

## Statement of significance

### *Waterfall Railway Station Group*

The Waterfall Railway Station Group does not have an existing significance assessment on file. The assessment in the following **Table 6.32** summarises the significance criteria in relation to this item.

**Table 6.32 Waterfall Railway Station Group significance assessment (Australian Government, 2007)**

<b>Significance Criteria</b>	<b>Application of Criteria (Existing Assessment)</b>
<b>Historical significance SHR criteria (a)</b>	The Waterfall Railway Station Group has historical significance as evidence of steam train technology at a major locomotive depot developing since the station opened in 1886 through to contemporary travel still being undertaken there at the time of this assessment.
<b>Historical association significance SHR criteria (b)</b>	The item does not meet this criterion.
<b>Aesthetic significance SHR criteria (c)</b>	<p>The turntable, water tank and water column are of technical significance as technologically illustrative of the functioning of steam trains. The water tank is of aesthetic significance as a landmark visible from the Princes Highway and Waterfall Railway Station. The 1905 timber island station building had aesthetic value as a large timber island station building with projecting roof at one end and an awning each side supported on timber rafters and simple brackets, but this structure was removed and replaced in 1995.</p> <p>The current structure is a green coloured steel and concrete platform building with associated canopy, connecting via concrete ramp with canopy to the street (the ramp having replaced the previous access by timber stairs). Like the original platform building, the current one is linear containing facilities such as the ticket office, station master's office and toilets. The ticket office faces the entrance ramp.</p>
<b>Social significance SHR criteria (d)</b>	The place has the potential to contribute to the local community's sense of place and can provide a connection to the local community's past.
<b>Technical/Research significance SHR criteria (e)</b>	The item does not meet this criterion.
<b>Rarity SHR criteria (f)</b>	The Waterfall turntable is locally rare, being one of three turntables now extant on the Illawarra line (Bomaderry, Waterfall and Kiama), as well as the water tank and water spout of which there are few in the metropolitan railway network.

Significance Criteria	Application of Criteria (Existing Assessment)
<b>Representativeness SHR criteria (g)</b>	The 1908 turntable and 1905 water tank and water column are representative structures from the steam technology period of railway operation.
<b>Integrity/Intactness</b>	The turntable is relatively intact (although the retaining wall on the eastern side is missing), while the water spout and water tank are intact. The platform building was removed and replaced in 1995 and the residences were removed in 2016.

The existing Statement of Significance for this item states:

*“Waterfall is an unusual group of structures in that it retains elements from the steam era - such as the turntable, tank and spout and has retained a timber standard island passenger station building. As a group it has high significance and the individual items all have significance. It is particularly important because of its location within the metropolitan area where very little remains of steam facilities or staff accommodation”* (Australian Government, 2007).

This Statement of Significance is undated but was produced prior to 2007 when the RNE was reclassified as a non-statutory heritage register. Since then the platform building and residences have both been removed, affecting the heritage significance of this listing.

#### *Waterfall Railway Turntable, Watering Facilities and Movable Items*

The listing for Waterfall Railway Turntable, Watering Facilities and Movable Items, has been assessed in **Table 6.33** against the State Heritage Register (SHR) criteria in the RailCorp Section 170 Register.

**Table 6.33 Significance assessment – Waterfall Railway Turntable, Watering Facilities and Movable Items** (OEH, 2019)

Significance Criteria	Application of Criteria (Existing Assessment)
<b>Historical significance SHR criteria (a)</b>	The 1908 turntable and 1905 water tank and water column are of historical significance as evidence of steam train technology at a major locomotive depot.
<b>Historical association significance SHR criteria (b)</b>	The item does not meet this criterion.
<b>Aesthetic significance SHR criteria (c)</b>	The turntable, water tank and water column are of technical significance as technology illustrative of the functioning of steam trains. The water tank is of aesthetic significance as a landmark visible from the Princes Highway and Waterfall Railway Station.
<b>Social significance SHR criteria (d)</b>	The place has the potential to contribute to the local community's sense of place and can provide a connection to the local community's past.
<b>Technical/Research significance SHR criteria (e)</b>	The item does not meet this criterion.
<b>Rarity SHR criteria (f)</b>	The Waterfall turntable is locally rare, being one of three turntables now extant on the Illawarra line (Bomaderry, Waterfall and Kiama), as well as the water tank and water column of which there are few in the metropolitan railway network.

Significance Criteria	Application of Criteria (Existing Assessment)
<b>Representativeness SHR criteria (g)</b>	The 1908 turntable and 1905 water tank and water column are representative structures from the steam technology period of railway operation.
<b>Integrity/Intactness</b>	The turntable retaining wall on the eastern side is missing, however the turntable is still relatively intact. The water tank and water column are intact.

The existing Statement of Significance for this item states:

*“The 1908 turntable and 1905 water tank and water column are of historical significance as rare extant evidence of steam train technology at a major locomotive depot and are of technical significance as technology illustrative of the functioning of steam trains. The water tank is of aesthetic significance as a landmark visible from the Princes Highway and Waterfall Railway Station. The turntable is locally rare, being one of three turntables now extant on the Illawarra line (with Bomaderry and Kiama). The water tank and water column are rare examples in the metropolitan network” (OEH, 2019).*

This Statement of Significance was last updated 15 May 2017.

### 6.5.3 Potential impacts

#### Construction phase

Discussion of potential impacts to heritage items resulting from the construction phase of the Proposal is undertaken in **Table 6.34**.

**Table 6.34 Proposed impacts to nearby heritage items during construction**

Listed Item	Proposed Impact
Row of 3 railway workers' cottages including Community College (#A4004)	It was confirmed during the inspection that this item has been destroyed, as the cottages were removed in 2016. An impact assessment is not appropriate for a previously destroyed item.
Waterfall Turntable, Watering Facilities & Movable Items (SRA#139); (SHI#4801139)	Access to the water tank will be blocked for periods of the construction. An alternative water source would be provided during this time.

In relation to potential archaeological impacts as a result of the construction of the Proposal, the Proposal area would be located within the current rail corridor. The area has been subjected to high levels of impacts from the construction, use and ongoing development of the railway line, including modifications to the platform and rail alignments. The extension of the station platform would occur over an area that has not had any other rail infrastructure present, with the exception of the current tracks.

The new staff amenities building would be located on the western side of the rail corridor, to the north west of the station. This assessment has not identified any previous structures constituting archaeological potential in this section of the corridor.

Based on the understanding of the historical development of the railway station and corridor and site inspection, there is likely to be no historical archaeological remains associated with any former railway infrastructure or earlier structures built on the site.

## Operational phase

### Direct impacts

Discussion of the Proposal's direct impacts to relevant identified heritage items is undertaken in **Table 6.35**.

**Table 6.35 Potential direct impacts to nearby heritage items during operation of the Proposal**

Listed Item	Proposed Impact
Heathcote National Park (#1530)	No direct impacts have been identified in relation to this item.
Waterfall Railway Station Group (#101153) – Non-statutory listing	This item's listing is on the non-statutory RNE. It was confirmed during the inspection that one of the key aspects of this listing (the 1905 platform building) has already been removed and replaced, and the overall aesthetic has already been altered by replacing entry stairs with a ramp and removing the listed row of cottages that were visible from the platform to the immediate east of the station. The remaining aspects specified as contributing to this listing's significance (the turntable, water tank and water column) will not be subject to any direct impacts, but the landscape connecting all these features would be altered.
Waterfall Turntable, Watering Facilities & Movable Items (SRA#139); (SHI#4801139)	No direct impacts are proposed to the turntable and watering facilities. The watering facilities are 160 metres north of the extended platform and new facilities. The turntable is on the opposite side of the tracks from the Proposal. One repercussion of the proposed works is that due to the reconfiguration of tracks, steam trains travelling in the down direction (towards Wollongong) will no longer be able to use the heritage tank to fill up. Steam trains travelling in the up direction (towards Sydney) will still be able to use the tank. It is proposed that a water hydrant will be placed on the opposite side of the tracks to the existing water tank to service steam trains travelling in the down direction. Although not a physical impact, this limitation will reduce the use of the existing water tank and impact on its connection to the wider rail network and landscape. A reduction of use of the existing water tank is a heritage impact in that it alters the current use of this feature only.
Waterfall Railway turntable (#A4003)	No direct impacts are proposed to the turntable which is on the opposite side of the tracks from the Proposal.
Pair of semi-detached houses (#4001)	No direct impacts have been identified in relation to this item.
Watertank (#A4005)	No direct impacts have been identified in relation to this item, but as noted above, access for its use will be limited to steam trains travelling in the Up direction, altering its current use.

As previously noted, the sidings and yards contribute to the heritage value of Waterfall Railway Station as a visual landscape and physical connections relating to steam engine use at Waterfall. The proposed works will alter the existing fabric and visual aesthetic of the sidings and yards on the western side of the station. They will also limit steam train use of the water tank to those travelling in the Up direction only.

Although the impact to steam train use will be mitigated by installing a water hydrant on the opposite side of the tracks to service steam trains travelling in the Down direction (a refilling option already adopted elsewhere in the rail network to address water access for Heritage Trains), the reduction in use of the water tank is an impact on its heritage significance as it affects how the item is contextualised within the wider rail network.

No direct impacts are proposed to the current platform building, which houses plaques and interpretation boards displayed on its eastern wall.

#### *Indirect impacts*

Discussion of the potential indirect impacts resulting from the proposed works is undertaken in **Table 6.36** below.

**Table 6.36 Potential indirect impacts to nearby heritage items during operation of the Proposal**

Listed Item	Proposed Impact
Royal National Park and Garawarra State Conservation Area (#105893)	It is likely the elevated footbridge may be visible if close by, but it is highly unlikely to present a visible impact to the park itself. An assessment of significance was undertaken for this item resulting in 'no significant impact'.
Heathcote National Park (#1530) – Non-statutory listing	This item's listing is only on the non-statutory RNE. No direct impacts have been identified in relation to this item.
Waterfall Railway Station Group (#101153) – Non-statutory listing	This item's listing is only on the non-statutory RNE but it does include the Waterfall Railway Turntable and Watering Facilities (water tank and column), which are listed on the RailCorp s.170 Register and the Sutherland LEP 2015. Those items are discussed separately below, but it should be noted in relation to their relationship to each other that the proposed works will permanently alter the existing visual aesthetic at Waterfall Railway Station.
Waterfall Turntable, Watering Facilities & Movable Items (SRA#139); (SHI#4801139)	The proposed works will have a permanent visual impact in the area adjacent to the turntable and watering facilities. The extended platform and new facilities will not obscure views to the items but will present increased viewing capacity for the general public. The extended platform and new facilities will be 40 metres closer to the watering facilities (still 160 metres further north) and provide additional vantages to view the turntable across the tracks to the east. There is a risk for accidental impacts to these items during works due to works being undertaken in the vicinity, but these can be avoided through control measures.
Waterfall Railway turntable (#A4003)	The proposed works will have a permanent visual impact in the area adjacent to the turntable. The extended platform will provide additional vantages to view the turntable across the tracks to the east. There is a risk for accidental impacts during works being undertaken in the vicinity, but these can be avoided through control measures.
Pair of semi-detached houses (#4001)	No indirect impacts have been identified in relation to this item.
Watertank (#A4005)	The proposed works will have a permanent visual impact as the extended platform and new facilities will be 40 metres closer to the watertank (still 160 metres further north). There is a risk for accidental impacts during works undertaken in the vicinity, but these can be avoided through control measures.

