption or economic loss) of any kind whatsoever, suffered on incurred by a third party.

REFERENCES

- Clarke, N.R. & Jones, D.C. 1991. Penrith 1:100 000 Geological Sheet 9030. Sydney: Geological Survey of New South Wales.
- Hazelton, P.A., Bannerman, S.M. & Tillie, P.J. (1989). Soil landscapes of the Penrith 1:100000 Sheet 9030. Soil conservation Service of NSW, Sydney.
- Mackay Tree Management. (2019). Arboricultural Impact Assessment Tree Survey Museum of Applied Arts and Science Museum Discovery Centre 172 Showground Road Castle Hill NSW Proposed New Storage facility Expansion.
- NSW National Parks and Wildlife Service. (2002). Landscapes (Mitchell) of NSW. Hurstville NSW National Parks and Wildlife Service.
- State Government of NSW and Department of Planning, Industry and Environment. (2010). Bushland Survey - Baulkham Hills Shire.
- State Government of NSW and Department of Planning, Industry and Environment. (2010). Southeast NSW Native Vegetation Classification and Mapping – SCIVI.
- State Government of NSW and Department of Planning, Industry and Environment. (2012). Australian Soil Classification (ASC) Soil Type map of NSW.
- State Government of NSW and Department of Planning, Industry and Environment. (2015). Remnant Vegetation of the western Cumberland subregion, 2013 Update.
- Thackway, R & Cresswell, I.D. (1995). An Interim Biogeographic Regionalisation of Australia, Canberra, Australian Nature Conservation Agency.
- WSP (2020). Powerhouse Museum Discovery Centre Expansion Project Biodiversity Development Assessment Report.

APPENDIX A

RECOMMENDED SPECIES FOR PLANTING

Table A.1 Recommended species for planting, suggested plant numbers and density

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Diverse grass mix. Note that some species may not be available. Species are to be chosen from the list below. Not all species need to be planted. Grasses should be plated at a density of 5,000 plants / ha.				
Speargrass	*Aristida benthamii* var. *benthamii*	MAAS and TAFE sites	Hiko Cells	Spring or Autumn
Purple Wiregrass	*Aristida ramosa*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Threeawn Speargrass	*Aristida vagans*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Speargrass	*Aristida warburgii*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Corkscrew Grass	*Austrostipa setacea*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Stout Bamboo Grass	*Austrostipa ramosissima*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Austrostipa	*Austrostipa rudis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Whitetop	*Rytidosperma caespitosum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wallaby Grass	*Rytidosperma fulvum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wallaby Grass	*Rytidosperma racemosum var. racemosum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wallaby Grass	*Rytidosperma setaceum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wallaby Grass	*Rytidosperma tenuius*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Redleg Grass	*Bothriochloa decipiens* var. *decipiens*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Red Grass	*Bothriochloa macra*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Scented-top Grass	*Capillipedium spicigerum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Windmill Grass	*Chloris truncata*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Plump Windmill Grass	*Chloris ventricosa*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Barb Wire Grass	*Cymbopogon refractus*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Queensland Bluegrass	*Dichanthium sericeum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Shorthair Plumegrass	*Dichelachne micrantha*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Plumegrass	*Dichelachne parva*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Open Summer-grass	*Digitaria diffusa*	MAAS and TAFE sites	Hiko cells	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Digitaria	*Digitaria ramularis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Hedgehog Grass	*Echinopogon caespitosus*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Hedgehog Grass	*Echinopogon ovatus*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Windmill Grass	*Enteropogon acicularis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wiry Panic	*Entolasia stricta*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Brown's Lovegrass	*Eragrostis brownii*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Clustered Lovegrass	*Eragrostis elongata*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Paddock Lovegrass	*Eragrostis leptostachya*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Weeping Lovegrass	*Eragrostis parviflora*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Early Spring Grass	*Eriochloa pseudoacrotricha*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Blown Grass	*Lachnagrostis filiformis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Weeping Grass	*Microlaena stipoides* var. *stipoides*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Basket Grass	*Oplismenus aemulus*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Basket Grass	*Oplismenus imbecillis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Hairy Panic	*Panicum effusum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Two-colour Panic	*Panicum simile*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Paspalidium	*Paspalidium criniforme*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Paspalidium	*Paspalidium distans*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Tussock	*Poa labillardieri* var. *labillardieri*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Poa	*Poa sieberiana*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Wild Sorghum	*Sorghum leiocladum*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Western Rat's Tail Grass	*Sporobolus creber*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Slender Rat's Tail Grass	*Sporobolus elongatus*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Kangaroo Grass	*Themeda australis*	MAAS and TAFE sites	Hiko cells	Spring or Autumn
Grass like species mix (sourced as tubestock). Species will be selected based on availability. Not all species need to be used. Grass like species should be plated at a density of 900 plants / ha.				
