



Memorandum

25 February, 2019

To John McManus

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From Gary Leonard

Tel

Subject TfNSW TAP 3 Como Station: Ecological Assessment

Job no. 21/27503

1 Introduction

1.1 Proposal overview

Transport for NSW (TfNSW) is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the proposed Como Station Upgrade (the Proposal). The Proposal is part of the Transport Access Program, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, secure and integrated transport infrastructure.

The proposed upgrade is being assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and TfNSW is both the proponent and determining authority. A Review of Environmental Factors (REF) is being prepared to assess the potential environmental benefits and impacts of the Proposal, and will outline mitigation measures to reduce the identified impacts. This Ecological Assessment has been undertaken to support the REF. The key features of the Proposal are summarised as follows:

- incorporate a new paved area that connects a new lift lobby with the underpass on Como Parade
- installation of a new lift and stairs at the commuter car park off Como Parade to connect to the existing underpass
- removal of the existing non-compliant pedestrian ramp off Como Parade and rehabilitation of the area
- installation of a new lift from the pedestrian underpass to the station platform
- relocation of the existing non-compliant DDA parking spaces within the commuter car park close to the new lift, with construction of the relocated spaces compliant to current standards
- extension of the existing access ramp on eastern side of the station (Railway Road) to provide DDA compliant pedestrian route to the underpass
- new handrails, installation of tactile ground surface indicators (TGSIs) and nosing to the existing stairs
- removal of vegetation and trees as minimally required to accommodate new infrastructure
- modification of the existing station building layout to allow for new amenities
- installation of a canopy on the platform between the station building and new lift structure
- housing of the digital communications equipment in a compliant enclosure within the existing station building

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- upgrading of the existing toilets to accommodate one unisex Family Accessible toilet and Ambulant male & female toilets
- ancillary works including adjustments to lighting, Opal card readers, handrails, low voltage electrical upgrades, minor drainage works, landscaping, improvements to station communications systems including closed circuit TV (CCTV) cameras, hearing loops, wayfinding signage, emergency help points and installation of tactile ground surface indicators (TGSIs).

Construction activities associated with various upgrade elements on the western side of the station would require the removal of a small number of native and planted non-indigenous trees and shrubs adjacent to the Como Parade carpark. The proposed improvements to existing pedestrian access adjacent to Railway Parade would require the removal of several planted indigenous trees, growing within a fenced section of the railway reserve. Protective measures would be required for some trees and shrubs which are located adjacent to the proposed construction areas.

1.2 Purpose of this report

An assessment of the vegetation which occurs at, and adjacent to, Como Railway Station (the Proposal site) has been undertaken to identify trees and shrubs within the Proposal site which would require removal, those that can be retained and to determine the likely significance of impacts of the Proposal on threatened biota listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The primary objectives of this Ecological Assessment is to:

- Identify biodiversity values at the Proposal site, including the presence or likely presence of species, populations and ecological communities and their habitats listed under the BC Act and EPBC Act;
- Provide arboriculture assessments of trees which may be affected by the Proposal;
- Identify the potential impacts of the Proposal on surveyed trees and listed species, populations and ecological communities and their habitats;
- Assess the likely significance of impacts on listed biota and identify if further assessment or approvals under the BC Act or EPBC Act are required;
- Advise on specific protection and management measures to avoid or minimise impacts on trees and habitat features; and
- Identify trees for removal and tree replacement requirements in accordance with TfNSW's 'Vegetation Offset Guide' (2017).

This assessment has been prepared as a separate specialist study to inform the REF for the Proposal.

1.3 Glossary of terms and acronyms

Term	Definition
BC Act	NSW <i>Biodiversity Conservation Act 2016</i>
DBH	Diameter at Breast Height
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
LEP	Local Environmental Plan
Locality	The area within a 5 km radius of the project site.
OEH	Office of Environment and Heritage
Study area	The area that was subject to a detailed site survey and assessed for direct or indirect impacts arising from future construction and operation of the proposal.
Project site	The area that would be directly impacted by construction and operation of the proposal.
SRIV	Sustainable Retention Index Value
SRZ	Structural Root Zone
SULE	Safe Useful Life Expectancy
TPZ	Tree Protection Zone

1.4 Limitations

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2 Method

2.1 Desktop review

A desktop review of existing information, including the Como TAP3 Architectural Scoping Design (TfNSW 2018) was undertaken to define the Proposal site for the assessment and areas of vegetation to be potentially affected by the Proposal. Mapping of the site in Sutherland Shire Local Environmental Plan 2015 was accessed in order to confirm the presence or absence of heritage trees or patches of significant vegetation within or adjacent to the Proposal site.

A desktop review of vegetation mapping and threatened species databases was also carried out to identify threatened biota and migratory species listed under the BC Act and EPBC Act previously recorded in the locality and which have the potential to occur within the Proposal site or be affected by the Proposal. Database records pertaining to the Proposal site and locality (i.e. within a 5 km radius of the Proposal site) were reviewed and included:

- NSW Office of Environment and Heritage (OEH) BioNet database for records of threatened species listed under the BC Act (database queried on 11 December 2018).
- Department of the Environment and Energy (DotEE) Protected Matters Online Search Tool for Matters of National Environmental Significance (MNES) listed under the EPBC Act and predicted to occur in the locality (database queried on 10 December 2018).
- Vegetation Mapping of Metropolitan Sydney (OEH, 2016).
- Descriptions of vegetation of Sutherland Shire (Benson and Howell, 1990).