Other indirect impacts could accidentally be caused by vibration and accidental damage during construction works, however these potential impacts can be managed through the application of appropriate control measures such as ensuring safe work offset distances are maintained between vibration intensive machinery and heritage structures.

#### **6.5.4 Mitigation measures**

The following mitigation measures would apply to the Proposal:

- a heritage architect should be involved in detailed design and would endeavour to minimise impacts to the station and consider implementing as practicable matching materials and finishes (brickwork and mortar), retain/reuse existing fabric and contain new works in areas of existing modification. The heritage architect should also consider the connected visual landscape and the relationship of the station to the water tank, water column and turntable, where possible retaining views from the station to each of these items.
- once the detailed design has been developed, if it is significantly different from what has been assessed in this report, consideration should be given to undertaking a SoHI report to assess the potential impacts against the detailed design for the Proposal, the extant RailCorp S170 Register and Sutherland LEP 2015 listed items.
- as the visual landscape will be permanently altered by these works and the relationship between the RailCorp S170 and Sutherland LEP 2015 listed items changed, consideration should be given to undertaking a photographic record before and after the proposed changes. Ideally an archival recording if produced should follow NSW Heritage Division guidelines *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006) and *How to prepare archival records* (NSW Heritage Office, 1998). Copies should be provided to Sydney Trains for future reference
- the existing heritage interpretation signage should be retained. Contractors should be made aware of the plaques and interpretation boards displayed on the eastern wall of the platform building, and ensure they are not accidentally impacted during works.
- the turntable and water tank are both listed on the Sutherland LEP 2015. SSC should be informed of any works that may affect these items and given 21 days to respond.
- following completion of works, the S170 listing description and historical context should be updated to accurately reflect the significance of the station and the new works and elements within the precinct. This should be undertaken with the Sydney Trains staff or team that administer to the Sydney Trains S170 register.
- a heritage induction should be provided to all on-site staff and contractors involved in the Proposal. The induction should clearly describe the heritage significance of the site, including individual items and heritage fabric.
- the Construction Environmental Management Plan (CEMP) should include stop work procedures in accordance with TfNSW's Unexpected Heritage Finds Guideline (Transport for NSW, 2015) to manage activities in the unlikely event that intact archaeological relics or deposits are encountered.

## **6.6 Socio-economic impacts**

### **6.6.1 Existing environment**

Land uses adjacent to Waterfall Station and the wider proposal area are generally comprised of infrastructure, national parks, residential and industrial areas.

To the east of the station and the railway line is the Royal National Park. To the north and south of the station is the railway line, with the Princes Highway to the west. Further west is the main residential area of Waterfall, characterised by low density residential dwellings with pockets of public recreation areas. Further west is Heathcote National Park. An industrial area is present to the northwest of the project area comprising the Hanrob Pet Hotel.

The closest residential properties are located on the Princes Highway approximately 30 metres to the west of Waterfall Station. Waterfall Public School is the only educational facility within the area and is located 300 metres south of Waterfall Station on McKell Avenue. There are no places of worship in the vicinity of the Proposal. Other educational and religious facilities are located approximately six kilometres north in Heathcote and approximately 10 kilometres south in Helensburgh.

A review of Australian Bureau of Statistics (ABS) 2016 census data was undertaken for Waterfall. The suburb of Waterfall has a population of 494 people with a median age of 39. 85.4 per cent of people living in the suburb of Waterfall were born in Australia and 55.7 per cent of people over the age of 15 are employed full time (ABS, 2018). Approximately 970 trips per average weekday were recorded in 2018 for Waterfall Station (TPA, 2018).

## 6.6.2 Potential impacts

### Construction phase

Construction of the Proposal has the potential to temporarily affect customers, pedestrians, residents, motorists, local businesses and other receivers as a result of:

- temporary changes to vehicular pedestrian access to, through and movements around the station
- temporary impacts to local traffic movements
- temporary loss of parking within the Waterfall Commuter Car park
- increased truck movements delivering materials and equipment and transporting waste
- construction noise, vibration, dust and visual impacts.

Access to the station via the existing ramp and lift would be maintained where possible during construction.

During construction, there is potential for temporary disruptions to private property access for residents along McKell Avenue and students and parents of the Waterfall Public School during activities such as the delivery and unloading of oversized materials.

In such situations, affected people would be notified in advance of the scheduled works. Property access would be maintained at all times wherever possible.

Station customers, students and parents of Waterfall Public School and residents on McKell Avenue, Kooraban Street and the Princes Highway would be temporarily affected during construction as a result of impacts to local traffic and parking, visual amenity, construction noise and vibration and air quality. These impacts have been assessed in more detail in **Section 6.1**, **Section 6.2**, **Section 6.3** and **Section 6.10**. Targeted consultation with these affected stakeholders would be undertaken prior to construction to determine appropriate measures to manage construction related impacts.

The Proposal would require the acquisition of approximately 2,500 m<sup>3</sup> of land owned by SSC to facilitate the construction. Much of this land would be occupied by permanent Project infrastructure.

Notwithstanding the above impacts, there would be benefits of the Proposal during construction including increased trade for business located close to the construction sites or en-route to construction sites, selling goods and services to construction workers.

## Operational phase

Overall, the operation of the Proposal would provide positive socio-economic benefits to the Waterfall community and the wider Sutherland Shire LGA, including:

- improved services including capacity, reliability and connectivity
- improved facilities for staff, including safe access to and from the station via an elevated staff footbridge
- improved business outcomes through the support of freight movements (i.e. modifications to the existing Up Refuge Loop to allow freight trains to pull into the stabling loop).

The operation of the Proposal would result in potential adverse impacts to amenity, particularly in relation to noise from rail operations and visual impacts arising from trains stabled in the proposed stabling area. These impacts would not be significant and would be the subject of ongoing mitigation and management by TfNSW and Sydney Trains to reduce impacts.

### 6.6.3 Mitigation measures

A number of safeguards would be implemented to minimise potential impacts on the community with a particular focus on keeping the community informed. The following mitigation measures would apply to the Proposal:

- sustainability criteria would be established to encourage construction personnel to purchase goods and services locally helping to ensure the local community benefits from the construction of the Proposal
- feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the project, where practicable
- contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase
- the community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Management Plan to be developed prior to construction
- measures to avoid, reduce or mitigate amenity impacts would be implemented, as outlined in other sections of this REF.

Refer to **Sections 6.1, 6.2 and 6.3** for discussion on potential traffic/access, visual and acoustic amenity impacts arising from the Proposal and their respective proposed management strategies.

Refer to **Section 7.2** for a full list of proposed mitigation measures.

## 6.7 Biodiversity

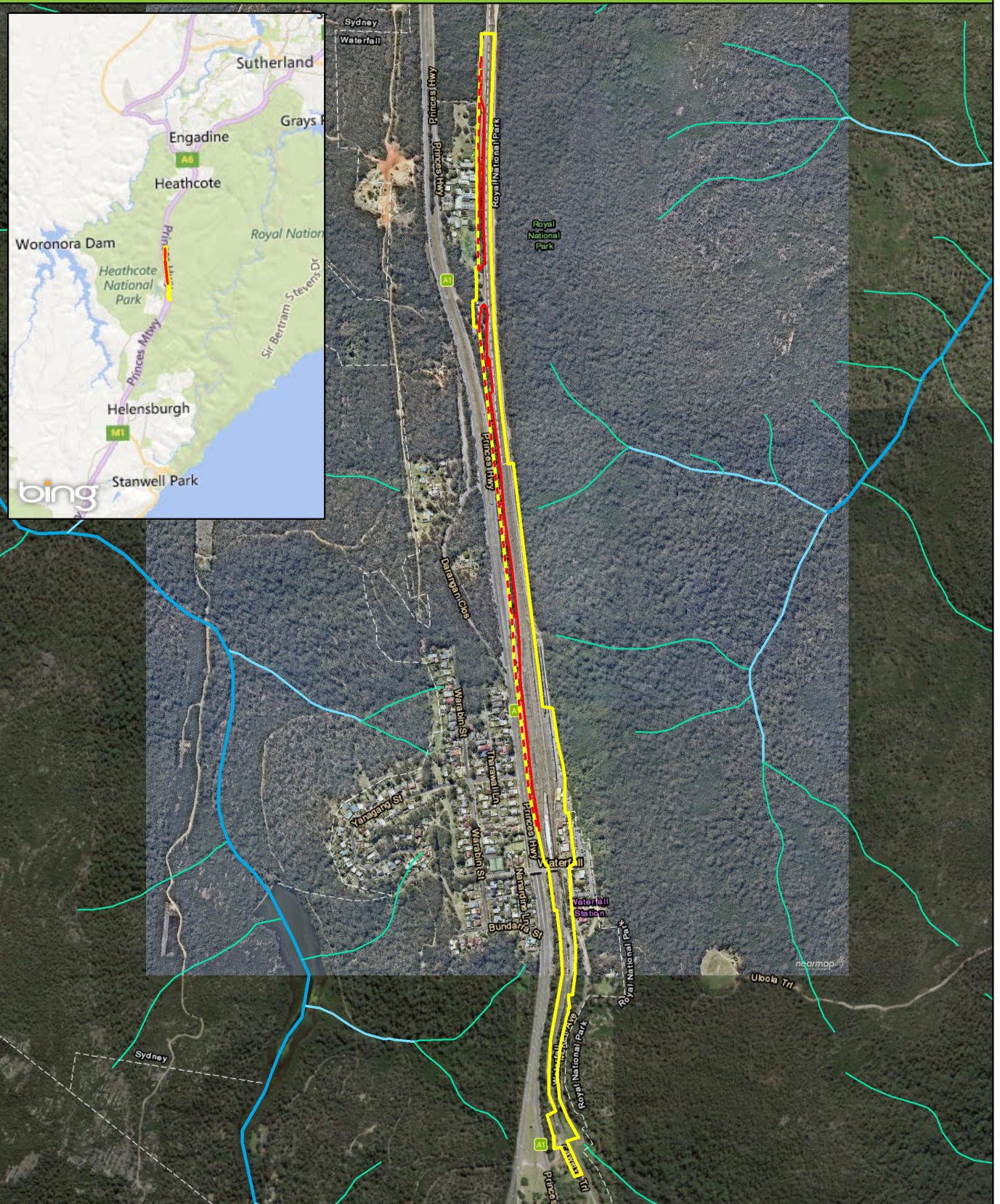
### 6.7.1 Methodology

Eco Logical Australia Pty Ltd (ELA) was engaged to provide a Flora and Fauna Assessment (FFA) Report and an Aborigicultural Impact Assessment (AIA) for the proposed station upgrades at Waterfall Station. The study area in the FFA and the AIA is within the rail corridor, extending south of Waterfall Station at the junction with Cawley's Trail and to north of the Hanrob Pet Hotel at Heathcote. The study area includes the proposed vegetation clearance footprint as



shown in **Figure 6.12**. The full FFA and AIA are attached as **Appendix G** and **Appendix H** respectively.

