MT COLAH FOOTBRIDGE

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Executive Summary

Sydney Trains is proposing to replace the existing footbridge at Mount Colah Station. The proposal is located at Mount Colah, New South Wales (NSW) at approximately 37.7 kilometres (km), between Asquith and Mount Ku-ring-gai Station on the Sydney Trains Main North Rail Line. The main objective for the proposal is to develop a suitable Reference Design for replacement of the existing footbridge, as well as installation of lifts to provide easy access to the platform, which is currently only accessible via staircase.

The proposal is part of Sydney Trains line maintenance works and addresses the *Transport Administration Act 1987* (TAA) objectives for transport service providers. Specifically, the works meet the object of Part 1 2A (c) to enable effective planning and delivery of transport infrastructure and services.

This Review of Environmental Factors (REF) has been prepared to assess the environmental impact associated with the construction and operation of the proposal under the provisions of Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Description of the proposal

The proposal would involve the following key features:

- Design of new footbridge, with three lifts and stairs
- Design of additional Station Services required for the upgrade to station footbridge
- Relocation of the existing 11kV feeder section 649/1
- Relocation/protection of existing services (Sydney Trains owned and third party) impacted by construction and permanent works of the new footbridge
- Realignment of overhead wiring (OHW) impacted by the decommissioning and demolition of the existing footbridge
- Option for the relocation of existing Station Services Equipment Room (SSER) from the station building to beneath the new platform stairs
- Platform regrading and resurfacing
- Option for full platform regrading and resurfacing.
- The decommissioning and demolition of the existing footbridge

The preparation of the Reference Design would enable Sydney Trains to proceed to a Detailed Design and Construction tender.

The proposal would not involve alterations to non-Aboriginal or Aboriginal heritage items.

Need for proposal

The proposal is needed to replace the existing footbridge and address accessibility issues at Mount Colah Station.

Statutory considerations

The EP&A Act provides for the environmental impact assessment of development in NSW. Part 5 of the EP&A Act generally specifies the environmental impact assessment

requirements for activities undertaken by public authorities, such as Sydney Trains, which do not require development consent.

The Transport and Infrastructure SEPP (T+ISEPP) Chapter 2 aims to assist in the effective delivery of public infrastructure across the State by improving certainty and regulatory efficiency through a consistent planning assessment and approvals regime for public infrastructure and services and through the clear definition of environmental assessment and approval processes for public infrastructure and services facilities. This proposal is for rail infrastructure facilities and is to be carried out on behalf of Sydney Trains (which is a public authority). The proposal can be assessed under Part 5 of the EP&A Act. Development consent from council is not required.

This REF has been prepared to assess the construction and operational environmental impacts of the proposal. The REF has been prepared in accordance with clause 228 of the *Environment Planning and Assessment Regulation 2000* (the EP&A Regulation).

In accordance with Division 5.5 and 5.7 of the EP&A Act, Sydney Trains, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.

Community and stakeholder consultation

Sydney Trains is the proponent for the proposal. RailCorp is the asset owner and manager. Consultation with external stakeholders is not required for the works.

Environmental impact assessment

This REF identifies the potential environmental benefits and impacts of the proposal and outlines the mitigation measures to reduce the identified impacts. The following key impacts have been identified should the proposal proceed:

- Visual aesthetic and urban design: construction plant, equipment and staff would negatively impact the proposal area. However, the proposal is architecturally designed. A landscaping plan has also been developed. These design features complement the local environment and have a positive impact on visual aesthetics and urban design.
- Landforms geology and soils: ground-breaking activities would be required for the installation of the proposed new footbridge and lift shafts. Construction may involve erosion and other impacts to landforms, geology and soils due to asset relocations and trenching.
- Noise and vibration: a quantitative noise and vibration impact assessment was carried out to determine the level of impact on the surrounding sensitive receivers (refer Appendix F). Noise and vibration associated with the proposal would have moderate, temporary impacts. There would be no impacts during operation.
- Biodiversity: the proposed works would involve clearing of 0.32 ha of native vegetation within the rail corridor, including about 0.08 ha of Duffys Forest Endangered Ecological Community (EEC).
- Traffic and access: short term, there would be an increased traffic due to construction vehicles, staff and equipment. However, once operational, the proposal would improve accessibility of public infrastructure, including bus and rail services.
- Socio-economic: long term, the proposal would benefit the local community, through increase connectivity from residential to commercial areas, improving accessibility of the station, and improving safety through the installation of lighting and closed-circuit television (CCTV)

Conclusion

This REF has been prepared having regard to Division 5.5 and Division 5.7 of the EP&A Act, and clause 228 of the EP&A Regulation, to ensure that Sydney Trains takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the proposal.

Should the proposal proceed, any potential associated adverse impacts would be appropriately managed in accordance with the mitigation measures outlined in this REF. This would ensure the proposal is delivered to maximise benefit to the community and minimise any adverse impacts on the environment.

In considering the overall potential impact and proposed mitigation measures outlined in this REF, the proposal is unlikely to generate long term adverse impacts to the environment.

The updates to this REF (Revision 1) contained in the version dated 25 May 2022 only include minor amendments to incorporate the potential additional works associated with the SSER relocation and full platform regrading to Mount Colah station. As the proposed design intent to be taken forwards into PDR and CDR submissions is aligned with the reference design prepared for this project, that was completed under a separate contract no fundamental amendments are required to this REF.

The updates to this REF (Revision 2) contained in the version dated 12 July 2022 include updated ecological and arborist reports detailing the impacts the new infrastructure works will have at Mount Colah station.

Terms and Definitions

Term	Definition
ABS	**Australian Bureau of Statistics**
AHD	**Australian Height Datum**
AHIP	**Aboriginal Heritage Impact Permit**
AHIMS	**Aboriginal Heritage Information Management System**
BC Act	***Biodiversity Conservation Act 2016*** **(NSW)**
Biosecurity Act	***Biosecurity Act 2015***
BOF	**Biodiversity Offset Fund**
CBD	**Central Business District**
CCTV	**Closed circuit television**
CEMP	**Construction Environmental Management Plan**
CLM Act	***Contaminated Land Management Act 1997*** **(NSW)**
CSIRO	**Commonwealth Scientific and Industrial Research Organisation**
DBYD	**Dial Before You Dig**
DDM	**Design Delivery Manager**
DEES	**NSW Government Department of Environment, Energy and Science (formerly Office of Environment and Heritage)**
DoEE	**Department of the Environment and Energy**
DPIE	**NSW Government Department of Planning, Industry and Environment**
DSS	**Detailed services search**
EEC	**Endangered Ecological Community**
EMS	**Environmental Management System**
EP&A Act	***Environmental Planning and Assessment Act 1979*** **(NSW)**
EP&A Regulation	***Environmental Planning and Assessment Regulation 2000*** **(NSW)**
EPBC Act	***Environment Protection and Biodiversity Conservation Act 1999*** **(Cth)**
EPA	**NSW Environment Protection Authority**
EPI	**Environmental Planning Instrument**
EPL	**Environmental Protection License**
ESCP	**Erosion and Sediment Control Plan**

Term	Definition
ESD	**Ecologically Sustainable Development**
FFA	Flora and Fauna Impact Assessment Report (Land Eco, 2022)
FY	**Financial year**
FM Act	***Fisheries Management Act 1994* (NSW)**
Heritage Act	***Heritage Act 1977* (NSW)**
ICNG	***Interim Construction Noise Guidelines* published by the NSW Department of Environment and Climate Change (now OEH)**
T+ISEPP	***State Environmental Planning Policy (Transport and Infrastructure) 2021***
Km	**kilometre**
LEP	**Local Environmental Plan – A local government level EPI**
LGA	**Local government area**
LRS	**NSW Land Registry Service**
MEM Act	***Marine Estate Management Act 2014* (NSW)**
MNES	**Matters of National Environmental Significance**
MSA	**Master Services Agreement**
MSDS	**Material Safety Data Sheet**
NPW Act	***National Parks and Wildlife Act 1974* (NSW)**
OEH	**NSW Office of Environment and Heritage**
OHW	**Overhead wiring**
OHWS	**Overhead wiring structure**
PMST	**Protected Matters Search Tool**
POEO Act	***Protection of the Environment Act 1997* (NSW)**
Roads Act	***Roads Act 1993* (NSW)**
REF	**Review of Environmental Factors**
ROL	**Road occupancy license**
s170 Register	**Heritage and Conservation Register, a list of heritage items made under s170 of the *Heritage Act 1977***
SEED	**The NSW Government Sharing and Enabling Environmental Data spatial resource**
SEPP	**State Environmental Planning Policy – a state level EPI**
SHR	**NSW State Heritage Register**
SMEC	**SMEC Australia Pty Ltd**

Term	Definition
SSER	**Station Services Equipment Room**
TAA	***Transport Administration Act 1988*** **(NSW)**
TAHE	**Transport Asset Holding Entity**
TEC	Threatened Ecological Communities
TMC	**Transport Management Centre**
TMP	**Traffic Management Plan**
TPZ	**Tree Protection Zone**
WARR Act	***Waste Avoidance and Resource Recovery Act 2001*** **(NSW)**
WoNS	**Weeds of National Significance**

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1 Introduction

1.1 The proposal

Sydney Trains is proposing to replace the existing footbridge at Mount Colah Station as the existing footbridge is in poor condition and nearing the end of its serviceable life. The proposed new footbridge (the proposal) would improve accessibility to the station platforms.

Key features of the proposal include:

- A new footbridge, with three lifts and stairs providing access to Platforms 1 and 2
- The relocation of the existing 11kV aerial line feeder
- The relocation and or protection of other existing services (both Sydney Trains owned and third party) impacted by construction and permanent works of the new footbridge
- Realignment of overhead wiring (OHW)
- Option for the relocation of the existing Station Services Equipment Room (SSER) from the station building to beneath the new platform stairs
- Platform regrading and resurfacing
- Option for full platform regrading and resurfacing
- Additional station services ancillary to the upgrade of the footbridge.
- The decommissioning and demolition of the existing footbridge

A detailed description of the Proposal is provided in Section 2 of this Review of Environmental Factors (REF). The Reference Design for the proposal is provided at Appendix A.

The proposal is being undertaken as part of Sydney Trains' Master Services Agreement (MSA) and operational maintenance activities. Sydney Trains is the proponent for the proposal.

This REF has been prepared to assess the potential environmental impacts associated with both the construction and operation of the proposal under the provision of Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This REF details safeguards and mitigations measures to address any potential adverse impact identified through the assessment.

1.2 Project location

Mount Colah Station is located on the T1 Main North Rail Line in Sydney's north, about 38 kilometres (km) north west of the Sydney Central Business District (CBD). The surrounding environment is a mixture of low to medium density residential, community facilities, commercial areas and the road corridor.

The station is comprised of an island platform (Platform 1 and 2). The footbridge is bounded by Pierre Close to the east and Pacific Highway to the west. The proposal is primarily located within Lot 1, DP 1172693.

Mount Colah Railway Station is located within the local government area (LGA) of Hornsby Shire Council. The Hornsby Local Environmental Plan 2013 (Hornsby LEP 2013) applies to the Mount Colah area and identifies the land use zones within the study area. The proposal is primarily located within land zoned as SP2 – Infrastructure under the Hornsby LEP 2013.

The nearest residential properties to the proposal area are:

- 1 Cowan Road, Mount Colah, about 40 m south
- 583 Pacific Highway, Mount Colah, about 70 m west
- 7-9 Cowan Road, Mount Colah, about 100 m east.

Figure 1-1 Locality map

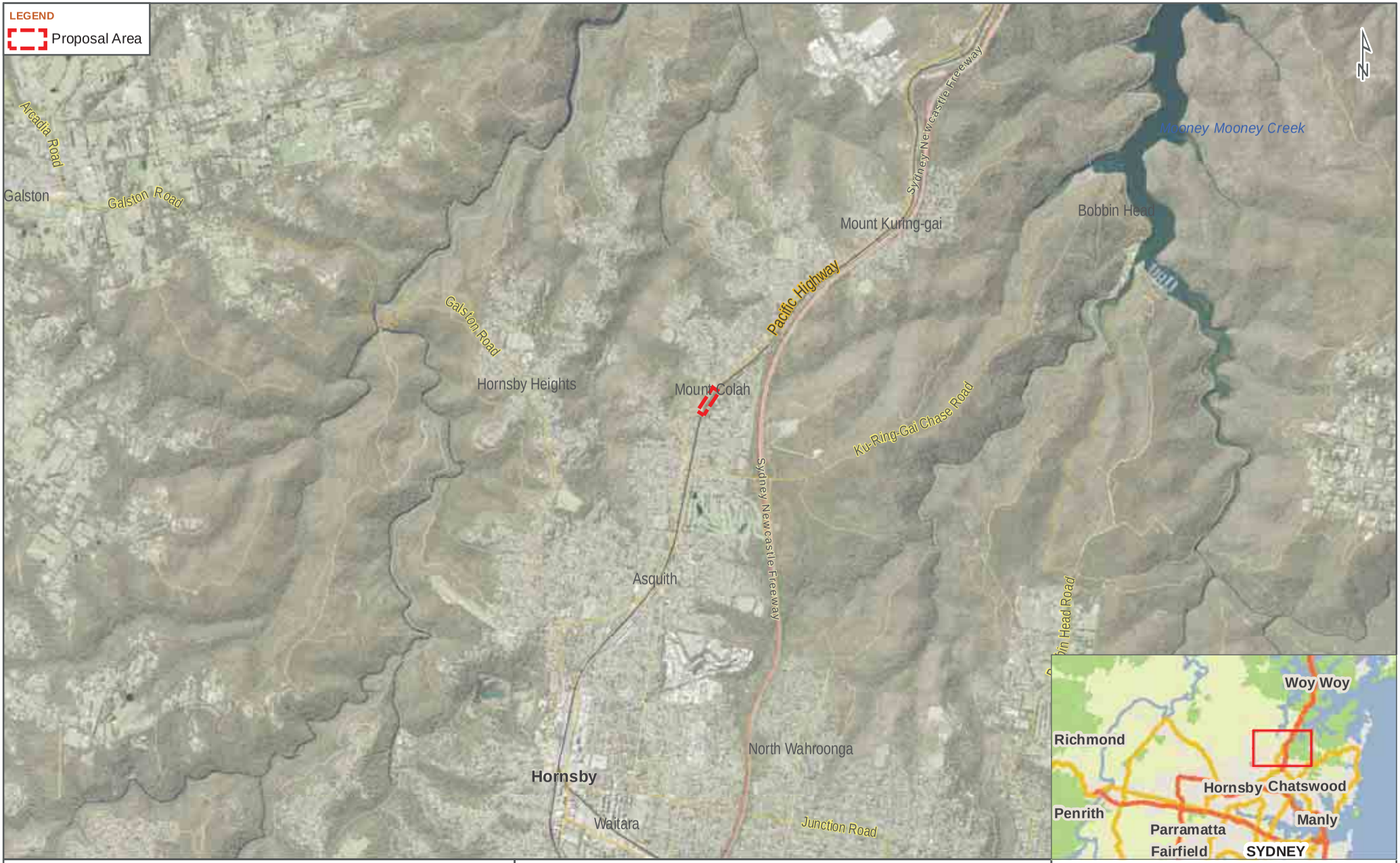

FIG NO. 1-1	**FIGURE TITLE** Locality map	**DATE** 05/11/2020	**PAGE SIZE** A4	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30012921	**PROJECT TITLE** Mount Colah REF	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020 public_NSW_Imagery: © Department of Customer Service 2020	

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1.3 Purpose of REF

This REF has been prepared by SMEC on behalf of Sydney Trains. Updates to the original REF have been completed by Gartner Rose & AECOM. The purpose of the REF is to:

- Describe the project;
- Document, examine and take into account to the fullest extent possible the likely impacts of the project on the environment;
- Detail mitigation measures to be implemented;
- Determine whether an Environmental Impact Statement or Species Impact Statement is required in relation to the project; and
- Determine whether the project can proceed.

For the purposes of these works, Sydney Trains is both the proponent and the determining authority for this REF under Part 5 of the EP&A Act.

The proposed works and associated environmental impacts have been described in the context of clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), other relevant NSW legislation and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so, the REF helps to fulfil the requirements of Section 5.5 of the EP&A Act, for Sydney Trains to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The findings of the REF would be considered when assessing:

- Whether the project is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Infrastructure under Division 5.2 of the EP&A Act;
- The significance of any impact on threatened species as defined by the *Biodiversity Conservation Act 2016* and/or *Fisheries Management Act 1994* and therefore the requirement for a Species Impact Statement, and
- The potential for the project to significantly impact a matter of national environmental significance or Commonwealth land and the need to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2 The Project

2.1 Need and Objectives of the Project

Improving transport customer experience is the focus of the NSW Government's transport initiative. In April 2019, the NSW Government outlined its key policy priorities, which included creating well-connected communities with quality local environments. The proposal assists in meeting this priority by providing the community of Mount Colah with improved access to Mount Colah Station, its surrounds and all the places that it provides connections to.

Existing accessibility

The existing footbridge was constructed circa 1909 and is in poor condition and nearing the end of its serviceable life. Access to the platforms is from the existing footbridge via stairs.

The existing footbridge structure includes two spans over the T1 Main North Line. It is located at the northern end of the station and provides pedestrian and cyclist access over the rail line and to the station platform between Pierre Close and Pacific Highway.

The existing footbridge and station do not comply with the *Disability Standards for Accessible Public Transport 2002*, as access to the footbridge and platforms is via stairs, making these areas inaccessible for wheelchairs.

The need for the proposal and objectives of the proposal have been prepared with consideration of:

- Providing value-for-money design solutions that achieve high quality low maintenance architectural and urban design outcomes that have longevity
- Providing connectivity and permeability for pedestrians
- Integrating the proposal with the surrounding area
- Maximising the amenity of the public domain
- Maximising positive view opportunities
- Designing an efficient and functional transport solution which enhances and contributes to local amenity and prosperity
- Protecting and enhancing the existing environmental and social features of the surrounding area.

2.2 Description of proposal

The Reference Design for the new Mount Colah Footbridge consists of the following key features:

- A new footbridge, with three lifts and stairs providing access to Platforms 1 and 2
- The relocation of the existing 11kV aerial line feeder
- The relocation and or protection of other existing services (both Sydney Trains owned and third party) impacted by construction and permanent works of the new footbridge
- Realignment of OHW
- Option for the relocation of existing Station Services Equipment Room (SSER) from the station building to beneath the new platform stairs
- Platform regrading and resurfacing
- Option for full platform regrading and resurfacing
- Additional station services ancillary to the upgrade of the footbridge.
- The decommissioning and demolition of the existing footbridge

Figure 2-1 Proposal area

FIG NO. 2-1 **FIGURE TITLE** Proposed Area	**DATE** 10/11/2020	0 10 20 40 60 80 Metres 1:3,000	**PAGE SIZE** A4	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30012921 **PROJECT TITLE** Mount Colah REF	**CREATED BY** FA13847	**SOURCES** Roadnet MDS 2020 public_NSW_Imagery: © Department of Customer Service 2020		

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2.2.1 Existing Structures

Existing platform

Mount Colah Station consists of a single island platform. Trains arriving on Platform 1 proceed to either Central, Richmond or Penrith, via Gordon. Trains on Platform 2 proceed to Berowra. The platform is on a curved alignment, with the platform width narrowing towards the ends. The view looking along the length of the platform towards the existing footbridge is provided in Figure 2-2. Current access to the island platform is by the existing footbridge central stairs on the northern end of the platform. The existing station entry, including the current electronic Opal ticketing is shown in Figure 2-3.

Figure 2-2 View from the southern end of the platform (facing north towards Country)

Figure 2-3 View of existing station entry and Opal ticketing (facing north towards Country)

Existing footbridge

The existing footbridge is a two-span structure located at the northern end of the station. The bridge is currently non-compliant as there is no access for less able or wheelchair-using patrons to access the platform. The existing bridge consists of a steel beams and a concrete deck superstructure, supported on steel trestles.

The existing OHW is attached to the soffit of the existing footbridge on both the Down and Up Main is shown in Figure 2-4 and Figure 2-5. The elevation of the existing footbridge, including the OHW attachments is 5.3 m. The existing footbridge also provides cross corridor access between Pacific Highway on the western side (Down Main side) and Pierre Close on the eastern side (Up Main side).

Existing structures

The existing station structure at Mount Colah Station is a small, closed building which includes an awning to provides cover from inclement weather (refer Figure 2-6). The awning extends 17 m north to south, and 10 m east to west. The station building is comprised of a staff area and provisions room and contains the SSER. These are closed in and not accessible to the public. There is also a unisex toilet located at the southern end of the structure which is accessible to the public.

Existing infrastructure

Within the project area, the existing 11kV aerial line feeder runs along on the Down Main side of the track within the rail corridor. Hornsby super structure supplies the feeder from the City Side and Cowan super structure supplies the feeder from the Country Side.

A Detailed Services Search (DSS) for the services supported on the existing footbridge is not available at the time of the reference design development. Based on a review of publicly

available Dial Before You Dig (DBYD) data, surrounding DSS plans and site visit observations, the following services were identified on the existing footbridge:

- Signalling Sydney Trains (main) supply (from Pole 26 mounted transformer)
- Signalling Ausgrid (backup) supply
- Station power supply from Ausgrid
- Telstra connection from Pacific Highway
- Telstra connection from Pierre Close
- Signalling and communications from Loc N23.48R

Figure 2-4 View of existing footbridge from platform (Down Main, facing north towards Country)

Figure 2-5 View of existing footbridge from platform (Up Main, facing north towards Country)'

Figure 2-6 Existing structure at Mount Colah Station (facing south towards City)

2.2.2 Proposed Design

The objective of the proposal is to replace the existing footbridge. Key features of the proposed design out outlined in the following sections.

Footbridge and Platform

The new footbridge would comprise of three lifts and three staircases, providing access to Pacific Highway, Mount Colah Island Platform and Pierre Close. The footbridge is positioned centrally along the platform. A two-span concrete structure is proposed for the new footbridge with an overall width of 3.6 m and a three-metre clear width between handrails. The piers and stair landings comprise of rectangular headstocks and circular columns. The existing SSER located in the station building would be relocated to beneath the platform stairs. The platform would be regraded and resurfaced. The proposed bridge plan is provided in Figure 2-7. The proposed bridge elevation is provided in Figure 2-8.

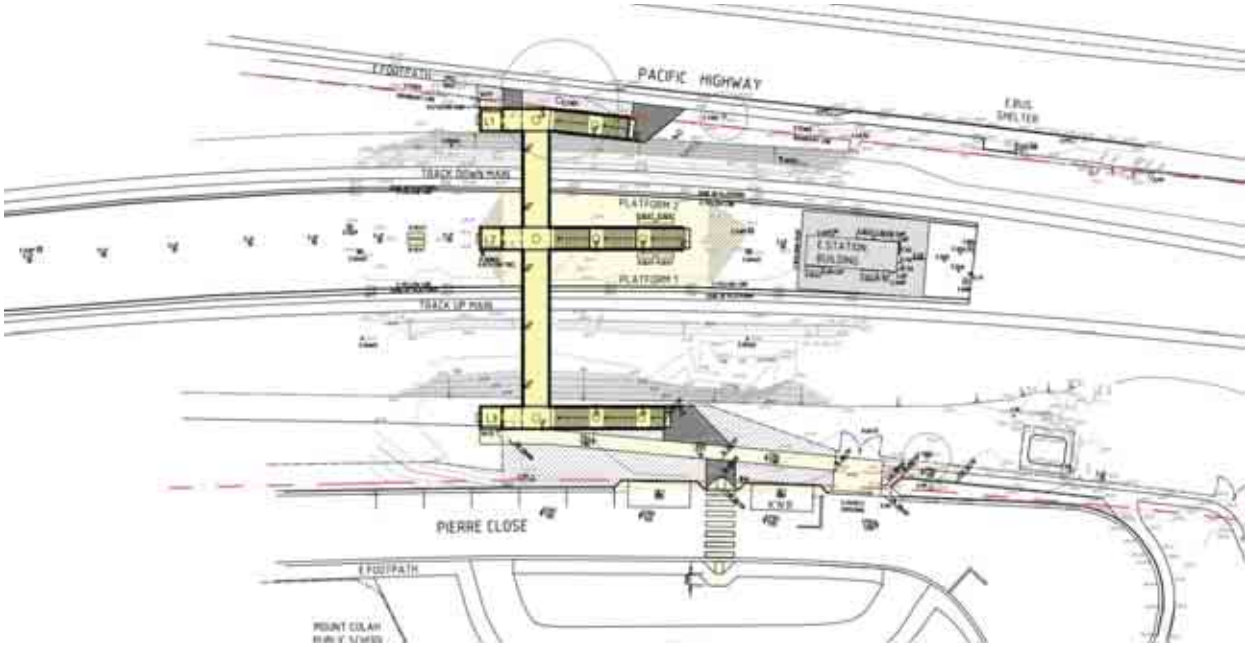

Figure 2-7 Proposed footbridge

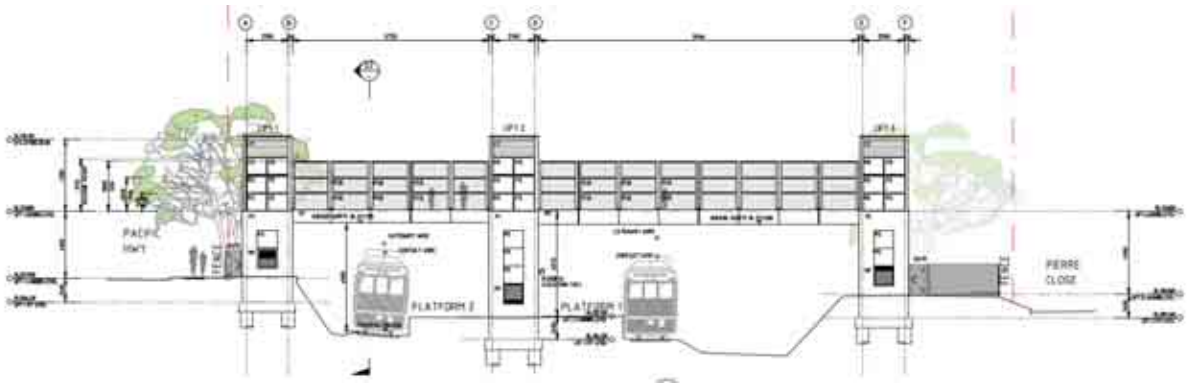

Figure 2-8 Proposed footbridge elevation (south elevation)

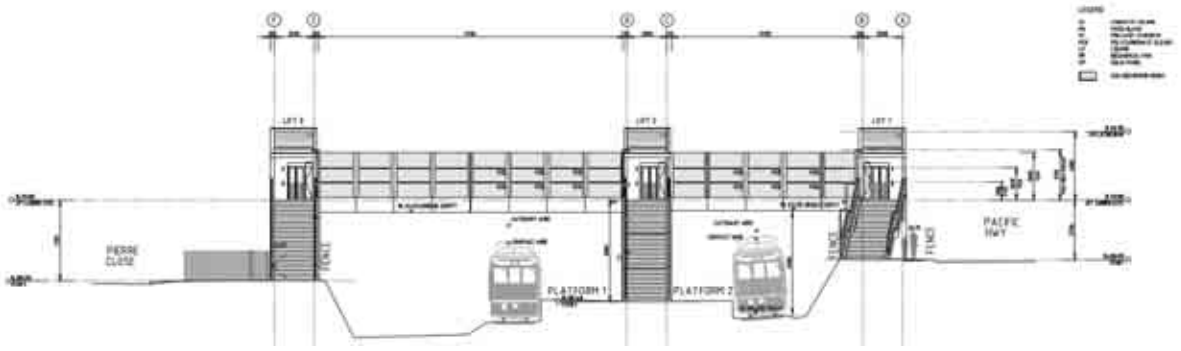

Figure 2-9 Proposed footbridge elevation (north elevation)

Safety screens

The new footbridge would include new safety screens, which would be comprised of transparent, clear polycarbonate panels.

The panels would be oriented horizontally along the length of the footbridge to highlight the span and length of the bridge superstructure (refer Figure 2-10). A vertical end polycarbonate panel is provided at the lift entries on the footbridge level to provide weather protection to the lift control panel. This would be oriented vertically to accentuate the height of the lift shaft when viewed from Pacific Highway and Pierre Close (refer Figure 2-11).

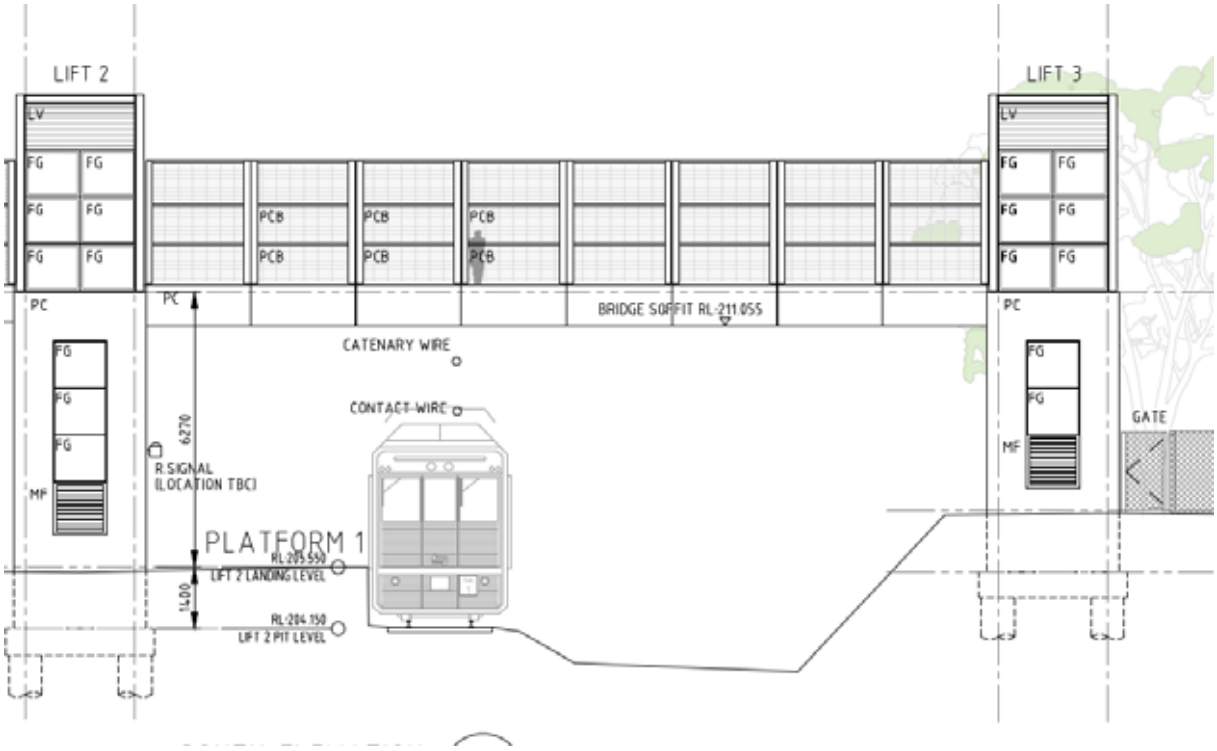

Figure 2-10 Proposed polycarbonate screens along length of the footbridge

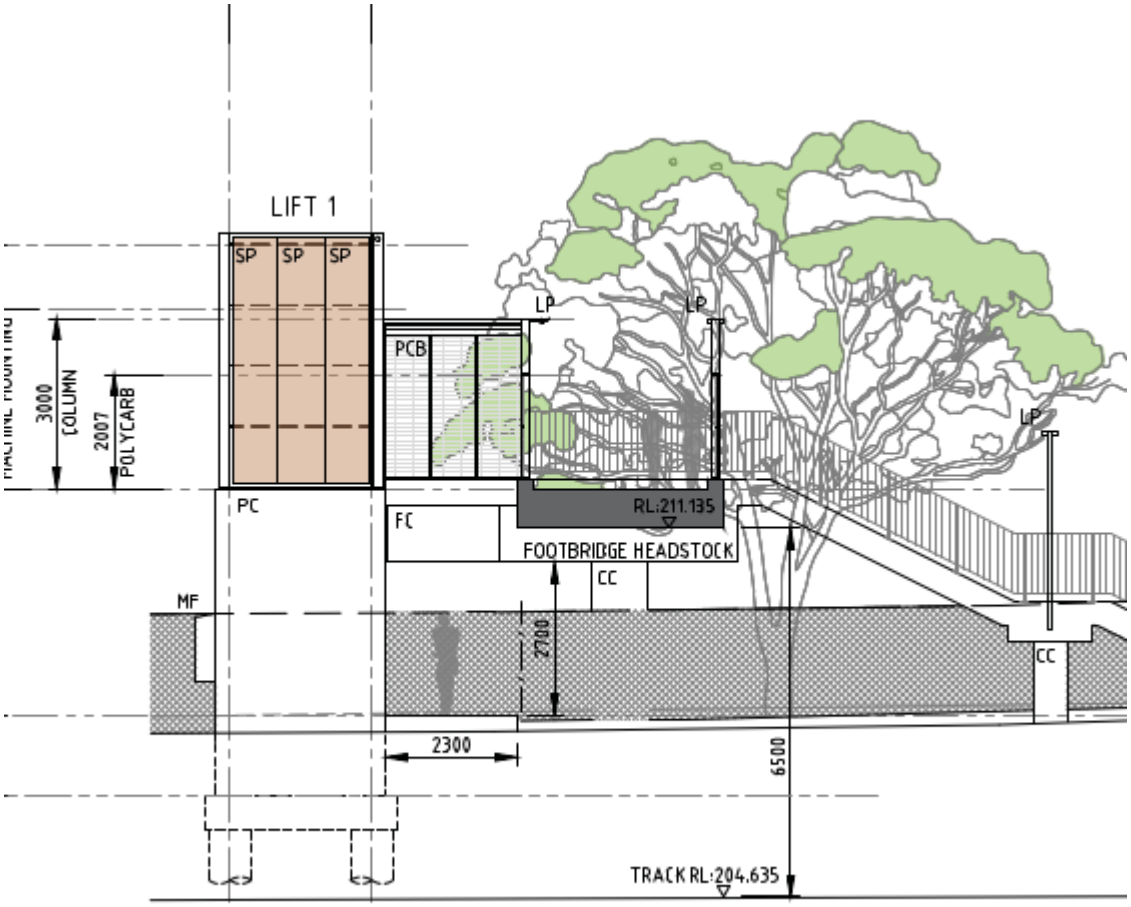

Figure 2-11 Proposed polycarbonate screens at the end of the footbridge facing west towards Pacific Highway

Lighting

The new footbridge would include an updated lighting arrangement. The areas requiring new lighting includes the footbridge, stairs, entry to lifts, ramps and platform, particularly at the lift shafts. This would provide additional safety for pedestrians and those accessing the platform via the lifts.

To make sure illuminance level can meet design criteria, lighting simulations have been modelled on overbridge, ramp and part of station platform area. As both bridge and stairs are open, pole mounted light fittings are proposed. The proposed lighting simulation is provided in Figure 2-12. The isometric view of the proposed lighting arrangement at the lift shafts is shown in Figure 2-13.

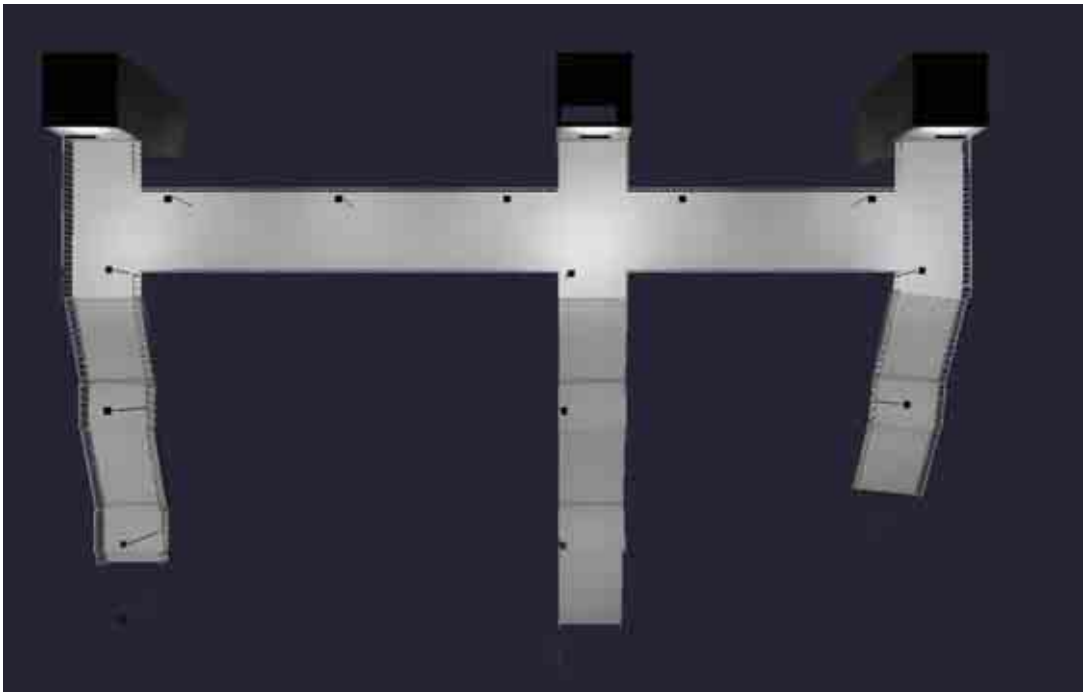

Figure 2-12 Proposed lighting layout

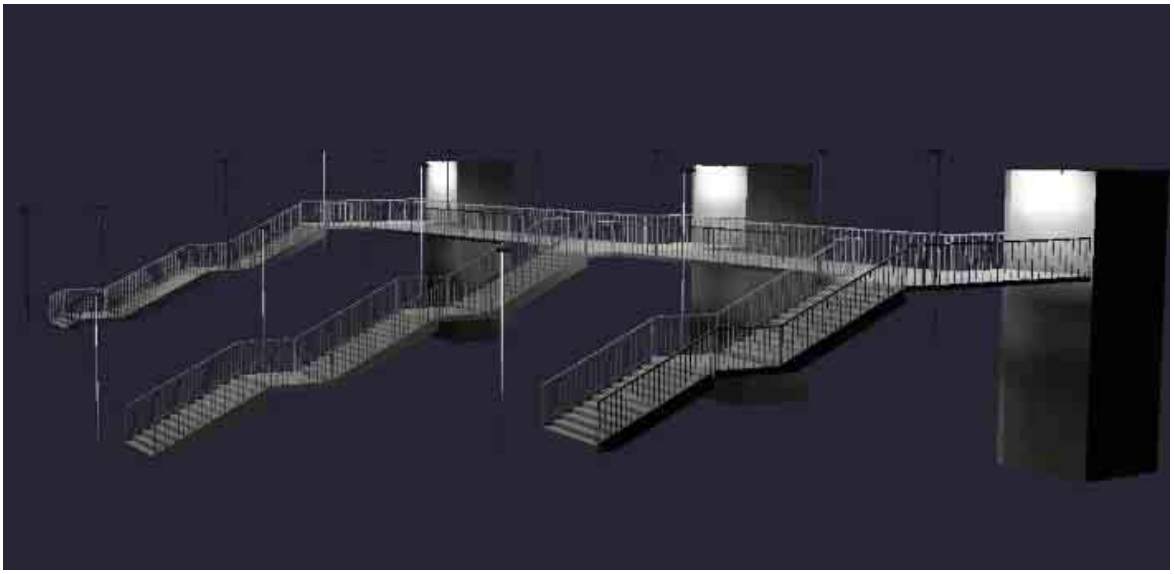

Figure 2-13 Three-dimensional view of proposed lighting

Lifts

The Reference Design provides for three separate lifts with up to 17-passenger capacity. Lift 1 and 3 would be located at the Pacific Highway and Pierre Close, respectively. These two lifts would provide access to street level and the footbridge. Lift 2 provides access to the station platform and the footbridge. All three lifts doors are positioned to provide access from the north.

The lift shafts are positioned south of the footbridge and separated from the footbridge via a 2.4 m long walkway. This positioning of the lift shaft allows for improved visibility and passive surveillance at street level (refer Figure 2-14). The separation of the lift shaft from the footbridge also improves circulation on the footbridge. The walkway provides weather

protection to the lift entry at ground level, and the small canopy provides weather protection to the lift entry at the footbridge level. Refer Figure 2-15 for the lift shaft arrangement relative to the new footbridge.

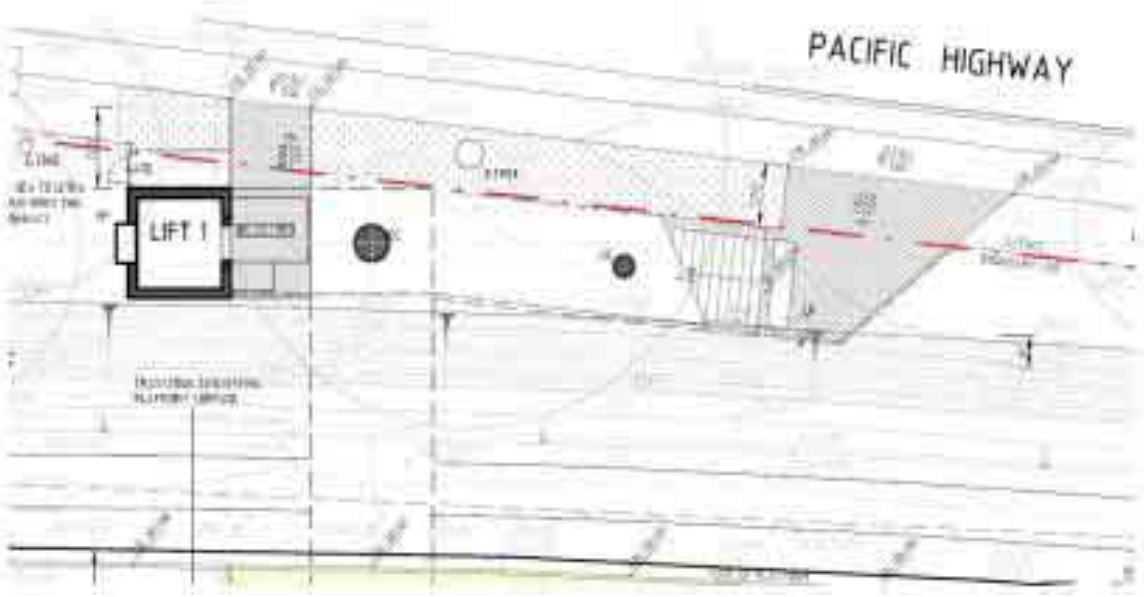

Figure 2-14 Proposed lift shaft arrangement at street level

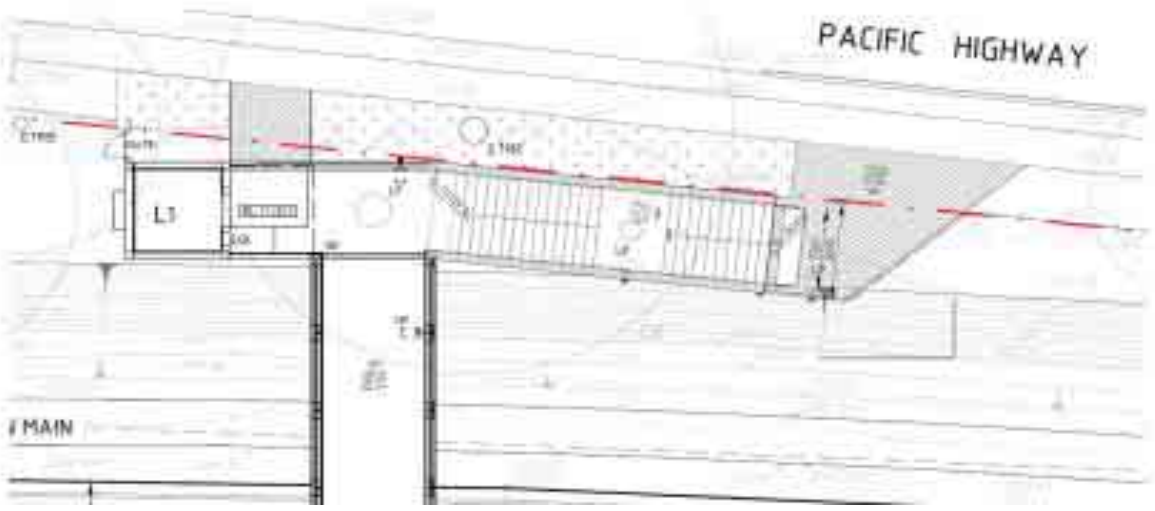

Figure 2-15 Proposed lift shaft arrangement at footbridge level

Station entry

New access paths would be provided from the Pacific Highway to the new lift and staircase on Pacific Highway. These paths would tie-in with the existing footpath. Refer to Figure 2-16 for proposed access arrangement to new footbridge from Pacific Highway.

A new path is required on Pierre Close to provide access to Lift 3 and Stair 3. The proposed path is extended from the existing footpath on the cul-de-sac at the end of Pierre Close. A new kiss ‘n’ ride and disabled car parking is proposed along Pierre Close, accessed via a new kerb ramp. The existing ground level at the rail corridor is higher than Pierre Close and

will need to be lowered to allow for accessible paths between the disabled car space, kerb ramp and kiss 'n' ride along the street to the lift and stairs. The footpath levels maintain a 2.7 m minimum headroom.

Fencing is to be modified and existing gates relocated to suit to the new public access and allow maintenance access. Figure 2-16 shows the arrangement for the new station access from Pierre Close. A site strategy and flow and zone plan has been developed to suit these new exits during the reference design.

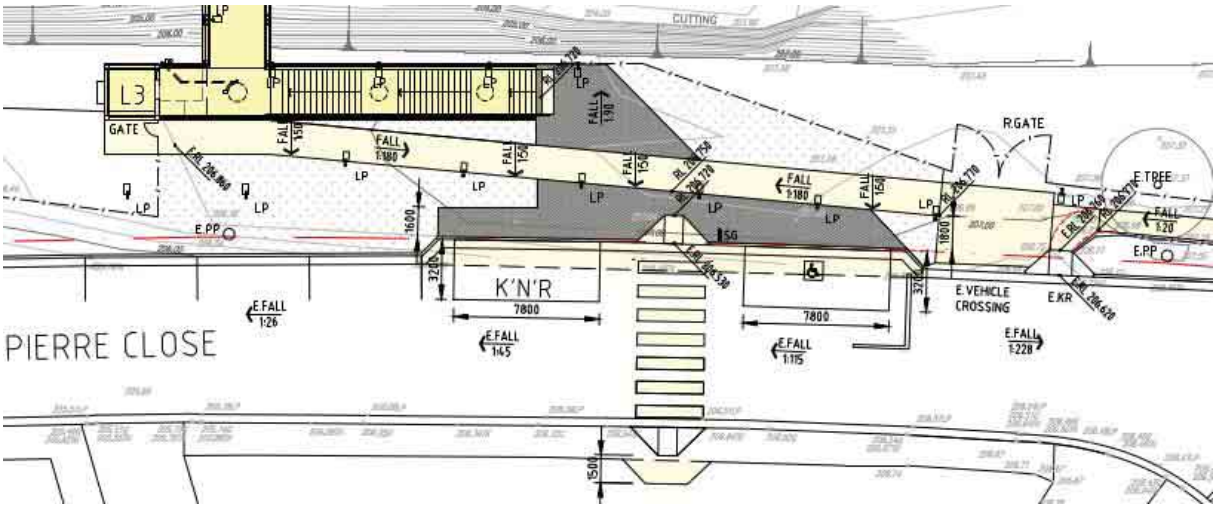

Figure 2-16 Access arrangement to Lift 3 and Stair 3 from Pierre Close (including new kiss 'n' ride and disabled car parking)

The Reference Design Report and drawings are provided as Appendix A to this REF.

2.3 Construction Methodology

There is a safety risk of materials and equipment falling onto tracks during installation. Construction staff will also be active within the rail corridor. As a result, out of hours/possession work is required for the installation of the new footbridge. Due to spatial constraints between the tracks and embankment on the western side (Down Main side), relocation works would also be carried out during possession periods in the interest of safety for construction staff.

Construction would likely require nine processions with one possession in 2022, four possessions in 2023, and four possessions in 2024. Possessions would generally occur in March, June, July, and October.

For construction, standard working hours are defined as:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sunday and public holidays: No works

Outside of standard working hours are defined as:

- Monday to Friday: 6pm to 10pm
- Saturday: 1pm to 10pm

- Sunday: 8am to 10pm

Night time working hours are defined as:

- Monday to Friday: 10pm to 7am
- Saturday to Sunday: 10pm to 8am
- Sunday to Monday: 10pm to 7am

Possession works are therefore considered to be 'night' hours.

Construction staff, plant and equipment would access the rail corridor from the east via an access gate at the northern end of Pierre Close. A site compound would be located at Lot 1, DP 1172693 located along the embankment of the eastern side (Up Main side) of the rail corridor. A second site compound would also be located at Lot 8, DP20511 and Lot 1, DP 934343 on the western side (Down Main side) of the rail corridor, at the southern end of the platform. This compound and the rail corridor would be access via the Pacific Highway. A third site compound would be located in the middle of the existing platform, immediately south of the existing tree. The proposed site layout is provided in Figure 2-17.

2.3.1 Plant and equipment

Construction would involve the following plant and equipment:

- Excavators
- Water cart
- Dump truck, bobcat, back hoe
- Concrete truck/pump
- Compressor
- Elevated work platforms
- Flatbed delivery trucks
- Generator
- Hand and power tools (electric and pneumatic)
- Lighting tower
- Crane and lifting gear
- Tactile stud machine
- Impact wretch
- Breaker
- Hi-rail and non hi-rail versions of plant and equipment (crane, excavator, telehandler, etc.)
- Vegetation removal - chipper, stump grinder, chainsaws.

2.3.2 Construction Sequencing

The proposed construction sequencing, including proposed activities, as well as plant and equipment, is provided in Table 2-1. The proposed construction sequencing is indicative only and would be confirmed once a contractor is been engaged by Sydney Trains.

Table 2-1 Proposed construction sequencing

Phase	Description	Activities	Plant and equipment
1	Out of possession/enabling works	• Clearing of vegetation • Relocate Signal and Comms Service on eastern side (Up Main side) (-28-) • Extend existing cable route to suit temporary guard indicator location (if required) • Relocate existing platform lighting and platform furniture. Install temporary platform lighting. Relocate existing platform lighting and platform furniture	• Generator • Hand and power tools (electric and pneumatic) • Flat-bed delivery trucks • Dump truck • Lighting tower
2	Out of Possession	• Construct new 11kV/415V pad mount transformer • Install galvanised steel troughing (GST)s/buried conduits for new 11kV cable route on Down side for extents outside danger zone • Install buried LV conduits from new pad mount transformer to Lift 1 for extents outside danger zone • Install buried CSR from new pits to Signal Loc N23.48R on Up Side. This can be done in conjunction with the relocation of the existing Signal and Comms (-28-) service. • Install temporary works for lift shaft construction, including temporary road barriers and fencing where required • Complete excavation and piling work for Lift 3 (Pierre Close/Up Side). Construct Up Side bridge pier and stairs.	• Hand-held saw • Excavator/Bobcat • Compactor • NDD/Super sucker Truck • Breaker
3	Possession 1	• Prepare foundation for new UGOH poles 23 and	• Excavator/Bobcat • Compactor

Phase	Description	Activities	Plant and equipment
		25 on Up Side using low profile plants. Construct new UGOH pole 23. • Install buried conduits on down side for extent within danger zone for 11kV • Erect necessary temporary hoarding/fencing around excavation.	• Concrete trucks/pumps/agitator • Crane • Piling rig
4	Possession 2	• Construct new UGOH pole 25 with traffic management on Pacific Highway • Transfer 11kV onto new underground to overhead connection and into temporary GSTs/buried conduits and commission new route	• Excavator/Bobcat • Compactor • Crane • Low height piling rig
5	Possession 3	• Commence piling for stair landing, bridge pier and lift shaft foundation on Pacific Highway/Down Side with traffic management on both Pacific Highway and Pierre Close • Erect necessary hoarding/fencing around proposed work site on platform and complete piling for stair landing, bridge pier and lift shaft foundation on platform, including drainage relocation	• Excavator/bobcat • Piling rig • Concrete trucks/pumps/agitator • Crane (if precast is used)
6	Possession 4	• Complete piling for stair landing, bridge pier and lift shaft foundation on Pacific Highway/Down Side with traffic management on both Pacific Highway and Pierre Close • Erect necessary hoarding/fencing around proposed work site on platform and complete piling for stair landing, bridge pier and lift shaft foundation on platform,	• Excavator/bobcat • Piling rig • Concrete trucks/pumps/agitator • Crane (if precast is used)

Phase	Description	Activities	Plant and equipment
		including drainage relocation	
7	Possession 5	• Erect formwork and construct the concrete portion of the lift shafts. The upper steel lift shaft frame to be prefabricated and installed with cranes located on Pacific Hwy and Pierre Close. • Erect formwork and construct bridge piers and stair supports on Pacific Highway, Pierre Close and platform with traffic management and pedestrian diversions in place. • Construct new OHWS footings	• Concrete trucks/pumps/agitator • Crane • Elevated work platforms • Excavator/bobcat
8	Possession 6	• Install precast girders into position. It is anticipated that span 1 girders will be installed with the crane located on Pacific Highway with traffic and management. Span 2 girders will be installed with the crane located on Pierre Close with traffic management. A traffic assessment/turning path assessment should be undertaken at detail design to assess the conditions on Pierre Close during construction. Pedestrian diversions will also be required. • Install conduits for services and cast in-situ deck • Install steelwork for new OHWS	• Crane • Elevated work platforms • Excavator/bobcat • Concrete trucks/pumps/agitator
9	Possession 7	• Install balustrades, safety and protection screens • Complete platform works around new footbridge (asphalting, platform furniture, lighting, CCTV, ticketing) • Install new lighting poles on footbridge • Install lifts	• Crane • Elevated work platforms • Hand-held saw • Excavator/bobcat

Phase	Description	Activities	Plant and equipment
		• Relocate guard indicator to final location and commission new guard indicator • Install conduits and pits for permanent 11kV route • Platform regrading and resurfacing • Relocation of SSER	
10	Out of possession – after possession 6	• Install new cabling for CCTV, communications, signalling LV • Install new Ausgrid isolation transformer • Commission new station power supply (main and backup) and relocated services (except signalling power) on new footbridge • Complete landscaping works • Complete new kiss and ride and new disability parking • Realign fencing and relocate access gates • Commission new footbridge	• Concrete trucks/pumps/agitator • Excavator/bobcat • Elevated work platform
11	Possession 8	• Attach OHW to new OHWS • Adjust OHW contact heights at N37+681, N37+714 and the installation of the new cantilever at N37+722 • Re-dropper bays on Down Main between N37+642 to N37+805 and on Up Main between N37+665 to N37+805 • Relocate backup signalling padmount 5kVA 240/120V from Pacific Highway to Pierre Close. • Connect and commission new Signal Loc N23.48R power supply cables (backup and main supply) • Commission permanent 11kV route	• Crane • Hand-held saw, jack hammer • Oxy-cutting equipment • Elevated work platform • Excavator/bobcat
12	Possession 9	• Demolish existing footbridge superstructure	• Crane

Phase	Description	Activities	Plant and equipment
		• Demolish existing footbridge substructure • Platform resurfacing	• Hand-held saw, jack hammer • Oxy-cutting equipment • Elevated work platform • Excavator/bobcat

Figure 2-17 Proposed site layout

FIG NO. 2-17 **FIGURE TITLE** Proposed Site Layout

DATE 0/11/2020

0 10 20 40 60 80
1:3,000 Metres

PAGE SIZE A4

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30012921 **PROJECT TITLE** Mount Colah REF

CREATED BY FA13847

SOURCES Roadnet MDS 2020
public_NSW_Imagery: © Department of Customer Service 2020

Location: \\ausyfsv003\Group\projects\30012921 - Reference Design Mt Colah FB\4 Design\Environment\GIS\Maps\30012921_F0003_PropSiteLayout.mxd

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2.4 Timing and Costing

It is anticipated that construction would commence late 2022. Sydney Trains is responsible for funding the works. The proposal would be funded from the Sydney Trains Major Periodic Maintenance Capital Funding which forms part of the Footbridge Renewals Annual Works Plan.

A breakdown of the cost per stage is provided in Table 2-2.

Table 2-2 Staging for the proposal

Staging	*Estimated cost ($AUD)*
Detailed Design	$1 500 000
Site Establishment	$350 000
Electrical Enabling Works	$2 000 000
Pacific Highway Side Works	$3 000 000
Platform Works	$3 000 000
Pierre Close Side Works	$3 250 000
Footbridge Installation	$3 000 000
Existing Footbridge Demolition	$250 000
Finishing Works	$1 000 000
Completion and Demobilisation	$150 000

2.5 Alternates Considered

As outlined in the Reference Design Report (SMEC, 2020a), the following projects have been commissioned to date by Sydney Trains for the development of the replacement footbridge design and associated enabling works:

- **Replacement Footbridge Detail Design (Jacobs, 2014):** In 2014 the proposed replacement footbridge was to be constructed to the north of the existing footbridge. The footbridge design consisted of ramp/stair access to Pacific Highway and lift/stair access to the platform and Pierre Close. This design was not preferred as it required an extension of the northern end of the existing platform. This additional construction and design was not considered to be the most efficient or economical design solution. For further details, refer to *'Mount Colah Footbridge Final Design Report', Report No. NB98036-RP-002, dated 05 November 2014.*
- **Replacement Footbridge Concept Options (GHD, 2019):** Development of four options for the replacement footbridge were developed as follow:
    - Option 1: Footbridge located centrally within the platform, south of the existing station building with ramp/stair access to Pierre Close and lift/stair access to Pacific highway and the platform
    - Option 2: Footbridge located approximately 40 m south of Option 1, with multiple mechanical lifts
    - Option 3: Footbridge at southern end of platform with multiple mechanical lifts
    - Option 4: Footbridge at northern end of platform adjacent to existing bridge

Sydney Trains selected Option 1 as the preferred option in 2017, as it would provide several key benefits due to the footbridge position within the platform, topography configurations, and

proximity to existing infrastructure. For further details, refer to *'Mt Colah Station Footbridge Concept Options Report', Report No. 2126499, Dated April 2019*

- **11kV Feeder 649/1 Relocation Option Study (AECOM, 2019):** Four concept options were provided for the relocation of 11kV Feeders 649/1 on Pacific Highway to enable the construction of the replacement Mount Colah Footbridge and avoid the non-compliance issue of bare HV conductors above the new footbridge. The four options developed were as follow:
    - Option 1 – Installation of GST adjacent to rail track
    - Option 2 – Trenching outside corridor, under pedestrian footpath
    - Option 3 – Trenching and GST inside corridor
    - Option 4 – Under bore through embankment inside rail boundary

Option 1 was the recommended option; however, Option 4 was the Sydney Train's preferred option. This due to spatial constraints within the rail corridor. Maintenance of the GST option would only be safely undertaken during a possession. This is due to the proximity of the embankment to the tracks. It was clarified in a design meeting with Sydney Trains on 20 August 2020 that Sydney Train's preference for Option 4 is to retain the pole top transformer at Pole 26, rather than the specific under bore method of construction.

2.6 Justification of Preferred Option

An investigation and assessment report (Arup, 2010) identified that the existing Mount Colah footbridge is in poor condition.

Option 4 was the preferred option for the 11kV relocation proposal. Option 4 would allow maintenance to be carried out outside of possessions and is therefore the preferential option. Option 4 also does not require additional construction associated with the extension of the existing platform. Option 1 was the preferred bridge option as it was positioned centrally along the platform and allowed for the gradient of the ramps to be designed in a gentle slope that is user friendly for the elderly, those in wheelchairs, or people pushing prams. Option 2 was chosen as the preferred following optioneering on the Ausgrid Power Supply Option, as outlined in Reference Design Report (SMEC, 2020a). This option minimises the potential clearing footprint for vegetation along the western side (Down Main side) of the rail corridor.

3 Statutory Requirements

3.1 State Environmental Planning Policies

3.1.1 *State Environmental Planning Policy (Infrastructure) 2007*

The *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T+ISEPP) Chapter 2 aims to assist in the effective delivery of public infrastructure across the State by improving certainty and regulatory efficiency through a consistent planning assessment and approvals regime for public infrastructure and services and through the clear definition of environmental assessment and approval processes for public infrastructure and services facilities.

Clause 2.92 of the T+ISEPP permits development on any land for select appropriate description the purpose of a railway or rail infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the proposal is for rail infrastructure facilities and is to be carried out by Sydney Trains, it can be assessed under Part 5 of the EP&A Act.

Chapter 2, Part 2.2 of the T+ISEPP contains provision for public authorities to consult with local councils and other agencies prior to the commencement of development, as described in Section 4.1.1.

The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NPW Act) and does not affect land or development regulated by:

- SEPP (Resilience and Hazards) 2021: Coastal Management,
- SEPP (Planning Systems) 2021: State and Regional Development,
- SEPP (Precincts – Eastern Harbour City) 2021, Chapter 2 State Significant Precincts,
- SEPP (Precincts – Central River City) 2021, Chapter 2 State Significant Precincts,
- SEPP (Precincts – Western Parkland City) 2021, Chapter 2 State Significant Precincts,
- SEPP (Precincts – Regional) 2021, Chapter 2 State Significant Precincts.

3.1.2 *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*

The *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017* (Vegetation SEPP) regulates the clearing of vegetation in non-rural areas (Greater Sydney area) and non-rural land zones. Approvals are not required for any clearing that is part of an activity carried out by a determining authority under Part 5 of the EP&A Act.

The proposal is to be carried out by Sydney Trains under Part 5 of the EP&A Act. Therefore, no approvals under the Vegetation SEPP are required for the proposal.

3.2 Local Environmental Plans

The proposal area is located in the Hornsby Shire Council, and within land zoned under the within the Hornsby LEP 2013.

The proposal is primarily located in land zoned as SP2 – Infrastructure and comprises small areas of land zoned as R2 – Low Density Residential, R4 – High Density Residential and RE1 – Public Recreation. The objectives and permissibility of activities within these land zones are outlined in Table 3-1. The land zoning relevant to the proposal is shown in Figure 3-1.

Table 3-1 Land zoning

Aspect	Activities
SP 2 – Infrastructure	
Objective	• To provide for infrastructure and related uses. • To prevent development that is not compatible with or that may detract from the provision of infrastructure.
Permitted without consent	Environmental protection works; Roads; Water reticulation systems
Permitted with consent	Aquaculture; The purpose shown on the Land Zoning Map, including any development that is ordinarily incidental or ancillary to development for that purpose
Prohibited	Any development not specified in item 2 or 3
R2 – Low Density Residential	
Objective	• To provide for the housing needs of the community within a low-density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of resident
Permitted without consent	Environmental protection works; Home occupations
Permitted with consent	Boarding houses; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dwelling houses; Educational establishments; Emergency services facilities; Exhibition homes; Flood mitigation works; Group homes; Home-based child care; Home businesses; Information and education facilities; Oyster aquaculture; Places of public worship; Pond-based aquaculture; Public administration buildings; Recreation areas; Recreation facilities (outdoor); Respite day care centres; Roads; Tank-based aquaculture; Tourist and visitor accommodation; Veterinary hospitals; Water reticulation systems
Prohibited	Backpackers' accommodation; Farm stay accommodation; Hotel or motel accommodation; Serviced apartments; Any other development not specified in item 2 or 3
R4 – High Density Residential	
Objective	• To provide for the housing needs of the community within a high-density residential environment. • To provide a variety of housing types within a high-density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents
Permitted without consent	Environmental protection works
Permitted with consent	Boarding houses; Building identification signs; Business identification signs; Centre-based child care facilities; Community facilities; Dwelling houses; Emergency services facilities; Flood mitigation works; Home-based child care; Home occupations; Neighbourhood shops; Oyster aquaculture; Places of public worship; Recreation areas; Recreation facilities (indoor); Recreation facilities (outdoor); Residential flat buildings; Respite day care centres; Roads; Shop top housing; Water reticulation systems
Prohibited	Pond-based aquaculture; Tank-based aquaculture; Any other development not specified in item 2 or 3
RE1 – Public Recreation	

Aspect	Activities
Objective	• To enable land to be used for public open space or recreational purposes. • To provide a range of recreational settings and activities and compatible land uses. • To protect and enhance the natural environment for recreational purposes. • To protect and maintain areas of bushland that have ecological value.
Permitted without consent	Environmental protection works
Permitted with consent	Aquaculture; Building identification signs; Business identification signs; Camping grounds; Car parks; Caravan parks; Cemeteries; Centre-based child care facilities; Community facilities; Emergency services facilities; Environmental facilities; Flood mitigation works; Kiosks; Public administration buildings; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Respite day care centres; Roads; Water reticulation systems
Prohibited	Any development not specified in item 2 or 3

The proposal would be carried out in the SP2 Rail Infrastructure zone and in the zone adjacent to the Pacific Highway (a State road) and Pierre Close (a local road). The proposal area is not located in a foreshore protection zone or a conservation area. The proposed works are generally consistent with the objectives of these zones as outlined in the Hornsby LEP 2013.

The T+ISEPP applies to the works and therefore the proposal can be assessed under Division 5.1 of the EP&A Act. As a result, the works would not require development consent from council.

Figure 3-1 Land zoning

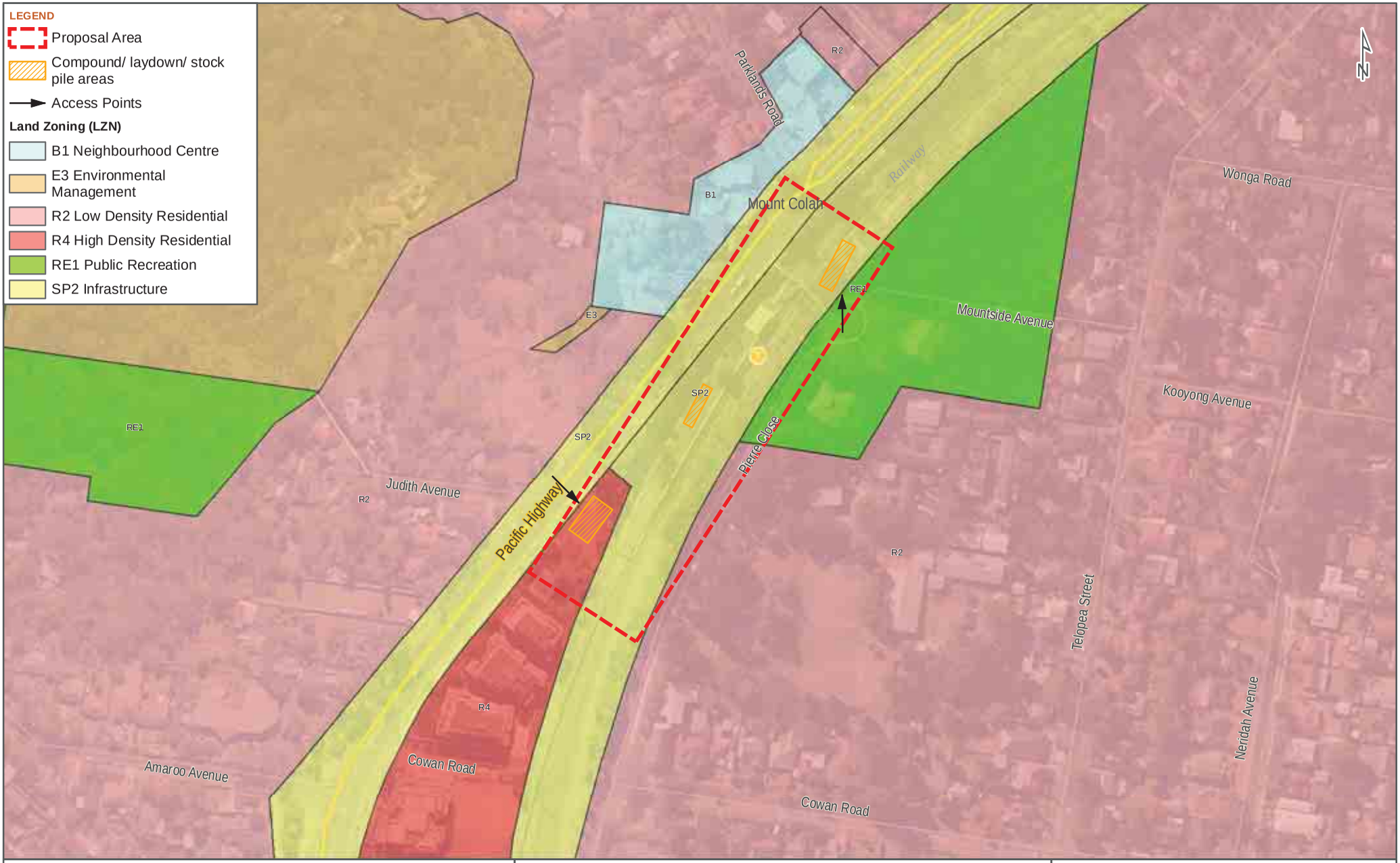

FIG NO. 3-1 **FIGURE TITLE** Land use zoning

DATE 10/11/2020

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COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30012921 **PROJECT TITLE** Mount Colah REF

CREATED BY FA13847

SOURCES Roadnet MDS 2020
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Location: \\ausyfsv003\Group\projects\30012921 - Reference Design Mt Colah FB\4 Design\Environment\GIS\Maps\30012921_F0004_LandZoning.mxd

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3.3 NSW State legislation

3.3.1 *Environment Planning and Assessment Act 1979*

In NSW, the EP&A Act and the EP&A Regulation regulate the majority of planning and environmental impact assessment requirements. Under Section 5.5 of the EP&A Act, Sydney Trains is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of its activities.

Clause 228 of the EP&A Regulation identifies factors to be considered by Sydney Trains in order to assess the likely impacts of the project on the natural and built environment in producing the REF. The clause 228 factors are considered in Section 6 of this REF.

3.3.2 *Protection of the Environment Operations Act 1997*

The *Protection of the Environment Operations Act 1997* (POEO Act) is the key piece of environmental protection and pollution control legislation in NSW. All work potentially resulting in pollution must comply with the POEO Act.

The POEO Act is administered by the NSW Environmental Protection Authority (EPA) and provides for the issue of Environment Protection Licences (EPLs) where works or activities are to be carried out which may pose a risk to the environment. Sydney Trains operates under EPL 12208. This EPL authorises the carrying out of 'railway system activities' on the NSW metropolitan rail network as defined by the premises map. Railway system activities are predominantly characterised by track and/or track related infrastructure activities (see section 3.7 below for further information).

Specifically, EPLs relate to activities listed under Schedule 1 of the Act. 'Railway systems activities' are listed under Clause 33 of Schedule 1 as scheduled activities meaning;

"The installation, on site repair, on-site maintenance or on site upgrading of track, including the construction or significant alteration of any ancillary works (including bridges) ..."

Consequently, the proposal is a scheduled activity. Sydney Trains holds an existing licence (EPL 12208) for 'railway system activities' and the proposal would be undertaken under the requirements of this licence.

The POEO Act was updated in July 2019, and as an EPL holder, Sydney Trains is required to comply with all amendments to the Act.

3.3.3 *Contaminated Land Management Act 1997*

The *Contaminated Land Management Act 1997* (CLM Act) establishes a process for investigating and remediating land where contamination presents a "significant risk of harm" to human health or the environment. It applies to contamination which occurred before or after its commencement.

Sydney Trains must consider contamination caused by past activities (including rail activities) and potential contamination from spills and leaks in developing and managing land.

There is potential for contamination to exist within the proposal area due to spills from train operation and maintenance. Under Section 60 of the CLM Act, Sydney Trains must notify the

NSW EPA if they become aware at any stage that the site has been contaminated or if they become aware that their activities have resulted in contamination of land.

This REF does not assess the demolition phase of the works and the potential for any contamination associated with the decommissioning of the bridge. The demolition of the bridge would be the subject of a separate assessment at future stage of the proposal, if approved.

3.3.4 *National Parks and Wildlife Act 1974*

The NPW Act consolidates the law concerning the establishment, preservation, conservation and management of various reserved parks and historic sites. In addition, it provides for the protection of native flora and fauna, objects of Aboriginal cultural value, and the conservation of threatened species, population and ecological communities.

Sydney Trains must consider the NPW Act carefully when proposing to carry out any actions which may occur within a national park or another area reserved or dedicated under the NPW Act, affect native flora and fauna or any threatened species, populations or ecological communities, or affect any objects of Aboriginal cultural value.

Under the NPW Act, all Aboriginal objects and places are protected, irrespective of their level of significance or matters of land tenure. The NPW Act sets up ‘strict liability’ offences for harming or desecrating Aboriginal objects and Aboriginal places (this type of offence may apply even if a person is unaware that they are harming an Aboriginal object). All persons are therefore responsible for taking reasonable precautions and exercising their due diligence to ensure that their actions will not harm Aboriginal objects. A person who exercises their due diligence has a defence against prosecution if they later unknowingly harm an object.

The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010) (the Code) provides guidance on how to identify activities that may harm an Aboriginal object or place, and to determine whether they should apply for consent to harm an Aboriginal object or place in the form of an Aboriginal Heritage Impact Permit (AHIP) under Section 90A of the NPW Act. The *National Parks and Wildlife Regulation 2009* removes the need to follow the due diligence process if you are carrying out an activity which is specifically defined as a ‘low impact activity’.

A search of the Aboriginal Heritage Information Management System (AHIMS) was undertaken 28 August 2020. Two Aboriginal objects were found within 200 m of the proposal area. In accordance with the Code, a detailed AHIMS search was carried out 1 September 2020 to locate the records. These records are over 100 m from the proposal area. The proposal does not involve works that would disturbed these records. The proposal area and associated construction footprint shown in Figure 2-17 would not encroach on the AHIMS records and further assessment is not required.

In addition, the proposal would be carried out on ‘disturbed land’. Land is disturbed if it has been the subject of human activity that has changed the land’s surface, being changes that

remain clear and observable, which is considered 'low impact' under clause 80B, section 87 (4) (4) of the *National Parks and Wildlife Regulation 2009.*

3.3.5 *Biodiversity Conservation Act 2016*

The BC Act was introduced to consolidate various pieces of legislation relating to threatened species and the environment. On commencement, the BC Act repealed the following:

- *Threatened Species Conservation Act 1995*;
- *Nature Conservation Trust Act 2001*; and
- The provisions relating to animals and plants in the NPW Act.

The BC Act seeks to conserve biological diversity at bioregional and State scales; to maintain the diversity and quality of ecosystems and enhance their capacity to adapt to change and provide for the needs of future generations; to assess the extinction risk of species and ecological communities and identify key threatening processes through an independent and rigorous scientific process; and to establish a framework to avoid, minimise and offset the impacts of proposed development and land use change on biodiversity.

Sydney Trains must identify the location of any threatened species or threatened ecological communities or areas of outstanding biodiversity value when undertaking construction and maintenance activities in or near areas in which the above mentioned are known to occur or may occur.

A Flora and Fauna Assessment has been carried out for the proposal (refer Appendix B – Biodiversity). The proposal would impact on one threatened ecological community and is further discussed in Section 5.2 of this REF.

3.3.6 *Biosecurity Act 2015*

The *Biosecurity Act 2015* (Biosecurity Act) and its subordinate legislation commenced on 1 July 2017. The Biosecurity Act replaces wholly or in part 14 separate pieces of biosecurity related legislation including the *Noxious Weeds Act 1993*. Under the Biosecurity Act, all plants, including weeds are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

The Biosecurity Act and Regulations provide specific legal requirements for high risk activities and State level priority weeds. The State level priority weeds and associated legal requirements relevant to the region are outlined in the Greater Sydney Regional Strategic Weed Management Plan 2017 - 2022 (Local Land Services, 2017) together with the high-risk priority weeds from the regional prioritisation process.

3.3.7 *Transport Administration Act 1988*

The *Transport Administration Act 1988* (TAA) provides a framework for the governance and delivery of transport services, promotes integration of the transportation system and enables effective planning and delivery of transport infrastructure and services.

Pursuant to section 98 of the TAA and clause 4 of Schedule 6A of the TAA, RailCorp, by authority of its Chief Executive or his or her authorised delegate specifies that all persons who are:

- Sydney Trains personnel who work within the Sydney Trains Maintenance Directorate; or
- Contractors engaged by Sydney Trains personnel within the Major Works Division of the Sydney Trains Maintenance Directorate,
- Are authorised to exercise the powers of entry onto land, buildings or facilities pursuant to section 98 and clause 3 of Schedule 6A to the TAA.

This power can allow Sydney Trains to enter onto, pass and repass across and carry out works on land it does not own for the purpose of exercising its functions.

The proposal area would be accessed via public roads and Sydney Trains access gates. There may be temporary closures of Council-controlled footpaths along the Pacific Highway and Pierre Close during construction only. Additional access to land, buildings and facilities outside of Sydney Trains control would not be required.

3.3.8 *Roads Act 1993*

The *Roads Act 1993* (Roads Act), commenced on 1 July 1993 and superseded the roads provisions of the *Crown and Other Roads Act 1990*, the *State Roads Act 1986*, the *Local Government Act 1919*, the *Public Gates Act 1901* the *Width of Roads and Lanes Act 1902* and the *Traffic Safety (Lights and Hoardings) Act 1951*.

It sets out procedures for opening and closing public roads, and establishes the authorities responsible for roads, i.e. the TfNSW Roads and Maritime Service, the council of a local government area, Lord Howe Island Board or Crown Lands on behalf of the Minister Administering the *Crown Lands Act 1989*. Key Provisions include:

- Road opening/closing applications made before 1 July 1993 will continue under the provisions of the prior Act which created them
- Road opening applications by councils will be lodged directly with NSW Land Registry Service (LRS)
- Only roads authorities may apply to close a road. Applications must be made to Crown Lands.

The Transport Management Centre (TMC) on behalf of TfNSW (formerly Roads and Maritime Services) assesses, manages and issues Road Occupancy Licence Applications. A road occupancy consists of any activity likely to impact on the operational efficiency of the road network, in other words, an activity that requires the road to be used in such a way as to affect traffic flow, or an off-road activity that affects traffic flow. A road occupancy may involve the closure of traffic lane/s.

Examples of road occupancies are:

- Road maintenance such as re-surfacing, or line-marking
- Lane closures around a building site (as a hazard reduction) or to get cranes or other equipment in and out

Obtaining an ROL for the specified activities is a legal requirement under Section 138 of the Roads Act and would be required for the construction of the proposal.

3.3.9 *Waste Avoidance and Resource Recovery Act 2001*

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) sets out the priorities and mechanisms by which waste reduction is to be achieved in NSW. The waste hierarchy is a set of priorities for the efficient use of resources; this underpins the objectives of the WARR Act. The waste hierarchy is:

1. Avoidance including action to reduce the amount of waste generated by households, industry and all levels of government
2. Resource recovery including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources
3. Disposal including management of all disposal options in the most environmentally responsible manner

The WARR Act requires the development of a waste strategy for NSW, which is contained in the current NSW Waste Avoidance and Resource Recovery Strategy 2014 – 2021 (Waste Strategy 2014). The Waste Strategy 2014 provides guidance for key industry, local government and State agencies and groups to assist in the minimisation of environmental harm from waste disposal and the conservation and efficient use of resources.

The waste hierarchy and the provisions of the Waste Strategy 2014 have been considered as part of the REF.

3.4 Commonwealth Legislation

3.4.1 *Environment Protection and Biodiversity Conservation Act 1999*

Matters of National Environmental Significance (MNES) are protected under the EPBC Act and Sydney Trains must not take an action that has, will have or is likely to have a significant impact on any MNES without approval from the Commonwealth Minister for the Environment. An action is a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things.

MNES are considered further in Section 6.

The assessment of the project's impact on MNES and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of NES. Accordingly, the proposal has not been referred to the Australian Government Department of the Environment.

3.4.2 *Native Title Act 1993*

The NT Act provides a framework for the determination of native title claims within Australia, and for negotiations and decision making regarding the use and management of native title lands and waters. Exclusive rights to land are only available on certain unallocated or vacant Crown lands.

A Native Title Registrar is responsible for maintaining three Registers under the NT Act: the National Native Title Register, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements. Exclusive rights to land are only available on certain unallocated or vacant Crown lands.

There are no Native Title claims over the proposal area (refer Appendix D).

3.5 Ecologically Sustainable Development

Ecologically sustainable development (ESD) entails using, conserving and enhancing the community's environmental resources in a manner that sustains and improves ecological processes, and hence the quality of life, for present and future generations.

Section 5(2)(e) of the TAA states that an objective of Sydney Trains is that where its activities affect the environment, it must conduct its operations in compliance with the principles of ESD contained in section 6 (2) of the *Protection of the Environment Administration Act 1991.*

Section 6(2) of the POEO Act requires compliance with the following four principles of ecologically sustainable development, where an activity affects the environment.

1. **The precautionary principle:** For example, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. **Inter-generational equity:** The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
3. **Conservation of biological diversity and ecological integrity** should be a fundamental consideration of the decision to undertake the activity.
4. **Improved valuation, pricing and incentive mechanisms:** For example, the users of goods and services should pay prices that include the use of natural resources and assets and the ultimate disposal of any waste generated by the provision of that good or service, and that environmental goals, having been established, should be pursued in the most cost-effective way.

Sydney Trains is committed to ensuring that its projects are consistent with the principles of ecologically sustainable development. The principles of ESD have therefore been an integral consideration in the project. Table 3-2 outlines the how the principles of ESD have been applied to the proposal.

Table 3-2: The principles of ESD applied to the proposal

ESD Principle	*Application to the Project*
Precautionary principle	The proposal does not pose a risk of serious or irreversible environmental damage. Adverse impacts associated with the proposal would be minor. Measures to reduce adverse impacts as far as practicable have also been identified within this REF
Intergenerational equity	The proposal is expected to contribute towards regional strategic benefits for future generations, including improved public

ESD Principle	Application to the Project
	transport, assuming the proposal encourages modal shift towards public transport.
Conservation of biological diversity and ecological integrity	This REF includes an assessment of the clause 170 EP&A Regulation factors that broadly consider biological diversity and ecological integrity of the proposal area. The proposal area is located in an urban area. Native vegetation would be removed from the proposal area. However, extensive mitigation measures is proposed to reduce the significance of the loss of biodiversity or ecological integrity.
Improved valuation and pricing of environmental resources	Sydney Trains recognises the value of environmental resources and aims to minimise the impacts of its activities by ensuring that appropriate mitigation measures are implemented for all aspects of the proposal.

A detailed climate change risk assessment is not required for the proposal. Generally, the projected effects of climate change for the Sydney region include increased maximum temperatures, and drier periods of less frequent rain, coupled with higher intensity downpours. It is unlikely the proposal would be impacted by these projections. The proposal is not located on flood liable land. There are no drainage structures that will need to account for increased storm intensity. There are no large overhead structures (such as stays) that will need to consider changes to wind loading associated with changes in storm intensity. For these reasons, no further climate change risk assessment is required for the proposal.

3.6 Licences, Approvals and Permits

Sydney Trains operates the metropolitan train network under EPL 12208 issued under the POEO Act, administered by the NSW EPA. EPL 12208 authorises the carrying out of rail systems activities on the NSW Rail Network as defined by the TAA.

The proposed works fall within the scope of Sydney Trains EPL 12208. No variations to this licence are required. The EPL contains requirements for contractors to implement reasonable and feasible noise mitigation and management measures to minimise any offensive noise likely to be generated by construction activities. This is discussed further in Section 5.5 of this REF.

As described in Section 3.3.2, these activities include “the installation, on site repair, on-site maintenance or on site upgrading of track, including the construction or significant alteration of any ancillary works”. Schedule 1(33)(5) defines ‘ancillary works’ as including bridges and over track structures. The proposal involves the construction of a new footbridge, which is considered as ‘ancillary work’.

3.7 Summary of Statutory Requirements

Table 3-3 summarises the statutory requirements for the proposal.

Table 3-3 The statutory requirements relevant to the proposal

Aspect	*Legislation*	*Section/Clause*	*Approval authority*	*Comment*
Planning Pathway	EP&A Act	Part 5	Sydney Trains	Sydney Trains is the Determining Authority for this REF
	T+ISEPP	Subdivision 1, section 2.92	Sydney Trains	Railway Infrastructure
Licensing	EPL 12208		NSW EPA	Railway Systems Activity.
Other approvals	Roads Act	Section 138	Roads and Maritime Services	Temporary road closures

4 Consultation

Consultation is undertaken as a means of ensuring that stakeholders are informed of the project and their concerns are taken into consideration and addressed where relevant, practical and feasible. Consultation with external organisations aims to ensure that requirements for both Sydney Trains and other participants are clearly understood, and that the assessment process and decisions made are transparent.

4.1.1 Transport and Infrastructure SEPP Consultation

The *State Environmental Planning Policy (Transport and Infrastructure) 2021* (T+ISEPP) contains provisions for public authorities such as Sydney Trains to consult with local councils and other public authorities prior to the commencement of certain types of development. Sydney Trains must take consideration of any responses received within 21 days after notification. A summary of the T+ISEPP consultation requirements is detailed below in Table 4-1.

Table 4-1 Summary of Infrastructure SEPP consultation

Is consultation with council or other agencies required under clauses 13-16 of the T+ISEPP?	
Are the works likely to have a substantial impact on the stormwater management services which are provided by council? Agency – Hornsby Shire Council	No The proposal would not involve any connection to or impact on stormwater management services provided by the council.
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area? Agency – Hornsby Shire Council	No Construction activities associated with the proposal would involve works within the rail corridor and adjacent council-managed footpaths along the Pacific Highway and Pierre Close, Mount Colah. It is likely that construction would involve temporary closures of the Pacific Highway and adjacent footpath. However, this would be temporary in nature and managed through an ROL. As a result, it is unlikely that the proposal would place a strain on the road system in the LGA. Construction plant, equipment and staff would access the site via existing, formalised roads and gates. The proposed site compounds and stockpiles would be located within the rail corridor.
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system? Agency – Hornsby Shire Council	No The works would not involve connection to council-owned sewage systems.
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water? Agency – Hornsby Shire Council	No The works would not involve connection to council-owned sewage systems.