The habitat resources present at the Proposal site (determined during the field survey) were compared with the known habitat associations/requirements of the threatened and migratory biota highlighted by the desktop review. This was used to determine the likelihood of each threatened ecological community, endangered population and threatened or migratory species occurring within the Proposal site.

2.2 Site inspection

A site assessment was undertaken on 12 December 2018. The extent of the Proposal site was confirmed to identify trees that would require removal and those that could be retained with appropriate protective measures.

2.2.1 Tree assessment

Trees within the Proposal site were identified in accordance with the Sutherland Shire Council Tree Protection Order (TPO) (Sutherland Shire Development Control Plan, 2003). A 'tree', is described in the Sutherland Shire Council TPO as:

- a) A single or multi trunked tree with a diameter of 100 mm or more measured at 500 mm above ground level.
- b) Any bushland vegetation, including mangroves. Bushland vegetation for the purpose of this clause means vegetation which is either remnant of the natural vegetation of the land or, if

altered, is representative of the structure and the floristics of the natural vegetation. For the purposes of this sub-clause, bushland vegetation includes trees of any size, shrubs and all herbaceous species; and

- c) Any tree and/or riparian vegetation growing within 4 metres of a creek or watercourse

Trees were assessed by conducting a ground based Visual Tree Assessment (VTA) (see Lonsdale, 2001). Identification of trees was made according to current nomenclature according to the Royal Botanic Gardens' PlantNET website (plantnet.rbgsyd.nsw.gov.au).

Attributes for each tree recorded included:

- tree number
- botanical name of tree species
- common name of tree species
- height of tree in metres (m)
- spread (radius m.)
- diameter at breast height (DBH) (m)
- age class
- health
- structure
- comments.

Trees were assessed individually and the Safe Useful Life Expectancy (SULE) and Sustainable Retention Index Value (SRIV) determined. No diagnostic equipment was used. No aerial inspection (climbing) or tree root mapping was undertaken.

Individual trees or small tree groups, comprising multiple trees, were numbered on a tree map for identification purposes (see Figure 1). The details of individual trees and the trees that make up tree groups were documented in a tree schedule with reference to the unique numerical identifier indicated on the tree map (see Appendix 3). The information provided in this report reflects the condition of the trees at the time of inspection and only relates to the trees surveyed. In the interests of minimising harm, the trees were not tagged. Trees in the Figure 1 are colour-coded as:

- green: to be retained and protected
- amber: may require removal
- red: to be removed.

The height and crown spread of trees were estimated and the diameter at breast height (DBH) measured using a forestry measuring tape. For each tree, the SULE and SRIV were determined based on the health and structure of the subject tree (after Barrell, 2001; IACA, 2010). The SULE code is presented in Appendix 1 and the SRIV matrix is presented in Appendix 2.

Tree age estimates were based on the definitions outlined by Draper and Richards (2009). Trees were considered young (EM) if they were judged to be of an age <20% of their life expectancy *in situ*. Trees of

mature age (M) are defined as trees being aged between 20 to 80% of their life expectancy *in situ*, while trees aged >80% of their life expectancy *in situ* were described as over-mature (OM) (Draper & Richards, 2009). The calculation of the Tree Protection Zone (TPZ) was based on tree DBH and the calculation of the Structural Root Zone (SRZ) was based on the difference between the subject tree's DBH and the diameter near the tree's base, as outlined in Australian Standard 4970 'Protection of Trees on Development Sites' (SA, 2009). Where the specimen had two or more leaders, the following formula was used to calculate $(dbh1^2+dbh2^2+...+dbhn^2)^{0.5}$.

2.2.2 Flora and fauna assessment

As the Proposal site does not contain stands of intact native vegetation, dedicated plot/transects to identify vegetation types or threatened ecological communities were not warranted. Vegetation at the Proposal site was inspected on foot and trees and shrubs identified. Searches were carried out for self-recruited native plants, including threatened plant species previously recorded or predicted to occur in the locality.

Surveys were undertaken to identify fauna habitat features and to assess the potential for threatened and migratory species to occur and be potentially affected by the Proposal. Fauna habitat assessments at the Proposal site included active searches for the following:

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

All fauna species observed or heard during the site inspection were recorded.

3 Existing environment

3.1 The site

The Proposal site is located approximately one kilometre to the south of Como Bridge and approximately three kilometres to the north of Sutherland Station.

The Proposal site occurs on both sides of Como Station. On the eastern side, a small section of railway reserve adjacent to Railway Road will be affected by the Proposal. The topography is gently inclined and the aspect is easterly. On the western side, a number of trees within the existing car park and pedestrian access would be affected. Topography on the western side is moderately inclined to steep and the aspect is mostly easterly.