# Location



<b>Legend</b> Extent of Works Vegetation Clearance Footprint		<b>Strahler Stream Order</b> 1st Order Stream 2nd Order Stream 3rd Order Stream		0 100 200 400 Metres Datum/Projection: GDA 1994 MGA Zone 56 Scale: 1:11,500 @ A4 page size
				 Imagery: 16/09/2018 <a href="http://i.com">i.com</a>
				 A TETRA TECH COMPANY Prepared by: NR Date: 5/08/2019

FIGURE 6.12 ECOLOGICAL STUDY AREA

Prior to field surveys being undertaken a desktop literature and database review was undertaken to inform the FFA. This included review of the following information and data sources:

- BioNet / Atlas of NSW Wildlife (OEH 2019a)
- EPBC Act Protected Matters Search Tool (DotEE 2019)
- NSW Threatened Species Profiles (OEH 2019b)
- Native Vegetation Maps of the Sydney Metropolitan Area v3.0 (OEH 2016).

Aerial photography of the study area and surrounds were also used to investigate the extent of native vegetation cover and landscape features in the study area.

### **Field survey**

A field survey was conducted on 12 April 2019 by an ELA ecologist. Weather conditions during the survey were clear and sunny with temperatures ranging from 15.5°C to 23°C (BOM 2019).

The subject site was traversed on foot by the ecologist. The survey focused on, and included, the following:

- validation of existing vegetation mapping, determining type, condition and extent
- threatened flora and fauna habitat assessment
- habitat-bearing tree search
- opportunistic fauna sightings
- assessment of vegetation present against ISCA criteria
- assessment of vegetation present against TfNSW offsetting guide.

The results of the surveys and database reviews are discussed in 6.7.2 below.

### **Aboricultural assessment methodology**

A total of 25 subject trees were inspected on 12 April 2019 by an ELA arborist using the following methodology:

- trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing
- no aerial inspections or root mapping was undertaken
- tree heights were determined using a clinometer 15 m from the base of the tree
- canopy spread was determined using a measured stride out on site
- the diameter at breast height (DBH) was measured by placing a diameter tape around the trunk of the tree at 1.4 m above ground and recording the measurement
- the structural root zone (SRZ) was calculated by an estimated measurement of the trunk diameter taken above the root buttress
- tree identification to species level was based on broad taxonomical features present and visible from ground level at the time of inspection
- in the absence of a detailed survey, the locations of trees have been determined using hand held GPS units and these locations are accurate to 6 metres
- only trees within the defined footprint have been assessed

Impacts to the tree protection zone (TPZ), which is the combination of crown and root area, requiring restriction of access during the construction process, is used to assess the overall impacts to trees from the Proposal. Impacts are assessed as follows:

- **high impact:** The SRZ may be impacted if the proposed encroachment is greater than 20 % of the TPZ. Trees may not remain viable if they are subject to high impact.
- **medium impact:** If the proposed encroachment is greater than 10% of the TPZ and outside of the SRZ, the project arborist may require detailed root investigation to demonstrate that the tree(s) would remain viable.
- **low impact:** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required.
- **no impact:** No likely or foreseeable encroachment within the TPZ.

## 6.7.2 Existing environment

### Literature and database review

The literature and database review returned 28 threatened flora, 88 threatened fauna (including migratory species) and six threatened ecological communities either known or considered likely to occur within a 5 km radius of the study area. *Phascolarctos cinereus* (Koala), *Hirundapus caudacutus* (White-throated Needletail), *Varanus rosenbergi* (Rosenberg's Goanna) and *Heleioporus australiacus* (Giant Burrowing Frog) have been previously recorded immediately adjacent to the study area. There are no threatened flora or fauna species previously recorded within the study area.

### Vegetation mapping

Four vegetation communities were previously mapped within the study area (OEH 2016):

- Sydney South Exposed Sandstone Woodland
- Undifferentiated regenerating shrubs
- Coastal Upland Damp Heath Swamp
- Urban Native and Exotic.

## Field survey

### *Vegetation validation*

A field survey undertaken by an ELA ecologist on 12 April 2019 confirmed the presence of two vegetation communities in the study area. The vegetation communities are described below and shown in **Figure 6.14**, **Figure 6.15** and **Figure 6.16**.

- Sydney South Exposed Sandstone Woodland
- Planted native and exotic cover.

The study area contains existing rail infrastructure, remnant patches of native vegetation and planted vegetation. The study area does not contain any riparian corridors or bodies of water, such as dams. No threatened ecological communities were identified in the subject site during the survey.

### Sydney South Exposed Sandstone Woodland

Sydney South Exposed Sandstone Woodland is a low eucalypt woodland with a diverse heathy understorey found on Hawkesbury sandstone ridgetops in the north-east of the Woronora Plateau. It is associated with high mean annual rainfall (greater than 1200 millimetres) and coastal elevations (10-250 metres above sea level). In these moister climates sites are dominated by *Eucalyptus haemastoma*/*Eucalyptus racemosa* (Scribbly Gum) and/or *Eucalyptus sieberi* (Silver-top Ash) with *Corymbia gummifera* (Red Bloodwood) a frequent associate.

The rainfall level also appears to encourage a very diverse and dense shrub layer in which five species of banksia are known to occur. The taller *Banksia serrata* (Old-man Banksia) and *Banksia ericifolia* subsp. *ericifolia* (Heath-leaved Banksia) are the most common. Other genera are similarly diverse with multiple species of hakeas, wattles, tea-trees and peas found within the community. The ground layer is a sparse cover of forbs, grasses and sedges.

The distinctive *Doryanthes excelsa* (Gynea Lily) occurs amongst the ground and lower shrub layers on sites of heavily eroded ironstone laterite. These mantles are a feature of the central and eastern Woronora Plateau. The community occurs extensively throughout Royal and Dharawal National Parks and eastern sections of the Woronora catchment area.

Field survey confirmed the presence of Sydney South Exposed Sandstone Woodland in two conditions; moderate condition and regeneration.

Where the community was in moderate condition is contained a canopy of *Eucalyptus sieberi* (Silver-top Ash), *Corymbia gummifera* (Red Bloodwood) and *Eucalyptus racemosa* (Narrow-leaved Scribbly Gum). The midstorey contained *Allocasuarina littoralis* (Black She-oak), *Astroloma humifusum* (Cranberry Heath), *Isopogon anemonifolius* (Broad-leaf Drumsticks), *Leucopogon juniperinus* (Prickly Beard-heath), *Acacia myrtifolia* (Myrtle Wattle) and *Dodonaea triquetra* (Common Hop Bush).

The groundcover varied in condition containing native and exotic flora species. Where native species were present, they included *Wahlenbergia gracilis* (Sprawling Bluebell), *Entolasia marginata* (Bordered Panic), *Aristida ramosa* (Threeawn Speargrass), *Desmodium brachypodum* (Large Tick-trefoil) and *Dichondra repens* (Kidney Weed). Exotic species included *Eragrostis curvula* (African Lovegrass), *Setaria parviflora* (Pigeon Grass), *Paspalum urvillei* (Vasey Grass), *Poa annua* (Winter Grass) and *Conyza bonariensis* (Flax-leaf Fleabane). The vegetation community in the ecology study area is shown below in **Figure 6.13**.



12 Apr 2019, 1:07:54 pm  
 1806–1808 Princes Highway  
 Waterfall NSW 2233  
 Australia  
 city south 3

**Figure 6.13 Sydney South Exposed Sandstone Woodland in good condition in the study area**

Where the community existed as regeneration, the patches did not contain a canopy, but were dominated by midstorey species typical to Sydney South Exposed Sandstone Woodland. This community occurred along the steeper embankments of the rail corridor. The midstorey species present included *Banksia ericifolia*, *Acacia binervata* (Two-veined Hickory), *Leptospermum polygalifolia* (Jelly Bush) and *Pomaderris lanigera* (Woolly Pomaderris). The groundcover contained *Pteridium esculentum* (Bracken Fern), *Cynodon dactylon* (Couch) and *Imperata cylindrica* (Blady Grass).

#### *Planted native and exotic cover*

Planted native and exotic cover occurred along the edges of the rail corridor closest to the existing platforms at Waterfall. The species present included *Callistemon citrinus* (Crimson Bottlebrush), *Cupressus* sp., *Ficus benjamina* (Weeping Fig) and *Pittosporum revolutum* (Wild Yellow Jasmine). The midstorey was absent and the groundcover was dominated by *Cenchrus clandestinus* (Kikuyu) and *Bidens pilosa* (Beggar's Ticks).