Is consultation with council or other agencies required under clauses 13-16 of the T+ISEPP?	
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow? Agency – Hornsby Shire Council	No Construction of the proposal would likely involve temporary closures of footpaths and roads. Mount Colah station would remain operational throughout the works, and construction activities would occur during weekend possessions. However, there would be not closures of public structure or public space.
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance? Agency – Hornsby Shire Council	No The proposal may involve minor excavation of roads and footpaths.
Are the works located on flood liable land? If so, will the works change flooding patterns to a more than minor extent? Agency – Hornsby Shire Council	No The proposal is not located on flood liable land.
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential? Agency – Hornsby Shire Council	No Mount Colah Railway Station is not listed on any local, State or Commonwealth heritage registers. There is one local listed heritage item located in proximity to the replacement footbridge. The nearest local heritage item listed on the Hornsby LEP 2013 is Item 582 - Mount Colah Public School – grounds (excludes the buildings). This item is adjacent to the proposal area along Pierre Close. The item includes the school grounds only and excludes any buildings. The proposal would be confined to the existing road and rail corridor and would not impact on this heritage item.
Are the works adjacent to a national park, nature reserve or other area reserved under the *National Parks and Wildlife Act 1974?* Agency – Office of Environment and Heritage	No Kur-ring-gai Chase National Park is located about 500 m west of the proposal. The national park is separated from the proposal area by residential development and the Pacific Motorway, which is a major road corridor and heavy haulage route.
Are the works adjacent to a declared aquatic reserve under the *Marine Estate Management Act 2014?* Agency –	No The proposal is not located within or adjacent to aquatic reserve. The proposal is located at least four kilometres from the Cowan Creek, which forms part of the Hawksbury marine area.
Are the works adjacent to a declared marine park under the *Marine Parks Act 1997?* Agency – Marine Parks Authority	No The proposal involves works at the Mount Colah Station, which is within the disturbed rail corridor. The proposal is located at least four kilometres from the Cowan Creek, which forms part of the Hawksbury marine area.

Is consultation with council or other agencies required under clauses 13-16 of the T+ISEPP?	
Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998?* Agency –	No The proposal is not located in the Sydney Harbour Foreshore Area
Do the works involve the development of a fixed or floating structure in or over navigable waters? Agency –	No The proposal does not involve the development of any fixed or floating structures
Are the works for the purpose of residential development, as educational establishment, a health services facility, a correctional facility or group home in an area that is bush fire prone land? Agency –	No The proposal is located within land mapped as bush fire prone. However, the proposal does not involve any of the relevant establishments.

4.1.2 Other Agency and Community Consultation

Table 4-2 summarises the key proposal stakeholders that have been identified during the development of the Reference Design.

Table 4-2: Key stakeholders

Stakeholder	*Interface*
Sydney Trains	Sydney Trains is the primary stakeholder, as the asset maintainer and operator. Consultation with Sydney Trains is via design reviews facilitated by Sydney Trains' Design Delivery Manager (DDM).
Ausgrid	Local network service provider. Consultation with Ausgrid is required for any changes to the Ausgrid LV network and for changes to the fibre optic pilot cable that is supported on 11kV 649 Feeder Poles 24 and 25. Initial consultations with Ausgrid is undertaken by SMEC during the reference design phase.
Telstra	Telecommunications provider for Mount Colah Station. Consultation with Telstra is required for proposed modifications to the existing service from Pierre Close and Pacific Highway. Initial consultations with Telstra will be undertaken by SMEC during the reference design phase.
Hornsby Shire Council	Local governing body for Hornsby Shire. Consultation is required with council for impacts to existing footpaths and local roads during construction works and for modifications to the station precinct i.e. new proposed disability parking and kiss 'n' ride on Pierre Close. As agreed at the project kick off, consultation with council will be undertaken by Sydney Trains.
Sydney Water	Consultation with Sydney Water is required during detail design for assessment of construction impacts on the existing Sydney Water service on Pacific Highway.
Roads and Maritime Services	Coordination with TfNSW Roads and Maritime services will be required during construction for temporary road closures and impacts to Pacific Highway.

5 Environmental Impact Assessment

5.1 Assessment of Applicable Environmental Factors

A scoping exercise has been completed for the proposal. The scoping exercise has considered the potential environmental impacts of the project to identify those environmental factors requiring environmental impact assessment within this REF. The environmental factors relevant to the project are summarised in Table 5-1. For environmental factors that do not require further environmental assessment standard control measures are identified in Section 7 of this REF.

Table 5-1: Applicable Environmental Factors

Environmental Factors	*Comments*	*Detailed discussion in REF?*		*Where?*
Landforms, geology and soils	The proposal would involve excavation works along embankments adjacent to the Pacific Highway. A specialist geotechnical report has been prepared to investigate landforms, geology and soils and is located in Appendix G of this REF.	Yes	☒	Section 5.4 and Standard control measures in Section 7 of this REF
		No	☐	
Water quality and hydrology	The nearest water body to the proposal is about 200 m west of the proposal area. It is an ephemeral creek and is separated from the proposal area by the Pacific Highway. The proposal would not alter the existing drainage and hydrology at Mount Colah Station. There are no other water sources or natural waterways such as rivers or lakes near the footbridge. As a result, further assessment of impacts to this environmental factor is not required.	Yes	☐	Standard control measures in Section 7 of this REF
		No	☒	
Air quality	There is the potential for minor impacts on air quality due to construction activities such as dust.	Yes	☒	Section 5.8 and Standard control measures outlined in Section 7 of this REF
		No	☐	
Biodiversity	The embankments on both sides of the station are vegetated. The vegetation is a mix of regrowth, natives and exotic species. Vegetation consistent with Duffys forest threatened ecological community is located on the western	Yes	☒	Section 5.2 and Standard control measures in Section 7 of this REF
		No	☐	

Environmental Factors	Comments	Detailed discussion in REF?		Where?
	embankment and Sydney North Exposed Sandstone Woodland is located on the eastern embankment. The proposal would require the clearing of this vegetation for the installation of the new footbridge, and for the relocation of services. Refer to Appendix B for the specialist Flora and Fauna Assessment (FFA) and Section 5.2 of this REF for the biodiversity assessment.			
Noise and vibration	The proposal involves the replacement of the existing footbridge. The activities assessed in this REF are not expected to permanently alter the existing noise environment of the locality. A noise and vibration assessment of construction activities was prepared using the Sydney Trains Quantitative Construction and Maintenance Noise and Vibration Quantitative assessment tool. The assessment was used to evaluate the potential impact of the proposed works on the local environment. The full noise assessment can be found at Appendix F of this REF. The construction of the proposal would generate noise that would negatively impact the local community. Several safeguards; including strategic constructions staging, selection of quieter plant and equipment and notification to receivers 250 m of the proposal area have been development to mitigate these impacts.	Yes No	☒ ☐	Section 5.5 and Standard control measures in Section 7 of this REF
Aboriginal heritage		Yes	☐	

Environmental Factors	Comments	Detailed discussion in REF?		Where?
	A basic AHIMS search was carried out for the proposal area (28 August 2020) (Appendix D). There are two AHIMS records identified within 200 m of the proposal. A detailed AHIMS search was carried out to locate the sites. Both records are located about 100 m north of the proposal area, within the rail corridor. The proposal is located within the existing rail corridor, which is heavily disturbed. The works would not involve activities in areas outside of the proposal area and would not encroach on the AHIMS records to the north.If approved, the project Construction Environmental Management Plan (CEMP) would include the implementation of Unexpected Finds Procedures (listed in Section 7) to mitigate any potential impact to Aboriginal heritage.	No	☒	Standard control measures in Section 7 of this REF
Non-Aboriginal heritage	There are no other heritage listings for the proposal area on the State heritage register (SHR), LEPs and Commonwealth Heritage list. As the works are maintenance works and would not involve alterations to the heritage item, the potential impacts are negligible. No further specialist assessment is required for the works. The nearest local heritage item listed on the Hornsby LEP 2013 is Item 582 - Mount Colah Public School – grounds (excludes the buildings). This item is adjacent to the proposal area along Pierre Close. The item includes the school grounds only and excludes any buildings. The proposal would be confined to the existing road and rail corridor and would not impact on this heritage item.	Yes	☐	Standard control measures in Section 7 of this REF
		No	☒	
		Yes	☐	

Environmental Factors	*Comments*	*Detailed discussion in REF?*		*Where?*
Waste management	The waste hierarchy is a set of priorities for the efficient use of resources; this underpins the objectives of the WARR Act. The waste hierarchy is: 1. Avoidance including action to reduce the amount of waste generated by households, industry and all levels of government 2. Resource recovery including re-use, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources 3. Disposal including management of all disposal options in the most environmentally responsible manner Waste associated with the proposal would be managed in accordance with the POEO Act and WARR Act.	No	☒	Standard control measures in Section 7 of this REF
Contaminated land and hazardous materials	A search of the relevant databases was carried out 1 September 2020. The proposal is not located within 100 m of any listed contaminated sites (Appendix C of this REF) or listings on the National Pollutant Inventory or NSW Contaminated Sites Register. The details of these searches are discussed in Section 5.4. There is a risk that the existing footbridge has been treated with lead paint in the past. However, as assessment of the demolition of the existing footbridge is outside the scope of this REF.	Yes No	☐ ☒	Standard control measures in Section 7 of this REF
		Yes	☒	

Environmental Factors	*Comments*	*Detailed discussion in REF?*		*Where?*
Visual aesthetics and urban design	The proposal would alter the existing visual aesthetic. A specialist Urban Design Report and Landscaping Plan has been prepared to assess the impacts of the proposed changes. The full report can be found at Appendix E of this REF.	No	☐	Section 5.2 and Standard control measures in Section 7 of this REF
Socio-economic effects	There are several community facilities adjacent to the proposal area. The proposal would have minor adverse impact to the community facilities during the construction stage of the works. However, the proposal would have a net positive socio-economic impact due to increased connectivity and accessibility of the station.	Yes	☒	Section 5.7 and Standard control measures in Section 7 of this REF
		No	☐	
Traffic and access	The proposal would involve temporary closures or restrictions to traffic and access. Once operational, the proposal would have a positive impact of accessibility at the station for less mobile passengers and the elderly.	Yes	☒	Section 5.6 and Standard control measures in Section 7 of this REF
		No	☐	
Demand on resources	The proposal would adopt the Resource Management Hierarchy principles embodied in the WARR Act. The proposal would not require the use of any resources that are or are likely to become in short supply. It is unlikely that the proposal would substantially diminish local supplies or incur high transportation costs.	Yes	☐	
		No	☒	Standard control measures in Section 7 of this REF
Cumulative environmental effects	The cumulative impacts of other projects in the locality have been considered in this REF. Based on the proposed construction program, it is unlikely that the works would induce any significant cumulative impacts.	Yes	☒	Section 5.9 and Standard control measures in Section 7 of this REF
		No	☐	

5.2 Biodiversity

A specialist Flora and Fauna Assessment (FFA) was prepared by Land Eco Pty Ltd (Land Eco) for the proposal. The full FFA can be found at Appendix B of this REF. The following section is a summary of that report.

A site assessment was undertaken on 26 May 2022 to focus on the following:

- identification of threatened ecological communities (TECs)
- threatened species and priority weeds
- identification of threatened fauna habitat such as nesting, roosting or foraging microhabitats and opportunistic fauna species sightings
- targeted habitat surveys of the following habitat values of trees proposed for removal:
    - tree hollows
    - caves and crevices
    - termite mounds
    - soaks
    - wetlands
    - drainage lines
    - fruiting trees
    - flowering trees
    - trees and shrubs supporting nest structures
    - any other habitat features that may support fauna

A desktop biodiversity assessment was carried out for the proposal. Databases and literature reviewed as part of the desktop biodiversity assessment include:

- A search of the BioNet Atlas of NSW Wildlife Database (OEH, 2018) based on a 10-kilometre radius around the proposal area
- A search of the Commonwealth Department of the Environment and Energy (DoEE) Protected Matters Search Tool (PMST) (DoEE 2018b) based on a10 km radius around the proposal area
- Review of the NSW Sharing and Enabling Environmental Data spatial portal Vegetation Map - Hornsby LGA 2008 - VIS 4471 (21 October 2020)
- A search of the Atlas of Living Australia Spatial Viewer (https://spatial.ala.org.au/)
- A search of the National Flying-fox monitoring viewer accessed by the Department of the Environment Interactive Flying-fox Web Viewer (15 September 2020)
- Sydney Trains Environmentally Sensitive Sites list (update October 2020)

5.2.1 Existing Environment

The proposed works are planned to occur within the rail corridor, which is largely cleared of vegetation and limited potential fauna habitat. The proposal is adjacent to predominately urban and residential areas and bounded by the road corridors of the Pacific Highway to the west, and Pierre Close to the east.

No threatened flora species were found on the proposal area during the site assessment undertaken for the FFA (Appendix B). The proposal area was found to be disturbed and

severely weed-infested. However, there was a section between Pacific Highway and the rail corridor that has lower weed infestation and was therefore in good condition.

Biodiversity searches

The BioNet search identified 65 threatened terrestrial species within 10 by 10 km grid centred on the proposal area, including:

- 24 threatened flora species
- 15 threatened mammal species
- 22 species of terrestrial birds.

The BioNet search identified that nine threatened bat species have been recorded within the search area, all considered Vulnerable under the BC Act. Of these, the Large-eared Pied Bat (*Chalinolobus dwyeri*) and the Grey-headed flying fox (*Pteropus poliocephalus*) are considered Vulnerable under the EPBC Act. These species include:

The results of the PMST search are shown in Table 5-2.

Table 5-2 Protected Matters Search – 10 km

Protected Matter	Status
World Heritage Properties	None
National Heritage Places	1 - Ku-ring-gai Chase National Park, Lion, Long and Spectacle Island Nature Reserves
Wetlands of International Important	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	9
Listed Threatened Species	86
Listed Migratory Species	42

Invasive species

The PMST search identified 20 weeds of national significance (WoNS), along with other introduced plants that are considered to pose a particularly significant threat to biodiversity.

Vegetation Communities

The proposal area contains a severely weed-infested patch of native vegetation occurring in ‘Remnant’ (structurally complete) and ‘Part clear’ (remnant native canopy absent) condition. The following distinct vegetation communities are within the proposal area (refer Figure 5-1):

- PCT 1783 – Red Bloodwood – Scribbly Gum / Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast(Sydney North Exposed Sandstone Woodland)
- PCT1786 – Red Bloodwood – Silvertop Ash Stringybark open forest on ironstone in the Sydney region (Duffys Forest)

Figure 5-1 Vegetation mapping of the proposal area

Sydney North Exposed Sandstone Woodland

PCT 1783: Sydney North Exposed Sandstone Woodland is shown in yellow in Figure 5-1 and was dominant across the eastern and northern ends of the proposal area. The vegetation community was found to have the following features:

- The canopy was dominated by *Eucalyptus haemastoma* and *Corymbia gummifera* with *Eucalyptus punctata* over a diverse suite of *Acacia spp*.
- The following species were present:
    - *Allocasuarina littoralis*
    - *Angophora hispida*
    - *Pittosporum undulatum*
    - *Banksia oblongifolia*
    - *Kunzea ambigua*
    - *Hakea dactyloides*
    - *Grevillea sericea*

The ground layer was similarly diverse with a range of native grasses, forbs and herbs. The southern extent of this PCT was severely weed infested and this infestation became less prevalent further north, where the soil strata was less disturbed, less nutrient-rich and more typical of a natural sandstone ridgetop soil

Figure 5-2 Sydney North Exposed Sandstone Woodland on the upline (south facing) railway line

* Note for photo on the left: The dense African Love Grass (*Eragrostis curvula*) and Lantana (*Lantana camara*) weeds in the background. Weed severity was most intense in the southern extent (pictured).

* Note for photo on the right: The extent photographed was located toward the northern portion of the upline vegetation clearing extent. Weed severity was lower in this part of the vegetation extent.

PCT 1786: Duffys Forest

All the vegetation in the proposal area qualifies as 'Duffys Forest Ecological Community in the Sydney Basin Bioregion Endangered Ecological Community' (Duffys Forest EEC). This is shown in red in Figure 5-1.

- The canopy was dominated by Silver-top Ash (*Eucalyptus sieberi*)
- The following species were present:
    - *Eucalyptus haemastoma*
    - *Angophora costata*
    - *Allocasuarina littoralis*
    - *Acacia longifolia*
    - *Acacia suaveolans*
    - *Acacia linifolia*
    - *Acacia myrtifolia*
    - *Hakea dactyloides*
    - *Grevillea sericea.*

The ground layer was dominated by a dense layer of *Pteridium esculentum* and *Imperata cylindrica* with *Xanthorrhoea media* and *Entolasia stricta* among a diverse suite of fern, forb, low shrub, grass and sedge groundcover.

There is limited habitat available for Duffys Forest EEC in Mount Colah because the suburb only contains a small area of geology/soils that typically that supports the laterised Hawkesbury Sandstone geology required to support the EEC, as shown in Figure 5-3. This geology is limited to the narrow ridge-top of Mt Colah and is absent from the surrounding slopes and gullies.

Figure 5-3 Weathered laterised Hawkesbury Sandstone gravel and pebbles in the proposal area

Most of the Mount Colah ridge was historically cleared for the existing railway line, Pacific Highway and surrounding commercial and residential development. The only known elements of Duffys Forest EEC remaining in Mount Colah (outside of the Sydney Trains rail corridor) consists of remnant scattered canopy trees including *Angophora costata*, *Eucalyptus capitellata*, and *Corymbia gummifera* over exotic dominant, planted and manicured shrub and ground layers. These trees are mostly confined to private property. There are no known patches of Duffys Forest in Mount Colah that support mature *Eucalyptus sieberi*, let alone in the density present at Mount Colah Railway station, as shown in Figure 5-4. The structural completeness of this patch (species rich and structurally complete canopy, shrub and ground layer) make this patch of Duffys Forest EEC a considerable landscape remnant and an important reference of the original, remnant, native vegetation that formerly occurred over the laterised soils of the Mount Colah ridgetop.

Despite the severe weed infestations over most of the proposal area, the Duffys Forest EEC had comparatively lower weed infestation and therefore was in good condition, especially when compared to the vegetation on the eastern (upline) side of the proposal area, which did not support Duffys Forest EEC.

Figure 5-4 Structurally complete, good condition Duffys Forest EEC in the proposal area

* Note the tall canopy of the *Eucalptus sieberi* over *Allocasuarina littoralis*. Lower shrub layer contained a Proteaceae and *Acacia spp*. Ground cover was grassy with a diverse suite of ferns, shrubs and forbs.

Figure 5-5 Location of Duffys Forest EEC in the south-western corner of proposal area (downline)*

* Note the tall canopy of the *Eucalptus sieberi*.

No threatened flora species were identified within the proposal area. Table 3 in the FFA (Appendix B) indicates a list of threatened flora that may occupy the proposal area at some stage of their lifecycles, as identified by Bionet (DPE, 2022). There were no historical records of threatened flora within the proposal area.

Native trees were identified as part of the FFA (Appendix B) and the Arborist Report (Appendix H).

Figure 5-6 Vegetation along the western side (Down Main side) embankment

Three mature trees are located between Platform 1 and Platform 2. The trees are located north of the ticketing office and two are located south of the ticketing office. These are native trees, identified as Brush Box (*Lophostemon confertus)* (refer Figure 5-7 and Figure 5-8).

Figure 5-7 Shade tree - south end of platform (facing south towards Sydney)

Figure 5-8 Shade tree - south end of platform (facing north towards existing footbridge)

Figure 5-9 Mature tree outside of the rail corridor and within Council-controlled land along Down Side at the Pacific Highway Mount Colah facing south towards City.

Fauna

No threatened fauna species were identified within the proposal area during the site inspection. The range of habitat features suitable for threatened fauna species are shown in Figure 5-10 and Table 5-3.

Table 5-3 Threatened fauna habitat features within and near the proposal area

Habitat component	Site values
Hollow-bearing trees, including dead stags	Two hollow-bearing trees, each containing one small hollow were identified on the proposal area. These hollows are suitable for roosting and potentially breeding for a range of threatened microbats and small birds.
Large trees with basal cavities	Nil
Rock outcrops and bush rock	Minor exposed areas of surface rock provide shelter for common small reptiles and common frogs
Caves, crevices and overhangs	Nil
Natural burrows	Nil
Coarse woody debris (logs)	Low densities of course woody debris spread across some parts of the proposal area.
Wetlands, soaks and streams	Nil
Open water bodies	Nil
Nests and roosts	Nil
Sap and gum sources (feed trees for gliders)	Mature *Corymbia gummifera* showed evidence of glider feeding. The feeding marks are from the locally common Sugar Glider (*Petaurus breviceps*) and not a threatened species.
Distinctive scats or latrine sites	Brush-tailed Possum (*Trichosurus vulpecula*) scats identified on the proposal area.
She-oak fruit (Glossy Black Cockatoo feed)	*Allocasuarina littoralis* was common across the proposal area.
Culverts, bridges, mine shafts, or abandoned structures (microbat subterranean roosts)	There is no evidence of microbats roosting at the existing footbridge (Appendix B).
Decorticating bark or palm fronds suitable for microbat roosts	Moderate amounts of decorticating bark on mature *Eucalyptus sieberi*.
Flying-fox camps	Nil
Nectar-bearing trees (e.g. winter-flowering)	Several Eucalyptus trees on the subject property have the potential to act as a food source for nectivorous animals.
Lerp-bearing trees	Several Eucalyptus trees on the subject property have the potential to be lerp-bearing, acting as a food source for flying foxes, gliders and a variety of birds.
Nectar-bearing shrubs	Several nectar bearing shrubs including abundant *Banksia spp.* and *Grevillea sericea* may provide foraging habitat for nectivorous birds.
Mistletoes	*Amyema congener* occurs in low density within the proposal area. May be a foraging area for nectivorous birds.

Habitat component	Site values
Koala browse trees	There were six species of koala (*Phascolarctos cinereus*) use trees identified on the proposal area with documented koala use in the Central Coast Koala Management Area, including the locally significant *Eucalyptus punctata*.
Seed-bearing trees and shrubs	Several Eucalyptus trees in the proposal area produce woody fruit and seeds may be foraged on by locally common native bird species.
Soft-fruit-bearing trees or shrubs	Abundant native and exotic fruiting shrubs may provide foraging habitat for Grey-headed Flying-fox (*Pteropus poliocephalus*).
Dense shrubbery and leaf litter	The vegetation within the proposal area is dense in areas and severely weed-infested.
Dense grassland	Nil
Estuarine, beach, mudflats, and rocky foreshores	Nil

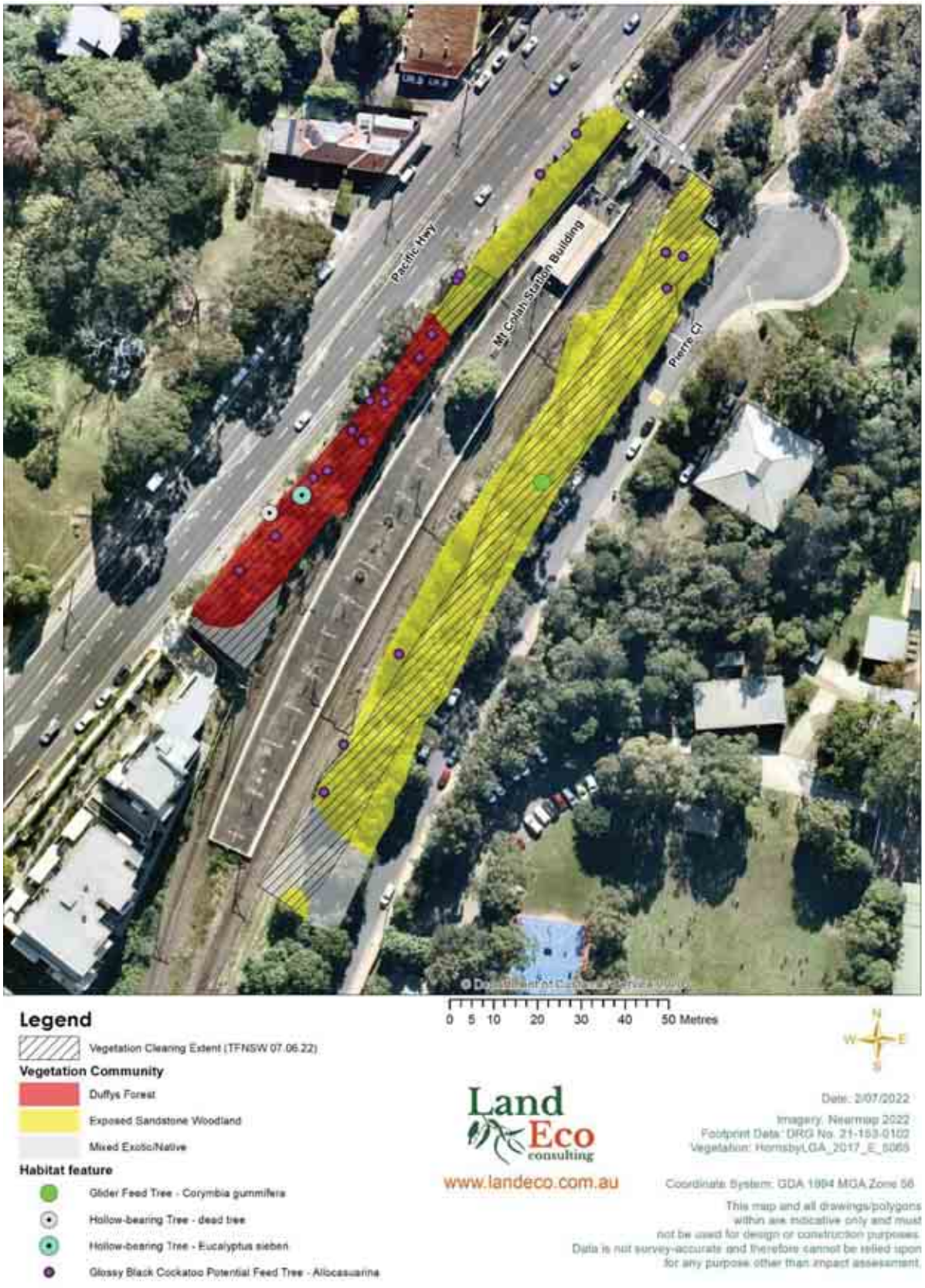

Figure 5-10 Habitat features within and near the proposal area

The list of threatened fauna species which have the potential to use the habitat within the proposal area during part of their lifecycle are provided in Table 5 of the FFA (Appendix B). Those species that were deemed to have a moderate to high likelihood of occurrence within the proposal area are shown in Table 5-4.

Table 5-4 Threatened fauna that may occupy the proposal area at some stage of their lifecycle (DPE, 2022)

Scientific name	Common Name	BC Act	EPBC Act	Habitat required	Likelihood of occurrence
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows in the Proposal area. Breeding possible though unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (Appendix B). One record in the locality from 2005 ~2km north-west of the Proposal area near Galston Road.
Glossopsitta pusilla	Little Lorikeet	Vulnerable	-	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	High. May forage on nectar (*Corymbia gummifera, Eucalyptus sieberi* or Mistletoes) or lerp-bearing eucalypts in Subject Property. Not likely to remain in the locality for extended periods as the species is nomadic and the habitat is disturbed, frequented by more dominant, aggressive species such as the Noisy Miner. No suitable breeding habitat in the Proposal area, too disturbed.
Hirundapus caudacutus	White-throated Needletail	Protected	Vulnerable	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Peninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (e.g. termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	High. This species is an aerial forager only. Likely to fly over the Proposal area on occasion. Not likely to utilise habitat in the Proposal area, nor will the proposed action impact upon this species.
Lathamus discolor	Swift Parrot	Endangered	Critically Endangered	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Moderate. May forage on nectar (*Corymbia gummifera, Eucalyptus sieberi* or Mistletoes) or lerp-bearing eucalypts in Subject Property. Not likely to remain in the locality for extended periods as the species is nomadic and the habitat is disturbed, frequented by more dominant, aggressive species such as the Noisy Miner. This species does not breed locally. Recorded in locality twice in 2020, locations withheld.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	-	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Proposal area. Breeding unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (Appendix B). Five records in the locality, all located >2km from the Proposal area, most near Wahroonga and North Turramurra.

Scientific name	Common Name	BC Act	EPBC Act	Habitat required	Likelihood of occurrence
Ninox strenua	Powerful Owl	Vulnerable	-	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, and a number of eucalypt species.	High. Likely to hunt, perch and roost in trees in the Subject Property and adjacent bushland. Likely to hunt for birds, rats or possums in the locality. Powerful owls require hollows greater than 45 cm diameter and greater than 100 cm deep for breeding (Powerful Owl Coalition 2018). There are no large hollow-bearing trees of suitable dimensions for nesting in the Subject Property. 260 records spread across locality, recorded as recently as 2021, including a large number from the past five years.
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.	High. It is considered likely that Grey-headed Flying-fox would forage in the trees in and nearby the Subject Property on fruiting shrubs and when trees are in flower. No roost camps were identified within or in close proximity to the Subject Property and no known camps nearby. 113 records in the locality, last recorded in 2021.
Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Proposal area. Breeding unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (Appendix B). Five records in the locality, all located >2km from the Proposal area, most near Wahroonga and North Turramurra.

Microbats

The existing footbridge structures were reviewed from by a senior ecologist (refer Figure 5-11 and Figure 5-13). An ecologist also visited the site 1 October 2020. The existing structure appears to be inadequate habitat for microbat species. This is due to a lack of coverage. In addition, the materials would result in temperature variation, which would discourage microbat roosting at the footbridge.

Figure 5-11 View of existing metal structures under the stair case - unsuitable microbat habitat (from Down Side platform, facing north)

Figure 5-12 View of existing metal structures - OHW (from Down Side platform, facing north)

Figure 5-13 View of existing metal structures from Pacific Highway side of footbridge - unsuitable microbat habitat

5.2.2 Potential Impacts

Construction activities for the proposal would result in the removal of vegetation, including native trees. No threatened vegetation would be removed and no threatened species of fauna would be impacted.

Direct impacts

- Access to the site in the railway corridor is assumed to utilise the existing road access on either side of the railway tracks. It is assumed this is suitable access to the site and no further vegetation is removed for site access
- While a large number of threatened flora records occur in the locality, there was no threatened flora recorded in the proposal area. The proposal area is disturbed and severely weed-infested. It is unlikely that the proposal will have a significant impact on any threatened flora such that their local occurrence will be put at risk of extinction, as substantial amounts of high quality remnant vegetation will continue to occur in Berowra Valley National Park and Ku-ring-gai Chase National Park, less than 2 km from the proposal area.
- A total of 2,926 m^2 of native vegetation (refer to Figure 5-1 for clearing areas) will be removed for the proposal, as follows:
  - Sydney North Exposed Sandstone Woodland: 1,786 m^2
  - Duffys Forest EEC: 792 m^2
  - Mixed exotic / native: 348 m^2.
- The proposal would involve the removal of one tree (*Eucalyptus haemastoma*) that is not hollow, outside the rail corridor (refer Figure 5-9 and Figure 5-10). The tree is located within land controlled by the Hornsby Shire Council. Two hollow-bearing trees that provide suitable roosting and possibly breeding habitat for threatened microbats may be removed for the proposal.
- An additional 45 native trees within the proposal area would be removed, including two hollow-bearing trees (Appendix B).
- While no individuals of *Cryptostylis hunteriana* were identified on the proposal area, the site assessment was conducted outside of the recommended survey period. This species is leafless, making detection outside of the flowering period (November – January) very difficult. It is known to occur in woodland dominated by Scribbly Gum (*Eucalyptus sclerophylla*), Silvertop Ash (*E. sieberi*), Red Bloodwood (*Corymbia gummifera*) and Black Sheoak (*Allocasuarina littoralis*), as is present on the proposal area. While the proposal area is highly disturbed and has a low/moderate likelihood of providing habitat for this species, it is recommended that targeted surveys be undertaken during the flowering period to confirm the presence/absence of this species to determine whether a significant impact is likely to occur as a result of the proposed activity.

Indirect impacts

The spread of weeds may create competition with the existing native flora, potentially changing the species composition within these vegetation communities.

The removal of vegetation within the rail corridor may lead to erosion, altered hydrology regimes and sedimentation impacts. Erosion can reduce the inherent soil productivity whereas altered hydrology and sedimentation can damage young plants and fill drainage lines. This can result in a change to the species composition within these vegetation communities. These impacts are likely to be confined to the construction stage of the works and therefore temporary in nature.

However, as the rail corridor has been heavily modified by past development, it is unlikely that any ecological communities would be significantly impacted by construction. The test of significance completed for the proposal area confirms that there was no significant impact to any of the ecological communities. Refer to Appendix 3 of the FFA (Appendix B)

Biodiversity Offsets

According to the "Sydney Trains Biodiversity Offsets Calculator Environmental Management System EMS-06-WI-0177", the proposed activity will affect the following items of concern:

- Item 2: Threatened Vegetation
- Item 4: Remnant Native Vegetation
- Item 5: Native Tree Removal.

Based on the anticipated removal of threatened vegetation, non-native vegetation and individual trees, the total offset fee is calculated at $152,674.00. The fee breakdown is detailed as follows:

- **Item 2 (Threatened Vegetation):** A total of 792 m^2 of threatened vegetation belonging to the Duffys Forest EEC will be removed for the proposal. This requires the payment of $29,304 to the Sydney Trains offset fund to offset this impact
- **Item 4 (Remnant Native Vegetation):** A total area of 1,786 m^2 of remnant native vegetation belonging to 'Sydney North Exposed Sandstone Woodland' will be cleared for the proposal. This requires payment of $44,650 to the Sydney Trains offset fund to offset this impact.
- **Item 5 (Native Tree Removal):** Up to 64 trees are proposed for removal and must be offset according to the above guidelines. This requires payment of $78,720 to the Sydney Trains offset fund to offset this impact. Furthermore, the proponent must replace all hollows to be removed with 3 or more nest boxes and contribute the appropriate amount to the Biodiversity Offset Fund (BOF) depending on the option pursued.

5.2.3 Control Measures

The following control measures are recommended.

- An Ecologist with a minimum of a tertiary degree in a relevant discipline would be engaged to oversee the implementation of the control measures in the FFA identified during the construction phase.
- A Bat Management Protocol (Appendix B) to be included in the CEMP to ensure appropriate checks are undertaken for the presence of bats in bridge structures prior to, and during demolition works. If bats are identified to be actively roosting in the

work area, all works are to cease until the roost can be evaluated by a qualified ecologist.

- An ecologist is to undertake a pre-clearing survey of the proposal area. All felling of native trees should be supervised by an ecologist who will be available on site to capture, treat/relocate any displaced fauna.
- If unexpected threatened flora or fauna species are discovered, stop works immediately and contact Sydney Trains environment branch for advice.
- Should any priority or high threat weeds be encountered, appropriate management and disposal of these weeds must be carried out.
- The extent of clearing and/or trimming must be marked out and minimised where possible.
- All trees to be retained must be protected in accordance with Australian Standard - Protection of Trees on Development Sites (AS-4970-2009), which outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. This is an area isolated from construction disturbance so that the tree remains viable.
- As per the Sydney Trains Biodiversity Offsets Calculator, all tree hollows removed must be replaced with an equivalent sized nest hollow at a 3:1 ratio. Hollows from felled trees can be salvaged and erected in trees elsewhere in the property. At least six small nest boxes (less than 5 cm entry hole diameter) should be installed into trees in suitable vegetation remaining along the rail corridor.
-
- Storage and stockpiling (soil and material): All storage, stockpile and laydown sites will be established away from any native vegetation that is planned to be retained. No stockpiles shall be placed within the TPZ of a tree to be retained. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site.
- Low spill lighting or shielding should be used where possible to minimise the impacts on nocturnal fauna using nearby habitats.

5.3 Visual Aesthetics and Urban Design

A specialist urban design report has been prepared for the proposal (Taylor Brammer, 2020). The following section is a summary of the key findings of the report. The full report is provided in at Appendix E of this REF.

The methodology for the urban design report involved the following:

- Review of existing land use
- Analysis of access and movement at the station
- Appreciation of local context and setting
- Description of vegetation within the proposal area
- Identification of opportunities and constraints

5.3.1 Existing Environment

Footbridge

The existing footbridge is a two-span structure located at the northern end of the station. The footbridge is about 27 m long and 3.0 m wide. The structure is oriented in an east/west direction. Vertical protection screens are provided longed along the footbridge, and handrails are provided along the staircase leading to Mount Colah platform. The elevation the footbridge is 5.3 m Australian Height Datum (m AHD) from the track.

There is no access for less able or wheelchair-using patrons to access the platform. The existing bridge consists of a steel beams and a concrete deck superstructure, supported on steel trestles. The existing OHW is attached to the existing footbridge on both the Down and UP Mains. The footbridge is uncovered and lined with 1.8 m high fencing. There are concrete stairs leading providing access to the platform from the footbridge platform, and 'tap-on, tap off' Opal readers are located at the base of the stairs.

Refer to Figure 2-2 to Figure 2-5 for photograph of the existing footbridge.

Platform

The existing platform is about 14 m wide and provides passenger access to Platform 1 and Platform 2; eastern side (Up Main side) and western side (Down Main side) respectively. There are limited awnings and canopies, and minimal coverage from sun and inclement weather at the station.

There are three mature trees planted along the station; one north of the ticketing office and two to the south. Species appear to include Brush Box *Lophostemon confertusnclude*, which is a non-native. This species was likely planted for shading purposes.

Further details and figures of the existing vegetation within the proposal area are provided in Section 5.2 Biodiversity of this REF.

Ticketing office

The existing station structure at Mount Colah Station is a small, closed building which includes an awning to provides cover from inclement weather (refer Figure 2-6). The awning extends 17 m north to south, and 10 m east to west.

Lighting

There is existing street lighting and some limited sources of light spill from the rail corridor and Pacific Highway.

Land use and character

The proposal area is located within the existing, active rail corridor which is zoned as SP2 - Infrastructure under the Hornsby LEP 2013. The land use of the surrounding areas to the existing Mount Colah Railway Station is zoned as RE1 – Public Recreation, R2 – Low Density Residential, and B1 – Neighbourhood Centre, with the R4 - High Density Residential zoning further to the south.

The existing vegetation from both the Pacific Highway and Pierre Close entrances to the station provide good shade, shelter, amenity, and a good visual buffer of the railway line.

The character of the surrounding residential area can be summarised as single dwelling free standing homes disbursed with low rise residential flat buildings to a maximum two stories

high. Further to the south, numerous buildings can be found under construction within the R4 zone.

West of the rail corridor is the NSW State road, the Pacific Highway. The Pacific Highway is bidirectional main road. To the east of the rail corridor is Pierre Close. The turning circle at the end of Pierre Close serves as an informal kiss and ride area for rail commuters. There are no existing commuter car parks provided at the station or surrounds.

5.3.2 Potential Impacts

Construction

- Temporary lighting during the construction stage would be within the contractor scope of work. To maintain rail station operational during lift and overbridge construction stage, temporary lighting will be provided around construction zone at platform. Wall mounted temporary light would be proposed on the temporary wall or structure to illuminance platform.
- The locality would be temporarily transformed during construction. These transformations would be associated with construction plant and equipment, site compounds, site amenities and construction staff in the area.
- The proposal would involve the temporary trimming or clearing of vegetation along the Down Main side. This would be required for the installation of the new footbridge, and the relocation of services. This clearing may result in the increased visibility of the rail corridor from the Pacific Highway or residential receivers immediately south of the proposal area. However, the rail corridor and rail activities are in keeping with the existing land use and character for the SP2 - Infrastructure land zone. As a result, impacts to visual aesthetics would be minor adverse and temporary in nature.

Operation

The overall visual aesthetics and urban design of the station would be positively impacted by the proposal, once operational. Operational impacts may include:

- Improvement to the existing amenity through upgrading access, and additional planting and finishes to the areas at the base of the footbridge.
- A functional solution to the shortcomings of the existing structure whilst minimising visual impact through the installation of a new tree and associated planting. There is risk of graffiti and vandalism of the new footbridge, which would negatively impact the visual environment
- The new safety screens would be comprised of warm colours including orange and yellow. The design would complement the existing greenery found at both sides of the platform along Pierre Close and Pacific Highway and would provide visual interest to the footbridge.
- The upgraded lighting would provide additional safety for pedestrians and those accessing the platform by the lifts.

- The lift shafts would be positioned south of the footbridge and separated from the footbridge via a 2.4 m long walkway. This positioning of the lift shaft allows for improved visibility and passive surveillance at street level.

All of these factors would have a net positive impact on the existing visual aesthetic and urban design.

5.3.3 Control Measures

Recommended control measures to mitigation these impacts include:

- Where appropriate, existing urban elements such as bike racks, bins and bollards must be retained, relocated and or removed for re-use as required.
- New pavements would be concrete and brick. The pavement would be sensitive to the existing urban design around the station. Broom finish or an alternative comparable hard-wearing finish would be required to suitably complement the existing landscape character.
- The planting of native trees, shrubs and ground covers would soften the visual impact of the proposed works. Proposed planting would comprise of low maintenance species.
- It is recommended that a sub-surface drip irrigation system is installed as part of the landscaping works. This low cost and automatically operated system would help to establish and support planting stock, and encourage growth of species selected as part of the landscaping plan
- The materiality and surface treatment of retaining walls and lift shafts are designed to deter graffiti and allow for easy graffiti removal
- Increased lighting of the station and footbridge would deter vandalism and graffiti of the structures.

5.4 Landforms, Geology and Soils

A Geotechnical Technical Memo was prepared to describe the subsurface conditions of the proposal area. This memo can be found at Appendix G of this REF. The following section is a summary of that technical memo. Information from the following databases was also used to understand the landforms, geology and soils relevant to the proposal:

- Search of the POEO Public Register
- Search of the NSW EPA Notified Sites
- Review Hornsby LEP 2013 acid sulphate soils map.

5.4.1 Existing Environment

Topography and drainage

The elevation of the proposal area is 250 m AHD. The rail corridor is generally level within the proposal area, and drains slightly to the south, towards the City Side of the proposal

area. The east of the rail corridor is typically bounded by residential properties ad community facilities along Pierre Close, as well as vegetation. The western side is bounded by vegetation along the embankment on the Down Side, and the heavily disturbed road corridor of the Pacific Highway.

Regional geology

Reference to the Sydney 1:100 000 Geological Series Sheet 9130 (Edition1, 1983) indicates that the site is underlain by Hawkesbury Sandstone. This formation comprises medium to coarse grained quartz sandstone, very minor shale and laminite lenses.

Subsurface profile is generally comprised of:

- Fill (sand/clayey sand)
- Residual soil
- Various classes of sandstone.

Soil landscapes

The proposal area is located on the Lucas Heights soil landscape (refer Table 5-5), The Lucas Heights soil landscape is comprised of gently undulating crests and ridges. Soils are stony with low fertility and low available water capacity.

Table 5-5 Soil landscapes

Landscape	Soils	Limitations
Lucas Heights		
Gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes <10%. Rock outcrop is absent. Extensively or completely cleared, dry sclerophyll low forest and woodland.	moderately deep (50-150 cm), hardsetting Yellow Podzolic Soils and Yellow Soloths (Dy2.41); Yellow Earths (Gn2.24) on outer edges	Stony soil, low soil fertility, low available water capacity.

Acid sulphate soils

A review of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Australian Soil Resource Information System was carried out on 9 November 2020. The Hornsby LEP acid sulphate soils maps were also reviewed. The search indicated that there is a low to extremely low probability of encountering any acid sulphate soils within the proposal area.

Contamination

A search of the NSW EPA Contaminated Sites register was carried out on 03 September 2020. The proposal is not located within 100 m of any listed contaminated sites (Appendix C). The following databases were also searched 03 September 2020.

- Department of Planning, Industry and Environment (DPIE) division of Environment, Energy and Science (EES) contaminated land records for Hornsby Council: These records showed there were no contaminated site records within 500m of the proposal area
- The POEO Act public register: This showed that there were no licences on record for within 100 m of the proposal area. No other licences or notices are for properties or operations within and/or immediately next to the proposal area
- The review of contamination databases indicates low potential for contamination within the proposal area. However, the rail corridor and ballast are generally associated with non-specific contamination, such as diesel and hydrocarbon spills associated with locomotive activities
- Contamination is considered a low risk to the proposal as the works would occur wholly within the existing rail corridor and access track. For this reason, it is unlikely that point sources of contamination (such as discharge sites, illegal dumping, etc.) would be encountered. There may be contamination surrounding the proposal area associated with rail activities.

Groundwater

No free groundwater was observed in the boreholes used in the interpretation of subsurface profiles at the proposed lift, pier and stair foundation locations. However, groundwater was observed. For the purposes of the design, groundwater has been assumed to be at the interface of soil and bedrock.

5.4.2 Potential Impacts

Potential impacts to landforms, geology and soils may include:

- The earthworks would result in a minor change to the topography of the proposal area. However, this change is consistent with the existing topography and would not be expected to be significant
- Construction activities have the potential to impact existing nearby structures, such as rail track formations, OHWS and rail fill embankment. There are potentially problematic ground conditions which can lead to excessive ground movements, particularly at rail track level
- Soil erosion and loss of topsoil: This could result from the removal of vegetation (clearing and grubbing) along both sides of the proposal area, and disturbance of the ground surface during site preparation, earthworks, excavation and other construction activities. Earth moving activities have the potential to expose loose soils and mobilise these materials. Soil erosion and loss of top soil would be most likely be concentrated at the culvert locations and would be temporary in nature
- Disturbance of contaminated soil: Work within the rail corridor is generally expected to carry a moderate risk of encountering contaminated material, particularly if works involve the disturbance of ballast. The proposed works would involve work within the corridor, and ballast disturbance and rail cutting would be required to remove and replace the existing structures at Culvert A and Culvert B. Movement of construction staff and plant/equipment also carries the general risk of disturbing ballast throughout the proposal area and therefore transporting potentially contaminated materials
- Spills of contaminating materials: Construction activities may result in contamination of soil and/or water due to leaks and spills of potentially contaminating materials
- The potential for encountering acid sulphate soils during construction is low. However, there is a risk that unexpected acidic soils may be disturbed during construction. Some indicators of encountering acid sulphate soils include:
    - Change in colour of the soil from grey tones to brown tones
    - Effervescence
    - The release of sulphur smelling gases such as sulphur dioxide or hydrogen sulphide
- It is anticipated that groundwater may rise to near the interface of soil and bedrock particularly after heavy rainfall events. Groundwater levels may also fluctuate over time due to seasonal and climatic variations
- The foundations on the Pacific Highway side and Pierre Close side are located adjacent to the existing sandstone cutting. The ultimate lateral capacity of rock socketed pile on a cut face is typically controlled by the presence of adverse rock mass discontinuity, which can result in the formation of rock wedges and reducing the ultimate lateral capacity of pile

- As the piles on the Pacific Highway side is located at proximity to the cut face, further site investigation or geological mapping of the rock cuttings shall be included as part of the detailed design to identify the presence of rock mass discontinuities, bedding, seams and joints which could affect pile lateral capacity as well as the potential for kinematic failures due to loading from foundations e.g. OHWS foundations
- Spills of contaminating materials: Construction activities may result in contamination of soil and/or water due to leaks and spills of potentially contaminating materials.
- Further investigation may be required pending the final location of OHWS foundations as well as the final route of the 11kV cable
- The interpreted boundaries between the layers is based on the available geotechnical information. Local variations in the subsurface profile may exist and shall be verified during construction by a suitably qualified geotechnical engineer or geologist to assess the suitability of the socket and founding material.

Operation

Once the proposal is operational, the areas disturbed during construction would have been revegetated and, therefore, the risk of erosion would be minimal.

5.4.3 Proposed Control Measures

The following mitigation measures are proposed to manage impacts to landforms, geology and soils:

- The rehabilitation of disturbed areas would be carried out progressively as construction stages are completed, and in accordance with Landcom's Managing Urban Stormwater: Soils and Construction series (Landcom, 2004)
- Erosion and sediment control would be managed in line with the ‘Blue Book’ (Landcom, 2004). Prior to construction, the area would be assessed for likely sources of sediment leaving the site (e.g. dust or water) and appropriate mitigation measures developed
- A site-specific Erosion and Sediment Control Plan (ESCP) would be included in the CEMP
- A site-specific emergency spill plan would be incorporated into the CEMP. The CEMP will include spill management measures in accordance with Sydney Trains EMS-14-PR-0012 Erosion and Sediment Control and relevant NSW EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Sydney Trains and EPA officers)
- Stockpiles would be designed, established, operated and decommissioned in accordance with the relevant Sydney Trains EMS-14-PR-0012 Erosion and Sediment Control and relevant NSW EPA guidelines
- Spill containment would be used at ancillary site to contain spills and spill response procedures would be followed.
- If, in the unlikely event that contaminated areas are encountered during construction, appropriate control measures would be implemented to manage the immediate risks

of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Sydney Trains Environment Manager and/or EPA

- The likelihood of encountered acid sulphate soils during construction is extremely low. However, if excavated materials are suspected as being acid (i.e. are demonstrative of the acid sulphate soils indicators, excavation would cease. The material would be contained, and the Sydney Trains Environmental Representative would be contacted.
- All vehicles would be cleaned prior to leaving the work area and the site access/egress points would be stabilised to minimise any sediment tracked onto local roads
- Should a spill occur on site, it would be immediately contained and cleaned up. Contaminated soil would be excavated and transported to a licensed facility.
- Slope stability do not form part of the reference design and should be included as part of the detailed design
- The construction of bored piles would be supervised by a qualified geotechnical engineer/engineering geologist to assess that the ground materials meet the design requirements and assess the pile length and cleanliness
- Temporary casing from ground level to the top of the bedrock (Class V Sandstone) may be required. This is to reduce the risk of granular materials collapsing into the pile hole and limit the potential for groundwater seepage (should it be encountered).

5.5 Noise and Vibration

A noise and vibration assessment was undertaken using the Sydney Trains *EMS-10-FM-0166 Maintenance Quantitative Noise and Vibration Assessment Tool* (Noise Tool). The Noise Tool assesses noise generated from rail systems activities (as defined by the POEO Act) and incorporates the methodology defined by the Interim Construction Noise Guideline (ICNG). The results of the noise assessment are provided in the following section. The full noise assessment can be found at Appendix F of this REF.

The proposed works would be carried out during possession and non-possession periods. As outlined in Section 2.3 of this REF, possession periods are considered to be ‘night’ hours. Night working hours are defined as:

- Monday to Friday: 10pm to 7am
- Saturday to Sunday: 10pm to 8am
- Sunday to Monday: 10pm to 7am.

As the proposed construction sequencing outlined in Table 2-1 is indicative only, ‘night’ hours were selected for every stage of the noise assessment. When using the Noise Tool, ‘night hours’ assess the ‘worst case scenario’.

5.5.1 Existing Environment

Acoustic environment

The proposal area is located within the existing rail corridor at Mount Colah Station. Existing noise sources include the active rail activities (commuter and freight), highway traffic, the school as well as noise from local traffic and suburban noise.

The rail track configuration is comprised of one up line and one down line and services the T1 North Shore Line and Central Coast and Newcastle Line. Around 510 commuters access Mount Colah Station within a 24-hour period (TfNSW, 2014). The line also services freight locomotives, which generally transport coal and other general freight. There is no formal commuter parking associated with Mount Colah Station.

Immediately east of the rail corridor is a grassed, open recreational area and the Mount Colah Scout Hall. To the south east is Mount Colah Public School, Mount Colah Community Centre and the Mount Colah Seventh Day Adventist Church. Pierre Close and other local roads east of the rail corridor provide access to single storey residential dwellings. To the west of the proposal area is the Pacific Highway and Mount Colah shops, which are described in Section 5.7 of this REF.

The Pacific Highway is a major road corridor. The Pacific Highway is not generally used as a heavy haulage route, as the Pacific Motorway (about 500 m east of the proposal area) is favoured. There is an existing bus stop located adjacent to the station off the Pacific Highway (refer Figure 5-15). The bus stop services at least 20 public bus services. An additional 16 bus services that are associated with school bus routes also frequent the bus stop. Further details are provided in Section 5.6 of this REF.

Noise sensitive receivers

The proposal area is located within the existing, active rail corridor which is zoned as SP2 - Infrastructure under the Hornsby LEP 2013. There are a number of sensitive receivers immediately east of the proposal area, along Pierre Road and the Pacific Highway.

The nearest residential properties to the proposal area are:

- 1 Cowan Road, Mount Colah, 40 m south
- 583 Pacific Highway, Mount Colah, 70 m west
- 7-9 Cowan Road, Mount Colah, 100 m east.

The residential receivers are shown as R2 Medium Density Residential and R3 High Density Residential in Figure 5-14. Commercial retailers are shown at B1 Neighbourhood Centre and B2 Community Centre.

The closest representative non-residential receiver to the station is the Mount Colah Community Centre, located around 58 m east of the proposal area. The proximity of other nearby receivers to the proposal area is shown in Table 5-6.

Table 5-6 Noise sensitive receivers

Receiver	*Address*	*Receiver type*	*Proximity to proposal area*
Mount Colah Community Centre	6X Pierre Close, Mount Colah	Community facility	58 m east

Receiver	Address	Receiver type	Proximity to proposal area
1st Mount Colah/Mount Ku-ring-gai Scout Group	Pierre Close, Mount Colah	Community facility	65 m east
Mt Colah Public School,	19 Telopea Street, Mount Colah	School	120 m east
Mount Colah Seventh Day Adventist Church	7 Cowan Road, Mount Colah	Place of Worship	210 m south east

The nearest hospital is Hornsby Ku-ring-gai Hospital, about 3.4 km south of the proposal area. The nearest cemetery is Old Man's Valley Cemetery, 3.8 km south west of the proposal area.

The nearest receivers considered in the noise assessment are shown in Figure 5-14

Figure 5-14 Noise sensitive receivers

FIG NO. 5-14 **FIGURE TITLE** Noise Sensitive Receivers

DATE 0/11/2020

0 10 20 40 60 80
1:3,000 Metres

PAGE SIZE A4

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30012921 **PROJECT TITLE** Mount Colah REF

CREATED BY FA13847

SOURCES Roadnet MDS 2020
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SMEC

Location: \\ausyfsv003\Group\projects\30012921 - Reference Design Mt Colah FB\4 Design\Environment\GIS\Maps\30012921_F0005_NoiseSR.mxd

Last updated by: FA13847 on 10/11/2020 at 11:42

5.5.2 Potential Impacts

Construction

As outlined in Section 2.3 of this REF, the proposed works would be undertaken during day shifts over possession weekends. For the purpose of the noise assessment, all works would occur during 'night hours'. The REF is a live document and changes to construction timings and assessments such as this noise and vibration will be updated accordingly as the project progresses

The nearest residential properties to the proposal area are:

- 1 Cowan Road, Mount Colah, 40 m south
- 583 Pacific Highway, Mount Colah, 70 m west
- 7-9 Cowan Road, Mount Colah, 100 m east.

There is natural screening in the form of cuttings, residential fences and structure such as garages and secondary dwellings.

The majority of the work would be undertaken during shoulder hours or at night in accordance with EPL 12208. The aim of doing so is to minimise disruption and safety risks to rail customers. As such, the quantitative noise assessment methodology assumed the majority of the proposed works would be undertaken during day shifts during possession weekends. Construction hours are provided in Section 2.3 of this REF.

In accordance with track possession, rail side work would be carried outside of normal peak commuter periods. Possession works would occur during day shifts. These are the maximum time frames and could be shorter in duration due to access limitations, productivity etc. The construction staging, and scheduling is shown in Table 2-1 of this REF.

Potential noise impact associated with construction of the work may include noise disturbance to receivers and annoyance. The site establishment and finishing works are anticipated to have the least noise impacts, given the existing nature of the facilities and the utilisation of cleared areas. Similarly, noise impacts to receivers during the possessions are expected to be minor considering the short duration of the works and the distance to the nearest receivers.

The quantitative construction noise assessment is provided Table 5-7 and Table 5-8.

Table 5-7 Qualitative noise assessment

Work Phase: Date(s)	Work Phase: Description of noisiest activity undertaken on the date(s)	Plant Category of noisiest plant	Noisiest plant to be used	Duration (days)	Receiver most likely to be affected	Distance to nearest receiver (m)	Most sensitive time of day noisiest plant will be operating[2)]	Is noisiest plant used intermittently? <7 mins in any 15-min period	Reversing beepers used in phase?	Work site noise screening
1	Clearing vegetation, enabling and relocation works	Earthworks	Dump Truck, tipping fill	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
2	Construction of pad mount, GST, LV, CSR. Install temporary works for lift shaft. Complete excavation along Pierre Close	Breaker	Breaker, pneumatic, 14kg standard	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
3	Temporary guard indicators, prepare foundations, install conduits, erect temporary hoardings	Piling	Bored Piling Rig	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
4	Construct new OGOH poles, transfer 11kV, install temporary/permeant protection to 11kV at Lift 1	Earthworks	Compactor	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
5	Complete piling for stairs, bridge pier and lift shaft on Down Side and platform	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
6	Construct lift shafts, bridge piers and OHWS footings	Piling	Bored Piling Rig	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
7	Crane in precast girders, install conduits for services and steelworks for OHWS	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
8	Install balustrades and safety screens, complete platform works, install lighting poles on footbridge and install lifts, commission station	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
9	Landscaping, kiss and ride, commission new footbridge	General	Truck	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening
10	Signalling and OHW reattachment	Excavator	Excavator (approx. 20 tonne)	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening

Table 5-8 Noise calculations for the proposal

Work Phase: Date(s)	Sound pressure of noisiest plant at 10m	PNL (Predicted noise level at receiver)	NML (Noise Management Level)	Noise above NML (PNL-NML)	HAL (Highly Affected Level)	Noise above HAL (PNL-HAL)	Level of risk (High, Medium, Low)	Radius of noise above NML (m)	Radius of noise above HAL (m)	Confirm if a specialist noise study is needed for Phase?	Confirm if a specialist noise study needed for Project?	Vibration assessment required for Phase?
1	82	60	40	20	60	-	Medium Risk	398	40	No	No	No
2	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
3	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
4	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
5	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
6	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
7	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
8	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
9	77	55	40	15	60	-	Medium Risk	224	22	No	n/a	No
10	77	55	40	15	60	-	Medium Risk	224	22	No	n/a	No

Operation

At the operational stage, the proposal is not expected to have any impact on the existing noise environment.

5.5.3 Control Measures

The Sydney Trains quantitative noise assessment triggered the noise controls listed in Table 5-9 and Table 5-10. The potential noise controls for the proposal includes letterbox notification for receivers within 250 m of the proposal area. The recommended letterbox drop radius triggered by the Sydney Trains Noise Tool is shown in Figure 5-14.

The receivers likely to be notified may include (but not be limited to) residential properties along Pierre Close, Cowan Road and the Pacific Highway. All the non-residential sensitive receivers listed in Table 5-6 would receive letterbox notification. In addition, the entire commercial precinct located along the Pacific Highway would also receive notification vis letterbox drop.

Based on the indicative construction methodology, construction would be carried out over a total of 20 days. As the works are planned to occur over separate full possession weekends, there would be significant respite periods between construction activities. The Noise Tool assumes that the work would be undertaken over consecutive days. However, due to the proposed construction sequencing, a specialist noise assessment is not required.

A vibration assessment was triggered for the proposed works. Consultation with the Sydney Trains Environment and Noise divisions was also carried out regarding vibration and it was confirmed that a vibration assessment would not be required for the proposal.

The recommended noise control measures for the proposal have been generated from the Sydney Trains Quantitative Nosie Assessment Tool. These control measures are described in Table 5-9 and Table 5-10.

Table 5-9 Impact assessment triggered noise controls

Potential Noise Controls	*Triggered for project?*
Contact Noise Specialist to confirm if a specialist noise study required?	No
Complete 'Vibration impacts and Approval' worksheet?	Yes
Recommended minimum letterbox notification distance	250 m
Communicate expected periods of particularly high noise to community in the letterbox drop?	Yes
Program in respite: Max 4 days >HAL in any 7-day period?	No
Program in respite: 2 days respite (no or all works below NML at receiver) for every 14 days?	No
Temporary work screening to be added as a control?	Yes

Table 5-10 Assessment of standard noise controls for the proposal

Assess Standard Suite of Noise Controls	Adopted (Yes/No)	If No, provide reasoning as to why it is not 'reasonable' and 'feasible' to include?
Is this project carried out during a track possession period?	Yes	Letterbox drop will be carried out as part of possession community notification process
Undertake work during 'day' hours only	No	In order to access the Down Main, proposed lift shaft locations and platform, the majority of the construction would need to be undertaken during possessions. This is in the interest of safety and efficiency for construction staff, plant and equipment. All possession works would occur during day shifts.
Implement 1-hour respite for every 3-hour period of PNL over HAL	Yes	When possible, respite periods will be implemented. However, during track possessions, respite periods may be limited due to time constraints. The use of excavators, compactors or dump trucks will not be continuous over this period, and it is feasible to implement respite periods.
Plant used intermittently is to be throttled or shut down when not required	Yes	Equipment will be switched off when not in use
Use alternative quieter equipment	Yes	Smallest equipment is already been selected.
Use temporary screening near noisy plant and activities	Yes	Temporary screening will be erected during activities such as excavation and when using hand-held tools

5.6 Traffic and Access

5.6.1 Existing Environment

Public transport - rail

Mount Colah Station is located in the centre of the suburb of Mount Colah. The railway corridor and Pacific Highway alike create a vehicular barrier, resulting in cross pedestrian activity to one focused location opposite Parklands Road (Taylor Brammer, 2020).

Mount Colah station, and the proposal area forms part of NSW's public transport system. The station is surrounded by an existing network of local and sub-arterial roads including Pierre Close, Belmont Parade and Parklands Road. Pierre Close is a 'No through' road, which terminates as a cul-de-sac immediately outside of the Mount Colah Scout Hall.

The station is not wheelchair accessible and is a short platform. This means that passengers are required to leave the train from the last six cars only. Peak times are shown in Table 5-11.

Table 5-11 Peak commuter times at Mount Colah Station

Monday to Friday	Morning	Afternoon
Peak times	6:30am-10:00am	3:00pm-7:00pm

Public transport - bus

There is an existing bus stop located adjacent to the station off the Pacific Highway (refer Figure 5-15).

Figure 5-15 Bus stop at Pacific Highway facing north east towards the footbridge (source: GoogleMaps)

The bus stop services at least 20 bus services, including:

- Route 592 Brooklyn to Mooney Mooney (loop service)
- Route 595 Hornsby to Mt Colah (loop service)
- Route 597 Berowra to Hornsby
- Route 598 Hornsby to Asquith (loop service).

There are another 16 bus services that are associated with school bus routes.

Road network

The proposal area is located adjacent to the Pacific Highway, an arterial road that services traffic between Sydney and the Central Coast of NSW. The Pacific Motorway is located about 500 m east of the proposal area.

A kiss and drop area for the school is located outside of the school, about 140 m south of the footbridge. The turning circle at the end of Pierre Close serves as an informal kiss and ride area for rail commuters. There are no existing commuter car parks provided at the station or surrounds.

The proposal area would be accessed via an existing gate located off Belmont Parade and Pierre Close (refer Figure 5-16).

Active transport

The existing footbridge crossing from Pierre Close to the Pacific Highway. It is the only point of access onto the Mount Colah Railway Station platform. There is a Council footpath which runs parallel to the Pacific Highway and rail corridor, which connects to the existing footbridge from the west. The Pacific Highway is mapped as part of the NSW Bike Network.

This footbridge provides pedestrian connectivity to the educational and residential facilities on the on the east of the station, to the commercial and retail facilities on the west (Taylor Brammer, 2020). There is a formal footpath is provided along Pierre Close on the eastern side of the proposal area. It is assumed that this footpath is utilised by school children and staff of the Mount Colah Public School. There is a footbath that leads from the cul-de-sac to the east, which is likely used by local residents to access the station.

Figure 5-16 Transport and access

FIG NO. 5-16 **FIGURE TITLE** Traffic and Access

DATE 01/11/2020

0 10 20 40 60 80
1:3,000 Metres

PAGE SIZE A4

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30012921 **PROJECT TITLE** Mount Colah REF

CREATED BY FA13847

SOURCES Roadnet MDS 2020
public_NSW_Imagery: © Department of Customer Service 2020

Location: \\ausyfsv003\Group\projects\30012921 - Reference Design Mt Colah FB\4 Design\Environment\GIS\Maps\30012921_F0008_TrafficAccess.mxd

Last updated by: FA13847 on 10/11/2020 at 12:15

5.6.2 Potential Impacts

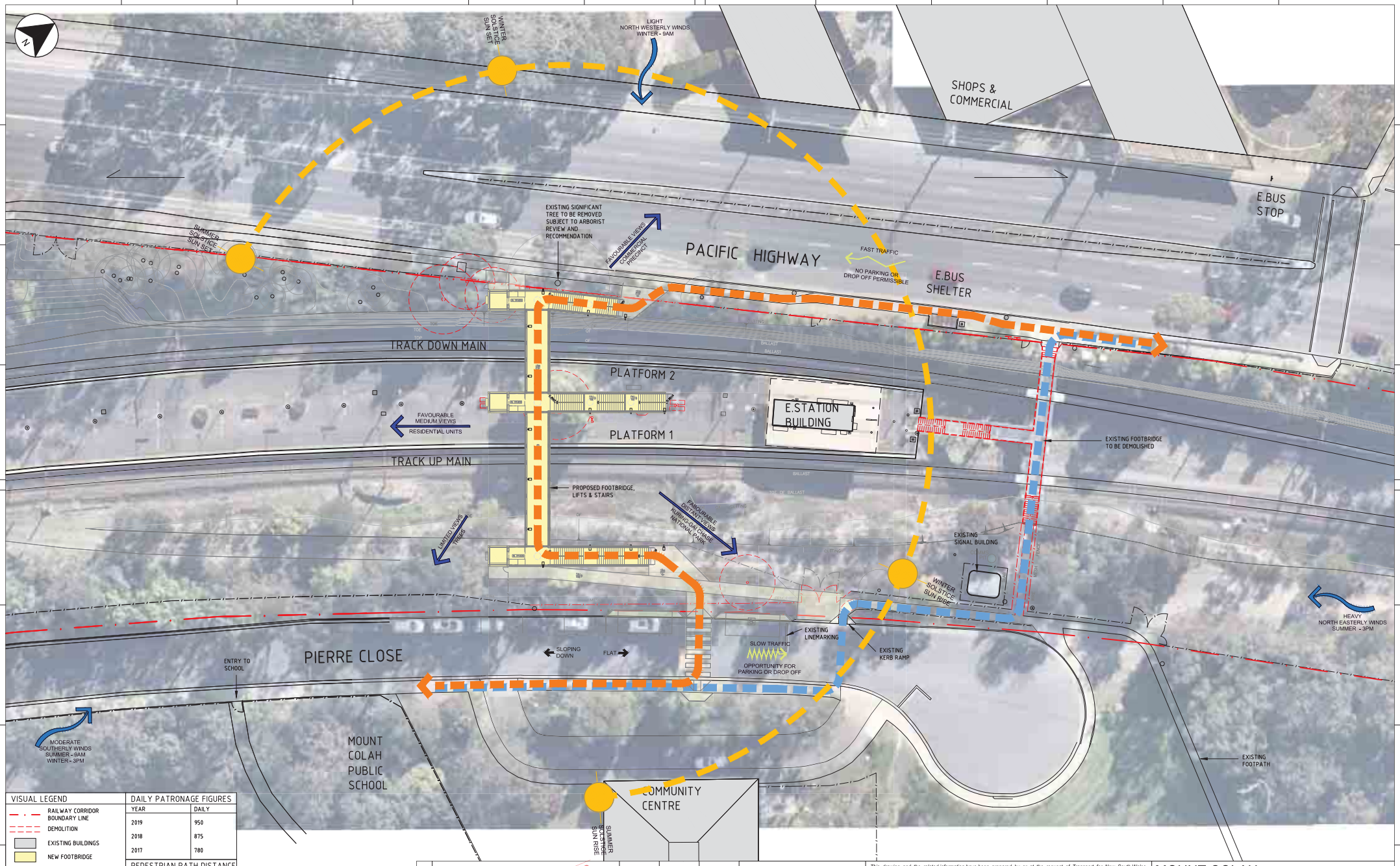
Construction

- During construction, there would be an increase in vehicle numbers during each possession period. It is estimated that the proposal would generate 20 additional vehicle movements per day during busy periods spread across a 24-hour period.
- Increased volumes of heavy vehicles and congestions at the access points at Pacific Highway and Pierre Close
- The bus shelter at Pacific Highway may be temporarily obstructed during construction activities
- Footpaths adjacent to the Pacific Highway and rail corridor may be temporarily obstructed during construction
- The additional traffic movements would have negligible impacts on the Pacific Highway, however, peaks in activity are likely. Property access would need to be maintained while construction vehicles are located on Belmont Parade and Pierre Close and there may be temporary changes in access for users of the Mount Colah Community Centre and Mount Colah/Mount Ku-ring-gai Scout Group
- Forecast traffic would have only a very minor impact on the regional road network. However, Belmont Parade and Pierre Close would experience a moderate level of change during each possession period. Possessions occur during weekend hours and this would reduce the likelihood of construction traffic negatively affective local roads and/or commuters
- Oversized deliveries of plant and materials would be scheduled outside of peak hours to minimise impacts on local traffic and local residents
- Car parking by construction workers would be limited to Pierre Close and surrounding streets if necessary. There may be minor impacts to local parking if designated parking areas reach capacity
- These impacts would be minor as works are planned for off-peak periods, when demand for parking in the local area is likely to be lower. For example, construction would be undertaken during weekend possessions, and therefore construction parking would not impact parking associated with the school drop off and staff parking
- There would be temporary impacts to users of the rail network during each possession period. These impacts would be minor, as replacement buses would be provided for commuters.

Operation

- Once operational, the proposal would have a positive impact of accessibility at the station. The proposal would make platform access easier for station for less-mobile passengers through the incorporation of the lifts and access ramps passengers
- The proposal would enhance the interconnection between road and rail public transport systems, particularly for less mobile passengers such as those in wheelchairs, prams and the elderly. The new pedestrian path is shown in Figure 5-17.

Figure 5-17 New pedestrian path



VISUAL LEGEND
RAILWAY CORRIDOR BOUNDARY LINE
DEMOLITION
EXISTING BUILDINGS
NEW FOOTBRIDGE
EXISTING PEDESTRIAN PATH
NEW PEDESTRIAN PATH
WINDS
VIEWS
TRAFFIC
SUN PATH

DAILY PATRONAGE FIGURES	
YEAR	DAILY
2019	950
2018	875
2017	780

PEDESTRIAN PATH DISTANCE	
PATH	METRES
EXISTING	148
NEW	200
DIFFERENCE	+52

2.5 0 5 10m
1 : 250 FULL SIZE A1

WORK IN PROGRESS 23.11.2020

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
2	ISSUED FOR REFERENCE DESIGN	HN/25.11.20	HN/25.11.20	DC/25.11.20
1	ISSUED FOR REFERENCE DESIGN REVIEW	HN/17.09.20	HN/17.09.20	DC/17.09.20

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1:250

NSW GOVERNMENT Transport for NSW

SMEC

CCG ARCHITECTS PTY LTD
ARCHITECTURE

DRAWN	A.BAHARUDDIN	17.09.20
DESIGNED	H.NOORI	17.09.20
DRG CHECK	R.WILLOUGHBY	17.09.20
DESIGN CHECK	R.WILLOUGHBY	17.09.20
APPROVED	D.COOK	17.09.20

MOUNT COLAH

MAIN NORTH LINE 37.635km

RAILWAY STATION FOOTBRIDGE RENEWAL ARCHITECTURE

EXISTING/PROPOSED SITE ANALYSIS PLAN

FILE No. - | SHEET: 3 OF 12 | A1

STATUS: REFERENCE DESIGN ©

DRG No. 30012921-AR-101 | 2 | EDMS No. - | -

DF 8011554

File Plotted P:\19+\19 SMEC Mount Colah Footbridge Renewal\AutoCad\Drawings\30012921-AR-0001 - Existing+Proposed Site Analysis Plan.dwg

Plot Date & Time 11/23/2020 1:46 PM

Plotted by CONTRACTOR2

ASA STANDARD DRAWING SHEET Ver 2.0

5.6.3 Control Measures

The following control measures would be implemented ensure any traffic and access impacts that would result from the proposal would be minimised:

- A Traffic Management Plan (TMP) would be included in the CEMP. The TMP for the proposal must be reviewed and updated to minimise and manage the disruption caused by the proposed works.
- The TMP would be distributed to Hornsby Shire Council prior to construction
- If required, temporary relocation of bus stops will be outlined in the TMP
- The TMP would detail site entry and exit requirements, access points, access to designated off-site staging areas and truck movements, and be in line with Roads and Maritime Services' standards. The TMP would address whether the works require partial or periodic full road closure and if traffic controllers are required, particularly along the Pacific Highway, Belmont Parade and Pierre Close
- Consultation with TfNSW Roads and Maritime is recommended to confirm traffic controls strategy
- All impacted stakeholders are to be notified of the lane closures and of the available alternate routes well in advance of works commencement
- No signalised intersections are proposed to be altered by TfNSW. However, as the responsible road authority can choose to modify signal operation at any time during the construction works
- Prior to and throughout the construction period, heavy vehicles will be accommodated within construction area. Construction vehicles are not permitted to queue or park within the local streets of the surrounding area
- Heavy vehicle movements to/from the site would be restricted to designated truck routes and confined to the arterial road network to ensure minimal impact on local streets within the vicinity of the site
- Construction vehicles, materials and equipment must be positioned to minimise impacts to public access and parking
- Additional truck movements associated with deliveries and waste disposal would be limited to standard construction hours and non-peak periods where possible. This would limit the impact of traffic related noise on nearby sensitive receivers and minimise the queuing of construction vehicles on local roads
- Where daytime deliveries are not possible, routes and drop off points would be positioned away from sensitive receivers. If traffic queuing is required, idling would be minimised by asking truck drivers to turn off their vehicles when queuing
- Normal mitigation measures would apply for the management of public transport impacts during the track possessions. These would include community notification through internet and station announcements, planning possession periods outside of high demand periods and providing replacement buses during each possession period.

5.7 Socio-Economic Effects

5.7.1 Existing Environment

The proposal area is located within in a medium density suburban/urban area and is an established part of the area. The proposal primarily comprises land zoned as SP2 – Infrastructure, as well as RE1 – Public Recreation, R2–Low Density Residential, R4 – High Density Residential (refer Figure 3-1).

Community facilities are located along Pierre Close and other connecting local roads adjacent to the proposal area. These facilities include:

- Mount Colah / Mount Ku-ring-gai Scout Group
- Mount Colah Community Centre
- Mount Colah Seventh Day Adventist Church
- Mount Colah Public School

The nearest residential properties to the proposal area are:

- 1 Cowan Road, Mount Colah, 40 m south
- 583 Pacific Highway, Mount Colah, 70 m west
- 7-9 Cowan Road, Mount Colah, 100 m east

The proximity of community facilities and residential receivers to the proposal area is illustrated in Figure 5-14 and described in Section 5.5 of this REF.

Census data

A search of the Australian Bureau of Statistics (ABS) data from 2016 showed the suburb of Mount Colah had a population of around 7,095 with a median age of 39. Of these, 60.2 per cent worked full time, 32.4 per cent worked part time and 3.8 per cent were unemployed. The most common occupations included professionals, clerical and administration workers, technicians and trade works and managers. Around 24 per cent of employed residents travelled to work via public transport, 14.7 per cent travelled to work by train and around 4.4 per cent travelled to work via a combination of train and car (ABS, 2020).

Need for assistance

In 2016, 278 people (or 3.1 per cent of the population) in Mount Colah - Mount Ku-ring-gai reported needing help in their day-to-day lives due to disability. This was a 0.5 percentage increase from 2011 (Community ID, 2020).

Commercial area

Mount Colah has a small retail and commercial precinct, which is located along the Pacific Highway immediately adjacent to Mount Colah Station. This precinct is zoned as B1-Neighbourhood Centre under the Hornsby LEP 2013 (refer Figure 3-1).

There is a group of shops along the Pacific Highway, directly west of the proposal area. These generally include local retailers such as:

- Caltex Mount Colah
- Liquor land Mount Colah
- Mount Colah Pizzeria
- Jimmy and Harry's takeaway shop
- The newsagent
- Accountant
- Post Australia Mount Colah.

5.7.2 Potential Impacts

Construction

Potential socio-economic impacts associated with the proposal may include:

- Construction would be carried out over weekend possessions or during 'night hours', and would not coincide with school drop offs/pick up times
- There is potential for out of hours construction work to create adverse noise for residents and retail premises. Changes to access may cause inconvenience to pedestrians and motorists. These impacts are discussed further in Section 5.6 of this REF
- The existing footbridge would remain open throughout the construction period of the works, and access to the station platform would not be compromised
- During construction, materials, plant and equipment would be visible in and adjacent to the rail corridor causing temporary changes to the visual amenity of the area
- The project is not expected to have an adverse economic impact on the area. Improvements to the station's infrastructure including the footbridge and platform may support further patronage
- There may be a temporary increase in local business from construction workers using local goods and services, including the take away food outlets and Caltex service station.

Operation

- The proposal would have a positive operational impact for the community from improved pedestrian safety and access public transport infrastructure
- Increased accessibility to community services for those needing assistance, including passengers with impaired mobility. For example, the proposal would allow less-mobile passengers to access the platform and catch trains to non-local services
- Installation of ramps would result in increased connectivity between public transport modes for less mobile passengers (wheel chairs, walkers and prams, for example)
- Improved access and transport to community services along Pierre Close, including the Mount Colah Public School, Mount Colah Scout Hall, Mount Colah Community Centre, and Seventh Day Adventist Church
- The lift shafts would reduce the burden of mobility for the elderly, or those with prams, small children, wheel chairs or walkers

- The ramps would also improve connectivity between the residential areas east of Pierre Close and the Mount Colah commercial precinct on the western side of the Pacific Highway.

5.7.3 Control Measures

Recommended control measures to mitigate socio-economic impacts are as follows:

- Schedule deliveries and major construction activities at times that do not conflict with busy periods at the local community facilities
- Do not park construction vehicles at areas used for school parking, including the designated kiss and drop area
- Ensure that there is adequate communication about the planned construction scheduling with the administrators of community facilities (such as the church, scout hall and school)
- The relevant residents and businesses are to be notified between five days and two weeks prior to the start of any construction activity conducted outside standard construction hours. Further details are provided in Section 5.5.3 of this REF.
- Notifications would include a description of the work, location of the work areas, the timing, duration and the likely impacts of the project
- Construction plant and equipment would not remain on-site longer than necessary after the project is complete.
- The proposal area and specifically the site compounds would be cleared of waste materials and left in a tidy condition following completion.

5.8 Air Quality

5.8.1 Existing Environment

The nearest NSW Office of Environment and Heritage (OEH) Air Quality Monitoring site is located in Lindfield, located around 15 km to the south-east of the site. A review of available data indicates that air quality in the region is generally good to very good. Any variations in air quality in the area are likely due to meteorological conditions and bushfires. Sources of air pollutions in the area include emissions from industry, motor vehicles, commercial operations and domestic activities.

5.8.2 Potential Impacts

During construction, there is limited potential for dust to be generated as no major earthworks are planned. There is some potential for odour and fumes from construction machinery and equipment to be generated on-site and adjacent to the site.

5.8.3 Control Measures

- Dust suppression measures would be implemented to minimise dust, odour and fumes from the demolition, construction and transportation of materials. Control measures would include:
    - Covering all loads during transportation to and from site

- Wetting of dusty materials
- Maintaining and operating all equipment in the proper condition and to manufacturer's specifications
- Limiting the unnecessary idling of plant and equipment
- No operational mitigation measures are proposed.

5.9 Cumulative Environmental Impacts

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

The Landpearl residential development 'Colah View' is located at 544-558 Pacific Highway, Mount Colah. The 'Colah View' development is abutted to the south end of the proposal area. The development involves the construction of 42 units which is expected to be completed Q2 2021.

Cumulative **construction** impacts may involve:

- Noise and vibration: construction activities and the use of machinery at the 'Colah View' development site may be carried out at the same time as construction works for the proposal. This may have a compounded noise impact for local receivers
- Visual aesthetics and urban design: construction activities, including plant and equipment laydown areas, site compounds, stockpiles, materials waste piles and skip bins have a negative impact on the existing visual amenity of the area. If construction of the proposal is undertaken before the completion of the 'Colah View' development, there may negative impacts on the local aesthetic environment due to the proposal
- Traffic and access: deliveries of construction materials for the 'Colah View' development and the proposal would result in increased volumes of heavy vehicles along the Pacific Highway. Increased volumes and possible congestion may occur near the proposed site compound at Lot 8, DP 20511 at the Pacific Highway, which is adjacent to the 'Colah View' development site Reduce parking facilities due to construction staff for the proposal and the 'Colah View' development.

Cumulative **operational** impacts may involve:

- Visual aesthetics and urban design: together, the 'Colah View' and proposal would improve the visual aesthetic and urban design of the area. This would be through the installation of new, architecturally design structures that are sensitive to and complement the existing environment
- Socio-economic: the proposal and the 'Colah View' project would have a positive impact on the socio-economic landscape of Mount Colah. This would be done through improved access to housing and public transport, and increased connectivity between public transport services and commercial precincts.

6 Consideration of State and Commonwealth Environmental Factors

6.1 Clause 228 Factors

Clause 228 of the EP&A Regulation provides a list of factors that should be considered in determining the likely impacts of many varied activities on the natural and built environment. They are framed so that all potential effects on the environment are considered in Table 6-1.

Table 6-1: Clause 228 Factors

Clause 228 Factors		*Impact*
(a)	Any Environmental Impact on a Community?	Short term: minor adverse Long term: nil Construction noise associated with the proposal may impact the residential areas to the east and west of the proposal area. In addition, there may be brief interruptions to existing traffic flows and access routes while construction vehicles are accessing the proposal area. Installation of the new footbridge would be carried out under an ROL, and any impacts are anticipated to be brief in nature. Construction traffic is unlikely to impact local roads, as the works would be carried out during weekend possessions. In addition, there are substantial mitigation measure in place to alleviate pressure on the local community and circumvent short term negative impacts.
(b)	Any transformation of a locality?	Short term: minor adverse Long term: minor positive During construction, the locality would be temporarily transformed by plant and equipment, staff and amenities. Long term, the proposal would transform the locality by providing greater access to Mount Colah Station. The new footbridge would improve accessibility for less mobile passengers. Lighting would also be improved which would enhance community safety in the locality.
(c)	Any environmental impact on the ecosystems of the locality?	Nil. There are no areas listed on the RailCorp Environmentally Sensitive Sites list within the proposal area. No threatened flora was recorded within the proposal area. However, native vegetation would be removed from the proposal area. There is no evidence of microbats roosting at the existing footbridge. Overall, the proposal

Clause 228 Factors		Impact
		would not have a significant impact on ecosystem in the locality. The proposed scope is not intended designed to change land use or encroach on established flora and fauna ecosystems. There are extensive mitigation measures proposed to reduce the significance of impacts on existing flora and fauna, including a contribution of a total of $152,674 to the Sydney Trains biodiversity offset fund (BOF).
(d)	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Short term: minor adverse Long term: positive In the short term, stockpiling and site compounds may temporarily alter the existing aesthetic. Stockpiles and compounds may be visible from local residential properties during the construction phase of the works. However, compounds would be located within the rail corridor, which is heavily disturbed and industrial in nature. The long-term impacts would be positive. The new footbridge would include transparent, coloured polycarbonate panels to provide visual interest to the footbridge. A collection of warm colours including orange and yellow have been selected which will complement the existing greenery found at both sides of the platform along Pierre Close and the Pacific Highway. Overall, the proposal would have a positive impact on the aesthetic environment.
(e)	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Short term: minor adverse Long term: positive Mild negative impact during construction phase of the works. The proposal is largely non-invasive and is not anticipated to have any adverse effect on any of the value it provides to the community, functional, intrinsic or otherwise. The proposed works would reduce sedimentation and erosion occurring in the cess. Waterlogging would be alleviated. The design life of the proposal is 120 years. As a result, all of the current values will be protected and preserved to be enjoyed by future generations.
(f)	Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act* 1974)?	Nil.

Clause 228 Factors		Impact
(g)	Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	Nil. No, due to the duration of the works, as well as confined location no plant or animal species are expected to be directly or indirectly impacted. Appropriate mitigation measures have been designed to appropriately respond to flora or fauna in the unlikely event it is encountered.
(h)	Any long term effects on the environment?	The proposal would not result in the long-term alteration of the existing environment. Any trimming or pruning required for the installation of the new footbridge would be regenerated over time. Upgrades to the existing lighting of the footbridge are unlikely to negatively impact residential properties, as there is screening provided my vegetation and community facilities. In addition, the upgraded lighting would enhance the safety at the station and result in a positive impact on the environment
(i)	Any degradation of the quality of the environment?	Nil
(j)	Any risk to the safety of the environment?	Short term: minor adverse Long term: positive There may be general risks associated with construction, which would be addressed by the contractor and Site Manager. In terms of traffic, works will be completed during Sydney Trains possessions and motorists will be managed appropriately. As the works are located within the rail corridor, there is a risk associated to staff and personnel undertaking maintenance activities. However, as the drainage structures are fixed in nature and do not contain moving mechanical parts, maintenance is expected to be minimal. Safety risks associated with maintenance would be identified and addressed by Sydney Trains as the asset owner and operator.
(k)	Any reduction in the range of beneficial uses of the environment?	Nil.
(l)	Any pollution of the environment?	Short term: nil Long term: positive Contractors will adhere to best practices when carrying out maintenance and repair works to ensure no pollution to the environment occurs.