Regional-scale mapping of soil landscape groups by Hazelton and Tille (1990a) indicate the occurrence of soils derived from the GyMEA Group on both sides of the station. Soils of the GyMEA Group occur on "undulating to rolling rises and low hills on Hawkesbury sandstone" (Hazelton and Tille 1990b).

3.2 Flora

Regional-scale mapping of vegetation (OEH, 2013) of the Proposal site indicates the occurrence of patches of “Urban: Weeds and Exotics” on both sides of Como Station. North of the station, the patches of vegetation on both sides of the railway track are described as “Coastal Enriched Sandstone Dry Forest”. The occurrence of numbers of Smooth-barked Apple (*Angophora costata*) within the western side of the Proposal site indicate a gradient between planted non-indigenous species and self-recruitment of components of Coastal Enriched Sandstone Dry Forest, the vegetation type which likely originally occurred on the site (Photo 1).



Photo 1 Patch of Coastal Enriched Sandstone Dry Forest on western side of railway line, viewed from station platform. This patch occurs adjacent to the Proposal site in the north.

Commonly occurring plant species at the Proposal site which are indicative of Coastal Enriched Sandstone Dry Forest include:

- Smooth-barked Apple (*Angophora costata*)
- White Wattle (*Acacia linifolia*)
- Wiryagan (*Banksia serrata*)
- Hairpin Banksia (*Banksia spinulosa*)
- Large-leaf Hopbush (*Dodonaea triquetra*)
- Smooth Cheesetree (*Glochidion ferdinandi* var. *ferdinandi*)
- Needlebush (*Hakea sericea*)
- Flakey-barked Tea-tree (*Leptospermum trinervium*)

- Bracken (*Pteridium esculentum*)
- Brush Daphne (*Pittosporum undulatum*).

The vegetation on the eastern side of the station consists of planted native and exotic trees, shrubs, forbs and grasses which have been planted or have self-recruited (Photo 2). The vegetation is located within a fenced area of Railway Reserve, adjacent to the footpath which follows Railway Road. The assessed trees which require removal include:

- Brush Daphne (*Pittosporum undulatum*)
- Coast Banksia (*Banksia integrifolia* subsp. *integrifolia*)
- African Olive (*Olea europaea* subsp. *cuspidata*)
- River Bottlebrush (*Callistemon viminalis*)
- Sweetgum (*Liquidambar styraciflua*)

A dense groundcover of mostly exotic grasses and forbs extends along this fenced section of Railway Reserve.



Photo 2 View of patch of planted trees and shrubs on eastern side of station.

3.3 Tree assessment

Locations of the trees and tree groups assessed are indicated in Figure 1. Details of surveyed trees are presented in the tree schedule at Appendix 3. All of the surveyed trees on the eastern side of the station appear to have been planted, while the surveyed trees on the western side are a combination of naturally occurring indigenous species and apparently planted specimens. The trees vary in age from 25 years old to, in the case of the Hill's Weeping Fig (a component of Tree group 4, photo 5) greater than 60 years old. Most of the surveyed trees are in good condition and form. Mid-storey species are mostly self-recruited, and include two invasive exotic Palm species, Cocos Palm (*Syagrus romanzoffiana*) (Photo 3) and Canary Island Date Palm (*Phoenix canariensis*).



Photo 3 Self-recruited Cocos Palm adjacent to Como Parade carpark.

One specimen of regional importance is Tree 5, a Port Jackson Cypress (*Callitris rhomboidea*) (Photo 4). The distribution of Port Jackson Cypress is described as “widespread but not common” by Benson and McDougall (1993). This specimen will not be affected by the Proposal.



Photo 4 The regionally uncommon Port Jackson Cypress (Tree 5), growing near the pedestrian access entrance to Como Parade carpark.

The Hill’s Weeping Fig *Ficus microcarpa* var. *hillii* (a component of tree group 4) is growing outside of the Proposal site, but has been assessed because it is understood that concerns were raised during public consultation (Photo 5). Hill’s Weeping Fig, although not indigenous to Sutherland Shire, is “widely grown

in New South Wales and northwards, especially as a roadside tree especially near the coast” (Spencer, 1997). This specimen has a low, broadly-spreading canopy which may require management to allow vehicular access. A branch which extended over the road has recently been damaged, probably by a passing vehicle (Photo 6).



Photo 5 View of the Hill's Weeping Fig (a component of tree group 4), viewed from the western side of Como Parade.



Photo 6 Recently broken lateral (branch) of the Hill's Weeping Fig (a component of Tree group 4), above south-bound parking lanes on Como Parade.

3.4 Flora and fauna habitats

The vegetation on the western side of the Proposal site occurs as a small linear patch between Como Parade and the railway line. Canopy connection extends northwards and southwards. A large proportion of the canopy species consists of indigenous species which appear to have self-recruited after initial clearing, possibly during construction of the railway. Over-mature trees with hollows are absent from the subject site, although several hollow-bearing trees were recorded to the north of the Proposal site.

The vegetation on the eastern side of the Proposal site consists of a short narrow band of fenced shrubbery which is not maintained. Some invasive flora species have self-recruited amongst the planted specimens. All specimens appear to be less than 20 years old. The Coast Banksia, Brush Daphne and River Bottlebrush would provide seasonal forage and shelter, although they are not sufficiently large to provide nesting opportunities. Although the Sweetgum has large branches with dense shelter, no nests or drey were recorded during the survey.