#### Threatened flora and fauna habitat assessment

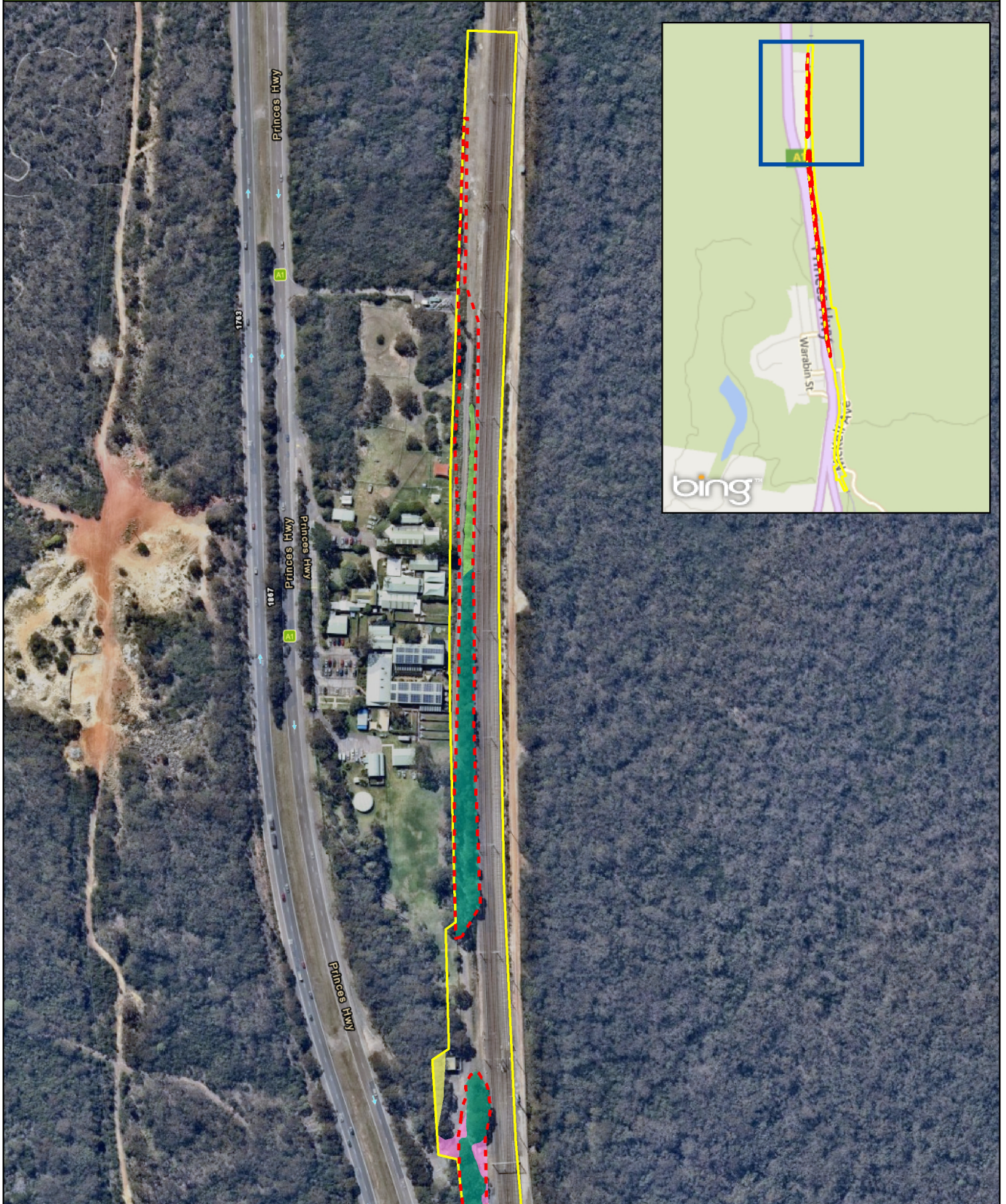
The study area lacked habitat features beyond the native vegetation present. No habitat trees were identified during survey. There were no water bodies, riparian corridors, areas of good leaf litter, rocky outcrops or caves. The native vegetation in the study area may provide foraging habitat for the following threatened fauna species:

- *Calyptorhynchus lathami* (Glossy Black Cockatoo) – vulnerable under the BC Act
- *Cercartetus nanus* (Eastern Pygmy Possum) – vulnerable under the BC Act
- *Glossopsitta pusilla* (Little Lorikeet) – vulnerable under the BC Act

- *Miniopterus australis* (Little Bentwing-bat) – vulnerable under the BC Act
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-bat) – vulnerable under the BC Act
- *Pteropus poliocephalus* (Grey-headed Flying-fox) – vulnerable under the BC Act and EPBC Act.

There are no habitat features in the study area that would provide roosting or breeding habitat for these species, given there are no hollow bearing trees or camps (with respect to the Grey-headed Flying-fox) in the study area. The native vegetation in the study area would likely provide an occasional foraging resource for these species. Throughout the REF, these species will be referred to as the 'potentially affected species'. Where differences in foraging or roosting behaviour, these will be discussed separately.

**Validated Vegetation Communities (ELA 2019)**



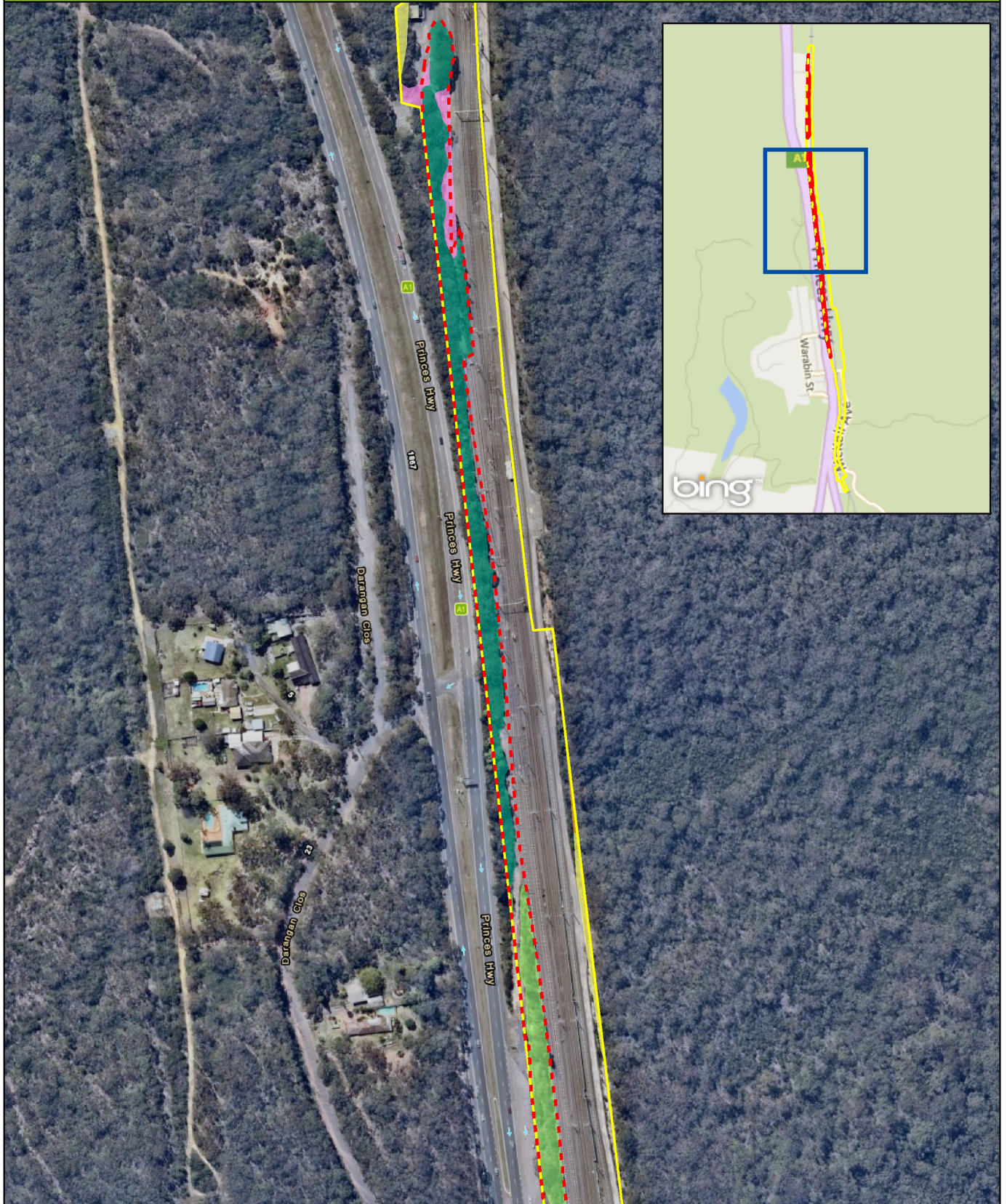
Extent of Works	<b>Vegetation Communities (OEH 2016)</b>	
Vegetation Clearance Footprint	Sydney South Exposed Sandstone Woodland	Datum/Projection: GDA 1994 MGA Zone 56 Scale: 1:3,000 @ A4 page size
<b>Validated Vegetation Communities (ELA 2019)</b>		
Sydney south exposed sandstone woodland	Urban Exotic/Native	
Sydney south exposed sandstone woodland - Regeneration		Prepared by: NR Date: 5/08/2019

nearmap Imagery: 16/09/2018

FIGURE 6.14 VALIDATED VEGETATION COMMUNITIES (ELA 2019) AND OEH VEGETATION MAPPING (2016) IN THE STUDY AREA



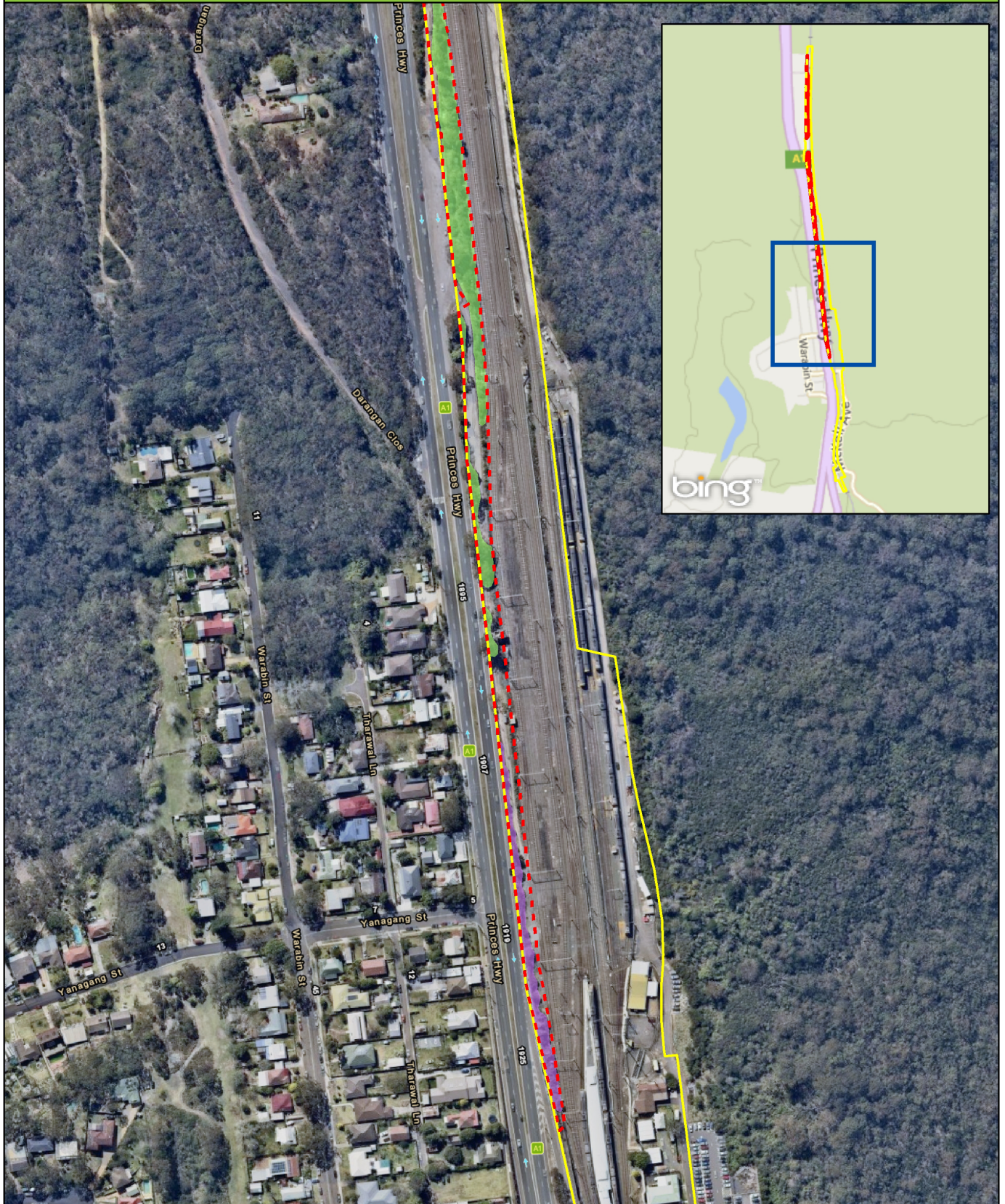
# Validated Vegetation Communities (ELA 2019)