Clause 228 Factors		Impact
		The risk of pollution to the environment associated with the demolition of the existing footbridge is not assessed in this REF.
(m)	Any environmental problems associated with the disposal of waste?	Nil. The scope of the REF does not include the demolition of the existing footbridge. All waste associated with the construction of the new footbridge would be managed in accordance with the WARR Act.
(n)	Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	Nil. Contractors will follow best practices and all waste will be taken offsite and disposed of in the appropriate facilities.
(o)	Any cumulative environmental effect with other existing or likely future activities?	Short term: minor adverse Long term: positive There may be alignment between the construction program for the proposal and adjacent residential development. Should this occur, there may be cumulative noise and vibration and traffic and access impacts to the locality. These impacts are considered to be short term and minor in nature. Long term, both the accessibility of Mount Colah Station and the functionality of the station and local area would be improved.
(p)	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	Short term: Nil Long term: Neutral The proposal does not fall within the coastal zone. The proposal is not expected to be adverse affected by changes in climate or increased major weather events.

6.2 Matters of National Environmental Significance Factors

Under the environmental assessment provisions of the EPBC Act, the following MNES and impacts on Commonwealth land are required to be considered to assist in determining whether the project should be referred to the Australian Government Department of the Environment. Table 6-2 addresses the MNES for the project.

Table 6-2: MNES

MNES	Impact
Any environmental impact on a World Heritage property?	Nil
Any environmental impact on National heritage places?	Nil
Any environmental impact on RAMSAR wetlands?	Nil

MNES	Impact
Any environmental impact on Commonwealth listed threatened species or ecological communities?	Removal of about 0.08 ha of Duffys Forest EEC which has been confirmed in a test of significance as not significant.
Any environmental impact on Commonwealth listed migratory species?	Nil
Does any part of the project involve nuclear action?	Nil
Any environmental impact on a Commonwealth marine area?	Nil
Any impact on Commonwealth land?	Nil
Any impact on the Great Barrier Reef Marine Park?	Nil
Any impact on a water resource, in relation to coal seam gas development and large coal mining development?	Nil

There are no MNES that would be affected as a result of this proposal No Commonwealth land would be affected, either directly or indirectly, as a result of this proposal.

7 Environmental Management Measures

7.1 Summary of Control Measures

The following control measures have either been identified through the assessment undertaken through this REF or are standard best practice environmental management controls. They will be incorporated into the detailed design phase of the project and during construction and operation of the project, should it proceed. These control measures would minimise any potential adverse environmental impacts arising from the project. The controls measures are summarised in Table 7-1

Table 7-1: Summary of Site Specific Control Measures

Aspect	Potential Impact	Control measures
Landforms, Geology and Soils	☒ Soil Erosion / Stability ☒ Site Rehabilitation ☐ Acid Sulphate Soils	• The rehabilitation of disturbed areas will be carried out progressively as construction stages are completed, and in accordance with Landcom's Managing Urban Stormwater: Soils and Construction series (Landcom, 2004) • Erosion and sediment control will be managed in line with the 'Blue Book' (Landcom, 2004). Prior to construction, the area will be assessed for likely sources of sediment leaving the site (e.g. dust or water) and appropriate mitigation measures developed • A site-specific Erosion and Sediment Control Plan (ESCP) will be included in the CEMP • A site-specific emergency spill plan will be incorporated into the CEMP. The CEMP will include spill management measures in accordance with Sydney Trains EMS-14-PR-0012 Erosion and Sediment Control and relevant NSW EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Sydney Trains and EPA officers) • Stockpiles will be designed, established, operated and decommissioned in accordance with the relevant Sydney Trains EMS-14-PR-0012 Erosion and Sediment Control and relevant NSW EPA guidelines • Spill containment will be used at ancillary site to contain spills and spill response procedures will be followed. • The likelihood of encountered acid sulphate soils during construction is considered to be extremely low. However, if excavated materials are suspected as being acid (i.e. are demonstrative of the acid sulphate

Aspect	Potential Impact	Control measures
		soils indicators, excavation will cease. The material will be contained, and the Sydney Trains Environmental Representative will be contacted. • All vehicles will be cleaned prior to leaving the work area and the site access/egress points will be stabilised to minimise any sediment tracked onto local roads • Should a spill occur on site, it will be immediately contained and cleaned up. Contaminated soil will be excavated and transported to a licensed facility. • Slope stability do not form part of the reference design and should be included as part of the detailed design • The construction of bored piles will be supervised by a qualified geotechnical engineer/engineering geologist to assess that the ground materials meet the design requirements and assess the pile length and cleanliness • Temporary casing from ground level to the top of the bedrock (Class V Sandstone) may be required. This is to reduce the risk of granular materials collapsing into the pile hole and limit the potential for groundwater seepage (should it be encountered).
Water Quality and Hydrology	☒ Pollution ☒ Sedimentation ☒ Oil Spills	• Pollution incidents that cause or may cause material harm to the environment to be reported to the NSW EPA. • Chemicals must be appropriately stored and handled in accordance with relevant Material Data Safety Sheets (MSDS). • All required chemicals and fuels must be located within a bunded enclosure located away from drainage lines and stormwater drains. • Spill kits appropriate to products used on site must be readily available. • Plant and equipment must be regularly inspected to check for oil leaks. • Refuelling of vehicles or machinery is to occur within a containment or hardstand area designed to prevent the escape of spilled substances to the surrounding environment. • Wash down of concrete mixers, concreting equipment and trucks must take place in an appropriate area away from drainage lines and stormwater drains. • Wash down areas must be appropriately constructed, and the collected material disposed of off-site.

Aspect	Potential Impact	Control measures
		• An Erosion and Sedimentation Control Plan must be prepared by suitable qualified persons as per EMS-14-PR-0012 *Erosion and Sediment Control* and is to be fully implemented and managed through all stages of the project.
Air Quality	☒ Dust ☒ Odour & Fumes ☒ Greenhouse Gases	• Dust suppression measures will be implemented to minimise dust, odour and fumes from the demolition, construction and transportation of materials. Control measures would include: o Covering all loads during transportation to and from site. o Wetting of dusty materials. o Maintaining and operating all equipment in the proper condition and to manufacturer's specifications. o Limiting the unnecessary idling of plant and equipment. • No operational mitigation measures are proposed • The techniques adopted for stripping out and / or demolition must minimise the release of dust into the environment. • At the conclusion of the demolition works, the project site must be examined visually for any evidence of paint chips or debris resulting from the demolition activities. All debris must be removed. • Emission of dust from unsealed roads and other exposed surfaces such as unprotected earth or soil stockpiles must be controlled by use of surface sealants and/or water spray carts or other appropriate cover material. • Disturbed areas must be rehabilitated upon completion of demolition works by provision of protective ground cover such as mulches, vegetation, organic binders or dust retardants. • Stockpiles must be appropriately maintained and contained which could include covering or regular watering to minimise dust. • Traffic movements on any disturbed areas must be limited. • Work must be minimised during high wind periods. • Trucks or train carriages transporting spoil and other waste materials from the site must be covered. • Plant and equipment must be operated in a proper and efficient manner and switched off when not in use.

Aspect	Potential Impact	Control measures
		• Plant and equipment must be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition. • Plant and equipment must be regularly inspected to ascertain that fitted emission controls are operating efficiently.
Biodiversity	☒ Trimming and removal of trees ☒ Noxious weeds ☒ Native vegetation ☒ Habitat ☒ Threatened species ☐ Sensitive areas	• An Ecologist with a minimum of a tertiary degree in a relevant discipline and licensed under the NSW DPE would be engaged to oversee the implementation of the control measures in the FFA. • A Bat Management Protocol (Appendix B) to be included in the CEMP to ensure appropriate checks are undertaken for the presence of bats in bridge structures prior to, and during demolition works. If bats are identified to be actively roosting in the work area, all works are to cease until the roost can be evaluated by a qualified ecologist. • An ecologist to undertake a pre-clearing survey of the proposal area. All felling of native trees should be supervised by an Ecologist who will be available on site to capture, treat/relocate any displaced fauna. • If unexpected threatened flora or fauna species are discovered, stop works immediately and contact Sydney Trains environment branch for advice. • Should any priority or high threat weeds be encountered, appropriate management and disposal of these weeds must be carried out. • The extent of clearing and/or trimming must be marked out and minimised where possible. • All trees to be retained must be protected in accordance with Australian Standard - Protection of Trees on Development Sites (AS-4970-2009), which outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. It is an area isolated from construction disturbance so that the tree remains viable. • As per the Sydney Trains Biodiversity Offsets Calculator, all tree hollows removed must be replaced with an equivalent sized nest hollow at a 3:1 ratio. Hollows from felled trees can be salvaged and erected in trees elsewhere in the property. At least six small nest boxes (less than 5cm entry hole diameter) should be installed into trees in suitable vegetation remaining along the rail corridor. • Storage and stockpiling (soil and material): All storage, stockpile and laydown sites will be established away from any native vegetation that is planned to be retained. No stockpiles shall be placed within the TPZ of a tree. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site.

Aspect	Potential Impact	Control measures
		• Low spill lighting or shielding should be used where possible and restrictions around night-time construction work will be enforced to minimise the impacts on nocturnal fauna using nearby habitats. •
Noise and Vibration	☒ Noise ☐ Vibration ☒ Adjoining landowners	• Communicate expected periods of particularly high noise to community in the letterbox drop within a minimum radius of 250 m radius of the proposal area • Noisy plant items must be positioned any as far as practical from residential receivers. • Program in respite: Max 4 days >HAL in any 7 day period • Implement 1 hour respite for every 3 hour period of PNL over HAL • Plant used intermittently is to be throttled or shut down when not required • The use of plant and equipment should be staged to avoid the simultaneous operation of two or more noisy plant items in close vicinity and adjacent to residential receivers where possible. • Noisy activities must be conducted during standard construction hours where possible, i.e. Monday to Friday 7am to 6pm; Saturday 8am to 1pm; and no work on Sundays or public holidays. • Out of hours works will only be considered if <insert specific requirements>. Any proposed out of hours works must be assessed using EMS-10-PR-0048 *Construction and Maintenance Noise and Vibration Management* or equivalent assessment process. • Residents and other sensitive receivers must be notified of any of any works that are likely to be noisy at least five days prior to those works being carried out. • Loading and unloading activities must be carried out where practical during business hours and away from residential receivers. • No yelling, slamming of car doors or portable radios on site. • Avoid dropping materials from a height where practical. • Truck movements must be scheduled to avoid residential streets where possible.
Heritage	☒ Aboriginal Heritage ☐ Non Aboriginal Heritage	• Should an unexpected historic relic or Aboriginal object be identified during construction, work in the immediate vicinity of the find is to stop and the area must be fenced off with suitable markers (star pickets, flagging or barrier mesh). The Sydney Trains Project Manager and Environment Division are to be notified. Engage an archaeologist to determine the significance

Aspect	Potential Impact	Control measures
	☐ Conservation area ☐ Archaeological potential	of the find, and if required, determine the notification, consultation, and approval requirements. Works must not recommence until Sydney Trains has provided written approval to do so.
Waste Management	☒ Spoil ☒ Litter ☒ Chemicals ☒ Hazardous, Liquid or Special Waste ☒ Solid waste	• Resource management options for the project must be considered against a hierarchy of the following order embodied in the *Waste Avoidance and Resource Recovery Act 2001*. • Avoid unnecessary resource consumption. • Recover resources (including reuse, reprocessing, recycling and energy recovery). • Dispose (as a last resort). • All wastes must be classified in accordance to the *Waste Classification Guidelines* (DECC, 2009) prior to disposal and transported to a licensed waste disposal facility. • Excavated material must be temporarily stored in a bunded area or with appropriate environmental controls in place to prevent run-off of contaminants entering the stormwater system. • Should volumes of excavated material exceed the capacity for stockpiling prior to off-site disposal, excavation works must cease until existing stockpiled material has been disposed of offsite or an additional appropriate stockpiling area is identified elsewhere on the site. • Any spoil or waste material tracked onto paved areas such as roads and car parks must be immediately swept up. No water is to be used to wash any such material tracked onto roads into stormwater drains. • Any concrete aggregate from concrete washdown areas must be disposed off-site either to a recycling facility or a licensed waste disposal facility. • An adequate numbers of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas of the project site would be kept clean and free of litter, including cigarette butts, at all times. • The only fill material that may be imported to the site is Virgin Excavated Natural Material (VENM) within the meaning of the POEO Act and/or any other waste-derived material the subject of a resource recovery exemption under clause 51A of the *POEO (Waste) Regulation 2005* that is permitted to be used as fill material. Any fill material received at the site must be accompanied by documentation proving its waste classification or the material's compliance with the exemption conditions.

Aspect	Potential Impact	Control measures
		• All waste must be removed from the site on completion of the works. • Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility must be retained in a waste register as evidence of proper disposal.
Contaminated Land and Hazardous Materials	☒ Soil Contamination ☒ Hazardous spills	• If, in the unlikely event that contaminated areas are encountered during construction, appropriate control measures must be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Sydney Trains Environment Manager and/or EPA • Should a spill occur on site, it would be immediately contained and cleaned up. Contaminated soil would be excavated and transported to a licensed facility. • All excavated material must be analysed prior to transportation and disposal in accordance with NSW *Waste Classification Guidelines* (DECC, 2009). • Hazardous materials must be transported, stored and used in accordance with the corresponding Material Safety Data Sheets (MSDS). • Fuels, lubricants and chemicals must be stored and, where practicable, used within containment/hardstand areas designed to prevent the escape of spilt substances to the surrounding environment, as required by relevant legislation and standards (e.g. AS1940: Australian standard for the storage and handling of flammable and combustible liquids). • All fuels and other hazardous substances must be stored at designated construction compounds in containers within a bunded enclosure with sufficient capacity to hold 120% of the stored material. • Adequate spill prevention and containment measures (e.g. drip trays) must be used when refuelling equipment on site. • All storage and handling equipment on site must be maintained properly. • The amount of hazardous material stored and used on site must be kept to the minimum practicable. • Construction personnel to be trained in spill containment and response procedures. • Appropriate spill response material to be kept on site. • Spills or leaks to be reported to the senior officer on site and clean up measures commenced immediately.

Aspect	Potential Impact	Control measures
		• Spills to be reported in accordance with legislative and licensing requirements. • If a spill occurs, the material to be contained to the smallest area possible. • Where possible, spilt material and contaminated soils to be treated on site. If this is not possible, the material or soils to be removed off-site for disposal at an appropriately licensed facility, • All spills that cause or may cause material harm to the environment to be reported to the NSW EPA.
Visual Aesthetics and Urban Design	☒ Visual ☐ Views and vistas ☐ Overshadowing ☒ Light spill	• Where appropriate, existing urban elements such as bike racks, bins and bollards be retained, relocated and or removed for re-use as required. • New pavements will be concrete and brick. The pavement will be sensitive to the existing urban design around the station. Broom finish or an alternative comparable hard-wearing finish would be required to suitably complement the existing landscape character. • The planting of native trees, shrubs and ground covers will soften the visual impact of the proposed works. Proposed planting will comprise of low maintenance species. • It is recommended that a sub-surface drip irrigation system is installed as part of the landscaping works. This low cost and automatically operated system would help to establish and support planting stock, and encourage growth of species selected as part of the landscaping plan • The materiality and surface treatment of retaining walls and lift shafts are designed to deter graffiti and allow for easy graffiti removal • Increased lighting of the station and footbridge would deter vandalism and graffiti of the structures. • A high level of housekeeping must be maintained by ensuring that the work site is kept in a clean and tidy condition, with appropriate areas identified for waste materials. • Waste materials must be removed from site regularly. • Any disturbed areas of the site must be revegetated using locally indigenous species in accordance with EMS-06-GD-0074 *Revegetation Guide* and EMS-06-TP-0066 *Revegetation Technical Specification Template*.
Socio-Economic Effects	☐ Land Use ☐ Property Effects ☐ Economic Effects	• Schedule deliveries and major construction activities at times that do not conflict with busy periods at the local community facilities

Aspect	Potential Impact	Control measures
	☒ Other community impacts	• Do not park construction vehicles at areas used for school parking, including the designated kiss and drop area • Ensure that there is adequate communication about the planned construction scheduling with the administrators of community facilities (such as the church, scout hall and school) • The relevant residents and businesses must be notified between five days and two weeks prior to the start of any construction activity conducted outside standard construction hours. Further details provided in 5.5.3 of this REF. • Notifications will include a description of the work, location of the work areas, the timing, duration and the likely impacts of the project • Construction plant and equipment will not remain on-site longer than necessary after the project is complete. • The proposal area and specifically the site compounds must be cleared of waste materials and left in a tidy condition following completion.
Transport	☒ Traffic and access ☒ Transport	• A Traffic Management Plan (TMP) must be included in the CEMP. The TMP for the proposal must be reviewed and updated to minimise and manage the disruption caused by the proposed works. • The TMP will be distributed to Hornsby Shire Council prior to construction • If required, temporary relocation of bus stops will be outlined in the TMP • The TMP will detail site entry and exit requirements, access points, access to designated off-site staging areas and truck movements, and be in line with Roads and Maritime Services' standards. The TMP would address whether or not the works require partial or periodic full road closure and if traffic controllers are required, particularly along the Pacific Highway, Belmont Parade and Pierre Close. • Consultation with TfNSW Roads and Maritime will be carried out to confirm traffic controls strategy • All impacted stakeholders must be notified of the lane closures and of the available alternate routes well in advance of works commencement. • No signalised intersections are proposed to be altered by TfNSW. However, as the responsible road authority can choose to modify signal operation at any time during the construction works.

Aspect	Potential Impact	Control measures
		• Prior to and throughout the construction period, heavy vehicles will be accommodated within construction area. Construction vehicles are not permitted to queue or park within the local streets of the surrounding area. • Heavy vehicle movements to/from the site will be restricted to designated truck routes and confined to the arterial road network to ensure minimal impact on local streets within the vicinity of the site. • Construction vehicles, materials and equipment must be positioned to minimise impacts to public access and parking. • Additional truck movements associated with deliveries and waste disposal would be limited to standard construction hours and non-peak periods where possible. This would limit the impact of traffic related noise on nearby sensitive receivers and minimise the queuing of construction vehicles on local roads. • Where daytime deliveries are not possible, routes and drop off points would be positioned away from sensitive receivers. If traffic queuing is required, idling would be minimised by asking truck drivers to turn off their vehicles when queuing. • Normal mitigation measures would apply for the management of public transport impacts during the track possessions. These would include community notification through internet and station announcements, planning possession periods outside of high demand periods and providing replacement buses during each possession period. • Construction vehicles, materials and equipment must be positioned to minimise impacts to public access and parking.

7.2 Implementation Process

The environmental management measures contained in this REF (as outlined in Section 7) would be implemented to ensure that the environment is adequately protected and that adverse impacts are avoided or otherwise substantially ameliorated.

The construction contractor would be required to prepare a specific CEMP incorporating the mitigation measures specified in this REF. A copy of this REF and the CEMP is to be retained on the work site and produced upon request. The CEMP is to be reviewed by a Sydney Trains Environmental Professional, where required and endorsed by the Project Manager prior to works commencing on site. The CEMP is to include the following:

- Identification of the environmental issues and risks of the project;
- Details of environmental controls to be implemented including location and timing;
- Details of statutory requirements including those of any approvals and licences (see Table 7-2 below)
- Assignment of responsibility for implementation and monitoring of environmental controls;
- Reporting, incident notification and emergency procedures;
- Contact details for all site personnel and agency contacts; and
- Corrective action requirements and their verification.

The details of permits, licenses and approvals, including but not limited to those identified in Section 3.7 can be summarised in Table 7-2 where relevant. Details of the other permits and approvals must also be provided in the CEMP.

Table 7-2 Summary of permits and other approvals required

Aspect	*Legislation*	*Section/Clause*	*Approval authority*	*Comment*
Planning Pathway	EP&A Act	Part 5	Sydney Trains	Sydney Trains as a determining authority must assess the potential impacts of the proposal on the environment
	T+ISEPP	Subdivision 1, section 2.92	Sydney Trains	Railway Infrastructure
Licensing	EPL 12208		NSW EPA	Railway Systems Activity.
Other approvals	*Roads Act 1993*	Section 138	Roads and Maritime Services	Temporary road closures

8 Finalisation

8.1 Justification and conclusion

This REF has been prepared in accordance with the provisions of Division 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 majority of the impacts of the safety screen upgrades would be confined to the construction stage of the works. These impacts would be temporary in nature and managed in accordance with site-specific CEMP, which would be developed from this REF if approved.

This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and requirements of the EPBC Act. Based on the assessment contained in this REF, it is considered the proposal is not likely to have a significant impact upon the environment or any threatened species, populations or communities. Accordingly, an EIS is not required.

The proposal would also take into account the principles of ESD. These would be considered during the 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.

The potential adverse impacts of the proposal are likely to be temporary in nature. These impacts may involve:

- Temporary negative impacts to visual aesthetics and urban design during construction
- Potential removal of 0.32 ha of vegetation within the rail corridor
- Temporary noise impacts associated with construction of the new structures, particularly for the installation of lift shafts
- Access to the station would be retained throughout construction, with the potential for alterative access to bus stops along the Pacific Highway. This would be determinate at subsequent design stages and outlined in the TMP
- Temporary dust generated by construction activities

When considered against the ‘do nothing’ option, the proposal would provide the following benefits:

- Replacing the existing footbridge with a new footbridge with 120 year design life would improve safety and result in the long term access to the station
- Installation of ramps and lift shafts would improve connectivity and accessibility to public transport facilities
- Landscaping and architecture would positively affect the urban design and visual aesthetics of the area
- Relocation of OHW and other services, which would improve maintenance costs and reduce OHW visibility and visual congestion

- Increased lighting and CCTV at the new footbridge and station would reduce potential loitering and improve the safety at Mount Colah Station for users, as well as the wider public
- Increased access to the station for less mobile passengers, as well as increased connectivity between public transport infrastructure services. In addition, the installation of ramps would allow result in unobstructed movement between the residential areas east of Pierre Close to the Mount Colah commercial precinct at the Pacific Highway
- Reduction in maintenance time and costs that would be incurred if the upgrades were not undertaken

On balance, the benefits derived from proceeding with the proposal are considered to outweigh the potential impacts and hence the proposal is considered to be justified.

8.2 REF Determination

8.2.1 Author Declaration

I declare that:

- This REF has been prepared in accordance with the following plans and supporting information (insert table of plans or specific assessments, where relevant).
- This REF addresses the requirements of Section 5.5 of the EP&A Act.
- An examination and assessment of the activity has been undertaken to take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity, as addressed in this REF.
- The likely significance of the environmental impacts of the activity has been assessed in accordance with Clause 228 of the EP&A Regulation.
- An assessment of the impacts of the activity on critical habitat and on threatened species, populations or ecological communities or their habitats, for both terrestrial and aquatic species has been undertaken. The activity described in the REF will not significantly affect threatened species, populations or ecological communities or their habitats. Therefore, no Species Impact Statement is required.
- The assessment has addressed the potential impacts of the activity on matters of national environmental significance and any impacts on Commonwealth land and concluded that there will be no significant impacts. Therefore there is no need for a referral to be made to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.
- The environmental impacts of the proposal are not likely to be significant and therefore it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister of Planning under Division 5.2 of the EP&A Act.
- This REF provides a true and fair review of the activity in relation to the likely impacts of the proposed activity on the environment, and details the control measures to be implemented to minimise the potential impact on the environment.

- I have complied with the Sydney Trains EMS-03-WI-0124 *Part 5 Review of Environmental Factors Process*.

Author:	**Revision 0**	
Name:	[redacted]	
Position:	Experienced Environmental Scientist	
Signature	[redacted]	**Date:** **8 December 2020**
Author:	**Revision 1**	
Name:	[redacted]	
Position:	Principal Environmental Planner	
Signature	[redacted]	**Date:** **25 May 2022**
Author:	**Revision 2**	
Name:	[redacted]	
Position:	Senior Environmental Planner	
Signature	[redacted]	**Date:** **12 July 2022**
Author:	**Revision 3**	
Name:	[redacted]	
Position:	Senior Environmental Planner	
Signature	[redacted]	**Date:** **13 September 2022**

8.2.2 Assessor Declaration

I declare that:

- I have independently reviewed this REF.
- It is my judgement that the declaration made by the Author is correct and not false or misleading in a material respect.
- I have complied with the Sydney Trains EMS-03-WI-0124 *Part 5 Review of Environmental Factors Process.*
- It is recommended that the project proceed subject to the implementation of all mitigation measures identified in this REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

Assessor:		
Name:	[redacted]	
Position:	**Environment and Sustainability Manager, Transport for NSW**	
Signature	[redacted] 2022.10.24 14:28:18 +11'00'	**Date:**

Sydney Trains must publish this approved document if it meets the EP&A Regulation publishing requirements (s.171).

[ ] This document does not meet the criteria for publish and DOES NOT need to be published
[x] This document DOES meet the criteria for publishing

8.2.3 Certifier Declaration

I declare that:

- The description of the project in this REF thoroughly and accurately represents the proposed activities associated with the project.
- The REF provides a true and fair review of the activity in relation to the likely impacts of the proposed works on the environment, and details the control measures to be implemented to minimise the potential impact on the environment.
- I have reviewed the Assessment and Evaluation requirements of the EMS-03-WI-0124 *Part 5 Review of Environmental Factors Process* and am satisfied these have been adequately completed.
- I accept the REF on behalf of Sydney Trains (check subject to any review process)
- A copy of this REF will be retained onsite and produced upon request.
- All mitigation measures described in this REF will be implemented.
    - A CEMP shall be prepared to implement the mitigation measures identified in the REF (Section 7.0)
- The CEMP must be endorsed/approved by the Project Manager (or delegate) prior to any works commencing on site.
- Copies of the plans must be retained onsite and produced upon request:
- The following management plans will be developed and in place before work commences and will be implemented throughout the construction phase.
    - An Erosion and Sediment Control Plan (ESCP);
    - An Environmental Controls Map with erosion controls, access points, important contacts, sensitive receivers, location of amenities and any vegetation clearing or trimming; and
    - Any other management plan required by this REF.
- Personnel will be briefed during site induction on the location of sensitive areas and control measures identified in the CEMP, ESCP and Environmental Controls Map.
- Control measures will be regularly monitored and maintained to ensure effectiveness.
- Any additional approvals, licences or permits required under relevant environmental legislation will be obtained and the conditions therein diligently implemented.
- I have complied with the Sydney Trains EMS-03-WI-0124 *Part 5 Review of Environmental Factors Process.*
- I acknowledge that I will be held accountable for implementing all of the activities listed under the Certifier Declaration.

Certified by:		
Name:	[redacted]	
Position:	Works Manager - Project and Support	
Signature:	[redacted]	**Date:** 19/10/2022

8.2.4 Determiner's Declaration

I declare that:

- Having considered the scope of the project, the impacts and controls identified in the REF, in accordance with Section 5.5 and 5.7 of the *Environmental Planning and Assessment Act 1979,* I approve the undertaking of the project as described by the REF <with the following conditions: insert or provide additional conditions as recommended by Assessor and / or Certifier …>.
- This project determination will remain current for five years until 19 October 2027 at which time it shall lapse if works have not been physically commenced
- I have complied with the EMS-03-WI-0124 *Part 5 Review of Environmental Factors Process*.

Determiner's Declaration and Approval:		
Name:	[redacted]	
Position:	Manager Civil Programs • Engineering & Maintenance	
Signature:	[redacted]	Date:

9 References

Australian Bureau of Statistics (2020), 2016 Census QuickStats: Mount Colah, <https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC12750#:~:text=People%20%E2%80%94%20demographics%20%26%20education&text=In%20the%202016%20Census%2C%20there,up%200.8%25%20of%20the%20population.&text=The%20median%20age%20of%20people,State%20Suburbs)%20was%2039%20years.>

AECOM (2019), Mount Colah Station, 11kV Feeder 649/1 Relocation Option Study, prepared for Sydney Trains

Arup (2010) Mount Colah Footbridge Investigation and Assessment Report, prepared for Sydney Trains

Community ID (2020), Mount Colah – Mount Kuring-gai, Need for assistance, <https://profile.id.com.au/hornsby/assistance?WebID=220>

Hornsby Shire Council (2020), Application to Remove or Prune Trees & Vegetation, <https://www.hornsby.nsw.gov.au/environment/flora-and-fauna/tree-management/application>

GHD (2019), Replacement Footbridge Concept Options Mt Colah Station Footbridge Concept Options Report', prepared for Sydney Trains

Jacobs (2014), Mount Colah Footbridge Final Design Report, prepared for Sydney Trains

Landcom (2004), Managing Urban Stormwater, vol. 1, 4th edition

Landpearl (2020), Colah View development, <http://www.landpearl.com.au/project/colah-view/>

Land Registry Service (2020), Registrar General's Guidelines: General principles, <https://rg-guidelines.nswlrs.com.au/deposited_plans/roads/general_principles>

NSW Environmental Protection Authority (2017), The waste hierarchy, https://www.epa.nsw.gov.au/your-environment/recycling-and-reuse/warr-strategy/the-waste-hierarchy

NSW Department of Planning and Environment (2022) NSW Bionet. The website of the Atlas of NSW Wildlife

SMEC (2020b), Mount Colah Footbridge Renewal, Geotechnical Technical Memo, prepared for Sydney Trains

Transport for NSW (2020), Mount Colah Station, <https://transportnsw.info/stop?q=10101129#/>

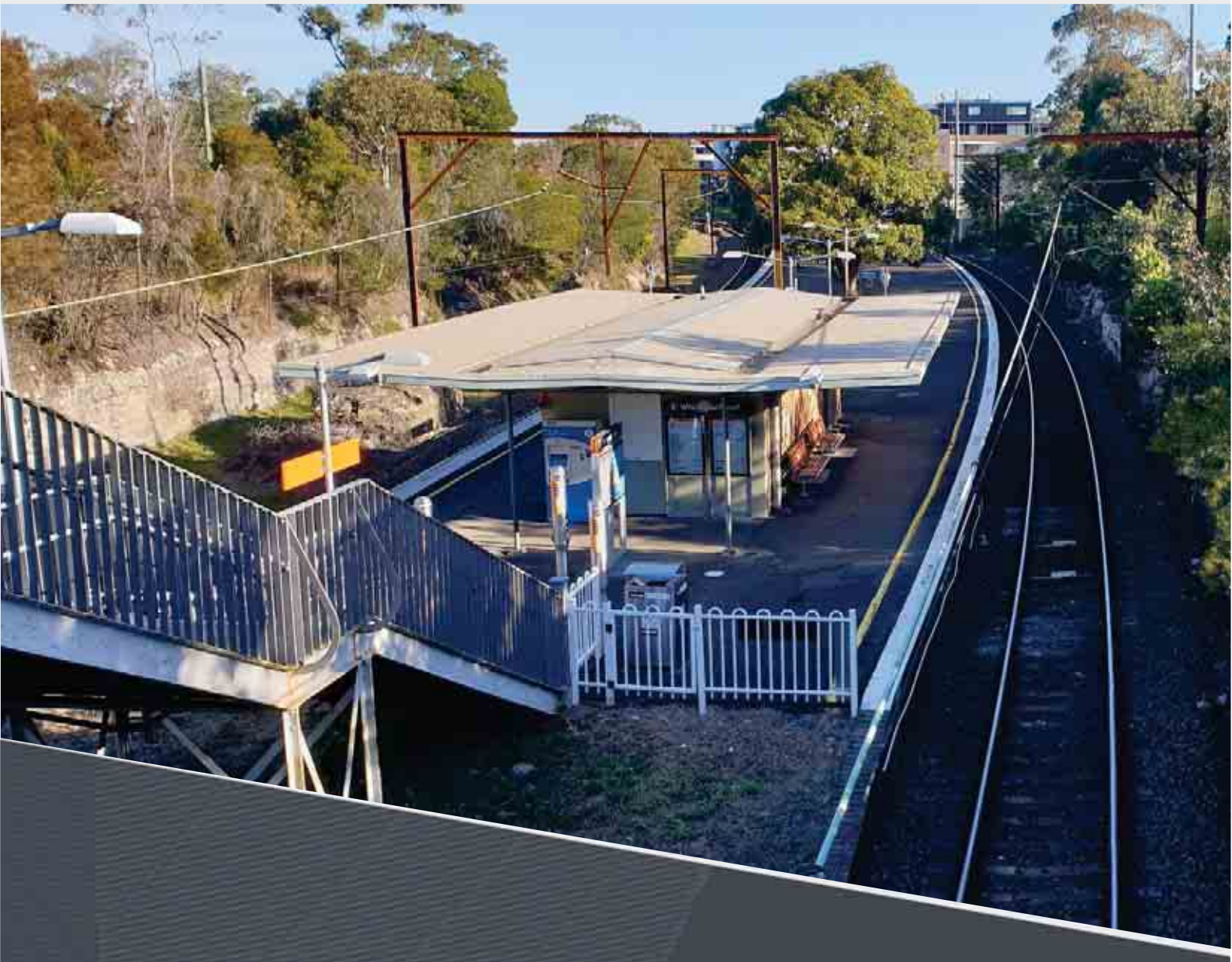
Transport for NSW (20[illegible] Tran Statistics 2014, <https://www.transport.nsw.gov.au/sites/default/files/media/documents/2017/Train%20Statistics%202014.pdf>

Appendices

Appendix A – Design Report

SMEC
Member of the Surbana Jurong Group

local people
global experience



Reference Design Report

Mount Colah Footbridge Renewal

Reference No. 30012921-GE-R-01
Prepared for Sydney Trains
10 December 2020

SMEC INTERNAL REF. 30012921

Document Control

Document:	Reference Design Report
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Project Name:	Mount Colah Footbridge Renewal
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Revision No.	Date	Prepared by	Reviewed by	Approved for Issue by
A (30% Issue)	22 August 2020	[redacted]	[redacted]	[redacted]
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0 (Final)	10 December 2020	As above	As above	As above

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SMEC Company Details

Approved by:	[redacted]		
Address:	[redacted]		
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Tel:	[redacted]	Fax:	-
Email:	[redacted]	Website:	www.smec.com

Important Notice

This report is confidential and is provided solely for the purposes of reference design for Mount Colah Footbridge Renewal. This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and Sydney Trains, under which SMEC undertook to perform a specific and limited task for Sydney Trains. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. The executive summary is not a substitute for this. Any subsequent report must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents or which come to light after the date of the report. SMEC is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which SMEC becomes aware, after the date of this report.

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EXECUTIVE SUMMARY

Mount Colah Railway Station is situated in the North Sydney suburb of Mount Colah, within the local government area of Hornsby Shire Council between Asquith and Mount Kuring-gai Station. The station consists of an island platform (Platform 1 and 2) which services the electrified Down Main to the west of and electrified Up Main to the east. The island platform is currently accessed via a two-span steel trestle bridge that is located at the northern end of the station, constructed circa 1909. The existing footbridge also provides cross corridor access between Pacific Highway on the Down side and Pierre Close on the Up side. The existing footbridge was previously assessed by Arup in 2010 to be in poor condition. Having exceeded its design life, the footbridge has been prioritised by Sydney Trains for replacement

Sydney Trains engaged SMEC in June 2020 to complete the reference design for a replacement footbridge at Mount Colah, based on the past concept options developed by GHD and AECOM. Sydney Trains' main objective for this project is to minimise project risk in relation to scope, cost and time by integrating the 11kV Feeder 649 modification and new footbridge as a single reference design to enable Sydney Train to proceed to a detail design and construct tender.

SMEC's reference design consists of the following key features:

- Two span semi-integral PSC plank bridge, with 6.5 m and 6.7 m clearances from the soffit to the Down and Up Mains, respectively. New footbridge is located centrally along Mount Colah Platform, with lift and stair access.
- New station access from Pierre Close and Pacific Highway. New kiss 'n' ride and DDA parking on Pierre Close and associated accessible paths to footbridge entry.
- Decommissioning of 11kV/649 aerial spans between poles 23-24,24-25 and 25-26 and undergrounding of cable route on the down side between new UGOH poles 23 and 25.
- New 11kV/415V padmount substation connected to 11kV aerial feeder 649 has been proposed to supply the new and existing Mt Colah Station loads on the Down Side.
- Existing 5kVA pole mounted 11kV/120V main signalling supply to be decommissioned. Main signalling supply to be obtained from new 11kV/415V padmount connected to 11kV aerial feeder 649.
- Alternative station power supply from new Ausgrid supplied 200kVA 415/415V isolation transformer on Up Side. Existing signalling backup supply 5kVA transformer (240/120V) to be relocated to Up Side and supplied from Ausgrid 200kVA 415/415V transformer.
- Services on existing footbridge (signal loc N23.48R power and communications) relocated to new footbridge. New station power supply from 11kV/415 padmount to be routed on new footbridge.
- Removal of existing Platform 1 guard indicator and installation of two (2) new guard indicators; one (1) mounted on the lift shaft and one (1) mounted on a pole approximately 50-70 m towards city
- Auxiliary works including localised platform regrading, relocation of platform furniture and landscaping

This report documents the reference design as per the format below:

- Section 1 – Introduction
- Section 2 – Overview of Site
- Section 3 – Design Inputs
- Section 4 – Reference Design Description
- Section 5 – Constructability
- Section 6 – Safety in Design
- Section 7 – Cost Estimation
- Section 8 – Outstanding Issues and Risks

Key outstanding issues for resolution at detail design have been included in Section 8 and Appendix V.

DEFINITIONS AND ABBREVIATIONS

Term/Abbreviation	Definition
AFC	Approved for Construction
AFIL	Audio Frequency Induction Loop
AS	Australian Standard
ASA	Asset Standards Authority
BCA	Building Code of Australia
CB	Circuit Book
CCT	Correlated Colour Temperature
CCTV	Close Circuit Television
CDR	Critical Design Review
CIS	Customer Information System
CRI	Colour Rendering Index
CSR	Combined Services Route
DB	Distribution Board
DDA	Disability Discrimination Act
DSMSB	Distribution Supply Main Switch Board
ETS	ETS Electronic ticketing system
FLR	FLR Fixed Location Reader
GST	Galvanised Steel Troughing
HV	High Voltage
IDF	Intermediate Distribution Frame
IK	Impact protection Rating
IMSB	Installation Main Switch Board
IP	Ingress Protection
LV	Low Voltage
MDF	Main Distribution Frame
OCDN	Operations Critical Data Network
OHW	Overhead Wiring
OHW	Overhead Wiring
OHWS	Overhead Wiring Structure
OHWS	Overhead Wiring Structures
PA	Public Address

Term/Abbreviation	Definition
PAS	Public Address System
PID	Passenger Information Displays
POD	Proposed Operating Diagram
REF	Review of Environmental Factors
RFI	Request for Information
RIM	Rail Infrastructure Manager
RMU	Ring Main Unit
SME	Subject Matter Expert
SMOF	Single Mode Optical Fibre
SP	Signalling Plan
SPI	Station Passenger Information
SRS	System Requirements Specifications
SS	Substation
SSER	Station Services Equipment Room
SSM	Security Standards Manual
ST	Sydney Trains
TAP	Transport Access Program
TfNSW	Transport for New South Wales
TIP	Track Insulation Plan
TIS	Train Information System
VOIP	Voice over Internet Protocol

1 Introduction

1.1 Project Background

Mount Colah Railway Station is situated in the North Sydney suburb of Mount Colah, within the local government area of Hornsby Shire Council. The station is on the Main North Line at approximately 37.7 km, between Asquith and Mount Kuring-gai Station. The station consists of an island platform (Platform 1 and 2) which services the electrified Down Main to the west of and electrified Up Main to the east. The lines are used for both passenger and freight movement.

The island platform is currently accessed via a two-span steel trestle bridge that is located at the northern end of the station, constructed circa 1909. The existing footbridge also provides cross corridor access between Pacific Highway on the Down Side and Pierre Close on the Up side. Refer to Figure 1-1 below for the layout of existing footbridge. Mount Colah Railway Station (including the existing footbridge) is not listed on any local, state or commonwealth heritage registers. The existing footbridge was previously assessed by Arup in 2010 to be in poor condition. Having exceeded its design life, the footbridge has been prioritised by Sydney Trains for replacement.

Figure 1-1: Site Layout (© SixMaps 2020); indicative location of new footbridge shown in orange

1.2 Project Objectives

Sydney Trains engaged SMEC in June 2020 to complete the reference design for the footbridge replacement, based on the past concept options developed by GHD and AECOM. Sydney Trains' main objective for this project is to provide a reference design for the footbridge replacement to enable Sydney Train to proceed to a detail design and construct tender.

The aim of reference design is to minimise project risk in relation to scope, cost and time by integrating the 11kV Feeder 649 modification and new footbridge as a single project.

1.3 Previous Related Projects

The following projects have been commissioned to date by Sydney Trains for the development of the replacement footbridge design and associated enabling works.

- **Replacement Footbridge Detail Design (Jacobs) – 2014:** Jacobs completed the detail design up to AFC for a replacement footbridge to the north of the existing footbridge. The footbridge design consisted of ramp/stair access to Pacific Highway and lift/Stair access to the platform and Pierre Close. The design required an extension of the northern end of the existing platform. This design was not preferred by Sydney Trains as its location at the end of the platform was not favoured. For further details, refer to *'Mount Colah Footbridge Final Design Report'*, *Report No. NB98036-RP-002*, *dated 05 November 2014.*
- **Replacement Footbridge Concept Options (GHD) – 2019:** GHD developed four concept options for the replacement footbridge as follow:
  - Option 1: Footbridge located centrally within the platform, south of the existing station building with ramp/stair access to Pierre Close and lift/stair access to Pacific highway and the platform
  - Option 2: Footbridge located approximately 40 m South of Option 1, with multiple mechanical lifts
  - Option 3: Footbridge at southern end of platform with multiple mechanical lifts
  - Option 4: Footbridge at northern end of platform adjacent to existing bridge

  Option 1 was chosen as the preferred based on a workshop with Sydney Trains and GHD in 2017. For further details, refer to *'Mt Colah Station Footbridge Concept Options Report'*, *Report No. 2126499*, *Dated April 2019*
- **11kV Feeder 649/1 Relocation Option Study (AECOM) – 2019:** Aecom prepared four concept options for the relocation of 11kV Feeders 649/1 on Pacific Highway to enable the construction of the replacement Mount Colah Footbridge and avoid the non-compliance issue of bare HV conductors above the new footbridge. The four options developed were as follow:
  - Option 1 – Installation of GST adjacent to rail track
  - Option 2 – Trenching outside corridor, under pedestrian footpath
  - Option 3 – Trenching and GST inside corridor
  - Option 4 – Underbore through embankment inside rail boundary

Sydney Trains preferred Option 4 of AECOM Mount Colah 11kV Feeder 649 Relocation option study has been used as reference. As later clarified by Sydney Trains, this option was preferred not due to the construction methodology but the alignment of the 11kV on the Down Side and retention of pole top transformer on pole 26. Following the 30% reference design submission, the preference to decommission the pole top transformer on pole 26 following the decision to use the new 11kV/415V padmount as the main power supply for the station and signal LOC 23.48

1.4 Scope of Works

The Reference Design for the Mount Colah Footbridge replacement consists of the following main scope items:

- Design of new footbridge, with three lifts and stairs (based on preferred GHD Option 1) and new access from Pacific Highway and Pierre Close
- Design of additional station services required for the upgrade to station footbridge including new CCTV and lighting
- Realignment of OHW impacted by the decommissioning and demolition of the existing footbridge
- Provision of new kiss 'n' ride and DDA parking
- Relocation of the existing 11kV feeder section 649/1
- Relocation/protection of existing services (Sydney Trains and 3rd Party) impacted by construction and permanent works of the new footbridge
- Relocation of existing services (owned and 3rd Party) impacted by the decommissioning and demolition of the existing footbridge

SMEC has been engaged for the following scope of works:

- Project kick-off and information gathering; including site walkover
- Systems Requirements Definition (development of SRS), based on the project RFP and stakeholder comments
- Development of reference design with inputs from the following disciplines:

- Architectural (including BCA/DDA, urban design, landscaping and wayfinding)
- Structural
- Geotechnical
- Civil (including 3rd party utilities)
- Drainage
- Electrical (including HV, LV, Lighting, Earthing and Bonding)
- Signalling
- CSR
- OHW
- Building services (security, mechanical, vertical transportation and communications)

1.5 Project team

SMEC has partnered with the following sub-consultants for the delivery of the reference design:

- Caldis Cook Group (CCG) –Architecture
- Taylor Brammer – Urban Design and Landscaping
- Blue Sky Design Group - Wayfinding
- Matt Shuter and Associates (MSA) – BCA/DDA
- JHA Consulting –Building Services (Security, Communications, Mechanical and Vertical Transportation)
- JMDR – Signalling
- Slattery – Cost Estimation
- Degotardi, Smith and Partners – Detailed Site Survey

1.6 Stakeholders

Table 1-1 below summarises the key project stakeholders that have been identified during reference design.

Table 1-1: Key Project Stakeholders

Stakeholder	Interface
Sydney Trains	Sydney Trains is the primary stakeholder, as the asset maintainer and operator. Consultation with Sydney Trains is via design reviews facilitated by Sydney Trains' Design Delivery Manager (DDM).
Ausgrid	Local network service provider. Consultation with Ausgrid is required for any changes to the Ausgrid LV network and for changes to the pilot cable that is supported on 11kV 649 Feeder poles 24 and 25. Initial consultations with Ausgrid have been undertaken by SMEC during the reference design phase.
Telstra	Telecommunications provider for Mount Colah Station. Consultation with Telstra is required for proposed modifications to the existing service from Pierre Close and Pacific Highway.
Hornsby Shire Council	Local governing body for Hornsby Shire. Consultation is required with council for impacts to existing footpaths and local roads during construction works and for modifications to the station precinct i.e. new proposed disability parking and kiss 'n' ride on Pierre Close. As agreed at the project kick off, consultation with council will be undertaken by Sydney Trains at the next design stage.
Sydney Water	Consultation with Sydney Water is required during detail design for assessment of construction impacts on the existing Sydney Water service on Pacific Highway.
Roads and Maritime Services	Coordination with Roads and Maritime services will be required during construction for temporary road closures and impacts to Pacific Highway.

1.7 Changes from Previous Submission

The following changes have been made from 30% to 100% reference design:

- Decommissioning of air break switch on Pole 27 as proposed RMU will make it redundant.
- Provision of alternate supply for station (including new footbridge lifts) via new 200kVA 415/415V Ausgrid isolation transformer on Pierre Close (Up Side).
- Addition of temporary 11kV GST arrangement for conservative construction sequencing
- Modifications to signalling power supply arrangement:
  - Decommissioning of signalling main supply transformer mounted on Pole 26 and replaced by 240/120kV padmount transformer supplied from proposed DSMSB.
  - Relocation of signalling backup transformer to Pierre close (Up Side).
- Modification of proposed 11kV/415V padmount substation location to suit temporary 11kV GST arrangement and topography.
- Adjustment of realigned signal and communications -28- route for pit / penetrations at Signal Loc 23.48
- Removal of temporary guard indicator relocation for construction, as requested by Sydney Trains
- Addition of new pole mounted guard indicator 50-70 m city side of new platform lift (final location subject to signal sighting)
- Reticulation updates including:
  - LV backup supply for Station and Signal Hut reticulation updated for 415V/415V padmount adjacent to Signal Hut
  - Vertical reticulation adjusted for lift service riser locations
  - Platform reticulation updated to accommodate Comms Room and Station Building penetrations
  - Station lighting reticulation added
  - Additional guards indicator reticulation added
  - Footbridge reticulation
- Modifications to OHW including:
  - Change of Down Main OHWS from a simple mast with a push arrangement to a cantilever mast with a drop vertical and a pull arrangement, as requested by Sydney Trains.
  - Increase of catenary height at N37+722 to 6.7 m to provide adequate system depth in the middle of the wire bay. A new cantilever will be required to be designed in detailed design as a result.

The following changes have been made from 100% reference to FINAL reference design:

- Removal of coloured polycarbonate safety screens from footbridge, with clear colourless polycarbonate proposed
- Reduction in extent of polycarbonate safety screens on footbridge (limited to required extent required by T HR EL 08001 ST and weather protection for lift control board on footbridge level)
- Replacement of polycarbonate on side of lift shaft with solid aluminum cladding
- Update of architectural elevations to show central mullion, reducing glazing panel sizes

2 Overview of Site

2.1 Existing Platform

Mount Colah Station consists of an island platform. Platform 1 on the eastern side services the Up main whilst Platform 2 on the western side services the Down Main. The platform is on a curved alignment, with the platform width narrowing towards the ends. Figure 2-1a show a view of looking along the length of the platform towards the existing footbridge. Current access to the island platform is via the existing footbridge central stairs on the northern end of the platform. Figure 2-1b shows the existing station entry, including the current electronic ticketing (OPAL).

Figure 2-1: a) LEFT: View of platform (looking North, towards Country) showing curve in platform; b) RIGHT: View of existing station entry

2.2 Existing Footbridge

The existing footbridge is a two-span structure located at the northern end of the station. The bridge is currently non-DDA compliant as there is no access for less able or wheelchair bound patrons to access the platform. The existing bridge consists of a steel beams and a concrete deck superstructure, supported on steel trestles. OHW is attached to the soffit of the existing footbridge on both the Down and Up Mains. Figure 2-2 below shows the elevation of the existing footbridge, including the OHW attachments. The existing footbridge also provides cross corridor access between Pacific Highway on the Down side and Pierre Close on the Up side.

Figure 2-2: View of existing footbridge from Platform a) LEFT: Span over Down Main, b) RIGHT: Span over Up Main

2.3 Existing Services

2.3.1 11kV Feeder 649

Within the project area, the existing 11kV aerial line feeder runs along on the Down Main side of the track within the rail corridor. Hornsby SS supplies the feeder from the city side as shown in Figure 2-3 and Cowan SS supplies the feeder from the country side.

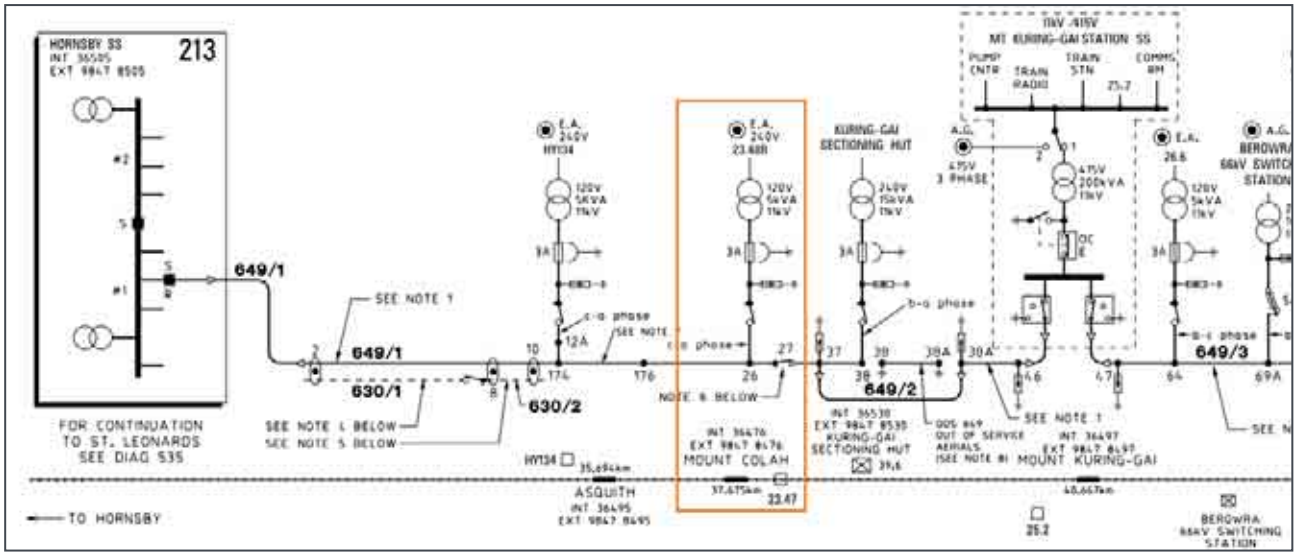


Figure 2-3: Extract from EOD SY536

Refer to Figure 2-4 and items below for site summary of 11kV feeder:

- Pole mounted transformer on pole 26 supplies signalling location on Up Side
- Air break switch on pole 27
- Conductors are tensioned at pole 21
- Conductors are tensioned at pole 26 and pole 27

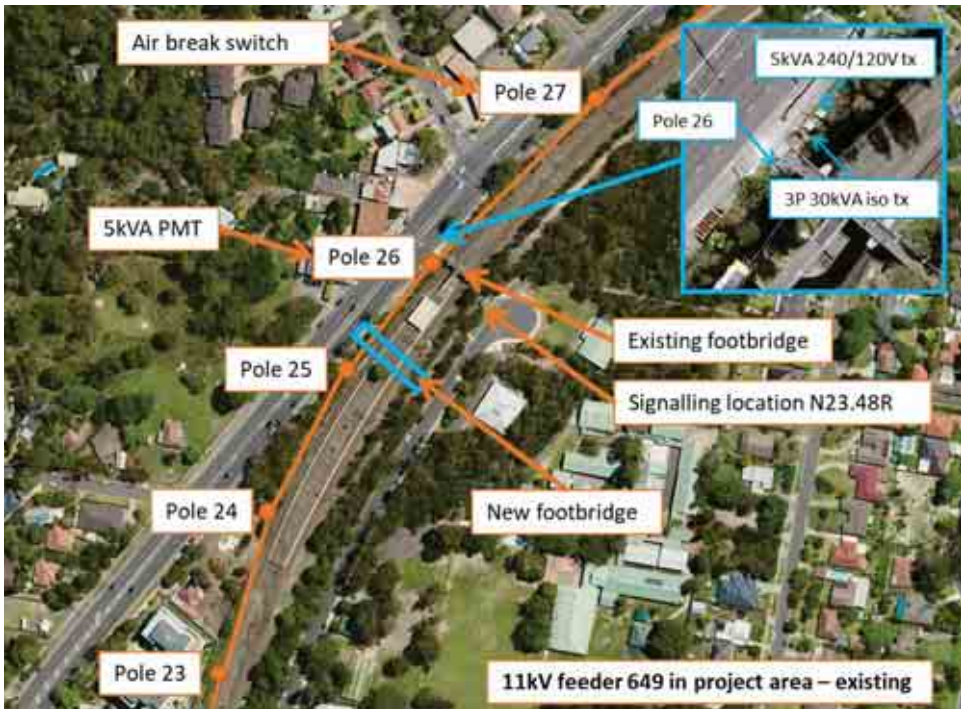


Figure 2-4: Sketch of existing 11kV feeder in project area

2.3.2 Ausgrid Pilot Cable

Following a review of the DSS, Dial Before You Dig Plans and initial site visit, it was noted that there is a third-party asset running along the Down Side of the corridor. This asset would be impacted by the proposed replacement footbridge as well as the proposed undergrounding of the 11kV feeder which would result in removal of poles (poles 24 and 25) that the asset is supported by.

Refer to Figure 2-5 and Figure 2-6 below for the location of the asset on the DSS and pole attachments.

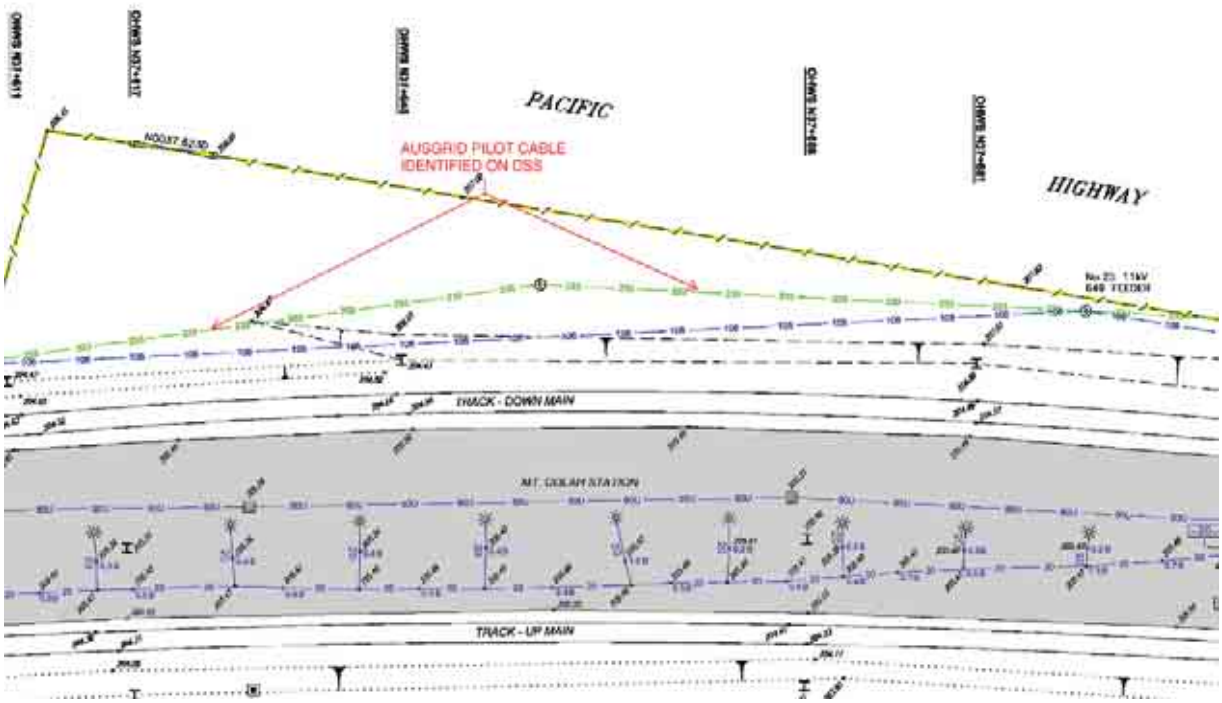


Figure 2-5: Ausgrid Pilot Cable Identified on DSS (incorrectly identified as an external electric power cable less than 33 kV)

Figure 2-6: Photo of Ausgrid Pilot Cable Attached to Pole No.25

Following ongoing liaison with Ausgrid, it has been confirmed that this asset is a copper pilot cable that is part of their network which has recently been made redundant. SMEC met onsite with representatives from both Ausgrid and Sydney Trains on 6th November 2020 to discuss the proposed works and required adjustments to this pilot cable.

Ausgrid confirmed during the discussions onsite that the cable can be removed and that they would tentatively book in to “cut and cap” the cable at either end of the site during the first possession in 2021. This will enable the contractor to

remove sections of the cable and poles as required during the construction of the footbridge without the need for Ausgrid to be present or undertake the work themselves.

SMEC has requested that Ausgrid provide confirmation that these works will go ahead and what information is required from Sydney Trains end. While Ausgrid mentioned onsite that there may be costs involved with these works, it is yet to be determined if there is a pre-existing leasing arrangement for the cable running through the rail corridor which would require them to remove any redundant assets at their own cost.

Correspondence with Ausgrid regarding the removal of the redundant cable has been included in Appendix K.

2.3.3 Services on the Footbridge

A DSS including the services supported on the existing footbridge is not available at the time of the reference design development. Based on a review of the available DBYD, surrounding DSS plans and site visit observations, the following services were identified on the existing footbridge:

- Signalling Sydney Trains (main) supply (from Pole 26 mounted transformer)
- Signalling Ausgrid (backup) supply
- Station power supply from Ausgrid
- Telstra connection from Pacific Highway
- Telstra connection from Pierre Close
- Signalling and communications from Loc N23.48R

Figure 2-7 below shows an indicative mark-up of the service routes on the existing footbridge. Photos of the existing services are also shown in Figure 2-8 to Figure 2-10 below.

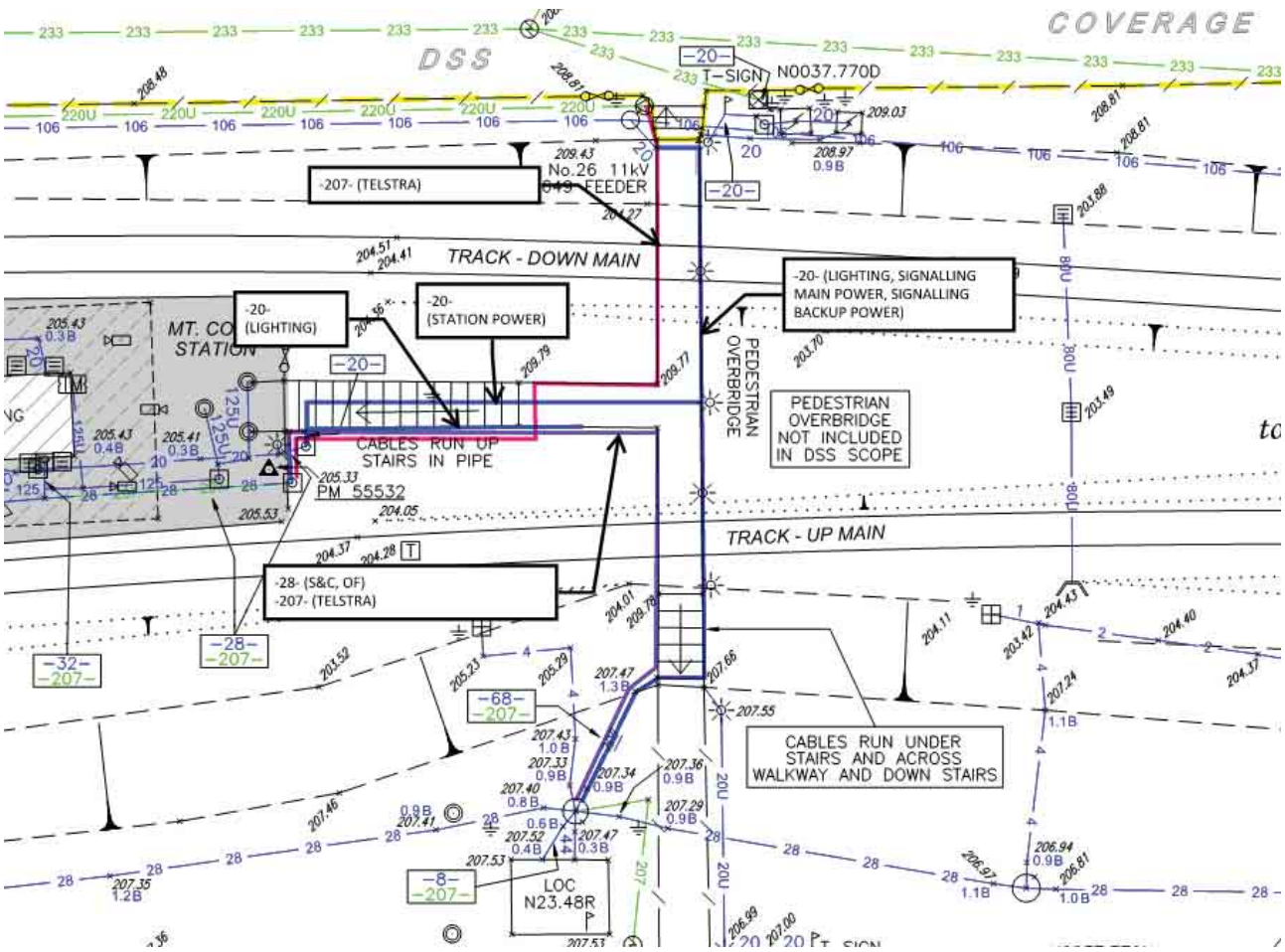


Figure 2-7: Mark-up of services on bridge

Figure 2-8: a) LEFT: View of existing services on Country side of existing footbridge (power supply); b) RIGHT: View of services from Signal Loc N23.48R on City side of existing footbridge (signalling and communications)

Figure 2-9: a) LEFT: View of services on eastern side of central stairs (lighting, signalling and communications), b) RIGHT: View of service from Pacific Highway crossing from western to eastern side of central stairs (Telstra)

Figure 2-10: a) View of services running below existing footbridge (station power supply),b) View of services at bottom of central staircase (signalling and communications, LV)

2.4 Station Services Equipment Room

The station does not have a dedicated SSER room associated with communication and security services. The existing room is also used as a staff toilet. The current room is non-compliant. Refer to Section 0 for further details.

The station communication and security systems head end consist of one ETS cabinet and three (3) services racks, two (2) located within a common room with the bathroom and one (1) within the station master office as follows (refer Figure 2-11 and Figure 2-12 below):

- 1 x 45RU CCTV rack
- 1 x 27RU PA rack
- 1 x 27RU Communication rack

Figure 2-11:Existing services rack in station building

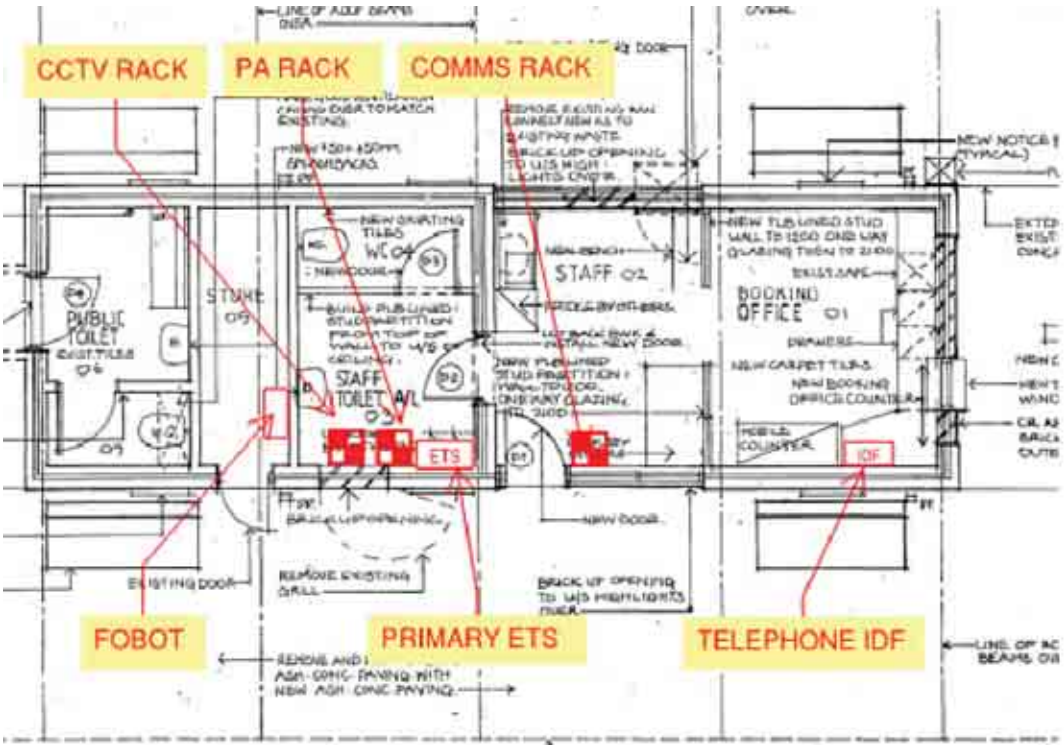


Figure 2-12: Existing station systems head end racks within station building

2.5 Signalling

There are two signals within the vicinity of Mount Colah Station. Signal N23.48 at 37.568 km is located on the Up Main approximately 20 m from the City from the end of the existing platform. Due to existing poor sighting, there is currently a repeater signal approximately 50 m from the country end of the existing platform. Refer to Figure 2-13 below for Signal N23.48 and repeater signal.

Figure 2-13: a) LEFT: Signal N23.48 at 37.568 km (View of Up Main towards city from Mount Colah Platform); b) RIGHT: Repeater N23.48 Signal at 37.774 km (View towards country from existing footbridge)

Signal N23.61 on the Down Main is positioned approximately 250 m from the end of the existing Mount Colah Platform. Figure 2-14 below shows the existing signals within the vicinity of Mount Colah Platform.

Figure 2-14: Signal N23.61 at 37.996 km a) LEFT: View of signal from Northern end of Mount Colah Platform, b) RIGHT: View towards country from Down access track

There is currently a guard indicator servicing the Up platform (platform 1) due to the close proximity of Signal N23.48 to the existing platform. The current guard indicator is pole mounted, with a non-standard back to back mounting with incandescent light fittings. Refer to Figure 2-15 below for the current guard indicator arrangement.

Figure 2-15: Existing back-to-back Guard Indicator on Up Platform (Platform 1)

A signalling interface report was provided by Sydney Trains dated 9th July 2018 in Appendix C of the GHD Concept Options Report. The following were concluded as part of the initial investigation.

- Signal N23.48 at 37.568 km: There is currently poor sighting of this signal and a repeater signal is currently available at 37.774km. No sighting issues will be introduced with the new footbridge footings positioned beyond the Up Side cutting.
- Signal N23.61 at 37.996 km: Driver visibility of the signal when travelling through the station will be removed with the new footbridge. However, this will not introduce sighting issues as the minimum sighting distance of 165 m will still be achievable. This was reconfirmed at a meeting with Sydney Trains on 3rd September 2020 (refer Appendix T).
- It is likely that the existing guard indicator on the Up platform (Platform 1) will be impacted during construction of the new footbridge and will need to be relocated.

3 Design Inputs

3.1 Existing Drawings

Table 3-1 below summarises the existing drawings used in the development of the reference design.

Table 3-1: List of drawings used for reference design

Drawing Number	Drawing Title	Revision	Source
EL0477724	HV reticulation diagram	-	Sydney Trains – RFI #010
EL0027676	11kV system diagram	-	Sydney Trains – RFI #010
SG041757	Hornsby – Berowra 37.000km-45.500 km Signalling Plan	A	Sydney Trains – RFI #004
SG0041583	Asquith 35.150km-44.000 km Track Insulation Plan	A	Sydney Trains – RFI #004
CB009	Hornsby – Berowra (Excl) Circuit Book	-	Sydney Trains – RFI #004
EL0006662	Railways Overhead Wiring Transmission Lines and Cables - Hornsby to Cowan Combined Layouts	B	Sydney Trains - VPR
EL0006663	Railways Overhead Wiring Transmission Lines and Cables - Hornsby to Cowan Combined Layouts	C	Sydney Trains - VPR
EL0006664	Railways Overhead Wiring Transmission Lines and Cables - Hornsby to Cowan Combined Layouts	B	Sydney Trains - VPR
EL0744201-EL744215	Mt Colah CCTV Upgrade Project	A	Sydney Trains – RFI #013
CV0232397	Sewerage Service Diagram	-	Sydney Trains - VPR

3.2 Existing Reports

Table 3-2 below lists existing reports referenced in the development of the reference design.

Table 3-2: List of reports used for reference design

Document Number	Drawing Title	Revision/Date
2126499	Mt Colah Station Footbridge Concept Options Report	April 2019
60605415	11kV Feeder 649 Relocation Option Study *Option Study Report - System Definition Review (SDR)*	16 September 2019
MN3_10001_ISG_UM_MOC MN4_10002_ISG_DM_MOC	Design track alignment files	25 June 2020 (source Sydney Trains – RFI# 017)
12523511	Mount Colah Station Footbridge Renewal Geotechnical and Contamination Investigation (Draft) by GHD Pty Ltd	June 2020
60605415	Geotechnical Investigation Report – Mt Colah HV Feeder, Condemned Poles by AECOM Australia Pty Ltd	29 August 2019

Document Number	Drawing Title	Revision/Date
P1504601JR01V01	Preliminary Geotechnical Assessment: 554 & 556-558 Pacific Highway, Mount Colah, NSW, produced by Martens Consulting Engineer	13 February 2015
NB98036-RP-002	Mount Colah Footbridge Final Design Report, produced by Jacobs	5 November 2014

3.3 Site Survey

The following existing surveys have been used in the development of the reference design:

- Degotardi, Smith and Partners November 2018 Survey, 'Mount Colah Station, Sydney Main Northern Line (Approx. 37+720), Detail & Levels Over Part of Mount Colah Station',
- Cardno July 2019 survey, 'Mount Colah, Main North line 36.856km TO 38.215km Aerial Feeder Detail', 35091A01 Rev B.dwg
- Degotardi, Smith and Partners were engaged as part of the reference design in July 2020 to undertake further survey as part of the reference design to include details up to 10 m north of the existing footbridge, increased OHW extents and further details of Pierre Close. 35542A01.DWG, 'Mount Colah Station Sydney Main Northern Line (Approx. N 37+570 To N37+846) Detail & Levels Over Mount Colah Station & Overhead Wiring', 35542A01.dwg, Rev B.

Refer to Appendix B for a copy of the site survey files used in the development of the reference design.

3.4 DSS

The following DSS files were provided by Sydney Trains in response to RFI 003 and RFI 008 and used as inputs into the reference design:

- 'Mt Colah to Mt Kuring-gai, Main North Line OHWS N37+490 to OHWS N39+742, Services Search DSS No. F2014/00359, CV 0560830 to CV 0560836, Sheets 6-12.
- 'Asquith to Mt Colah, Main North Line OHWS N35+435 to OHWS N37+490, Services Search DSS No. F2013/21145, CV 0549154 to CV 0549159, Sheets 22-27.

Refer to Appendix C for the DSS files used in the development of the reference design.

3.5 Design Standards

Refer to Appendix D for the list of design standards used.

3.6 Reference Design RFIs

Refer to Appendix S for the list of RFIs raised to inform the development of the reference design.

3.7 Design Constraints and Interfaces

3.7.1 Key Constraints

The following are key constraints identified during the development of the reference design:

- Limited space between rail corridor boundary and top of rock cutting to accommodate new Lift (1), stairs and relocated 11kV.
- Existing ground profile and site geology.
- Low vertical clearance of existing footbridge, impacting on OHW construction staging.
- Construction of platform works whilst maintaining operation of the platform.
- Construction of the Down side works whilst maintaining traffic and footpath operation of Pacific Highway.
- Limited construction periods during rail possession.
- Services to be relocated prior to existing footbridge removal and remain in service between possessions
- Buried route to be adopted in locations of public access/maintenance tracks.

- Vegetation. Sydney Trains has undertaken a review and have advised that no significant species have been listed in the area and vegetation clearing will be managed by typical controls. A detailed biodiversity has been recommended for the subsequent design stage.
- Maintaining 2700 mm headroom clearance at access paths.
- BCA performance solution required for platform stairs to accommodate compliant 6500 mm vertical clearance between track and bridge soffit and straight stair arrangement.

3.7.2 Interface Management

Design interfaces were identified and managed throughout the reference design development as follow:

- Systems breakdown and functional analysis to identify both functional and physical interfaces.
- Internal design meetings to scope out and define constraints between sub-system interfaces.
- Liaison meeting with key stakeholders to identify interface issues.

Table 3-3 below summarises the key interfaces identified during the design development.

Table 3-3: Summary of key design interfaces

Key Design Elements	Civil	CSR	Security and Comms	Electrical	Environmental	Geotechnical	OHW	Structural	Signalling	Architectural	Vertical transportation
Location of footbridge	✓	✓	✓	✓	✓	✓		✓		✓	
Lifts		✓	✓	✓		✓		✓		✓	✓
Cable reticulation		✓	✓	✓				✓		✓	✓
Signalling		✓		✓					✓		
BCA/DDA								✓		✓	✓
Drainage and sewer	✓	✓						✓		✓	
OHW							✓	✓	✓		
Aerial line relocation	✓	✓		✓	✓	✓		✓		✓	
Power supply	✓	✓		✓	✓				✓		✓
Lighting		✓		✓						✓	
Security and communications		✓	✓	✓						✓	
Utility Network Owners	✓	✓	✓	✓				✓	✓		
Constructability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wayfinding and landscape	✓	✓								✓	
Earthing and bonding		✓		✓			✓	✓		✓	✓
Clearances		✓		✓			✓	✓		✓	
Guard indicator	✓	✓						✓	✓	✓	

4 Reference Design

4.1 Architectural

4.1.1 Design Description

Footbridge

The new footbridge design comprises of three lifts and three staircases, providing access to Pacific Highway, Mount Colah Island Platform and Pierre Close. Refer to Figure 4-1 and Figure 4-2 below for footbridge arrangement and elevation. The footbridge is positioned centrally along the platform. A two-span concrete structure is proposed for the new footbridge with an overall width of 3600mm and a 3000mm clear width between handrails. The piers and stair landings comprise of rectangular headstocks and circular columns.

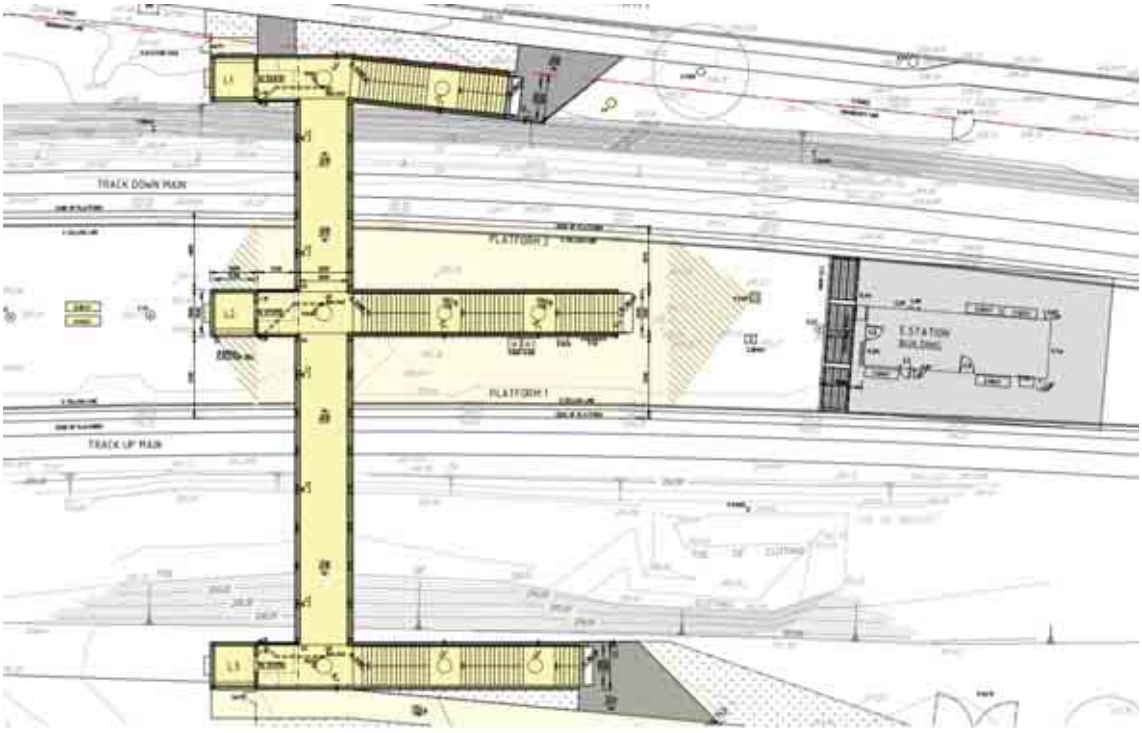


Figure 4-1: Bridge plan

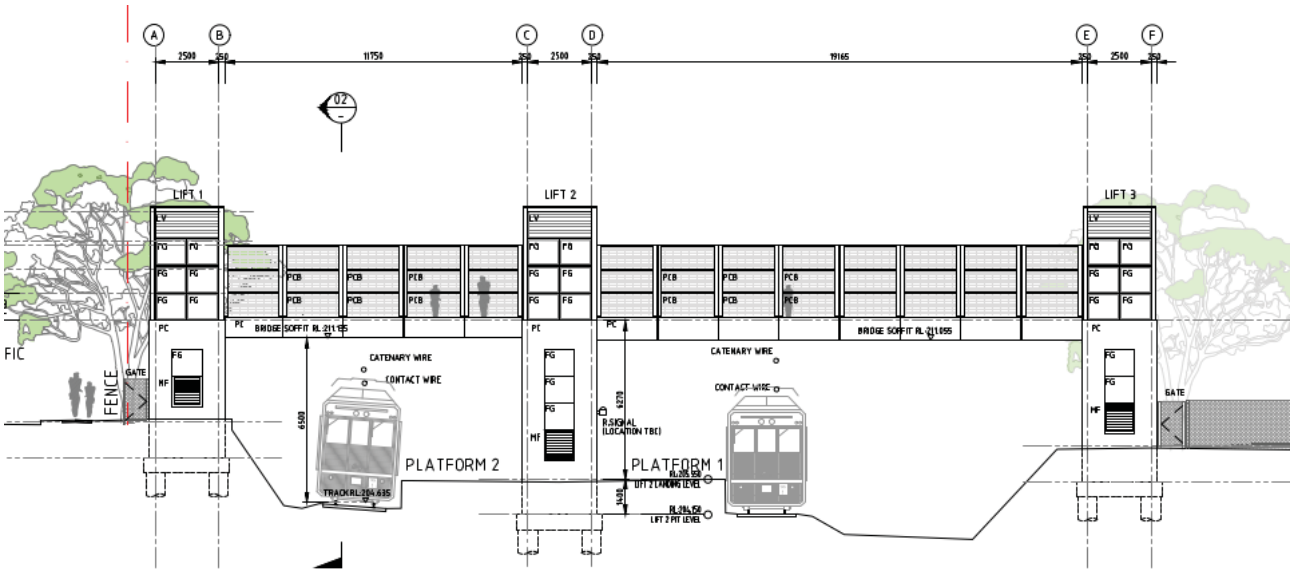


Figure 4-2: Bridge Elevation

Stair

All three stair cases are consistent clear widths of 2400 mm between handrails, in accordance with ESB 003 3.3.3.7 b) Stair Widths. The numbers of risers between landings have also been made consistent, where possible, with five of the eight flights across the three stairs having a 14-riser flight. This allows for an opportunity for repeatability in the construction, should precast stairs be specified during the detail design.

Stair 1 and 3 to Pacific Highway and Pierre Close respectively have compliant risers of less than 36. The central stair (Stair 2) to the platform is non-compliant, with more than 36 risers without a change in direction. A performance solution will be required at detail design to support this noncompliance (refer Section 4.2 and Appendix E).

Lifts

The reference design provides for 17 passenger lifts in accordance with the requirement of ESB 003 Clause 3.3.3.9. Lifts are Machine-Room-Less (MRL) electric traction design with all lift motor equipment located within the shaft. They are to be electronic for improved reliability, speed and reduced maintenance. Lifts are to be manufactured, supplied and installed by Sydney Trains preferred contractor, Liftronic Pty Ltd.

All three lifts serve two floors. Lifts 1 and 3 provides access to the street level and the footbridge and are located at Pacific Highway & Pierre Close respectively. Lift 2 provides access to the station platform and the footbridge. All three lifts doors are positioned to provide access from the north.

The lift shafts are positioned south of the footbridge and separated from the footbridge via a 2300mm long walkway. This positioning of the lift shaft allows for improved visibility and passive surveillance at street level. The separation of the lift shaft from the footbridge also improves circulation on the footbridge. The walkway also provides weather protection to the lift entry at ground level. A small canopy along with a vertical polycarbonate screen provides weather protection to the lift entry at the footbridge level. Refer to Figure 4-3 below for the lift shaft arrangement relative to the new footbridge.

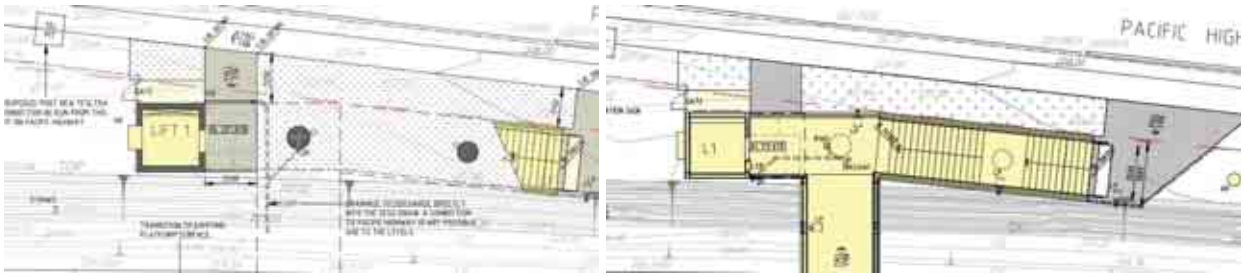


Figure 4-3: a) LEFT: Lift shaft arrangement at street level, b) RIGHT: Lift shaft arrangement at footbridge level

The eastern and western faces of the lifts from footbridge level comprise of solid panels (MondoClad® solid aluminium cladding). Sydney Trains expressed a preference for a concrete lift shaft finish with no cladding post 100% Reference Design submission. This should be investigated further at detail design.

Safety Screens

Safety Screens have been detailed in the reference design in accordance with T HR EL 08001 ST for protection against 1500V electrical wires. Polycarbonate panels have been chosen which is permissible, subject to acceptance by the RIM. Clear, colourless polycarbonate panels have been proposed and are visually transparent consistent with CPTED principles. The panels are oriented horizontally along the length of the footbridge to highlight the span and length of the bridge superstructure.