Rough Saw-sedge	*Gahnia aspera*	MAAS and TAFE sites	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Rapier sedge	*Lepidosperma laterale*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Lomandra	*Lomandra filiformis* subsp. *coriacea*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Lomandra	*Lomandra glauca*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Spiny-headed mat-rush	*Lomandra longifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Lomandra	*Lomandra multiflora*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Forb like species mix (sourced as tubestock). Species will be selected based on availability. Not all species need to be used. Grass like species should be plated at a density of 20 plants / ha.				
Austral bugle	*Ajuga australis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Common Woodruff	*Asperula conferta*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Creeping Saltbush	*Atriplex semibaccata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Blue Trumpet	*Brunoniella australis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Purple Burr-daisy	*Calotis cuneifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Burr daisy	*Calotis dentex*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Bogan Flea	*Calotis hispidula*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Yellow burr-daisy	*Calotis lappulacea*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Indian Pennywort	*Centella asiatica*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Yellow buttons	*Chrysocephalum apiculatum*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Commelina	*Commelina cyanea*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Button Everlasting	*Coronidium scorpioides*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Bears-ear	*Cymbonotus lawsonianus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Blueberry Lily	*Dianella longifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Blue Flax-Lily	*Dianella revoluta*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Kidney Weed	*Dichondra repens*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Berry Saltbush	*Einadia hastata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Climbing Saltbush	*Einadia nutans*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Saltbush	*Einadia polygonoides*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Fishweed	*Einadia trigonos*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Cudweed	*Euchiton involucratus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Geranium	*Geranium solanderi*	MAAS and TAFE sites	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Forest goodenia	*Goodenia hederacea*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Pennywort	*Hydrocotyle sibthorpioides*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Slender Lagenophora	*Lagenophora gracilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Blue Bottle-daisy	*Lagenophora stipitata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Buttons	*Leptorhynchos nitidulus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Whiteroot	*Lobelia purpurascens*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Slender Mint	*Mentha diemenica*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Creeping Mint	*Mentha satureoides*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Plantain	*Plantago debilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Narrow plantain	*Plantago gaudichaudii*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Cockspur flower	*Plectranthus parviflorus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Dwarf Milkwort	*Polygala japonica*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Pastel Flower	*Pseuderanthemum variabile*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Pale fan-flower	*Scaevola albida*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Dwarf Skullcap	*Scutellaria humilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Hill Fireweed	*Senecio hispidulus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Cotton Fireweed	*Senecio quadridentatus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Indian Weed	*Sigesbeckia orientalis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Forest Nightshade	*Solanum prinophyllum*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Eastern Nightshade	*Solanum pungetium*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Solenogyne	*Solenogyne bellioides*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Trailing Speedwell	*Veronica plebeia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Fuzzweed	*Vittadinia cuneata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Fuzzweed	*Vittadinia muelleri*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Woolly New Holland Daisy	*Vittadinia gracilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Fuzzweed	*Vittadinia pustulata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Fuzzweed	*Vittadinia sulcata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Tufted Bluebell	*Wahlenbergia communis*	MAAS and TAFE sites	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Australian bluebell	*Wahlenbergia stricta*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Early Nancy	*Wurmbea dioica* subsp. *dioica*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Zornia	*Zornia dyctiocarpa* var. *dyctiocarpa*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Shrub species mix (sourced as tubestock). Not all species will be available. Species are to be selected from the list below. Not all species need to be planted. Shrubs should be plated at a density of 40 plants / ha.				