Extent of Works	<b>Vegetation Communities (OEH 2016)</b>	
Vegetation Clearance Footprint	Sydney South Exposed Sandstone Woodland	Datum/Projection: GDA 1994 MGA Zone 56 Scale: 1:3,000 @ A4 page size
<b>Validated Vegetation Communities (ELA 2019)</b>		
Sydney south exposed sandstone woodland	Coastal Upland Damp Heath Swamp	
Sydney south exposed sandstone woodland - Regeneration	Urban Exotic/Native	
Imagery: 16/09/2018 I.com		Prepared by: NR Date: 5/08/2019

FIGURE 6.15 VALIDATED VEGETATION COMMUNITIES (ELA 2019) AND OEH VEGETATION MAPPING (2016) IN THE STUDY AREA

# Validated Vegetation Communities (ELA 2019)



<p><b>Validated Vegetation Communities (ELA 2019)</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #90EE90; border: 1px solid black; margin-right: 5px;"></span> Sydney south exposed sandstone woodland - Regeneration</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #800080; border: 1px solid black; margin-right: 5px;"></span> Planted Native and Exotic</li> </ul>	<p><b>Vegetation Communities (OEH 2016)</b></p> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #FFFF00; border: 1px solid black; margin-right: 5px;"></span> Sydney South Exposed Sandstone Woodland</li> <li><span style="display: inline-block; width: 15px; height: 15px; background-color: #FF0000; border: 1px solid black; margin-right: 5px;"></span> Undifferentiated Regenerating Shrubs</li> </ul>	<p>0 25 50 100 Metres</p> <p>Datum/Projection: GDA 1994 MGA Zone 56 Scale: 1:3,000 @ A4 page size</p> <p style="text-align: center;">N ↑</p> <p style="text-align: center;"><b>eco logical</b> AUSTRALIA A TETRA TECH COMPANY</p> <p style="text-align: center;"><b>nearmap</b> Imagery: 16/09/2018   .com</p> <p style="text-align: right;">Prepared by: NR Date: 5/08/2019</p>
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FIGURE 6.16 VALIDATED VEGETATION COMMUNITIES (ELA 2019) AND OEH VEGETATION MAPPING (2016) IN THE STUDY AREA

### 6.7.3 Potential impacts

#### Construction phase

##### *Direct impacts*

Construction of the proposal would result in the removal of Sydney South Exposed Sandstone Woodland and foraging habitat for potentially affected species (**Table 6.37**). No threatened ecological communities, flora or endangered populations would be affected by the construction works.

**Table 6.37 Values that will be affected in the study area**

Value	Affected (ha)
Sydney South Exposed Sandstone Woodland	0.82
Sydney South Exposed Sandstone Woodland Regeneration	0.41
Planted Native and Exotic cover	0.08
<b>TOTAL</b>	<b>1.31</b>
Foraging habitat for the potentially affected species	0.82

The clearing of native vegetation has been identified as a key threatening process.

From the arboricultural assessment, the following direct impacts would be anticipated:

- High impact (>20%): 23 trees would be subject to a major encroachment (>20%) within the TPZ. These trees are unable to be sustainably retained without substantial modification of the proposed footprint. Trees in this category have the following retention values:
  - eight trees with a low retention value
  - 14 trees with a medium retention value
  - one tree with a high retention value.
- No impact: Two trees will not be affected by the proposed development. Under the current proposal, these trees can be successfully retained. Trees within this category have the following retention values:
  - two trees with a low retention value

A complete list of the species of trees subject to this assessment can be found in the AIA in **Appendix H**

##### *Indirect impacts*

Indirect impacts associated with the construction of the Proposal could affect DPIE land in addition to the study area, and include:

- temporary increases in noise during construction
- permanent increase in noise resulting from the operation of fixed facilities and the new stabling yard and freight loop
- increased movement of dust, soil and plant material during construction.

Tests of significance under the BC Act were applied to the threatened ecological community: Coastal Upland Swamp in the Sydney Basin Bioregion (previously mapped in the study area [OEH 2016]) and the threatened species listed in **Section 6.7.2** and concluded that the proposal is unlikely to constitute a significant impact. The Commonwealth Significant Impact Criteria was applied with respect to the Grey-headed Flying-fox and Coastal Upland Swamps in the Sydney Basin Bioregion, both of which concluded that a significant impact is unlikely to occur. The tests of significance can be found in the FFA in **Appendix G**.

## Operational phase

### *Indirect impacts*

Indirect impacts associated with the operation of the Proposal could affect DPIE land in addition to the study area, and include:

- permanent increase in noise resulting from the operation of fixed facilities and the new stabling yard and Up freight loop
- increased movement of dust, soil and plant material during operation.

### **6.7.4 Mitigation measures**

A number of safeguards would be implemented to minimise potential impacts on biodiversity including:

- works within the corridor should be consistent with the following guidelines:
  - TfNSW Vegetation Management (Protection and Removal) Guidelines (TfNSW, 2019c)
  - TfNSW Weed Management and Disposal Guideline (TfNSW, 2019d)
  - Offsets should be secured consistent with the TfNSW Offsetting Guideline
  - *Potential offset requirements or retention of some native vegetation present should be considered in relation to the ISCA tool metrics.*
- ensure activities adjacent to vegetation to be retained does not alter existing drainage and existing light conditions
- ensure fertilisers, turf, mulch, weeds and imported soils are not unintentionally introduced into bushland areas adjacent to the rail corridor (i.e. through natural drainage pathways or general proximity)
- temporary tree protection measures (such as machinery exclusion zones from tree roots and tree trunk protection) must be in place for any retained trees and to protect adjacent native vegetation during all construction works. High visibility orange bunting must be placed at a one metre distance from the trunk of the tree with “no-go” signage attached
- no chemicals or rubbish must be allowed to escape the construction area
- all chemicals must be correctly stored within bunding
- works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained
- equipment, heavy machinery and materials must be situated in designated lay-down areas in portions of cleared land where they are least likely to cause erosion or damage vegetation
- work vehicle access must be restricted to designated work areas and existing formed access tracks/roadways

- weed removal must be undertaken using mechanical and manual means, without the use of herbicides
- where construction ancillary facilities share a boundary with DPIE land a survey would be engaged to ensure the boundary has been accurately mapped and that construction ancillary facilities do not encroach DPIE land
- temporary fencing would be erected during construction marking out DPIE land, to ensure that DPIE land is not encroached on
- all tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture
- all tree work must be in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998)
- pre-construction:
  - indicate clearly (with spray paint on trunks) trees marked for removal
- during construction:
  - monthly inspection of trees by the project arborist (or other timing as agreed with the project arborist)
  - notification to be given prior to the commencement of work within the tree protection zone, with supervision by the project arborist of any work undertaken in this zone
- post-construction:
  - final inspection of trees by project arborist after all major construction has ceased and following the removal of tree protection measures.

Refer to **Section 7.2** for a full list of proposed mitigation measures.

## **6.8 Contamination, landform, geology and soils**

### **6.8.1 Existing environment**

#### **Landform, geology and soils**

The elevation of the Proposal area is about 220 to 230 metres Australian Height Datum (AHD). Reference to the *1:100,000 Geological Map of Wollongong – Port Hacking* (Stroud et al, 1985) indicates the Proposal area is underlain by Hawkesbury Sandstone which comprises of medium to coarse-grained quartz sandstone, very minor shale and laminite lenses.

The Proposal is underlain by the Hawkesbury soil landscape (OEH, 2019) which typically consists of rugged, rolling to very steep hills with narrow crests and ridges, narrow incised valleys, steep side slopes with narrow rocky benches, broken scarps and boulders. The Proposal itself is located on relatively flat terrain.

Limitations of this landscape include extreme soil erosion hazard, mass movement hazard, steep slopes, rock outcrop, shallow, stony, highly permeable soil and low soil fertility.

#### *Acid sulfate soils*

Reference to the online *Acid Sulfate Soils Risk Map* (Office of Environment and Heritage, 1998) shows the Proposal is located within an area of no known occurrence of acid sulfate soils.

## Contamination

A search of the NSW EPA Contaminated Land Register on 7 June 2019 did not identify any contaminated sites within close proximity to the Proposal site. No other notified or regulated contaminated sites are known within the vicinity of the Proposal area.

The *AS 4482.1-2005 – Guide to the investigation and sampling of sites with potentially contaminated soil – Non-volatile and semi-volatile compounds* lists the chemicals used by specific industries. The Standard lists the following chemicals that are commonly associated with railway yards and may be present at Waterfall Station:

- hydrocarbons
- arsenic
- phenolics
- heavy metals
- nitrates and ammonia.

Given the historical use of the station as a rail corridor, there is potential for contaminants to be present within the soils underlying the station. Historic activities associated with rail corridors that have the potential to result in contamination include the introduction of fill materials including ash, the use of asbestos containing materials, fuel or oil spills and accidental leaks or spills from maintenance and operational activities.

A limited contamination investigation was completed for the Proposal in May 2019 (*Transport for NSW More Trains More Services Limited Contamination Investigation*, Coffey, 2019). The investigation included borehole drilling and large diameter auger holes within Waterfall Station and stabling yard, as well as test pitting within the stabling yard and laboratory testing of the collected soil samples for various contaminants of potential concern. These included arsenic, cadmium, chromium (III+VI), copper, lead, mercury, nickel, zinc, total recoverable hydrocarbons, BTEX, polycyclic aromatic hydrocarbons, total petroleum hydrocarbons, organochlorine pesticides, acid sulfate soils and asbestos.

Chemical concentrations reported for soil samples were less than the adopted health-based investigation and screening levels in the samples analysed. Petroleum hydrocarbons were not detected above the Management Limits in the soil samples analysed.

The soil analytical results were compared to thresholds listed in the NSW EPA (2014) '*Waste Classification Guidelines - Part 1: Classifying Waste*'. Concentrations of chemicals were detected below the respective general solid waste criteria (CT1/SCC1/TCLP1), in the majority of samples analysed. Given the limited nature of the investigation and testing program, further testing would be required to further characterise the material for waste classification purposes.

Based on observations made and analytical laboratory results obtained from the limited sampling program, widespread contamination exceeding the human health criteria has not been identified to date. However, due to the limited nature of this investigation, the presence of localised contamination yet to be identified cannot be precluded due to the limited number of samples collected for testing.

### 6.8.2 Potential impacts

#### Construction phase

The Proposal would require excavation work for the installation of foundations and footings for the platform extension, new staff amenities building and the associated staff footbridge. Other excavation work may be required for the establishment of new base for new and upgraded

sections of track, services relocation and/or adjustments, construction of a retaining wall to facilitate the extension of the Up refuge loop, and associated electrical upgrades.