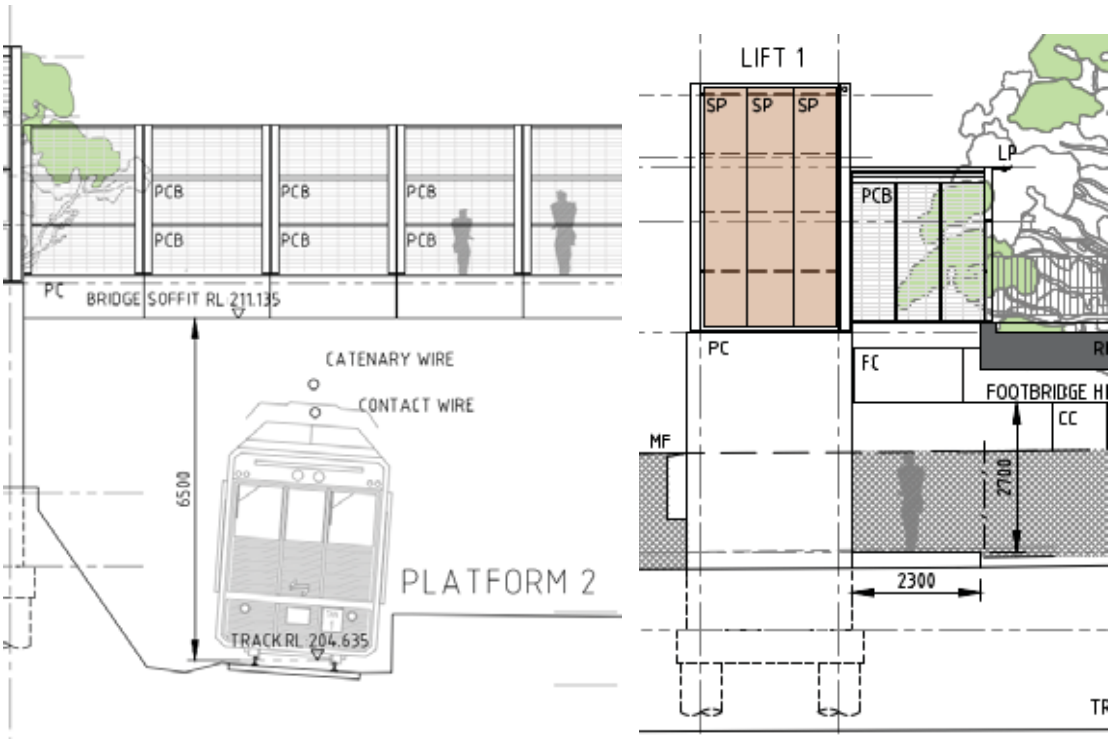


Figure 4-4: a) LEFT: Polycarbonate screens over OHW; b) RIGHT: Polycarbonate screens at end of bridge

Station Entry

New access paths will be provided from the Pacific Highway to the new lift and staircase on Pacific Highway. These paths will tie into the existing footpath. Refer to Figure 4-5 for proposed access arrangement to new footbridge from Pacific Highway.

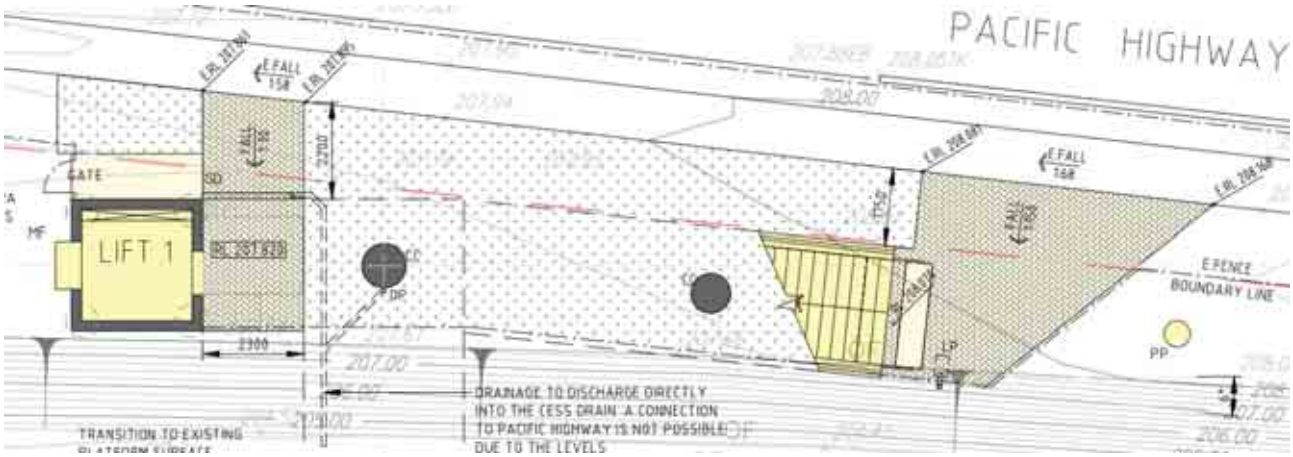


Figure 4-5: Access to Lift 1 and Stair 1 from Pacific Highway

A new path is required on Pierre Close to provide access to Lift 3 and Stair 3. The proposed path is extended from the existing footpath on the cul-de-sac. New 7800 mm x 3200 mm kiss ‘n’ ride and disabled car parking is proposed along Pierre Close, accessed via a new kerb ramp. The existing ground level at the rail corridor is higher than Pierre Close and will need to be lowered to allow for accessible paths between the disabled car space, kerb ramp and kiss’n’ride along the street to the lift and stairs. The footpath levels maintain a 2700 minimum headroom.

Fencing is to be modified and existing gates relocated to suit to the new public access and allow maintenance access. Figure 4-6 below shows the arrangement for the new station access from Pierre Close. A site strategy and flow and zone plan has been developed to suit these new exits during the reference design. Refer to Section 4.4.

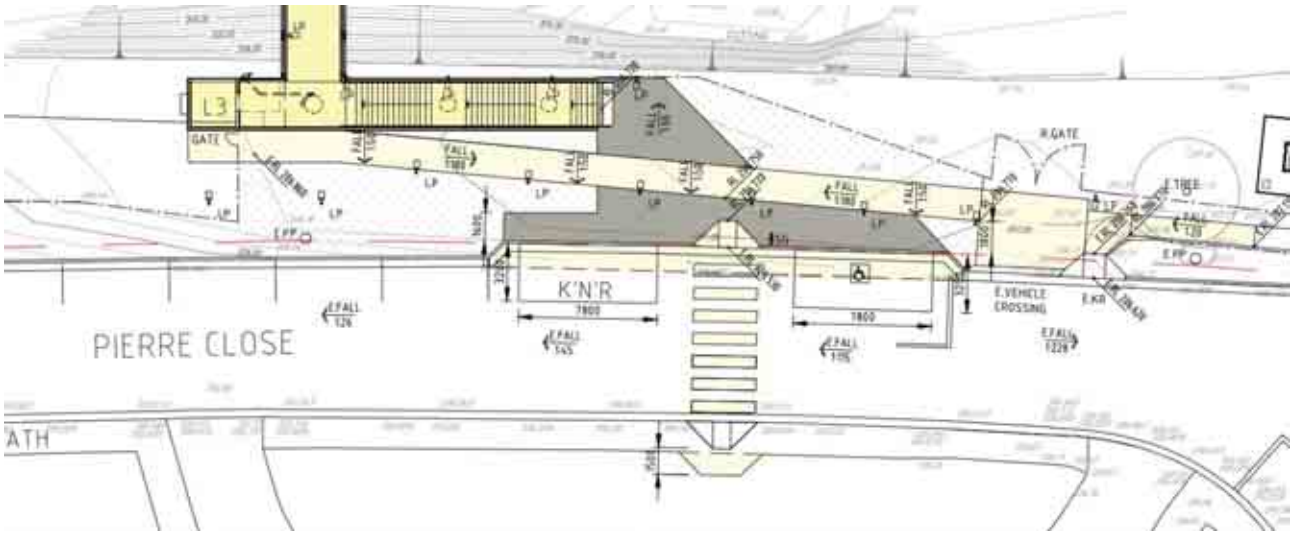


Figure 4-6: Access arrangement to Lift 3 and Stair 3 from Pierre Close (including new kiss 'n' ride and disabled car parking)

Platform Regrading

The new footbridge will require the removal of the existing tree and garden beds on the platform. Refer to Figure 4-7 below for the platform landscaping affected by the new footbridge. The existing platform will be regraded to provide compliant crossfalls (maximum of 1:40) between the landing of Stair 2 and the access point to Lift 2. This will transition and tie into the existing platform surface.

Figure 4-7: Existing tree on platform, view towards City

Building Awning Extension

An extension to the building awning of 2600 mm towards country is proposed to accommodate the relocation of the ticketing machine and SPIs. Refer to Section 4.12.6 for further details on the relocated SPIs and ticketing machine.

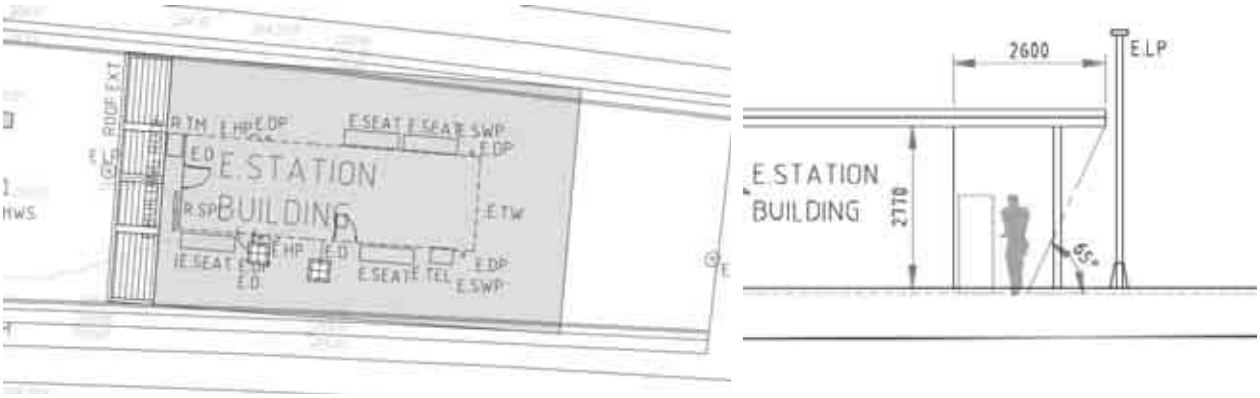


Figure 4-8: a) LEFT: Plan of awning extension; b) RIGHT: Elevation showing awning extension

4.1.2 Architectural Design Criteria

The architectural concept design was developed based on an appraisal of the GHD Concept Option 1 to achieve the following objectives:

- TfNSW TAP objectives:
  - Improve accessibility and compliance with the Disability Discrimination Act (DDA) and the Disability Standards for Accessible Public Transport (DSAPT);
  - Improve modal access facilities and integration with surrounding precinct;
  - Minimise the cost of ownership and maintenance;
  - Minimise construction impacts to customers and station operations.
- Maintain simplicity in the architectural planning and design
- Ensure compliance with functional and operational requirements
- Promote efficient and effective wayfinding
- Designing all elements for easy maintenance and within an appropriate human scale
- Ease of constructability and effective utilisation of track possessions
- Minimise pedestrian conflict, congestion and crowding points
- Increase accessibility for commuters with mobility impairment
- Maximise perception of security and safety
- Accommodate growth of patronage and changing travel and working patterns
- Improve station functionality (i.e. platform clearance rates and station control (including congestion and pinch points)
- BCA and DDA compliance

4.1.3 Design Assumptions

The following assumptions were adopted in the development of the architectural design:

- It is assumed that the new assisted boarding zone will be located within the proposed extent of the regraded platform. Reference design scope is limited to localised regrading to suit new footbridge. Boarding zones are to be confirmed and considered at detailed design.
- It is assumed that accepts the new works will interface with existing non-compliant station and platform items i.e. existing platform height
- The existing egress arrangement on the platform shall be maintained as per current configuration of one egress point only.

4.2 BCA

An assessment was completed of the reference design against the requirements of the National Construction Code (NCC)/ Building Code of Australia (BCA) to identify any non-compliances with the deemed to satisfy provision of the BCA. Refer to Appendix E for BCA report. The following are key findings:

- Fire and life safety assessment is required to confirm the reference design assessment. In general, it has been deemed that the existing fire and life safety is maintained or improved.
- Performance solutions to be prepared at detail design have been identified at this reference design stage. These are for the following:
  - Non-compliance to BCA Clause D2.13: Stair 2 from the new footbridge to the platform has more than 36 risers in consecutive flights.
  - Non-compliance to BCA Specification E3.1: Lift shafts temperatures may exceed 40°C during high ambient outdoor temperatures.
- Review of polycarbonate use on footbridge against requirements of BCA Clause C1.9. Fire Engineering support is required for the use of polycarbonate on the footbridge.

4.3 DDA

An assessment was completed of the reference design against the requirements relating to 'Access for People with Disabilities'. Refer to Appendix F for the DDA report.

In general, the reference design can readily comply with DDA requirements, subject to the detail design. It is recommended that a compliant nosing to AS 1428.1-2009 be specified at detail design for consistency across the station network. This will require a BCA performance solution as BCA H2.7 references AS1428.2-1992.

It is noted that Transport for NSW issued a memo dated 4th September 2020 indicating preference for AS 1428.2:1992 Part 2 to be applied to stair nosing across the transport network.

4.4 Wayfinding

The new footbridge will create two new main entries and one new exit on the platform. Clear signage required to highlight these entries and exits. Clear signage is also required on the platform to direct commuter traffic to the new footbridge.

New lifts on platform are hidden by the adjoining staircase. Clear signage is required to direct to lift entries. Refer to wayfinding drawings in Appendix A for details.

4.5 Urban Design and Landscaping

An urban design report and accompanying public domain plan was prepared as part of the reference design to identify the proposed impacts to the urban form due to the access improvements, mitigate any potential negative impact on the existing urban character, and provide a suitable public domain outcome. Refer to Appendix G for the urban design report.

The report documents a review of the existing conditions, urban patterns, and propose materials and vegetation types to achieve the objectives of maintaining an appropriate urban character within the affected area. Refer to Appendix A for the landscaping drawings.

4.6 Structural

4.6.1 Design Description

The proposed new pedestrian footbridge is a two-span structure; with span lengths of 11.75m and 19.2m over the Down and Up Mains respectively. The footbridge achieves a 6500mm clearance over the top of the highest rail (the Down Main) and maintains a 4300mm horizontal clearance between the track centreline and bridge supports in accordance with the requirements of ESC 215. Refer to Figure 4-9 and Figure 4-10 below for elevations of the new footbridge.

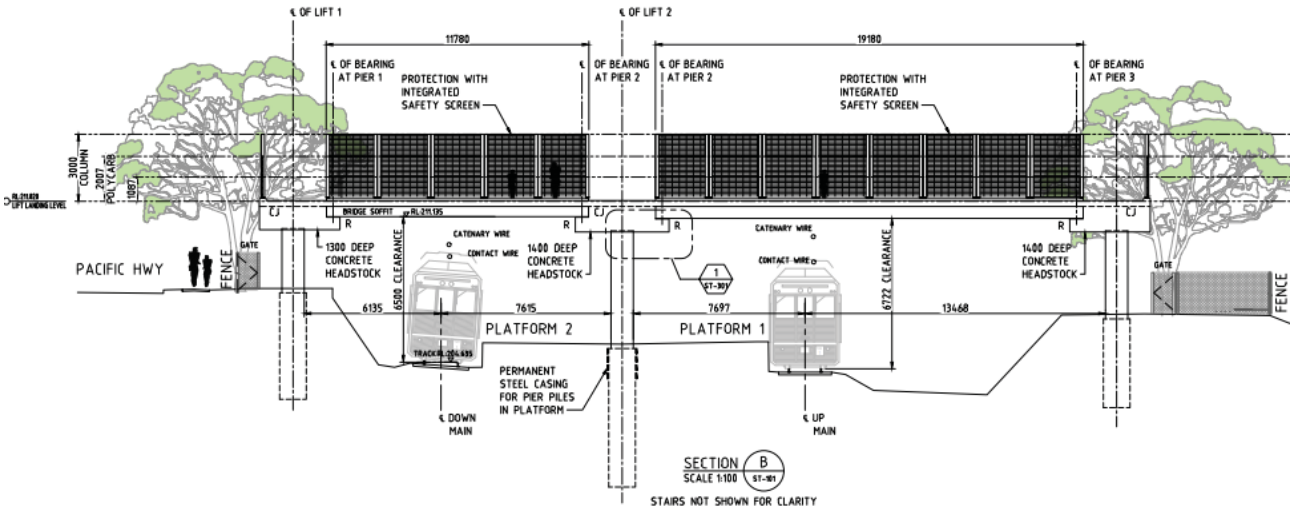


Figure 4-9: Bridge Elevation showing girder span lengths'

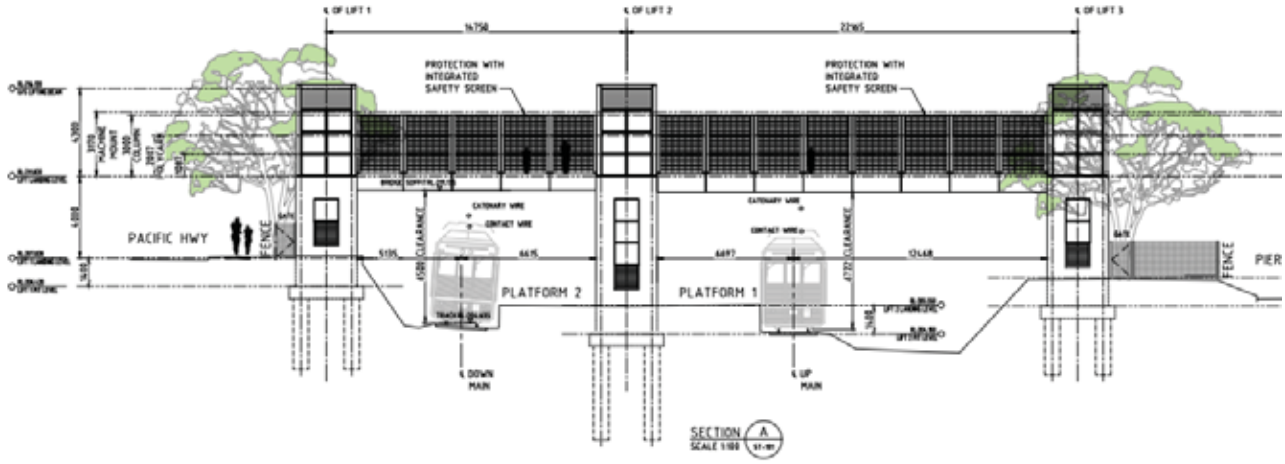


Figure 4-10: Bridge Elevation showing proposed lifts

The bridge superstructure comprises side by side 455mm deep precast, prestressed concrete planks with a minimum 230mm thick cast in-place deck to accommodate services over the Down Main. Deeper 535mm side by side prestressed concrete planks are provided over the Up Main to eliminate sag under permanent effects. The deck has a two-way cross fall to facilitate surface drainage.

A 150mm high, 300mm wide kerb has been detailed on both sides of the bridge to accommodate the balustrade and protection screen/safety screen fixings. Refer to Figure 4-11 below for a cross section of the bridge superstructure.

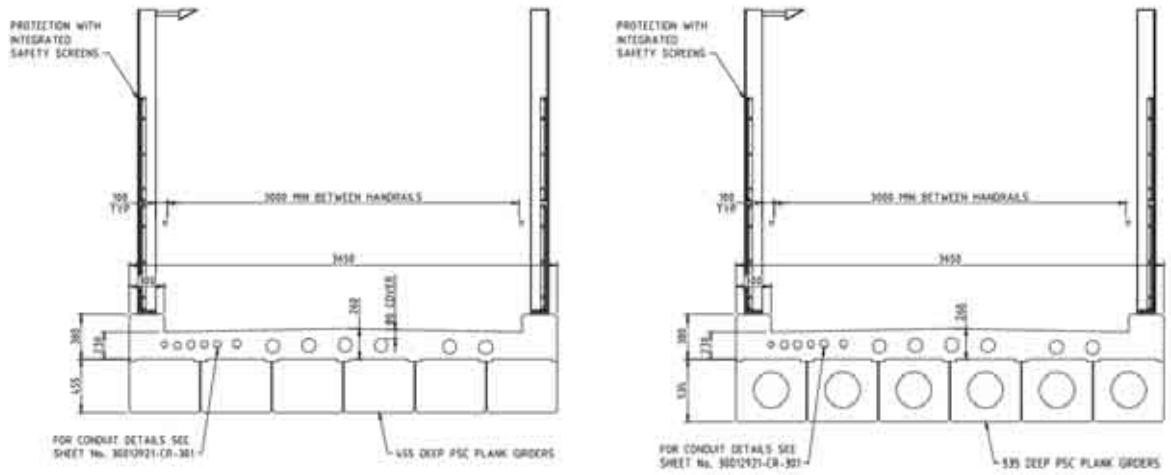


Figure 4-11: a) LEFT: Cross section of superstructure over Down main (455mm deep planks), b) RIGHT: Cross section of superstructure over Up main (535mm deep planks)

The bridge superstructure is semi-integral with the substructure. A 1000mm long de-bonded zone has been detailed between the deck and the plank girders at both ends of the plank. The ends of the planks are supported on elastomeric bearing strips, eliminating the requirement for ongoing maintenance over the bridge's 120-year design life.

The piers consist of cast in-place rectangular concrete headstocks supported on 1000mm diameter cast in-place concrete columns founded on 1200mm diameter concrete bored piles. The Pacific Highway pier headstock is 1300mm deep, maintaining a 2700mm vertical clearance over the lift entry footpath. The platform and Pierre Close pier headstocks are 1400mm deep to suit the deeper PSC plank over the Up Main. Refer to Figure 4-12 below for an elevation of the bridge showing the semi-integral connection and concrete piers.

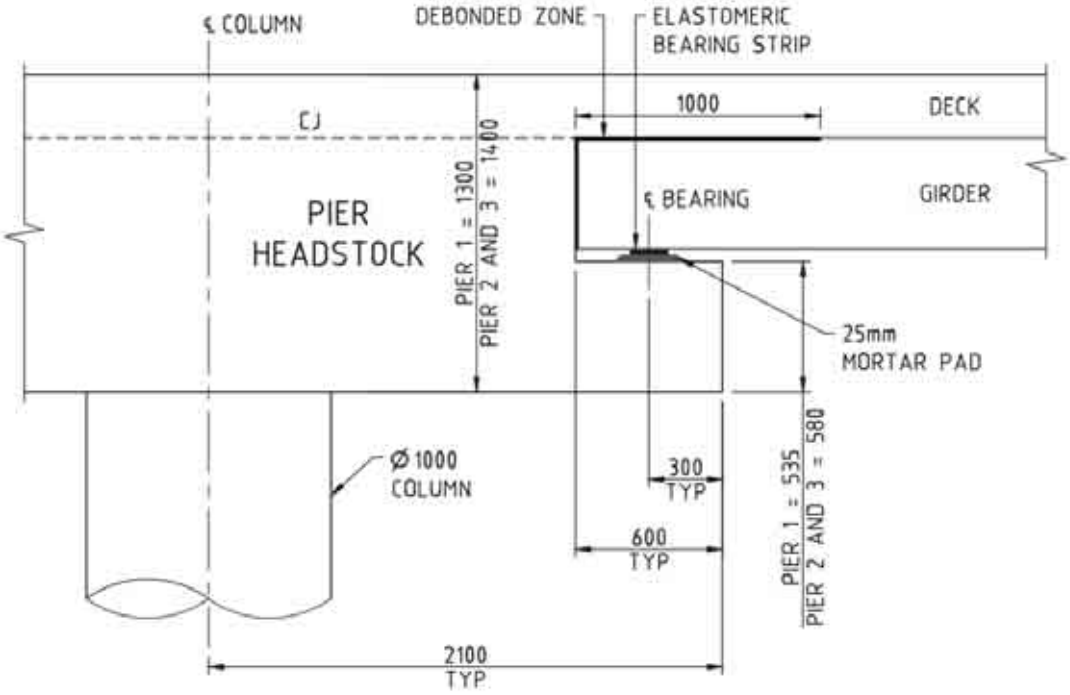


Figure 4-12: Elevation of span over the UP main, showing semi-integral arrangement and cast in-place pier headstock and column

The three lift shafts consist of precast concrete below the bridge deck level and steel frames with glass panels above the finished deck level. Each lift is supported on a 750mm deep cast in-place pile cap founded on four 750mm diameter concrete bored piles. Figure 4-13 below shows the lift shaft arrangement.

3000mm height protection screens have been provided on each side of the footbridge (for unlawful climbing/restrict objects being thrown onto track) in accordance with the requirement of AS5100.1. These are integrated with the 1800mm high vertical safety screen for electrical protection.

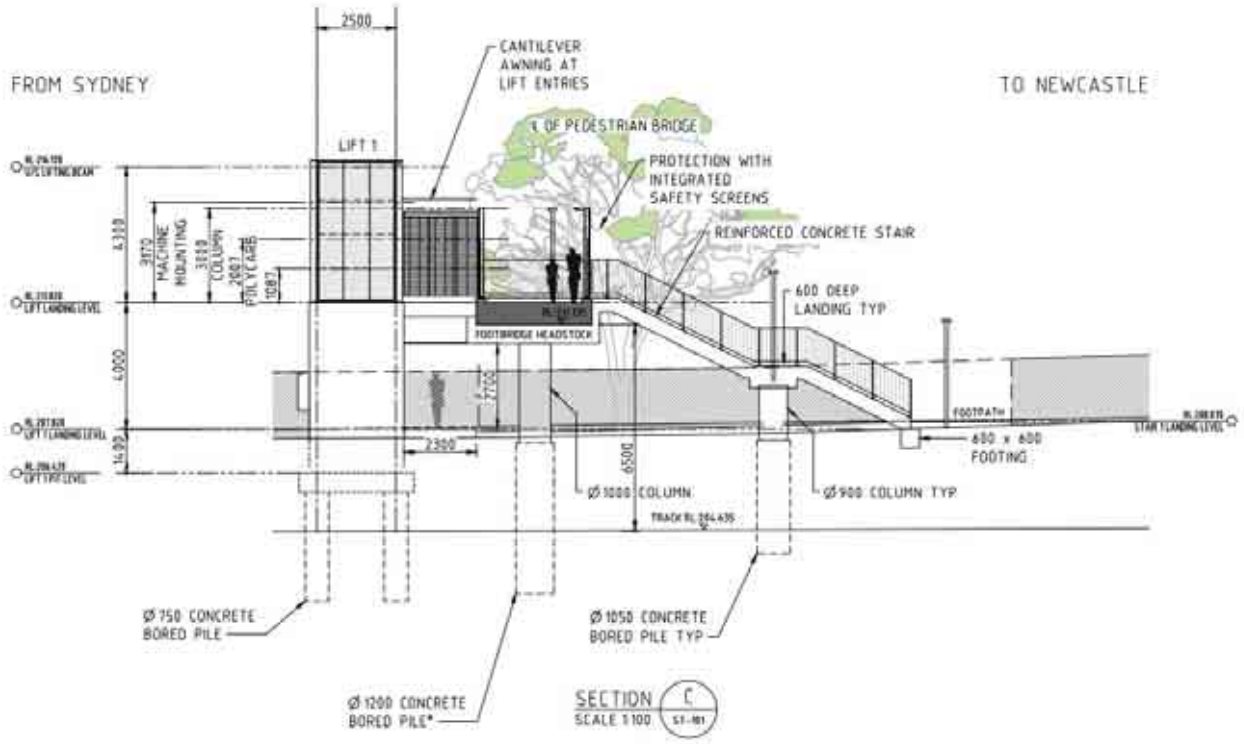


Figure 4-13: End elevation of the bridge, showing lift and stair structure

The lift shaft is connected to the bridge deck via a 250mm thick reinforced concrete link slab, which is designed as a propped cantilever with an integral connection to the concrete lift shaft and a support on the pier headstock. Figure 4-14 below shows the link slab arrangement.

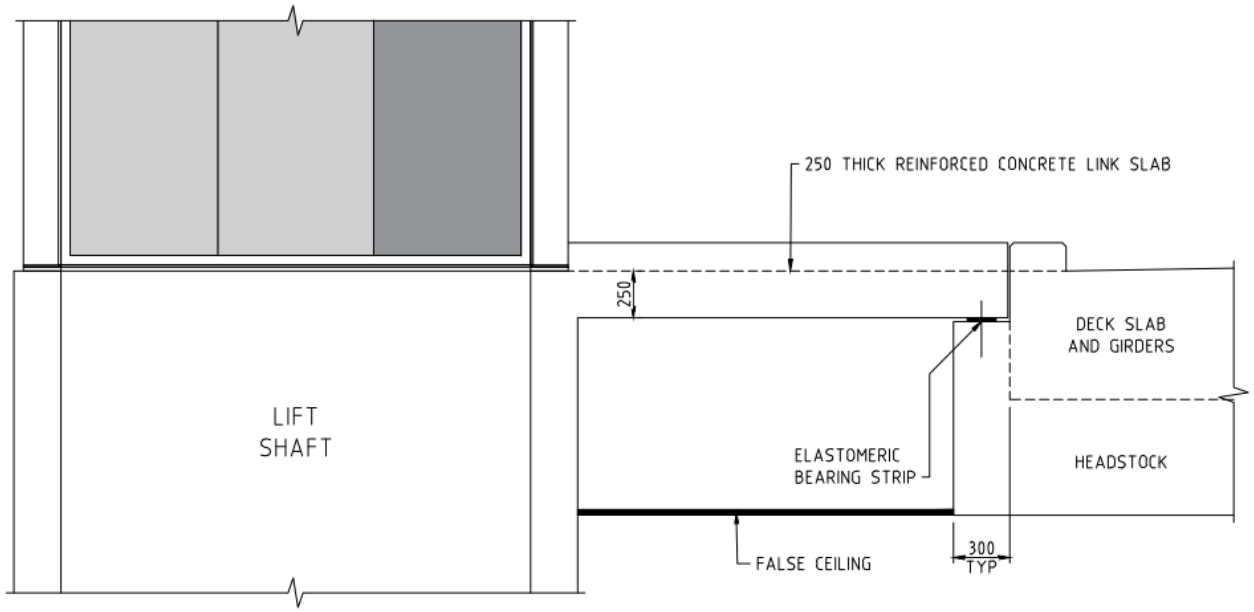


Figure 4-14: Link slab detail between lift shaft and bridge pier

The stair structure consists of 200mm thick reinforced concrete stairs. The stairs can be detailed as pre-cast or cast in-place during the detail design subject to contractor preference. The top flight of the stairs is simply supported between the pier headstock and 600mm deep stair landings. The landings are supported on 900mm cast in-place reinforced concrete columns founded on 1050mm diameter concrete bored piles. The bottom flight of stairs spans between the lower landing and 600 x 600mm deep footings.

4.6.2 Structural Design Criteria

The design loading and load combinations adopted in the development of the reference design are in accordance with the requirements of AS 5100 and T HR Cl 12030 ST. These are as follow:

Design Life

The following design life apply to the new footbridge and associated elements:

- Bridge Structure: 120 years
- Bearings: 120 years (strip bearing, non-replaceable)
- Safety screens: 60 years
- Drainage systems: 40 years replaceable, 120 years non-replaceable

Permanent Effects

Dead loads were calculated based on cross section and the material weights below.

- Concrete: 24 kN/m^3
- Steel: 77 kN/m^3

Superimposed dead loads considered are as follow:

- Safety screens and protection screens, with provision for future awning: 10 kN/m
- Lift system: 151.8 kN (refer Figure 4-15 for lift loading)

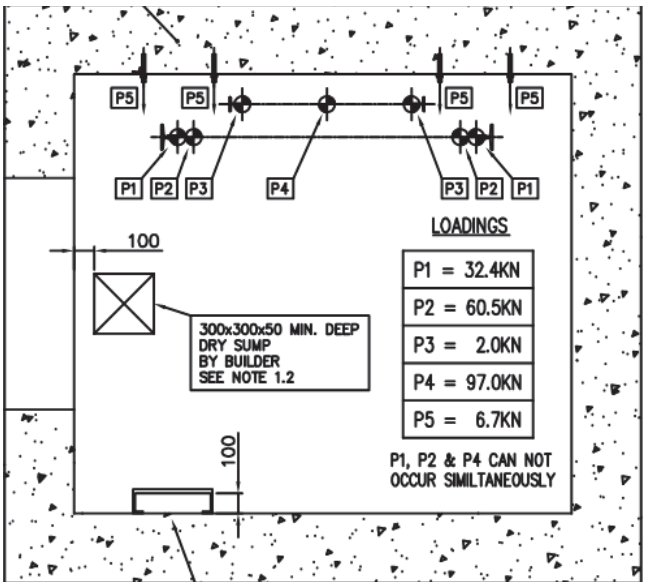


Figure 4-15: Lift reactions on pit floor

Live Loading

The following live loads were considered for the reference design:

- Pedestrian live load: 5 kPa
- Lift live load: 12.5 kN

Collision Load

The following collision loads were considered for the reference design:

- Road: 2700 kN acting in any direction in a horizontal plane, applied 1.2m above ground level on Pacific Highway supports
- Rail: 500 kN collision load applied in any direction and at any height, except downwards over an area of 2m^2

It was assumed that pier columns 1 and 3 are not subjected to rail collision loading given the structural members of the lift shafts are located over 2 m above the track level.

Thermal Load

The effects of thermal loads have been considered in the reference design using the following design parameters:

- Location: Coastal
- Height above sea level: <1000m
- Region: Region II
- Installation temperature: 18°C
- Concrete coefficient of thermal expansion: $1e^{-5}$/°C
- Average bridge temperature:
  - Maximum: 48°C
  - Minimum: 5°C

Wind Load

The effects of wind loads have been considered in the reference design in accordance with Section 17, AS 5100.2 using the following design parameters:

- Wind Terrain Category: 2.5
- Wind Region: A2
- Regional Wind Speed SLS: 37m/s
- Regional Wind Speed ULS: 48m/s
- Average Recurrence Interval ULS: 2000 years
- Average Recurrence Interval SLS: 20 years

Seismic Load

Seismic loads were calculated as per the force-based method in AS 5100.2:2017 and AS 1170.4:2007. Seismic forces were calculated to be less than the minimum lateral restraint load and collision loads based on the following design parameters, and therefore does not govern the design:

- Bridge Classification: Type 3
- Importance Factor: 1.5
- Probability Factor: 1.3
- Hazard Factor: 0.08
- Design Category: BDEC-3
- Site Sub Soil Class: Class Ce
- Design Ductility Factor: 4.0

Load Combinations

Load combinations below were considered for the reference design, with load factors in accordance with Appendix D of AS 5100.2:2017.

- Permanent effects + live loads
- Permanent effects + thermal loads
- Permanent effects + collision load

4.6.3 Structural Modelling

The replacement footbridge was modelled using proprietary structural analysis software. The superstructure was modelled as a grillage in Autodesk Bridge Design for sizing of the precast concrete girders. Refer to Figure 4-16 below for a screenshot of the Autodesk bridge design grillage.

A global bridge model was created using beam elements in Strand 7 to determine the bridge design behaviour under longitudinal and lateral loads for sizing of the substructure elements. Piles were fixed at the top of Sandstone-IV. Refer to Figure 4-17 below for a screenshot of the Stand 7 global model.

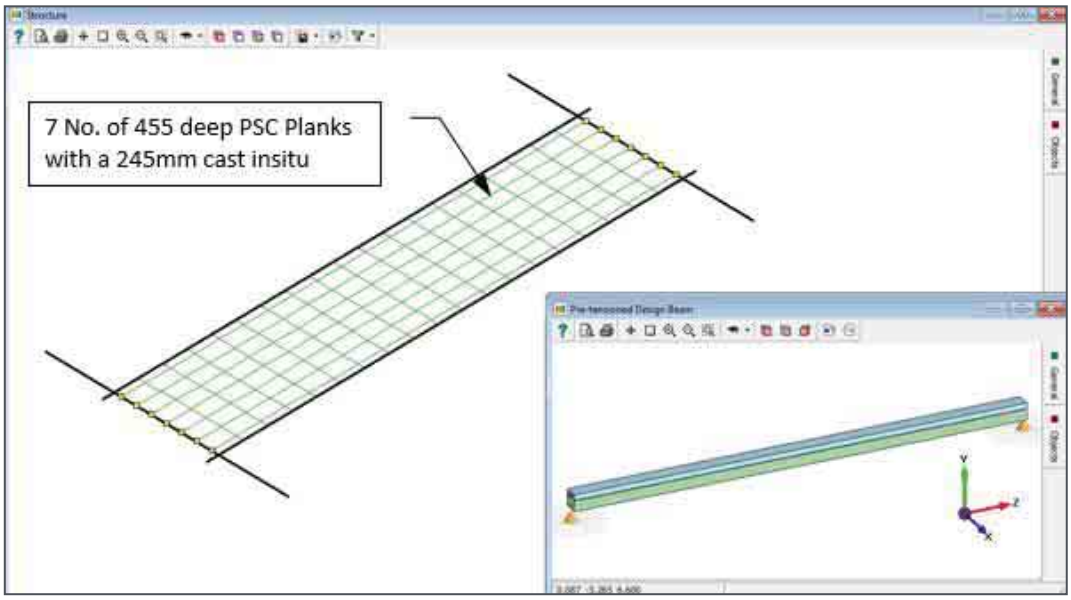


Figure 4-16: Autodesk Bridge Design Grillage used for superstructure reference design

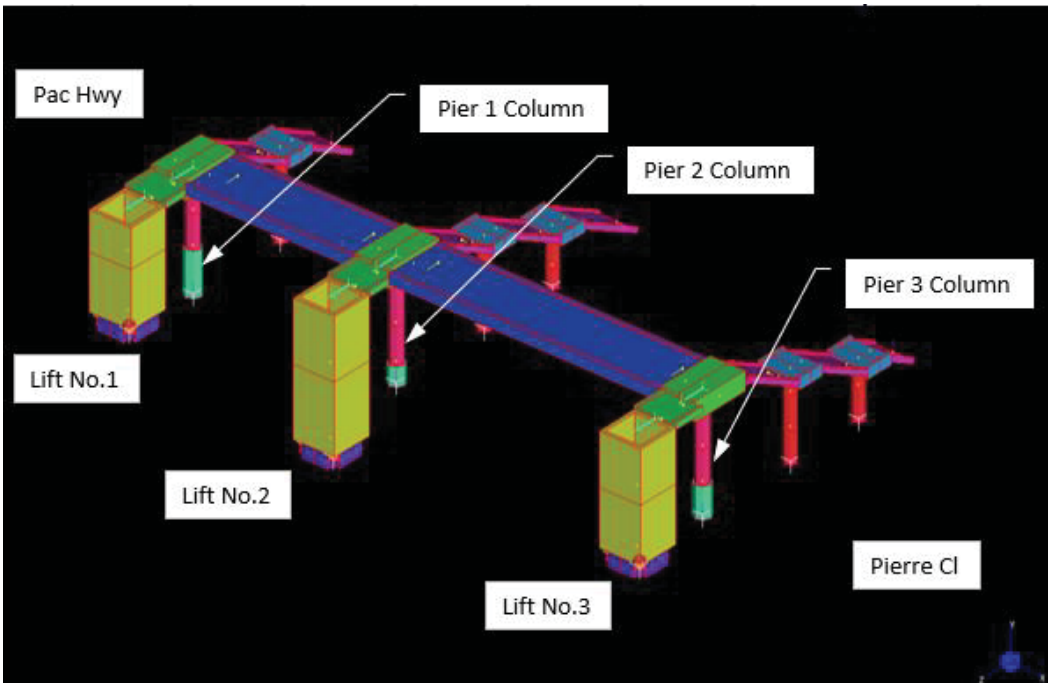


Figure 4-17: Rendered Strand 7 model (Beam elements) used for substructure reference design

4.7 Geotechnical

The geotechnical reference design was undertaken based on the following available existing geotechnical reports as listed in Table 3-2.

Refer to Appendix H for the geotechnical technical memorandum.

4.8 Electrical

4.8.1 Design Life

The design life requirements related to this electrical package are outlined in Table 4-1: Design life of electrical assets below:

Table 4-1: Design life of electrical assets

Item	Asset Element of the Works	Design Life (Years)
1	High voltage switchboards, transformers and electrical systems	30
2	Low voltage switchboards, lighting fixtures and electrical systems	30
3	Electrical cabling, conduits, pits, GST and support systems	25
4	HV aerial lines (as per T HR EL 10001 ST Section 5.1)	50

4.8.2 Low Voltage

Currently, Mount Colah station is supplied by Ausgrid LV network via an isolation transformer near the footbridge at Pacific Highway. There is a DB (typically referred as IMSB, however at this station is labelled as DB) located at the station building which supplies existing loads including lighting, communications and rest of the loads excluding signalling. This DB is fed from pad mount isolation transformer (30KVA). This DB will not be affected by footbridge decommissioning. Refer to Figure 4-18 below for current LV arrangement.

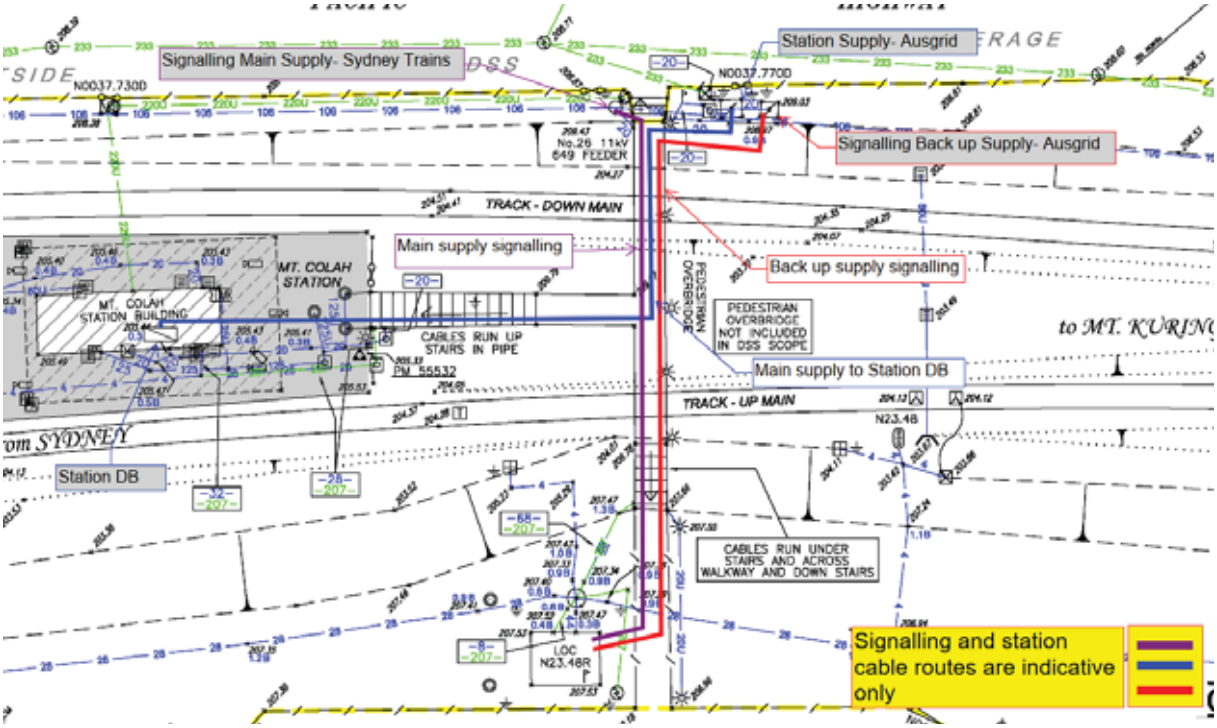


Figure 4-18: DSS around existing footbridge showing existing LV assets

Signal location N23.48R is currently fed from 5kVA pole mounted 11kV/120V transformer, supplied power from the Sydney Trains 11kV network. Back up supply for this load is also provided from Ausgrid supplied pad mount 5kVA transformer (240/120V) located next to isolation transformer. Power supply cables are routed to DB and signalling hut through existing footbridge which will be demolished following construction of the new footbridge. Refer to Figure 4-19 for the existing power supply arrangement and Figure 4-20 for the existing 30kVA padmount 415/415V isolation transformer.

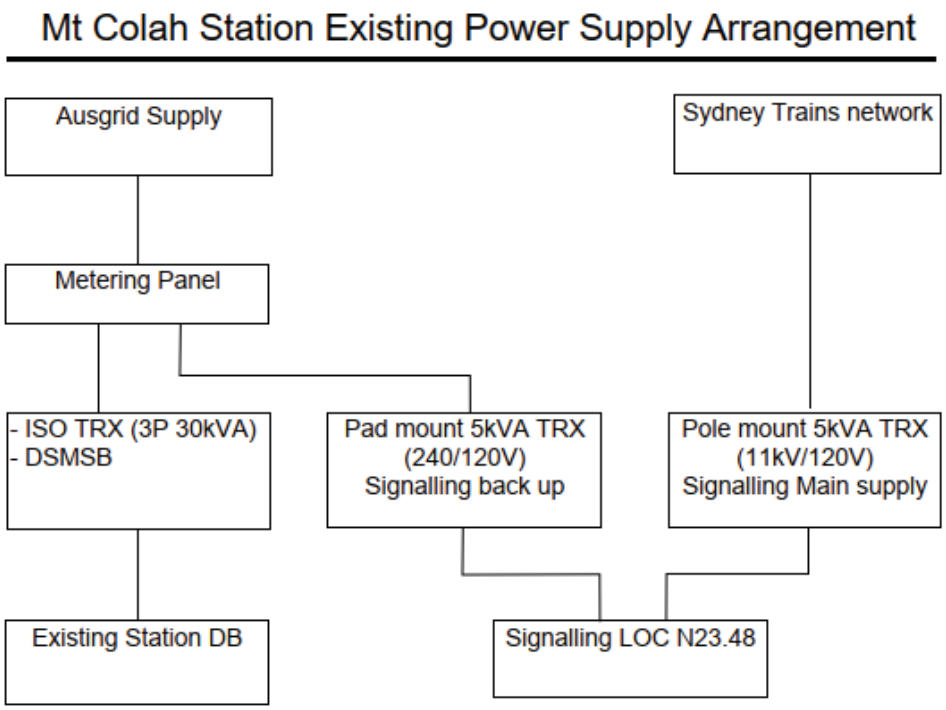


Figure 4-19: Mt Colah station existing power supply configuration

Figure 4-20: Existing 30kVA padmount 415/415V isolation transformer supplying station DB

Due to upgrade of station, following major new loads are identified in addition to the existing electrical loads at the station:

- Three lifts, each one demanding 27A three phase
- New Footbridge lighting 6.3 A three phase
- Additional Comms equipment 10A single phase
- Upgrade to SSER room AC equipment 15A single phase
- Signalling main supply 22A single phase

4.8.2.1 Design Criteria

The LV design has been developed in accordance with T HR SS 80002 ST and AS/NZS 3000 2018.

4.8.2.2 Existing Loads

The existing loads (excluding signalling) are connected to station DB located in station building (refer Figure 4-21 to Figure 4-23). This DB is fed from 30kVA (415V/415V) three phase isolation transformer supplied from Ausgrid network. Data logging information was requested in RFI 024, however, no recent data logging information has been made available. As such, for the purposes of the reference design, SMEC has assumed 30kVA to be the maximum electrical demand of the station's connected loads. It is noted that the luminaires on the footbridge are among the connected loads, which will be decommissioned and removed.

Signalling load (maximum demand) will not be affected by LV switchboard upgrade, however it will be supplied from new proposed padmount substation directly. Refer to Signalling section and Appendix I for further details.

Figure 4-21: Existing Station DB

Figure 4-22: Existing Station DB schedule

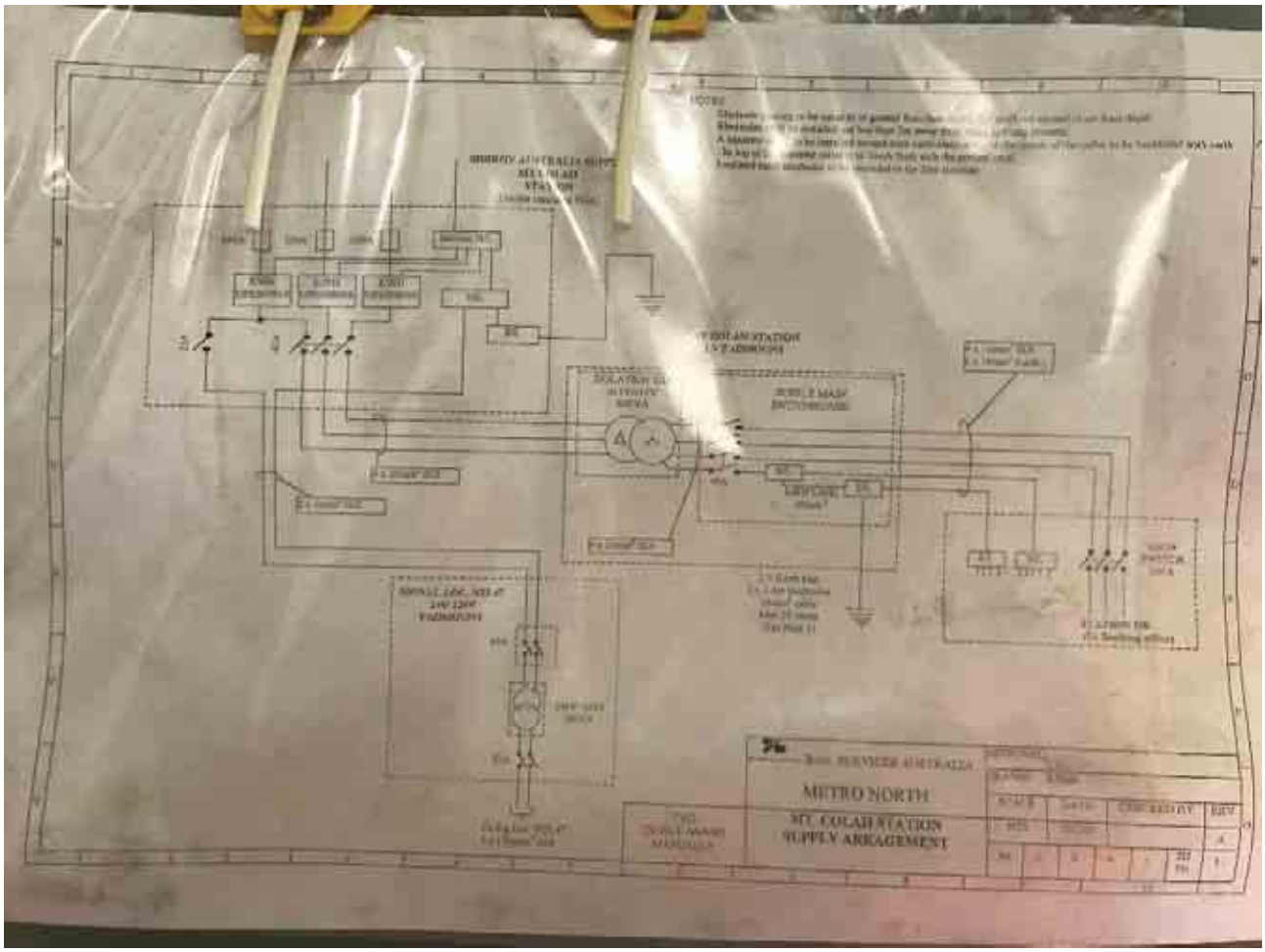


Figure 4-23: Mt Colah station exiting power supply arrangement

4.8.2.3 New Loads

As part of the station upgrade works, there will be additional loads with respect to the existing loads. These loads will comprise of three off lifts, lighting, communications and security systems including AC equipment upgrade. Also, ST has requested to decommission the existing pole mounted signalling main supply(5kVA) transformer and supply the signalling from new padmount substation (main DSMSB). Refer to Table 4-2 below for a summary of the new loads.

Table 4-2 New loads table

Item	Load	kW	Phase current		
			R	**W**	**B**
1	Three Lifts (3Ph)	53.2	81	81	81
2	Lighting (3Ph)	4.1	6.3	6.3	4.2
3	Comms (1Ph)	2.2	10	-	-
4	SSER room AC equipment upgrade (1Ph)	3.3	-	15	-
5	Signalling Main supply (5kVA- 1Ph)	4.8	-	-	22
6	Total (75kVA)	67.6	97.3	102.3	107.2

4.8.2.4 Total Load

Table 4-3 summarises the new maximum demand for station:

Table 4-3: Summary of new maximum demand for Mt Colah station

Item	Load	kVA
1	New loads (Lifts, Lighting, Comms, AC equipment, Signalling)	75
2	Existing station DB	30
TOTAL	Required supply + 30% spare	136.5

The station's existing isolating transformer is rated at 30kVA and considering new max demand (136.5kVA), it does not have the capacity to supply the increased load demand (new and existing loads). Following assessment of the power supply options recommended (refer to Appendix I: Technical note 30012691-EL-MEM-002), it was recommended to install a new 200kVA padmount transformer (11kV/415V) supplied from Sydney Trains network. Details of padmount substation are provided in HV section.

Existing Ausgrid connection infrastructure including isolating transformer will be made redundant and all station loads (excluding signalling back up) will be supplied from proposed ST padmount substation.

The existing Ausgrid power supply including the existing isolation transformer and LV metering board will be made redundant. All the loads (excluding Signalling back up) connected to the existing Ausgrid power supply will now be transferred to the new Sydney Trains power supply. Backup signalling transformer will be retained and will be connected to Ausgrid network. Refer to 4.8.2.6 below for further details on the alternate supply arrangement.

Considering the information provided by Sydney Trains (ST) and site visit conducted on 06/07/2020, the existing DB does not have capacity to accommodate required loads. Hence, a new IMSB is required for the station. This new IMSB will supply the new loads directly, and supply existing loads through existing station DB. IMSB will be fed from the main DSMSB (within the ST distribution kiosk substation), providing power supply to existing and new station loads except signalling which will be directly connected to main DSMSB.

The new IMSB will be provided in accordance with section 7 of ASA standard T-HR-SS-80002-ST. Main power supply will be distributed to all the electrical loads (including new and existing DB) from the IMSB.

4.8.2.5 Installation Main Switchboard – IMSB

It is proposed that new IMSB be installed under the footbridge stairs at platform near the proposed lift 2. It will be housed inside a 2-hours fire-rated equipment room.

Installation Main Switchboard (IMSB) will be proposed separately and fed from DSMSB, providing power supply to existing and new station loads including lifts. The switchboard and cable criteria is as per Table 4-4 below.

Table 4-4: Switchgear design criteria

Item	DSMSB	IMSB
Load rating (A)	400	250
Fault Level (kA)	25	25
IP rating	IP65	IP65
Form type	3B	3B
Spare Capacity	30%	30%

Table 4-5: LV cable criteria

Item	Safety services	Other services
Fire resistance rating	WS52W	N/A
Max voltage drop	5%	5%
Spare	30%	30%

4.8.2.6 Alternative Supply

Provision of an alternative power supply has been assessed in accordance with Table 5 Appendix A of ASA standard T HR SS 80002 ST Low Voltage Electrical Installations. As per this section an alternative power supply and Uninterruptible Power Supply (UPS) are required if stations employed lifts for emergency evacuation of disabled persons. However, it also mentions that stations where the evacuation of disabled persons is affected through alternative procedures that do not use lifts, are exempt from the requirement of having an alternative power supply.

This assessment has been communicated to ST and on 10/11/2020 ST has specified the requirement of full alternative power supply for the station. In this regard, three options to provide the alternative supply from local distributor (Ausgrid) were investigated in “Backup Supply Options Assessment” technical memo. ST has confirmed that option 2 (Modification to Ausgrid LV Network on Telopea St North) is their preferred option. The proposed location would be upside of the rail corridor in the proximity of the new Private Pole on Pierre Close. Refer to Appendix I, technical memo (30012921-EL-MEM-002) for details.

Figure 4-24: overview of option 2 “backup supply options assessment”

The following items are incorporated into design:

- RailCorp dual supply arrangement (EL0494650) is incorporated to the design.
- As alternative power supply (Ausgrid), new 200kVA 415/415V isolation transformer is proposed on Pierre Close side.
- ATS is provided at main DSMSB (located inside the main supply padmount substation) to switch the power between main and alternative supply.
- New cable and cable route will be required to connect the alternative supply to the ATS on main DSMSB

- Private pole close to LOC N23.48 as a connection point to Ausgrid pole MC-1406

Isolation Transformer

Design of an isolation transformer for the new alternative power supply obtained from Ausgrid's low voltage network, will be in accordance with the requirements of ASA standard T-HR-EL-17002-SP. Following are some of the details pertaining to the proposed isolation transformer:

- Power rating: 200KVA
- Primary/secondary voltages: 415/415V three-phase
- Transformer impedance is 4%
- Type of cooling: Air natural
- Transformer type: Dry
- Transformer enclosure rating: IP65
- Inrush current: T HR EL 17002 SP table 2 shows the inrush current of isolation transformer is no more than 10 times the rated current. The inrush current is calculated as 10 x 288.7 (rated current for a 200kVA transformer) = 2.88 KA.
- Neutral terminal: Star point or neutral of lower voltage winding shall be connected to a bushing or terminal, the neutral terminal shall be sized to be capable of carrying the same current as the phase terminals.
- Construction: Class II
- Rated insulation level for power frequency (one minute, dry, flashover voltage) for primary and secondary windings: 5kV (rms)
- Maximum winding temperature rise (dry type at 40°C ambient): 125°C

The isolation transformer is installed inside standard kiosk with separate enclosures for supply authority meter panel and DSMSB on either ends of the kiosk. The Sydney Trains standard drawing EL0480479 is referred as LV kiosk template, as below. The LV kiosk includes one isolating transformer (415V/415V) in the middle, meter panel in one end and DSMSB in the other end.

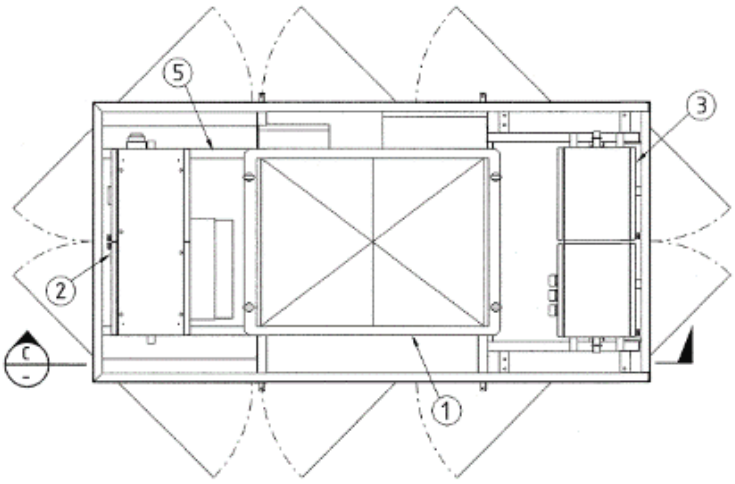


Figure 4-25: Typical isolation transformer layout

Signalling Transformer

Considering decommissioning of existing main signalling transformer, 5kVA 11kV/120V, padmount transformer mounted on pole 26, new padmount 5kVA 240/120V (same as existing back up signalling transformer) transformer is proposed.

Figure 4-26: Existing backup signaling padmount substation 5kVA 240/120V

- Power rating: 5KVA
- Primary/secondary voltages: 240/120V single-phase
- Transformer impedance is 3%
- Type of cooling: Air natural
- Rated input current: 21.04A
- Rated output current: 41.67A
- Maximum value of in-rush current / Full load current (nominal x 6): 126A
- Transformer enclosure rating: IP65

4.8.2.7 Proposed New Power Supply Arrangement

Considering the provision of main and alternative supply for station, RailCorp dual supply arrangement (EL0494650) is incorporated to the design:

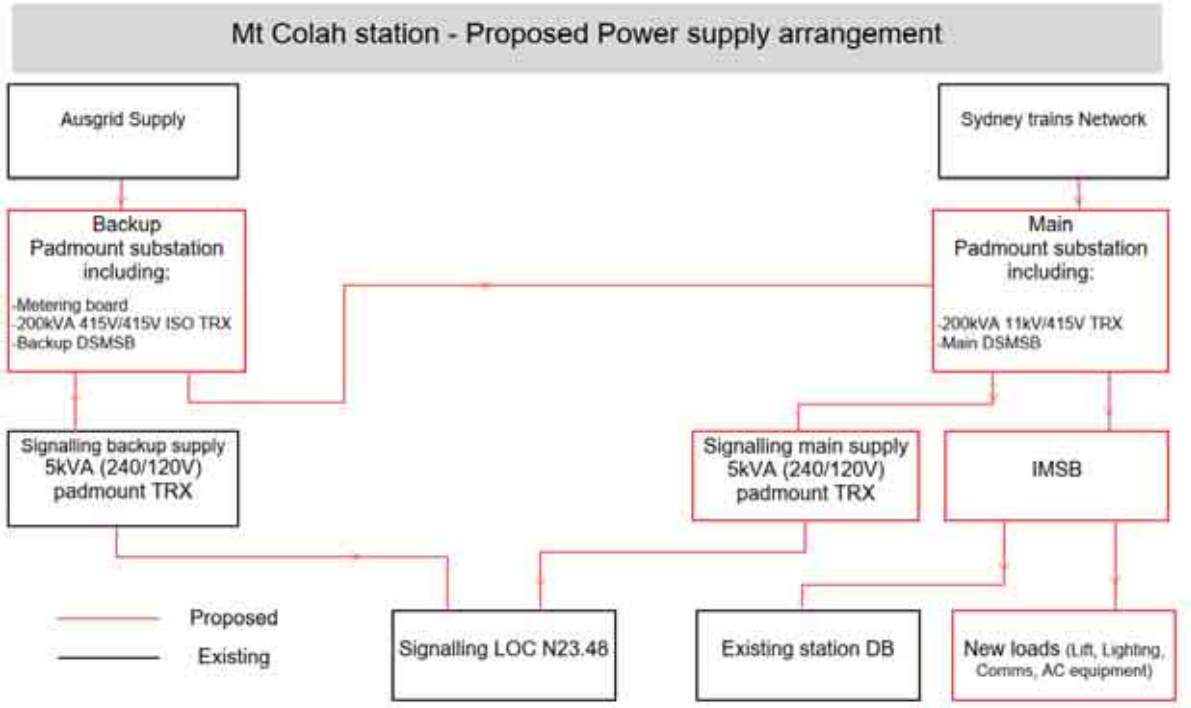


Figure 4-27: Proposed dual power supply arrangement for Mt Colah station

Main supply of the station would be obtained off the 11kV/415V padmount substation supplied from ST 11kV network. Ausgrid padmount substation would be connected to main DSMSB through ATS located at main padmount substation as a full backup for all station loads.

4.8.3 Lighting

4.8.3.1 Scope of Works

Scope of work includes lighting for new proposed pedestrian footbridge and associated components at Mt Colah railway station including ramps, stairs and affected platform area. The areas requiring new lighting includes footbridge, stairs, entry to lifts, ramps and affected platform area.

4.8.3.2 Design Criteria

The design criteria are based on:

- AS/NZS 1158.3.1:2020 Pedestrian area (Category P) lighting – Performance and design requirements
- T HR SS 80001 ST Infrastructure Lighting
- T HR SS 80003 ST Infrastructure Emergency Lighting
- AS 1428.2-1992 Design for access and mobility Part 2: Enhanced and additional requirements –Buildings and facilities

Light Fittings and Poles

Table 4-6 below summarises the light fitting criteria adopted in the reference design.

Table 4-6: Light fitting criteria

Item	Criteria
Light source type	LED
Light source efficiency (internal)	No less than 85lm/w
Light source efficiency (external)	No less than 80lm/w
Light source colour temperature	4000K

Item	Criteria
Light source colour rendering index	No less than 80
Luminaire protection	IP65
Luminaire impact resistance	IK8 or above
Power Factor	No less than 0.9
Light pole material	Hot dip galvanised steel

Illuminance

Table 4-7 below summarises the illuminance criteria adopted in the reference design, as per T HR SS 80001 ST Table 2.

Table 4-7: Illuminance criteria

Area	Eh (Lux)	Eph (Lux)	Epv (Lux)	Ue2
Ramps and steps (open)	150	21	14	7
Open footbridge	150	21	14	7
Yellow line (platform edge)	N/A	30	N/A	N/A
General platform	42	21	14	7

Emergency Lighting

Based on T HR SS 80003 Section 5.3.2, “High-risk task area emergency lighting shall be available on loss of power, meaning it shall automatically switch on and be available for the minimum duration specified in section 5.4.1”, the emergency lighting will be provided for pedestrian bridge. The 2-hour requirements for the minimum battery discharge periods shall be applied.

Once normal power supply is not available, high risk task area shall be illuminated in emergency mode. The in-built battery will energise the emergency lightings. Emergency lighting are designed in accordance with T HR SS 80003. The minimum horizontal illumination for emergency lighting at floor level shall not be less than 0.2 lx with an associated minimum average of 0.5 lx as per clause 4.6.1.3 of AS 2293-1:2018.

Exit Sign

Directional exit sign will be provided for public to evacuate via footbridge stairs and platforms. Illuminated exit signs are proposed to be mounted on existing and new poles at platform level and also on footbridge level. Each exit signs also includes a replaceable battery pack with a minimum discharge period.

4.8.3.3 Design Development

Equipment Schedule

As the new bridge and stairs are open without roof, pole mounted light fittings are proposed. Lighting poles on platforms, stairs and footbridges, and all poles over four metres in height shall be collapsible (collapsing, tilting or fold down poles).

In addition, batten lights are proposed to illuminate lift entry area. Light fittings are mounted on lift entry canopies. Figure 4-28 below shows the proposed luminaires.

Table 4-8: Luminaire Schedule

Type	Manufacturer	Description	Lamp	Power (W)	CCT	CRI	IP	IK	Mounting
P	Philips Greenvision Xceed Gen2	BRP381 LED111/NW 90W 220-240V DWP P7 HP	LED	90	4000K	80	IP66	IK08	Pole Mounted
L	Arag F 15 P-VW 80-840 PC	LED weather-proof batten lights	LED	58	4000K	80	IP66	IK08	Ceiling mounted
E	CLEVERTRONICS	Economy Lithium weatherproof of Emergency EXIT	LED	2.0	-	-	IP66 / IP67	IK10	Wall / Ceiling single-sided / Ceiling double-sided

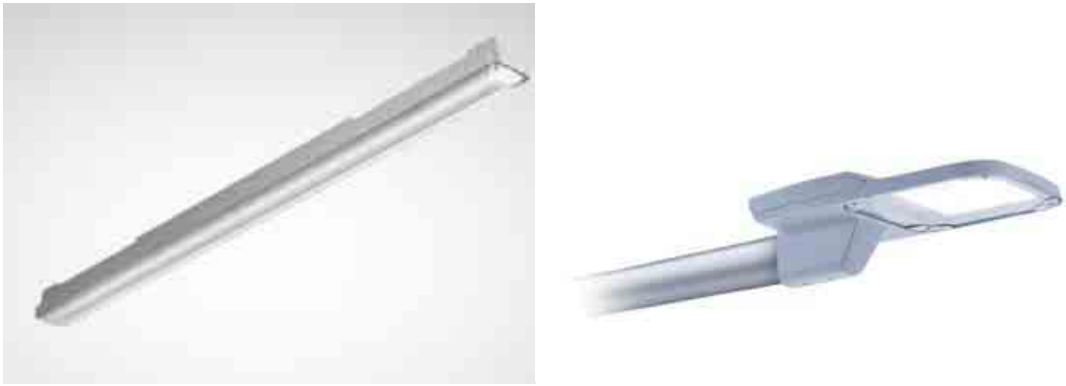


Figure 4-28: a) LEFT: Batten Lights, b) RIGHT: Pole Mounted Lights

Lighting Control and Power Supply

The proposed lighting control will comprise of daylight sensor (including PE cell and timer) with manual override switch at the IMSB. The PE cell will switch 'on' the luminaires when it senses the daylight level to be below 100 lux. It shall switch 'off' the luminaires if the illumination level exceeds 100 lux for a minimum period of 10 minutes.

The power supply will be fed from Mt Colah station IMSB. Double insulated cables are reticulated via conduits from distribution board to light fittings. The minimum cable size for lighting circuits shall be 1.5 mm^2, except where the cable is to be installed in underground ducts, for example, platform lighting columns and illuminated signs, where the minimum cable size shall be 2.5 mm^2. The minimum cable size for control wiring is 1 mm^2.

AGi32 Modelling

To make sure illuminance level is able to meet design criteria, lighting simulations have been modelled on footbridge, ramp and part of station platform area.

As both footbridge and stairs are open, pole mounted light fittings are proposed. The lighting simulation in AGi32 is undertaken as shown in Figure 4-29 to Figure 4-33 below.

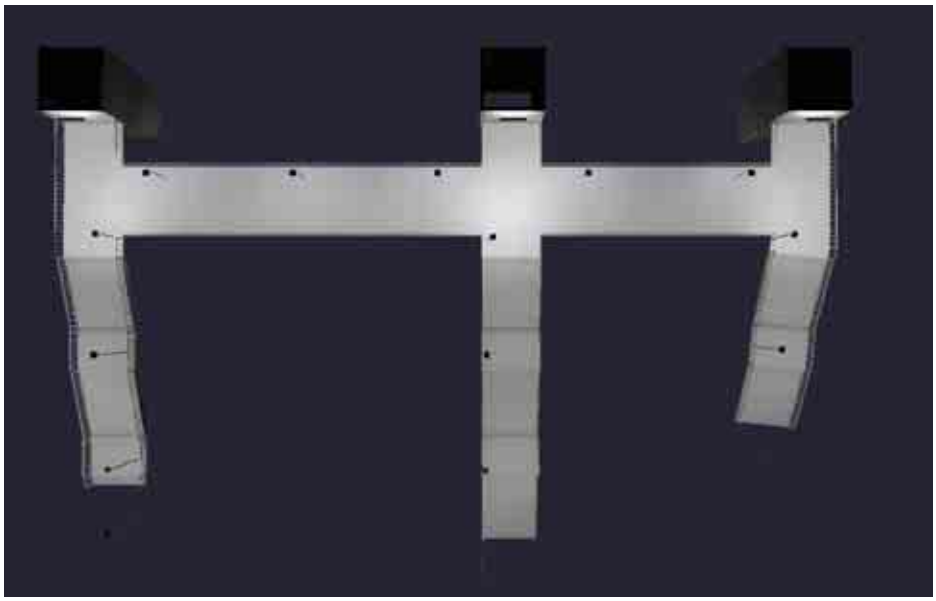


Figure 4-29 Lighting layout

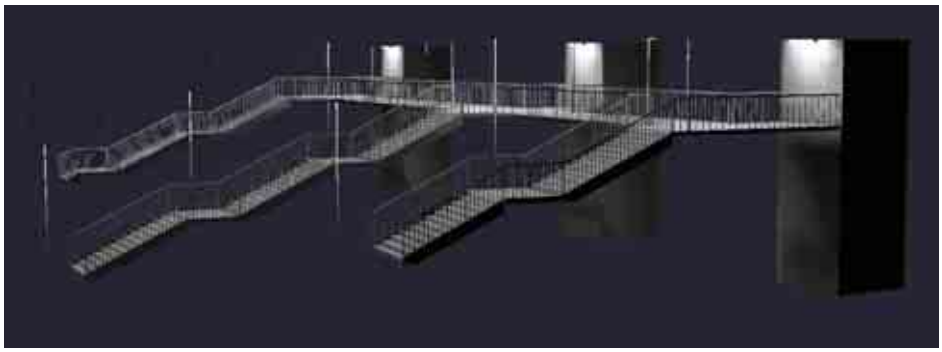


Figure 4-30 Lighting isometric view

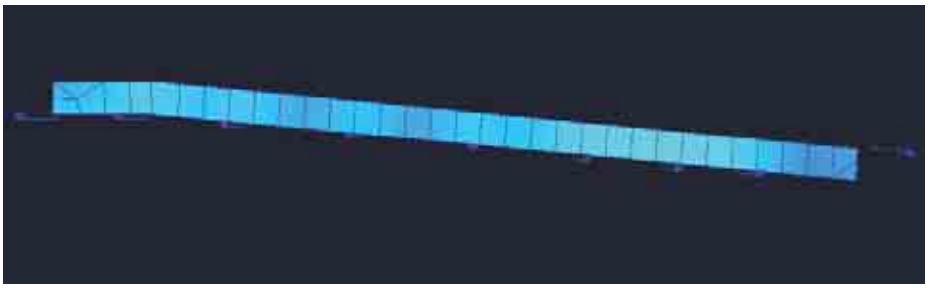


Figure 4-31: Footpath lighting layout

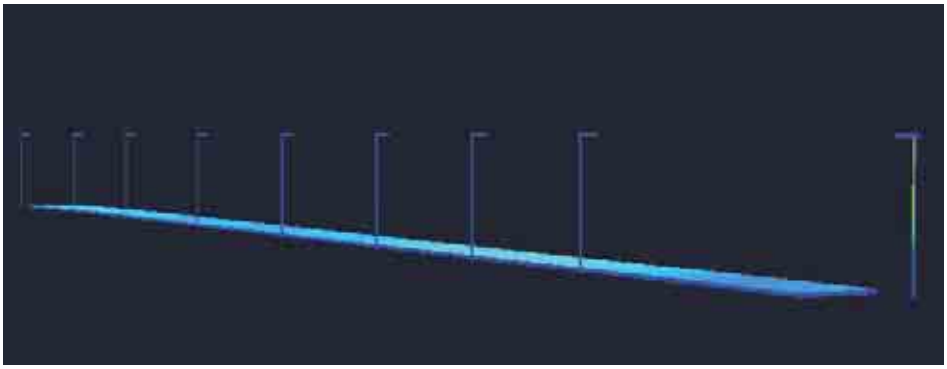


Figure 4-32: Footpath lighting - isometric view

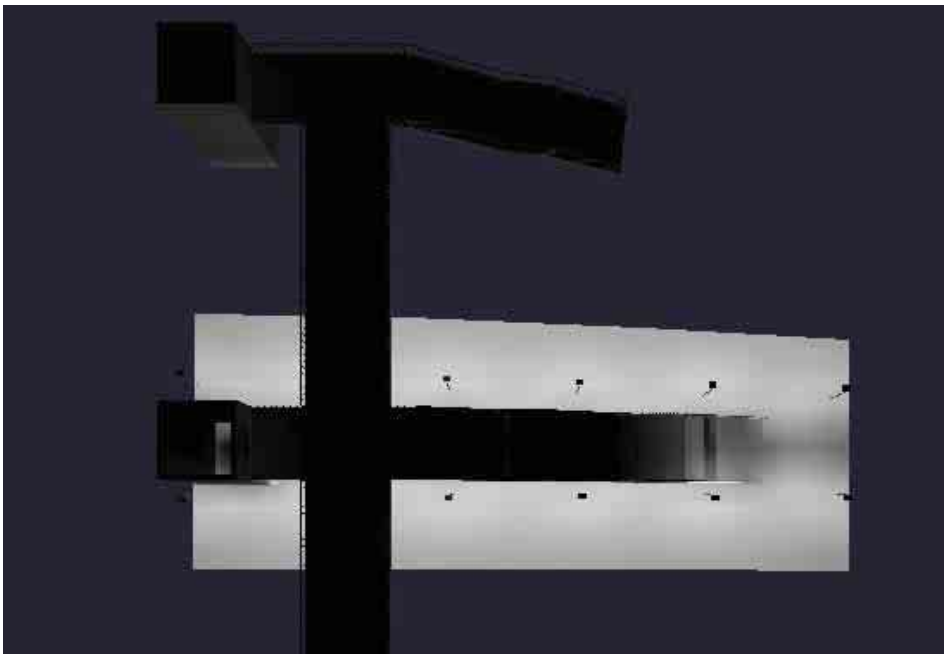


Figure 4-33: Platform Lighting Layout (affected area only)

Calculation Summary

Lighting simulation results are based on footbridge and platform level lighting layouts detailed in 30012921-EL-131 and 30012921-EL-131.

Table 4-9- Lighting simulation results summary

Location	Eh	Eph	Epv	Ue2
Bridge	242.1	167.5	44.5	1.77
Stairs 1	167.4	117.7	39.7	1.60
Stairs 2	201.8	121.5	41.3	1.89
Stairs 3	200.4	146.4	50.8	1.72
Ramp	210.2	152.7	26.3	1.28
Platform	142.9	39.2	67.2	1.28
Platform yellow line	134.0	108.6	-	-

Temporary Lighting during Construction

Temporary lighting during construction stage will be within contractor scope of work. To maintain rail station operational during lift and overbridge construction stage, temporary lighting will be provided around construction zone at platform. Wall mounted temporary light will be proposed on the temporary wall or structure to illuminance platform.

Based on T HR SS 80001 ST, Section 6.10, the temporary light fittings will be double insulated.

4.8.4 High Voltage

4.8.4.1 General

Due to addition of new lifts and lights on the new footbridge, the existing power capacity is not sufficient to supply the new loads, and a new source of supply will be required. Different supply options have been assessed and documented in technical memo 30012691-EL-MEM-002 included in Appendix I of the report. The proposed options detailed in this technical memo include modification to the Ausgrid LV nearby network, installation of an Ausgrid substation and utilisation of Sydney Trains 11kV network. The proposed options have been compared and SMEC recommends a new

padmount connected to Sydney Trains HV network as the most feasible and reliable solution for the station normal supply.

As a result of this assessment, a new 11kV/415V padmount substation connected to 11kV feeder 649 has been proposed to feed the new and existing Mt Colah Station loads and the new signalling transformer. The DSMSB is proposed to be backed up by an Ausgrid supply on the up main side.

This section of the report encompasses the design of the proposed 11kV/415V padmount substation as main supply from the Sydney Trains HV network and its associated HV cables.

Design of the HV electrical equipment and design documentation will be in accordance with the Australian and ASA standards listed in Appendix D of the report. The proposed padmount substation and the HV cables are selected from the Sydney Trains type approved equipment list which have been in use in the rail network satisfactorily.

4.8.4.2 Design Description

Distribution Padmount Substation Configuration

The 11kV/415V padmount substation is proposed to be installed on the downside of the track inside the rail corridor near existing 11kV pole 24 as shown on drawing 30012921-EL-121. It will be connected to the existing Sydney Trains HV network 11kV feeder 649 using standard ring main unit (RMU) between UGOH pole 23 (the existing pole 23 will be replaced with a UGOH pole) and UGOH pole 25 (the existing pole 25 will be replaced with a UGOH pole) as shown on the Proposed Operating Diagram (POD) drawing 30012921-EL-011. The proposed configuration complies with the hybrid feeder requirements of T HR EL 10001 ST regarding minimum length and span numbers achieved in adjacent aerial sections.

The LV cables of the padmount substation will be routed together with the 11kV feeder cable running towards pole 25 and then, the LV cables will be routed up the new footbridge to the station IMSB. Drawing 30012921-EL-121 shows layout of the padmount substation and its connections to HV and LV networks. Refer the CSR design for details of HV and LV cable routes.

Size of the Padmount Substation

Existing and new load requirements are summarised in Table 4-10 below. Refer to Section 4.8.2 for details of load requirement calculations.

Table 4-10: Station existing and new electrical loads

Item	Load	kVA
1	New loads (Lifts, Lighting, Comms, AC equipment, Signalling)	75
2	Existing station DB	30
TOTAL	Required supply + 30% spare	136.5

The proposed padmount substation is going to supply the new and existing Mt Colah station loads. EP 16 00 00 02 SP standard, Table 1 has the approved ratings of 75kVA followed by 200kVA for the transformer size. Based on the above assessment, 200kVA transformer is chosen. Padmount substation comprises of the HV RMU, 11kV/415V transformer and LV switchboard (DSMSB). These three compartments are accommodated in an outdoor kiosk enclosure.

HV Cable Section

ASA standard T HR EL 20001 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Requirements is used for selection of HV cables. As per section 10.4 of this standard, for simple installation configurations and for cables with a nominal voltage up to 33 kV, it is acceptable to apply derating factors published by the relevant cable manufacturer. Therefore, 11 kV cables will be sized to the cable manufacturer's recommendations.

The following factors were considered in the selection of the 11kV screened cable type to satisfy the circuit requirements:

1. Minimum current-carrying capacity for the feeder. This is dependent upon the cable size, method of installation and the presence of external influences, such as thermal insulation, which restrict the operating temperature of the cable.
2. Short-circuit temperature limit dependent upon energy produced during the short-circuit condition (incl. prospective short-circuit current and clearing time).

3. Voltage drop dependent upon the impedance of the cable, the magnitude of the load current, and the load power factor.

As per Sydney Trains response to RFI 0012, minimum required capacity for the new cable section shall be 95mm^2 cable and with an ampacity of 240 A as per T HR EL 20001 ST (Table 1 "Approved 11kV Cables" and Table 4 in Section 10.7 "Approved Cable Rating").

(a) Derating cable to installation conditions

The HV cables will be fixed to the UGOH poles (in air in sun) and then will be installed in the GST running to the location of padmount substation. At the location of padmount substation, cables will transition from GST to underground conduits to connect to the substation ring main unit (RMU).

As per Table 4 of T HR EL 20001 ST (Figure 4-34), the reference current carrying capacity of the selected cable are as follows:

Table 4 – 11 kV cables with TR-XLPE insulation– Continuous current ratings

Conductor area mm²	No of cores	Direct buried (A)	Buried in ducts (A)	In air in shade (A)	In air in sun (A)	In troughing in sun (A)
35	1	175	150	180	160	120
95	3	270	240	275	230	200

Figure 4-34: 11kV cables continuous current ratings – Excerpt from Table 4 of T HR EL 20001 ST

As the reference installation conditions mentioned in section 10.3.2 of T HR EL 20001 ST will not change for the GST installation, the de-rating factor will be unity and the maximum continuous current rating of the cable for installation in GST will be 200A.

For underground installation considering the site-specific typical HV trench, the derating factors compared to the standard conditions are as follow:

- *F1: Ambient soil temperature variation from* 25˚C *= 1*
- *F2: Depth of burial variation from 0.8m to 1.8m = 0.94*
- *F3: Soil thermal resistivity variation = 1*
- *F4: Grouping factor for installation of cable = 1*

Note 1: No information is available for the soil temperature variation at the location of the padmount substation. It is assumed that the soil temperature will not be higher than 25˚C.

Note 2: The value of Soil Thermal Resistivity is assumed to be 1.2 based on the stabilised sand 1:14 fill suggested for the HV trench.

Maximum cable current carrying capacity (Buried in duct) = 240 x 1 x 0.94 x 1 x 1 = 225.6A

Comparing the maximum capacity of the GST and buried conduit installations, it will result in the final current carrying capacity of 200A for the selected cable. As per Sydney Trains response to RFI 0012, feeder 649/1 load under normal and backup feeding arrangement is less than 50A. Therefore, the cable is suitable from the point of current carrying capacity. This cable type must also be checked for fault current and voltage drop adequacy.

(b) Short circuit check

Section 10.6 of ASA – T HR EL 20001 ST High Voltage AC and 1500 V DC Power Supply Cable Requirements, states that phase conductors and metallic screens shall be rated to carry the maximum fault current at the location for the longest clearing time of the backup protection covering that fault. The phase conductors shall be rated to carry the maximum 3-phase fault current for the longest clearing time of the backup protection covering that fault. The cable screen shall be able to carry the maximum earth fault current. The maximum conductor temperature under short-circuit operation conditions shall comply with AS/NZS 1429.

From EL00046 cable type approval, the short circuit rating for copper, XLPE 95 mm² three-core cable is taken to be:

- *13.6 kA/1 sec for phase conductors and 13.4 kA/1 sec for metallic screen*

Based on the information provided by Sydney Trains in response to RFI 0012, the maximum fault levels and maximum clearing times are as follows:

- *Maximum clearing time of 0.8 seconds for the back-up 3ph fault of 919A at pole 23 under normal feeding arrangement from Berowra BSP via Hornsby SS*
- *Maximum clearing time of 0.9 seconds for the back-up phase-earth fault of 805A at pole 28 under normal feeding arrangement from Berowra BSP via Hornsby SS*

The rated short circuit withstand values provided by the cable manufacturer exceed the maximum fault levels the cable will experience as per fault levels provided by Sydney Trains, even if c-factor and decrement factor are included. Therefore, the selected cable is adequately rated for feeder short-circuit current.

(c) Voltage drop

A power study has been conducted by Sydney Trains, confirming that the voltage drop of the feeder with the proposed modifications is acceptable. Refer to Electrical Functional Specifications 30012921-EL-S-01 in Appendix N for power study. Note that the AC resistance and inductive reactance of the cable is approximately three times less than the existing aerial conductor, so the overall voltage drop is expected to reduce.

(d) Cable Pulling

The sections of cable to be pulled in underground conduit are very short and not expected to create any issues in terms of pulling tensions. Calculations shall be conducted during detailed design along with the proposed pulling arrangement and location for cable drum and winch.

(e) Conclusion

The selected 6.35/11 kV, XLPE 1x3C, 95mm² copper cable is suitable for use with 200kVA padmount substation and feeder.

4.8.5 High Voltage Aerial

4.8.5.1 Changes from Previous Concept

The following changes have been made to Aecom's Option 4 as the reference design has been further developed and optimised:

- Concept option 4 proposes new conductors from pole 26 to 27 and a slack span from pole 26 to proposed UGOH. SMEC has proposes conductors from pole 26 to pole 27 to be retained and proposed span from pole 26 to UGOH pole 25 to be re-strung using existing conductors. This deviation from the concept option 4, eliminates the need for new conductors. Furthermore, not having span 25-26 a slack span minimizes the change in tipload of existing pole 26.
- UGOH on countryside of proposed footbridge proposed to be closer towards new footbridge. This location reduces the length of CSR route required for the 11kV relocation and provides sufficient clearances to fence and embankment from proposed UGOH pole 25. This alignment also eliminates CSR constraints associated with the existing footbridge and existing isolation transformers.
- No stay pole required for pole 25, unlike concept option 4. Preliminary structural assessment of pole 25 using Power Lines Pro has indicated that stay pole not required.
- PMT on pole 26 and air break switch on pole 27 to be decommissioned. Proposed RMU and signalling padmount make this existing pole top equipment redundant.

4.8.5.2 General

Existing pole 25 clashes with the propose footbridge location. Due to this, the 11kV feeder needs to be relocated and the following overall steps are proposed for achieving this:

- Decommissioning spans 23-24 and 24-25,
- Replacement of pole 23 with 12kN pole and transformation into UGOH,
- Replacement of pole 25 with 12kN pole, and
- Cable section (underground & GST) from new pole 23 UGOH to new pole 25 UGOH – see Section 4.10 for details.

In addition to this, the following modifications to the 11kV network are proposed:

- Decommissioning pole mounted signalling transformer (11kV/120V) on pole 26, as signalling location on up main is proposed to be supplied from the new padmount substation via a new padmount signalling transformer.
- Decommissioning air break switch on pole 27, as the proposed RMU will provide means of isolating this section of the feeder, eliminating the requirement of the air break switch on pole 27.