Bird species recorded in the trees included:

- Spotted Pardalote (*Pardalotus punctatus*)
- Crested Pigeon (*Ocyphaps lophotes*)
- Noisy Miner (*Manorina melanocephala*)
- Magpie (*Cracticus tibicen*)
- Magpie-lark (*Grallina cyanoleuca*)
- Little Wattlebird (*Anthochaera chrysoptera*)
- Rainbow Lorikeet (*Trichoglossus haematodus*)
- Australian Raven (*Corvus coronoides*)

No nests were recorded in any trees or on the ground of the Proposal site. The trees are mature to early-mature, therefore no hollows occur in any trees on the site (see Gibbons and Lindenmayer, 2002). No scratches were recorded on the leaders of any smooth-barked trees and no deposits indicating regular roosting sites were recorded during site surveys.

Microchiropteran bats that forage within the complete, continuous patches of native vegetation in Georges River National Park to the west and Towra Point Nature Reserve and Botany Bay National Park to the east may occur on the site. However they are unlikely to roost in trees on the site, given the narrow width of the vegetated section at the Proposal site and the absence of hollows for roost sites. There is no suitable roosting habitat for cave-roosting species. Small, common garden skinks may occur in the mulched beds and sandstone cliff faces (Photo 7). There are no waterbodies to provide habitat for frogs.



Photo 7 Sandstone cliff, showing available habitat for reptiles.

3.5 Threatened biota and migratory species

The Proposal site is located within a developed environment which has been subject to significant disturbance due to its use as a railway corridor along with the surrounding land use.

The following threatened biota and migratory species listed under the BC Act and EPBC Act have been previously recorded or are predicted to occur within 5 km of the Proposal site:

- 9 threatened ecological communities (TECs)
- 5 threatened flora species
- 18 threatened fauna species
- 7 migratory species (terrestrial species only).

No other ecological Matters of National Environmental Significance (MNES), such as World Heritage Areas or Ramsar wetlands, occur within the locality or would be impacted by the Proposal.

Of the threatened plant species previously recorded or predicted to occur in the locality, the most likely occurrences include two Eucalypt species; Camfield's Stringybark (*Eucalyptus camfieldii*) and Yellow-Top Ash (*Eucalyptus luehmanniana*). No evidence of these or any other threatened plants was detected during searches within the Proposal site and in areas of self-recruited natives on the railway batters on both sides of the railway station. Given that no complete, continuous stands of vegetation occur in the Proposal site, and the modified nature of the areas to be affected by the Proposal, threatened flora species are unlikely to occur.

No threatened fauna species were observed during the site inspection. Of the range of threatened fauna species listed under the BC Act and EPBC Act that have been previously recorded in the locality, the Grey-headed Flying Fox (*Pteropus poliocephalus*), Powerful Owl (*Ninox strenua*) and several microbats are the most likely to occur at the Proposal site. The Hill's Weeping Fig (*Ficus microcarpa* var. *hillii*) within the Proposal site in particular, may provide nectar for Grey-headed Flying Foxes when the tree is

flowering or fruiting. The vegetation in the Proposal site does not provide diurnal roosting habitat for this species.

The Powerful Owl has been recorded about 150 m south of the Proposal site and may forage within the Proposal site on occasion. A number of records (~150 records since 1999; OEH, 2018) of the Powerful Owl in the locality indicate the species is generally restricted to large narrow stands of remnant vegetation associated with the Georges and Woronora Rivers. The Proposal site would comprise a negligible proportion of this species' home range, does not provide suitable hollows for breeding and would not comprise core habitat for this species.

Microbat species that are capable of using small patches of urban vegetation for foraging may potentially occur at the Proposal site on occasion. No over-mature trees containing hollows were recorded on the Proposal site, although it is possible that tree-roosting microbats may utilise cracks and crevices in trees for temporary diurnal shelter. There is no suitable roosting habitat for cave-roosting microbat species.

While it is possible that these more mobile threatened species may occur at the Proposal site on occasion, they would not be reliant on the small number of individual trees identified for removal for their persistence in the locality.

The Proposal site does not contain suitable habitat for other threatened and migratory fauna species, including forest and woodland birds, known from the locality that rely on more structurally and floristically complex stands of native vegetation for foraging and roosting. There is no suitable habitat in the study area for threatened reptiles, frogs or migratory waders.

3.6 Values of trees

The large, mature Hill's Weeping Fig (a component of Tree Group 4) has landscape value, as well as habitat value, even though this species is not indigenous to Sutherland Shire. Although the tree is not listed as a Heritage Item in the Sutherland Shire LEP 2015, public concerns for this tree, as expressed during community consultation are recognised and recommendations for protection of this tree during construction are included in Section 5.