#### *Erosion and sedimentation*

Excavation and other earthworks such as trenching and stockpiling activities, if not adequately managed, could result in the following impacts:

- erosion of exposed soil and stockpiled materials
- dust generation from excavation and vehicle movements over exposed soil
- increase in sediment loads entering the stormwater system and/or local runoff.

Such impacts can lead to an adverse environmental impact on biodiversity, for example, through the introduction of sediment into waterways or onto DPIE land.

Unmitigated, this potential impact would be considered to be of high significance due to the extreme soil erosion hazard and the relatively flat topography of the Proposal area. Erosion risks are however likely to be able to be adequately managed through the implementation of standard measures as outlined in *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) (the Blue Book).

#### *Contamination*

Excavation also has the potential to expose contaminants, which if not appropriately managed, can present a health risk to construction workers and the community. The exposure of contaminants could also pose an environmental risk if they were to enter nearby waterways via stormwater infrastructure.

As there is potential for onsite contamination, chemical testing and visual characterisation would be undertaken during construction to confirm the composition and nature of the excavated material. Spoil would be characterised as outlined in the NSW EPA *Waste Classification Guideline* (EPA, 2014) and if classified as unsuitable for reuse, would be transferred to an appropriately licensed offsite waste disposal facility.

There is also potential for activities to result in the contamination of soil through accidental fuel or chemical spills from construction plant and equipment.

The risk of impacts from contamination (if any) on human health (workers) from the construction activities is considered to be moderate due to the potential presence of hazardous material in old structures to be demolished and/or removed (e.g. redundant tracks and sleepers). The risks of impacts from contamination (if any) on human health (public) and the receiving environments from the construction activities is considered to be low.

### **Operational phase**

During operation of the project there is potential contamination of soil to occur via accidental fuel or chemical spills or leakages.

#### **6.8.3 Mitigation measures**

The following mitigation measure would apply to the Proposal:

- prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of works and maintained throughout construction

- erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. These measures would be maintained and left in place until the works are complete and areas are stabilised
- vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area
- all fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015i)
- prior to or during construction, further assessment and testing would be carried out to further characterise and target materials to be disturbed/excavated
- an appropriate Unexpected Finds Protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements
- all spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility
- all spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) prior to disposal
- any concrete washout would be established and maintained in accordance with TfNSW's Concrete Washout Guideline (TfNSW, 2019e) with details included in the CEMP and location marked on the ECM

Refer to **Section 7.2** for a full list of proposed mitigation measures.

## 6.9 Hydrology and water quality

### 6.9.1 Existing environment

#### Surface water

Waterfall Station is located in the Hacking River catchment. The Proposal area is located broadly on a ridge sloping away to the east and west. Natural drainage of the area has been historically altered due to the development of the railway line and station. There are two drainage channels to the southwest of the station that drain into Lake Toolooma and there is another drainage channel to the northeast of the station that flows into Kangaroo Creek.

#### Groundwater

A search of the Bureau of Meteorology (2019) Australian Groundwater Explorer identified no groundwater monitoring bores within one kilometre of the Proposal area.

#### Flooding

The Proposal is not located on land that is flood-prone land under Sutherland LEP 2015. During large rainfall events, overland flows within the Proposal area are intercepted and conveyed by the existing drainage network.



## 6.9.2 Potential impacts

### Construction phase

Without appropriate safeguards, pollutants (fuel, chemicals or wastewater from accidental spills and sediment from excavations and stockpiles) could potentially reach nearby stormwater drains and flow into waterways. Activities which would disturb soil during construction work also have the potential to impact on local water quality as a result of erosion and runoff sedimentation including erosion and the movement of sediment onto DPIE land.

Direct impacts to the underground stormwater network may occur from demolition and construction activities through damaged infrastructure and pollutants entering waterways. Impacts to the stormwater network could also result in increased stormwater runoff to DPIE land.

Heavy wet weather events may cause localised flooding which could increase the potential for soil erosion and sedimentation impacts. Works would need to ensure that the drains within the Proposal area are kept unobstructed during construction.

### Operational phase

The overall area of hardstand would slightly increase as a result of the Proposal (specifically the area of the new staff amenities building and platform extension) increasing the total impervious area of the station vicinity. This could potentially increase the volume and velocity of stormwater entering the network downstream. Considering the Proposal would result in minor changes to the existing ground surface it is considered that the effect on overland flows would also be minor.

New eaves and gutters would be installed for new canopies and roofs, which would be connected to the existing drainage network, along with the establishment of new drainage outlets to connect to existing stormwater pits from part of SSC's stormwater system (subject to detailed design). The Proposal would connect to the existing SSC stormwater system and would not discharge stormwater directly to DPIE land. Runoff from the new staff amenities building would continue to drain into the existing street drainage system. It is likely that existing water and sewer connections would be utilised for the new staff amenities building. All works would be designed and undertaken in accordance with relevant standards and requirements.

The final drainage arrangements are subject to detailed design. Consultation would be undertaken with SSC regarding the proposal of any additional discharge in stormwater from the station or yards into the Council's existing drainage system.

Overall the operational Proposal is unlikely to result in a significant impact on the hydrology of the surrounding area.

## 6.9.3 Mitigation measures

The following mitigation measure would apply to the Proposal:

- the following hydrology and water quality mitigation measures are to be considered during detailed design:
  - a hydrological assessment would be undertaken during the detailed design phase to determine final drainage arrangements and flooding risks
  - consultation would be undertaken with SSC and/or DPIE regarding any additional discharge in stormwater from the station or yard into the Council's existing drainage system

- all fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015c)
- water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2015c) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill
- in the event of a pollution incident, works would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act
- the existing drainage systems would remain operational throughout the construction phase
- dewatering activities, if required, would be undertaken in accordance with the Blue Book and TfNSW's *Water Discharge and Reuse Guideline* (2019f)
- should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the Waste Classification Guidelines (EPA, 2014) and TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2019f)
- work should not take place during or after heavy rain when doing so is likely to cause soil erosion or soil structural damage or result in indirect impacts to any neighbouring vegetation or riparian corridors.

Refer to **Section 7.2** for a full list of mitigation measures.

## 6.10 Air quality

### 6.10.1 Existing environment

Based on a review of the existing land uses surrounding the Proposal Area, the existing air quality is considered to be characteristic of a suburban area with dense vegetation (Royal National Park) on the eastern side of the railway and on the western side of the Waterfall suburban area (Heathcote National Park).

A search of the National Pollutant Inventory undertaken on 20 May 2019 for the 2017-2018 reporting period identified 37 air polluting substances from six sources in the Sutherland Shire LGA. The closest source was identified at Woronora Dam Road, Waterfall, around six kilometres northwest of the station. Other contributors to air quality surrounding the Proposal include emissions from motor vehicles on the surrounding road network and diesel trains on the rail corridor.

Potentially affected sensitive receivers in the vicinity of the Proposal include staff and customers at Waterfall Station, residential properties along the Princes Highway to the west of the Proposal and teachers and students at Waterfall Public School.

### 6.10.2 Potential impacts

#### Construction phase

Temporary air quality impacts that may occur during construction include minor increases in dust and vehicle emissions. These include pollutants such as carbon monoxide, sulphur dioxide, particulate matter, nitrous oxides, volatile organic compounds and other substances

associated with the combustion of diesel fuel and petrol from construction plant and equipment.

Anticipated sources of dust and dust-generating activities include:

- excavation for the stabling yard, platform extension, new staff amenities building, and staff footbridge
- other trenching and excavation for relocation and installation of services and drainage works
- stockpiling activities
- loading and transfer of material from trucks
- other general construction activities.

These activities, and associated air quality impacts, would be localised to work areas. Appropriate measures would be established to manage dust emissions from demolition works.

The operation of plant, machinery and trucks may also lead to increases in exhaust emissions in the local area however these impacts would be minor and short-term.

### Operational phase

Overall impacts to air quality during the operation of the Proposal would be negligible as the Proposal would not result in any changes in land use. Also, as the Proposal would improve the customer experience, the Project may contribute to a mode shift to public transport from private vehicles which would reduce emissions in the long-term.

#### 6.10.3 Mitigation measures

The following mitigation measure would apply to the Proposal:

- air quality management and monitoring for the Proposal would be undertaken in accordance with TfNSW's *Air Quality Management Guideline* (TfNSW, 2019a)
- methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks
- plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling
- vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable
- to minimise the generation of dust from construction activities, the following measures would be implemented:
  - apply water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)
  - cover stockpiles when not in use
  - appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading
  - prevent mud and dirt being tracked onto sealed road surfaces.

Refer to **Section 7.2** for a full list of proposed mitigation measures.

## 6.11 Waste

### 6.11.1 Potential impacts

During construction of the Proposal, the following waste materials would be generated:

- asphalt and concrete
- surplus building materials
- excavated spoil
- building material wastes (including metals, timbers, plastics, fencing, packaging, etc.)
- electrical wiring and conduit waste (from electrical connections)
- hazardous chemical wastes
- green waste (including weeds)
- general waste, including food scraps generated by construction workers.

Careful planning of construction activities would ensure that the volume of surplus materials is minimised. Waste management would be undertaken in accordance with the WARR Act and a Waste Management Plan would be prepared that would identify all potential waste streams associated with the works and outline methods of disposal, reuse and recycling as well as other onsite waste management practices.

With the exception of the additional waste collection and bin storage area for the new staff amenities building, the Proposal would not result in any additional changes to operational waste management arrangements.

### 6.11.2 Mitigation measures

The following mitigation measure would apply to the Proposal:

- the CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:
  - identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities
  - detail other onsite management practices such as keeping areas free of rubbish
  - specify controls and containment procedures for hazardous waste and asbestos waste
  - outline the reporting regime for collating construction waste data

The project will aim to achieve an 'Excellent' rating through the ISCA rating scheme. The application of the ISCA Rating scheme would also result in waste management targets to be developed for the Proposal and would include reuse and recycling.

Refer to **Section 7.2** for a full list of proposed mitigation measures.

## 6.12 Cumulative impacts

In accordance with clause 228 of the EP&A Regulation, any cumulative environmental effects of the Proposal associated with other existing and likely future activities must be taken into account in determining the potential impacts of the proposal on the environment.

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was undertaken in isolation. Multiple projects undertaken at a similar time/similar location may also lead to construction fatigue, particularly around noise, traffic and air quality impacts, if not appropriately managed.

### 6.12.1 Existing or potential projects

A search of the Department of Planning, Industry and Environment's (DPIE) Major Projects Register and the Sydney South and Sydney East Joint Regional Planning Panel Development and Planning Registers on 20 May 2019 did not identify any major development proposals within two kilometres of Waterfall Station.

A search of development applications submitted to SSC within the last month in Waterfall was conducted on 20 May 2019 and did not identify any developments within 500 metres of the Proposal.