Refer to design drawings 30012921-EL-006, 30012921-EL-101 and 30012921-EL-102 for aerial line reference design.

4.8.5.3 Design Criteria

The HV aerial line refence design has been developed in accordance with T HR EL 10001 ST and AS/NZS 7000. The following criteria have been applied:

Maximum Loading Conditions

The maximum wind and maximum weight loading conditions were obtained from RailCorp T HR EL 10001 ST Overhead design section 9.6.1 in Table 2 as they comply with AS/NZS 7000 and capture the conditions present in the site.

- Timber poles with wind loading at 1110 Pa – applying drag coefficient of 1.3, wind load becomes 1443 Pa
- Conductors are checked against 15°C and 900Pa
- Strength reduction factor for wood poles 0.4
- Load factors as per AS7000 Table 7.1

Everyday Loading Conditions

The everyday loading conditions were obtained from RailCorp T HR EL 10001 ST Overhead design section 9.6.2 in Table 3.

- Timber poles with no wind loading
- Conductor loads are considered at 5°C and 0Pa
- Strength reduction factor for wood poles 0.26
- Load factors as per AS 7000 Table 7.1

Clearance Requirements

The electrical clearance requirements for the modified route are identified below.

The conditions under which the minimum clearances shall be calculated are established in Section 13 of T HR EL 10001 ST as the following:

- Conductor temperature 70 °C and 0 Pa wind (ground / vertical clearance)
- Conductor temperature 50 °C and 500 Pa wind (blowout / horizontal clearance)

For these calculations, conductor creeping factor has also been taken into consideration.

Table 4-11: Vertical Electrical Clearances

Type of Clearance	Clearance required for 11kV (m)	Environment	Source
Over the carriageway of roads	6.7	Maximum Temperature (0Pa 70°C)	AS/NZS 7000 Table 3.5

Table 4-12: Electrical Clearances from Structures

Type of Clearance	Clearance required for 11kV (m)	Environment(s)	Source
Vertically above a part that a person cannot normally access but can stand	3.7	Hot (no wind 70°C)	AS/NZS 7000 Table 3.7

Type of Clearance	Clearance required for 11kV (m)	Environment(s)	Source
In any direction from the part of a structure normally accessible, or from any part not normally accessible but which a person can stand	2.1	Hot (no wind 70°C) Blowout (500Pa 50°C)	AS/NZS 7000 Table 3.7
In any direction from those parts of any structure not normally accessible to persons	1.5	Hot (no wind 70°C) Blowout (500Pa 50°C)	AS/NZS 7000 Table 3.7

Table 4-13: Electrical Clearances from electrical structures

Type of Clearance	Clearance required for 11kV (m)	Environment(s)	Source
Horizontal clearance from 11kV conductors	2.4 (hand-reach + SAD)	Maintenance wind (100Pa 70°C)	AS/NZS 7000 Section 3.5
Vertical clearance from 11kV conductors	1.5 (working zone + SAD)	Hot (no wind 70°C)	AS/NZS 7000 Section 3.7.4

Table 4-14: Minimum separation between poles and track based on ESC 215 – Transit Span

Type of Clearance	Access path	Separation (m)
Horizontal clearance from track centreline to face of pole	Access path between track and pole	5.0
	No access path between track and pole	6.2

4.8.5.4 Pole and Pole Top Arrangement

See table below for poles and pole top arrangements to be installed, decommissioned and modified:

Table 4-15: Summary of poles and pole top arrangements

Pole ID	Status	Pole Type	Argument	Easting	Northing	RL at pole base
22A	To remain – conductors to new pole 23 to be restrung	14.0/8	11/15	310225.83	1278347.82	204.8
23	To be decommissioned	18.5/8	11/41A	310243.77	1278427.66	203.2
23	To be installed – conductors to pole 22A and UGOH to transition to proposed underground cable to be installed	18.5/12	11kV Termination UGOH (EL0186406)	310431.24	1272592.88	203.2

Pole ID	Status	Pole Type	Argument	Easting	Northing	RL at pole base
24	To be decommissioned	17.0/8	11/41A	310287.29	1278542.54	204.6
25	To be decommissioned	14.0/8	11/41	310325.91	1278615.46	207.7
25	To be installed – conductors to pole 25 and UGOH to transition to proposed underground cable to be installed	14.0/12	11kV Termination UGOH (EL0186406)	310525.21	1272796.98	204.4
26	To remain – conductors to new pole 25 to be restrung and pole mounted transformer to be decommissioned	12.5/12	11/35 to remain C/70372 to be decommissioned	310374.10	1278672.87	209.1
27	To remain – air break switch to be decommissioned	17.0/8/0.25	11/35 to be installed or termination arrangement of existing 10/S5 to be maintained once air break switch decommissioned	310650.41	1272927.34	205.0

4.8.5.5 Conductors

Existing spans 23-24 and 24-25 are to be decommissioned. The two spans 22A-23 and 25-26 are to be restrung to proposed UGOH poles 23 and 25. See table below for details of restrung spans. Current rating is based on T HR EL 10002 ST table 7.

Table 4-16: Summary of proposed changes to conductors

Span		Length (m)	Descriptions	Type	CBL% at 21.1°C	Current Rating (A)
Pole 22A	Pole 23 (New)	85.1	To be restrung	7/0.080" (7/2.0mm) HD Cu	1499N (E/63611)	Summer days – 130A Winter days – 150A
Pole 25 (New)	Pole 26	53.9				

4.8.5.6 Powerlines Pro Modelling

The existing configuration was modelled in Power Lines Pro 2.2.0 using the following inputs:

- Survey 60605415-SV-11892301001-01 from 2018 by Cardno – for ground line, pole locations, pole above ground heights and attachment heights of conductors
- As-built drawings EL0006663 and EL0006664 – for pole top arrangements, conductor types and tension
- Pole inspection reports received in response to RFI-011 – verification of pole types given on as-built drawings and indication of remaining pole strengths

Following this, the existing configuration was modified on Powerlines Pro using the proposed pole locations and keeping the modified spans' conductors at standard tension.

No issues regarding structural and geotechnical considerations were raised at this stage.

4.8.5.7 Clearances

See table below for the calculated clearances to OHWS in proximity to restrung spans 22A-23 and 25-26:

Table 4-17: Aerial line clearances to OHWSs

Span	OHWS	Measured Clearance (m)	Clearance Required (m)	Pass / Fail
22A – 23	N37+445	4.7	Horizontal – 2.4 Vertical – 1.5	PASS
25 – 26	N37+722	4.4	Horizontal – 2.4 Vertical – 1.5	PASS

Mid-span conductor separation and other required clearances were also checked and no issues were encountered.

4.8.5.8 Conclusion

No issues were encountered at this stage of the design regarding the aerial line modification. Full assessment of clearances and structural review to be completed during the next design stage.

4.8.6 Earthing and Bonding

The earthing, bonding and isolation design has been assessed against ASA requirements and standards as listed in Appendix D, applicable to the works as defined in the project scope.

4.8.6.1 Scope of Works

The scope of works for the earthing and bonding reference design are as below:

- Proposed footbridge and lift structures at Mt. Colah Station,
- Proposed OHWS – N37 +770 UP and DOWN main,
- Proposed 11kV/415V padmount substation,
- Proposed backup padmount substation 415V/415V isolation transformer,
- Proposed UGOH poles - Pole 23 and Pole 25,
- Proposed permanent and temporary GST, and
- Existing boundary fenceline and GST.

4.8.6.2 Proposed pedestrian footbridge

A two-span concrete structure is proposed for the new footbridge which comprises of three lifts and three staircases, providing access to Pacific Highway, Mount Colah Island Platform and Pierre Close.

The bridge superstructure of the proposed footbridge is semi-integral with the substructure, this means the superstructure and substructure is one continuous length. It should be noted that while there will be no OHW attachment proposed, however there will be LV equipment (such as lighting and CCTV) proposed on the footbridge it is therefore assessed that an earthing and bonding assessment is required in accordance to TN 016:2015. The proposed footbridge crosses the railway corridor within the electrified track system and is exposed to indirect hazards associated with the 1500V DC traction system. This is due to the risk that the public may be exposed to inadvertent indirect contact of the 1500V DC traction supply system by mean of a faulty train pantograph.

As part of the scope of works of the footbridge reference design, LV reticulations (for lift, CCTV and lighting) and light fittings are proposed on the footbridge.

4.8.6.3 Requirements

A high-level assessment has been conducted in accordance with TN 016 and the requirements have been tabulated in Table 4-18 and Table 4-19 with recommendations to demonstrate compliance and/or their relevance and application to earthing, bonding and isolation hazards of the proposed footbridge.

Table 4-18: Technical Note TN016:2015 Common Requirements

Common Requirements	Recommendations
The bridge structure shall be insulated from boundary fences, preferably via insulation panels, as well as other metallic structures and services outside of the rail corridor. See drawing CV 0478385 for a compliant insulation panel arrangement.	Insulated fence panels to be installed at adjoining fence.
Exposed continuous metallic services, such as galvanised steel troughing, crossing the bridge shall be provided with insulation breaks at a distance of 2 m +/- 0.5 m from the edge of the bridge or any metallic item attached to the bridge.	No existing GST. Future GST crossing the footbridge is to have insulation breaks installed.
Exposed metallic services that are attached to, and run along the bridge, shall have insulation breaks at the railway corridor boundary.	No exposed metallic services proposed in the footbridge reference design.
Where possible, all insulation breaks shall be aligned. All insulation breaks shall be clearly shown on as-built drawings with appropriate labels identifying the isolation gaps.	Insulation breaks to be installed on GST/boundary fenceline which in vicinity of OHWS, UGOH poles and 11kV padmount substation based upon earthing assessment.
Where a high voltage bare aerial conductor is located above the bridge: The bridge structure shall not be galvanically connected to an adjacent building. Refer to EP 10 01 00 06 SP HV Aerial Standards for Design and Construction for buildings that are prohibited to be under high voltage aerial lines. Suitable measures shall be provided at the entrance to the bridge and at any joints in the bridge structure or other metallic components to mitigate the risk of electric shock from step and touch voltages due to fallen conductors.	Existing HV aerial line to be removed as it clashes with the proposed footbridge structure. New HV cables to be direct buried.
Buildings on the bridge shall not be located under the high voltage aerial line. Refer to EP 10 01 00 06 SP for prohibited configurations with buildings under high voltage aerial lines.	No building proposed on footbridge in the project scope of work.
Test terminals shall be provided to allow for testing of the integrity of the installation, including the effectiveness of insulation across any joints and the continuity of bonding circuits, during commissioning and maintenance.	Test terminals to be provided on footbridge.
Where low voltage equipment, such as lighting, is installed on the bridge, earthing arrangements shall comply with EP 12 10 00 21 SP Low Voltage Installations Earthing.	CCTV, light fittings and LV reticulations are proposed on the footbridge.
Design of the bonding circuit shall minimise the inserted impedance and shall ensure that the relevant DCCB will operate under fault conditions.	Bonding circuit is not proposed in the referenced design.

Table 4-19: Technical Note TN016:2015 requirements to concrete bridges

Common Requirements	Recommendations
Horizontal safety screens shall be insulated from the bridge structure by ASA type approved means.	No horizontal safety screens and OHW attachment proposed on footbridge.
Vertical safety screens shall be insulated from the bridge structure.	Vertical safety and protection screens are proposed, and they shall be insulated from the bridge structure.

Common Requirements	Recommendations
Other conductive parts, such as protection screens and balustrades, shall be insulated from the bridge structure.	The handrail/balustrade on lift link slab shall be insulated from the link slab and bridge structure.
Where overhead wiring structures, such as drop verticals and anchor brackets, are attached to the bridge, such structures shall be insulated from the bridge by ASA type approved means.	No OHW attachment proposed in footbridge reference design.
Horizontal safety screens and overhead wiring structures attached to the bridge shall be bonded to rail via an ASA type approved voltage limiting device.	No horizontal safety screens and OHW attachment proposed on footbridge.

4.8.6.4 Bridge structure

Stray DC current has been assessed as a low risk due to the OHW not being attached to the footbridge. Regardless, this is a critical piece of infrastructure which requires mitigation for protection from corrosion as per durability requirements for bridges. Test terminals shall be provided on the footbridge at accessible locations on the pier headstocks to measure the insulation and continuity between bridge structures as well as any stray DC current flowing through the concrete bridge structure. If stray current monitoring shows that this is required, the test terminals can be also used to provide cathodic protection system or drainage bond to protect against stray DC current electrolysis corrosion.

4.8.6.5 Safety and protection screens on footbridge

Vertical safety and protection screens are proposed to be installed on the footbridge superstructure. In accordance to ASA standard T HR EL 08001 ST, the vertical safety screen will provide a solid barrier finish with no spaces below or between screen panels, providing impenetrable barrier (polycarbonate panels have been proposed). The vertical screen shall be a minimum 1,800mm height, with a minimum 2,000mm horizontal width from track centreline and 2,500mm taut string line distance to any OHW so that it is to prevent access to touching the catenary wire and the 1,500V traction system. These requirements have been met in the proposed footbridge reference design, refer to drawing 30012921-ST-006 and 007.

Horizontal safety screens are not required as the vertical protection & safety screens are proposed to be constructed using solid barrier, satisfying the vertical screen requirements of T HR EL 08001 ST.

The frame of the proposed vertical safety and protection screens shall be insulated from the bridge structure via insulation pad, bush and washer in accordance to TN016:2015.

4.8.6.6 LV installation

The LV equipment on the footbridge is supplied by the proposed 11kV/415V padmount substation and is as follows:

- CCTV
- light fittings
- Lift supply boards

The LV reticulations will run inside the conduit in the cast in-place deck as shown in Figure 4-11. As the footbridge is assessed to be exposed to risk of pantograph failure, the CCTV poles are proposed to be insulated from the bridge structure and light fittings on the footbridge shall be double insulated.

In accordance to T HR EL 12004 ST Section 6.5, a minimum earth cable size of 16 mm^2 is required between earth bars and sub-circuits as per AS/NZS 3000.

4.8.6.7 Lift structures

Three new lifts are proposed as part of the reference design, the three lift shafts consist of precast concrete below the bridge deck level and steel frames with glass panels above the finished deck level, as shown in drawing 30012921-ST-007. Lifts 1 and 3 provides access to the street level and the footbridge and Lift 2 provides access to the station platform and the footbridge.

The lift shafts are separated from the footbridge via a reinforced concrete link slab, as shown in Figure 4-35. The concrete link slab is supported on the bridge structure pier headstock and insulated from the bridge structure via

elastomeric bearing, non-conductive materials (i.e. expansion joint or non-conductive dowels) shall be applied between the bridge structure and link slab.

The reinforcement of the reinforced concrete link slab shall be made electrically continuous to the lift steel frames and the reinforcement of the lift shaft precast section and ultimately to the cast in-place pile cap and concrete piles.

The handrail/balustrade on the link slab shall be insulated from the link slab by using approved insulation bush/washer and epoxy grout. An air gap of minimum of 50mm is to be maintained between the handrail/balustrade and vertical safety and protection screen post at bridge interfacing.

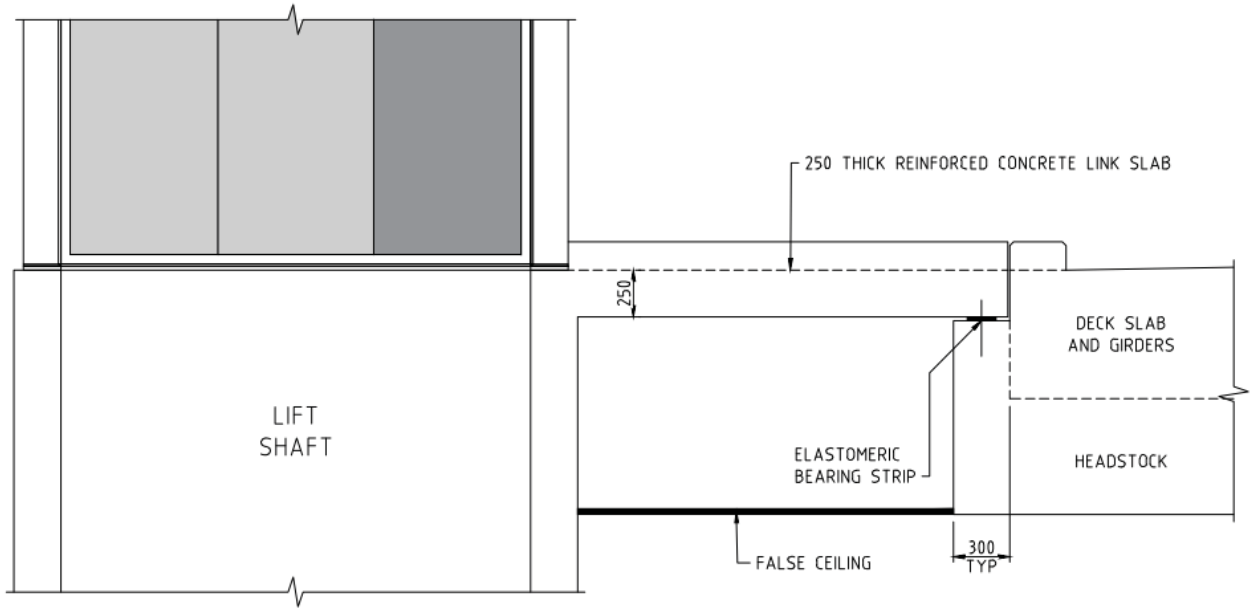


Figure 4-35: Reinforced concrete link slab detail between lift shaft and bridge pier

4.8.6.8 Lightning risk assessment

The lift structures will likely be the worst case in regard to the risk of introducing a direct strike as the surrounding structures are lower in height. The identified risk is for an electrical shock to general public and personnel when physical contact is made by using the lift under the event of lightning strike.

Lightning risk assessment has been undertaken in accordance with AS/NZS 1768 which presents lightning ground flash density in the form of a contour map of Australia (AS/NS 1768 Figure 2.3). The average annual lightning ground flash density of 2 strikes per km^2 has been adopted for the lightning protection assessment. The lightning protection risk assessment concludes that there are no unacceptable risks due to direct strikes to the lift structures. Refer to Lightning Risk Assessment spreadsheet in Appendix J.

Although the likelihood of a strike to the lift structure is assessed to be low, lightning protection design for the lift structures has been implemented to further reduce the impact of a lightning strike.

The precast lift shaft units are to be bonded to each other via connection terminals, the reinforcement inside the precast lift shaft structure shall be made electrically continuous to the reinforcement in the capping beam and ultimately to the reinforcement in the pile structure and lift pit structure (wall and slab). The bonding cable shall be $70mm^2$ PVC insulated copper cable.

It should also be noted that the reinforcement of the reinforced concrete link slab shall be made electrically continuous to the reinforcement of the precast lift shaft unit and ultimately to the cast in-place pile cap and concrete piles.

4.8.6.9 Proposed OHWS

It is proposed that two new single mast OHWS (N37 +770) be placed on the country side of the existing footbridge (more than 2m from the existing footbridge) on UP and DOWN main as shown on Figure 4-36. It should be noted that no earthed metallic equipment/platform structure/services to be within 2m from the OHWS.

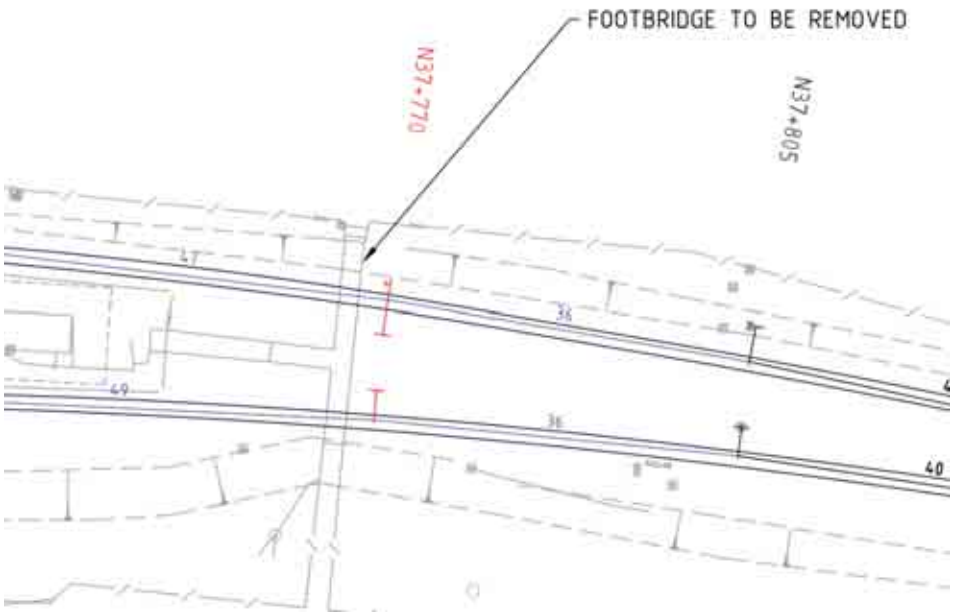


Figure 4-36:Proposed OHWS N37 +770

4.8.6.10 Primary power supply arrangement

As stated in Section 4.8.2, it is proposed that a new HV power supply will be required for the station and new lift and lighting installation. A new 11kV/415V padmount substation (with 200kVA transformer rating) is proposed and it will be connected to the Sydney Trains HV network – 11kV feeder 649, refer to Section 4.8.2 for locations of the new 11kV/415V padmount substation and HV cable route. The existing 11kV feeder 649 alignment is to be relocated and reconfigured between the existing Pole 22A and Pole 26 as part of the reference design. Two existing poles (Pole 23 and Pole 25) will be decommissioned and relocated to new locations and converted to UGOH poles. Therefore, the scope of HV earthing design applies to the proposed 11kV/415V padmount substation and two UGOH poles.

4.8.6.11 Backup power supply arrangement

As stated in Section 4.8.1.11, a 415V/415V isolation transformer which is to be supplied by Ausgrid, is proposed as a backup source which is located to the existing signalling loc.

4.8.6.12 Fault Levels

The fault levels and protection clearing times applicable to the new 11kV/415V earthing design have been provided on the 23/07/20 and are included in RFI #012 (refer to Appendix S). The worst-case fault level and clearing time shall be used to assess the minimum conductor sizing requirements, safety criteria and EPR assessment.

4.8.6.13 Safety Criteria

The following hazards to personnel and equipment safety are assessed in the detailed design:

- Hand-to-Hand Touch Voltage: with a maximum reach of 2m;
- Touch Voltage: Hand to foot potential difference at a maximum separation of 1m;
- Step Voltage: Potential difference between feet based on an average stride length of 1m; and
- Soil Voltage Contours: The EPR transfer to conductive objects that may be earthed remotely such as communication cables or metallic pipelines.

It should be noted that the hazards to personnel and likelihood of damage to metallic pipelines and communication equipment as a result of an induced voltage of EPR shall be assessed based on the requirements of AS/NZS 4853 and AS/NZS 3835.1 respectively.

4.8.6.14 Step and Touch Voltage Limits

The step and touch voltage criteria to be used in the earthing design shall be derived from ENA EG1 which considers the effects of different body impedances for publicly assessable areas (50kg person) and restricted locations (70kg person) and footwears. It is an ASA requirement to consider the touch voltage safety criteria derived from both ENA EG1 and AS/NZS 60479.1.

The safety criteria limits for each of the contact scenarios and different surface conditions shall be calculated, for each contact scenario, the more onerous safety criterion is to be assessed against in the earthing system design.

4.8.6.15 Soil Resistivity Testing

The soil resistivity testing has been conducted on the 21/08/2020, refer to Appendix J for illustration of soil resistivity test locations and test results. It should be noted that the soil test was not carried out at the proposed Location 2 (property owned by RMS) as access into the land has not been approved at time of testing.

The soil resistivity measurements have shown inconsistency in both test traverses at Location 1 due to sloped terrain. It can be seen the measured soil resistivity for Traverse 2 from Location 1 and Traverse 1 from Location 3 are found to be consistent in the underlying layer in the order of 761-798 Ωm, however discrepancies have shown in the resistivity and thickness in the top layers.

Using this soil resistivity model will result in difficulty in achieving the design criteria or require a larger earthing grid to achieve compliance. To reduce this risk it is recommended that a soil test not shorter than a spacing of 32m to be carried out at the proposed location 2 (or different locations if assessed applicable) to justify the soil layers and determine the soil model which will be used in the earthing design of the new UGOH poles (Pole 23 and Pole 25), 11kV/415V padmount substation and 415V/415V padmount substation.

However, as part of the reference design, a preliminary earthing design of the padmount substations and UGOH poles have been conducted to determine the length and number of the electrodes required to comply with relevant standards. The soil resistivity result of Location 3 Traverse 1 has been used for the earthing designs, as shown in Table 4-20.

Table 4-20: Soil resistivity model

Layer	Resistivity (Ωm)	Thickness (m)
1	432	1.9
2	761	∞

4.8.6.16 11kV/415 padmount substation earth grid design requirements

The ASA standard drawing EL0480394 shall be considered for earthing design of the 11kV/415V padmount substation. In accordance to ASA standard EP 12 10 00 11 SP, the HV and LV earthing system shall be separated. The HV system earth grid shall be designed that the resistance to earth shall not exceed 30Ω and the LV system resistance to earth not exceeding 15Ω.

The earthing of substation of the local HV earth grid is to consist of:

- Local earth grid comprising of bare copper grading ring at a nominal distance of 1m from the padmount footprint.
- 4 x 24m electrodes at four corners.

Using the recommended soil resistivity model from Table 4-20, the earth grid resistance to remote earth is determined to be 28Ω.

The LV earth grid is designed to be separated from the HV earthing system and achieve a maximum resistance to ground of 15Ω. The minimum recommended LV earth grid, consisting of six 35m electrodes. The earth grid resistance to remote earth is determined to be 11Ω.

It should be noted that the HV and LV earth grids are preliminary designs and to be revised in the detailed design stage for alternative earthing arrangements (i.e. increase/decrease the number and length of the electrodes). The HV earthing system is required to be designed to address the step/touch voltage criteria based upon the revised soil resistivity model.

4.8.6.17 11kV UGOH earth grid design requirement

The proposed earthing grid arrangement for the proposed UGOH poles shall be constructed in accordance with ASA standard drawing EL 0284008.

The earthing of the UGOH pole is to consist of four 24m electrodes and using the recommended soil resistivity model from Table 4-20, the earth grid resistance to remote earth is determined to be 28Ω.

It should be noted that the earthing system is preliminary design and to be revised in the detailed design stage for alternative earthing arrangements (i.e. increase/decrease the number and length of the electrodes). The HV earthing system is required to be designed to address the step/touch voltage criteria based upon the revised soil resistivity model.

A potential risk of transfer voltage hazard has been identified to the nearby GST and boundary fence, an EPR assessment is to be conducted at the UGOH poles. Insulation break/fence insulation panel are proposed to be installed to mitigate the hazard.

4.8.6.18 415/415 padmount earth grid design requirements

The bonding requirement of the isolating transformer is to be in accordance with T HR EL 12004 ST Section 5.2. The power rating of the isolating transformer is rated at 200kVA, the LV earth grid for the new isolating transformer is designed to achieve a maximum resistance to ground of 15Ω in accordance to EP 12 10 00 11 SP.

The minimum recommended LV earth grid, consisting of six 35m electrodes. The earth grid resistance to remote earth is determined to be 11Ω. It should be noted that the earth grid is a preliminary design and to be revised in the detailed design stage for alternative earthing arrangements (i.e. increase/decrease the number and length of the electrodes).

It is understood that there is an existing Sydney Trains signalling loc nearby the location of the proposed isolating transformer, the proposed LV earthing system shall be located with a minimum distance of 2m away from the existing signalling earthing system.

4.8.6.19 Hazard Assessment

The hazards identified in the vicinity of the 11kV/415V padmount substation, UGOH poles and existing OHWS are:

- communication pits
- boundary fence,
- permanent and temporary GST, and
- other metallic services.

These hazards will be allocated a safety criteria set for them depending on access (public/restricted) and the design will be carried out to mitigate the touch/step hazards.

If allowable safety limits cannot be achieved, mitigation solutions may include:

- Installing fence insulation panel;
- Installing insulation breaks on GST;
- Shifting the OHWS electrodes away from the GST and boundary fence;
- Shifting the padmount substation away from boundary fenceline; and
- Reassessing standard earth grid design by increasing/decreasing number and length of electrodes.

4.9 Signalling

4.9.1 Scope of Works

The scope of works for the signalling reference design is as below:

- New Guard Indicators (LED) for Platform 1
- New power arrangement for N23.48R location
- New cable route for guard indicator and power supplies to Signal location N23.48R
- Spark gaps for new bridge (track insulation plan updates)

Signal sighting is to be undertaken at detail design to confirm the proposed design.

4.9.2 Guard Indicator

Existing Guard Indicator

Figure 4-37 below shows the location of the existing guard indicator relative to the new footbridge.

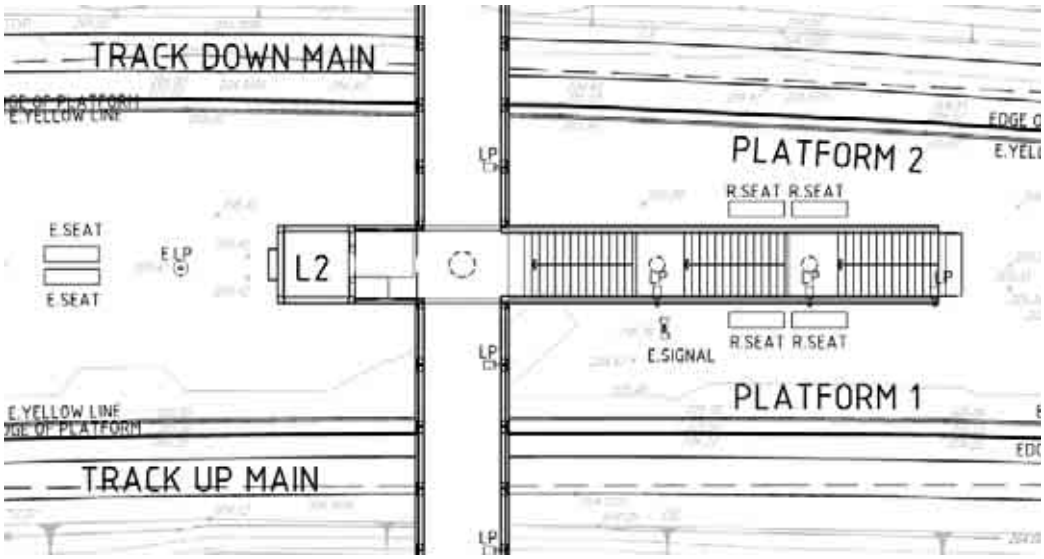


Figure 4-37: Location of existing guard indicator relative to new footbridge

The existing guard indicator can be temporarily supported and protected during the construction of the new footbridge. ST preference is to keep the existing GI at the current position and extend the GI/ bracket out towards the track to assist construction. This is to be reviewed by the contractor and the relevant signal sighting committee.

If temporary re-location of the existing guard indicator cannot be achieved effectively, due to space or sighting constraints, relevant concessions may be applied for "taking out of service" of guard indicator for the duration of the construction. This is subject to ASA approval.

The existing guard indicator is to be removed following the installation and commissioning of the new guard indicators.

New Guard Indicator

A signal sighting was not undertaken at reference design. Based on Sydney Train's initial review, the following new guard indicators have been proposed:

- New standard guard indicator (LED) mounted on the new lift shaft for Up Platform, lights facing towards countryside. Final position of the guard indicator or additional requirements will be confirmed after the outcome of signal sighting Investigation (to be undertaken at detail design).
- New additional standard guard indicator (LED) mounted on a pole directed towards countryside. It will be approx. 50-70m from lift shaft towards Sydney side. Final position to be confirmed during signal sighting (to be undertaken at detail design).

The above guard indicator locations are as proposed by Sydney Trains following an internal meeting between Signals and Major Works.

Signal Sighting

A preliminary signal sighting was initially arranged for the 25th of August 2020 to inform the temporary and final position of the Up-platform (Platform 1) guard indicator. This was subsequently cancelled by Sydney Trains. In the following meeting, it was agreed that a signal sighting would be convened following the 30% reference design submission and findings of the signal sighting incorporated into the 100% reference design resubmission where possible. This was not available at the completion of the 100% reference design.

It was also confirmed during the meeting that no additional guard indicator will be required on the Down Platform (Platform 2) as existing Signal N23.61 is positioned greater than a train length from the end of Platform 2. Refer to Appendix T for meeting minutes.

4.9.2.1 New Power Supply Route

Power calculations were undertaken for the updated cable route. Refer to Appendix L for a copy of the power calculations.

4.9.3 Signalling requirements for detail design

The following requirements have been identified for consideration at detail design:

- Detail Design to consider Westrace data changes as required for LED GI upgrades
- New power arrangement to consider new IVAP or replacing existing ECO as required

4.10 Combined Services Route

The CSR for reference design provides the reticulation arrangement for the following elements:

- Undergrounded portion of works required for 11kV Feeder 649/1
- Relocation and protection of existing Rail and Station services impacted by temporary and permanent works of interfacing disciplines
- Permanent works for Rail and Station services accommodating the replacement footbridge and station upgrades
- Baseline materials list and expected Design Service Life
- Design assumptions

Expected construction sequencing for CSR reference design is documented in Section 5.

4.10.1 Undergrounding of 11kV Feeder 649/1

Sections 2.3.1 and Section 4.8.5 document the existing and proposed aerial reconfiguration for Feeder 649/1. This arrangement provides the limits for the undergrounding works with the alignment transitioning through the 11kV/415V padmount substation.

4.10.2 Temporary Works

Reference design provides a conservative approach to the construction staging in this highly constrained area, providing a temporary alignment of GST. In the direction of country to city the alignment transitions from UGOH Pole 25, down the existing embankment and reticulates along the toe of the embankment to the 11kV/415V padmount substation. From the substation, the alignment is installed as the permanent arrangement continuing towards the city, along the rail corridor boundary and returns to an aerial arrangement at UGOH Pole 23. This strategy allows all construction works for Lift 1 to be undertaken without the potential risk of damaging the feeder arrangement or the requirement to protect it.

4.10.3 Permanent Works

The 11kV Feeder permanent works will be trenched and buried from the 11kV/415V substation to UGOH Pole 25 and located between Lift one and the Down Main Rail Corridor boundary. This arrangement is to be laid after the completion of the capping beam and when the remedial backfilling is taking place. A second cut over and cable pull will be required to finalise the 11kV Feeder construction actives and the contractor will remove all GST components associated with the project.

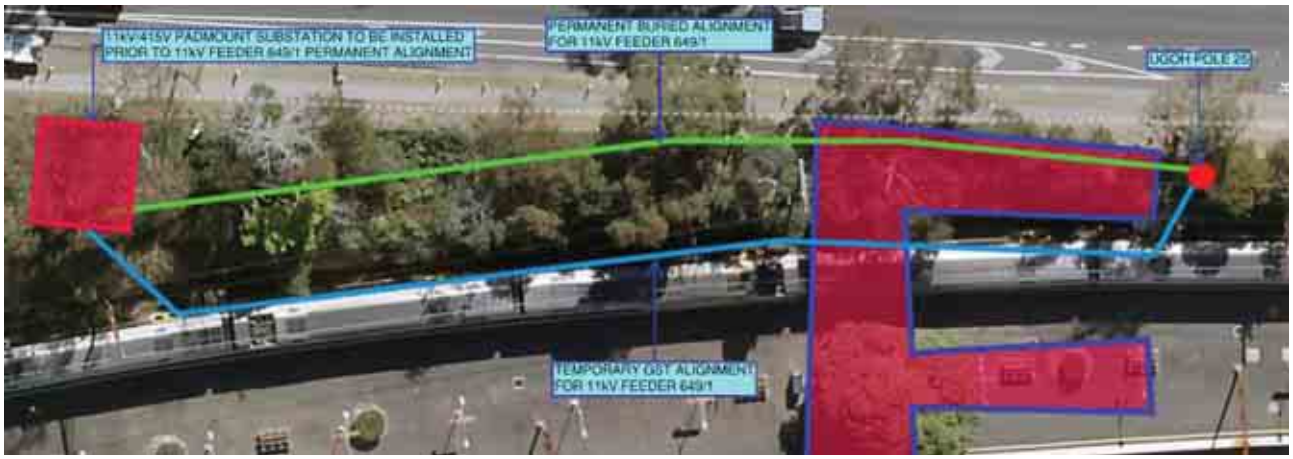


Figure 4-38: Underground 11kV Feeder 649/1 Alignment

4.10.4 Relocation and Protection of Existing Rail and Station Services

Existing Footbridge

All services documented in Section 2.3 should be protected until the Replacement Bridge has been constructed.

Down Main

Excluding the 11kV Feeder, no Sydney Train System services are located on the Down Main.

Platform

Existing station lighting, communications and security assets will be assessed at Detailed Design in line with the Construction Methodology and determine any temporary arrangement if required. The existing Guards Indicator reticulation will be protected during all construction activities until the approved Guards Indicator have been commissioned.

Up Main

Between the Up Main track and Pierre Close there is an existing signalling and communications service (-28-) that has been identified as a clash with the proposed location of Lift 3. This route currently runs from the double width LOC 23.48 to the Signal Hut LOC N23.48R. It is proposed to install a new route between the LOC's clear of the footbridge infrastructure and affiliated construction works. Refer to drawings CR-101 & CR-102 for details.

Figure 4-39: Proposed signals and communications relocation

4.10.5 Permanent Works for Rail and Station Services

Station Power Supply

The main station supply will be fed from the 11kV/415V padmount substation located on the Down Main embankment and reticulated via the replacement footbridge and service risers to the IMSB under Lift 2 stairs on the platform.

The backup supply will be fed from the 415V/415V padmount located near Signal Hut N23.48R and reticulate via the replacement footbridge and service risers to the 11kV/415V padmount substation located city side of the proposed footbridge on the Down Main. This supply will feed the station via the main supply cables in the event the Main power supply is disrupted.

Signalling

Similarly, for the power supply to N23.48R, the main supply will be supplied via the 11kV/415V padmount substation located city side of the proposed footbridge on the Down Main via the service risers of Lift 1 & 3 through the replacement bridge. Backup supply from the 415V/414V padmount situated adjacent to the existing Hut.

The requirement for two guard indicators has been identified at Reference Design. Reticulation for the city end guard's indicator is a nominal platform trench and the guard's indicator located on the Up Main side of Lift 2 will require Detailed Design to accommodate reticulation when the location is confirmed by the Signalling Committee.

Communications

Station data and CCTV will be supplied from LOC N23.48R to the Comms Room under Lift 2 stairs and the station building as required. Permanent communication infrastructure to be located on replacement footbridge columns and lift awnings is to be developed at Detailed Design.

Auxiliary Station Data Supply (Telstra) for the station building will be supplied from and existing pit adjacent to the rail corridor near Lift 1. Cabling will be routed via the service risers and replacement footbridge to the existing rack within the station building. The riser and conduit within the deck has been nominated at a 100mm conduit to contain any third party communications if identified at Detailed Design.

Footbridge and Riser Reticulation

Rail and Station service routes interfacing with the replacement bridge will be reticulated through conduits cast in-place within the bridge deck longitudinally, transitioning through the headstocks from footbridge level to platform/ground level, lift control panel or canopy awnings respectively.

Table 4-21 below provides the extents for each service contained within the footbridge via it's nominated platform/ground reticulation. Vertical containment from footbridge to platform/ground level is provided with service risers at the nominated side of each lift.

Refer to drawings 30012921-CR-201 & 30012921-CR-301 for Rail and Station service risers and footbridge reticulation.

Table 4-21: Footbridge Level Cable Containment

Asset	Asset Type	Asset Owner	Origin of Supply – Pac Hwy / Pierre Cl / Both	Asset Interface – Platform / Bypass
Communication	Station Data	Sydney Trains	Pierre Cl	Platform
	CCTV	Sydney Trains	Pierre Cl	Platform
	Comms	Telstra	Both	Platform
Signalling	Main supply (11kV/120V)	Sydney Trains	Pac Hwy	Bypass
	UPS (Ausgrid)	Sydney Trains	Pac Hwy	Bypass
	Guards Indicator	Sydney Trains	Pierre Cl	Platform
Power Supply	Station Services	Sydney Trains	Pac Hwy	Platform
	Lighting	Sydney Trains	Pac Hwy	Platform

4.10.6 Material List with Design Service Life

Table 4-22 below outlines the materials expected to be installed during construction and is provided for costing purposes. Trench conduit arrangements and capacity requirements are to be finalised at Detailed Design and it is expected the Contractor will price to accommodate these requirements.

Table 4-22: CSR Materials List

Element	Area	Sub Region	Type	Design Life
GST	Rail Easements	N/A	150 mm	25 yrs
Conduits	Rail Easements	HV cable containment	150 mm	25 yrs

Element	Area	Sub Region	Type	Design Life
		Non-HV cable containment	100 mm	25/40 yrs #
	Platform	Upstream of distribution rooms	100 mm	25/40 yrs #
		Downstream of distribution rooms	50 mm	25/40 yrs #
Pits	Rail Easements	LV power supply upstream of distribution rooms	Half Abbott	25/40yrs #
	Main CSR	N/A	Half Abbott	25/40yrs #
	Platform	Upstream of distribution rooms	ACO 99	25/40yrs #
		Downstream of distribution rooms	ACO 66	25/40yrs #

Note: # Where stand alone or shared communication routes exist, 40 years is to be applied for the said route. Standalone non-communication assets to meet 25-year design life.

Contractor is to consider a sole manufacturer for cable risers and price vertical and footbridge cable containment as a separate line item.

4.10.7 Assumptions

The following assumptions were made in the development of the CSR design:

- Rail and Station services (excluding 11kV) will remain functional during the construction of the footbridge
- Temporary reticulations for platform services will be identified by the contractor during tender and captured within the construction methodology
- Temporary reticulations will be designed and approved when allocated as a possession-based task
- The temporary 11kV Feeder GST alignment is provided as per Sydney Train instruction and will not be subject to a concession should Detailed Design not meet required standards SFARP

4.11 Civil, Drainage and Third-Party Utilities

The scope of civil, drainage and third-party utilities items required to support the footbridge replacement is as follows;

- New footpath connection on Pacific Highway (Down side of corridor)
- New footpath connection to Pierre Close (Up Side of corridor)
- Creation of new disabled parking, kiss and ride area and pedestrian crossing on Pierre Close
- Adjustment to existing platform drainage
- Connection of the new footbridge drainage into the existing platform drainage
- Adjustment or protection to existing private sewer connection
- Protection of existing watermains on Pacific Highway
- Removal of Ausgrid pilot cable from the rail corridor

4.11.1 Scope of Works

As per SMEC's current engagement for this project, the civil, drainage and third-party utilities scope is limited to the following:

- Review DBYD and DSS information to determine any potential impacts on services.
- Undertake an assessment of the 'pre' vs 'post' catchment scenarios to determine the impact of potential increases to peak flows being conveyed by the existing drainage network
- Review the proposed footbridge alignment to advise the project team of civil and drainage considerations that will need to be addressed as part of detailed design.
- Provide input only into the reference design report and architectural / structural drawings with enough detail to convey the civil and drainage design intent. No allowance for separate drawings

The following are key items that have been looked at as part of the reference design that will inform the detailed design for the civil, drainage and third-party utilities.

4.11.2 Pedestrian Connections to New Footbridge

Refer to Sections 4.1 and [illegible] of this report for further detail on the proposed footpath connections and DDA compliance. Refer to Figures Figure 4-40 and Figure 4-41 below for an extract of the architectural drawings showing the detail of the proposed footpath connections from the new footbridge to Pacific Highway and Pierre Close. The footpath overhangs the top of the embankment at the base of Stair 1 by approximately 300 mm. This can be detailed with a downturn or as a cantilever at detail design.

The creation of the kiss and ride area and disabled parking space on Pierre Close will be subject to Local Traffic Committee approval. Liaison with Hornsby Shire council for this approval would be undertaken during detailed design.

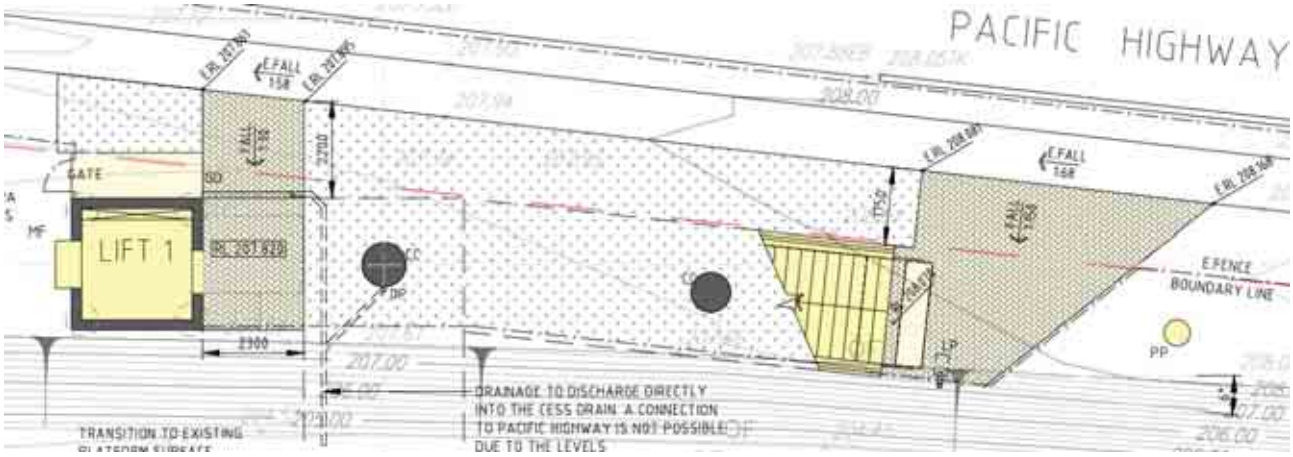


Figure 4-40: Proposed connection to the footpath on Pacific Highway

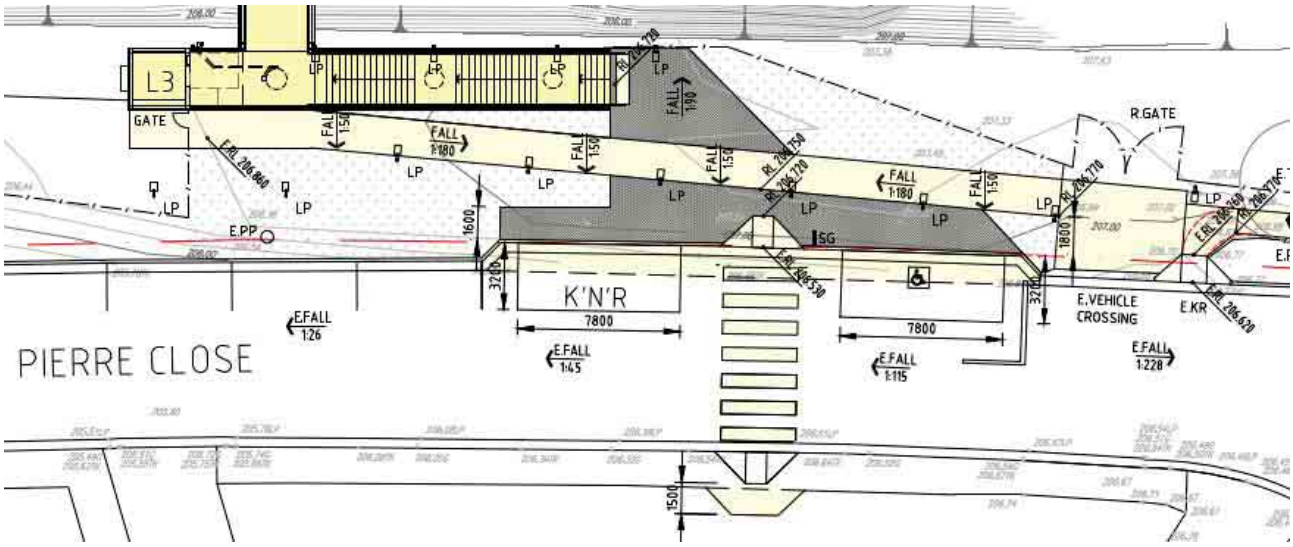


Figure 4-41: Proposed Connection to Footpath and Kiss and Ride Area on Pierre Close

4.11.3 Footbridge Drainage Intent

As part of the reference design, SMEC have undertaken a high level assessment of the drainage requirements for the footbridge deck to provide input to other disciplines for potential drainage design that will be developed in the detailed design. The general intent for the drainage, which is conveyed on the architectural plans, is as follows:

- Where possible, the area at street level will be graded to drain away from the corridor to be conveyed by the road drainage network.

- The footbridge deck will be graded with a high point in the middle of each span to minimise the additional catchment that will be conveyed to the platform drainage. Refer to Section 4.11.5 for further detail on the assessment undertaken for the additional catchment draining to the platform drainage line.
- The footbridge deck will be drained via rainwater outlets (RWOs) that will enable the downpipe from the awning at the lifts and future roof to be connected into the same downpipe that would be attached to the underside of the deck and down the columns to discharge either into the cess drain or platform drainage.
- On both the Pacific Highway side (Down side) and Pierre Close side (Up side), it is proposed to collect the runoff from the footbridge and provide a piped connection into the cess drain below. This is where the run off is currently discharging to for the site area and based on the indicative levels it will not be possible to discharge this drainage to the road drainage network.

4.11.4 Platform Drainage Adjustments

The proposed location of Lift No.2 and the stairs is likely to impact on the existing platform drainage line; a 240 mm clay pipe. It is proposed to adjust this drainage line by installing a new pit adjacent to the pier, with the drainage from the footbridge deck directly connecting into this pit.

Refer to Figure 4-42 below for an extract of the detail for the proposed drainage adjustments and platform surface regrading which is shown in the architectural drawings.

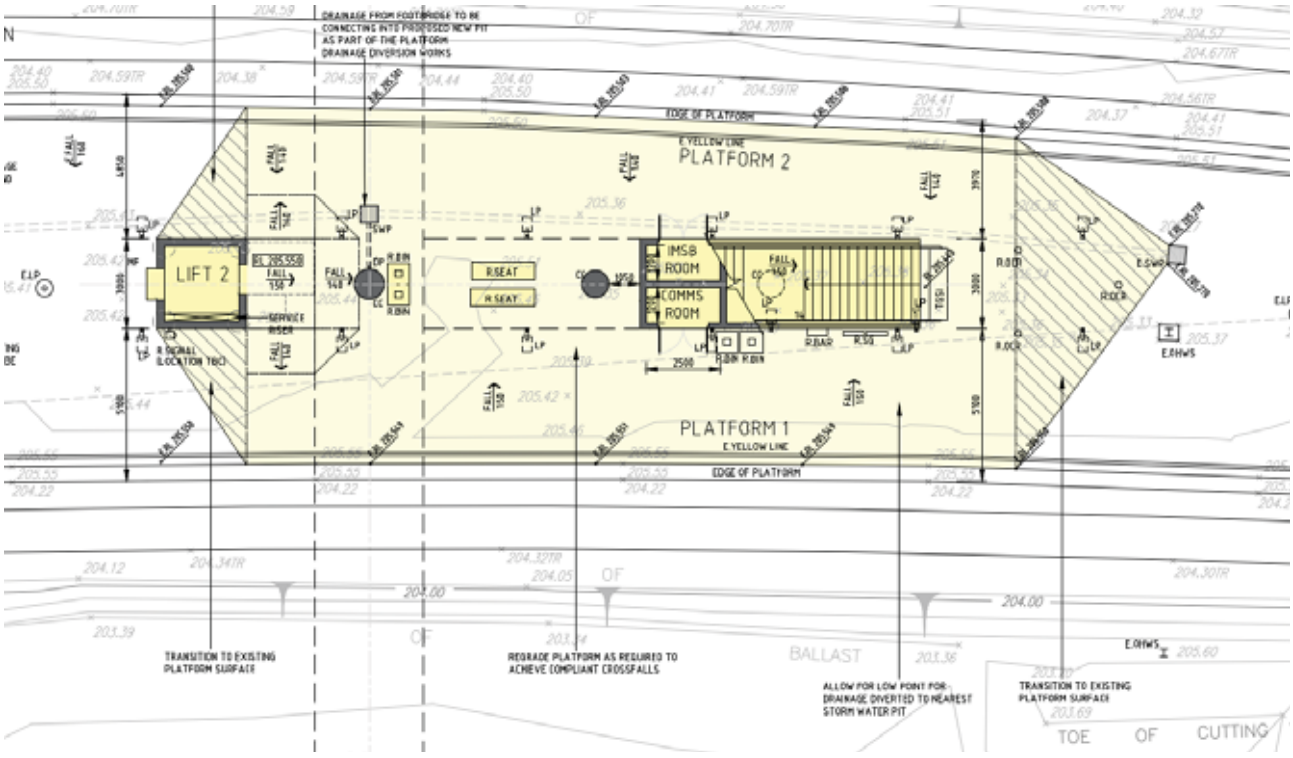


Figure 4-42: Proposed Platform Drainage Adjustments and Regrading Works

It should be noted that it is recommended that the entire platform drainage be looked at as part of the detailed design, refer to Section 4.11.6 below for further detail.

4.11.5 Increase to Platform Drainage Catchment

The proposed grading on the replacement footbridge will introduce an additional 19 m^2 to the existing catchment to the platform drainage. This equates to an overall 2 % increase in the upstream catchment to the existing pit on the city side of the replacement footbridge.

Modelling has been undertaken in DRAINS, using ARR2019 rainfall data, which shows that this equates to a 1 L/s increase in the peak 2% Annual Exceedance Probability (AEP) flow.

While this slight increase in additional peak flow will not cause detriment to the existing platform drainage system, it is recommended that the platform drainage be considered for upgrade as described below in Section 4.11.6.

4.11.6 Existing Drainage Non-Compliance

Based on a visual inspection and details obtained from the survey, it is recommended that as part of the detailed design an upgrade to the platform drainage be considered as part of the scope of works.

The existing pipes have minimal cover (less than 300 mm) and the proposed regrading works to make the area DDA compliant will likely reduce this cover further. Additionally, the existing platform drainage pipes are less than 1% grade and likely to have maintenance issues due to them consisting of ageing clay pipes.

The outlet arrangement also needs to be confirmed. Based on observations from a recent site inspection, there is a possibility that the platform drainage is connected into the sewer line which would need to be rectified as part of the proposed works.

It is recommended that as part of the detailed design scope, additional survey and CCTV be undertaken on the existing drainage to determine the condition and outlet arrangements which will determine the extent of upgrade works required.

4.11.7 Existing Third-Party Utilities

There are several existing third-party utility assets that have the potential to be impacted by the replacement footbridge works. A high-level assessment has been undertaken on these assets and details of the notable assets that need to be considered in the design development provided below.

4.11.7.1 Sydney Water

Based on Sydney Water plans obtained through a Dial Before You Dig enquiry, there is an existing 200 mm and 375 mm watermain running along the Pacific Highway (Down Side of the corridor). During the site inspection is was noted that the 200 mm watermain is running underneath the footpath and the 375 mm watermain is running under the bus zone/shoulder of the highway, refer to Figure 4-43 below.

Figure 4-43: Alignment of Watermains along Pacific Highway

While the replacement footbridge will not conflict with these watermains, they will need to be considered during construction given the depth of excavation and likely crane lifts that will be required to construct the replacement footbridge.

A Sydney Water Tap in™ application will be required, as part of the detailed design for the assessment of construction loads on these watermains and approval of protection measures by Sydney Water.

4.11.7.2 Ausgrid

Refer to Section 2.3.2 for details about the existing Ausgrid asset that will be affected by the proposed footbridge replacement.

4.11.7.3 Telecommunication Providers

There are several telecommunication provider assets running underneath the existing footpath on the Pacific Highway (Down side of corridor). These assets are unlikely to be affected by the proposed works.

A new Telstra connection is proposed (See 4.12.3) from an existing pit adjacent to Lift No.1, refer to Figure 4-44 below. Refer to communication drawings in Appendix A for further details.

The feasibility of connecting from this pit will need to be confirmed with Telstra during detailed design once the communications relocation design has been further developed.

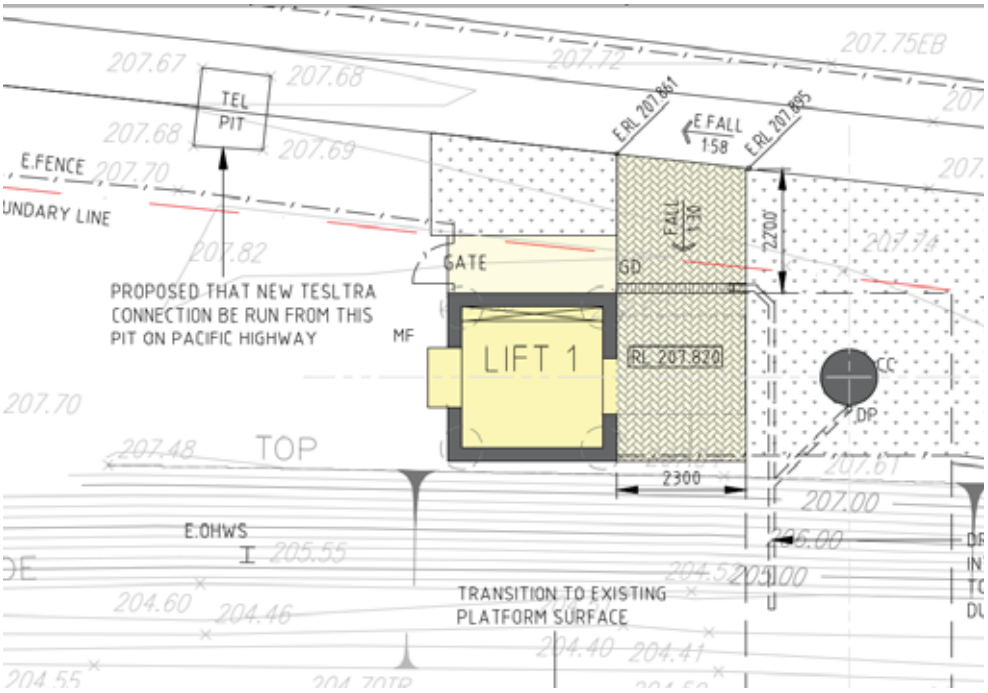


Figure 4-44: Location of Telstra Pit in Relation to Lift No.1

4.11.8 Existing Sewer Connection

The sewer connection for the toilets in the existing station building, as shown on Figure 4-45 below, is likely to be impacted and require realignment due to the proposed replacement footbridge. The approximate alignment of this sewer connection is shown on the architectural plans based on the information from the existing drawings.

This sewer line is not currently shown on the DSS and it is recommended that it is traced and located on a survey for incorporation into the detailed design. Based on the site levels, it is not envisaged that there will be issues with levels for any minor adjustment works that might be required in order to construct the replacement footbridge.

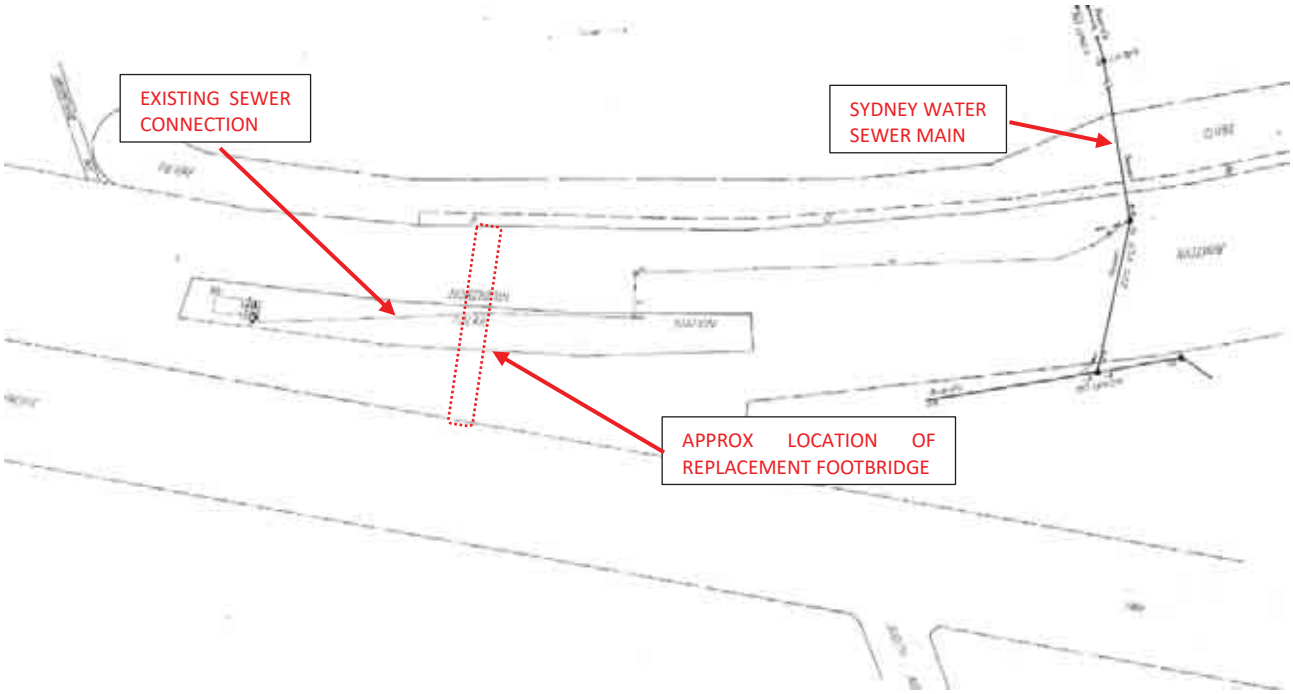


Figure 4-45: Current Sewer Connection (Ref EDMS CV0232397)

4.12 Security and Communications

4.12.1 Scope of Works

The scope associated with the communication and security services consist of the following two stages:

- Early works stage. This stage shall allow for relocation of all existing services backbone infrastructure which will be affected by the proposed new lifts and bridge structure.
- Main works stage shall include modification, relocation and/or extension of existing station systems and incoming lead-in services to accommodate the proposed new works and removal of existing bridge mounted lead-in service

The early works include the following:

- Relocation and augmentation of existing underground communication infrastructure, within Sydney Train's corridor, including Optical Fibre and signalling services along Pierre Close which will be affected by the introduction of the new lift no 3. This includes:
  - 72 SMOF Cable
  - 144 SMOF Cable
- Augmentation and relocation of existing fibre optic and copper lead-in services to the station. Cables servicing the station include:
  - New 12 SMOF fibre option cable and 50 pair cat 3 copper cable
  - New Telstra WIFI fibre + copper lead-ins reinstated from street network
  - NBN

Main Works include the following:

- Closed Circuit Television (CCTV) – relocate existing CCTV cameras, supply and install additional CCTV cameras and extend existing system head end to accommodate new footbridge and lifts.
- Public Address (PA) – modify existing and supply and install new extension of the existing system to accommodate new footbridge and lifts area.
- New Audio Frequency Induction Loops (AFIL) on platforms 1 and 2.
- Electronic Ticketing Systems (ETS) – modification and expansion to accommodate the new station entry.
- Review of existing SSER room compliance with the current requirements.
- Relocation of existing SPI services to suit the new station entry.
- Relocation of existing incoming services lead-ins currently installed via existing foot bridge and into the station building including fibre optic, CAT3 Copper, Telstra WiFi services relocation, NBN, etc, which will be demolished as part of the project scope.

4.12.2 Design Assumptions, Limitations and Constraints

The design is based on the following:

- Mount Colah railway station is located on the Main Northern line, serving the Sydney suburb of Mount Colah.
- The station is served by Sydney Trains T1 North Shore Line services and some early morning and late-night NSW Train Link Central Coast & Newcastle Line services.
- Mt Colah Design the design is based on this station being classified as Tier 3 according to T MU TE 61005 ST.

4.12.3 Relocation of Existing Communication Services

The proposed project scope currently conflicts with existing underground and above ground communication services infrastructure. Table 4-23 and Figure 4-46 below shows the services which will need to be relocated.

Table 4-23: Existing station communications services infrastructure affected by footbridge relocation

Service	Location	Proposed relocation
DSS cable No 28 (Signalling and Optical Fibre)	Conflicts with new lift no. 3	As part of early works – services to be relocated

Service	Location	Proposed relocation
Telstra (Copper) And Telstra WiFi Services fixed to existing bridge to be relocated prior removal of the existing bridge	Existing footbridge	Main works - Services to be relocated to new footbridge
Optical Fibre, Copper, WiFi services	Existing footbridge	Main works - Services to be relocated SE of Lift no 3

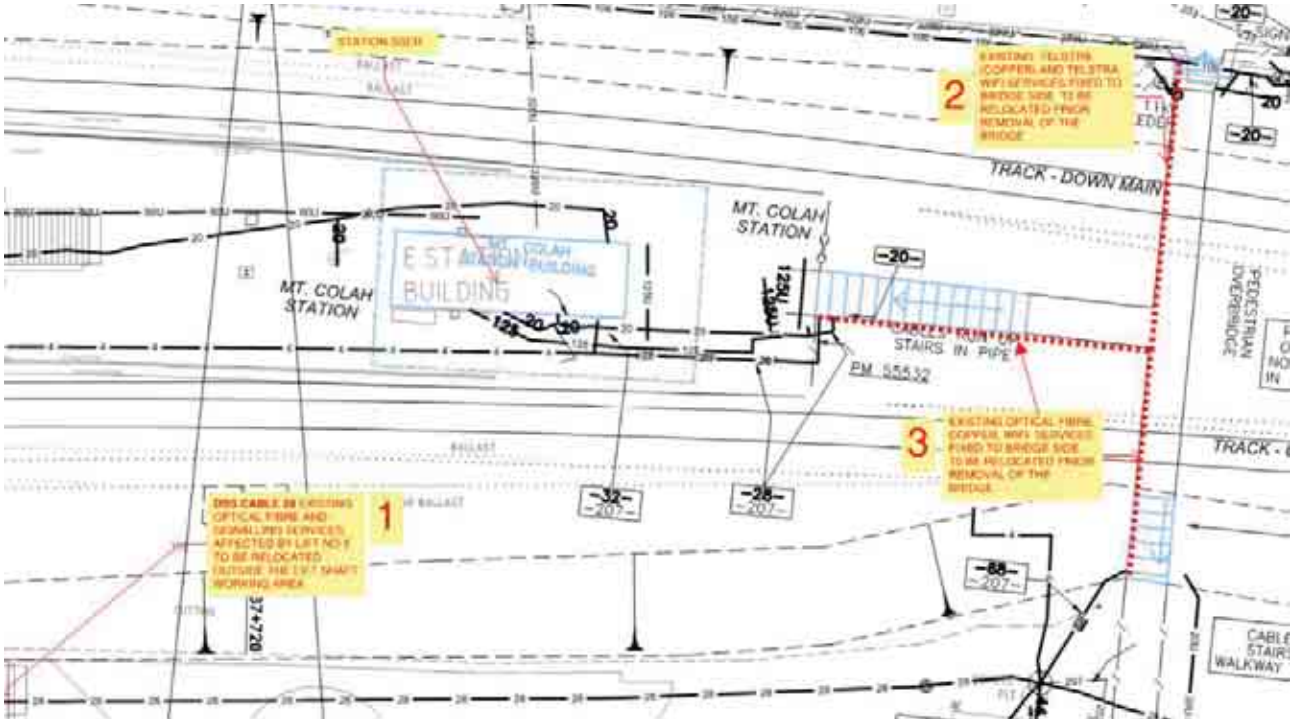


Figure 4-46: Existing station communications services infrastructure affected by footbridge relocation

4.12.4 CCTV

Sydney Trains has upgraded the station existing analogue CCTV system in 2019. There are 6 off CCTV cameras located within the station. The existing cameras are connected using range-extending line drivers connected through the existing coaxial cables via Vigitron VI2401A coaxial converters with pass-through PoE's.

The existing CCTV system will be maintained and adjusted to suit proposed to works. All new cameras will be IP type connected to existing system head. A new patch panel will be required to accommodate the additional cameras. The CCTV rack has a back-up UPS system. The contractor is required, under detail design to review the capacity of the existing system in lieu of the new services required and upgrade it as necessary.

Help Points

The station has two help points on the platform, one on each side of the building which will be retained. Dedicated CCTV cameras already cover each the help points, refer to CCTV layout. The existing help points are compliant with the current T MU TE 61006 ST standard requirements.

CCTV Cameras

Additional CCTV cameras will be required to suit the relocated footbridge. The proposed locations for these are shown in the security/communication services drawings. The CCTV cameras are to be mounted 2700mm minimum from finish ground level. Camera location shall be adjusted at detail design stage to achieve the minimum mounting height.

Application Objective and Resolution

The CCTV system shall provide video fit for the application specified in the functional requirements for the installation. Figure 4-47 below provides the minimum requirements for objectives and resolution for the new cameras as detailed in TfNSW Standard T MU SY 10001 ST.

Application	Objective	Object	Pixels (v)
Face identification (FI)	Use the video or still image for positive identification of an individual, for the purposes of supporting an investigation or prosecution. Given a comparative image of equal quality of a known individual, identification shall be beyond reasonable.	Face	80
Face recognition (FR)	Use of the video or still image to support recognition of an individual for the purposes of supporting an investigation. A viewer of the image can say with a high degree of certainty that the individual is, or is not, someone they have seen before.	Face	40
Activity observation (AO)	Use of the video to observe, with a high degree of reliability, the nature of the activity within the field of view.	Person	200
Presence detection (PD)	Use of the video to establish, with a high degree of certainty, the number, direction and speed of movement of people (or vehicles) within the field of view.	Person	120
Situational awareness (SA)	Use of the video to monitor an area to maintain awareness of operational conditions and possible activity requiring further attention.	Person	48
Number plate recognition (NPR)	Use of the video or still image to accurately identify, with a high degree of certainty, all characters on a vehicle number plate.	Number plate characters	30

Figure 4-47: CCTV cameras objectives and resolution Requirements

All new cameras will be connected to the existing CCTV head end. The contractor shall allow at detail design stage to design all cabling termination requirements including new termination patch panels, active switches, etc to accommodate the new cameras. The contractor must coordinate with Sydney Trains/Indra to ensure that there is sufficient capacity and OCDN Bandwidth at the station to accommodate the additional CCTV cameras.

4.12.5 Security Risk Assessment

A Security Review Assessment is required at detail design stage. This will inform of any additional security measures that should be implemented based on the project specific security risks at the station area.

The security consultant must undertake a security risk assessment of the station and organise a security risk workshop with all relevant parties including but not limited to TfNSW, Local Police, local Council, builder and design team.

The objective of the workshop is to identify all security related risks associated with the Mt Colah Station project based on a risk management approach using the International Standard ISO 31000:2009 Risk Management – Principles and Guidelines, and HB167:2006 Security Risk Management Handbook. Sydney Trains specify two Station Security categories to help inform operational management and security infrastructure development:

1. Operational Security Categorisation – This categorisation represents qualitative advice used to inform Security Alert Procedures at stations and is primarily focused on operations in the Counter Terrorism and Emergency Management context.
2. Protective Security Categorisation – This categorisation represents quantitative advice used to inform the protective security environment which impacts on customers, staff and assets, particularly as an activity or project relates to infrastructure development or the deployment of security resources

The Categorisation for Mt Colah Station is: Protective – D and Operational - 3.

Sydney Trains has undertaken an initial security assessment of the station. Refer to Appendix U.

This report, and other information and statistics provided by Local Police Commander Office are to be used as part of the security risk assessment process.

4.12.6 Customer Information Systems

Mt Colah station is provided with a customer information system consisting of the following:

PA System

This system is capable to deliver automated messages spoken messages by operational personnel using a microphone and alert tones which operates over local area network (LAN) and wide area networks (WAN). The PA system is digital Stagetec with PA speakers located within the platform covered area only.

Figure 4-48: View of PA rack and platform speakers City end of existing station building

The PA system shall be expanded to cover the new works. A proposed minimum PA layout has been provided for reference. At detail design stage the contractor shall detail the current proposal and ensure compliance with all Transport relevant standards. Subject to Sydney Trains review the PA system may need to be extended over the entire length of the platform.

AFIL

No Audio Frequency Induction Loop system (AFILS) has been sighted at this station. According to T MU TE 61003 ST Clause 6.6.1, hearing augmentation is required wherever PAS part of CIS is installed with a total coverage within a distinct passenger use area shall not be less than 10%. It should also be noted that the ASA Help Points standard (T MU TE 61006 ST) has a mandatory requirement for Help Points to have a corresponding AFIL Loop. The Help Points currently installed at Mt Colah Station do not have AFIL Loops.

A new AFIL system will need to be provided to provide coverage over coverage as per T MU TE 61003 ST with amplification system. System amplifiers will be housed within the PA rack. An indicative hearing loop system has been shown on the drawings. At detail design stage, the contractor must provide all calculations and document a full hearing augmentation system to achieve T MU TE 61003 ST standard and BCA compliance. AFILS design modelling shall be provided at detail design stage. Standard "T MU TE 61005 ST - Customer Information Systems for Public Transport Buildings and Conveyances; section 8.5.2 - Audio intelligibility" requirements shall be implemented within the detail design documentation. Loop drivers - Williams Sound model (PLADL107NETD) shall be used for the new AFIL system.

The contractor shall engage Sydney Trains CSD Passenger Information vision (Contact - Kim Ha) with regards to types and models of any PA & AFILS equipment.

SPIs

Existing “Which Platform” and “Plan You Trip” information panels are currently located at the existing station entry.

Figure 4-49: a) LEFT: Existing 'Which Platform' SPIs and b) RIGHT: Existing Plan Your Trip Panels

The SPI panels shall be relocated as part of the works. Indicative location is shown on the drawings.

Final location shall be coordinated with Sydney Trains. Additional SPI equipment may be required to be provided as part of the project scope. Sydney Trains shall be consulted at detail design of any additional requirements.

4.12.7 Ticketing System

Opal card readers (two single and one double) are located at platform level in front of the existing main entry, country end. An opal card top-up machine is also available at this station. The primary ETS is located within the communication SSER room. Refer to Figure 4-50.

Figure 4-50: Ticketing system FLR and ETS cabinet

The following items were determined as required as part of the project scope for the Opal ticket system:

- Existing FLR's at county end to b relocated at the new platform stairs landing.
- New double FLR to be provided at platform level in front of the new lift.
- The opal card top-up machine may need to be relocated towards the City end in a more visible location from the new station main entry.
- Ticketing system be modified to accommodate the additional FLR

It should also be noted that the installation of new FLRs or Electronic Ticketing Systems (ETS) are identified as a long lead item. The contractor is to ensure early correspondence with Sydney Trains is initiated during design stage to understand the time for procurement for various system equipment.

Existing ticketing system needs to remain operational during normal train running through the life the project. Ticketing SME will provide existing ETS as built, approved footing designs for the installation of the new Opal card readers and relocated SSM when required.

4.12.8 Telephone/Communication Systems

The station is currently provided with the following telephone services:

- Commuter passenger telephone located on the platform. There is no current upgrade scope for this service and will be retained. The phone is connected via existing IDF within the station master office and will be retained as part of the works.
- Telstra pay phone located on the northern side of the station near the carpark entry. Due to proposed works incoming telephone line will need to be relocated. The contractor shall allow at detail design stage to run new Telstra lead in Copper service from street network to provide and maintain the above services during construction.

Figure 4-51: Telstra and Commuter phones

4.12.9 Telstra Wi-Fi System

The station is provided with a Telstra Wi-Fi system consisting of a Telstra modem in a panel located on the footbridge column and wireless access points located on the platform. The lead-in fibre cable runs via the footbridge and will be affected by the proposed lift works. The incoming Telstra lead-in will be relocated due to demolition of the existing bridge.

The existing roof mounted access points will be affected by the building awning extension. Refer to architectural drawings for awning extension works. The contractor is to allow for relocate and rewiring of existing equipment to the edge of the new awning, as required for easy maintenance access.

Figure 4-52: Telstra Wi-Fi System

4.12.10 Station IDF

Existing Station IDF is located within the station master office. The MDF provides the following connections:

- 30 pair to N23-48 LOC
- 2 pairs to Commuter phone
- 10 pairs to AFC cabinet
- Internal telephone connections

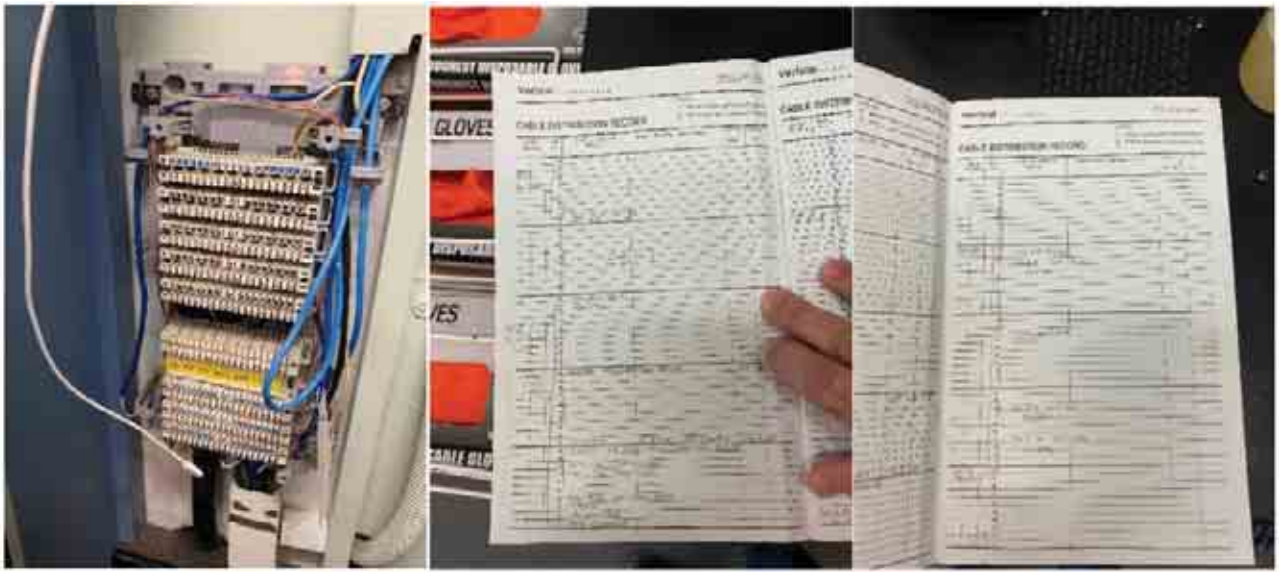


Figure 4-53: Station MDF and Cabled Distribution Record

The 30 pair to N23-48 LOC which is affected by the demolition of the existing bridge will need to be reinstated as part of the main works package and replaced with a 50 Pair Copper cable as part of the new works.

4.12.11 Intruder Alarm System

The statin master office building is fitted with an intruder alarm system consisting of a Bosh keypad panel at the door and PIR sensors within the master office and SER/toilet room. There is no current upgrade scope associated with this service

4.12.12 Electronic Access Control System

It should also be noted that the requirements of T MU SY 20001 ST specifies the installation of an Electronic Access Control System (EACS) in the SSER. At Mt Colah as the existing SSER is common with the bathroom this system cannot be provided. Subject to SSER room upgrade review an Electronic Access Control System will be provided to the new /modified room.

4.12.13 SSER Room Upgrade

According to T MU TE 21001 ST Equipment Rooms and Cubicles Version 1.0 standard a minimum SSER room size should have internal dimensions of 3400 mm x 3300 mm. If a full SSER upgrade is required for this station it should be noted that the existing building cannot accommodate the minimum communication room size of 3300 mm without major modifications. As it currently stands the overall width of the station building is approximately 2950 mm. Accordingly, any new SSER room within the building will not be fully a compliant solution however will increase overall area by providing a dedicated room with no through-to access to equipment and with external 24 hours maintenance access.

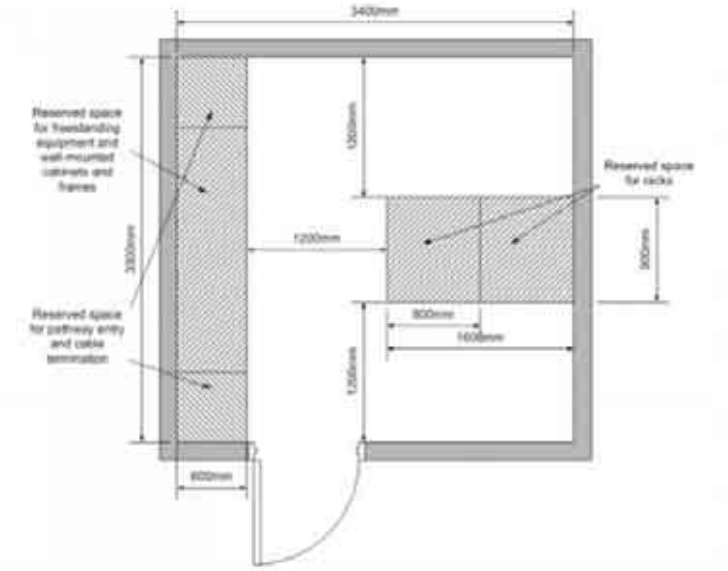


Figure 4-54: Standard SSER Room Size

The following options may be further investigated by Sydney Trains for an upgrade to the SSER room, if required:

1. Upgraded SER room within the building: The new Equipment Room will be dedicated, have increased space and will be separate staff toilet. External door could also be implemented. Refer to Figure 4-55.

Figure 4-55: Option 1 - SSER Room and Staff Toilet

2. Upgraded SER room within the building: The new Equipment Room will be moved to the back of the building with separate access, may require further building extension. Staff and public toilet could move internally to the building. Refer to Figure 4-56.

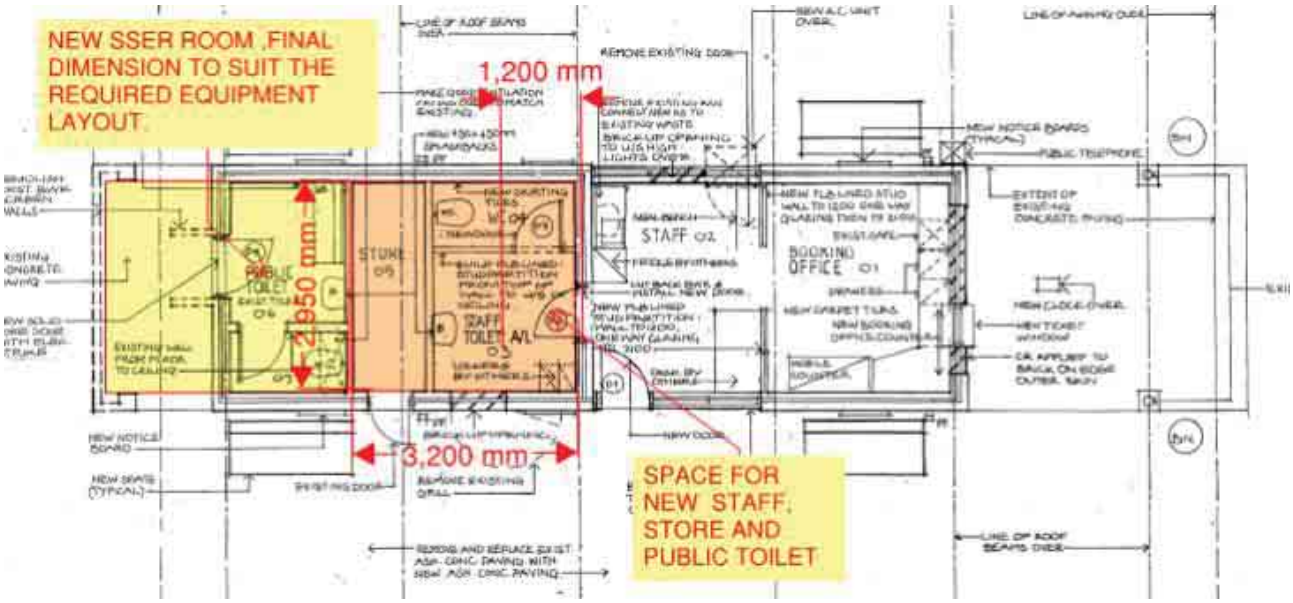


Figure 4-56: SSER room and staff/public toilet

3. New SSER room could be located under the new platform stairs. Refer to Figure 4-57 below.

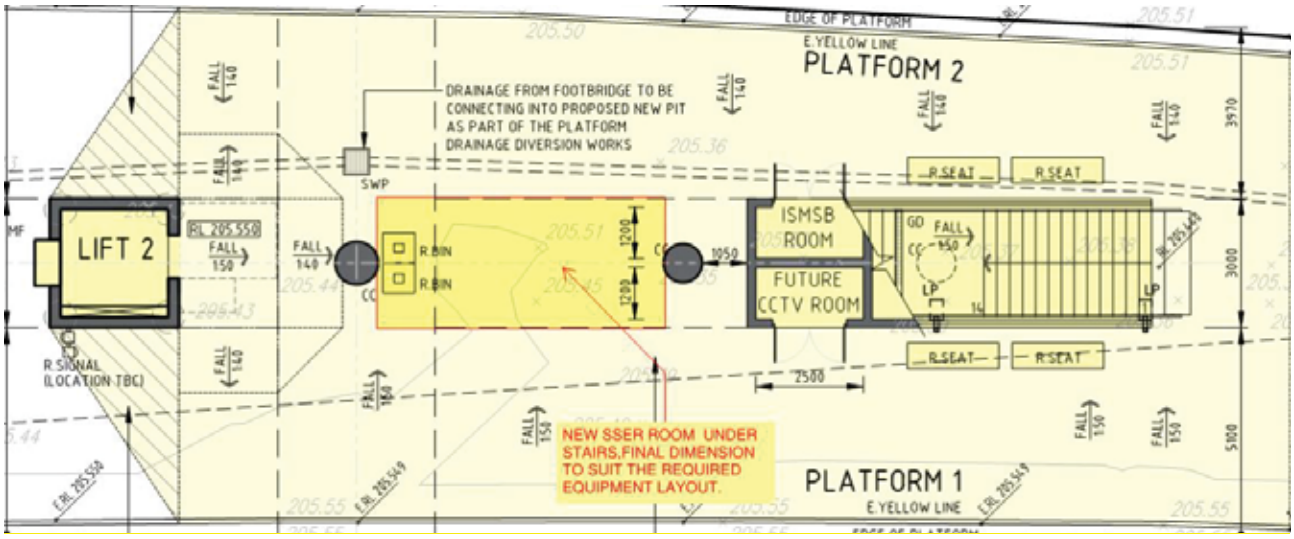


Figure 4-57: New SSER room under new stairs

4.13 Mechanical and Vertical Transportation

Refer to Appendix M for the vertical transportation services report.