Hickory wattle	*Acacia falcata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Bossiaea	*Bossiaea prostrata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Coffee Bush	*Breynia oblongifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Blackthorn	*Bursaria spinosa*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Eastern Flame Pea	*Chorizema parviflorum*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Hairy Clerodendrum	*Clerodendrum tomentosum*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Gorse Bitter Pea	*Daviesia ulicifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Narrow-leaved Orangebark	*Denhamia silvestris*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Parrot-pea	*Dillwynia sieberi*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Wedge-leaf hop-bush	*Dodonaea viscosa* subsp. *cuneata*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Winter Apple	*Eremophila debilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Wedge Guinea Flower	*Hibbertia diffusa*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Native Indigo	*Indigofera australis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Prickly Beard-heath	*Leucopogon juniperinus*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Myrsine	*Myrsine variabilis*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Mock Olive	*Notelaea longifolia*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Wallaby weed	*Olearia viscidula*	MAAS and TAFE sites	Tubestock	Spring or Autumn
White dogwood	*Ozothamnus diosmifolius*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Pultenaea	*Pultenaea microphylla*	MAAS and TAFE sites	Tubestock	Spring or Autumn
Tree species Cumberland Plain Woodland mix for the Council tree replacement site. Trees are to be replaced at a 2:1 ratio which would result in the need for 674 trees selected from the species below. Not all species need to be planted.				
Hickory wattle	*Acacia implexa*	Council tree replacement site	Tubestock	Spring or Autumn
Black wattle	*Acacia decurrens*	Council tree replacement site	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Sydney green wattle	*Acacia parramattensis*	Council tree replacement site	Tubestock	Spring or Autumn
Black She-oak	*Allocasuarina littoralis*	Council tree replacement site	Tubestock	Spring or Autumn
Rough-barked Apple	*Angophora floribunda*	Council tree replacement site	Tubestock	Spring or Autumn
Broad-leaved apple	*Angophora subvelutina*	Council tree replacement site	Tubestock	Spring or Autumn
Swamp Oak	*Casuarina glauca*	Council tree replacement site	Tubestock	Spring or Autumn
Spotted Gum	*Corymbia maculata*	Council tree replacement site	Tubestock	Spring or Autumn
Cabbage Gum	*Eucalyptus amplifolia* subsp. *amplifolia*	Council tree replacement site	Tubestock	Spring or Autumn
Narrow-leaved ironbark	*Eucalyptus crebra*	Council tree replacement site	Tubestock	Spring or Autumn
Thin-leaved Stringybark	*Eucalyptus eugenioides*	Council tree replacement site	Tubestock	Spring or Autumn
Red Ironbark	*Eucalyptus fibrosa*	Council tree replacement site	Tubestock	Spring or Autumn
Grey Box	*Eucalyptus moluccana*	Council tree replacement site	Tubestock	Spring or Autumn
Forest Red Gum	*Eucalyptus tereticornis*	Council tree replacement site	Tubestock	Spring or Autumn
Cherry Ballart	*Exocarpos cupressiformis*	Council tree replacement site	Tubestock	Spring or Autumn
Melaleuca	*Melaleuca decora*	Council tree replacement site	Tubestock	Spring or Autumn
Prickly-leaved Tea Tree	*Melaleuca styphelioides*	Council tree replacement site	Tubestock	Spring or Autumn
Tree species Blue Gum High Forest mix for the Council tree replacement site. Trees are to be replaced at a 2:1 ratio which would result in the need for 674 trees selected from the species below. Not all species need to be planted.				