4 Potential impacts

4.1 Construction phase

4.1.1 Tree removal

The following trees and tree groups on the eastern side of the station will be directly impacted and require removal (see Figure 1):

- Tree group 1 (River Bottlebrush, Brush Daphne and African Olive)
- Tree 2 (Coast Banksia); and
- Tree 3 (Sweetgum)

The following trees on the western side of the station are located within construction areas and will require removal (see Figure 1):

- Tree 9 (Smooth-barked Apple)
- Tree 10 (Smooth-barked Apple)
- Tree 13 (Spotted Gum)
- Tree 14 (Smooth Cheesetree)
- Tree 15 (Smooth-barked Apple).

Offset planting recommendations are included in Section 6.1 below.

The following trees (see Figure 1) may also require removal to allow for safe access during construction:

- Tree 8 (Smooth-barked Apple) is located near the proposed construction area and may require removal for machinery access. If retained it is likely that a portion of the TPZ would be removed
- Tree 11 (Smooth-barked Apple) is located near the southern edge of the construction area. Its removal should be considered because of its instability and the likelihood of leaders falling onto the railway line, or the lift building
- Tree 12 (Smooth-barked Apple) may require removal to provide machinery access from Como Parade to the carpark. This tree has good landscape and habitat value and should be retained if possible (Photo 9). During the survey, it was noticed that an over-mature *Bauhinia variegata* is growing to the south of Tree 12 (Photo 10). If possible, preference should be given to retention of tree 12 and removal of the Bauhinia for machinery access
- Tree 16 would be located adjacent to the construction area. The original tree has died and the necrotic growth is covered by the indigenous vine *Hibbertia scandens*.



Photo 8 Tree 14 (Spotted Gum), Tree 15 (Smooth-barked Apple) and Tree 16 (dead tree) to be removed for the car park extension and creation of additional disabled parking.



Photo 9 Tree 12 (Smooth-barked Apple), which may be removed for machinery access



Photo 10 Over-mature **Bauhinia variegata*, growing to the south of Tree 12

Tree removal and excavation for construction of the lift and access ramp would also require the removal of small trees, shrubs and forbs. Approximate numbers include:

12 x *Lomandra longifolia*

3 x juvenile *Pittosporum undulatum*

3 x *Myrsine variabilis*

4 x juvenile *Glochidion ferdinandi* var. *ferdinandi*

1 x *Angophora hispida*

1 x *Hakea sericea*

A number of exotic species, including **Syagrus romanzoffiana*, **Phoenix canariensis*, **Asparagus aethiopicus* and **Nephrolepis cordifolia* would also require removal. As these species are invasive, all propagules should be disposed of at an appropriate location in accordance with the TfNSW 'Weed Management and Disposal Guideline' (2015c).

4.1.2 Trees requiring protection

If Trees 11 (Smooth-barked Apple), 12 (Smooth-barked Apple) and 8 (Smooth-barked Apple) are to be retained, temporary protective fencing would be required, in order to protect an optimal proportion of the trees' TPZs. Trees 5 (Port Jackson Cypress), 6 (Smooth-barked Apple) and 7 (Smooth-barked Apple) will not require fencing if the existing fence is retained.

4.2 Operational phase

The Proposal site is located within a highly modified urban environment and the operational phase of the Proposal will not involve any additional impacts on native flora and fauna beyond existing conditions.

4.2.1 Significance of likely impacts

The Proposal site does not contain any threatened ecological communities or habitat for threatened flora. Given the small, isolated nature of the vegetation patches, the absence of important habitat features and the lack of connectivity with areas of known habitat, the vegetation on the Proposal site does not provide important resources for any threatened fauna species or migratory birds previously recorded or predicted to occur in the locality. Any local population of such species would not be reliant on the vegetation to be affected by the Proposal for their persistence in the locality.

The removal of three planted trees from the eastern side of the station and five trees from the western side of the station, along with a small number of shrubs would have a negligible impact on native flora and fauna within the locality. The Proposal will therefore not have a significant impact on any threatened species, population or ecological community listed under the BC Act. As such, a Species Impact Statement is not required for the Proposal. Similarly, the Proposal will not have a significant impact on threatened biota or migratory species listed under the EPBC Act and a Referral to the Commonwealth is therefore not required.

5 Mitigation measures

The following mitigation measures are recommended with respect to tree removal, and the protection and management of trees at the Proposal site:

- Construction of the Proposal must be undertaken in accordance with the TfNSW *Vegetation Management (Protection and Removal) Guideline* (TfNSW, 2015) and *Fauna Management Guideline* (TfNSW, 2015b).
- All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
- Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees nominated to be removed would be clearly demarcated onsite prior to construction,

to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below.