4.14 Overhead Wiring

4.14.1 Scope of Works

The OHW scope of works consist of providing a compliant OHW system to Mt Colah station at locations that need new Overhead Wiring Structures (OHWS) or adjustment as a result of new footbridge and removal of existing footbridge. The proposed design aims to ensure there is minimal change to the existing system, this includes minimal changes to the OHW profile (wire gradients and heights/staggers etc) thus reducing load changes on the existing OHWS.

There are three key design components:

1. Replace the registration/support for the OHW at the existing to-be-removed footbridge
2. Clearance compliance of the wire under the new bridge
3. A compliant OHW system where changes were required to be made

The scope of works area is around the Mount Colah Station island platform, where the track is a moderate curve. Existing information states that the existing OHW is regulated system 7 configuration (510mm 34.6 kN / 193mm 18.0 kN), running through Mt Colah station on a mix of masts, portals and cantilever masts, all of which show varying degrees of corrosion. Refer to Figure 4-58 showing current OHWS below for an aerial view of Mount Colah station, showing current overhead wiring structures.

Figure 4-58: Aerial view of Mount Colah Station showing current OHWS

Figure 4-59: a) LEFT: Down Main - Facing Country from platform - OHW Attached to existing bridge, b) RIGHT: Up Main - Facing country from platform - OHW attached to existing bridge

To enable the OHW to free-run under the new bridge, some preliminary wire clearance analysis of the Up and Down Main OHW has been undertaken, and is based on the following:

- The new bridge soffit height will be 6.5 m and 6.70 m from high rail on the Down and Up mains respectively
- The new bridge width will be 3.6 m wide (Sydney to Country bridge face distance)
- The Down and Up Main OHW system type is System 7 (as per Sydney Trains Layout Plan EL0006663)

The existing signal (N23.48 Repeater 37.796KM) to the country side of existing footbridge in the Up Main cess will not influence/impede the installation of the mast to the extent that the wires can no longer be unattached. (Note the risk of this is low as the proposal is to locate two new masts in between the Down and Up Tracks).

4.14.2 Design Description

Replacing Registration and Support for Removal of Existing Footbridge

It is proposed that two new OHWS be placed 2.5 m on the country side of the existing footbridge, in between the down and up tracks. The down main OHWS will be a cantilever mast with the footing in between the down and up main tracks and the Up main OHWS will be a single mast. These will both be 3.2 m from the track centre, and both of these structures will have with type 2 cantilevers as both have contact radial loads less than 1.2 kN. The mast on the Down Main will have a pull cantilever on the drop vertical and the Up Main will have a pull cantilever off the mast. It was requested by Sydney Trains to have the Down Main OHWS to be a cantilever mast with a drop vertical instead of a single mast with a push arrangement as a standard pull arrangement is preferable to the alternative. These two structures will be named N37+770. Both structures will have a proposed stagger of 250 mm (towards outside of curve) to ensure compliant blowout in these bays.

As stated above, it is proposed that the two new OHW masts be located to the country side of the existing footbridge at N37+770 and that both masts be located between the Up and Down Main tracks. This location gives the following advantages:

- Down Main mast will avoid the rock cutting in the down cess
- Up Main mast will avoid the existing signal in the Up main cess and therefore avoid any physical clashes and signal sighting issues.
- Up and Down Main masts will avoid the need for possible OHW staging design i.e. if the new structures were placed to the Sydney side of the existing footbridge they would clash with the existing bridge stairs.

Furthermore, the existing services search indicates that no services are currently located at the proposed location of the new masts. Refer to Figure 4-60 below.

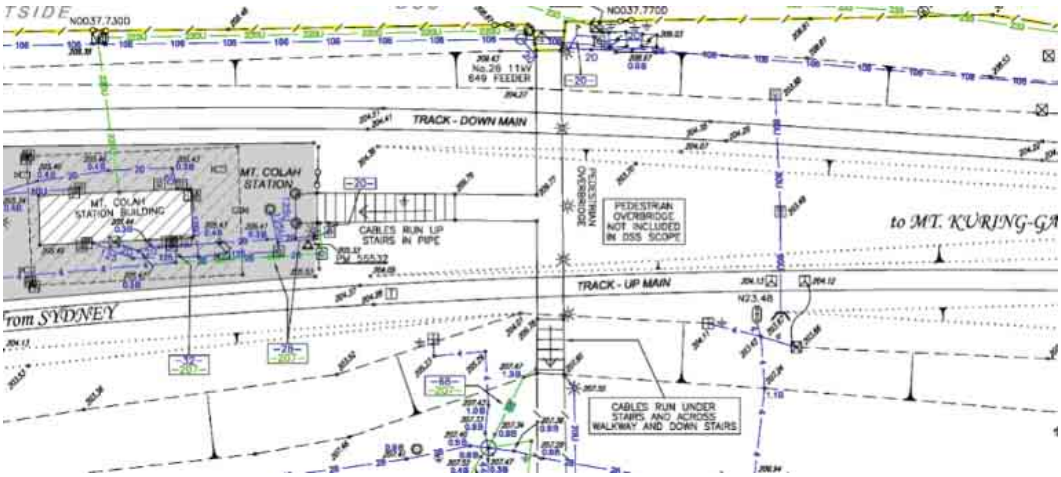


Figure 4-60 : DSS Extract from CV 0560832 shows no buried services located between the Up & Down Main immediately to the country (proposed OHWS is 2.5m towards country from existing footbridge)

It is proposed that piled footings be used and bolted based masts chosen to afford some flexibility for the construction programming/planning.

Clearance Compliance of the Wire under the New Bridge

The new footbridge has a height above rail of 6.55 m (down) and 6.70 m (up) and the OHW is not to be attached to this bridge. This requires vertical clearances of 450 mm from the underside of the bridge to ensure a compliant system as per T HR EL 08012 ST. On the basis of the 6.55m (down) and 6.70m (up) from rail to soffit (RL 211.135 and RL 211.055

for down and up, respectively) height, the clearances between the OHW catenary and the underside of the bridge are in Table 4-24 below.

Table 4-24: Clearances between OHW catenary and bridge soffit – all compliant

Track	Vertical clearance between catenary and underside of bridge (m)		
	City Side (m)	Country Side (m)	Required (m)
Down Main (6.5 m)	1.02	0.98	0.45
Up Main (6.7 m)	0.89	0.88	0.45

Stressed Catenary Length Change

With the modification of the catenary heights at N37+722 and N37+770 on the down main, there will be changes to length of the catenary wire length that is being utilised. This will impact the movement range of the moving anchor at N38+181. It was calculated that the changes are as follows. This was done by assessing the changes in catenary and contact height between structures N37+642 and N37+805 on the down main. It is advised in detailed design an inspection of the moving anchor of this down main is inspected to ensure that the changes in the wire are within its movement capacity.

Table 4-25: Stressed Catenary Length Change of Down Main

Wire	Length of Wire Change (m)	Change at moving weight (m)
Catenary	-0.049	-0.148
Contact	-0.02	-0.006

4.14.3 Additional Works

As there is a requirement for new OHWS, the scope of works extends to the immediate bays around this change. It was observed that at structures N37+722 and N37+714, there are contact heights that are lower than the required design standard height of 4.75 m as per T HR EL 08012 ST, at 4.69 m and 4.73 m respectively. It is assumed that these contact heights were designed this low to accommodate the low clearance footbridge that is to be removed. Since the removal of this bridge will remove this constraint, these contact wires at both N37+722 and N37+714 will need to be increased to greater than 4.75 m. This will require modification of the cantilever arrangement at these locations during a possession to achieve wire compliance. Since the contact wire height at N37+722 is being modified, the pull off OHWS adjacent to this structure, N37+681 will need to also be modified to the new wire profile.

Figure 4-61: Existing OHWS N37+722

Since the contact height at N37+722 is being increased to become a compliant height, this decreases the system depth between N37+642 and N37+722. To improve the system depth there is a requirement to increase the catenary height at N37+722 (6.14m to 6.7m). This results in a system depth of 0.61m (compliant). Given this large increase in height, there is a requirement to inspect the structure's ability to facilitate this new height (condition assessment). While a desktop assessment indicates that raising the catenary height from 6.14m to 6.7m will not cause a clash with the boom, it is recommended that in detailed design this be inspected on site (including potential clashes with the knee brace). Given the change in both the contact and catenary heights at this location (N37+722), it is recommended that a new cantilever should be put in at this location. This will require a new CCALC be produced at this location based on survey data of this OHWS. This should also be undertaken during detailed design.

Given the contact wire heights being changed at N37+681, N37+722, N37+714, as well as the introduction of the new OHWS with new catenary and contact heights, this will require new droppers to be developed for these wire runs. This means that from N37+642 to N37+805 on the Down Main, and N37+665 to N37+805 on the Up Main, this length will need to have new droppers to match the changed wire profiles.

With the eventual removal of the existing footbridge, the heights of the catenary and contact wire will no longer be vertically constrained. In addition to this, the clearances between the existing OHW arrangement and the new pedestrian footbridge are large (>>450mm). Due to these two factors, it is noted that there is an ability to change the catenary and contact heights of the surrounding OHWS to the standard 6.5m and 5m. This is beyond the scope of works and objectives of this project however there is opportunity and merit to raising these heights to the design standard. This would require additional investigation, design, including structural checks and an additional OHW design as well as increased construction works to achieve these changes. This has been noted by Sydney Trains in the 30% Reference Design and SMEC has been advised to not incorporate this into the 100% Reference Design submission.

With the modification of the contact wire and catenary wire on some existing structures within this area as well as changing the wire geometry at the new OHWS N37+770, this will impact the loads on the surrounding existing structures. With these changing loads on these surrounding existing structures, there is a need to ensure that these structures have the capacity to take these modified loads. It is recommended in Detailed Design of this job that these structural checks be undertaken to ensure the ability for these existing structures to take these 'new' loads.

Introducing a new footbridge and removing an existing footbridge changes the 'landmarks' at the Mount Colah location so an update to the POD diagram for this area is required. A marked up version of the proposed changes to the '1500 Volt Sectioning Diagram – Diagram 41' has been included Appendix A. As these changes do not impact the electrical functioning of the system it is assumed that these changes will not require POD committee approval. It is therefore

assumed that this can be considered a drafting exercise in adding in the new footbridge and removing the existing footbridge in the most up to date sectioning diagram.

4.14.4 OHW Signal Sighting with Existing Signals

With the introduction of new OHWS, a desktop signal sighting assessment was required to check that line of sight between the relevant signals and the oncoming trains was not impeded by these OHWS. This desktop assessment used a combination of both site photos and the Drivers Route Knowledge Diagrams (DRKD) for Main North Suburban Line Strathfield to Berowra. These resources both revealed there are two signals that are within this area (N23.48 AUTO 37.568KM and N23.48 Repeater 37.796KM [refer Figure 4-62]).

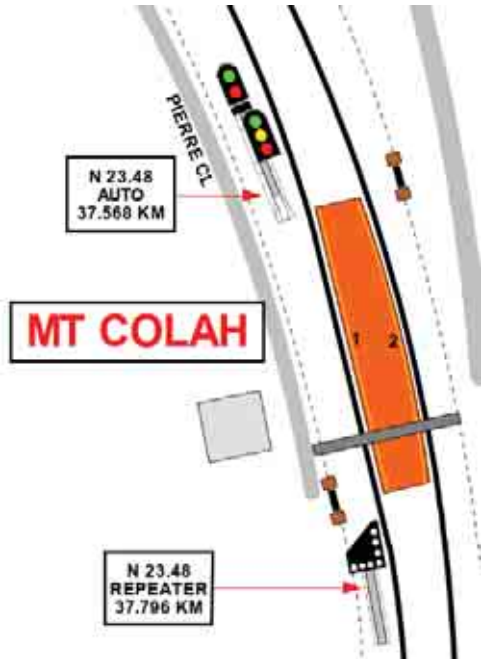


Figure 4-62 : Mount Colah Signals [extract from Drivers Route Knowledge Diagram for Main North Suburban Line Strathfield to Berowra.

However, given the location of the new OHWS, there is no line of sight issues interferences because of these new OHWS. The single masts N37+770, are located behind the 'N23.48 Repeater 37.796KM' signal (with respect to trains on the UP main) and are on the outside of the Up main curve whilst the 'N23.48 AUTO 37.568KM' signal is further along on the inside of the curve.

4.14.5 Construction Staging

The relocation of the OHW from the existing footbridge to the new OHWS is constrained by the height of the existing footbridge. Typically, the OHW catenary wire is held at 6.5m from rail height at support locations. The new OHWS footings construction and steelwork (masts) installation can be done whilst the existing footbridge remains in-tact. Given the height and location of the existing footbridge with respect to the new OHWS N37+770, there is no way however for the OHW catenary to be held at 6.5m without this bridge being removed prior to the re-attaching of the OHW. So that attaching of the wires to the new cantilevers must be done after the existing footbridge is removed.

This means all utilities on this bridge must be removed (relocated if required), the existing OHW disconnected from the bridge attachments and the bridge physically removed from the corridor, prior to being attached to the new OHW masts and their cantilevers. Because the OHW is currently attached to the existing footbridge, the disconnection of the OHW from the existing bridge, the removal of the bridge and the reattachment of the OHW to the new OHWS will have to be done in the same possession.

Within the same possession as the attachment of the OHW to the new N37+770 masts, the modification of the contact heights at N37+722(new cantilever), N37+714 and N37+681. This is to ensure a compliant contact wire height as well as correct wire gradient. In addition to this, there will be a requirement to re-dropper the bays impacted by these wire height changes.

Refer to Section 5 for the anticipated construction sequence.

4.15 Environmental

Sydney Trains has undertaken a review and have advised that no significant specifies have been listed in the area and vegetation clearing will be managed by typical controls. This assumption has been adopted for the development of the reference design.

A REF has been prepared at reference design to assess the potential environmental impacts associated with both the construction and operation of the proposal under the provision of Division 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Refer to REF 30012921-EN-R-01 Rev 0. The following further recommendations have been made:

- An Arborist Report shall be prepared at the Detailed Design stage of the proposal to develop a plan for any proposed tree removal or trimming. It is likely that a Tree Clearing Permits would be required through Hornsby Shire Council. Any permits, notices or approvals relating to tree clearing would be managed by Sydney Trains at Detailed Design stage of the proposal
- A specialist Biodiversity Assessment Report shall be carried out at the Detailed Design stage of the worked to fully assess the potential biodiversity impacts of the proposal. The Biodiversity Assessment Report would be carried out in accordance with the NSW BC Act and Biodiversity Assessment Method. Any relevant offsets would be calculated using the Sydney Trains Biodiversity Offset Calculator and Biodiversity Offset Scheme.

5 Constructability

SMEC's approach to constructability has been to develop a logical sequence of works that confirm the feasibility of the Reference Design solution.

The sequence presented should not be considered as a comprehensive construction programme but viewed as a demonstration that the sequence is feasible, maintains flexibility for the eventual construction contractor to deliver works, and identifies risks to the project.

When assessing the constructability of the strategic concept option, the following has been undertaken:

- Identify the minimum safe working zones for people, materials, and plant
- Locate positions of the plant (cranes) and define the required rail closures in terms of geometry and time constraints
- Develop staging of construction based on a 3D terrain and proposed bridge structural arrangement
- Consider opportunities to include many activities in enabling and early works. The approach taken has been to work out the required number of possession to optimised the overall project timeframe.

5.1 Anticipated Construction Sequence

The anticipated construction sequence for the works is as follow:

Enabling and Early works

- Clearing of vegetation
- Relocate Signal and Comms Service on Up side (-28-)
- Relocate existing platform lighting and platform furniture. Install temporary platform lighting.
- Construct new 11kV/415V padmount transformer
- Install GSTs/buried conduits for new 11kV cable route on Down side for extents outside danger zone
- Install buried LV conduits from new padmount transformer to Lift 1 for extents outside danger zone
- Install buried CSR from new pits to Signal Loc N23.48R on Up Side. This can be done in conjunction with the relocation of the existing Signal and Comms (-28-) service.
- Install temporary works for lift shaft construction, including temporary road barriers and fencing where required
- Complete excavation and piling work for Lift 3 (Pierre Close/Up Side). Construct Up Side bridge pier and stairs.

Track Possession No.1

- Install temporary GST for 11kV on Down Side
- Prepare foundation for new UGOH poles 23 and 25 on Up Side using low profile plants. Construct new UGOH pole 23.
- Install buried conduits on down side for extent within danger zone for 11kV
- Erect necessary temporary hoarding/fencing around excavation.

Track Possession No.2

- Construct new UGOH pole 25 with traffic management on Pacific Highway
- Transfer 11kV onto new UGOHs and into temporary GSTs/buried conduits and commission new route

Track Possession No.3

- Complete piling for stair landing, bridge pier and lift shaft foundation on Pacific Highway/Down Side with traffic management on both Pacific Highway and Pierre Close
- Erect necessary hoarding/fencing around proposed work site on platform and complete piling for stair landing, bridge pier and lift shaft foundation on platform, including drainage relocation

Track Possession No.4

- Erect formwork and construct the concrete portion of the lift shafts. The upper steel lift shaft frame to be prefabricated and installed with cranes located on Pacific Hwy and Pierre Close.

- Erect formwork and construct bridge piers and stair supports on Pacific Highway, Pierre Close and platform with traffic management and pedestrian diversions in place.
- Construct new OHWS footings

Track Possession No.5

- Install precast girders into position. It is anticipated that span 1 girders will be installed with the crane located on Pacific Highway with traffic and management. Span 2 girders will be installed with the crane located on Pierre Close with traffic management. A traffic assessment/turning path assessment should be undertaken at detail design to assess the conditions on Pierre Close during construction. Pedestrian diversions will also be required.
- Install conduits for services and cast in-situ deck
- Install steelwork for new OHWS

Track Possession No.6

- Install balustrades, safety and protection screens
- Complete platform works around new footbridge (asphalting, platform furniture, lighting, CCTV, ticketing)
- Install new lighting poles on footbridge
- Install lifts
- Relocate guard indicator to final location and commission new guard indicator
- Install conduits and pits for permanent 11kV route

Out of possession – after possession 6

- Install new cabling for CCTV, communications, signalling LV
- Install new Ausgrid isolation transformer
- Commission new station power supply (main and backup) and relocated services (except signalling power) on new footbridge
- Commission new communication and security services
- Complete landscaping works
- Complete new kiss and ride and new disability parking
- Realign fencing and relocate access gates
- Commission new footbridge

Track Possession No.7, pending demolition methodology

- Demolish existing footbridge superstructure
- Attach OHW to new OHWS
- Adjust OHW contact heights at N37+681, N37+714 and the installation of the new cantilever at N37+722
- Re-dropper bays on Down Main between N37+642 to N37+805 and on Up Main between N37+665 to N37+805
- Relocate backup signalling padmount 5kVA 240/120V from Pacific Highway to Pierre Close.
- Connect and commission new Signal Loc N23.48R power supply cables (backup and main supply)
- Demolish existing footbridge substructure
- Commission permanent 11kV route

6 Safety in Design

As part of the safety assurance process for this project, a risk workshop was undertaken to identify potential hazards as well as the opportunity to incorporate mechanisms to eliminate or reduce their impact.

In order to identify safety risks in relation this project, the following internal and external safety workshops took place involving internal and external attendees from the design team and key stakeholders:

- Internal Safety in Design Workshop (SMEC design team), 30th July 2020
- External Safety in Design Workshop (SMEC design team and Sydney Trains), 4th August 2020. Refer meeting minutes in Appendix O2.

The hazard log documents identified risks associated with:

- Construction within the rail corridor and adjacent to roads (Pacific Highway and Pierre Close)
- Operation, including risk to public and maintenance staff
- Maintenance operations

6.1 Project Safety Hazard Log

Risks identified throughout these workshops by SMEC have been documented in the Project Safety Hazard Log (refer Appendix O1). Risk were classified in accordance with the T MU MD 20002 ST *Risk Criteria for Use by Organisations Providing Engineering Services V1.* Refer to Figure 6-1 below for the risk assessment matrix.

- A – Unacceptable
- B – Undesirable
- C – Tolerable
- D – Broadly Acceptable

Likelihood			Negative Consequences						
Qualitative	Probability	Frequency	C1	C2	C3	C4	C5	C6	Rating
Frequent (Occurs often)	95% or greater probability of occurring	>10 times per year (Could occur on a daily / weekly basis)	C	B	B	A	A	A	L6
Probable (Likely to Occur)	>50% probability of occurring	2 - 10 times / year (Could occur on a monthly / quarterly basis)	C	C	B	B	A	A	L5
Occasional (Could occur but more than likely it won't)	20% to 49% probability of occurring	Once every 1 – 10 years	D	C	C	B	B	A	L4
Remote (May occur only in unusual circumstances)	1% to 19% probability of occurring	Once every 10 – 100 years	D	D	C	C	B	B	L3
Improbable (Would only occur under exceptional circumstances)	Less than 1% probability of occurring	Once every 100 to 1,000 years	D	D	D	C	C	B	L2
Incredible (Not expected to occur)	Not expected to occur	Less that 1 every 1000 years event	D	D	D	D	C	C	L1

Figure 6-1: Risk ranking matrix

This is a live document and will be reviewed and updated during the detail design stage to capture any additional hazards identified and controls implemented.

7 Cost Estimate

The P30 cost estimate based on the final reference design has been in Appendix R.

8 Outstanding Issues and Risk

8.1 Outstanding Issues for Resolution

The following are a list of key outstanding design issues for resolution during the detail design phase:

1. Arborist review of significant existing trees and biodiversity assessment.
2. Engagement and liaison with Hornsby Shire Council.
3. Performance solutions for BCA non-compliances.
4. Fire life safety review and assessment.
5. Signal sighting for new guard indicators.
6. Existing non-compliant SSER room to be upgraded to achieve compliance.
7. Confirmation of assisted boarding point on platform.
8. Security risk assessment.
9. Detailed assessment of existing platform drainage to determine extent of upgrade works that will be required. Refer to Section 4.11.6 for further detail.
10. Further liaison with relevant external utility providers to facilitate the works, refer to Section 4.11.7 for further detail.
11. Exact location of the existing sewer line along the platform, refer to Section 4.11.8 for further detail.
12. Additional soil resistivity testing.
13. Investigate modifications to lift shaft including reduction in glazing, removal of cladding and removal of louvers on southern face of lift shaft.
14. Investigate re-use of existing pits for -28- relocation
15. Detail design development including:
    - Structural check of adjacent OHWS where impacted by OHW modifications. Refer to Section 4.14.3 for further details.
    - Structural and geotechnical assessment of the proposed HV poles, pole top arrangements and foundations. Clearance checks to be conducted once pole embedment depths are defined.
    - Detailed signalling power calculation
    - Pulling calculations
    - Finalise AFIL extent and location
    - Finalise CCTV upgrades including upgrade of rack size, consolidation of ETS into a rack, enabling works for temporary arrangement for cameras, UPS capacity investigation
    - Detailed signalling power calculations and Westrace data changes for LED GI upgrades

Refer to Appendix Q and Appendix V for further details.

8.2 Key Risks

The following are key risks identified at reference design, to be resolved and managed during the detail design phase:

1. HV earthing design will be more complex and extensive due to the high soil resistivity. Additional testing is recommended to quantity this risk.

Prepared by

blue sky

Concept Design Package
Station Wayfinding – Drawings
Mount Colah

Wayfinding rollout package
Job number TBC

Version 4.3
09.12.2020

TfNSW Customer Services Division
Wayfinding Program

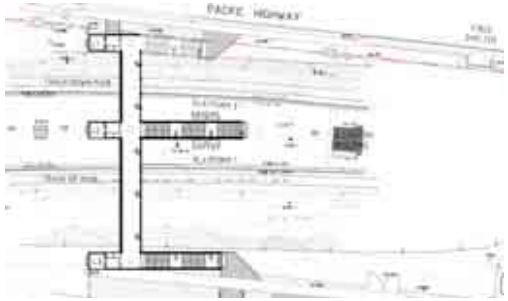
Site code MTC

Concept Design Package
Station Wayfinding – Drawings Register

MTC

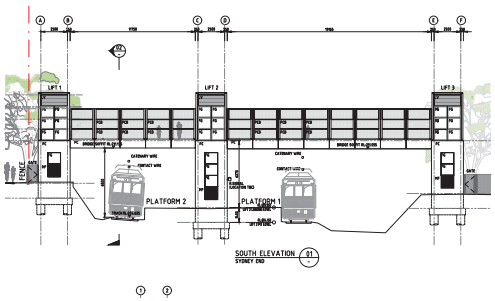
Last updated 09.12.2020

Drawing number	Drawing type	Drawing name	Project	TA	1	2	3	4. Working Drawings					5. Working CASID		6. Working DWG & Schedule		7. Concept Design Package		8. Production Order Package		9. As Built	Superseded	Date of most recent issue
DWG-001	Analysis	Site Specific Issues	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-002	Plan	Site Boundary and connections	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-003	Diagram	Site Relationships	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-004	Plan	Flow and Zone Plan - Precinct	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-005	Plan	Flow and Zone Plan - Footbridge	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-006	Plan	Flow and Zone Plan - Platforms 1-2	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-007	Plan	Site Strategy - Precinct	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-008	Plan	Site Strategy - Footbridge	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020
DWG-009	Plan	Site Strategy - Platforms 1-2	Wayfinding rollout package	Blue Sky				4.0	4.1	4.2	4.3												09.12.2020



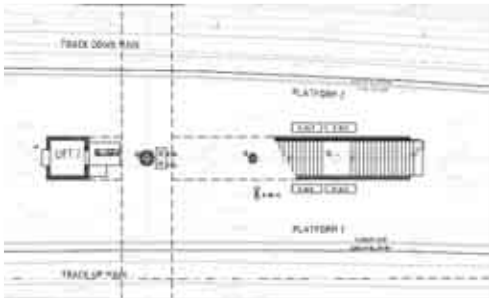
Additional Entries and Exits

- New footbridge has created two new main entries and one new exit on the platform.
- Clear signage required to highlight these entries and exits.



New Exit on Platform

- Clear signage required on platform to direct to new footbridge



Hidden Lift Entries

- New lifts on platform are hidden by the adjoining staircase.
- Clear signage required to direct to lift entries.

Connecting modes

- Walk
- Cycle
- Taxi
- Kiss and ride
- Parking

KEY

- Metro Station Entry
- Train Station Entry
- Bus Stop (OSD)
- Ferry Wharf Entry
- Light Rail Entry / Stop
- Property Boundary
- Site Location Boundary

Concept Design Package
Station Wayfinding – Drawings
Mount Colah

TfNSW Customer Services Division
Wayfinding Program

Wayfinding rollout package TAP
Job number TBC

DWG-002

Plan Site boundary and connections
Version 4.3 09.12.2020

MTC

Destinations list

Local destinations

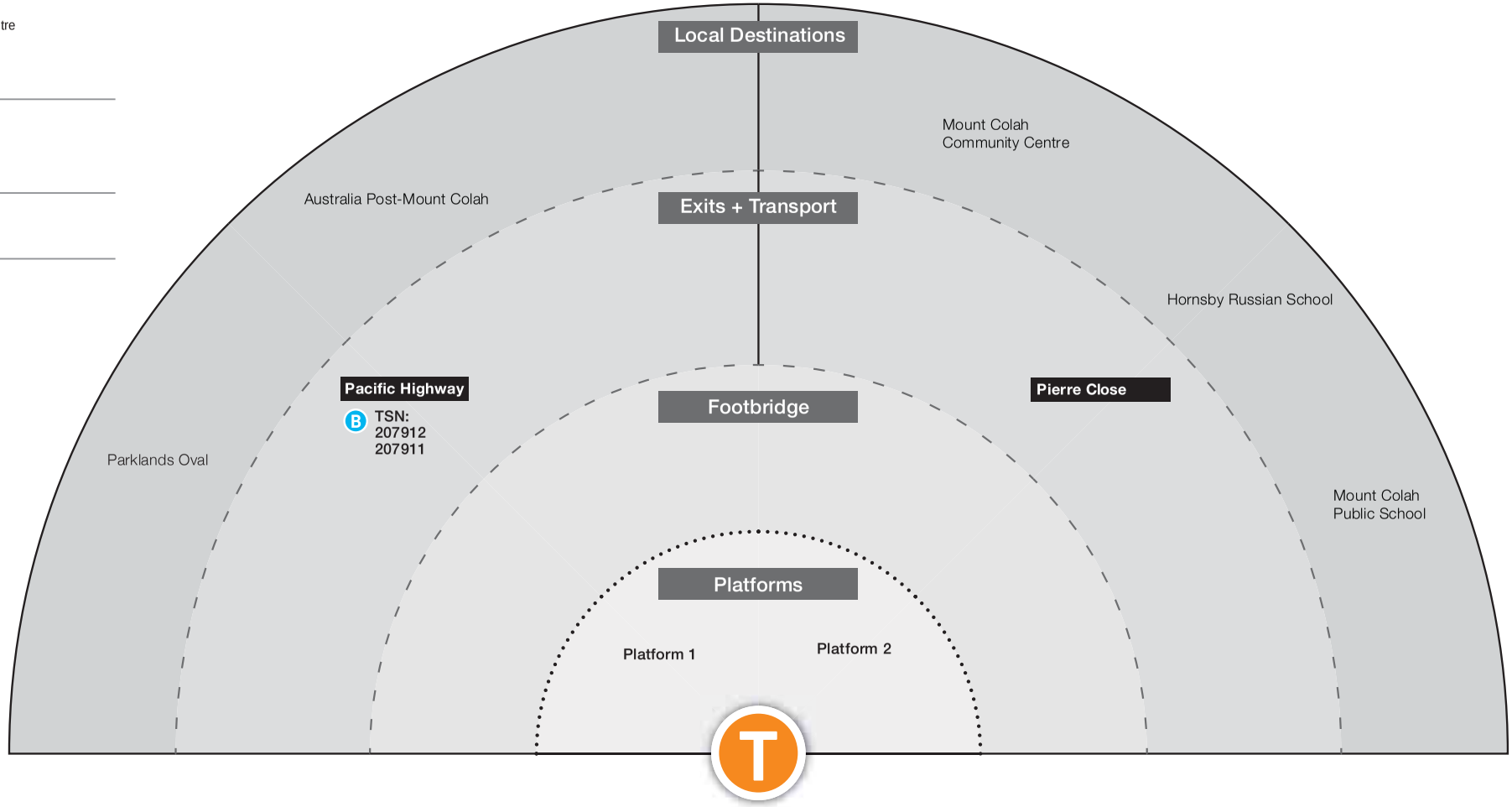
- Parklands Oval
- Australia Post-Mount Colah
- Mount Colah Community Centre
- Hornsby Russian School
- Mount Colah Public School

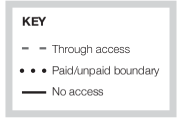
Exits

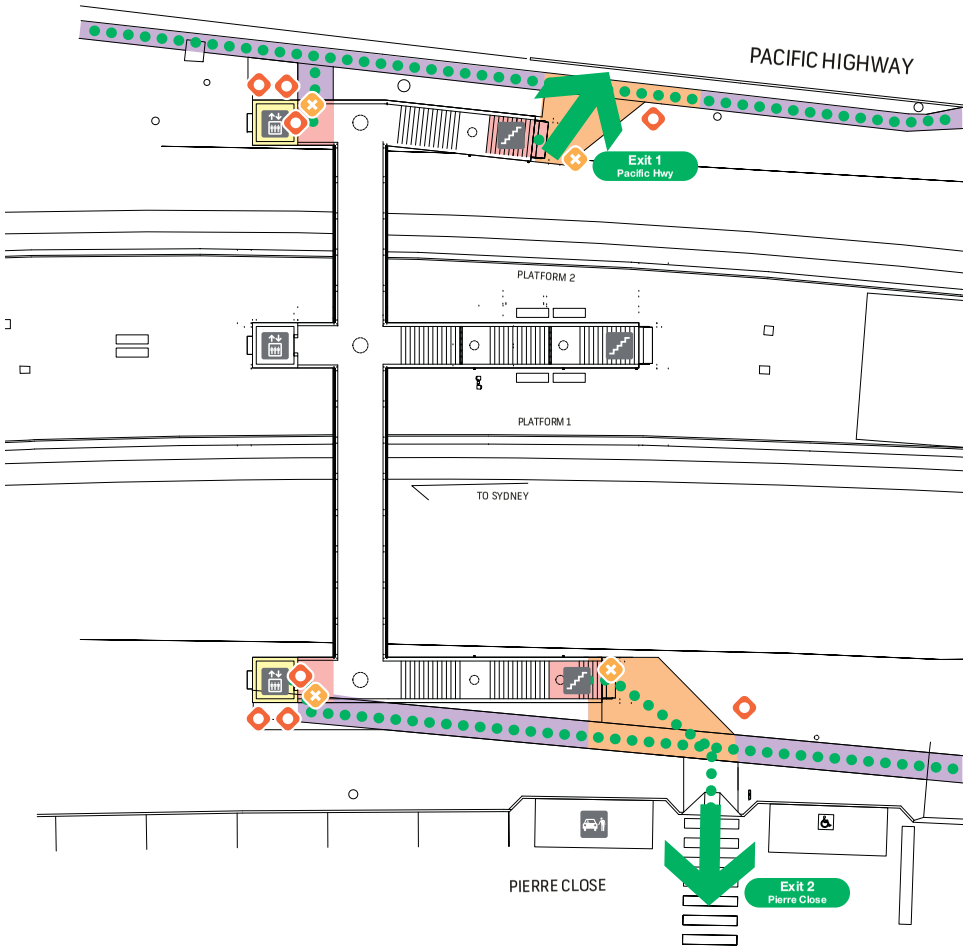
- Pacific Highway
- Pierre Close

Concourse

- Footbridge







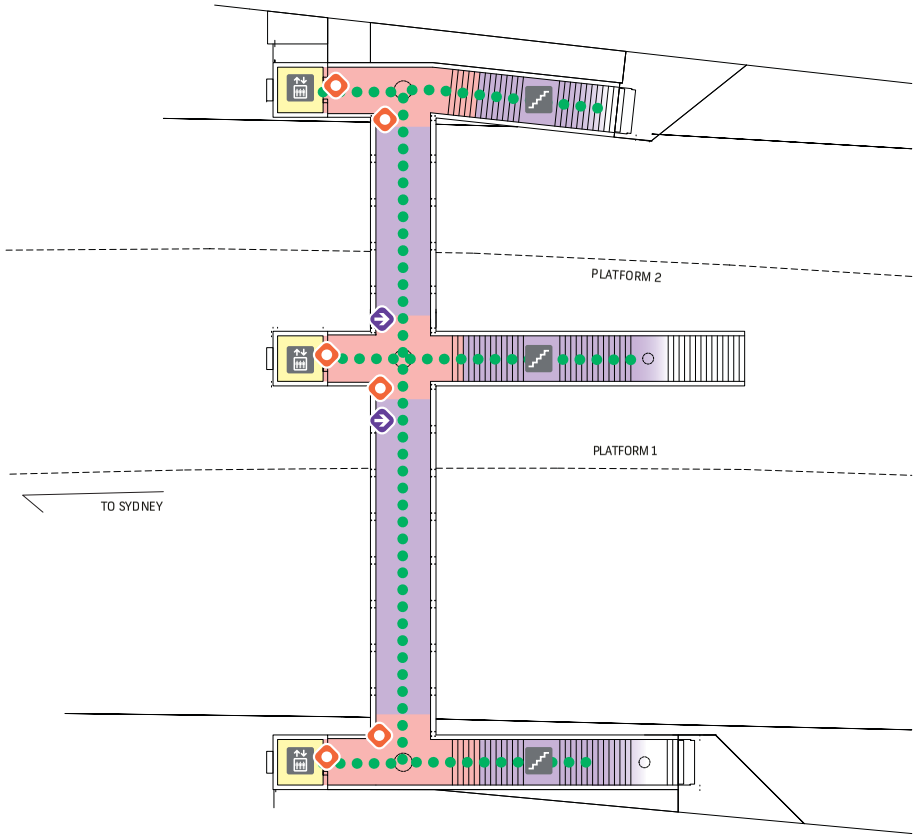
KEY

Signs
- Identification
- Direction
- Information
- Orientation
- Regulatory

Zones
- Identification/approach
- Portal
- Facilities/boarding
- Information
- Circulation
- Waiting
- Back of house

Paths
- Pedestrian path

Entrances/exits
- Primary
- Secondary
- Exit



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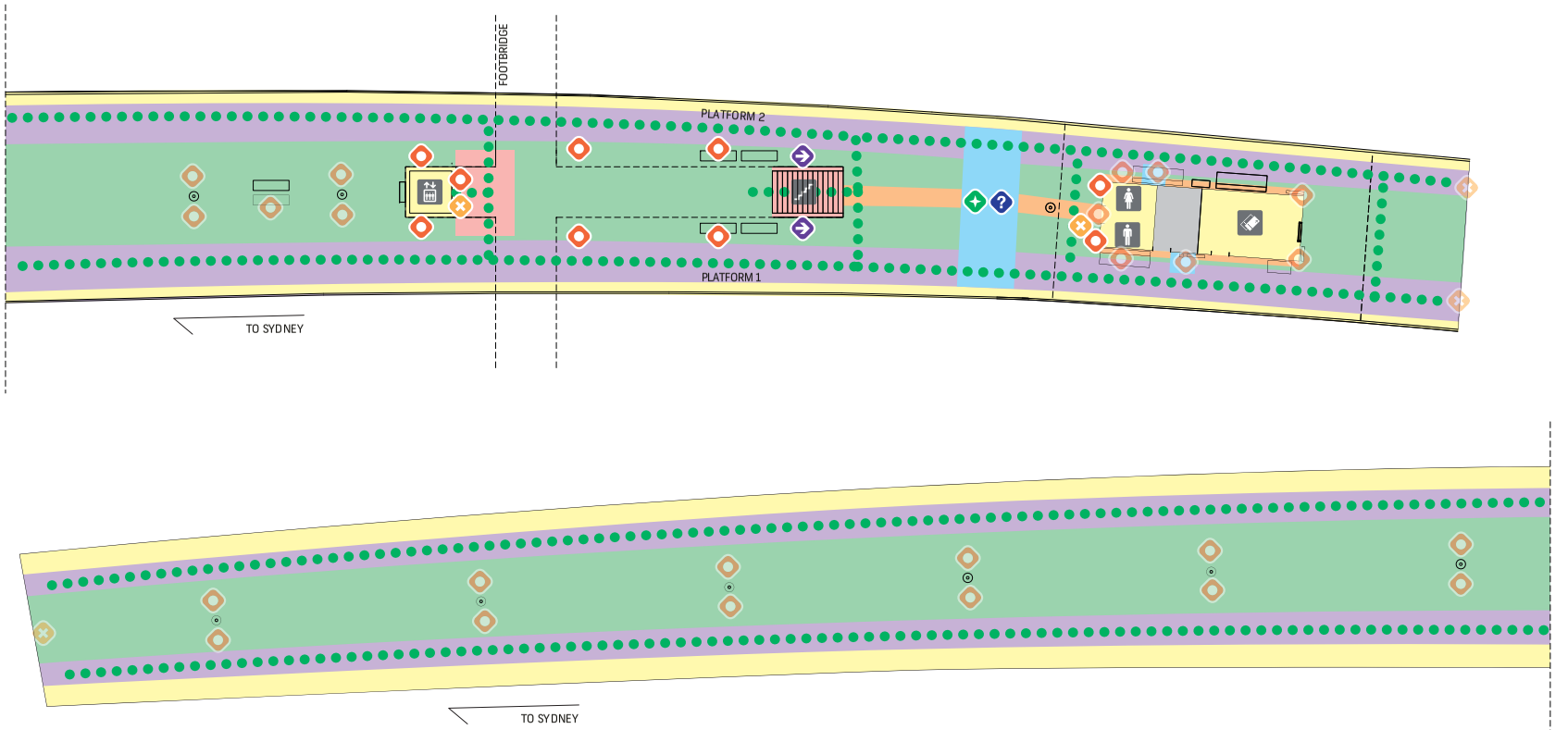

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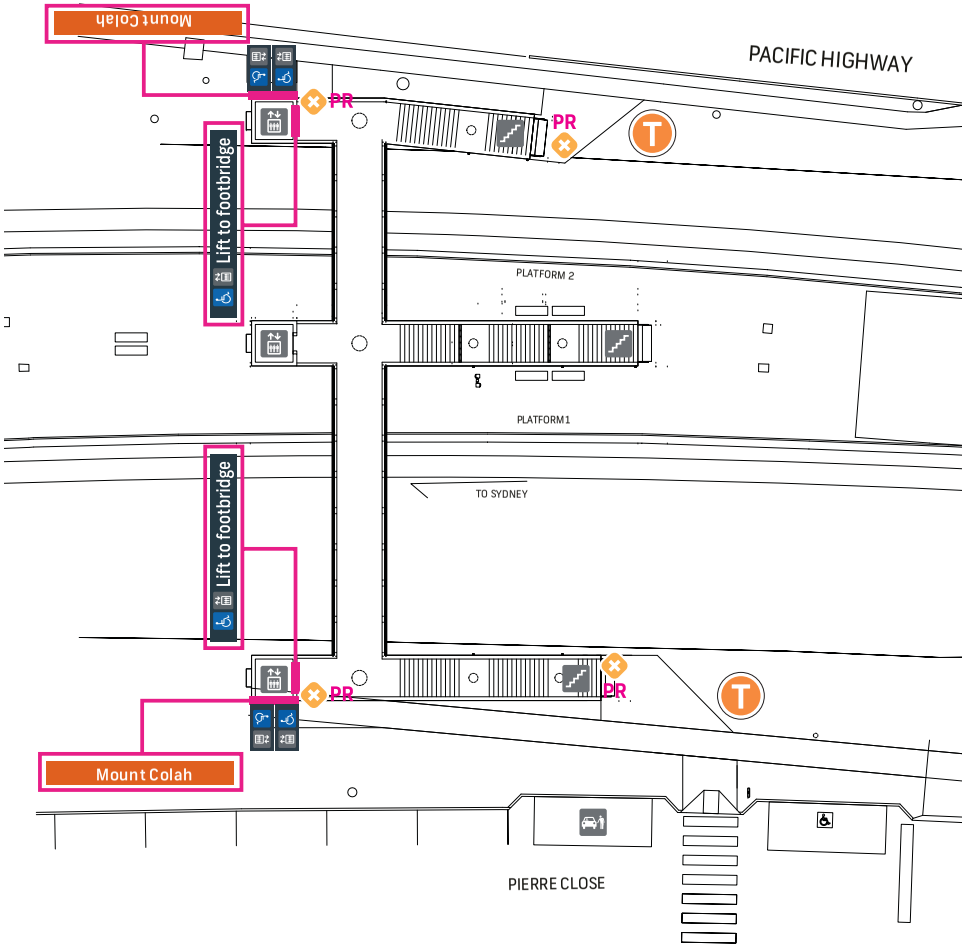
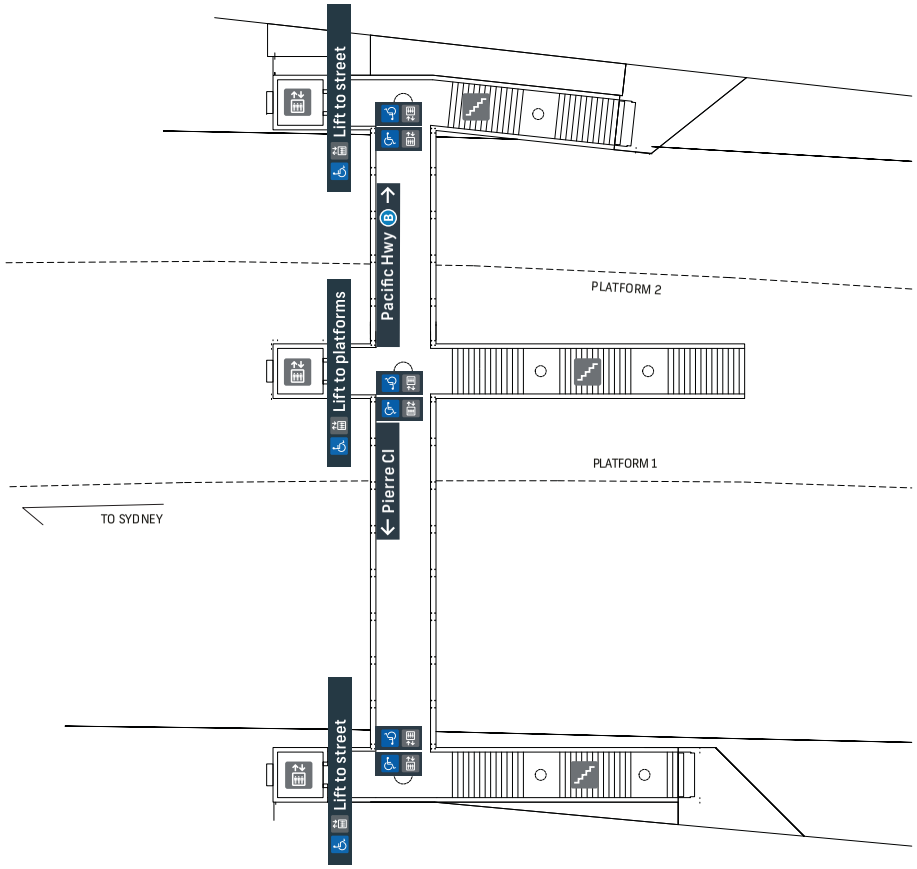


KEY

Signs

- HP — Help point
- CT — Commuter telephone
- PYT — Plan your trip
- SD — Station Directory
- C — Connect
- PR — Please remember
- EOP — End of platform signs



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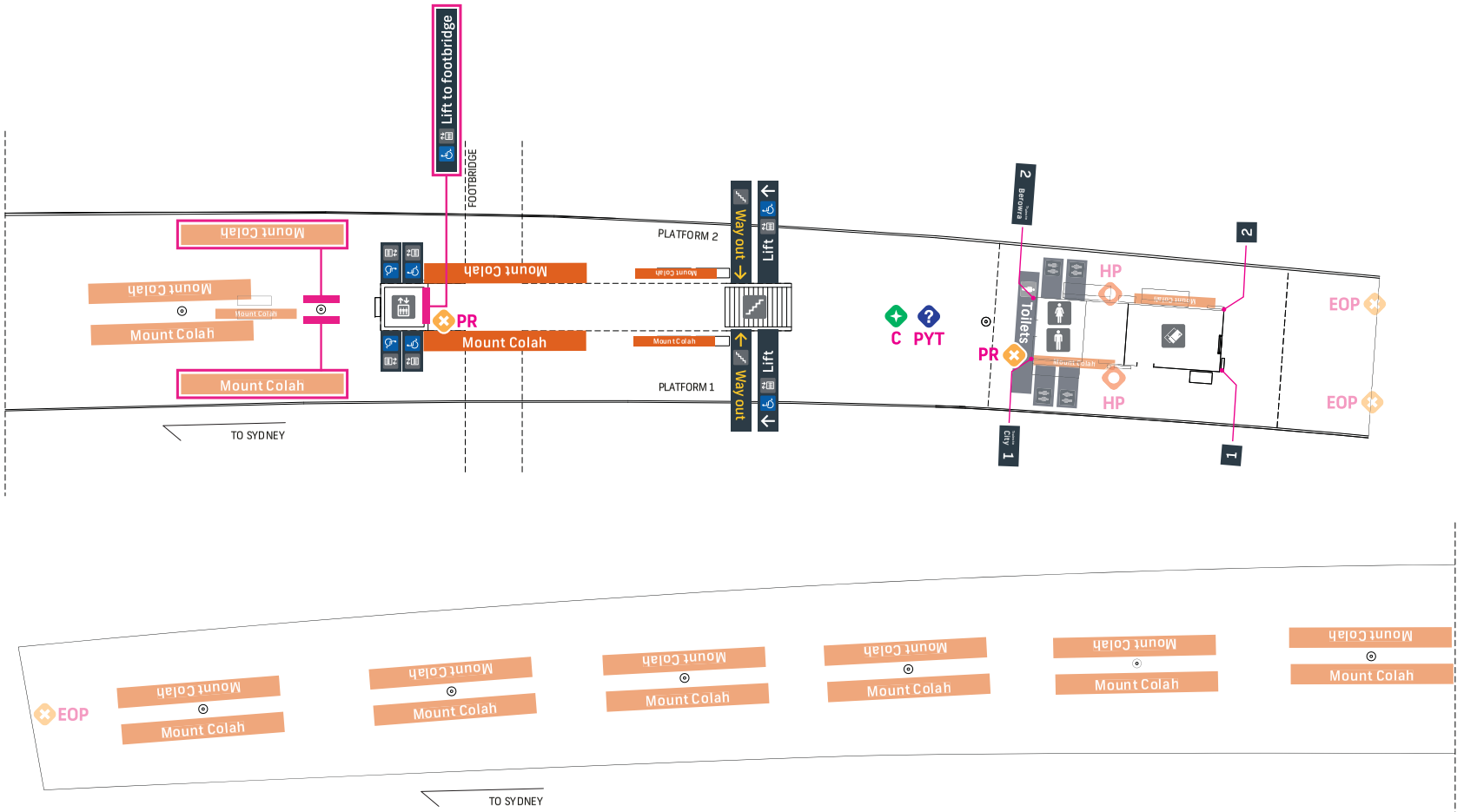

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Concept Design Package
Station Wayfinding – Drawings
Mount Colah

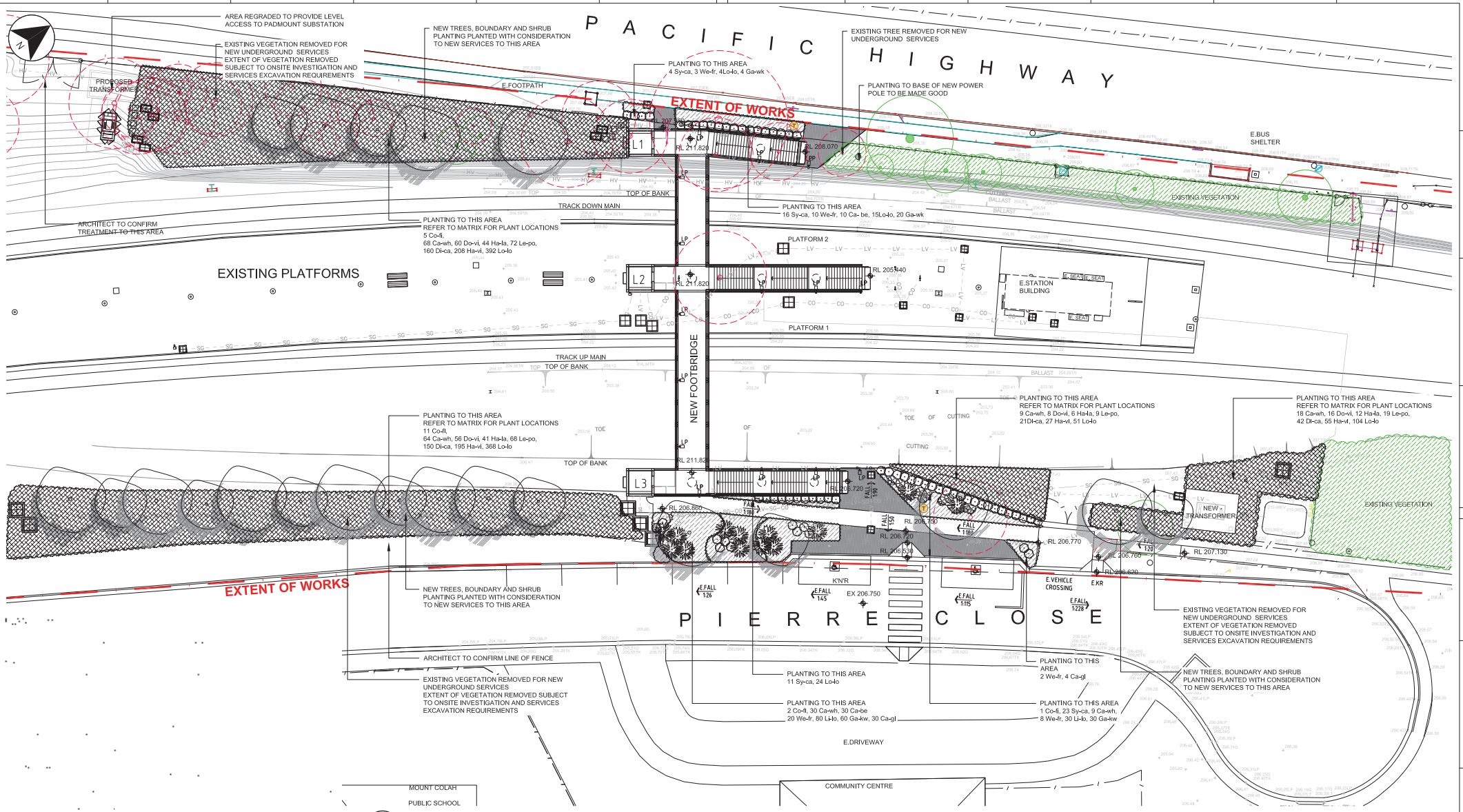
TfNSW Customer Services Division
Wayfinding Program

Wayfinding rollout package TAP
Job number TBC

DWG-009

Plan **Site strategy - Platforms 1-2**
Version 4.0 09.12.2020

MTC



01 LANDSCAPE PLAN
1:200

LEGEND

- EXISTING TREE RETAINED
- EXISTING TREE REMOVED
- EXISTING LEVELS
- TRAIN STATION SIGNAGE
- EXISTING VEGETATION
- SHRUBS
- GROUNDCOVERS
- EXISTING LEVEL PROPOSED LEVEL
- STEPPERS IN PLANTING MAINTENANCE PATH
- PLANT MATRIX
- EXISTING FENCE
- NEW FENCE TO MATCH EXISTING
- BENCH SEATS
- SERVICES BELOW BY OTHERS

1 : 200 FULL SIZE A1

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
3	ISSUED FOR REFERENCE DESIGN	AL/10.12.2020	JH/10.12.2020	MT/10.12.2020
2	30% ISSUE	AL/16.09.2020	JH/16.09.2020	MT/16.09.2020
1	DRAFT FOR 30% ISSUE	AL/20.08.2020	JH/20.08.2020	MT/20.08.2020
0	DRAFT ISSUE	AL/07.08.2020	JH/07.08.2020	MT/07.08.2020

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1:200

NSW GOVERNMENT Transport for NSW

SMEC

TaylorBrammer
TAYLOR BRAMMER LANDSCAPE ARCHITECTS PTY LTD

DRAWN	GEORGE JEREZ
DESIGNED	AARON LAKEMAN
DRG CHECK	AARON LAKEMAN
DESIGN CHECK	JAMES HERON
APPROVED	MATTHEW TAYLOR

MT COLAH

MAIN NORTH LINE - 37.635km

RAILWAY STATION FOOTBRIDGE RENEWAL

LANDSCAPE ARCHITECTURE

PLAN

FILE No.	SHEET: 1 OF 1	A1
STATUS: REFERENCE DESIGN		©
DRG No. 30012921-LA-101	3	EDMS No. -

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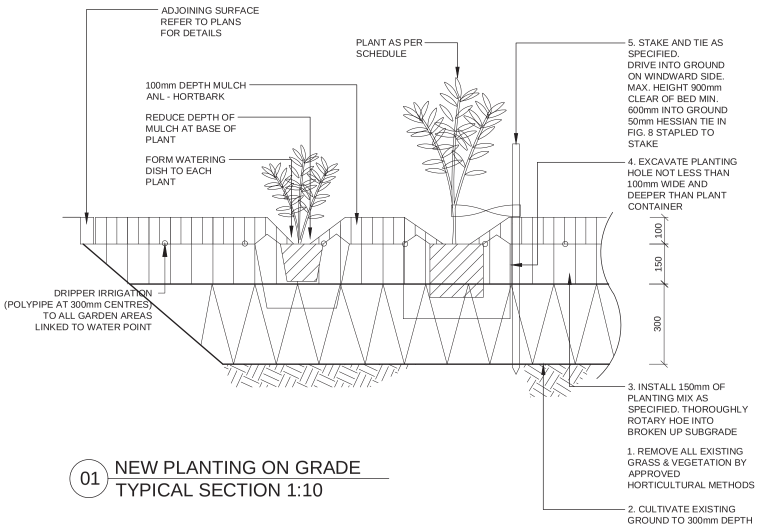
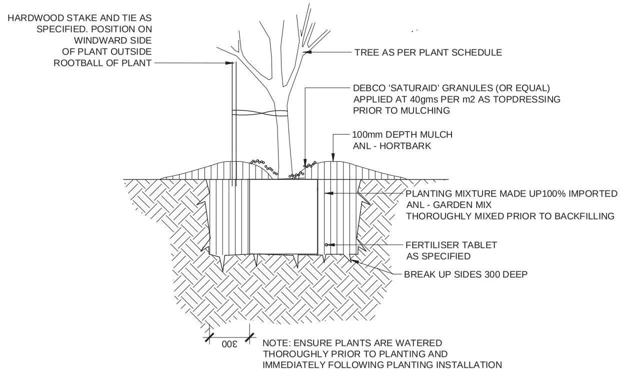
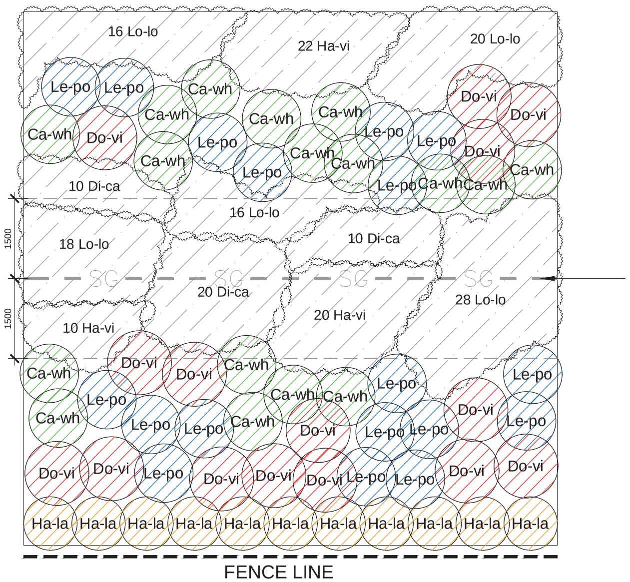


01 NEW PLANTING ON GRADE
TYPICAL SECTION 1:10



02 TREE PLANTING
TYPICAL SECTION 1:20



03 PLANTING MATRIX
TYPICAL PLAN 1:50

SPECIFICATION NOTES

SERVICES

Before landscape work is commenced. The Landscape Contractor is to establish the position of all servicelines and ensure tree planting is to be carried out at least 3 metres away from these services. Service lids, vents and hydrants shall be left exposed and not coverd by any landscape finishes (turfing, paving, garden beds etc.) Finish adjoining surfaces flush with pit lids.

PLANTING MIXTURE

Shall be homogenous blend of soil and additives in the following proportions:

Imported Topsoil	50%
Compost	30%
D/W Sand	20%

MULCH

APPLICATION: Place mulch to the required depth, (refer to drawings clear of plant stems, and rake to an even surface finishing 25mm below adjoining levels. Ensure mulch is watered in and tamped down during installation.

MULCH TYPE:
Hort-Bark
Supplier: ANLscape

PLANT MATERIAL

All plants supplied are to conform with those species listed in the Plant Schedule on the drawings. Generally plants shall be vigorous, well established, hardened off, of good form consistent with species or variety, not soft or forced, free from disease or insect pests with large healthy root systems and no evidence of having been restircted or damaged. Trees shall have a leading shoot. Immediately reject dried out, damaged or unhealthy plant material before planting. All stock is to be container grown for a minimum of six (6) months prior to delivery to site.

FERTILISER

MASS PLANTING AREAS: Fertiliser shall be 'Nutricote' or approved equivalent in granule form intended for slow release of plant nutrients over a period of approximately nine months. Thoroughly mix fertiliser with planting mixture at a recommended rate, prior to installing plants.

TREES INGRASS AND SUPER ADVANCE TREES: Pellets shall be in the form intended to uniformly release plant food elements for a period of approximately nine months equal to Shirles Kokei pellets, analysis 6.3:1.8:2.9. Kokei pellets shall be placed at the time of planting to the base of the plant, 50mm minimum from the root ball at a rate of two pellets per 300mm of top growth to a maximum of 8 pellets per tree.

STAKING AND TYING

Stakes shall be straight hardwood, free from knots and twists, pointed at one end and sized according to size of plants to be staked.

a. 5-15 litre size plant 1x(1200x25x25mm)
b. 35-75 litre size plant 2x(1500x38x38mm)
c. 100-greater than 200 litre 3x(1800x50x50mm)

Ties shall be 50mm wide hessian webbing or approved equivalent nailed or stapled to stake. Drive stakes a minimum one third of their length, avoiding damage to the root system, on the windward side of the plant.

IRRIGATION & WATERING

All subsurface drip Irrigation to be flushed and tested on a monthly basis. Irrigation filters, valves and zones to be reviewed and adjusted onsite to suit localised growing conditions of plant material. In excess of automatic irrigation on periodic anomalies of high temperatures, hand watering of plants may be required to ensure continuous health growth. Watering of street trees shall be carried out on a weekly basis throughout the maintenance period and modified based on weekly rainfall.

PLANTING CHARACTER

PROPOSED TREES


Corymbia 'Summer Red'
Red flowering gum

PROPOSED SHRUBS AND GROUNDCOVERS


Hakea laurina
Pincushion Hakea


Leptospermum polygalifolium
Yellow tea tree


Dodonaea viscosa
Hop bush


Callistemon viminalis 'Better John'
Bottlebrush


Callistemon viminalis 'White anzac'
Bottlebrush


Carpobrotus glaucescens
Pigface


Dianella "Little Jess'
Native flax


Gazania 'Kiss white'
Treasure flower


Hardenbergia violacea
False sarsaparilla


Lomandra longifolia
Mat Rush


Syzygium 'Cascade'
Lilly Pilly


Westringia fruticosa
Coastal rosemary

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
3	ISSUED FOR REFERENCE DESIGN	AL/10.12.2020	JH/10.12.2020	MT/10.12.2020
2	30% ISSUE	AL/16.09.2020	JH/16.09.2020	MT/16.09.2020
1	DRAFT FOR 30% ISSUE	AL/20.08.2020	JH/20.08.2020	MT/20.08.2020
0	DRAFT ISSUE	AL/07.08.2020	JH/07.08.2020	MT/07.08.2020

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE:

NSW GOVERNMENT Transport for NSW

SMEC

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MAIN NORTH LINE - 37.635km
RAILWAY STATION FOOTBRIDGE RENEWAL
LANDSCAPE ARCHITECTURE
DETAILS AND CHARACTER

FILE No. | SHEET: 1 OF 1 | A1 | ©
STATUS: REFERENCE DESIGN
DRG No. 30012921-LA-401 | 3 | EDMS No. -

File Plotted\\TBSV02\SydData\Current Projects\20-083s Mt Colah Footbridge Renewal\Landscape Documentation\DA\CAD\20-083s Mt Colah Footbridge Renewal.dwg
Plot Date & Time12/10/2020 2:02 PM
Plotted by GJEREZ
DF 801*554

EXTRACTS OF HORNSBY(EXCL) - BEROWRA(INCL)
37.000km - 45.500km SIGNALLING PLAN
EXTRACT OF HORNSBY(EXCL) - BEROWRA(EXCL)
35.150km - 44.000km TRACK INSULATION PLAN

HORNSBY - BEROWRA (EXCL)

Mt COLAH FOOTBRIDGE RE-LOCATION

(LAST PAGE NUMBERED 4)

AMD	DESCRIPTION	REVIEWED SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
2	ISSUED FOR 100% REFERENCE DESIGN			
1	ISSUED FOR 30% REFERENCE DESIGN	K.R/09.09.20		

NSW GOVERNMENT Transport for NSW

JMDR

JMDR
SIGNAL DESIGN

DRAWN [redacted] 23/11/2020
DESIGNED 23/11/2020
REVIEWED 24/11/2020
VERIFIED
APPROVED

CIRCUIT BOOK No: CB009
JOB No: S20224
STATUS: FOR REVIEW
BOOK: OF ©
PART: OF A3
DRG No. C0090A00
EDMS No.

CONTROL SHEET **Version Date: 23/11/2020**

CONTROL SHEET : 1 of 1

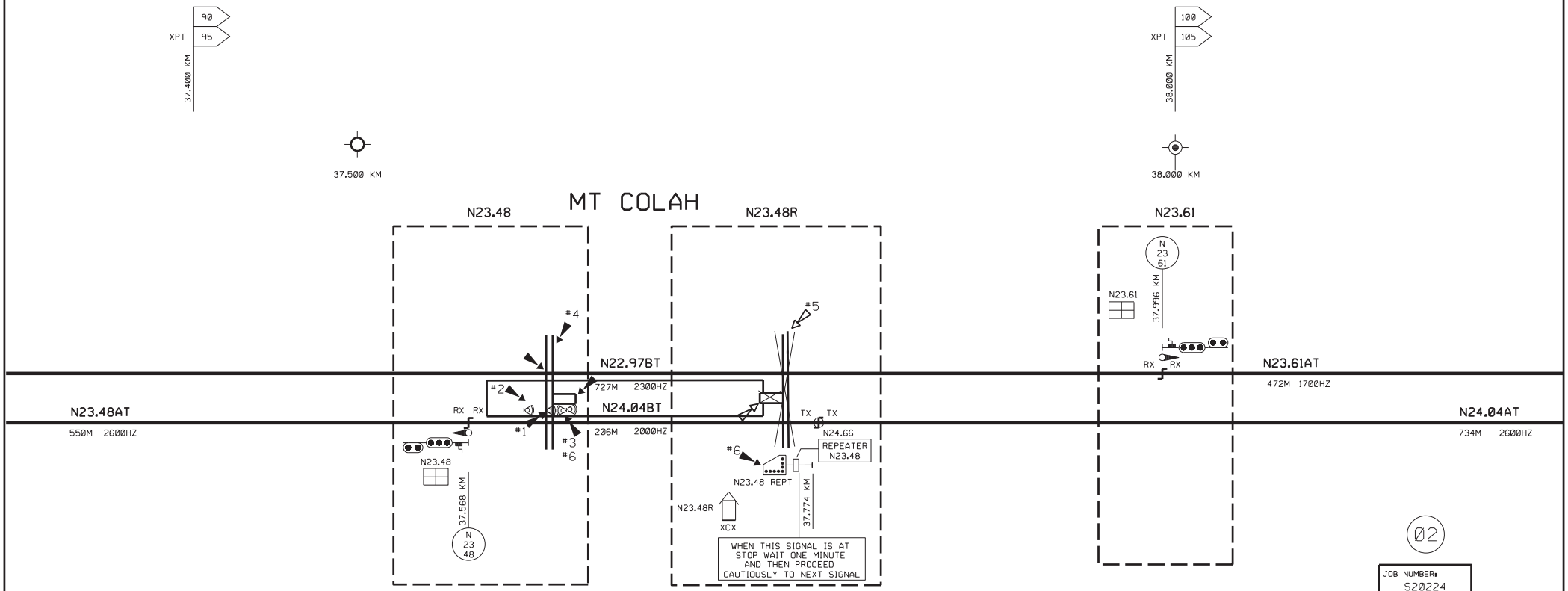
Circuit Book Title: HORNSBY - BEROWRA (EXCL) **CB: 009** **Job No: S20224**

Job Name: Mt COLAH FOOTBRIDGE RE-LOCATION **Book: 1 of 1**

List of Effective Pages			List of Effective Pages			List of Effective Pages			List of Effective Pages		
Page(from)	Page(to)	Version Date	Page(from)	Page(to)	Version Date	Page(from)	Page(to)	Version Date	Page(from)	Page(to)	Version Date
COVER		23/11/2020									
CP1		23/11/2020									
HORNSBY(EXCL) - BEROWRA(INCL) SIGNALLING PLAN											
EXTRACT 1 of 2		23/11/2020									
EXTRACT 2 of 2		23/11/2020									
HORNSBY(EXCL) - BEROWRA(INCL) TRACK INSULATION PLAN											
EXTRACT 1 of 1		23/11/2020									

1

COPY COMPLETE	These signatures certify that the sheets amended for this version of the control page are correct.				APPROVED BY
		NAME	DATE	SIGNATURE	
NAME	DESIGNED	[redacted]	23/11/2020		
	DRAWN	[redacted]	23/11/2020		
	REVIEWED	[redacted]	24/11/2020		
DATE	VERIFIED				DATE:



02

JOB NUMBER:
S20224
VERSION DATE:
23/11/2020

► NOTES: -

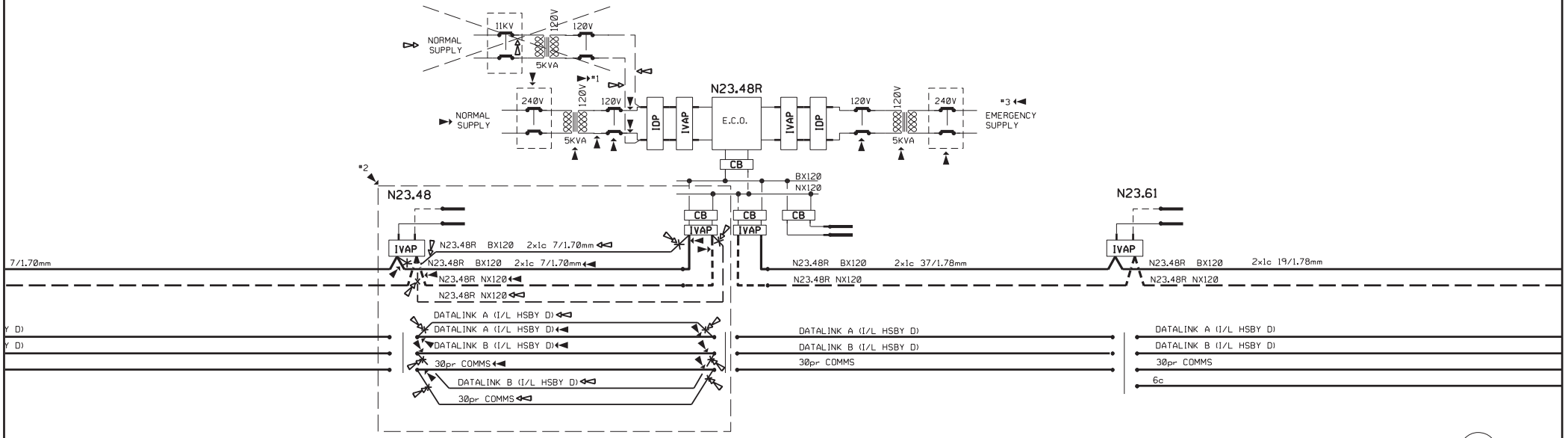
- ► #1 NEW STANDARD GI (LED) TO BE MOUNTED NEAR LIFT SHAFT POINTING TOWARDS COUNTRY SIDE FINAL POSITION TO BE CONFIRMED ON SIGNAL SIGHTING.
- ► #2 NEW ADDITIONAL STANDARD GI (LED) WILL BE MOUNTED ON POLE DIRECTED TOWARDS COUNTRY SIDE, NEARLY 50-70m FROM NEW BRIDGE LIFT SHAFT TOWARDS SYDNEY SIDE. FINAL POSITION TO BE CONFIRMED DURING SIGNAL SIGHTING.
- ► #3 EXISTING GI TO BE RETAINED IN CURRENT POSITION AND EXTEND GI/BRACKET TOWARDS TRACK TO ASSIST CONSTRUCTION. ONCE THE NEW GIs ARE INSTALLED, EXISTING GI TO BE REMOVED.
- ► #4 NEW FOOTBRIDGE CONSTRUCTION AT 37.635 km (FINAL POSITION TO BE CONFIMED ON SITE).
- ► #5 EXISTING FOOTBRIDGE TO BE REMOVED AFTER CONSTRUCTION OF NEW FOOTBRIDGE.
- ► #6 MAINTENANCE UPDATE

► REFERENCES:-

- ► 30012921-AR-102 & 103 ARCHITECTURE SITE PLAN, PLATFORM/STREET PLAN
- ► 30012921-AR-104 FOOTBRIDGE PLAN

NSW Transport Sydney Trains

EXTRACT OF HORNSBY - BEROWRA MAIN NORTH 37.000KM - 45.500KM SIGNALLING PLAN EXTRACT 1 OF 2



03

JOB NUMBER:
S20224
VERSION DATE:
23/11/2020

NOTES: -

- #1 240V/120V, 5KVA (NORMAL SUPPLY) POWER CABLES UPGRADE REQUIRED WITH NEW ROUTES TO N23.48R XCX. CABLES TO BE UPGARDED TO 19/1.78 (50 mm²) FROM 7/1.70 (16 mm²) AS PER POWER CALCULATION SUPPLIED.
- #2 CABLE CHANGES FROM N23.48R TO N23.48 LOC REQUIRED DUE TO ADDITIONAL PITS TO NAVIGATE BRIDGE FOOTING.
- #3 EMERGENCY SUPPLY TRANSFORMER IS RE-LOCATED CLOSE TO AUSGRID BACKUP PAD MOUNT SUBSTATION.

REFERENCES:-

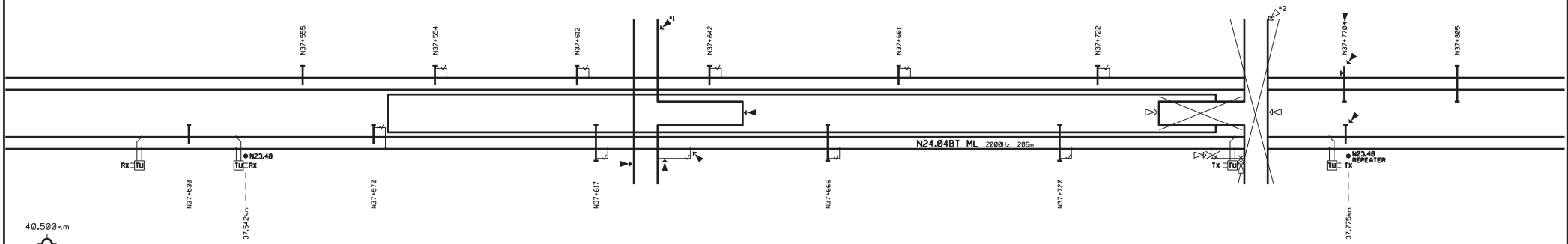
- 30012921-AR-103 PLATFORM/STREET PLAN
- 30012921-CR-101, 102, 201, 301 CSR DRAWINGS
- 30012921-EL-111 ELECTRICAL LOW VOLATGE PLAN

NSW Transport Sydney Trains

EXTRACT OF
HORNSBY - BEROWRA
MAIN NORTH 37.000KM - 45.500KM
SIGNALLING PLAN
EXTRACT 2 OF 2

37.500km

MT COLAH



40.500km

► NOTES: -

► #1 NEW FOOTBRIDGE CONSTRUCTION AT 37.635 km (FINAL POSITION TO BE CONFIMED ON SITE).

► #2 EXISTING FOOTBRIDGE TO BE REMOVED AFTER CONSTRUCTION OF NEW FOOTBRIDGE.

► REFERENCES:-

► 30012921-OH-101_A1

04

JOB NUMBER:
S20224
VERSION DATE:
23/11/2020

LAST PAGE

NSW Transport Sydney Trains

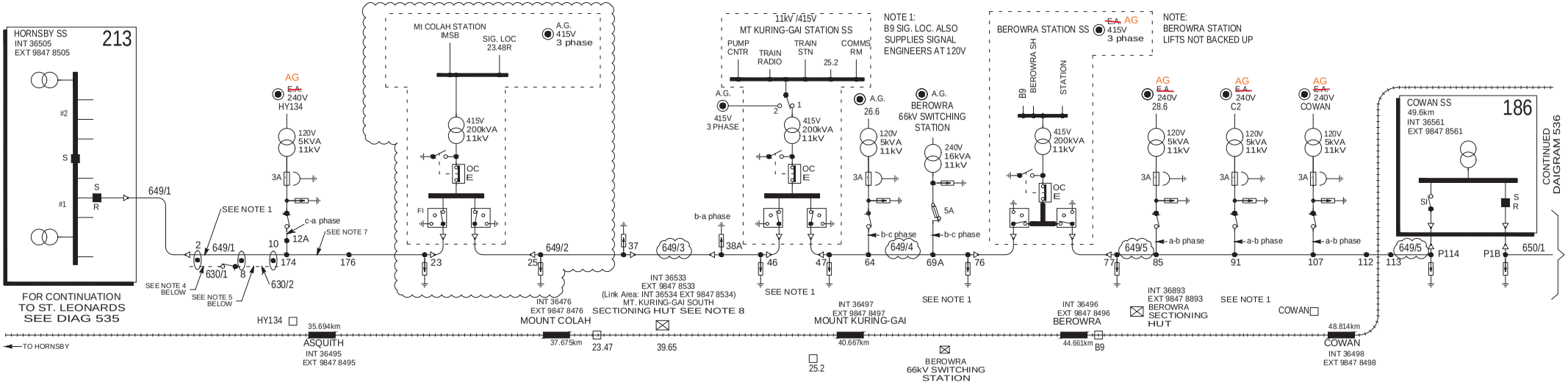
EXTRACT OF ASQUITH
HORNSBY(EXCL) - BEROWRA(EXCL)
35.150KM - 44.000KM

TRACK INSULATION PLAN
EXTRACT 1 OF 1

Appendix A3 – Proposed Operating Diagrams

THE PROPOSED NETWORK RE-CONFIGURATION HAS BEEN REVIEWED AND SIGNED IN REGARDS TO THE FOLLOWING FUNCTIONS

ORDER	FUNCTION OF SIGNING	POSITION OF SIGNATORY	AEO	PRINT NAME	SIGNATURE	DATE
1	SCOPE, FUNDING, AUTHORISED COMPETENT DESIGNER & CHECKER HAS PREPARED IN ACCORDANCE WITH STANDARDS	AUTHORISED ENGINEERING ORGANISATION REPRESENTATIVE	SYDNEY TRAINS	BRADLEY PINTO		24.11.2020
2	ENGINEERING AND SYSTEMS INTEGRITY AND STANDARDS COMPLIANCE	ENGINEERING ASSURANCE MANAGER	SMEC	GEVIK AVETIAN		23.11.2020
3	MAINTENANCE COMPATIBILITY AND OPERABILITY	ELECTRICAL ENGINEERING MANAGER - NETWORK MAINTENANCE DIVISION	SYDNEY TRAINS			
4	PROTECTION	ELECTRICAL PROTECTION ENGINEER - ENGINEERING SYSTEMS INTEGRITY	SYDNEY TRAINS	J.Yeo		30-11-2020
5	POWER SYSTEM AND NETWORK INTEGRATION	PRINCIPAL ENGINEER, POWER SYSTEMS - ENGINEERING AND SYSTEMS INTEGRITY	SYDNEY TRAINS	J.Siu		
6	ELECTRICAL SAFETY MANAGEMENT SYSTEM	MANAGER EDU ENGINEERING AND SYSTEMS INTEGRITY	SYDNEY TRAINS	Sally Bell		
7	ASSET MANAGEMENT	ASSET MANAGER ELECTRICAL - ASSET MANAGEMENT DIVISION	SYDNEY TRAINS			



PROPOSED CHANGES SHOWN WITHIN CLOUDED AREAS

REFER TO OPERATING DIAGRAM 536 ISSUE S2 FOR CONTEXT

DATE IN FORCE: 13 JUN 2022 CCR NUMBER: 14382

NOTES:

1. ICON ELECTRICAL TO NOTIFY ICON SIGNALS FOR SWITCHING OPERATIONS ON 649 11kV FEEDER
2. 650/3 & E.A. BROOKLYN FEEDER INSTALLED AS TWIN 11kV AERIAL BUNDLES CONDUCTOR ARRANGEMENT BETWEEN POLES 48 & 55
3. 650/3 FEEDER IN JOINT USE WITH 831 FEEDER BETWEEN POLES 41 & 61 INCLUSIVE
4. 630/1 (DIA.535) IN JOINT USE WITH 648/1 BETWEEN POLES 2 & 8 INCLUSIVE
5. 630/2 (DIA.535) IN JOINT USE WITH 649/1 BETWEEN POLES 8 & 10 INCLUSIVE
6. NOT TO BE OPERATED LIVE
7. 11kV FEEDER 649/1 IN JOINT USE WITH 66kV FEEDER 829 BETWEEN POLES 174 & 176 INCLUSIVE
8. 11kV FEEDER 649/2 IN JOINT USE WITH OUT OF SERVICE AERIALS OOS 649 BETWEEN POLE 38 AND 38A INCLUSIVE

*NOT TO BE OPERATED ALIVE UNLESS A PORTABLE EARTH MAT IS USED

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

B	FOR APPROVAL	Z.G/23.11.20	D.B/23.11.20	G.A/23.11.20
A	FOR APPROVAL	Z.G/11.11.20	D.B/23.11.20	G.A/23.11.20
1	ISSUED FOR REFERENCE DESIGN REVIEW	S.R/21.09.20	D.S/21.09.20	E.L/21.09.20
AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: A.H.D. | SCALE: NTS

Transport for NSW | Transport Sydney Trains

SMEC ELECTRICAL

DRAWN	IWAN SURJANATA	23.11.2020
DESIGNED	ZOE GOTTSTEIN	23.11.2020
DRG CHECK	GEORGE KENJALO	23.11.2020
DESIGN CHECK	OTAVIO BERNARDI	23.11.2020
APPROVED	GEVIK AVETIAN	11.11.2020

MT COLAH

MAIN NORTH LINE 37.635km

RAILWAY STATION FOOTBRIDGE RENEWAL

11kV SYSTEM DIAGRAM

PROPOSED 11kV SYSTEM DIAGRAM - FINAL

FILE No. 30012921-EL-011_3 | SHEET: 1 OF 1 | A1

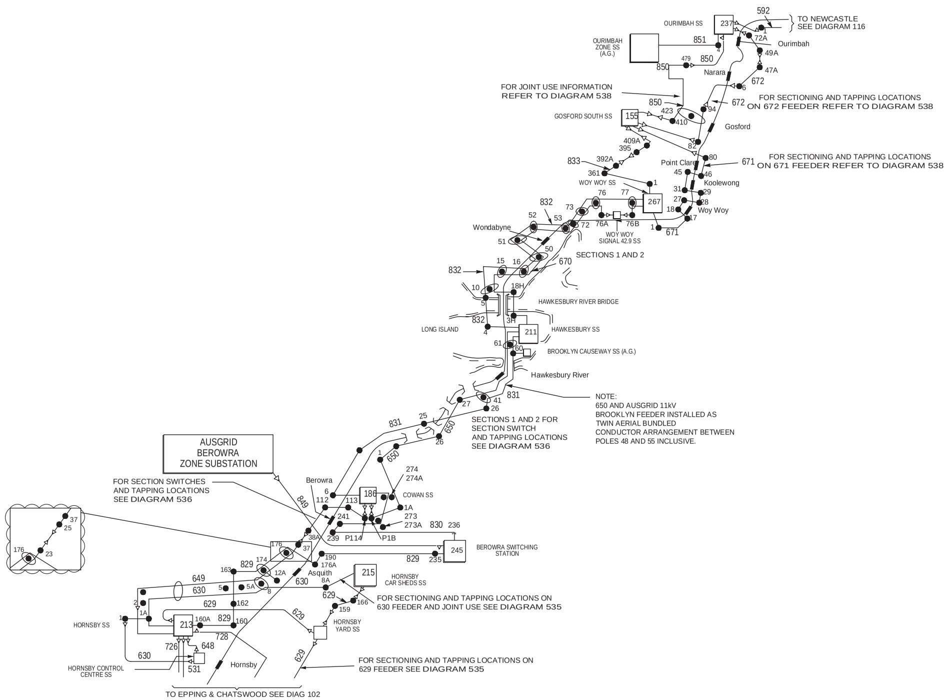
STATUS: FOR APPROVAL | ©

DRG No. 30012921-EL-011 | EDMS No. EL0795554 | A

OF 801*864

THE PROPOSED NETWORK RE-CONFIGURATION HAS BEEN REVIEWED AND SIGNED IN REGARDS TO THE FOLLOWING FUNCTIONS

ORDER	FUNCTION OF SIGNING	POSITION OF SIGNATORY	AEO	PRINT NAME	SIGNATURE	DATE
1	SCOPE, FUNDING, AUTHORISED COMPETENT DESIGNER & CHECKER HAS PREPARED IN ACCORDANCE WITH STANDARDS	AUTHORISED ENGINEERING ORGANISATION REPRESENTATIVE	SYDNEY TRAINS	BRADLEY PINTO		24.11.2020
2	ENGINEERING AND SYSTEMS INTEGRITY AND STANDARDS COMPLIANCE	ENGINEERING ASSURANCE MANAGER	SMEC	GEVIK AVETIAN	[signature]	23.11.2020
3	MAINTENANCE COMPATIBILITY AND OPERABILITY	ELECTRICAL ENGINEERING MANAGER - NETWORK MAINTENANCE DIVISION	SYDNEY TRAINS			
4	PROTECTION	ELECTRICAL PROTECTION ENGINEER - ENGINEERING SYSTEMS INTEGRITY	SYDNEY TRAINS	J.Yeo		30-11-2020
5	POWER SYSTEM AND NETWORK INTEGRATION	PRINCIPAL ENGINEER, POWER SYSTEMS - ENGINEERING AND SYSTEMS INTEGRITY	SYDNEY TRAINS	J.Siu		
6	ELECTRICAL SAFETY MANAGEMENT SYSTEM	MANAGER EDU ENGINEERING AND SYSTEMS INTEGRITY	SYDNEY TRAINS	Sally Bell		
7	ASSET MANAGEMENT	ASSET MANAGER ELECTRICAL - ASSET MANAGEMENT DIVISION	SYDNEY TRAINS			



PROPOSED CHANGES SHOWN WITHIN CLOUDED AREAS

REFER TO OPERATING DIAGRAM 115 ISSUE K2 FOR CONTEXT

DATE IN FORCE: 13 JUN 2022 CCR NUMBER: 14382

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
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A	FOR APPROVAL	Z.G/11.11.20	O.B/11.11.20	G.A/11.11.20

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: A.H.D. | SCALE: NTS

NSW GOVERNMENT Transport for NSW
NSW GOVERNMENT Transport Sydney Trains

SMEC ELECTRICAL

DRAWN IWAN SURJANATA 23.11.2020
DESIGNED ZOE GOTTSTEIN 23.11.2020
DRG CHECK GEORGE KENJALO 23.11.2020
DESIGN CHECK OTAVIO BERNARDI 23.11.2020
APPROVED GEVIK AVETIAN 11.11.2020

MT COLAH
MAIN NORTH LINE 37.635km
RAILWAY STATION FOOTBRIDGE RENEWAL
HV RETICULATION DIAGRAM
PROPOSED HV RETICULATION DIAGRAM - FINAL

FILE No. 30012921-EL-012_2 | SHEET: 1 OF 1 | A1
STATUS: FOR APPROVAL | ©
DRG No. 30012921-EL-012 | EDMS No. EL0795555 | A

DF 801*S54

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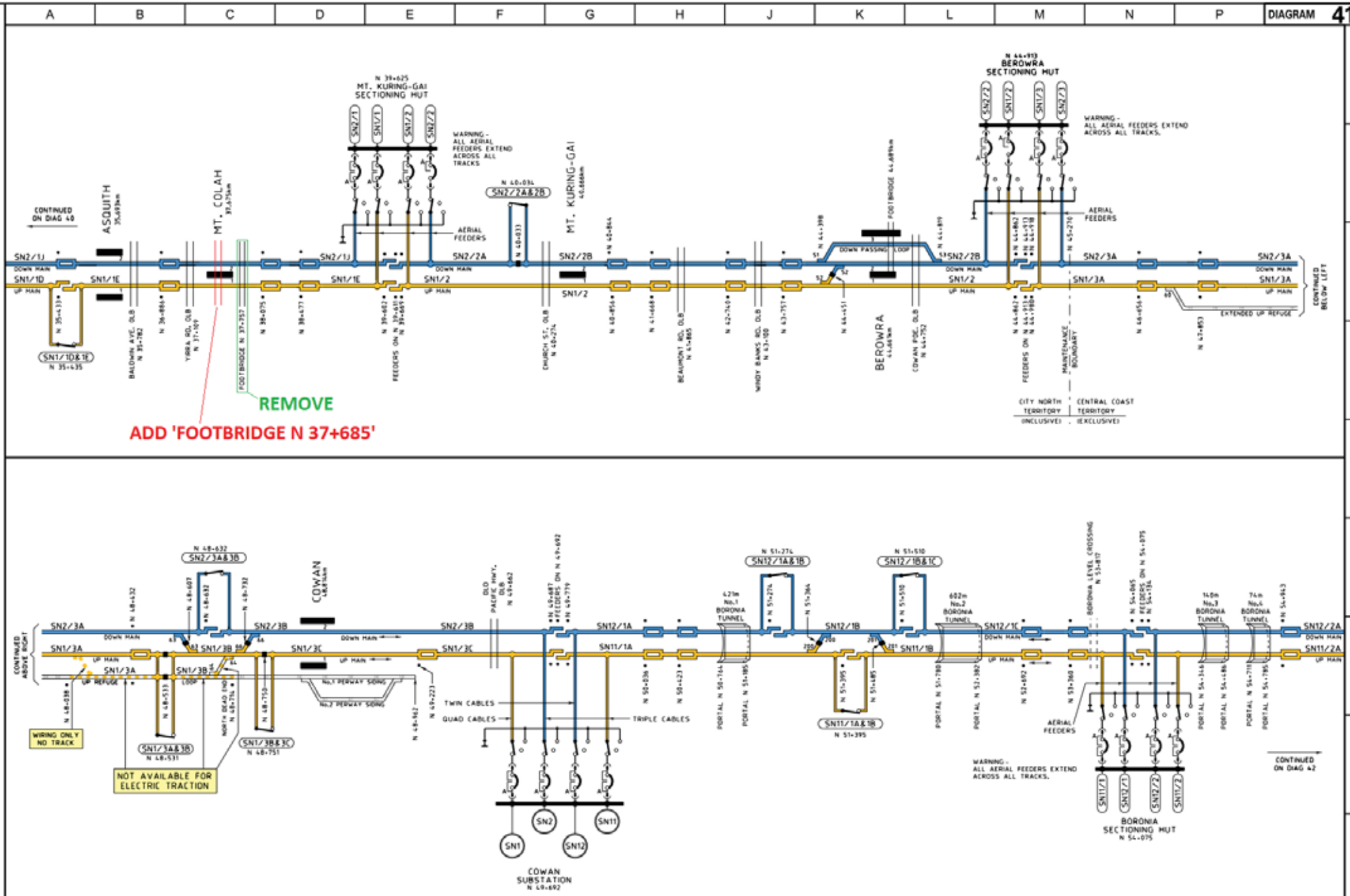

Diagrams are available on our website
HTTP://engextranet.railcorp.nsw.gov.au/
Produced and issued by Electrical Operating Diagrams Unit, 146-148 Manchester Rd. Auburn 2144.
Phone: 38096 or 38069 (internal), 9219 1066 or 9219 1069 (external).