Forest She Oak	*Allocasuarina torulosa*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Sydney Red Gum	*Angophora costata*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Blueberry Ash	*Elaeocarpus reticulatus*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Blackbutt	*Eucalyptus pilularis*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Sydney Blue Gum	*Eucalyptus saligna*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Turpentine	*Syncarpia glomulifera* subsp. *glomulifera*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Grey Ironbark	*Eucalyptus paniculata* subsp. *paniculata*	Council tree replacement site (Blue Gum High Forest)	Tubestock	Spring or Autumn
Tree species Sydney Turpentine Ironbark Forest mix for the Council tree replacement site. Trees are to be replaced at a 2:1 ratio which would result in the need for 674 trees selected from the species below. Not all species need to be planted.				
Sydney Red Gum	*Angophora costata*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
White Mahogany	*Eucalyptus acmenoides*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Thin-leaved Stringybark	*Eucalyptus eugenioides*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Red Ironbark	*Eucalyptus fibrosa*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
White Stringybark	*Eucalyptus globoidea*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Grey Ironbark	*Eucalyptus paniculata* subsp. *paniculata*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Blackbutt	*Eucalyptus pilularis*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Grey Gum	*Eucalyptus punctata*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Red Mahogany	*Eucalyptus resinifera* subsp. *resinifera*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Sydney Blue Gum	*Eucalyptus saligna*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn
Turpentine	*Syncarpia glomulifera* subsp. *glomulifera*	Council tree replacement site (Sydney Turpentine Ironbark Forest)	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Tree species Shale / Sandstone Transition Forest mix for the Council tree replacement site. Trees are to be replaced at a 2:1 ratio which would result in the need for 674 trees selected from the species below. Not all species need to be planted.				
Narrow-leaved Apple	*Angophora bakeri*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Yellow Bloodwood	*Corymbia eximia*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Red Bloodwood	*Corymbia gummifera*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Spotted Gum	*Corymbia maculata*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Narrow-leaved ironbark	*Eucalyptus crebra*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Thin-leaved Stringybark	*Eucalyptus eugenioides*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Red Ironbark	*Eucalyptus fibrosa*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Grey Gum	*Eucalyptus punctata*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Red Mahogany	*Eucalyptus resinifera* subsp. *resinifera*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Turpentine	*Syncarpia glomulifera* subsp. *glomulifera*	Council tree replacement site (Shale / Sandstone Transition geology)	Tubestock	Spring or Autumn
Tree species Sandstone mix for the Council tree replacement site. Trees are to be replaced at a 2:1 ratio which would result in the need for 674 trees selected from the species below. Not all species need to be planted.				
Narrow-leaved Apple	*Angophora bakeri*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Sydney Red Gum	*Angophora costata*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	MANAGEMENT ZONE/S OF PLANTING	PLANTING METHOD	TIMING (MONTHS OR YEAR)
Yellow Bloodwood	*Corymbia eximia*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Red Bloodwood	*Corymbia gummifera*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Narrow-leaved ironbark	*Eucalyptus crebra*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Thin-leaved Stringybark	*Eucalyptus eugenioides*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Sandstone Stringybark	*Eucalyptus oblonga*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Blackbutt	*Eucalyptus pilularis*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Grey Gum	*Eucalyptus punctata*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Red Mahogany	*Eucalyptus resinifera* subsp. *resinifera*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Large-fruited Red Mahogany	*Eucalyptus scias*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Narrow-leaved Scribbly Gum	*Eucalyptus racemosa*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn
Turpentine	*Syncarpia glomulifera* subsp. *glomulifera*	Council tree replacement site (Sandstone geology)	Tubestock	Spring or Autumn