- The shrubs and trees which require removal should be removed carefully, according to Safe Work Australia (2016).
- If appropriate, the felled trees should be mulched and spread over the TPZ of retained trees or regeneration areas.
- Although Tree 11 was not considered for removal in the construction design, its removal or pollarding should be considered because of its proximity to the cliff edge and the railway line and safety concerns.
- Removal of Trees 12, 16 and 8 should be determined once the final design details and machinery requirements are available. If the trees are to be retained, protection measures for retained trees should be followed (as outlined below).
- Those trees proposed for retention should be protected by temporary fencing. An example of suitable protective fencing is indicated in Appendix 4. Fencing should be installed prior to demolition and should be kept in place during excavation and construction. Tree 5 (Port Jackson Cypress), Tree 6 (Smooth-barked Apple) and Tree 7 (Smooth-barked Apple) will not require fencing if the existing fence is retained.
- Protection of Trees 4, 5, 6 and 7 would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and may require exclusion fencing of the TPZ .
- The following actions should not be permitted within TPZs:
 - storage of materials, plants or equipment
 - installation of site sheds or portable toilets
 - excavations, trenching, ripping or cultivation of soils
 - modification of existing soil level or addition of fill materials
 - disposal of waste materials and chemicals (both solid or liquid)
 - mechanical removal of vegetation
 - pedestrian or vehicular movement.
- Any root pruning required within the TPZ should be approved by the Project Arborist and any digging and pruning of roots (only roots < 5cm may be pruned) within the TPZ should be conducted by hand for a clean cut.
- To protect soil within the TPZ, a layer of organic mulch may be applied (no more than 75 mm thick). Any mulch used should comply with the Australian Standard – composts, soil conditioners and mulches AS4454-2012 (SA 2012).
- A Project Arborist should supervise works and inspect excavated areas adjacent to retained trees, in order to assess the amount of tree fine roots affected, the loss of which may affect tree health as well as the amount of supporting roots affected, the loss of which may affect tree stability. The project arborist would then determine appropriate ameliorative measures for retained trees (e.g. canopy reduction, irrigation, fertiliser applications) or provide recommendations for tree removal if required.

- If tall machinery needs to pass beneath the canopy of the Hills Weeping Fig (a component of Tree group 4), the projecting lower branches should be tied back by a qualified arborist, in order to lift them above the height of the machinery. Any damage to the lower canopy resulting from machinery should be treated by a qualified arborist.
- Offset for tree removal and landscaping would be undertaken in accordance with TfNSW's *Vegetation Offset Guide* (TfNSW 2017) and in consultation with the relevant council, and/or the owner of the land upon which the vegetation is to be planted. The 9 trees identified for removal would be offset with a minimum of 36 trees. Offset would also be required for any additional clearing, including for the four additional trees identified as possibly requiring removal. Offset requirements are discussed in Section 6.1.
- Weed control measures, consistent with TfNSW's *Weed Management and Disposal Guideline* (TfNSW, 2015c), would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the project.

6 Offset Requirement

6.1 Trees to be removed and replaced

Trees and shrubs that require removal at or adjacent to Como Station will be offset in accordance with TfNSW's 'Vegetation Offset Guide' (2017) as indicated in Table 1.

Table 1 Offsetting for individual tree removal

Size of tree (Diameter at Breast Height) to be removed	Offset required
Large tree (DBH >60cm)	Plant minimum of 8 trees
Medium tree (DBH 15-60cm)	Plant minimum of 4 trees
Small young tree (DBH <5cm)	Plant minimum of 2 trees

A minimum of 36 trees will need to be planted to offset the removal of 9 medium sized trees in the Proposal area (Table 2)

Table 2 Trees to be removed and required offset

Tree	Location	Tree Type	Number of Individuals to be removed	Tree replacement no. (minimum)	Offset (no. of trees to be planted)
Tree Group 1: Brush Daphne	East side of station, in rail reserve adjacent to Railway Road	Medium tree	1	4	4
Tree Group 1: River Bottlebrush	East side of station, in rail reserve adjacent to Railway Road	Medium tree	1	4	4
Tree 2: Coast Banksia	East side of station, in rail reserve adjacent to Railway Road	Medium tree	1	4	4
Tree 3: Sweetgum	East side of station, in rail reserve adjacent to Railway Road	Medium tree (exotic species)	1	4	4
Tree 9: Smooth-barked Apple	On sandstone batter, adjacent to pedestrian access	Medium tree	1	4	4
Tree 10: Smooth-barked Apple	On sandstone batter, adjacent to pedestrian access	Medium tree	1	4	4
Tree 13: Spotted Gum	In garden bed, Como Parade carpark	Medium tree	1	4	4
Tree 14: Smooth Cheese-tree	Close to fence, in garden bed, Como Parade carpark	Medium tree	1	4	4
Tree 15: Smooth-barked Apple	Close to fence, in garden bed, Como Parade carpark	Medium Tree	1	4	4
Total			9	36	36

Table 3 indicates the minimum offset requirement for Trees 8, 11, 12 and 16 if removal is required following detailed design and confirmation of machinery access requirements.