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USER NAME rhaes
PLOT DATE 31-MAY-2019 07:33

Transport NSW Sydney Trains
MAINTENANCE DIRECTORATE

BLUE
YELLOW
BROWN
MAGENTA
GREEN
RED
BLACK TEXT WITH YELLOW HIGHLIGHT

CAD

Drn	E.S.
Ckd	G.J.
Passed	
P.G.	B.J.F.

APPROVED
R. Davies 14-12-94
PRINCIPAL ELECTRICAL ENGINEER - S.R.A.
THE SIGNATURES TO THE LEFT AND ABOVE REFER TO THE ORIGINAL ISSUE OF THIS DIAGRAM

LAST AMENDED TO ADVICE CNT066

Drn	R.H.	Ckd	J.T.
Passed	G.F. 30-05-19		

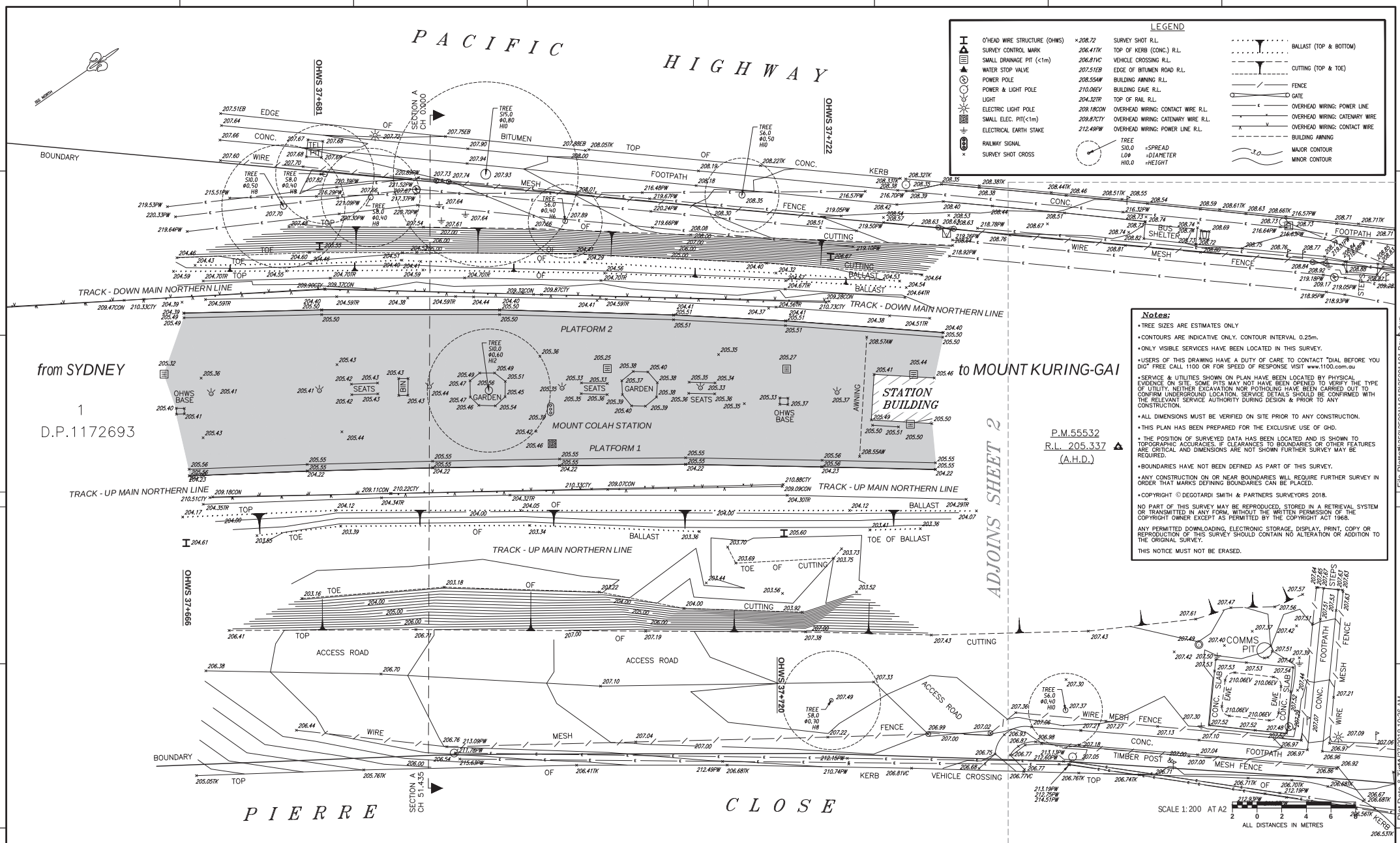
ASQUITH TO BORONIA
1500 VOLT SECTIONING DIAGRAM

DATE IN FORCE 10-06-19
TIME IN FORCE 20:00 Hrs
№ EL 0015109
ISSUE T1
DIAGRAM 41

TO BE PRINTED IN COLOUR ON A3 MINIMUM
UNCONTROLLED WHEN PRINTED

Appendix B Site Survey

Appendix B1 – Degotardi, Smith and Partners 2018 survey (GHD Concept Design)



LEGEND

- O'HEAD WIRE STRUCTURE (OHWS)
- SURVEY CONTROL MARK
- SMALL DRAINAGE PIT (<1m)
- WATER STOP VALVE
- POWER POLE
- POWER & LIGHT POLE
- LIGHT
- ELECTRIC LIGHT POLE
- SMALL ELEC. PIT(<1m)
- ELECTRICAL EARTH STAKE
- RAILWAY SIGNAL
- SURVEY SHOT CROSS
- SURVEY SHOT R.L.
- TOP OF KERB (CONC.) R.L.
- VEHICLE CROSSING R.L.
- EDGE OF BITUMEN ROAD R.L.
- BUILDING AWNING R.L.
- BUILDING EAVE R.L.
- TOP OF RAIL R.L.
- OVERHEAD WIRING: CONTACT WIRE R.L.
- OVERHEAD WIRING: CATENARY WIRE R.L.
- OVERHEAD WIRING: POWER LINE R.L.
- TREE SI0.0 =SPREAD, I.0 =DIAMETER, HI0.0 =HEIGHT
- BALLAST (TOP & BOTTOM)
- CUTTING (TOP & TOE)
- FENCE
- GATE
- OVERHEAD WIRING: POWER LINE
- OVERHEAD WIRING: CATENARY WIRE
- OVERHEAD WIRING: CONTACT WIRE
- BUILDING AWNING
- MAJOR CONTOUR
- MINOR CONTOUR

Notes:

- TREE SIZES ARE ESTIMATES ONLY
- CONTOURS ARE INDICATIVE ONLY. CONTOUR INTERVAL 0.25m.
- ONLY VISIBLE SERVICES HAVE BEEN LOCATED IN THIS SURVEY.
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SCALE 1: 200 AT A2

ALL DISTANCES IN METRES

AMD	DESCRIPTION	SURVEYOR SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
A	EXTRA DETAIL ADDED	G.S. 27/11/18	G.S. 27/11/18	G.S. 27/11/18
A	FINAL ISSUE	G.S. 05/11/18	G.S. 05/11/18	G.S. 05/11/18

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1 : 200

NSW GOVERNMENT Transport for NSW

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PYMBLE NSW 2073
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THIS DRAWING HAS BEEN CREATED FOR SYDNEY TRAIN

DRAWN [redacted]
SURVEYED [redacted]
DRG CHECK [redacted]
DESIGN CHECK
APPROVED

MOUNT COLAH STATION

SYDNEY MAIN NORTHERN LINE (APPROX. 37 + 720)

DETAIL & LEVELS OVER PART OF MOUNT COLAH STATION

MOUNT COLAH, NSW

FILE No. 35091 | SHEET: 1 OF 3 | A2

STATUS: FINAL ISSUE ©

DRG No. 35091A01.DWG | B | EDMS No.

DF 564*400

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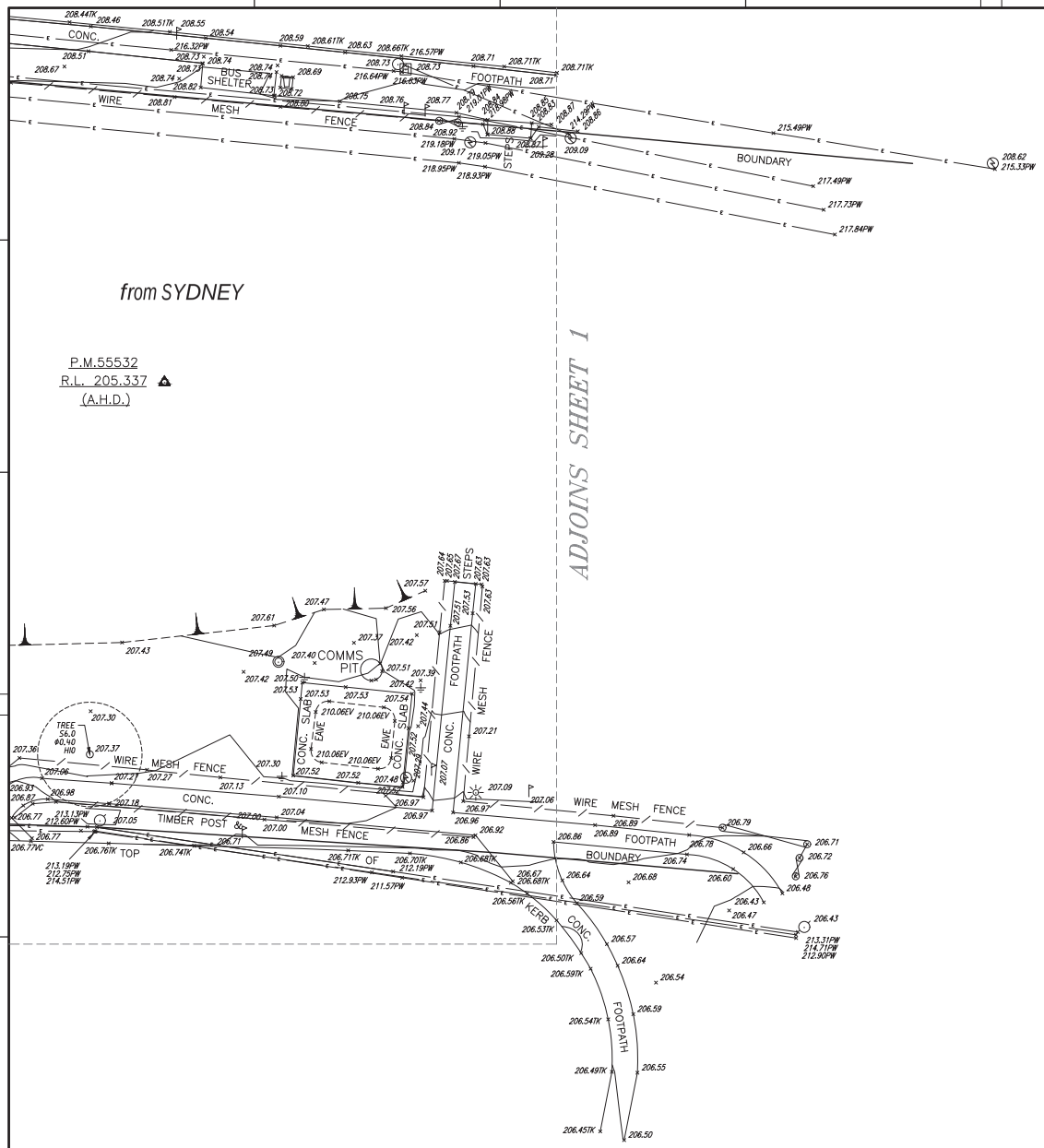
Plotted by: SHIRI



LEGEND

O'HEAD WIRE STRUCTURE (OHWS)	×208.72	SURVEY SHOT R.L.		BALLAST (TOP & BOTTOM)	
SURVEY CONTROL MARK	206.41TK	TOP OF KERB (CONC.) R.L.		CUTTING (TOP & TOE)	
SMALL DRAINAGE PIT (<1m)	206.81VC	VEHICLE CROSSING R.L.		FENCE	
WATER STOP VALVE	207.51EB	EDGE OF BITUMEN ROAD R.L.		GATE	
POWER POLE	208.55AW	BUILDING AWNING R.L.		OVERHEAD WIRING: POWER LINE	
POWER & LIGHT POLE	210.06EV	BUILDING EAVE R.L.		OVERHEAD WIRING: CATENARY WIRE	
LIGHT	204.32TR	TOP OF RAIL R.L.		OVERHEAD WIRING: CONTACT WIRE	
ELECTRIC LIGHT POLE	209.18CON	OVERHEAD WIRING: CONTACT WIRE R.L.		BUILDING AWNING	
SMALL ELEC. PIT(<1m)	209.87CTY	OVERHEAD WIRING: CATENARY WIRE R.L.		MAJOR CONTOUR	
ELECTRICAL EARTH STAKE	212.49PW	OVERHEAD WIRING: POWER LINE R.L.		MINOR CONTOUR	
RAILWAY SIGNAL		TREE S10.0 =SPREAD, I.0Ø =DIAMETER, H10.0 =HEIGHT			
SURVEY SHOT CROSS					

Notes:

- TREE SIZES ARE ESTIMATES ONLY
- CONTOURS ARE INDICATIVE ONLY. CONTOUR INTERVAL 0.25m.
- ONLY VISIBLE SERVICES HAVE BEEN LOCATED IN THIS SURVEY.
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SCALE 1: 200 AT A2

2 0 2 4 6 8

ALL DISTANCES IN METRES

AMD	DESCRIPTION	SURVEYOR SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
A	EXTRA DETAIL ADDED	G.S. 27/11/18	G.S. 27/11/18	G.S. 27/11/18
A	FINAL ISSUE	G.S. 05/11/18	G.S. 05/11/18	G.S. 05/11/18

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1 : 200

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THIS DRAWING HAS BEEN CREATED FOR SYDNEY TRAIN

DRAWN [redacted]
SURVEYED [redacted]
DRG CHECK [redacted]
DESIGN CHECK
APPROVED

MOUNT COLAH STATION

SYDNEY MAIN NORTHERN LINE (APPROX. 37 + 720)

DETAIL & LEVELS OVER PART OF MOUNT COLAH STATION

MOUNT COLAH, NSW

FILE No. 35091 | SHEET: 2 OF 3 | A2

STATUS: FINAL ISSUE ©

DRG No. 35091A01.DWG | B | EDMS No.

DF 564*400

Plotted by:SHIRI
Plot Date & Time:27/2018 10:36 AM
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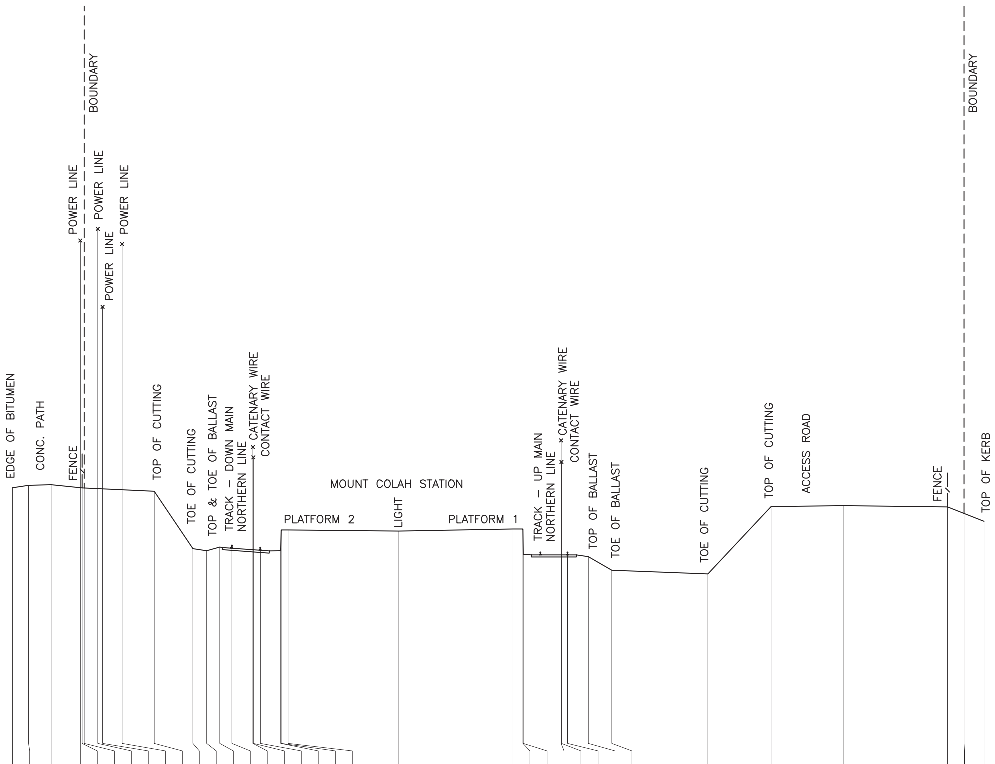

DATUM R.L.193.000

EXISTING LEVEL	CHAINAGE
207.734	0.000
207.862	0.840
207.898	2.037
220.827	3.586
207.728	3.676
-	3.793
221.447	4.506
217.312	4.766
220.643	5.796
207.549	7.493
204.512	9.549
204.404	10.272
204.593	10.972
204.699	11.611
209.884	12.718
209.348	12.747
204.588	13.118
204.401	14.196
205.501	14.216
205.501	14.586
205.438	20.452
205.549	26.497
205.549	27.022
204.219	27.042
210.239	29.041
209.102	29.058
204.333	29.382
204.085	30.480
203.368	31.731
203.175	36.817
206.739	40.165
206.788	43.981
206.717	49.506
-	50.378
205.955	51.435

CROSS SECTION A
HZ & VER. SCALE 1:200

SCALE 1: 200 AT A2
2 0 2 4 6 8
ALL DISTANCES IN METRES

AMD	DESCRIPTION	SURVEYOR SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
A	EXTRA DETAIL ADDED	G.S. 27/11/18	G.S. 27/11/18	G.S. 27/11/18
A	FINAL ISSUE	G.S. 05/11/18	G.S. 05/11/18	G.S. 05/11/18

CO-ORDINATE SYSTEM: ISG HEIGHT DATUM: AHD SCALE: 1 : 200

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DRAWN [redacted] [redacted]
SURVEYED [redacted] [redacted]
DRG CHECK [redacted] [redacted]
DESIGN CHECK
APPROVED

THIS DRAWING HAS BEEN CREATED FOR SYDNEY TRAIN

MOUNT COLAH STATION
SYDNEY MAIN NORTHERN LINE (APPROX. 37+720)
DETAIL & LEVELS OVER PART OF MOUNT COLAH STATION
MOUNT COLAH, NSW

FILE No. 35091 SHEET: 3 OF 3 A2
STATUS: FINAL ISSUE ©
DRG No. 35091A01.DWG B EDMS No.

File Plotted: \350\35091\ACAD\35091A01 Rev B.dwg
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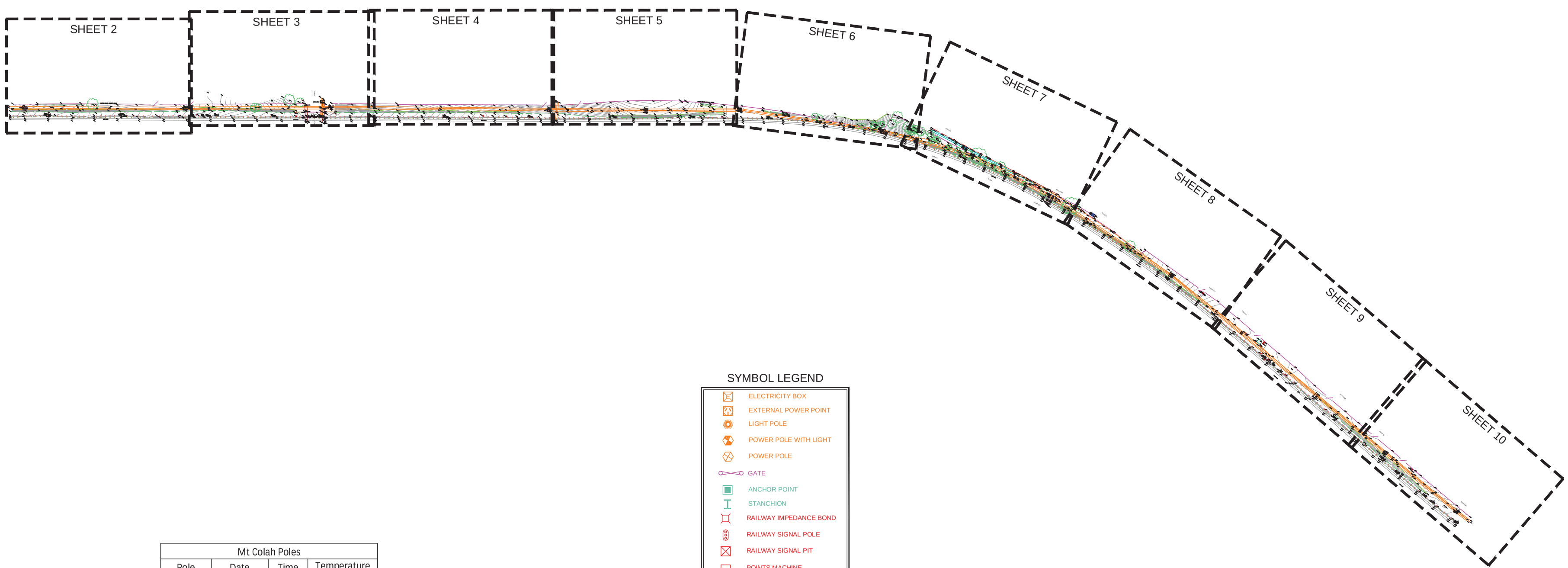
Plotted by: SHIRI
DF 564*400

Appendix B2 – Cardno July 2019 survey (AECOM 11kV Relocation Concept Design)



Mt Colah Poles

Pole	Date	Time	Temperature
29-28A	9/06/2019	8:30	10.6°C
28A-28	9/06/2019	7:30	9.7°C
28-27	8/06/2019	8:40	10.6°C
27-26	8/06/2019	10:00	14.5°C
26-25	8/06/2019	12:00	18.7°C
25-24	8/06/2019	13:40	19.5°C
24-23	9/06/2019	10:15	12.7°C
23-22A	9/06/2019	11:45	12.7°C
22A-22	9/06/2019	12:30	13.0°C
22-21	9/06/2019	13:30	13.6°C
21-20	14/06/2019	8:25	10.3°C
20-19	14/06/2019	10:45	13.7°C

SYMBOL LEGEND

- ELECTRICITY BOX
- EXTERNAL POWER POINT
- LIGHT POLE
- POWER POLE WITH LIGHT
- POWER POLE
- GATE
- ANCHOR POINT
- STANCHION
- RAILWAY IMPEDANCE BOND
- RAILWAY SIGNAL POLE
- RAILWAY SIGNAL PIT
- POINTS MACHINE
- TUNING UNIT
- RUBBISH BIN
- BOLLARD
- KILOMETRE POST
- TRAFFIC LIGHTS
- SIGN
- TOP OF POLE
- UNCLASSIFED UTILITY
- WATER METER
- TREE: 0.1 Ø — TRUNK DIAMETER; 1 S — TREE SPREAD; 1 H — TREE HEIGHT

LINETYPE LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
- EDGE OF BITUMEN
- FENCE
- TOE OF BANK
- TOP OF BANK
- BOTTOM OF BALLAST
- TOP OF BALLAST
- AERIAL ELECTRICITY LINE

CODE LEGEND

IK	DENOTES INVERT OF KERB
TK	DENOTES TOP OF KERB
INP	DENOTES INVERT OF PIT
BUN	DENOTES BRIDGE UNDERSTRUCTURE

SCHEDULE OF SURVEY CONTROL MARKS

	CO-ORDINATES (ISG)		A.H.D
MARK	EASTING	NORTHING	LEVEL
B/B 36+888	310 304.446	1 272 008.634	192.46
PM 55531	310 467.587	1 272 674.261	205.179
T/S TLP 38+181	310 897.550	1 273 098.087	200.017

0 40 60 80 120 160 200
SCALE 1: 2000 @ A1

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1	ORIGINAL ISSUE			JB 08.07.2019

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1:200

NSW GOVERNMENT | Transport for NSW
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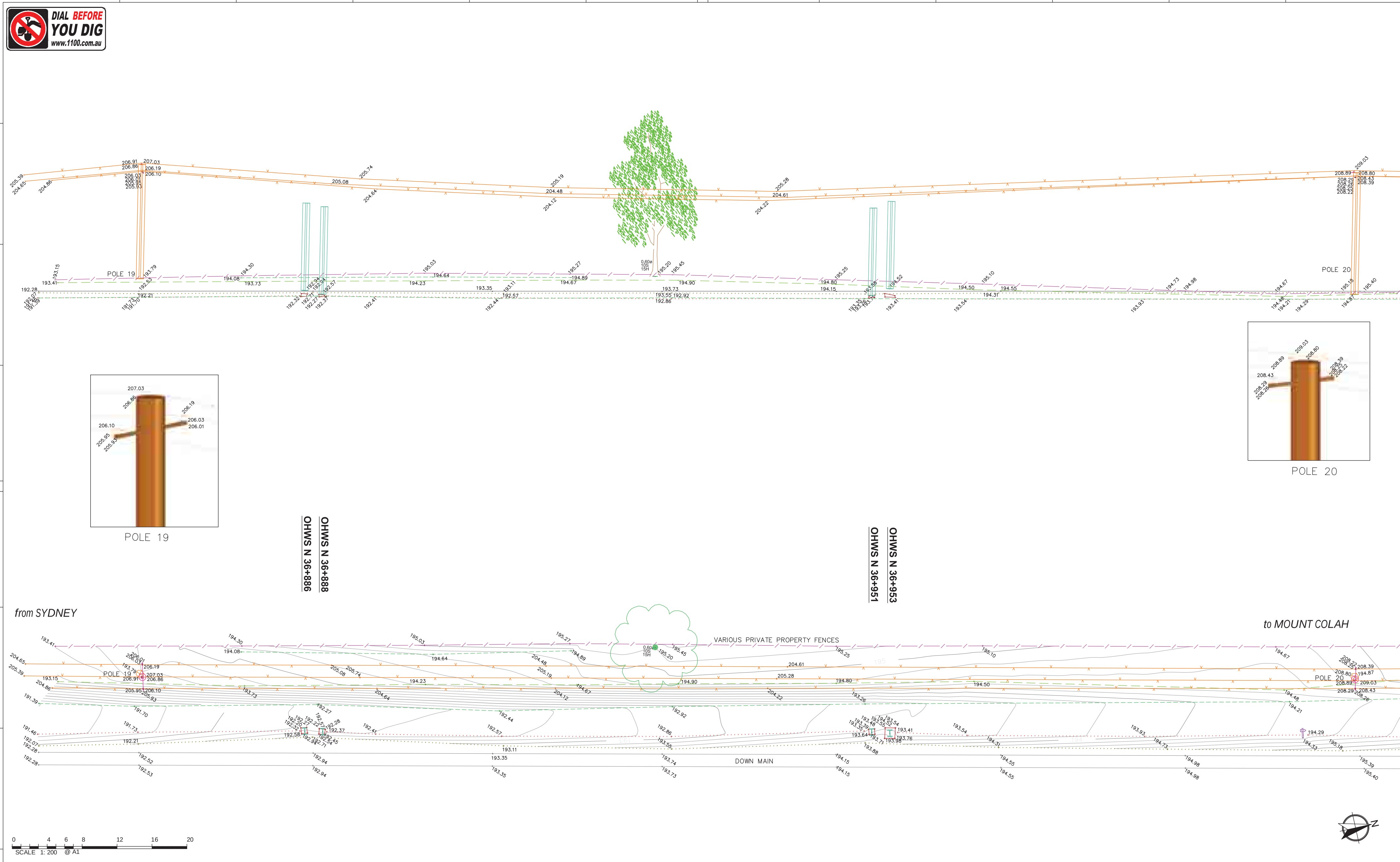
DRAWN
SURVEYED
DRG CHECK
DESIGN CHECK
APPROVED
[redacted]

MOUNT COLAH
MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

DETAIL SURVEY
FILE No. 11892301001-01.dwg | SHEET: 1 OF 10 | A1
STATUS: ©
DRG No. 11892301001 | 1 | EDMS No.

DF 801*554

File Plotted\\AURCKCFS01\e-drive\Projects\1189\11892301 Mount Colah HV Feeder\Drawings\11892301001.dwg
Plot Date & Time 7/8/2019 1:36 PM
Plotted by DANIEL.LEES



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1	ORIGINAL ISSUE			JB 08.07.2019

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1:200

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MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

[redacted] ETAIL SURVEY
[redacted] ILE No. 11892301001-01.dwg | SHEET: 2 OF 10 | A1
[redacted] TATUS: | ©
[redacted] RG No. 11892301001 | 1 | EDMS No.

DF 801*554

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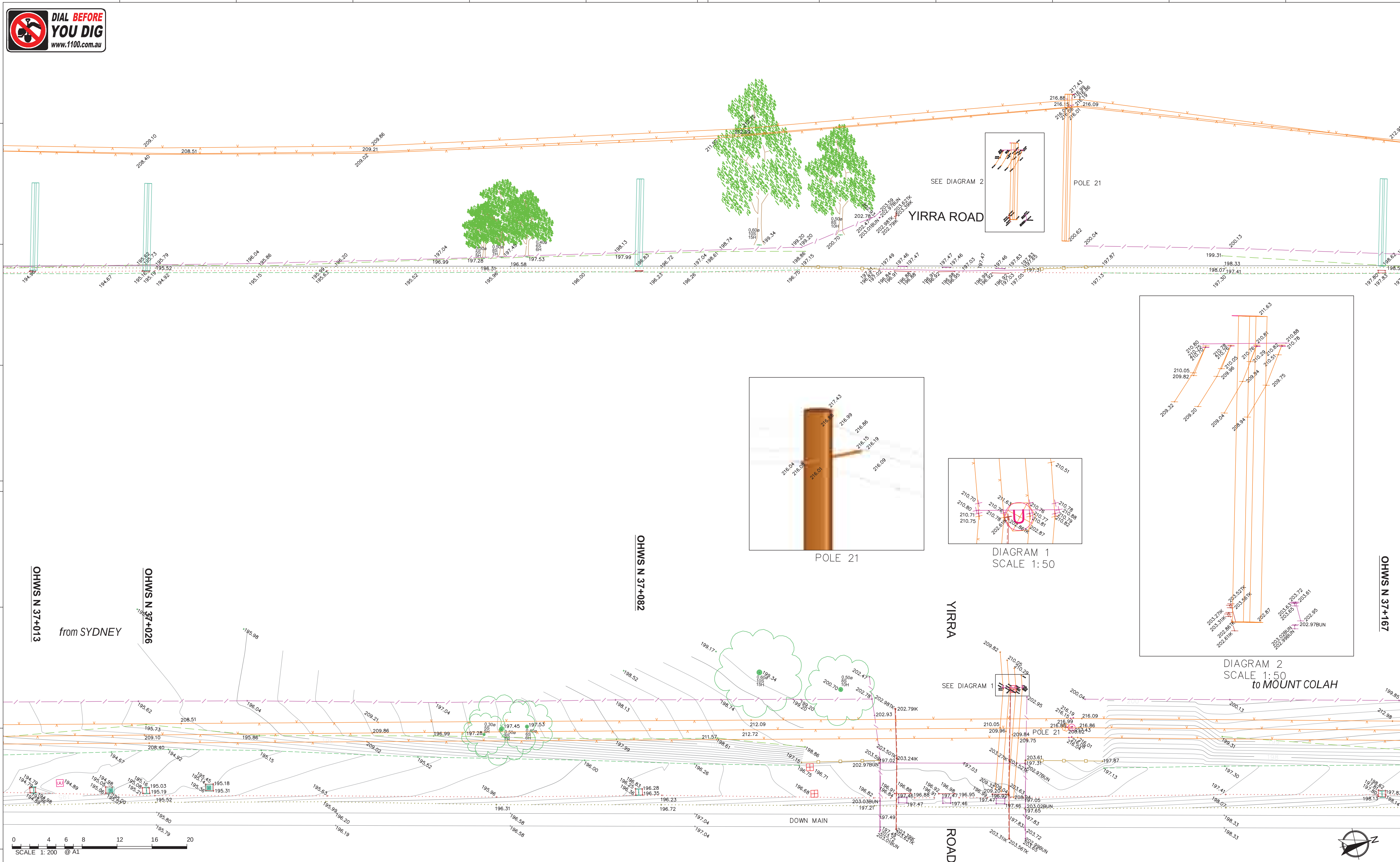
Plotted by DANIEL LEES



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1	ORIGINAL ISSUE			JB 08.07.2019

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1:200

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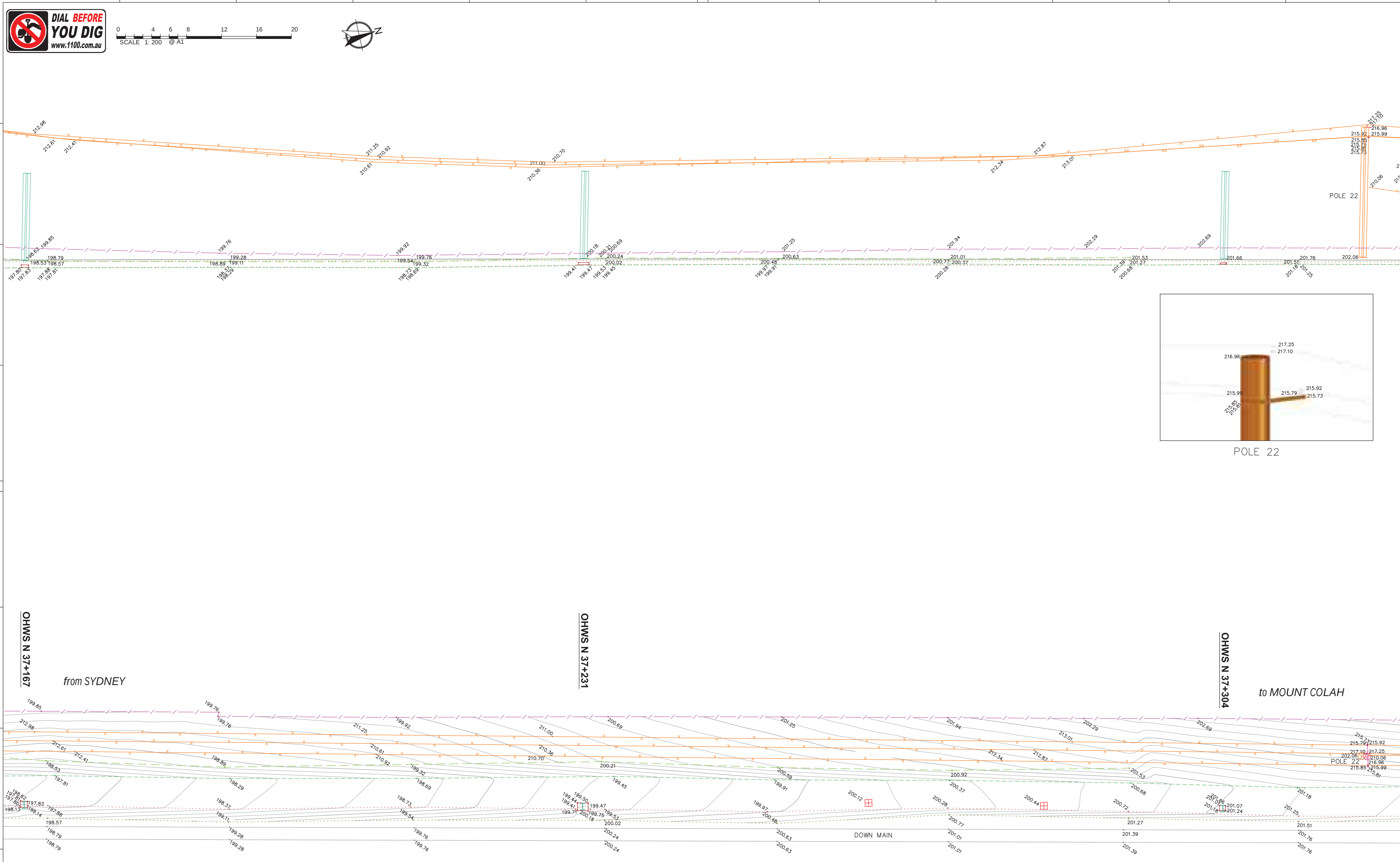
[redacted]

MOUNT COLAH
MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

DETAIL SURVEY
FILE No. 11892301001-01.dwg | SHEET: 3 OF 10 | A1
STATUS: ©
DRG No. 11892301001 | 1 | EDMS No.

DF 801*554

Plotted by DANIEL.LEES
Plot Date & Time 8/2019 1:38 PM



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[redacted]

MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km

AERIAL FEEDER

DETAIL SURVEY

FILE No. 11892301001-01.dwg | SHEET: 4 OF 10 | A1

STATUS: ©

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Plot Date & Time7/8/2019 1:38 PM

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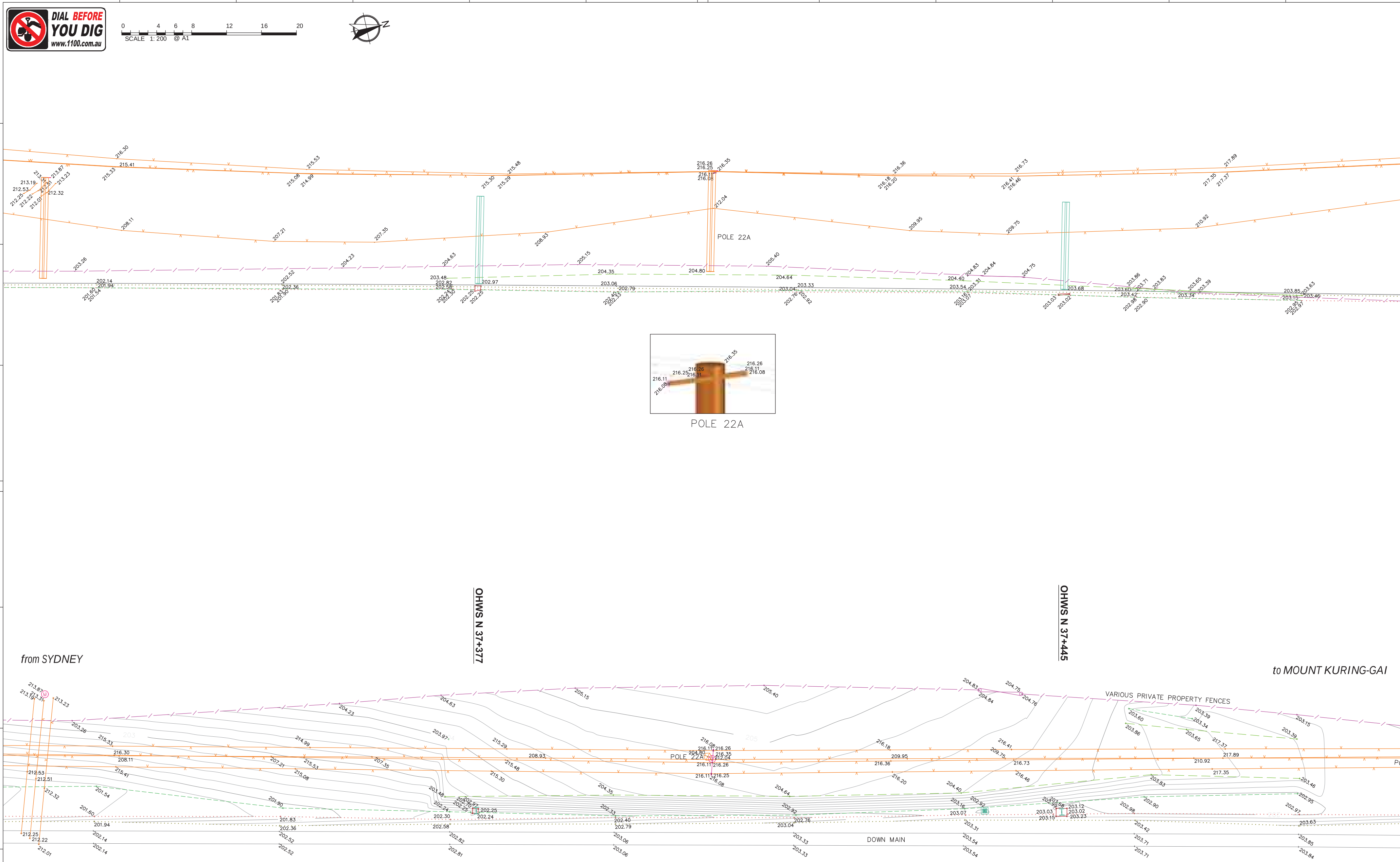

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MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km

AERIAL FEEDER

DETAIL SURVEY

FILE No. 11892301001-01.dwg | SHEET: 5 OF 10 | A1

STATUS: ©

DRG No. 11892301001 | 1 | EDMS No.

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[redacted]

MOUNT COLAH
MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

DETAIL SURVEY
FILE No. 11892301001-01.dwg SHEET: 6 OF 10 A1
STATUS: ©
DRG No. 11892301001 1 EDMS No.

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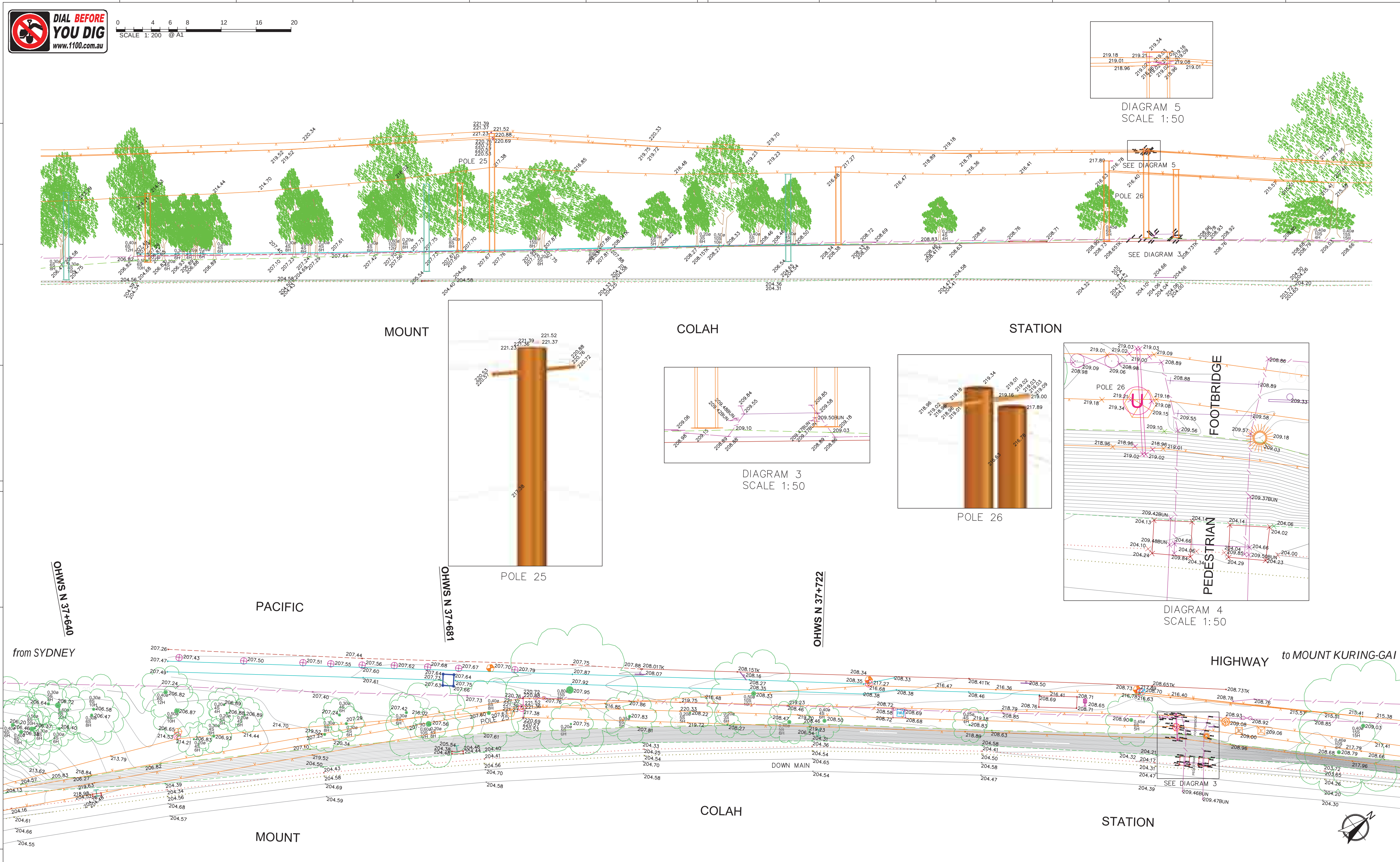
Plot Date & Time 7/8/2019 1:40 PM
Plotted by DANIEL LEES
DF 801*554



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MOUNT COLAH
MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

DETAIL SURVEY

FILE No. 11892301001-01.dwg	SHEET: 7 OF 10	A1
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DRG No. 11892301001	1	EDMS No.

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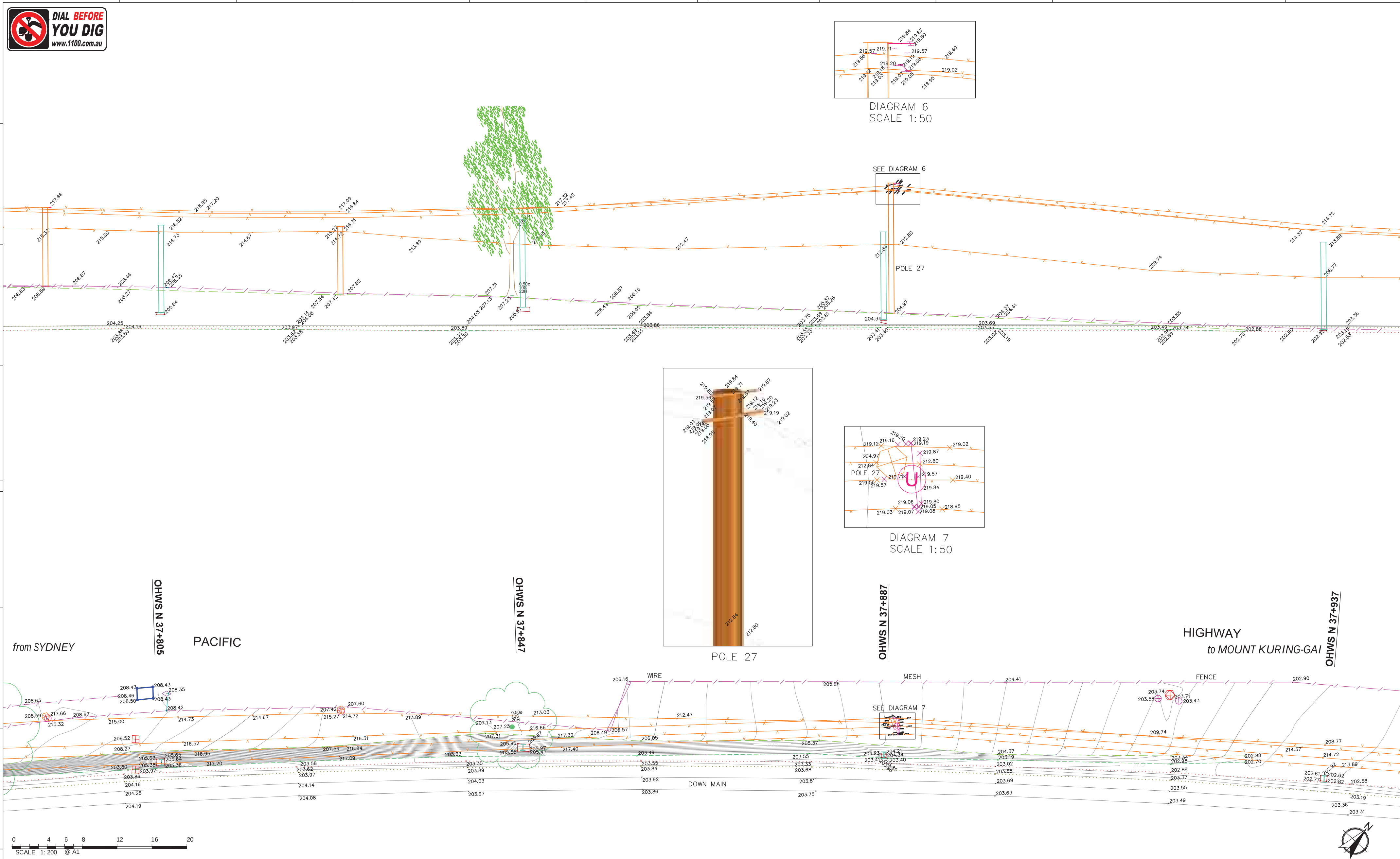

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MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km
AERIAL FEEDER

DETAIL SURVEY
FILE No. 11892301001-01.dwg | SHEET: 8 OF 10 | A1
STATUS: ©
DRG No. 11892301001 | 1 | EDMS No.

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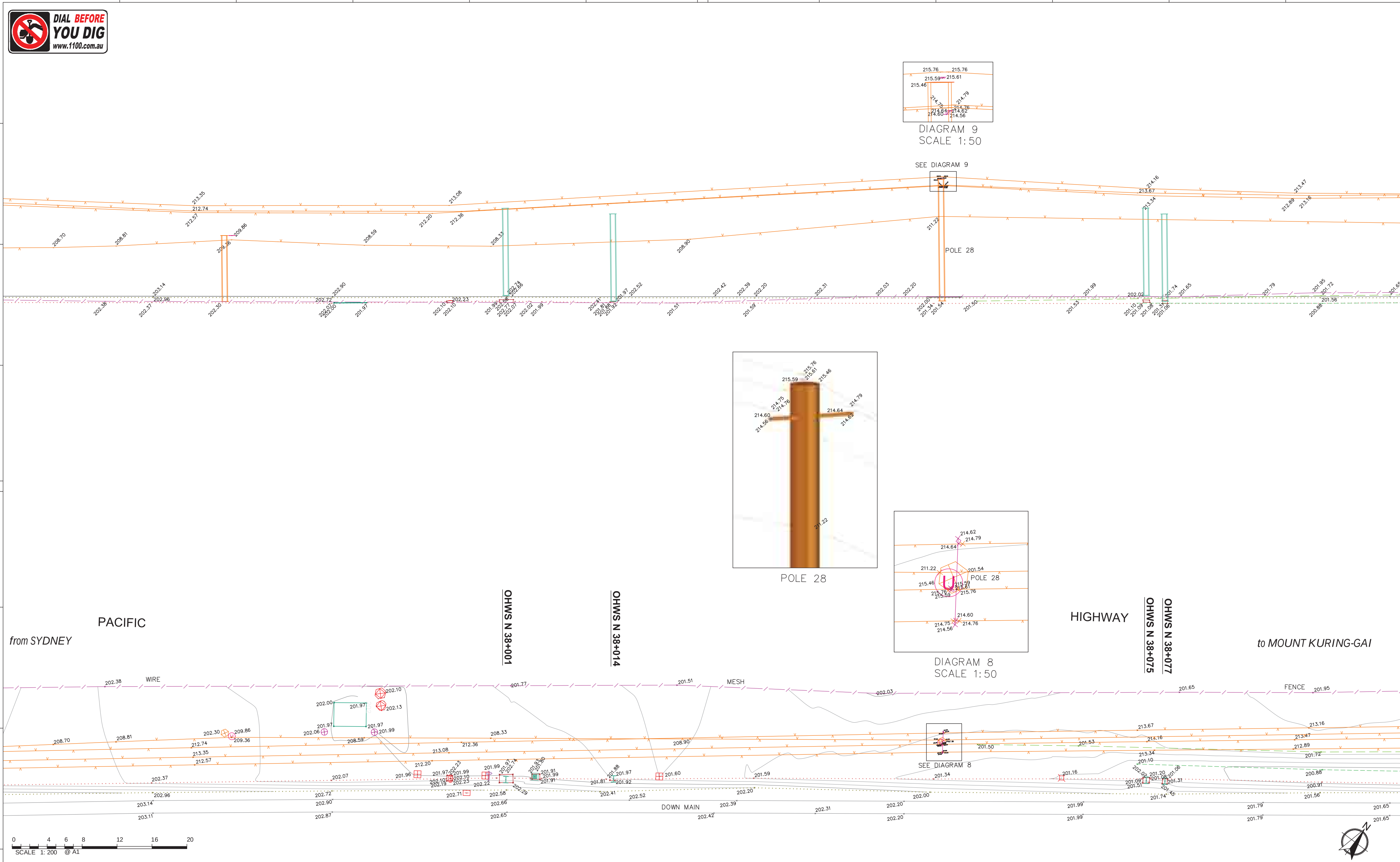
Plot Date & Time 7/8/2019 1:43 PM
Plotted by DANIEL LEES



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[redacted]

MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km

AERIAL FEEDER

DETAIL SURVEY

FILE No. 11892301001-01.dwg | SHEET: 9 OF 10 | A1

STATUS: ©

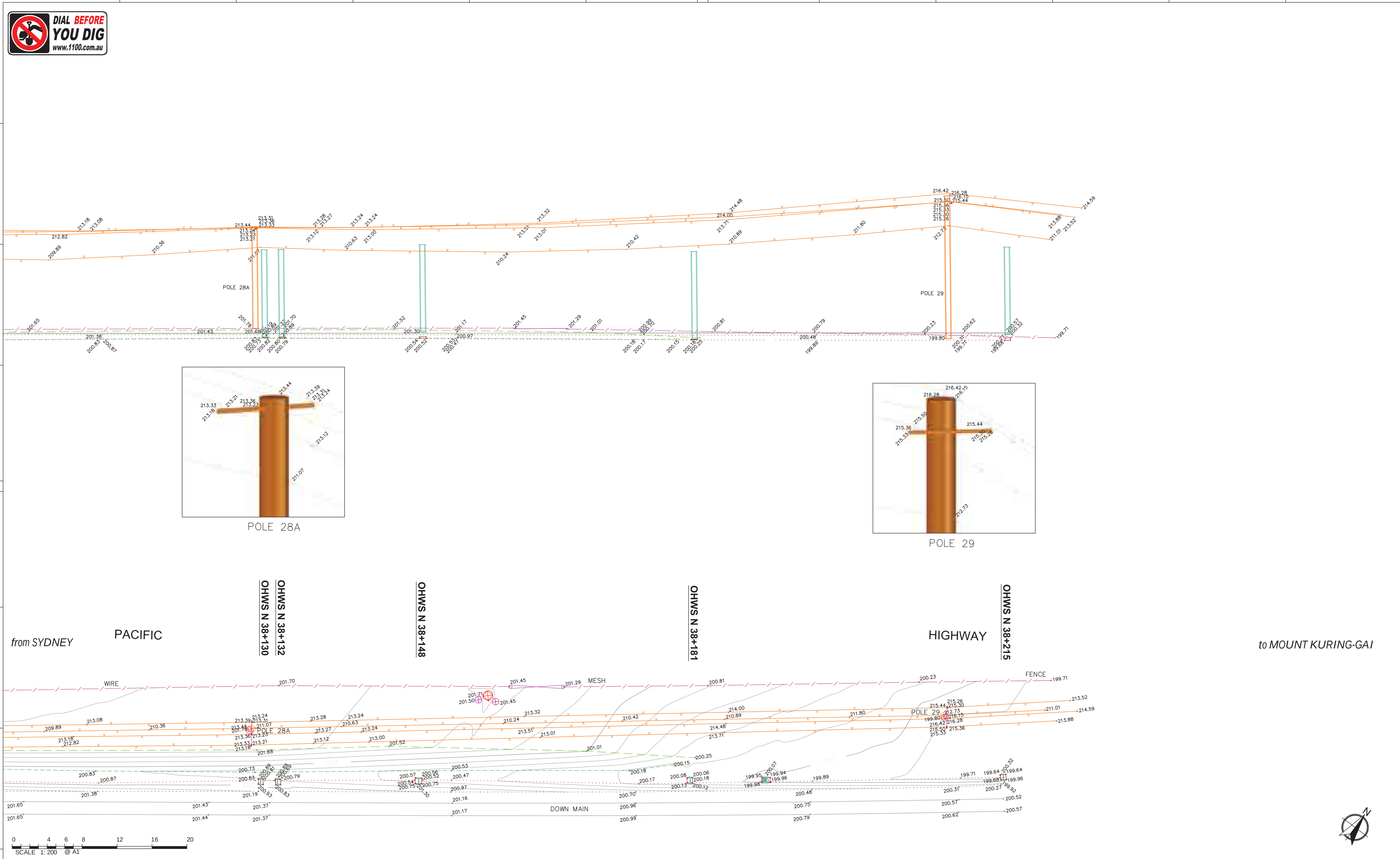
DRG No. 11892301001 | 1 | EDMS No.

File Plotted\AURCKCFS01\e-drive\Projects\118\11892301001 Mount Colah HV Feeder\Drawings\11892301001.dwg

Plot Date & Time 8/8/2019 1:45 PM

Plotted by DANIEL LEES

DF 801*554



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MOUNT COLAH

MAIN NORTH LINE 36.856km TO 38.215km

AERIAL FEEDER

[redacted]

DETAIL SURVEY

FILE No. 11892301001-01.dwg | SHEET: 10 OF 10 | A1

STATUS: ©

DRG No. 11892301001 | 1 | EDMS No.

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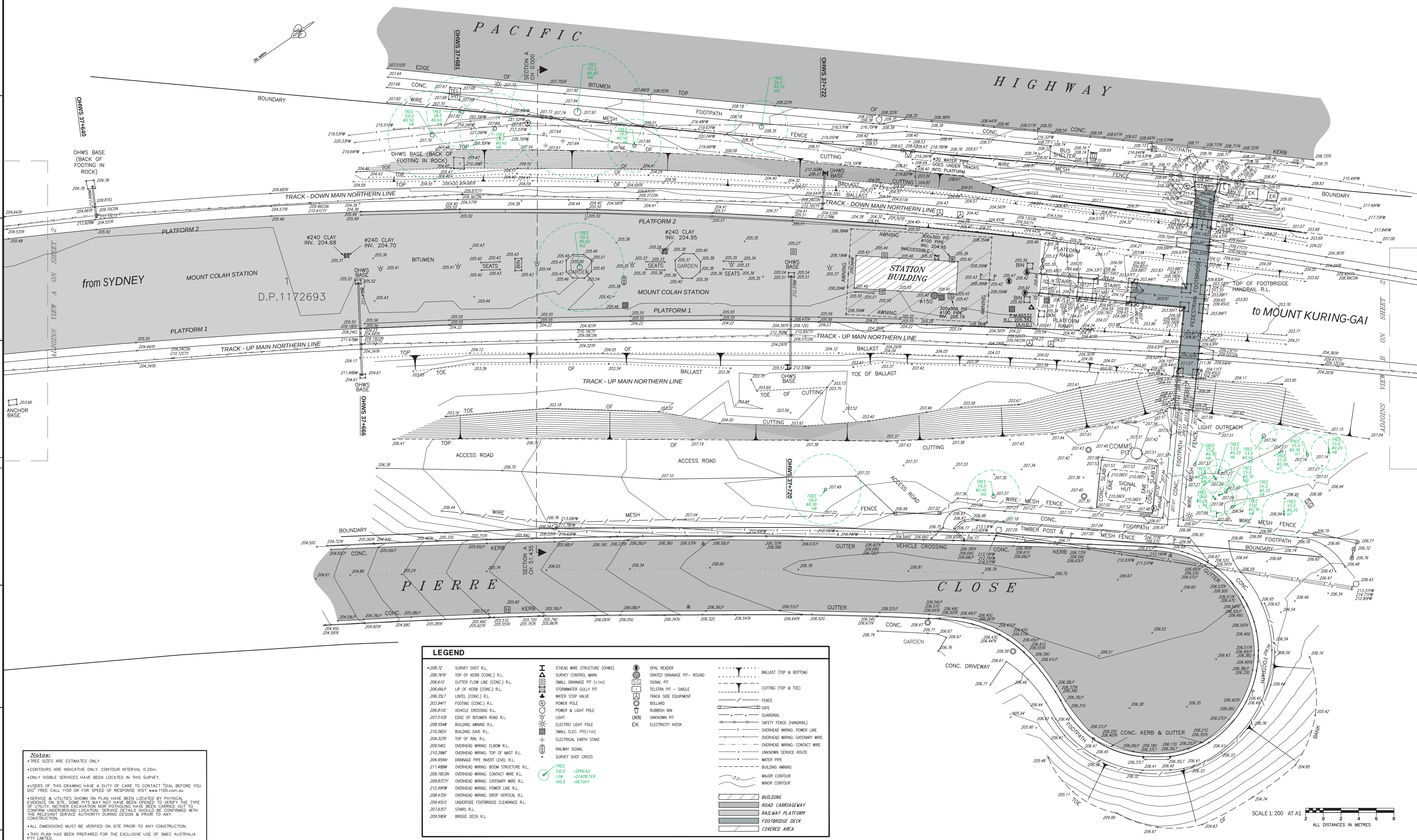
Plot Date & Time7/8/2019 1:45 PM

Plotted by DANIEL LEES

Appendix B3 - Degotardi, Smith and Partners 2020 Survey (SMEC Reference Design)



Notes:

- TREE SIZES ARE ESTIMATES ONLY
- CONTOURS ARE INDICATIVE ONLY. CONTOUR INTERVAL 0.25m.
- ONLY VISIBLE SERVICES HAVE BEEN LOCATED IN THIS SURVEY.
- USERS OF THIS DRAWING HAVE A DUTY OF CARE TO CONTACT "DIAL BEFORE YOU DIG" FREE CALL 1100 OR FOR SPEED OF RESPONSE VISIT www.1100.com.au
- SERVICE & UTILITIES SHOWN ON PLAN HAVE BEEN LOCATED BY PHYSICAL EVIDENCE ON SITE. SOME PITS MAY NOT HAVE BEEN OPENED TO VERIFY THE TYPE OF UTILITY. NEITHER EXCAVATION NOR POTHOLING HAVE BEEN CARRIED OUT TO CONFIRM UNDERGROUND LOCATION. SERVICE DETAILS SHOULD BE CONFIRMED WITH THE RELEVANT SERVICE AUTHORITY DURING DESIGN & PRIOR TO ANY CONSTRUCTION.
- ALL DIMENSIONS MUST BE VERIFIED ON SITE PRIOR TO ANY CONSTRUCTION.
- THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF SMEC AUSTRALIA PTY LIMITED.
- THE POSITION OF SURVEYED DATA HAS BEEN LOCATED AND IS SHOWN TO TOPOGRAPHIC ACCURACIES. IF CLEARANCES TO BOUNDARIES OR OTHER FEATURES ARE CRITICAL AND DIMENSIONS ARE NOT SHOWN FURTHER SURVEY MAY BE REQUIRED.
- BOUNDARIES HAVE NOT BEEN DEFINED AS PART OF THIS SURVEY.
- ANY CONSTRUCTION ON OR NEAR BOUNDARIES WILL REQUIRE FURTHER SURVEY IN ORDER THAT MARKS DEFINING BOUNDARIES CAN BE PLACED.

AMD	DESCRIPTION	SURVEYOR		
B	FINAL ISSUE	[redacted]	[redacted]	[redacted]
A	PRELIMINARY ISSUE	[redacted]	[redacted]	[redacted] 20

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1 : 200

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1/9-11 BRIDGE STREET
PYMBLE NSW 2073
+61 2 9440 1100
www.degotardi.com.au

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DRAWN	KEYVAN SHIRI	20/08/2020
SURVEYED	GRANT SCANLAN / NICHOLAS FAIRBANKS	04/08/2020
DRG CHECK	GRANT SCANLAN	20/08/2020
DESIGN CHECK		
APPROVED		

MOUNT COLAH STATION

SYDNEY MAIN NORTHERN LINE (APPROX. N 37+570 to N37+846)

DETAIL & LEVELS OVER MOUNT COLAH STATION & OVERHEAD WIRING

MOUNT COLAH, NSW

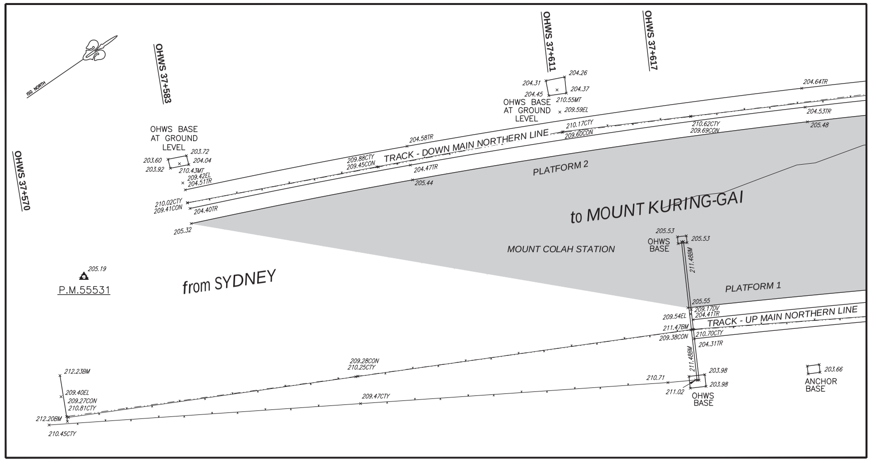
FILE No. 35542 | SHEET: 1 OF 2 | A1

STATUS: FINAL ISSUE ©

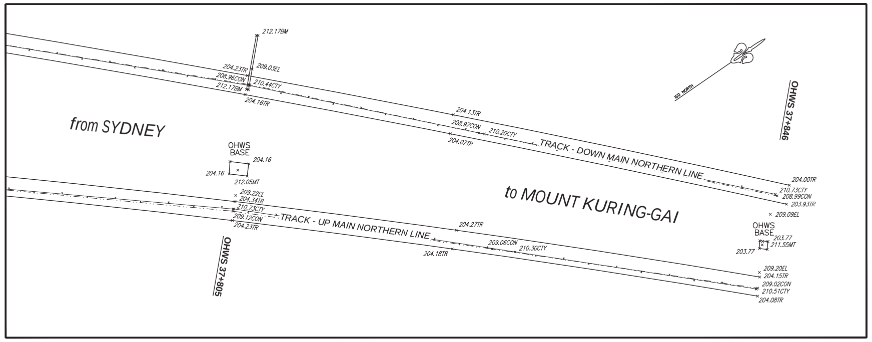
DRG No. 35542A01.DWG | B | EDMS No.

DF 801*554

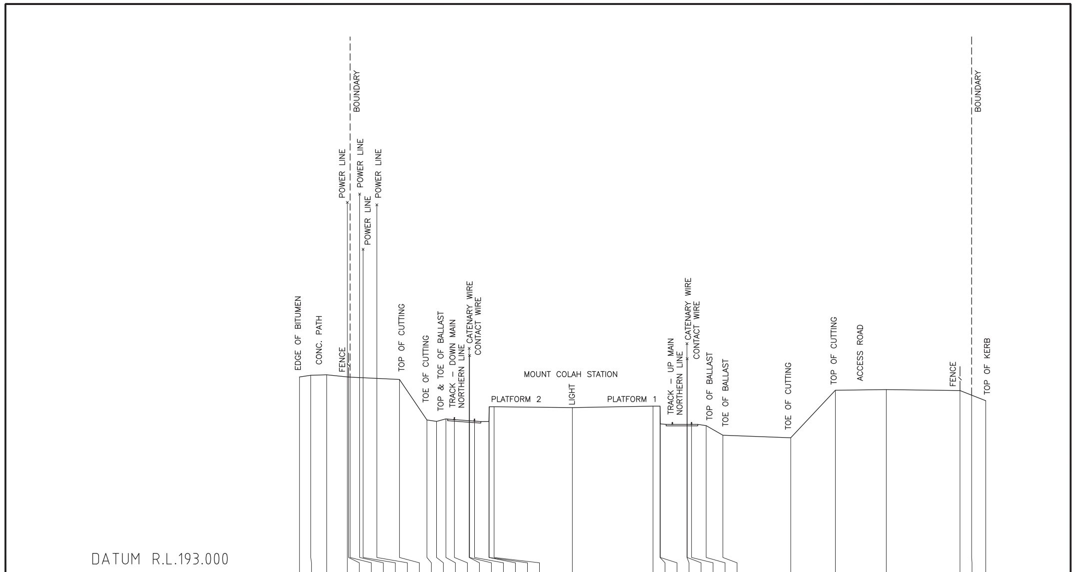
Plotted by KSHIRI | Plot Date & Time 8/21/2020 8:56 AM | File Plotted



PLAN VIEW A
SCALE 1:200



PLAN VIEW B
SCALE 1:200



EXISTING LEVEL	207.734	207.862	207.898	220.827	207.728	-	221.447	217.312	220.643	207.549	204.512	204.404	204.593	204.699	209.884	209.348	204.588	204.401	205.501	205.501	205.438	205.549	205.549	204.219	210.239	209.102	204.333	204.085	203.368	203.175	206.739	206.788	206.717	-	205.955
CHAINAGE	0.000	0.840	2.037	3.586	3.676	3.793	4.506	4.766	5.796	7.493	9.549	10.272	10.972	11.611	12.718	12.747	13.118	14.196	14.216	14.586	20.452	26.497	27.022	27.042	29.041	29.058	29.382	30.480	31.731	36.817	40.165	43.981	49.506	50.378	51.435

CROSS SECTION A
HZ & VER. SCALE 1:200

LEGEND

×208.72	SURVEY SHOT R.L.		O'HEAD WIRE STRUCTURE (OHWS)		OPAL READER		BALLAST (TOP & BOTTOM)
206.76TK	TOP OF KERB (CONC.) R.L.		SURVEY CONTROL MARK		GRATED DRAINAGE PIT- ROUND		CUTTING (TOP & TOE)
206.61G	GUTTER FLOW LINE (CONC.) R.L.		SMALL DRAINAGE PIT (<1m)	SG	SIGNAL PIT		FENCE
206.66LP	LIP OF KERB (CONC.) R.L.		STORMWATER GULLY PIT		TELSTRA PIT - SINGLE		GATE
206.35LT	LINTEL (CONC.) R.L.		WATER STOP VALVE		TRACK SIDE EQUIPMENT		GUARDRAIL
203.94FT	FOOTING (CONC.) R.L.		POWER POLE		BOLLARD		SAFETY FENCE (HANDRAIL)
206.81VC	VEHICLE CROSSING R.L.		POWER & LIGHT POLE		RUBBISH BIN		OVERHEAD WIRING: POWER LINE
207.51EB	EDGE OF BITUMEN ROAD R.L.		LIGHT	UKN	UNKNOWN PIT		OVERHEAD WIRING: CATENARY WIRE
208.55AW	BUILDING AWNING R.L.		ELECTRIC LIGHT POLE	EK	ELECTRICITY KIOSK		OVERHEAD WIRING: CONTACT WIRE
210.06EV	BUILDING EAVE R.L.		SMALL ELEC. PIT(<1m)				UNKNOWN SERVICE ROUTE
204.32TR	TOP OF RAIL R.L.		ELECTRICAL EARTH STAKE				WATER PIPE
209.54EL	OVERHEAD WIRING: ELBOW R.L.		RAILWAY SIGNAL				BUILDING AWNING
210.39MT	OVERHEAD WIRING: TOP OF MAST R.L.	×	SURVEY SHOT CROSS				MAJOR CONTOUR
204.95INV	DRAINAGE PIPE INVERT LEVEL R.L.		TREE				MINOR CONTOUR
211.48BM	OVERHEAD WIRING: BOOM STRUCTURE R.L.	S10.0	=SPREAD				BUILDING
209.18CON	OVERHEAD WIRING: CONTACT WIRE R.L.	1.0ϕ	=DIAMETER				ROAD CARRIAGEWAY
209.87CTY	OVERHEAD WIRING: CATENARY WIRE R.L.	H10.0	=HEIGHT				RAILWAY PLATFORM
212.49PW	OVERHEAD WIRING: POWER LINE R.L.						
208.47DV	OVERHEAD WIRING: DROP VERTICAL R.L.						
209.45US	UNDERSIDE FOOTBRIDGE CLEARANCE R.L.						
207.63ST	STAIRS R.L.						
209.59DK	BRIDGE DECK R.L.						

Notes:
- TREE SIZES ARE ESTIMATES ONLY
- CONTOURS ARE INDICATIVE ONLY. CONTOUR INTERVAL 0.25m.
- ONLY VISIBLE SERVICES HAVE BEEN LOCATED IN THIS SURVEY.
- USERS OF THIS DRAWING HAVE A DUTY OF CARE TO CONTACT "DIAL BEFORE YOU DIG" FREE CALL 1100 OR FOR SPEED OF RESPONSE VISIT www.1100.com.au
- SERVICE & UTILITIES SHOWN ON PLAN HAVE BEEN LOCATED BY PHYSICAL EVIDENCE ON SITE. SOME PITS MAY NOT HAVE BEEN OPENED TO VERIFY THE TYPE OF UTILITY. NEITHER EXCAVATION NOR POTHOLING HAVE BEEN CARRIED OUT TO CONFIRM UNDERGROUND LOCATION. SERVICE DETAILS SHOULD BE CONFIRMED WITH THE RELEVANT SERVICE AUTHORITY DURING DESIGN & PRIOR TO ANY CONSTRUCTION.
- ALL DIMENSIONS MUST BE VERIFIED ON SITE PRIOR TO ANY CONSTRUCTION.
- THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF SMEC AUSTRALIA PTY LIMITED.
- THE POSITION OF SURVEYED DATA HAS BEEN LOCATED AND IS SHOWN TO TOPOGRAPHIC ACCURACIES. IF CLEARANCES TO BOUNDARIES OR OTHER FEATURES ARE CRITICAL AND DIMENSIONS ARE NOT SHOWN FURTHER SURVEY MAY BE REQUIRED.
- BOUNDARIES HAVE NOT BEEN DEFINED AS PART OF THIS SURVEY.
- ANY CONSTRUCTION ON OR NEAR BOUNDARIES WILL REQUIRE FURTHER SURVEY IN ORDER THAT MARKS DEFINING BOUNDARIES CAN BE PLACED.

SCALE 1:200 AT A1
2 0 2 4 6 8
ALL DISTANCES IN METRES

AMD	DESCRIPTION	SURVEYOR SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
B	FINAL ISSUE	G.S. 20/08/20	G.S. 20/08/20	G.S. 20/08/20
A	PRELIMINARY ISSUE	G.S. 06/08/20	G.S. 06/08/20	G.S. 06/08/20

CO-ORDINATE SYSTEM: ISG | HEIGHT DATUM: AHD | SCALE: 1 : 200

NSW GOVERNMENT | Transport for NSW

This drawing and the related info purpose and may not be used for Transport for NSW does not provi of the related information for any and no part of this drawing may b [redacted]

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MOUNT COLAH STATION
SYDNEY MAIN NORTHERN LINE (APPROX. N 37+570 to N37+846)
DETAIL & LEVELS OVER MOUNT COLAH STATION & OVERHEAD WIRING
MOUNT COLAH, NSW

FILE No. 35542 | SHEET: 2 OF 2 | A1
STATUS: FINAL ISSUE | ©
DRG No. 35542A01.DWG | B | EDMS No.