Based on this assessment, it is anticipated that the cumulative impacts would be minor/negligible. This is determined on the basis that consultation with relevant stakeholders and mitigation measures in Chapter 7 are implemented.

### 6.12.2 Mitigation measures

The following mitigation measure would apply to the Proposal:

- during construction, the works would be coordinated with any other construction activities in the area. Consultation and liaison would occur with SSC, Sydney Trains, Transport for New South Wales (formerly Roads and Maritime Services) and any other relevant public authorities or developers identified so as to minimise cumulative construction impacts such as traffic and noise
- the potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.

## 6.13 Climate change and sustainability

### 6.13.1 Greenhouse gas emissions

An increase in greenhouse gas emissions, primarily carbon dioxide, would be expected during construction of the Proposal due to exhaust emissions from construction machinery and vehicles transporting materials and personnel to and from site.

The detailed design process would undertake an AS 14064-2 (Greenhouse Gases - project level) compliant carbon footprinting exercise in accordance with TfNSW's *Greenhouse Gas Inventory Guide for Construction Projects* (TfNSW, 2013) and *Carbon Estimate and Reporting Tool Guidelines* (TfNSW, 2015a). The carbon footprint would be used to inform decision making in design and construction.

Due to the small scale of the Proposal and the short term temporary nature of the individual construction works, it is considered that greenhouse gas emissions resulting from construction would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in **Table 7.1**.

It is anticipated that, once operational, the Proposal could result in a mode shift towards public transport and a relative decrease in use of private motor vehicles by commuters to travel to and from Waterfall. This may reduce the amount of fuel consumed with a corresponding relative reduction in associated greenhouse gas emissions.

### 6.13.2 Climate change

The dynamic nature of our climate system indicates a need to focus attention on how to adapt to the changes in climate and understand the limitation of adaptation. The effects of climate on the Sydney region can be assessed in terms of weather changes, storm intensity, flooding and increased risk of fire.

Climate change could lead to an increase in the intensity of rainfall events, whereby the rainfall expected to occur in a 100-year average recurrence interval flood event would occur more frequently. The Proposal is not located on flood prone land; therefore, it is not expected to be affected by potential rainfall events amplified by climate change.

Climate change could lead to an increase in frequency and severity in bushfires. The Proposal is situated on land mapped as bush fire prone (Vegetation buffer) and would be designed with appropriate fire protection measures.

### 6.13.3 Sustainability

The design of the Proposal has been developed in accordance with the project targets identified in the *Sustainability Report for More Trains, More Services Stage 2 Program* (Aurecon 2018) and further developed in the More Trains More Services Civil Concept with Site Investigations Packages 1 & 2 Sustainability Strategy (April 2019). TfNSW will aim to achieve an 'Excellent' rating through the ISCA rating scheme. The scheme requires a number of mandatory and discretionary initiatives to be applied. Refer to **Section 3.1.4** for more information regarding the application of the scheme.

Sustainability is a key priority for MTMS. TfNSW is committed to delivering sustainable transport for NSW. MTMS would contribute to the achievement of a sustainable transport system through:

- (a) minimising impacts to the environment through design, construction and maintenance;
- (b) reinforcing inherent sustainability benefits;
- (c) driving sustainability through recognised rating tools;
- (d) maximising energy efficiency, renewables and greenhouse gas reduction; and
- (e) advocating for sustainable communities.

The contractor will (in conjunction with TfNSW) play a role in endeavouring to achieve an ISCA rating of "Excellent" (in accordance with Version 1.2 of the ISCA Guidelines) for the delivery, operation and maintenance phases of MTMS.

## 7 Environmental management

This chapter of the REF identifies how the environmental impacts of the Proposal would be managed through environmental management plans and mitigation measures. **Section 7.2** lists the proposed mitigation measures for the Proposal to minimise the impacts of the Proposal identified in **Chapter 6**.

### 7.1 Environmental management plans

A CEMP for the construction phase of the Proposal would be prepared in accordance with the requirements of TfNSW's EMS. The CEMP would provide a centralised mechanism through which all potential environmental impacts relevant to the Proposal would be managed and outline a framework of procedures and controls for managing environmental impacts during construction.

The CEMP would incorporate as a minimum all environmental mitigation measures identified below in **Section 7.2**, any conditions from licences or approvals required by legislation, and a process for demonstrating compliance with such mitigation measures and conditions.

### 7.2 Mitigation measures

Mitigation measures for the Proposal are listed below in **Table 7.1**. These proposed measures would minimise the potential adverse impacts of the Proposal identified in **Chapter 6**, should the Proposal proceed.

**Table 7.1** Proposed mitigation measures

No.	Mitigation measure
	<b>General</b>
G1	A CEMP would be prepared by the Contractor in accordance with the relevant requirements of <i>Guideline for Preparation of Environmental Management Plans</i> (Department of Infrastructure, Planning and Natural Resources, 2004) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
G2	A project risk assessment including environmental aspects and impacts would be undertaken by the Contractor prior to the commencement of construction and documented as part of the CEMP.
G3	An Environmental Controls Map (ECM) would be developed by the Contractor in accordance with TfNSW's <i>Guide to Environmental Controls Map</i> (TfNSW, 2015b) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
G4	Prior to the commencement of construction, all contractors would be inducted on the key project environmental risks, procedures, mitigation measures and conditions of approval.
G5	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate intervals.
G6	Service relocation would be undertaken in consultation with the relevant authority. Contractors would mark existing services on the ECM to avoid direct impacts during construction.

No.	Mitigation measure
G7	Any modifications to the Proposal, if approved, would be subject to further assessment and approval by TfNSW. This assessment would need to demonstrate that any environmental impacts resulting from the modifications have been minimised.
	<b>Traffic and site access</b>
TT1	<p>A construction TMP would be prepared by the construction contractor in consultation with TfNSW and provided to SSC and Transport for New South Wales (formerly Roads and Maritime Services). The construction TMP would be the primary tool to manage potential traffic and pedestrian impacts associated with construction. At a minimum, the construction TMP would include:</p> <ul style="list-style-type: none"> <li>• ensuring adequate signage at construction work sites</li> <li>• consideration of safety and accessibility for pedestrians and cyclists</li> <li>• ensuring adequate sight lines to allow for safe entry and exit from the site</li> <li>• managing impacts and changes to on and off street parking, and parking locations for construction workers</li> <li>• routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses</li> <li>• details for relocating kiss and ride, taxi ranks and rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus/taxi operators. Particular provisions would also be considered for the accessibility impaired</li> <li>• measures to manage traffic flows around the area affected by the Proposal, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the TMP.</li> </ul>
TT2	Access to Waterfall Station, local businesses and residential properties would be maintained at all times (unless affected property owners have been consulted and appropriate alternative arrangements made).
TT3	Consultation with the relevant road authorities would be undertaken during preparation of the construction TMP. The performance of all project traffic arrangements would be monitored during construction.
TT4	Communication would be provided to the community and local residents to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site works.
TT5	Heavy vehicle movements required as part of construction of the Proposal near Waterfall Public School would be restricted during peak times and school zone hours. It may also be necessary to undertake other construction activities, such as concrete pours, crane lifts and delivery of oversized materials, outside standard construction hours to minimise traffic disruption.
TT6	Access for emergency vehicles would be maintained in accordance with relevant requirements. Emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes.
TT7	Road Occupancy Licences for temporary road closures would be obtained, where required.



No.	Mitigation measure
<b>Landscape and visual amenity</b>	
LV1	Establish TPZs around trees to be retained. Tree protection would be undertaken in keeping with AS 4970-2009 Protection of Trees on Development Sites and would include exclusion fencing of TPZs.
LV2	Provide well-presented and maintained construction hoarding and site fencing with shade cloth (or similar material) (where necessary) to minimise visual impacts on key view points during construction and remove hoardings and site fencing following the completion of construction.
LV3	Cut-off or directed lighting to be used within and outside of the construction site, with lighting location and direction considered to ensure glare and light spill is minimised.
LV4	Construction personnel to keep the construction areas clean and tidy including refuse placed in appropriate receptacles.
LV5	Measures taken to ensure no tracking of dirt and mud onto public roads and other public spaces.
<b>Noise and vibration</b>	
NV1	Prior to commencement of works, a CNVMP would be prepared and implemented in accordance with the requirements of the ICNG (Department of Environment and Climate Change, 2009), CNVS (TfNSW, 2019g) and the Noise and Vibration Impact Assessment for the Proposal (AECOM, 2019). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.
NV2	<p>The CNVMP should include, as a minimum, the following:</p> <ul style="list-style-type: none"> <li>• identification of nearby residences and other sensitive land uses</li> <li>• description of approved hours of work</li> <li>• description and identification of all construction activities, including work areas, equipment and duration</li> <li>• description of what work practices (generic and specific) would be applied to minimise noise and vibration</li> <li>• a complaints handling process</li> <li>• noise and vibration monitoring procedures, including for heritage structures</li> <li>• overview of community consultation required for identified high impact works.</li> </ul>
NV3	Construction works should be planned and carried out during standard construction hours wherever possible. The standard mitigation measures contained within the <i>Construction Noise and Vibration Strategy</i> (CNVS) (TfNSW, 2018) will be considered as mitigation measures as part of the CNVMP.

No.	Mitigation measure
NV4	<p>All residents and sensitive receivers impacted by noise levels from the Proposal which are expected to exceed the NML should be consulted prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works.</p> <p>The information provided to the receivers would include:</p> <ul style="list-style-type: none"> <li>• programmed times and locations of construction work</li> <li>• the hours of proposed works</li> <li>• construction noise and vibration impact predictions</li> <li>• construction noise and vibration mitigation measures being implemented on site.</li> </ul>
NV5	<p>Community consultation regarding construction noise and vibration would be detailed in a Community Liaison Plan for the construction of the Proposal and would include a 24 hour hotline and complaints management process.</p>
NV7	<p>TfNSW's CNVS provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from airborne noise, ground-borne noise and vibration generated during the construction of TfNSW projects. This is managed through the application of all feasible and reasonable mitigation measures. Where exceedances are still expected to occur after standard mitigation measures have been applied, the CNVS recommends the implementation of additional mitigation measures. These mitigation measures are specified within the CNVS.</p> <p>The provision of additional mitigation is based on the predicted exceedances above RBLs and when the exceedances occur.</p>
NV8	<p>It is recommended that a noise reduction program as outlined in Section 6.2 of the NPfI be developed in order to provide a formal, structured approach to reduce noise to acceptable levels over time, by applying reasonable and feasible control measures. A noise reduction program would review the site-specific activities that would occur due to stabling operations and take into consideration the noise expectations of the community.</p>
<b>Indigenous heritage</b>	
IH1	<p>All construction staff would undergo an induction in the recognition of Indigenous cultural heritage material. This training would include information such as the importance of Indigenous cultural heritage material and places to the Indigenous community, as well as the legal implications of removal, disturbance and damage to any Indigenous cultural heritage material and sites</p>
IH2	<p>If unforeseen Indigenous heritage objects are uncovered during construction, the procedures contained in TfNSW's Unexpected Heritage Finds Guideline (TfNSW, 2019b) would be followed, and works within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager, so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, DPC Heritage and the Local Aboriginal Land Council.</p>
IH3	<p>If human remains are found, work would cease, the site secured and the NSW Police and DPC Heritage notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to works recommencing at the location</p>