Table 3 Trees that may require removal and the required offset

Tree	Location	Tree Type	Number of Individuals	Replacement no.	Offset (no. to be planted)
Tree 8: Smooth-barked Apple	Growing close to footpath; root system is probably inter-connected with that of Tree 9	Medium tree	1	4	4
Tree 11: Smooth-barked Apple	Growing on sandstone plateau, close to cliff adjacent to railway line	Medium tree	1	4	4
Tree 12: Smooth-barked Apple	Growing on Council footpath, possibly located within proposed machinery access	Medium tree	1	4	4
Tree 16: dead specimen, covered with <i>Hibbertia scandens</i>	Growing in garden bed close to footpath and Como Parade	Replace with shrub	1	2	2
Possible totals			4	14	14

6.2 Recommended species for planting

The following indigenous tree and shrub species are indicative species of Coastal Enriched Sandstone Dry Forest that should be considered for offset planting and landscaping:

Medium trees

Eucalyptus piperita Sydney Peppermint

Eucalyptus punctata Grey Gum

Eucalyptus haemastoma Scribbly Gum

Angophora costata Smooth-barked Apple

Allocasuarina littoralis Black Oak

Corymbia gummifera Red Bloodwood

Small Tree/shrub

Ceratopetalum gummiferum NSW Christmas bush

Elaeocarpus reticulatus Blueberry Ash

Banksia serrata Wiriyagan

Grevillea linearifolia Linear-leaf Grevillea

Banksia spinulosa var. *spinulosa* Hairpin Banksia

Leptospermum trinervium Slender Tea-tree

Hakea sericea Needlebush

Acacia linifolia White Wattle

Persoonia linearis Geebung

Podocarpus spinulosus Spiny-leaf Podocarp

Ozothamnus diosmifolius Dogwood

Forbs and Sedges

Actinotus helianthi Flannel flower

Lomandra longifolia Spiny-headed Mat-rush

Lepidosperma laterale Sword-sedge

Pratia purpurascens Whiteroot

7 Summary of findings

The Proposal is located within a highly modified urban landscape and will involve the removal of two small patches of planted trees within landscaped gardens. There will be no disturbance of any complete, continuous patches of native vegetation, threatened ecological communities or habitat for threatened or migratory species adjacent to or within the Proposal site.

Based on these findings, the Proposal would not have a significant impact on any threatened biota (or associated habitat) listed under the BC Act and therefore would not trigger the requirement for a Species Impact Statement or Assessment using the Biodiversity Assessment Methodology (BAM) under the provisions of the Act. Similarly, the Proposal would not have a significant impact on any listed biota under the EPBC Act and consequently a referral to the Australian Government Minister for the Environment is not required.

The removal of individual trees for the Proposal will be offset in accordance with the Vegetation Offset Guide (TfNSW, 2016). A total of 36 replacement trees will be planted to offset the loss of 9 trees from the Proposal site. Any additional trees that are identified for removal once detailed design and machinery access requirements are confirmed would also need to be replaced in accordance with the Vegetation Offset Guide (TfNSW, 2016).

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Appendix 1– Safe useful life expectancy (SULE) matrix

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

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

Appendix 2 - Sustainable Retention Index Value (SRIV)©

SRIV Index (Developed by IACA (2010) – Institute of Australian Consulting Arborists)

Age Class	Vigour Class & Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	<p>Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. Retention potential – Medium- Long Term</p>	<p>Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential – Medium Term Potential for longer with remediation or more favourable environmental conditions.</p>	<p>Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential – Short Term. Potential for longer with remediation or more favourable environmental conditions.</p>	<p>May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential – short Term. Potential for longer with remediation or more favourable environmental conditions.</p>	<p>May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential – Short Term. Potential for longer with remediation or more favourable environmental conditions.</p>	<p>Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential – likely to be removed immediately or retained for Short Term. Potential for longer with remediation or more favourable environmental conditions.</p>
Young (Y)	<p>Index value 9 Retention potential – Medium – Long Term Likely to provide minimal contribution to local amenity if height <5m High potential for future growth and adaptability. Retain, remove or replace</p>	<p>Index value 8 Retention potential – Short –Medium Term. Potential for longer with improved environmental conditions. Likely to provide minimal contribution to local amenity if height <5m Medium-High potential for future growth and adaptability. Retain, remove or replace</p>	<p>Index value 5 Retention potential – Short Term. Potential for longer with improved environmental conditions. Likely to provide minimal contribution to local amenity if height <5m Low-medium potential for future growth and adaptability. Retain, remove or replace</p>	<p>Index value 4 Retention potential – Short Term. Potential for longer with improved environmental conditions. Likely to provide minimal contribution to local amenity if height <5m Medium potential for future growth and adaptability. Retain, remove or replace</p>	<p>Index value 3 Retention potential – Short Term. Potential for longer with improved environmental conditions. Likely to provide minimal contribution to local amenity if height <5m Low-Medium potential for future growth and adaptability. Retain, remove or replace</p>	<p>Index value 1 Retention potential – Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5m. Low potential for future growth and adaptability</p>

Age Class	Vigour Class & Condition Class					
Mature (M)	Index value 10 Retention potential – Medium – Long Term	Index value 9 Retention potential – Medium Term. Potential for longer with improved environmental conditions.	Index value 6 Retention potential – Short Term. Potential for longer with improved environmental conditions.	Index value 5 Retention potential – Short Term. Potential for longer with improved environmental conditions.	Index value 4 Retention potential – Short Term. Potential for longer with improved environmental conditions.	Index value 2 Retention potential – Likely to be removed immediately or retained for Short Term
Over-mature (O)	Index value 6 Retention potential – Medium – Long Term	Index value 5 Retention potential – Medium Term	Index value 4 Retention potential – Short Term	Index value 3 Retention potential – Short Term. Potential for longer with improved environmental conditions.	Index value 2 Retention potential – Short Term	Index value 0 Retention potential – Likely to be removed immediately or retained for Short Term