No.	Mitigation measure
<b>Non-Indigenous heritage</b>	
NH1	A heritage architect should be involved in detailed design and would endeavour to minimise impacts to the station and consider implementing as practicable matching materials and finishes (brickwork and mortar), retain/reuse existing fabric and contain new works in areas of existing modification. The heritage architect should also consider the connected visual landscape and the relationship of the station to the water tank, water column and turntable, where possible retaining views from the station to each of these items.
NH2	Once the detailed design has been developed, if it is significantly different from what has been assessed in this report, consideration should be given to undertaking a SoHI report to assess the potential impacts against the detailed design for the Proposal against the extant RailCorp S170 Register and Sutherland LEP 2015 listed items.
NH3	As the visual landscape will be permanently altered by these works and the relationship between the RailCorp S170 and Sutherland LEP 2015 listed items changed, consideration should be given to undertaking a photographic record before and after the proposed changes. Ideally an archival recording if produced should follow NSW Heritage Division guidelines <i>Photographic recording of heritage items using film or digital capture</i> (NSW Heritage Office, 2006) and <i>How to prepare archival records</i> (NSW Heritage Office, 1998). Copies should be provided to Sydney Trains for future reference
NH4	The existing heritage interpretation signage should be retained. Contractors should be made aware of the plaques and interpretation boards displayed on the eastern wall of the platform building, and ensure they are not accidentally impacted during works.
NH5	The turntable and water tank are both listed on the Sutherland LEP 2015. SSC should be informed of any works that may affect these items and given 21 days to respond.
NH6	Following completion of works, the S170 listing description and historical context should be updated to accurately reflect the significance of the station and the new works and elements within the precinct. This should be undertaken with the Sydney Trains staff or team that administer the Sydney Trains S170 register.
NH7	A heritage induction should be provided to all on-site staff and contractors involved in the Proposal. The induction should clearly describe the heritage significance of the site, including individual items and heritage fabric.
NH8	The Construction Environmental Management Plan (CEMP) should include stop work procedures in accordance with TfNSW's Unexpected Heritage Finds Guideline (Transport for NSW, 2015) to manage activities in the unlikely event that intact archaeological relics or deposits are encountered
<b>Socio-economic</b>	
SE1	Sustainability criteria would be established to encourage construction personnel to purchase goods and services locally helping to ensure the local community benefits from the construction of the Proposal
SE2	Feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the project, where practicable

No.	Mitigation measure
SE3	Contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase
SE4	The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Management Plan to be developed prior to construction
SE5	Measures to avoid, reduce or mitigate amenity impacts would be implemented, as outlined in other sections of this REF
<b>Biodiversity</b>	
BD1	<p>Works within the corridor should be consistent with the following guidelines:</p> <ul style="list-style-type: none"> <li>• TfNSW Vegetation Management (Protection and Removal) Guidelines (TfNSW, 2019c)</li> <li>• TfNSW Weed Management and Disposal Guideline (TfNSW, 2019d)</li> <li>• Offsets should be secured consistent with the TfNSW Offsetting Guideline</li> <li>• Potential offset requirements or retention of some native vegetation present should be considered in relation to the ISCA tool metrics.</li> </ul>
BD2	Ensure activities adjacent to vegetation to be retained does not alter existing drainage and existing light conditions.
BD3	Ensure fertilisers, turf, mulch, weeds and imported soils are not unintentionally introduced into bushland areas adjacent to the rail corridor (i.e. through natural drainage pathways or general proximity).
BD4	Temporary tree protection measures (such as machinery exclusion zones from tree roots and tree trunk protection) must be in place for any retained trees and to protect adjacent native vegetation during all construction works. High visibility orange bunting must be placed at a one metre distance from the trunk of the tree with “no-go” signage attached.
BD5	No chemicals or rubbish must be allowed to escape the construction area.
BD6	All chemicals must be correctly stored within bunding.
BD7	Works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained.
BD8	Equipment, heavy machinery and materials must be situated in designated lay-down areas in portions of cleared land where they are least likely to cause erosion or damage vegetation.
BD9	Work vehicle access must be restricted to designated work areas and existing formed access tracks/roadways.
BD10	Weed removal must be undertaken using mechanical and manual means, without the use of herbicides.
BD11	Where construction ancillary facilities share a boundary with DPIE land a survey would be engaged to ensure the boundary has been accurately mapped and that construction ancillary facilities do not encroach DPIE land.

No.	Mitigation measure
BD12	Temporary fencing would be erected during construction marking out DPIE land, to ensure that DPIE land is not encroached on
BD13	All tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture
BD14	All tree work must be in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998)
BD15	Pre-construction: <ul style="list-style-type: none"> <li>• indicate clearly (with spray pain on trunks) trees marked for removal</li> </ul>
BD16	During construction: <ul style="list-style-type: none"> <li>• monthly inspection of trees by the project arborist (or other timing as agreed with the project arborist)</li> <li>• notification to be given prior to the commencement of work within the tree protection zone, with supervision by the project arborist of any work undertaken in this zone</li> </ul>
BD17	Post-construction: <ul style="list-style-type: none"> <li>• final inspection of trees by project arborist after all major construction has ceased and following the removal of tree protection measures</li> </ul>
<b>Contamination, landform, geology and soils</b>	
CL1	Prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' Managing Urban Stormwater: Soils and Construction Guidelines (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of works and maintained throughout construction.
CL2	Erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. These measures would be maintained and left in place until the works are complete and areas are stabilised.
CL3	Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area.
CL4	All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's <i>Chemical Storage and Spill Response Guidelines</i> (TfNSW, 2015c).
CL5	Prior to or during construction, further assessment and testing would be carried out to further characterise and indicate materials to be disturbed/excavated.

No.	Mitigation measure
CL6	An appropriate Unexpected Finds Protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements.
CL7	All spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility.
CL8	All spoil and waste must be classified in accordance with the <i>Waste Classification Guidelines Part 1: Classifying waste</i> (EPA, 2014) prior to disposal.
CL9	Any concrete washout would be established and maintained in accordance with TfNSW's <i>Concrete Washout Guideline</i> (TfNSW, 2019e) with details included in the CEMP and location marked on the ECM.
<b>Hydrology and water quality</b>	
WQ1	<p>The following hydrology and water quality mitigation measures are to be considered during detailed design:</p> <ul style="list-style-type: none"> <li>• a hydrological assessment would be undertaken during the detailed design phase to determine final drainage arrangements and flooding risks</li> <li>• consultation would be undertaken with SSC and/or DPIE regarding any additional discharge in stormwater from the station or yard into the Council's existing drainage system.</li> </ul>
WQ2	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's <i>Chemical Storage and Spill Response Guidelines</i> (TfNSW, 2015c).
WQ3	Water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW <i>Chemical Storage and Spill Response Guidelines</i> (TfNSW, 2015c) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill.
WQ4	In the event of a pollution incident, works would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act.
WQ5	The existing drainage systems would remain operational throughout the construction phase
WQ6	Dewatering activities, if required, would be undertaken in accordance with the Blue Book and TfNSW's <i>Water Discharge and Reuse Guideline</i> (2019f).
WQ7	Should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the Waste Classification Guidelines (EPA, 2014) and TfNSW's <i>Water Discharge and Reuse Guideline</i> (TfNSW, 2019f).

No.	Mitigation measure
WQ8	Work should not take place during or after heavy rain when doing so is likely to cause soil erosion or soil structural damage or result in indirect impacts to any neighbouring vegetation or riparian corridors.
<b>Air quality</b>	
AQ1	Air quality management and monitoring for the Proposal would be undertaken in accordance with TfNSW's <i>Air Quality Management Guideline</i> (TfNSW, 2019a).
AQ2	Methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks.
AQ3	Plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling.
AQ4	Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
AQ5	<p>To minimise the generation of dust from construction activities, the following measures would be implemented:</p> <ul style="list-style-type: none"> <li>• apply water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)</li> <li>• cover stockpiles when not in use</li> <li>• appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading</li> <li>• prevent mud and dirt being tracked onto sealed road surfaces.</li> </ul>
<b>Waste</b>	
WA1	<p>The CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:</p> <ul style="list-style-type: none"> <li>• identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities</li> <li>• detail other onsite management practices such as keeping areas free of rubbish</li> <li>• specify controls and containment procedures for hazardous waste and asbestos waste</li> <li>• outline the reporting regime for collating construction waste data.</li> </ul>
WA2	The project will aim to achieve an 'Excellent' rating through the ISCA rating scheme. The application of the ISCA Rating scheme would also result in waste management targets to be developed for the Proposal and would include reuse and recycling.
<b>Cumulative impacts</b>	
CU1	During construction, the works would be coordinated with any other construction activities in the area. Consultation and liaison would occur with SSC, Sydney Trains, Transport for New South Wales (formerly Roads and Maritime Services) and any other relevant public authorities or developers identified so as to minimise cumulative construction impacts such as traffic and noise.

No.	Mitigation measure
CU2	The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.
<b>Climate change and sustainability</b>	
CC1	The project will aim to achieve an 'Excellent' rating through the ISCA rating scheme.



## 8 Conclusion

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This REF has been prepared in accordance with the provisions of section 5.5 of the EP&A Act, taking into account, to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The Proposal would contribute to the delivery of service improvements on the T4 Eastern Suburbs and Illawarra, and South Coast Lines, including capacity, reliability and connectivity improvements for customers. The Proposal would provide the following benefits:

- additional capacity for stabling of suburban trains on the T4 Illawarra line to support an uplift in the number of services,
- provide additional freight refuge to allow passenger services to overtake freight services
- facilitate new 10-car intercity trains stopping at Waterfall Station

The likely key impacts of the Proposal are as follows:

- temporary changes to vehicle and pedestrian movements in and around the station during the construction of the Proposal
- visual amenity impacts through the introduction of a new staff footbridge and amenities building, two new stabling loops, vegetation removal, and changes to fencing along the Princes Highway boundary
- noise and vibration impacts during construction and operation
- removal of some vegetation adjacent to the rail corridor on the Princes Highway side of the line.

This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and the requirements of the EPBC Act (refer to **Chapter 6, Appendix A and Appendix B**). Based on the assessment contained in this REF, it is considered that the Proposal is not likely to result in a significant impact upon the environment or any threatened species, populations or communities. Accordingly, an EIS is not required, nor is the approval of the Minister for Planning.

The Proposal would also take into account the principles of ESD (refer to **Section 3.1.4 and Section 4.6**). These would be considered during the detailed design, construction and operational phases of the Proposal. This would ensure the Proposal is delivered to maximum benefit to the community, is cost effective and minimises any adverse impacts on the environment.

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