Appendix 3 - Tree Schedule

Tree No.	Species	Common Name (number of individuals)	Height (m)	Dia. Spread (m. radius)	DBH (m) D. at base	Age Class ¹	Health ²	Structure ³	SULE ⁴	SRIV ⁵	TPZ ⁶ radius (m) SRZ ⁷	Comments
1 (tree group)	* <i>Callistemon viminalis</i>	River Bottlebrush	3	2	Multi	M	G	M	3A		2 1.5	Remove
	<i>Pittosporum undulatum</i>	Brush Daphne	5	2.5	0.21 0.24	M	G	G	2A		2.5 1.8	Remove
	* <i>Olea europaea</i> subsp. <i>cuspidata</i>	African Olive	4	2	Multi	M	G	G	5A		NA	Remove Invasive species
2	<i>Banksia integrifolia</i> subsp. <i>integrifolia</i>	Coast Banksia	11	4	0.34 0.36	M	G	G	2A		4.1 2.2	Remove
3	* <i>Liquidambar styraciflua</i>	Sweetgum	10	6	0.37 0.42	M	G	G	5A	MLVP2	NA	Remove
4 (tree group)	* <i>Ficus microcarpa</i> var. <i>hillii</i>	Hill's Weeping Fig	14	8	1.22; 1.35 1.30; 1.45	M	G	G	1A	MGVG10	15 4.3	Retain Large specimen with good landscape and habitat value; low laterals may require protection during works
	* <i>Eucalyptus grandis</i>	Flooded Gum	16	5	0.47; 0.23 0.54; 0.29	M	G	M	1A	MGVF9	6.2 2.8	Retain Co-dominant leaders
5	<i>Callitris rhomboidea</i>	Port Jackson Cypress	10	2	0.23 0.26	M	G	G	2A	MGVG10	2.8 1.9	Retain Regionally uncommon species
6	<i>Angophora costata</i>	Smooth-barked Apple	10	2	0.18 x 3	M	M	F	3A	MGVP6	3.7 2.1	Retain

Tree No.	Species	Common Name (number of individuals)	Height (m)	Dia. Spread (m. radius)	DBH (m) D. at base	Age Class ¹	Health ²	Structure ³	SULE ⁴	SRIV ⁵	TPZ ⁶ radius (m) SRZ ⁷	Comments
7	<i>Angophora costata</i>	Smooth-barked Apple	11	3	0.27 0.3	M	G	G	1A	MGVG10	3.2 2	Retain
8	<i>Angophora costata</i>	Smooth-barked Apple	13	5	0.32 0.35	M	G	G	2A	MGVG10	3.8 2.1	Possibly remove May be located within works area
9	<i>Angophora costata</i>	Smooth-barked Apple	14	4	0.39 0.42	M	M	M	3A	MGVF9	4.7 2.3	Remove Longicorn damage; leader damaged
10	<i>Angophora costata</i>	Smooth-barked Apple	12	3	0.24 x 3 0.27 x 3	M	M	F	4A	MLVP2	5 2.4	Remove Co-dominant leaders from lignotuberous regrowth
11	<i>Angophora costata</i>	Smooth-barked Apple	11	3	0.21 (x 3) 0.23	M	M	F	3A	MGVP6	4.3 2.2	Possibly remove Growing on sandstone shelf; has been previously damaged.
12	<i>Angophora costata</i>	Smooth-barked Apple	17	7	0.59 0.66	M	G	G	1A	MGVG10	7.1 2.8	Possibly remove Located on footpath; may require removal for machinery access
13	<i>Corymbia maculata</i>	Spotted Gum	16	4	0.34 0.37	M	G	G	1A	MGVG10	4.2 2.2	Remove Located within existing garden bed. Probably planted.
14	<i>Glochidion ferdinandi</i> var. <i>ferdinandi</i>	Smooth Cheesetree	12	4	0.22 (x4) 0.23	M	G	M	3A	MGVF9	5.3 2.4	Remove Co-dominant leaders; possibly coppiced previously

Tree No.	Species	Common Name (number of individuals)	Height (m)	Dia. Spread (m. radius)	DBH (m) D. at base	Age Class ¹	Health ²	Structure ³	SULE ⁴	SRIV ⁵	TPZ ⁶ radius (m) SRZ ⁷	Comments
15	<i>Angophora costata</i>	Smooth-barked Apple	9	2	0.17 (x 2) 0.20	M	M	F	3A	MGVP6	2.9 1.9	Remove Suppressed growth and lignotuberous regrowth
16	Dead tree; now covered with <i>Hibbertia scandens</i>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Possibly remove and replace

Legend for tree schedule

* not indigenous to Sutherland Shire

1 EM = early mature; M = mature; OM = over-mature

2 G = good; M = moderate

3 G = good; M = moderate

4 See Safe Useful Life Expectancy (SULE) matrix Appendix 1

5 See Sustainable Retention Index Value (SRIV) matrix Appendix 2

6 TPZ = Tree Protection Zone

7 SRZ = Structural Root Zone

Appendix 4– Tree protection fence example