Appendix C DSS

Appendix D Design Standards

Architectural and Structural

Standards referenced in architectural and structural design

Reference	Title	Version/Date
T HR CI 12002 ST	Durability Requirements for Civil Infrastructure	Version 1.0
T HR CI 12030 ST	Overbridges and Footbridges	Version 4.0
T HR SS 90002 ST	Barriers, Balustrades, Screens and Handrails	Version 1.0
T HR EL 08001 ST	Safety Screens and Barriers for 1500 V OHW Equipment	Version 1.0
T MU SY 20001 ST	Surface Transport Fixed Infrastructure Physical Security Standard	Version 1.0
ESB 001	Engineering Standard Stations & Buildings - Introduction	Version 1.1
ESB 002	Engineering Standard Stations & Buildings - Design Principles	Version 1.1
ESB 003	Engineering Standard Stations & Buildings - Station Functional Spaces	Version 1.1
ESC 215	Transit Space	Version 4.9
AS 1170.4	Structural Design Actions - Part 4: Earthquake actions in Australia	2007
AS 1428	Design for access and mobility	2009
AS 1735.2	Lifts, escalators and moving walks Passenger and goods lifts - Electric	2001
AS 3600	Concrete Structures	2018
AS 4100	Steel Structures	1998
AS 5100:2017	Bridge Design	2017
BCA	National Construction Code – Volume 1	2016
DDA	Commonwealth Disability Discrimination Act	1992
DSAPT	Disability Standards for Accessible Public Transport	2002

Geotechnical

Standards referenced in geotechnical design

Reference	Title	Version/Date
T HR CI 12100 ST	Geotechnical Risk Assessment and Hazard Management	Version 1.0
T HR CI 12101 ST	Geotechnical Problem Management	Version 1.0
T HR CI 12110 ST	Earthworks and Formation	Version 2.0
T HR CI 12190 ST	Service Installations within the Rail Corridor	Version 1.0
AS 1726	Geotechnical Site Investigations	2017
AS 2159	Piling - Design and installation	2009

Civil, Drainage & Third-Party utilities

Standards referenced in civil design

Reference	Title	Version/Date
T HR CI 12030 ST	Overbridges and Footbridges	Version 4.0
T HR CI 12130 ST	Track Drainage Standard	Version 2.0
T HR CI 12130 MA	Track Drainage Manual	Version 1.0
T HR CI 12190 ST	Service Installations within the Rail Corridor	Version 1.0
AS 1428.1	Design for access and mobility Part 1: General requirements for access – New building work	2009
AS/NZS 3500.3	Plumbing and drainage Part 3: Stormwater drainage	2018
ARR 2019	Australian Rainfall & Runoff – A Guide to Flood Estimation	2019
AGRD06A-17	Austroads Guide to Road Design Part 6A: Paths for Walking and Cycling	2017
-	Development Design Specification 0044 – Pathways and Cycleways (Hornsby Shire Council)	2016
SW269 04/15	Technical guidelines – Building over and adjacent to pipe assets (Sydney Water)	2015
SW195 2/14	Asset adjustment and protection manual – Managing new development process (Sydney Water)	2014
NS201	All Dielectric Self Supporting Fibre Optic Cabling for Installation on Distribution Assets	2008
-	Guide to Codes and Practices for Street Opening (NSW SOCC)	2018

Electrical

Standards referenced in electrical design

Reference	Title	Version/Date
AS/NZS 7000	Overhead line design	2016
AS/NZS 3000	Electrical installations “Wiring Rules”	2018
AS/NZS 3008	Electrical installations - Selection of cables Part 1.1: Cables for alternating voltages up to and including 0.6/1 kV	2017
AS 1158.3.1	Lighting For Roads And Public Spaces	2020
AS 1428.2	Design for access and mobility Part 2: Enhanced and additional requirements –Buildings and facilities	2015

Reference	Title	Version/Date
AS 2067	Substations and high voltage installations exceeding 1kV AC	2016
AS 60076	Power transformers (set)	Varies
T HR SS 80001 ST	Infrastructure Lighting	2020
T HR SS 80002 ST	Low voltage electrical installations	2018
T HR EL 17002 SP	Low Voltage Isolating Transformer	2019
T HR SS 80003 ST	Infrastructure Emergency Lighting	2019
T HR EL 10004 SP	Timber Poles	2018
T HR EL 10005 ST	Requirements for Electric Aerials Crossing RailCorp Infrastructure	2016
T HR EL 10001 ST	HV Aerial Line Standards for Design and Construction	2019
T HR EL 20001 ST	High Voltage AC and 1500 V DC traction power supply cable requirements	Version 1.0
T HR EL 20003 ST	Underground Installation Configurations for High Voltage and 1500 V dc Cables	Version 1.0
T MU MD 00006 ST	Engineering Drawings and CAD Requirements	Version 2.0
EP 16 00 00 01 SP	Pole Mounted Distribution Transformer	Version 3.1
EP 16 00 00 02 SP	Ground Type Distribution Transformers	Version 2.1
EP 01 00 00 03 SP	11kV AC Switchgear – RMU suitable for indoor and kiosk installation	Version 4.1

Earthing and Bonding

Standards referenced in earthing and bonding design

Reference	Title	Version/Date
AS/NZS 1768	Lightning protection	2017
AS/NZS 3835.1	Earth potential rise – Part 1: code of practice	2006
AS/NZS 3835.2	Earth potential rise – Part 2: application guide	2006
AS/NZS 4853	Electrical hazards on metallic pipelines	2012
AS/NZS 60479.1	Effects of current on human beings and livestock, Part1: General Aspects	2010
AS/NZS 7000	Overhead line design	2016
AS 2067	Substations and high voltage installations exceeding 1kV AC	2016
ENA EG1	Substation earthing guide	2006
EP 12 10 00 11 SP	Distribution substation earthing	3.0
EP 12 20 00 01 SP	Bonding of overhead wiring structures to rail	3.0

Reference	Title	Version/Date
ESC 510	Boundary fences	2.1
SPG 0705	Construction of cable routes and associated civil works	1.0
T HR EL 00004 ST	Buildings and structures under overhead lines	1.0
T HR EL 08001 ST	Safety screens and barriers for 1,500V OHW equipment	1.0
T HR EL 12002 GU	Electrolysis from stray DC current	1.0
T HR SS 80002 ST	Low voltage electrical installation	2.0
Technical Note – TN016	Overbridges and footbridges – Earthing and bonding requirement	2015
Electrical Technical Note 11/02	Earthing Designs for RailCorp's High Voltage AC system	2015

Signalling

Standards referenced in signalling design

Reference	Title	Version/Date
ESG 001	Basic Principles and Configuration Standards	Version 1.3
SPG 0703	Signalling Documentation and Drawings	Version 1.1
SPG 0707	Installation of Equipment Racks and Termination of Cables and Wiring (J manual)	Version 1.5
SPG 0709	Traction Return, Track Circuits and Bonding	Version 2.7
SPG 0729	Signalling Power Systems	Version 2.2
T HR SC 10001 ST	Signalling Design Principles	Version 1.0
T HR SC 02000 ST	Mandatory Requirements for Signalling Safe working Procedures	Version 3.0
T HR SC 00004 ST	Signalling Design Requirements - Signalling Symbols	Version 1.0
NSG 604	Indicators and signs	Version 10.0
SPG 0706	Installation of Trackside Equipment	Version 2.3
T HR SC 1006 ST	Signalling Design Principles – signalling signs	Version 1.0
SPG 1571	Specification of Light Signal	Version 1.5
T HR SC 00001 ST	Circuit Design Standards – Typical circuits	Version A

Security and Communications

Standards referenced in security and communications design

Reference	Title	Version/Date
-	Ticketing Standard / Guide for Installation of Ticketing Equipment	6/Aug 2003
ESB 001	Station Context and Processes	Version 1.1
ESB 002	Station Design Principles	Version 1.1
ESB 003	Station Functional Spaces	Version 1.1
ESB 004	Station Services and Systems	Version 1.1
F2010/22647 D2010/53406	Precise IP Clock Installation, Configuration and Commissioning Guideline	Version 1.0
F2010/25026 D2010/60521	Passenger Information Reference Design Overview	Version 0.4
FSYD2014/14276 DSYD2014/132395	Digital Public Address System Design and Installation Guideline	Version 2.0
IAD-WIS-10-001	CCTV Work instruction standard digital cabling and containment work instruction for Sydney Trains	Version 5.0
SPG 0705	Construction of Cable Routes and Signalling Civil Works	Version 1.16
T HR TE 01004 SP	Pre-terminated Fibre Tails and Link Cables	Version 1
T HR TE 21002 ST	Communications Earthing and Surge Suppression Standard	Version 1.0
T MU MD 21001 ST	Equipment Rooms and Cubicles for Programmable Electronic Systems	Version 1.0
T MU SY 10001 ST	Public Transport Closed Circuit Television (CCTV) Functional Requirements Standard	Version 1.0
T MU TE 61005 ST	Customer Information Systems for Public Transport Buildings and Conveyances	Version 1.0
T MU TE 61006 ST	Help Points	Version 1.0
T MU SY 20001 ST	Surface Transport Fixed Infrastructure Physical Security Standard	Version 1.0
AS/CA S009	Installation requirements for Customer Cabling (Wiring Rules)	2013
AS/CA S008	Requirements for customer cabling products	2010
AS/NZS 11801.1	Information technology - Generic cabling for customer premises - General requirements (ISO/IEC 11801-1:2017, MOD)	2019
AS 11801.2	Information technology - Generic cabling for customer premises - Office premises (ISO/IEC 11801-2:2017, MOD)	2019

Reference	Title	Version/Date
AS 11801.3	Information technology - Generic cabling for customer premises – Part 3: Industrial Premises (ISO/IEC 11801-3:2017, MOD)	2019
AS/NZS 2201.1	Intruder alarm systems - Client's premises - Design, installation, commissioning and maintenance	2007
AS/NZS 2201.3	Intruder alarm systems - Detection devices for internal use	1991
AS/NZS 2201.5	Intruder alarm systems - Alarm transmission systems	2008
AS/NZS 3013	Electrical installations - Classification of the fire and mechanical performance of wiring system elements	2005
AS/NZS 3084	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings	2017
AS/NZS 3085.1	Telecommunications installations - Administration of communications cabling systems - Basic requirements	2004
AS 3080:2013	Telecommunications installations - Generic cabling for commercial premises (ISO/IEC 11801:2011, MOD)	Amdt 1:2014
HB29	Communications cabling manual - Module 2: Communications cabling handbook	2007
AS/NZS 60950.1	Information technology equipment - Safety - General requirements (IEC 60950-1, Ed. 2.2 (2013), MOD)	2015
AS/NZS 61000.6.2	Electromagnetic compatibility (EMC) - Generic standards - Immunity for industrial environments	2006
AS/NZS 61000.6.3	Electromagnetic compatibility (EMC) - Generic standards - Emission standard for residential, commercial and light-industrial environments	2012
AS 4806	Closed Circuit Television; all parts.	2008

Mechanical and Vertical Transportation

Standards referenced for Lift Design

Reference	Title	Version/Date
AS 1735.1	Lifts, Escalators and Moving Walks, General Requirements	2016
AS 1735.11	Fire Rated Landing Doors	1986
AS 1735.12	Facilities for persons with disabilities	1999
AS/NZ 3000	Electrical Installations (known as the Australian/New Zealand Wiring Rules). Wiring requirements for lift installations	2018
AS/NZ 3008.1	Electrical installations - Selection of cables Cables for alternating voltages up to and including 0.6/1 kV	2017

Combined Services Route

Standards referenced in CSR design

Reference	Title	Version/Date
AS 1289	Methods of testing soils for engineering purposes Soil compaction and density tests - Determination of the dry density/moisture content relation of a soil using standard compactive effort	2003
AS 1650	Hot Dipped Galvanized Coatings on Ferrous Articles	1991
AS 2053	Conduits and fittings for electrical installations (set)	Varies
AS 2648.1	Underground marking tape - Non-detectable tape	1995
AS 3000	Wiring rules	2007
AS 3996	Access covers and grates	2006
AS 4296	Cable trunking systems	1995
AS 4799	Installation of underground utility services and pipelines within railway boundaries	2000
AS/CA S009	Installation requirements for customer cabling (Wiring Rules)	2013
ESB 003	Station Functional Spaces	2016
ESB 004	Stations Services and Systems	2016
PSC 02	Underground Installation Configurations for High Voltage and 1500 Vdc Cables	Issue 1, Rev 1
SPM 0123	Reinforced Pre-Cast Concrete Cable Pits	1.1
SPG 0705	Construction of Cable Routes and Signalling Civil Works	1.17
TMG 1440	Requirement for the Locating of Underground Services in the Rail Corridor	1.3
T HR CI 12002 ST	Durability Requirements for Civil Infrastructure	1.0
T HR CI 12030 ST	Overbridges and Footbridges	4.0
T HR CI 12065 ST	Station Platforms	2.0
T HR CI 12111 SP	Earthwork Materials	2018
T HR CI 12190 ST	Service Installations within the Rail Corridor	1
T HR EL 12004 ST	Low Voltages Distribution and Installations Earthing	2019
T HR EL 20003 ST	Underground Installation Configurations for High Voltage and 1500 V dc Cables	Version 1.0,
T HR EL 20004 ST	High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction	Version 1.0
T HR EL 20005 ST	Above Ground Installation Configurations for High Voltage AC and 1500 V DC Cables	Version 1.0

Reference	Title	Version/Date
T HR EL 20006 ST	High Voltage ac and 1500 V dc Cables - Transitions Between Underground and Above Ground Installation Configurations	Version 1.0
T HR EL 20007 ST	Cable Pits	Version 1.0
T HR SS 80002 ST	Low Voltage Electrical Installations	2.0
T HR SS 90002 ST	Barriers, Balustrades, Screens and Handrails	2016
T HR TE 01001 ST	Communication Outdoor Cabling	1.0
T MU MD 00006 ST	Engineering Drawings and CAD Requirements	Version 4.0

Overhead Wiring

Standards referenced in OHW design

Reference	Title	Version/Date
T HR CI 12040 ST	Overhead Wiring Structures and Signal Gantries	Version 1.0
TMC 331	Design of Overhead Wiring Structures and Signal Gantries	Version 1.0

Appendix E BCA Report

Building Code of Australia

Design Compliance Report

Reference Design Review

New Footbridge, Stairs and Lifts at Mount Colah Station

Report Number & Revision:	**MSA2004_BCA _MountColah_FB_2**
Prepared For:	**CCG Architects**
Date of Issue:	**25th November 2020**

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Revision History & Quality Management

REPORT NUMBER	REV	STATUS	DATE
MSA_BCA_MountColah_FB_1	Rev1	Draft Reference Level Design	06.08.20
MSA_BCA_MountColah_FB_2	Rev2	Reference Level Design	25.11.20

ROLE	NAME + SIGNATURES	CREDENTIALS
Written By:	[redacted]	**Building Code, Access & Fire Safety Consultant**
Reviewed By:	[redacted]	**Building Code, Access & Fire Safety Consultant** **Grade 1 - Accredited Building Certifier / PCA** Building & Development Certifier Registration No. BDC0809 Member of the Australian Institute of Building Surveyors Member of the Association of Accredited Certifiers

Contents

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Executive Summary

This report assesses the **Reference Level Design** for the proposed **New Footbridge, Stairs and Lifts at Mount Colah Station** against the requirements of the National Construction Code (NCC) / Building Code of Australia (BCA).

The primary purpose of the report is to identify any non-compliances with the deemed-to-satisfy provision of the BCA that would be caused by the proposed accessibility upgrade works.

Please note that this is an assessment of the proposed development works and does not constitute a full BCA upgrade assessment of the existing station (Refer to Section 3.3.2 *"Development in Existing Buildings"* of this report for more information).

Subject to compliance with the recommendations of this report, the development can readily comply with the relevant requirements of the BCA. Recommendations have been identified as follows:

- Significant BCA matters, being those with the ability to affect the design have been included in Table 1.0 below.
- A BCA Compliance Schedule suitable for the current level of design is also contained in in Table 6.0 of this report.

Table 1.0 – Significant BCA Compliance Matters

#	DTS Clause	Recommendation	Status
Maintaining Fire & Life Safety			
1.	Various	**Fire Engineering – Development not to Reduce Fire Protection** To ensure the development within the existing station meets minimum regulatory compliance, the fire engineer must review the development and confirm the following matters: • *Fire Protection* - Will not 'reduce the fire protection afforded to the occupants of the building' in comparison the existing station design (EP&A Act Regulatory benchmark) • *Floor Area* - Is not considered to increase the floor area of the building with regard to the BCA definition, as: a. The additional footbridge floor area, lift landings / canopy are not considered to contribute additional fire load, and b. Does not further impact on the safety of the occupants in relation to the provisions of the BCA	**Fire Engineer to Confirm** *Existing Fire and Life Safety is Maintained or Improved*

#	DTS Clause	Recommendation	Status
		• *Number of Exits (D1.2)* – Fire and Life Safety not reduced in relation to this clause. • *Exit Travel Distances (D1.4)* – Fire and Life Safety not reduced in relation to this clause. • *Dimensions of Exits and Paths of Travel (D1.6)* – Fire and Life Safety not reduced in relation to this clause. • *Travel Via Non-Fire Isolated Exits (D1.9)* – Fire and Life Safety not reduced in relation to this clause. • *Fire Hydrants (E1.3)* – Fire and Life Safety not reduced in relation to this clause. • *Fire Hose Reels (D1.4)* – Fire and Life Safety not reduced in relation to this clause.	
BCA Section C Fire Resistance			
2.	C1.1 & Spec C1.1	**Fire Rating of New & Existing Structure** • The structural engineer is to certify new structural works will comply with the fire resistance levels (FRL) specified in Table 4 of BCA Specification C1.1 for **Type B** Construction. Any deficiency in fire rating would need to be considered by the Fire Engineer. • FRLs to be confirmed and if not proposed to be fire rated, the Fire Engineer must include assessment of the matter as an BCA Performance (Fire Engineered) Solution. • To satisfy BCA compliance for the development, existing structure is only required to be upgraded for fire rating where it is relied upon by new fire rated structure, or where the F&LS Report specifically requires the upgrade. *See also Spec C1.1 in Table 6.0 and "Attachment A – Summary of Fire Resistance Levels" of this report for more details of fire rating requirements.*	**Design Certificate Required** *from structural engineer*
3.	C1.9 & C1.14	**Combustible Cladding - General** BCA C1.9 & C1.14 requires that external walls (including lift shaft walls) and any ancillary attachments are non-combustible as tested under AS1530.1. Provide details of all proposed external wall building elements, cladding, façade panels, screening, attachments or ancillary elements confirming they are non-combustible or otherwise comply with BCA C1.9 "Non-Combustible Construction" and C1.14 "Ancillary Elements".	**Design Certificate Required** *including relevant test reports.*

<table>
<tr><th>#</th><th>DTS Clause</th><th>Recommendation</th><th>Status</th></tr>
<tr><td>4.</td><td>C1.9 & C1.14</td><td>Combustible Cladding - Specific

BCA C1.9 & C1.14 requires that external walls and any ancillary attachments are non-combustible as tested under AS1530.1.

The use of polycarbonate wall cladding (where combustible) to the new lift shaft walls as well as screening of the lifts landings and footbridge must be supported by the project fire engineer or an alternative non-combustible product proposed which satisfies AS1530.1.</td><td>Fire Engineer to Confirm</td></tr>
<tr><td colspan="4">BCA Part D1 Provision for Escape & D2 Construction of Exits</td></tr>
<tr><td>5.</td><td>D2.13</td><td>Over 36 Risers in Stairs without a Change in Direction

Stair 2 to platform level contains more than 36 risers in consecutive flights in a Class 9b building without a minimum 30 degree change in direction.

As the stair does not include a minimum 30 degree change in direction, the non-compliance with BCA D2.13 must be supported by BCA Performance Solution under BCA DP2.</td><td>BCA Consultant

To provide Performance Solution</td></tr>
<tr><td colspan="4">BCA Part D3 Access For People with Disabilities & BCA Part H2 Public Transport Buildings</td></tr>
<tr><td>6.</td><td>Part H2</td><td>DDA Report

Refer to DDA Report for detailed assessment of accessibility features that are required for the development scope With regard to BCA Part H2 for passenger use areas of public transport buildings.</td><td>Design Certificate Required

Refer to DDA Report</td></tr>
<tr><td colspan="4">BCA Section E Fire Services & Equipment</td></tr>
<tr><td>7.</td><td>Section E</td><td>Required Fire Services for New Works

The BCA requires that the following fire services and equipment is provided under Section E of the BCA a to serve the new development works:

<table><tr><th>Essential Fire Safety Measure</th><th>Standard of Performance</th></tr><tr><td>Emergency Lighting</td><td>BCA Clause E4.2, E4.4 and AS2293.1-2005</td></tr><tr><td>Exit & Directional Signage</td><td>BCA Clause E4.5, E4.6, E4.8 & AS2293.1-2005</td></tr><tr><td>Portable Fire Extinguishers</td><td>BCA Clause E1.6, AS2444-2001</td></tr><tr><td>Fire Engineering Requirements</td><td>Any additional recommendations or requirements of the Fire & Life Safety / Engineering Report</td></tr></table>
Design certification is required for the above essential fire safety measures from the relevant designers / design engineers.</td><td>Design Certificate Required

from fire services engineer</td></tr>
</table>

#	DTS Clause	Recommendation	Status
8.	Spec E3.1	**Lift Shaft Temperatures – Cooling of Lift Shaft** The new lift shaft installations will not be provided with cooling or air-conditioning that would allow the lift shaft temperature to be maintained under 40ºC at all times the lift is in operation as required by Clause 4 of BCA Specification E3.1 (not possible to achieve during high ambient outdoor temperatures without active cooling). A **BCA Performance Solution** will be required to support the deletion of active cooling / air-conditioning from the lift shafts and consider accessibility during high temperatures or shutdown of the lifts.	**BCA Consultant** *To provide Performance Solution*
BCA Section F Health & Amenity			
9.	Various	**Details Required** Further to the above matters, those items that are indicated as 'can readily comply – subject to details' in table 6.0 also require further details to allow full assessment by the BCA Consultant.	**Details Required**

1.0 Introduction

This report assesses the **Reference Level Design** for the proposed **New Footbridge, Stairs & Lifts at Mount Colah Station** against the requirements of the National Construction Code (NCC) / Building Code of Australia (BCA)

2.0 Assessed Information

The following information was specifically relied upon for this assessment:

- Desktop assessment of **Reference design documentation** and supporting design plans and information prepared by CCG Architects (refer **Attachment B – Assessed Plans**)
- The Building Code of Australia (National Construction Code) 2019

  Note: BCA 2019 has been utilised on the basis of the invitation to tender to carry out the Crown Building Work falling within the BCA 2019 period of adoption.
- The Guide to the Building Code of Australia (National Construction Code) 2019
- RailCorp Engineering Standard - Stations and Buildings - Station Design Standard Requirements issued May 2010, where relevant to BCA issues only.

3.0 Purpose & Basis of the Report

3.1 Report Purpose

The purpose of this report is to assess the following:

- Assess the design documentation and requirements of the current BCA, and detail any significant issues (or those which have the ability to affect the current design);
- Provide recommendations to best address any significant departures from the requirements of BCA and to guide the detailed design development.

3.2 General Basis

The general basis of this report is to assess and address compliance with the significant requirements of the Building Code of Australia (BCA) as relevant to the new building works and with regard to the site conditions and current design documentation. The scope of services is limited to assessment against *Sections C - Fire Resistance, Section D - Access & Egress and Section E - Services & Equipment, Section F - Health and Amenity, and high level parameter advice on Section B – Structure, Part H2 Public Transport Buildings and Section J - Energy Efficiency* of the BCA.

3.3 Regulatory Basis

The following outlines the regulatory basis for assessment for Crown developments and existing buildings.

3.3.1 Clause 6.28 of Environmental Planning & Assessment Act, 1979

Developments by the Crown or on behalf of the Crown are required to be certified under Section 6.28(2) (formerly S109R) of the Environmental Planning & Assessment Act 1979, as follows:

> ***Section 6.28 (2) of the EP&A Act:***
>
> *Crown building work cannot be commenced unless the Crown building work is certified by or on behalf of the Crown to comply with the Building Code of Australia in force as at:*
>
> *(a) the date of the invitation for tenders to carry out the Crown building work, or*
>
> *(b) in the absence of tenders, the date on which the carrying out of the Crown building work commences, except as provided by this section.*
>
> *The following definitions are also applicable:*
>
> ***Crown** has the same meaning given to that expression by the regulations.*
>
> ***Crown building work** means development (other than exempt development), or an activity that is subject to environmental impact assessment under Division 5.1, by the Crown that comprises:*
>
> *(a) the erection of a building, or*
>
> *(b) the demolition of a building or work, or*
>
> *(c) the doing of anything that is incidental to the erection of a building or the demolition of a building or work.*

The above is the key regulatory consideration when determining BCA compliance for a Crown development. Effectively stating that Crown Building Work must be certified as meeting the requirements of the Building Code of Australia in force at the time of tender release / prior to commencement of works.

3.3.2 Development within Existing Buildings

Where a development is being undertaken to an existing building, the following methodology is used to determine if 'the building works' comply with the BCA:

- All *new* works must comply with the BCA, and
- The new works must not cause a contravention of the BCA within the existing building. If a contravention is caused, it must be addressed, and

- The new works must not cause a *reduction* in the fire protection afforded to the existing building when compared to existing, and

- The existing building (beyond the scope of the above three dot points) need not upgraded to comply with the BCA

This methodology meets the legislative requirements of the Environmental Planning & Assessment Act & Regulations, and will allow the 'building works' to ultimately be certified under Section 6.28 (formerly s109R) of the EP&A Act as required. Specific project scopes may exceed regulatory minimums.

3.3.3 Disability (Access to Premises – Building) Standard 2010

This Commonwealth legislation is now in-force as of 1st May 2011. Clause 3.1 of the Premises Standard stipulates certain accessible features that are required to be installed by certain target dates for existing station buildings. The table Clause 3.1 expresses these figures as a percentage of the overall existing buildings in which the features must be installed. That is, the percentage figures are an overall strategic objective for the existing public transport buildings under control of TfNSW / Sydney Trains.

The obligation to meet the upgrade requirements of the *Disability (Access to Premises – Building) Standard 2010* lies with both the owner and operator as defined under the Transport Standards, effectively being TfNSW & Sydney/NSW Trains. Whilst, these obligations do not specifically dictate the scope of the subject development, they should be identified for consideration by TfNSW/Sydney/NSW Trains in meeting their overall strategic requirements to upgrade their existing stations accessibility for people with disabilities.

4.0 Limitations & Exclusions of the Report

The Report does not specifically consider anything beyond the considerations contains in Section 2.0 "Assessed Information" and Section 3.0 "Purpose & Basis of Report" and is otherwise also subject to the following specific limitations:

- This report is limited strictly to assessment of the proposed project scope, ie 'the new building works' as detailed in the information referenced in Section 2.0 and does not constitute a full upgrade assessment of any existing building &/or station.

- The report is limited to assessment of the development against the deemed-to-satisfy provisions of the applicable Building Code of Australia. It does not constitute a Fire & Life Safety Assessment and does not consider the Rail Safety Act "So-far-as-reasonably-practical considerations" of the overall building which are typically considerations of any separate F&LS Strategy.

- No assessment has been made of any existing Fire Engineering or BCA Performance based Reports that may apply to the base building or development.
- The information provided to MSA as nominated in Section 2.0 is accepted in good faith as accurate and correct.
- Some requirements of the BCA / Access Regulations are recognised as being interpretive in nature. Where these matters are encountered, interpretations are made in accordance with MSA policy &/or as guided by other standards, guides and industry best practice. Specific relevant interpretations relevant to this assessment are included in Section 5.2 “BCA Assessment Data” of this report.
- MSA does not support the use of combustible cladding or aluminium composite panels as external cladding, lining or ancillary element in any way. Such products are recommended to be avoided and where such products are proposed, MSA automatically excludes their assessment from any reporting and certification and will not accept liability for their use in any way.
- The report does not consider compliance with *The Disability Discrimination Act, 1992*, the *Disability (Access to Premises – Buildings) Standards 2010*, or accessibility related parts of the *BCA* (unless specifically referred to). A separate accessibility (DDA) report is required.
- Detailed assessment of any engineering matters or Australian Standards– e.g.: structural, civil, electrical, hydraulic, mechanical, fire, bushfire protection is beyond the scope of this report.
- Assessment against ASA / Railcorp Design Requirements (except as noted within this report as directly relevant to BCA interpretation matters) is beyond the scope of this report.
- The Report does not provide for any Alternative /Fire Engineered Solutions.
- NFPA 130 Assessment, Pedestrian modelling and flow assessment is beyond the scope of this report.

5.0 Building Characteristics

5.1 Building Details

5.1.1 Mount Colah Station

The building is the existing **Mount Colah Station** located between Pacific Highway to the west and Pierre Close to the East at Mount Colah NSW.

The proposed works include the demolition of the existing footbridge and stair located at the northern end of the platform and the erection a new footbridge, lifts and stairs located centrally along the platform. The proposed works seek to provide improved accessibility to the station with the provision of new lifts, stairs and accessible paths between new and existing interchange facilities.

The existing station typically contains existing BCA non-compliances that will not necessarily be brought into conformity with current Building Code of Australia. This report relates to ensuring the proposed scope works will comply with the BCA and will not otherwise reduce the fire protection afforded to the building occupants.

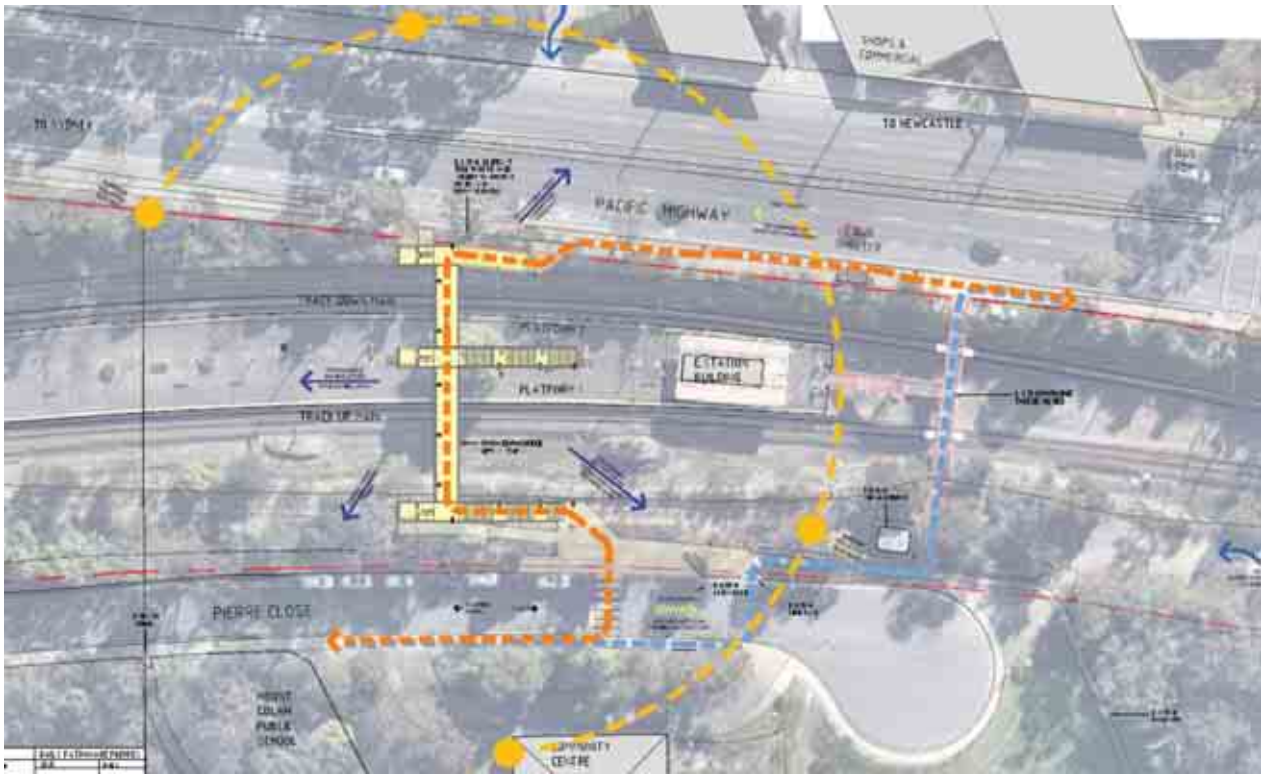

Figure 5.1.1 – Site Plan

Refer to separate Architectural Design Report for full extent of proposed works under scope.

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5.2 BCA Assessment Data

BCA Clause		Existing	Proposed
A1.1	Classification	Class 9b (Station) Class 5 (Staff Offices)	Class 9b (Station) Class 5 (Staff Offices)
A3.2	Rise in Stories	2	2
C1.2	Construction Type	Type B	Type B

5.3 BCA / Access Interpretation

- *Assembly Building* – means a building where people may assemble for transit purposes including a bus station, railway station, airport of ferry terminal

- *BCA Classification* – the public use areas of the building are considered to be a Class 9b "Assembly Building", which by BCA definition includes a building '*where people may assemble for transit purposes including a railway station'*.

- *Exit* means— any, or any combination of the following if they provide egress to a road or open space—

    a. An internal or external stairway.

    b. A ramp.

    c. A fire-isolated passageway.

    d. A doorway opening to a road or open space, or

    e. A horizontal exit or a fire-isolated passageway leading to a horizontal exit.

  For an above ground station, the 'exits' are typically considered to be the first riser of the platform stairs and the first riser of the concourse / footbridge stairs (or first part of stair or ramp) leading down to the street.

- *Extent of the 'Building'* – the entire station including staff areas, ticket areas, covered canopy areas and open platforms are considered to be floor area of the building for the purposes of assessment (unless otherwise stated). Public Roads and footpaths are generally not considered part of the building.

- *Multi-Classified Buildings* – Under BCA H2.1(d), all differing classifications in a Public Transport Building must be assigned separate classifications and the concession to allow

minor uses of less than 10% of the floor area to adopt the principle use of the storey (under A3.3(a)(i) cannot be applied.

- *Occupiable Outdoor Area* – open /unroofed sections of the platform are considered 'occupiable outdoor area' a new definition under Part G6 of BCA 2019 that requires unroofed parts of buildings meet certain BCA criteria in relation to fire resistance, egress and services and equipment as these areas can have an effect on the safety of occupants.

- *Public Transport Buildings / Passenger Use Area* – the enhanced access requirements contained under Part H2 of the BCA apply to all passenger use areas of the station (but not to staff/back-of-house areas).

  Where there is a difference between the requirements of Part H2 and requirements from Parts D3, E3 and F2, the deemed-to-satisfy provisions of Part H2 take precedence.

- *Travel Distances* – due to the risks associated with occupant safety on platforms (train fires, restricted points of egress) occupant travel distances have been considered from the entire platform areas, and not only the covered areas of the platforms. This is also consistent with the requirements of BCA Part G6 'Occupiable Outdoor Area' that requires areas such as open platforms comply with most BCA egress requirements.

6.0 BCA Recommendations

The following Table 6.0 provides a summary of assessment of the architectural plans against the significant requirements of the BCA. The following notations are made in the "Status" column of Table 6.0 for ease of reference.

Status	Description
Complies	The design documentation for the development demonstrates compliance with the BCA deemed-to-satisfy (DTS) provisions as relevant to the new building works &/or the existing level of compliance is maintained.
Can Readily Comply	Though strict compliance can't necessarily be ascertained on the current level of documentation detail, compliance can be readily achieved and must be ensured in the developing design/construction.
NA / Informational	The matter is not applicable to the item of the project scope or the clause is informational only
Does Not Comply	There is an apparent or foreseeable non-compliance with the BCA deemed-to-satisfy provisions indicated on the design documentation that will require re-design or further consideration.
Fire Engineering or BCA Performance Solution	A BCA Performance Solution Report (or Fire Engineering Report) will be required to support the deemed-to-satisfy non-compliance or to determine that the existing fire protection afforded to the occupants will not be reduced.
Design Cert Required	A certificate is required from the relevant designer &/or design engineer to certify their design is compliant with the specified requirements of the BCA &/or referenced Australian Standards. This design certificate will typically accompany their design plans or specifications.
Essential	Are recommendations that are considered mandatory for the development to comply with the BCA.
Desirable	Are advisory recommendations that could be considered by the design team to improve the BCA compliance of the building but may not relate specifically to scope works.

Table 6.0 provides a summary of key BCA considerations only and should be read in conjunction with the full terms, wording and requirements of the Building Code of Australia to ensure compliance. Some BCA Clauses that are not relevant have specifically not been included in the Table.

Table 6.0 –BCA Compliance Schedule

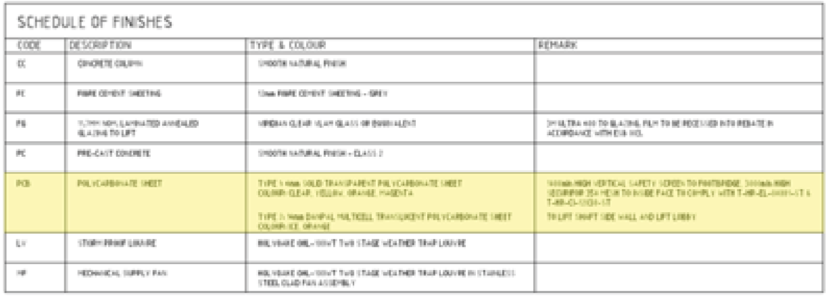
BCA Cl.	BCA Requirement	Compliance Comment	Status
BCA Regulatory Compliance			
Various	**BCA Compliance – New Works & No Reduction in Fire & Life Safety** All new works must be undertaken in accordance with the current BCA providing for improved BCA compliance of the station overall to meet the requirements of Section 6.28 (formerly Section 109R) of the Environmental Planning & Assessment Act, 1979. For works within existing buildings, it must be demonstrated that the modifications to the station maintain the existing level of fire safety. (see below for more detail to how this is applied).	*Fire & Life Safety* Fire Engineer to confirm the development will not 'reduce the fire protection afforded to the occupants of the building' in comparison the existing station design to meet the Environmental Planning & Assessment Act, 1979 (EP&A Act) Regulatory benchmark. Please note Fire & Life Safety Report requirements may exceed EP&A Act benchmarks. The above basis is to ensure the development complies with the BCA as required by the EP&A Act. *Fire & Life Safety - Floor Area (Not Increased)* Fire Engineer to confirm the development is not considered to increase the floor area of the building with regard to the BCA definition for "floor area" under Part A1, as: ▪ The overall development, including additional lift landings, canopies etc are not considered to contribute additional fire load, and • The overall development including additional lift landings, canopies etc does not further impact on the safety of the occupants in relation to the provisions of the BCA when compared to existing.	**Fire Engineer to Confirm**
Section B – Structure			
Section B	**Structural Compliance** All new works must meet current Structural Requirements of Section B of the BCA. Existing structures should be confirmed as capable of supporting any new loads.	Structural Engineer to certify any new structural works are in accordance with BCA Section B & Australian Standards in detailed design. For existing buildings, the structural engineer should confirm the existing building is capable of supporting the new loads.	**Design Cert Required** *From Engineer*
B1.4	**Glazing – BCA Clause B1.4** All glazing must be selected and installed in accordance with AS2047 & AS1288.	Any new glazing must comply. Plan or Spec note required.	**Can Readily Comply**
B1.4	**Lift Shafts – BCA Clause B1.4** Lift shafts which are not required to have an FRL must comply with BCA Clause B1.4(m) and BCA Specification E3.1.	Structural Engineer to certify any new structural works are in accordance with BCA Section B & Australian Standards in detailed design	**Design Cert Required** *From Engineer*

BCA Cl.	BCA Requirement	Compliance Comment	Status
Section C – Fire Resistance			
Part C1 – Fire Resistance & Stability			
Spec C1.1	**Type of Construction / Fire Resistance of Building Elements** All new works must meet current Fire Resistance Level (FRL) requirements of Section C and Specification C1.1 of the BCA for the required Type of Construction.	The structural engineer is to certify new structural works will comply with the fire resistance levels (FRL) specified in Table 4 of BCA Specification C1.1 for **Type B** Construction. Any deficiency in fire rating would need to be considered by the Fire Engineer. • *Floors* - The new footbridge floors, including lift landings are required to achieve an FRL of no less than 30/30/30 for BCA (typically 60/30/30 for ASA or more if freight). • *Supporting Structure* – new or existing structure where supporting new fire rated construction must also maintain an equivalent structural FRL as the part it supports or an Fire Engineered Solution is required to support any reduced FRL (so 30/-/- for BCA and 60/-/- for ASA). • *Loadbearing External Walls & Columns* – Where there are loadbearing external walls/columns (including lift walls, canopy screens to roofed areas and supporting columns) within 18m of a fire source feature (private boundary or the far side of a public road) - the building elements will require an FRL of up to 120/120/120 depending on exact setback. Subject to confirmation of fire source feature locations / boundaries - *The footbridge and lift shaft appear to be within 18m of the fire source feature being the far side of Pierre Close. Detailed setbacks and FRL's to be confirmed* • *Non-Loadbearing External Walls & Columns* – new external non-loadbearing columns and walls (including lift walls, footbridge screens, canopies and supporting columns) within 3m of a fire source feature require an FRL of up to -/120/120. Subject to confirmation of fire source feature locations / boundaries. • *Lift Shafts* – lifts shafts are not ordinarily required to be fire rated under BCA C2.10. However they must be fire rated if: - They provide structural support for other fire rated structures (such as the footbridge floor) or - If their external walls are within 18m of a fire source feature. • *Main Electrical Cupboards, ISMSBs, SSERs or the like* – electrical equipment that sustains emergency equipment power (where affected by the development)	**Design Cert Required** *From Structural Engineer*

BCA Cl.	BCA Requirement	Compliance Comment	Status
		must be enclosed in 120/120/120 construction with -/120/30 self-closing fire doors and separated from non-emergency equipment. The electrical and comms equipment should also be suitably smoke sealed with non-combustible construction and smoke seals to the board or greater room to satisfy BCA D2.7. • *Batteries* – where a battery or batteries have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours, it must be separated by 120/120/120 construction form the remainder of the building. *Note that BCA 2019 now only requires a battery system installed in the building that has a total voltage of 12 volts or more and a storage capacity of 200 kWh or more to be fire separated. To avoid battery separation under the BCA 2016 requirements, this 2019 requirement can be adopted by Fire Engineered Solution if desired.* • *Any Reduction in Required FRL* - FRLs to be confirmed and if not proposed to be fire rated, the Fire Engineer must include assessment of the matter as an BCA Performance (Fire Engineered) Solution. • *Existing Structure Upgrade* - To satisfy BCA compliance for the development, existing structure is only required to be upgraded for fire rating where it is relied upon by new fire rated structure, or where the F&LS Report specifically requires the upgrade. *See also Spec C1.1 in Table 6.0 and "Attachment A – Summary of Fire Resistance Levels" of this report for more details of fire rating requirements.*	
2.2 of Spec C1.1	**Fire Protection for Support of Another Part** Where a building element vertically or laterally supports a building element required to have an FRL, that part must generally maintain the same FRL as the part it supports.	Any building element providing direct vertical or lateral support to the new footbridge floor must achieve an equivalent structural FRL of 30/-/- (eg the existing footbridge structure or new lift structure). Any structure that will not achieve the required FRL must be identified to MSA and supported by the Fire Engineering Report. Subject to certification from the design engineer.	**Design Cert Required** *From Structural Engineer*
2.4 of Spec C1.1.	**Method of attachment not to reduce the fire resistance of building elements** The method of attaching or installing a finish, lining, ancillary element or service installation to a building element must not reduce the fire-resistance of that element below that required.	Where applicable, subject to detailed design.	**Can Readily Comply** *Subject to details*

<table>
<tr><th>BCA Cl.</th><th>BCA Requirement</th><th>Compliance Comment</th><th>Status</th></tr>
<tr>
<td>C1.9</td>
<td>Non-combustible building elements
a) In a building required to be of Type A or B construction, the following building elements and their components must be non-combustible:
• External walls and common walls, including all components incorporated in them including the facade covering, framing and insulation.
• The flooring and floor framing of lift pits.
• Non-loadbearing internal walls where they are required to be fire-resisting.
b) A shaft, being a lift, ventilating, pipe, garbage, or similar shaft that is not for the discharge of hot products of combustion, that is non-loadbearing, must be of non-combustible construction in—
• a building required to be of Type A construction; and
• a building required to be of Type B construction, subject to C2.10, in—
- a Class 2, 3 or 9 building; and
- a Class 5, 6, 7 or 8 building if the shaft connects more than 2 storeys.
c) A loadbearing internal wall and a loadbearing fire wall, including those that are part of a loadbearing shaft, must comply with Specification C1.1.
d) Certain concession apply for elements containing certain combustible elements such as plasterboard, FC and come bonded laminates</td>
<td>Non-combustible elements must be proposed for all specified building elements. Structural engineer and architect to confirm compliance during detailed design.

Detailed test reports to be supplied for the following elements, where used as an external wall, confirming they are not deemed combustible when tested in accordance with AS1530.1 - Combustibility Test for Materials.

 
SCHEDULE OF FINISHES
<table>
<tr><th>CODE</th><th>DESCRIPTION</th><th>TYPE & COLOUR</th><th>REMARK</th></tr>
<tr><td>CC</td><td>CONCRETE COLUMN</td><td>SMOOTH NATURAL FINISH</td><td></td></tr>
<tr><td>FC</td><td>FIBRE CEMENT SHEETING</td><td>12mm FIBRE CEMENT SHEETING - GREY</td><td></td></tr>
<tr><td>FG</td><td>[illegible] LAMINATED ANNEALED GLAZING TO LIFT</td><td>[illegible] CLEAR [illegible] GLASS OR EQUIVALENT</td><td>[illegible] TO GLAZING, FILM TO BE RECESSED INTO REBATE IN ACCORDANCE WITH [illegible]</td></tr>
<tr><td>PC</td><td>PRE-CAST CONCRETE</td><td>SMOOTH NATURAL FINISH - CLASS 2</td><td></td></tr>
<tr><td>PCB</td><td>POLYCARBONATE SHEET</td><td>TYPE 1: [illegible] SOLID TRANSPARENT POLYCARBONATE SHEET COLOUR: CLEAR, YELLOW, ORANGE, MAGENTA
TYPE 2: [illegible] TRANSLUCENT POLYCARBONATE SHEET COLOUR: ICE, ORANGE</td><td>[illegible] HIGH VERTICAL SAFETY SCREEN TO FOOTBRIDGE [illegible]
TO LIFT SHAFT SIDE WALL AND LIFT LOBBY</td></tr>
<tr><td>LV</td><td>STORM PROOF LOUVRE</td><td>[illegible] TWO STAGE WEATHER TRAP LOUVRE</td><td></td></tr>
<tr><td>MF</td><td>MECHANICAL SUPPLY FAN</td><td>[illegible] TWO STAGE WEATHER TRAP LOUVRE IN STAINLESS STEEL CLAD FAN ASSEMBLY</td><td></td></tr>
</table>
The use of polycarbonate wall cladding (where combustible) to the new lift shaft walls as well as screening of the lifts landings and footbridge must be supported by the project fire engineer or an alternative non-combustible product proposed which satisfies AS1530.1

Important Note: MSA does not support the use of combustible cladding or aluminium composite panels as an external cladding, lining or ancillary element in any way. Such products are recommended to be avoided and where such products are proposed, MSA automatically excludes their assessment from any reporting and certification and will not accept liability for their use in any way. Non-combustible materials are recommended.</td>
<td>Design Cert Required
From Structural Engineer/Architect

Fire Engineering required where combustible wall and screens used</td>
</tr>
<tr>
<td>C1.10</td>
<td>Fire Hazard Properties
Fire hazard properties for all new floor, wall and ceiling linings and assemblies must comply with BCA Specification C1.10 (or otherwise considered non-combustible).</td>
<td>All floor, wall and ceiling linings must meet the fire hazard properties specified in BCA Specification C1.10 or will be non-combustible.

Plan or specification note required and test reports for all products should be obtained from a registered testing authority confirming compliance.</td>
<td>Can Readily Comply
Subject to accompanying test reports from registered testing authorities.</td>
</tr>
</table>

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BCA Cl.	BCA Requirement	Compliance Comment	Status
C1.14	**Ancillary Elements** An ancillary element must not be fixed, installed or attached to the internal parts or external face of an external wall that is required to be non-combustible unless it is non-combustible or otherwise specified (given concession) in this clause.	Can readily comply. Subject to detail. *Important Note: MSA does not support the use of combustible cladding or aluminium composite panels as an external cladding, lining or ancillary element in any way. Such products are recommended to be avoided and where such products are proposed, MSA automatically excludes their assessment from any reporting and certification and will not accept liability for their use in any way. Non-combustible materials are recommended.*	**Can Readily Comply**
Part C2 – Compartmentation & Separation			
C2.2	**Fire Compartment Floor Area & Volume Limitations** The BCA requires that the floor area of fire compartments is limited to certain areas and volumes dependant on the Type of Construction. • Type C - Max FA of 3, 000m^2 & Volume of 18, 000m^2 • Type B - Max FA of 5, 500m^2 & Volume of 33, 000m^2 • Type A - Max FA of 8, 000m^2 & Volume of 48, 000m^2	The existing fire compartment / fire load is not considered to be increased to beyond the acceptable floor areas and volumes for the type of construction as a result of the development works.	**Complies**
C2.10	**Separation of Lift Shafts** Where a lift connects or passes by more than 2 stories, or more than 3 stories in a sprinkler protected building, the lift must be contained in a fire rated lift shaft achieving an FRL of no less than: • Type A Construction – the shaft meets the FRLs specified in Table 3 of Spec C1.1 • Type B Construction - if loadbearing, the shaft meets the FRLs specified in Table 3 of Spec C1.1, if non-loadbearing, the shaft must be non-combustible. • Openings for lift landing doors and services must meet BCA Part C3.	Lifts connect 2 stories and are not required to be contained in a fire rated shaft.	**Complies**
C2.12	**Separation of Equipment** Certain equipment must be separated from the remainder of the building with 120/120/120 construction including lift motors & control panels, emergency generators for emergency equipment, central smoke control plant, boilers, batteries and fire hydrant pumps.	Any equipment specified under BCA C2.12 including lift motor rooms and control panels must be fire separated from the remainder of the building by 120/120/120 construction. A battery or batteries installed in the building that have a voltage exceeding 24 volts and a capacity exceeding 10 ampere hours must be separated. Electrical engineer to confirm. Details of equipment and any required fire ratings to be provided	**Design Cert Required** *From Engineer*

BCA Cl.	BCA Requirement	Compliance Comment	Status
C2.13	**Electricity Supply System** Electrical substation and main electrical switchboards must generally be separated from the remainder of the building by 120/120/120 construction.	Where electrical switchboards will harvest power for emergency equipment, they must be fire separated from the remainder of the building (and other general switchboards) by construction achieving an FRL of no less than 120/120/120. ASA requirements may exceed BCA in this regard.	**Design Cert Required** *From Engineer*
Part C3 – Protection of Openings			
C3.12 & C3.15	**Openings for Service Installations** Where services penetrate a building element required to have an FRL, the services must generally be protected against the spread of fire (mechanical with dampers, hydraulic with collars and electrical with fire rated mastic). Alternatively, a fire rated shaft can be provided through floors if desired.	Where new services pass through the new footbridge floor (which is required to have an FRL), they must be appropriately fire stopped to meet BCA C3.12 and C3.15.	**Can Readily Comply**
Section D – Access & Egress			
Part D1 – Provision for Escape			
D1.2	**Number of Exits Required** Current BCA requires that a Class 9b building (ie the public areas) with more than 50 occupants (at any time) on a storey must be provided with at least two exits, evenly distributed around the storey.	There is no regulatory obligation to provide additional exits for this development under the EP&A Act. However, the development must not reduce the amount of exits available to occupants. Separate Fire & Life Safety Scope requirements for egress may also otherwise exceed BCA. *The existing platform has access to one (1) exit (does not comply) and the existing footbridge has access to two (2) exits (complies).* *The development proposes the demolition of the existing footbridge and the construction of a new footbridge with 1 exit from the platform and 2 exits from the footbridge.* *The development maintains access to the same number of exits via the new footbridge as required. Fire Engineer to also review and confirm fire & life safety not reduced in relation to this clause.*	**Fire Engineer to Confirm** *Existing Fire & Life Safety is Maintained or Improved*

BCA Cl.	BCA Requirement	Compliance Comment	Status
D1.4	**Exit Travel Distances** The maximum distance from any point on the floor of a building generally should not exceed 20m, or up to 40m if two exits are available.	There is no regulatory obligation to provide compliant travel distances from existing areas of the station for this development. However, the development must not increase the distance an occupant is required to travel to an exit when compared to existing. Separate Fire & Life Safety Scope requirements for egress may also otherwise exceed BCA. *The existing travel distance from the platforms is ~172m (does not comply) and less than 20m to the nearest of two exits from the footbridge / concourse (complies).* *The new footbridge reduces the travel distance from the platform to ~141m which is an improvement on existing. A distance of less than 20m to the nearest of 2 exits is proposed from the footbridge as required by BCA D1.4.* *The development appears to improve/reduce the existing travel distances to exits as required. Fire Engineer to also review and confirm fire & life safety not reduced in relation to this clause.*	**Fire Engineer to Confirm** *Existing Fire & Life Safety is Maintained or Improved*
D1.5	**Distance Between Alternative Exits** BCA requires that where exits are provided as 'alternative' from a storey, they must be located between 9m to 60m apart and should be distributed as uniformly as possible around the storey.	There is no regulatory obligation to upgrade the existing distance between any alternative exits under this development. However, the development must not diminish or increase the distance between alternative exits beyond the above parameters. Separate Fire & Life Safety Scope requirements for egress may also otherwise exceed BCA. *The distance between alternative exits does not apply to the platform level as there is only one exit (NA). The existing exits from the footbridge / concourse are ~20m apart (complies).* *The demolition of the existing footbridge and construction of the new footbridge maintains access from the platform to 1 exit. The distance between exits from the new footbridge is ~ 35m apart (complies)* *The development appears to maintain the existing distance between alternative exits as required. Fire Engineer to also review and confirm fire & life safety not reduced in relation to this clause.*	**Fire Engineer to Confirm** *Existing Fire & Life Safety is Maintained or Improved*
D1.6	**Dimensions of Exits & Paths of Travel to Exits** A minimum 1m egress path of travel must be provided, which can be reduced to 750mm at doorways (850mm for accessibility). Appropriate aggregate exit width must be provided or maintained in the building to allow for safe egress of the building populations. Exits should not diminish in width in the direction of travel / egress.	The development should not reduce the current available exit widths. Separate Fire & Life Safety Scope requirements for egress may also otherwise exceed BCA. *The existing stair widths from the platform level to the existing footbridge is ~1900mm. The new stair and footbridge egress widths exceed the existing egress widths as required.* *Fire Engineer to also review and confirm fire & life safety not reduced in relation to this clause.*	**Fire Engineer to Confirm** *Existing Fire & Life Safety is Maintained or Improved*

BCA Cl.	BCA Requirement	Compliance Comment	Status
D1.9	**Travel Via Non-Fire Isolated Stairs & Ramps** Under current BCA, the total travel distance from any point in a building via a non-fire isolated exits must generally not exceed 80m to open space, and discharge at the level of road or open space.	There is no regulatory obligation to provide compliant travel distances from existing areas of the station for this development. The development must not increase the total distance an occupant is required to travel from the platforms to the street via the non-fire isolated stairs. *The current total travel from the platform to the public road via the non-fire isolated stairs would appear to be up to ~210m (does not comply). The proposed new footbridge reduces the total travel distance to ~191m to the public road.* *Fire Engineer to also review and confirm fire & life safety not reduced in relation to this clause.*	**Fire Engineer to Confirm** *Existing Fire & Life Safety is Maintained or Improved*
D1.10	**Discharge of Exits** Exits from the building must be provided with an unobstructed path of travel to the street. Where exits discharge at a level that is different to the street level, compliant stairs and ramps must be provided to the street. Where necessary, exits must be provided with suitable barriers or bollards to prevent vehicles blocking them.	The discharge of exits will comply where affected by this development.	**Complies**
Part D2 - Construction of Exits			
D2.3	**Non-Fire Isolated Stairways & Ramps** Must generally be concrete, steel or 44mmm timber.	Any new or upgraded stairs to comply being concrete &/or steel.	**Complies**
D2.7	**Installations in the Path of Travel** Electrical & Comms cupboards installed in paths of egress must be suitably smoke sealed with non-combustible construction and door seals. Gas must not be installed on required exits.	Where affected by the project scope, and located in the path of travel to an exit, switchboards and DBs & Comms must be suitable smoke sealed.	**Can Readily Comply**
D2.8	**Enclosure of Space Below Stairs** Enclosed cupboards must not be installed in fire isolated stairs and if installed under non-fire isolated stairs must be fire separated with 60/60/60 walls & ceilings with self-closing -/60/30 fire doors.	Where under stair areas are enclosed, they must be fire rated in accordance with this clause. Any cages must be at least 50% open to not be considered 'enclosed' and avoid fire rating under this clause. The method of enclosing the new ISMSB and Comms room can readily comply subject to further details during later design stages	**Can Readily Comply**

BCA Cl.	BCA Requirement	Compliance Comment	Status
D2.9	**Width of Required Stairways & Ramps** A stair or ramp wider than 2m only counts as 2m for aggregate exit width purposes if there is no dividing handrails.	Informational. For consideration by Fire Engineer in any assessment.	**Informational**
D2.10	**Pedestrian Ramps** Where a ramp is serving as a required exit, it must have a gradient meeting AS1428.2 (where accessible), or otherwise be no steeper than 1:8 (BCA) with a preferred gradient of 1:10 (Railcorp ESB) and slip resistant floor surface.	Accessible ramps to meet AS1428.2, general pedestrian ramps to be no steeper than 1:8. Refer to DDA Report for full assessment.	**Informational** *Refer to DDA Report*
D2.13	**Goings & Risers** To satisfy BCA D2.13, a stairway must have— • Not more than 18 and not less than 2 risers in each flight (15 preferred under ASA) • 300mm goings and 150mm risers (ASA) • Constant goings and risers in each flight • No openings that would allow a 125mm sphere to pass through • Slip resistant treads or nosings • Where consecutive flights contain more than 36 risers in a Class 9b building, the stair must contain a minimum 30 degree change in direction. • Bottom riser may vary when meeting a public road only *See DDA Report for Accessibility Requirements relating to stairs.*	New and upgraded stairs to comply. The following issues are noted 1. Stairs 2 to platform level proposes more then 36 risers in consecutive flights without a 30 degree change in direction contrary to BCA Clause D2.13. The stairs should be redesigned to include a minimum 30 degree change in direction or, alternatively, if enlarged mid-landings are provided (1.5m minimum, 2m preferred), the stair flight can be supported as a straight run under BCA Performance Solution. MSA can assist in the preparation of the BCA Performance Solution if required. *Refer to DDA Report for full accessibility requirements that exceed standard BCA requirements for stairs.*	**BCA Performance Solution**
D2.14	**Landings** Landings at least 750mm long must be provided to divide stairs into flights no greater than 18 (15 preferred for Rail) and be no steeper than 1:50.	Provide details of all stair landing crossfalls on plan. Can readily comply subject to detail.	**Can Readily Comply**
D2.15	**Thresholds** A doorway must generally not contain a step or ramp within the door threshold unless it is leading externally and the step is no greater than 190mm (except on accessible paths where no step is allowable).	There are no new or existing thresholds affected by the proposed works.	**NA**

BCA Cl.	BCA Requirement	Compliance Comment	Status
D2.16	**Barriers to Prevent Falls** Where there is a fall of greater than 1m, new balustrades must be 1m in height to meet BCA but 1200mm in height to meet RailCorp requirements) and not contain gaps >125mm. Where there is a fall of >4m they must not contain climbable members between 150-760mm.	New balustrades must comply with this clause. where there is a fall of greater than 1m (except for platform edges facing the trains). Details of all new or affected balustrades to be provided for detailed assessment.	**Can Readily Comply**
D2.17	**Handrails** A handrail at 865mm-1000mm in height must be provided to at least one side of all stair and ramps in non-accessible areas. Accessible handrails must be provided to both sides of all stairs in accessible areas. *See Part H2 &/or DDA Report for enhanced requirements to passenger use areas.*	*Refer to DDA Report*	**Design Cert Required** *From DDA Consultant* *Refer to DDA Report*
D2.19	**Doorways & Doors** Generally sliding fire doors, sliding smoke doors, revolving doors, roller shutters and tilt-up doors must *not* be installed to exits. Where power operated doors are used, they must be openable with a force no greater than 110N and open automatically in power failure and lead directly to open space.	There are no new or existing doors affected by the proposed works	**Complies**
Part D3 – Access for People with Disabilities			
Part D3 & H2	**Access for People with Disabilities** Back of House areas are required to comply with BCA Part D3 Passenger Use Areas are required to comply with the enhanced provisions of BCA Part H2. Where a conflict arises, BCA Part H2 takes precedence. Access / DDA is not specifically considered by this BCA Report. Refer to separate DDA Report for assessment.	*Refer to DDA Report for compliance*	**Design Cert Required** *From DDA Consultant* *Refer to DDA Report*

BCA Cl.	BCA Requirement	Compliance Comment	Status
Section E – Services & Equipment			
Section E	**Services & Equipment** *BCA Section E* Any new or affected Fire Services must comply with the BCA Section E and relevant Australian Standards.	Existing Fire Services must be extended and adjusted to suit the new / revised layout. Where the existing building is not provided with fire services required under current code, there is no specific requirement to upgrade / provide those fire services, unless the development at-hand specifically 'triggers' their provision. See below for specific fire services. Where applicable, the fire services design should be accompanied by plans prepared by suitably qualified Electrical, Mechanical, Hydraulic or Fire Service Consultant for each of the required Fire Services.	**Design Cert Required** *From Engineers*
Part E1 – Fire Fighting Equipment			
E1.3	**Fire Hydrants** Fire hydrant coverage meeting AS2419.1 must be confirmed / provided: • to new buildings or new parts that are over 500m^2 in total floor area • to any additional floor area in an existing building that is already provided with hydrant coverage *Note: Hydrant coverage for train fires is beyond the considerations of the BCA though may require consideration under any Fire & Life Safety Report*	The existing building floor area is considered to be the entire platform (roofed and unroofed) as well as the entire footbridge/concourse (roofed and unroofed) which is existing and already >500m2 and not provided with compliant hydrant coverage throughout as required under current BCA Clause E1.3. This is considered to be an existing non-compliance not caused by the development. Subject to the fire engineer confirming that the development does not reduce the overall fire protection afforded to the occupants of the building (proposed vs existing), then there is not considered to be any increase in floor area and no regulatory trigger under the EP&A Act to provide/upgrade Fire Hydrants for this development.	**Fire Engineering Required** *(Confirm Fire Protection Not Reduced)*
E1.4	**Fire Hose Reels** Fire hose reel system meeting AS2441-2005 must be provided: • to any fire compartment that is greater than 500m^2 in total floor area • to any increase in floor of a fire compartment in an existing building that is already provided with hose reel coverage. *Note: Hose Reel coverage for train fires is beyond the considerations of the BCA though may require consideration under any Fire & Life Safety Report*	The existing building fire compartment is already considered to be >500m2 and is not provided with compliant fire hose reel coverage throughout as required under current BCA Clause E1.4. Subject to the fire engineer confirming that the development does not reduce the overall fire protection afforded to the occupants of the building (proposed vs existing), then there is not considered to be any increase in floor area of the fire compartment and therefore no regulatory trigger under the EP&A Act to provide/upgrade Fire Hose Reels for this development.	**Fire Engineering Required** *(Confirm Fire Protection Not Reduced)*

BCA Cl.	BCA Requirement	Compliance Comment	Status
E1.6	**Portable Fire Extinguishers** Portable fire extinguishers are required to serve Class A-Class E fire under BCA E1.6 & AS2444-2001. They are not required for Class A fire where fire hose reels are otherwise provided.	Portable fire extinguishers to be provided to new and affected rooms and areas. Design Engineer to certify design compliance with BCA E1.6 & AS244-2001 as appropriate for the new and affected areas.	**Design Cert Required** *From Engineer*
E1.10	**Provision for Special Hazards** Additional PFEs may be required should the building contain special hazards.	Should the Fire Services Engineer deem there are special hazards, additional PFEs may be required.	**Can Readily Comply**
BCA Part E2 – Smoke Hazard Management			
Part E2	**Smoke Hazard Management** Smoke Hazard Management must be provided per Table E2.2a and E2.2b depending on the class, rise in stories and nature of the building design. Class 9b buildings with mechanical air-handling systems that are ducted or exceed 1000l/s must shutdown in the event of smoke detector activation. Smoke detection per AS1670.1 can be required to allow exit / egress doors to unlock in the event of emergency under BCA D2.21.	Smoke hazard management is not required under the deemed-to-satisfy provisions, Fire Engineering may exceed DTS requirements. Design Engineer to review and certify compliance.	**Design Cert Required** *From Engineer*
Part E3 – Lift Installations			
E3.1	**Lift Installations** Electrical passenger lifts and electrohydraulic passenger lifts must comply with BCA Spec E3.1	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*

BCA Cl.	BCA Requirement	Compliance Comment	Status
Spec E3.1	**Lift Installations Specification** Lifts under E3.1 must be provided with the features included in BCA Specification E3.1 including; • Where exposed to solar radiation, the lift car must have mechanical ventilation at a rate of one air change per minute or mechanical cooling. • Have an alternative power source for ventilation or mechanical cooling in the event of normal power loss that last for at least 2 hours. • Contain an emergency lighting system that automatically activates upon failure of the normal lighting supply and provides at least 20 lux of lighting for 2 hours on the alarm initiation button. • Contain cooling of the lift shaft whilst the lift is in service that will– - ensure that a dry bulb air temperature in the lift shaft does not exceed 40°C - if the cooling is by a ventilation system, be provided with an air change rate determined using a temperature rise of no more than 5K.	New lifts to comply – subject to detailed design The following must be addressed in future design stages; **1. Ventilation of Lift Shaft – BCA Performance Solution Required** Under Clause 4 of BCA Specification E3.1 "Cooling of Lift Shaft", the cooling of the lift shaft must ensure that that dry bulb temperature in the lift shaft does not exceed 40 degrees. Due to the expected ambient temperatures in the area that may exceed 40 degrees (and active cooling is not proposed), compliance may at time not be achieved. It is proposed to address this non-compliance by way of BCA Performance Solution (MSA can prepare) with support of the Mechanical Engineer and Lift provider.	**BCA Performance Solution Required** *Lift shaft temperatures*
E3.2	**Stretcher Facilities in Lifts** Where serving a level >12m in effective height, the lift must contain a portion within the internal car dimensions that is 2000mm (deep) x 600mm (wide) to allow for stretcher facilities. Note ASA / ESB prefers that *all* lifts can accommodate a stretcher.	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*
E3.3	**Warning Against the Use of Lifts in Fire** A warning sign must be provided near the lift call buttons stating "DO NOT USE LIFTS IF THERE IS A FIRE".	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*
E3.4	**Emergency Lifts** Emergency lifts are typically required to buildings >25m in effective height.	NA – building less than 25m in effective height.	**NA**

BCA Cl.	BCA Requirement	Compliance Comment	Status
E3.5	**Lift Landings** Access and egress from lift landings must comply with BCA Section D. *Refer to DDA report for full Lift Landing Clearances and requirements for accessibility*	New lifts to comply – subject to detailed design	**Complies**
E3.6	**Passenger Lifts** In an accessible building, every passenger lift must be one of the types referred to in Table E3.6a and contain all features specified in Table E3.6b. In summary, the lift should generally comply with the relevant requirements of AS1735.12 and contain the following: • Minimum 1700mm x 1400mm internal lift car dimensions for accessibility (BCA E3.6 & AS1428.2). *Note: "Skinny" or "Through Lifts" can be reduced in width but require support by BCA Performance Solution if proposed.* • Minimum 2000mm (deep) x 600mm (wide) internal lift car portion to allow for stretcher facilities (Desirable / ASA) • Contain accessible features and controls per AS1735.12 *Refer to DDA Report for full accessibility requirements.*	New lifts to comply – subject to detailed design. *Note: Rail design requirements may exceed BCA.* *Refer to DDA Report for detailed accessibility requirements to lifts.*	**Design Cert Required** *From Engineer*
E3.7	**Fire Service Controls** Fire service controls are required to lifts serving >12m in effective height including a fire service recall switch per BCA E3.9 and lift car fire control per BCA E3.10 – see below.	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*
E3.9	**Fire Service Recall Control Switch** Fire service recall controls are required at each lift bank where serving an effective height greater than 12m in accordance with this clause.	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*
E3.10	**Lift Car Fire Service Drive Control Switch** Lift car fire service control switches must be provided in accordance with this clause where serving an effective height greater than 12m.	New lifts to comply – subject to detailed design	**Design Cert Required** *From Engineer*

BCA Cl.	BCA Requirement	Compliance Comment	Status
Part E4 – Visibility in an Emergency, Exit Signs & Warning Systems			
E4.2, E4.4	**Emergency Lighting** Emergency lighting must generally be provided throughout stories greater than 300m^2, and above all required exit stairs and ramps per AS2293.1-2005.	Emergency lighting must be upgraded to suit the amended layout. Design engineer to certify compliance for all new / upgrade works to BCA & AS2293.1-2005.	**Design Cert Required** *From Engineer*
E4.5, E4.6 & E4.8	**Exit & Directional Signs** Illuminated exit signs is required above all exit doors, stairs and final exit points and where the exist isn't readily apparent, directional exit signage is required per AS2293.1-2005.	Exit lighting to be upgrade to suit the proposed design. Design engineer to certify compliance for all new / upgrade works to BCA & AS2293.1-2005.	**Design Cert Required** *From Engineer*
Section F – Health & Amenity			
Part F1 – Damp & Weatherproofing			
F1.1	**Stormwater Drainage** Stormwater drainage must comply with AS3500.3	Where applicable, any new stormwater drainage to comply. Subject to design certification from drainage engineer.	**Design Cert Required** *From Engineer*
F1.13	**Glazed Assemblies** *See BCA B1.4*	All new glazing to comply. Subject to detail, plan or spec note.	**Can Readily Comply**

BCA Cl.	BCA Requirement	Compliance Comment	Status
Part F2 – Sanitary & Other Facilities			
F2.3 & F2.4	**Sanitary Facilities – Staff** Sanitary facilities are required to be provide at the following rates for *staff* use: • Male Closet Pans – 1 for 1-20 male occupants • Male Urinals – 0 for 1-10 & 1 for 11-25 male occupants • Male Washbasins – 1 for 1-30 male occupants • Female Closet Pans – 1 for 1-15 female occupants • Female Washbasins – 1 for 1-30 female occupants *Accessible and ambulant facilities must also be provided for staff where toilet facilities are provided.* *Accessible facilities should be provided at every storey containing a bank of toilets. An accessible toilet for staff use can count once for each sex.*	There are no new or existing sanitary facilities affected by the proposed works	**NA**
F2.3 & F2.4	**Sanitary Facilities – Public** BCA does not specify minimum sanitary facility numbers for patrons. Where provided, accessible facilities should meet the requirements of BCA, AS1428.1, relevant parts of AS1428.2 and ASA Standards Where male and female toilets are provided in addition to any accessible toilet, a separate male and female ambulant facility should also be provided. See BCA H2.8 for sanitary facility requirements for passenger use areas.	There are no new or existing sanitary facilities affected by the proposed works	**NA**

BCA Cl.	BCA Requirement	Compliance Comment	Status
BCA Part F3 - Room Heights			
F3.1	**Height of Rooms & Other Spaces** BCA requires that all public habitable areas must be typically: - 2700mm for public areas with >100 occupants - 2400mm generally for habitable rooms - 2100mm for non-habitable rooms - 2000mm above stairs and ramps *Note: Rail Design Requirements may exceed BCA.*	Compliance generally indicated.	**Can Readily Comply**
BCA Part F4 - Light & Ventilation			
F4.4	**Light** Artificial lighting is required to all newly created or affected areas in accordance with BCA F4.4 and AS1680.0-2009. Whilst natural light may be provided, it is not required.	Lighting to AS1680.0-2009 required to all affected areas. See also DDA Report. Subject to certification from the design engineer.	**Design Cert Required** *From Engineer*
F4.5	**Ventilation of Rooms** A habitable room, office, shop, factory, workroom, sanitary compartment, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have natural light amounting to 5% of the floor area of the room served or mechanical ventilation complying with AS/NZS 1668.2-2010.	Ventilation required to all newly created or affected rooms and spaces in accordance with this clause.	**Design Cert Required** *From Engineer*
Part G6 – Occupiable Outdoor Area			
-	**Occupiable Outdoor Area - Definition** *Occupiable outdoor area* means a space on a roof, balcony or similar part of a building— (a) that is open to the sky; and (b) to which access is provided, other than access only for maintenance; and (c) that is not open space or directly connected with open space. *Note: An occupiable outdoor area is not a storey for the purposes of Schedule 3of the NCC/BCA and therefore is not included in the determination of rise in storeys. It is considered a storey for the purposes of other parts detailed below.*	Open platforms and other unroofed areas within the station are generally considered occupiable outdoor area to which BCA Part G6 would apply.	**Informational**

BCA Cl.	BCA Requirement	Compliance Comment	Status
Part H2 – Public Transport Buildings			
Part H2	**Enhanced Public Transport Building Access –** *BCA Part H2* All new works under the project scope must comply with the "Access and Facilities for People with Disabilities" requirements of the BCA. The enhanced deemed-to-satisfy provision of Part H2 & AS1428.2 apply to passenger use areas of a Class 9b or 10 building used for public transport. Staff and Back of House Areas must otherwise comply with BCA Part D3 and AS1428.1-2009. The DTS provisions of Part H2 take precedent where there is a difference to the DTS provisions in BCA Part D3, E3 and F2.	*Refer to DDA Report for Part H2 compliance.*	**Design Cert Required** *From DDA Consultant* *Refer to DDA Report*
Section J – Energy Efficiency			
Section J	**Energy Efficiency** *BCA Section J* New works must comply with the Energy Efficiency requirements of Section J, including: Part J1 - Building Fabric Part J2 - Glazing Part J3 - Building Sealing Part J5 – Air-conditioning & Ventilation Systems Part J6 - Artificial Lighting and Power Part J7 - Hot Water Supply Part J8 – Access for Maintenance	Any new development works must comply with BCA Section J for Energy Efficiency. The design should be reviewed & certified by a suitably qualified Energy Efficiency Consultant during the detailed design.	**Design Cert Required** *From Energy Efficiency Consultant, Architect &/or Engineer*

7.0 Conclusion

This report assesses the **Reference Level Design** for the proposed **New Footbridge, Stairs and Lifts at Mount Colah Station** against the requirements of the National Construction Code (NCC) / Building Code of Australia (BCA).

The primary purpose of the report is to identify any non-compliances with the deemed-to-satisfy provision of the BCA that would be caused by the proposed accessibility upgrade works.

Please note that this is an assessment of the proposed development works and does not constitute a full BCA upgrade assessment of the existing station (Refer to Section 3.3.2 *"Development in Existing Buildings"* of this report for more information).

Subject to compliance with the recommendations of this report, the development can readily comply with the relevant requirements of the BCA. Recommendations have been identified as follows:

- Significant BCA matters, being those with the ability to affect the design have been included in Table 1.0 in the Executive Summary.
- A BCA Compliance Schedule suitable for the current level of design is also contained in in Table 6.0 of this report.

Attachment A – Summary of Fire Resistance Levels

The following is a summary of the required fire resistance levels of buildings elements required for Type B Construction. Refer to BCA Specification C1.1 for full details.

Note: Railcorp ESB Standards may exceed BCA.

<table>
<tr><th>Element</th><th>FRL & Comment</th></tr>
<tr><td>Lift Shaft</td><td>
No FRL required to lift shafts generally as the lift links only two stories. However, loadbearing lift shafts that are also external walls may require a fire rating if within 18m of a fire source feature (See “External Walls” above)

Where lift shaft provides structural support for the footbridge, the lift structure must achieve an equivalent FRL as the footbridge.

The walls of the lift shaft must comply with Specification C1.8 “Structural Tests for Lightweight Construction”.

The lift shaft must comply with the structural requirements of Section B including B1.4(m) which states:

Lift shafts which are not required to have an FRL, must—

(i) except as required by (ii), be completely enclosed with non-perforated material between the bottom of the pit and the ceiling of the lift shaft, other than—
(A) at landing doors, emergency doors and pit access doors; and
(B) low-rise, low-speed constant pressure lifts; and
(C) small-sized, low-rise automatic lifts; and
(ii) in atrium and observation areas, be protected with non-perforated material not less than 2.5 m in height—
(A) above any places on which a person can stand, which are within 800 mm horizontal reach of any vertical moving lift component including ropes and counterweights; and
(B) at the lowest level of the atrium area that the lift serves, on all sides except the door opening, for not less than 2.5 m in height, by enclosure with non-perforated material; and
(iii) be of non-brittle material; and
(iv) where glazing is used—
(A) comply with Table B1.4; or
(v) (B) not fail the deflection criteria required by Clause 6(c)(iii) of Specification C1.8.

Table B1.4 MATERIAL AND THICKNESS OF GLAZING
<table>
<tr><th rowspan="2">Application</th><th colspan="2">Minimum thickness</th></tr>
<tr><th>Lift shaft vision panels more than 65 000 mm², door panels, and lift shafts</th><th>Lift shaft vision panels less than or equal to 65 000 mm²</th></tr>
<tr><td>Laminated glass</td><td>10 mm (0.76 mm interlayer)</td><td>6 mm (0.76 mm interlayer)</td></tr>
</table>
Table B1.4 MATERIAL AND THICKNESS OF GLAZING — continued
<table>
<tr><th rowspan="2">Application</th><th colspan="2">Minimum thickness</th></tr>
<tr><th>Lift shaft vision panels more than 65 000 mm², door panels, and lift shafts</th><th>Lift shaft vision panels less than or equal to 65 000 mm²</th></tr>
<tr><td>Toughened/Laminated</td><td>10 mm (0.76 mm interlayer)</td><td>6 mm (0.76 mm interlayer)</td></tr>
<tr><td>Annealed, with security polyester film coating</td><td>10 mm</td><td>6 mm</td></tr>
<tr><td>Safety wire</td><td>Not applicable</td><td>Subject to fire test</td></tr>
<tr><td>Polycarbonate</td><td>13 mm</td><td>6 mm</td></tr>
</table>
</td></tr>
</table>

Element	FRL & Comment
Footbridge Floor	New footbridge floors must achieve an FRL of no less than 30/30/30 under BCA Table 4 of Spec C1.1 (RailCorp standards may exceed BCA).
Loadbearing Walls/Columns Supporting Footbridge	Under Clause 2.2 of Spec C1.1 "Support of Another Part" loadbearing walls and columns must achieve an equivalent structural FRL as the element they support, being 30/-/- to satisfy BCA, (RailCorp Standards may exceed BCA)
Roof	Must be Non-Combustible, No FRL required
Internal Footbridge Loadbearing Walls & Internal Columns	No FRL required to any internal columns and walls in the storey immediately below the roof - subject to concession 4.1(g) of Spec C1.1
External walls & Associated Columns on Footbridge	Benchmark 120 minute FRL required <18m from a fire source feature, or No FRL where >18m from a fire source feature
Service Risers	Where service penetrations are contained within a shaft (and not protected against the spread of fire where penetrating the fire rated floor), the shaft must achieve an FRL of no less than 30/30/30 to comply with BCA C3.12.
Separation of Equipment	Where provided, emergency generators, boilers, batteries and lift motor rooms and equipment otherwise specified in BCA Clause C2.12 are required to be fire separated by 120/120/120 construction.
Main Electrical Switchrooms, ISMSBs, SSERs	Where provided, 120/120/120 FRL
Comms Rooms	Where provided, there is no specific FRL required for Comms rooms, but they must be suitably smoke sealed in accordance with BCA Clause D2.7 "Installations in the Path of Travel".
Rooms Under Stairs	Where provided, Enclosed rooms under stairs must be provided with 60/60/60 walls and ceilings with -/60/30 self-closing doors.
Service Penetrations	All service openings through fire/smoke rated construction must also be fire or smoke rated as appropriate per BCA C3.15 and BCA D2.7.

DRAWING LIST

ARCHITECTURAL	DESCRIPTION
30012921-AR-001	COVER SHEET
30012921-AR-002	NOTES & LEGENDS
30012921-AR-003	EXISTING/PROPOSED SITE ANALYSIS PLAN
30012921-AR-101	EXISTING SITE / DEMOLITION PLAN
30012921-AR-102	SITE PLAN
30012921-AR-103	PLATFORM / STREET PLAN
30012921-AR-104	FOOTBRIDGE PLAN
30012921-AR-105	ROOF PLAN
30012921-AR-201	ELEVATION & LONG SECTION SHEET 1
30012921-AR-202	ELEVATION & LONG SECTION SHEET 2
30012921-AR-203	ELEVATION & LONG SECTION SHEET 3
30012921-AR-204	SECTIONS

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Appendix F DDA Report

MATT SHUTER + ASSOCIATES

Access for People with Disabilities

Design Compliance Report

Reference Design Review

New Footbridge, Stairs and Lifts at Mount Colah Station

Report Number & Revision:	**MSA2004_DDA_MountColah_FB_2**
Prepared For:	**CCG Architects**
Date of Issue:	**25th November 2020**

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Revision History & Quality Management

Report Number	Rev	Status	Date
MSA2004_DDA_MountColah_FB_1	Rev1	Draft Reference Level Design	07.08.20
MSA2004_DDA_MountColah_FB_2	Rev2	Reference Level Design	25.11.20

Role	Name + Signatures	Credentials
Written By:	[redacted]	**Building Code, Access & Fire Safety Consultant**
Reviewed By:	[redacted]	**Building Code, Access & Fire Safety Consultant** **Grade 1 - Accredited Building Certifier / PCA** Building & Development Certifier Registration No. BDC0809 Association of Access Consultants No. 564 Member of the Australian Institute of Building Surveyors Member of the Association of Accredited Certifiers

Contents

Executive Summary & Recommendations

This report has assessed the **Reference Level Design** for the proposed **New Footbridge, Stairs and Lifts at Mount Colah Station** under the relevant requirements relating to "Access for People with Disabilities".

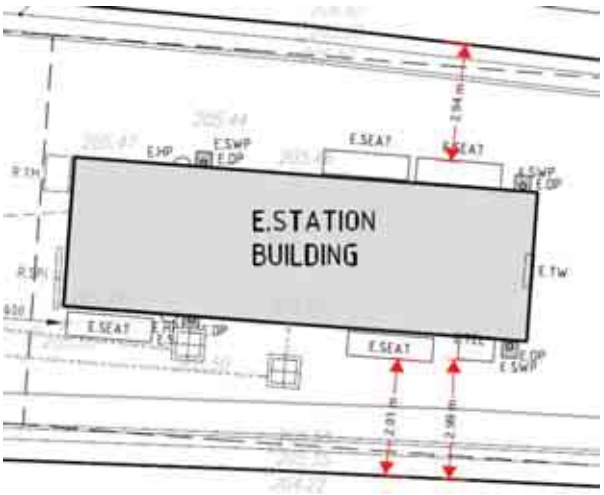
The primary purpose of the report is to assess the design documentation against the relevant accessibility provisions and to provide suitable recommendations to ensure the design will meet the appropriate accessibility requirements for specified scope works. The existing building may/will contain existing non-compliances that are not necessarily addressed by the project scope.

Subject to the recommendations of this report, the development demonstrates an ability to comply with the relevant provisions of access and facilities for people with disabilities for the new works that are specified under the scope.

Significant Recommendations are summarised below in **Table 1.0** and **Table 3.0** contains further detailed requirements.

Table 1.0 – Significant DDA Recommendations

#	Clause	DDA Recommendation	Status
1.	BCA H2.7 & AS1428.1 / AS1428.2	**Stairway Nosings** BCA Clause H2.7 still calls up AS1428.2-1992 type nosings which is a minimum 25mm return of the contrasting nosings on the vertical face. This style of nosings MSA no longer considered best practice as AS1428.1-2009 now limits the contrasting return on the vertical face to no greater than 10mm to allow the leading edge of the stair to be better identified and also specifies a minimum 30% contrast is achieved. The use of an AS1428.1-2009 compliant nosing to new or upgraded stairs is considered the most appropriate nosing design to provide for consistency and familiarity across the station network, but its use in lieu of AS1428.2-1992 compliant nosings will require support by BCA Performance Solution due to BCA H2.7 still calling up the Part 2 standard.	**Performance Solution Required**

#	Clause	DDA Recommendation	Status
2.	BCA H2.2	**Accessible Path and Platform Setbacks** Where accessible facilities are to remain on the northern side of the platform building (operational ticket counter, information boards, ticketing machines & payphone etc), it is recommended the accessible path between the platform building and 1500mm platform edge safety zone be upgraded to achieve compliance. This may require the relocation of existing facilities such as the seating and telephone. Detailed scope to be confirmed. 	**Desirable** *Subject to confirmation of scope*
3.	Various	**Design Detail** Further to the above matters, those items that are indicated as *"Can Readily Comply – (Subject to Detail)"* in Table 3.0 also require further detailed to allow full assessment by the DDA Consultant.	**Details Required**

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1.0 Introduction

This report has assessed the **Reference Level Design** for the proposed **New Footbridge, Stairs, Lifts and surrounding precinct works at Mount Colah Station** under the relevant requirements relating to "Access for People with Disabilities".

1.1 Assessed Information

This report is based on assessment of the following information:

- Desktop assessment of the **Reference design documentation** and supporting design plans and information prepared by CCG Architects (refer **Attachment A – Assessed Plans***)*
- Disability Discrimination Act ("DDA") related Regulations, Codes and Standards as detailed in Section 1.2 below.

1.2 Purpose of Report

The purpose of this report is to identify the extent to which the architectural design documentation complies with the following and to provide recommendations where necessary:

- *The Disability Discrimination Act 1992* ("DDA") – notably the DDA is a complaints-based legislative instrument. The Disability Discrimination Act 1992 seeks to eliminate discrimination, 'as far as possible', against people with disabilities. Public transport is a service covered by the Disability Discrimination Act 1992. The DDA does not contain specific building regulations or design requirements.

  The Disability Discrimination Act 1992 covers a range of disabilities, including the following: (a) partial or total loss of sight; (b) partial or total loss of hearing; (c) partial or total loss of speech; (d) disfigurements or deformities; (e) difficulties in walking (including partial or total loss of use of legs); (f) difficulties in fully using arms (including gripping); (g) learning and orientation difficulties; (h) sensitivity to chemicals causing malfunction of a person's body; (i) chronic diseases, illnesses or other medical conditions; (j) emotional or behavioural conditions.

- *The Disability Standards for Accessible Public Transport 2002* as amended in 13 May 2010 ("DSAPT") – majority of the building design requirements for passenger use areas of public transport buildings contained in DSAPT were shifted to both the Access to Premises Standard 2010 and BCA Part H2 in 2010. DSAPT still contains several applicable requirements including those for conveyances, infrastructure, waiting areas, rest points, boarding points and passenger information. The purpose of these Standards is to enable

public transport operators and providers to remove discrimination from public transport services.

- *Disability (Access to Premises Buildings) Standards 2010* – this federal legislative instrument requires new works in applicable premises to comply with the accessibility requirements of the BCA and also contains a mandated timetable of compliance to upgrade existing passenger use areas of public transport buildings to meet current BCA in relation to accessible features (Attachment B)

  Note in Relation to Disability Access to Premises Standard 2010 - This Commonwealth legislation has been in-force as of 1st May 2011. Clause 3.1 of the Premises Standard stipulates certain accessible features that are required to be installed by certain target dates for existing station buildings. The Table in Clause 3.1 expresses these figures as a percentage of the overall existing buildings in which the features must be installed. That is, the percentage figures are an overall strategic objective for the existing public transport buildings under control of Sydney / NSW Trains.

  The obligation to meet the upgrade requirements of the Disability (Access to Premises – Building) Standard 2010 lies with both the owner and operator as defined under the Transport Standards, effectively being TfNSW/Sydney/NSW Trains. Whilst, these obligations do not specifically dictate any upgrade, the objectives should be identified for consideration by TfNSW/ Sydney/NSW Trains in meeting their overall strategic requirements to upgrade their existing stations for accessibility.

- *The Building Code of Australia 2019 (Note: BCA 2019 has been utilised on the basis of the Invitation to Tender to carry out the Crown Building Work falling within the BCA 2016 – Amendment 1 period of adoption)*, it contains accessibility requirements for public transport buildings and structures, namely:

  - BCA Part D3 “Access for People with Disabilities” – this part contains general accessibility requirements for all types of buildings.

  - BCA Part E3 “Lift Installations” – this part specifies lift types, sizes and features required in all buildings

  - BCA Part F2 “Sanitary & Other Facilities” – this part includes requirements for sanitary facilities, including numbers vs populations, and accessible and ambulant facilities.

  - BCA Part H2 “Public Transport Buildings” – this part contains enhanced accessibility requirements for passenger use areas of public transport buildings, where a contradiction occurs with other parts of the BCA, these enhanced requirements prevail

- *The Guide to the Building Code of Australia* (National Construction Code) 2019

- *Australian Standards* – these are technical design standards published by Standards Australia. to provide for appropriate accessibility in buildings, including:

  - Relevant parts of *AS1428.1-2001/2009 "Design for Access and Mobility – Part 1: General Requirements for Access New Building Works"*

  - Relevant parts of *AS1428.2-1992 "Design for Access and Mobility – Enhanced and Additional Requirements – Buildings and Facilities"*

  - Relevant parts of *AS1428.4-1992 "Design for Access & Mobility – Part 4 Tactile Ground Surface Indicators For Orientation of People with Visual Impairment"*

  - Relevant parts of *AS1428.4-2009 "Design for Access & Mobility–Part 4.1 Means to Assist the Orientation of People with Vision Impairment – Tactile Ground Surface Indicators"*

  - AS1735.12-1999 *"Lifts, Escalators & Moving Walkways – Part 12 – Facilities for Persons with Disabilities"*

  - AS2890.6-2009 *"Parking Facilities - Off Street Parking for People with Disabilities"*

- *ASA / Railcorp Engineering Standard* - Stations and Buildings - Station Design Standard Requirements issued May 2010 (considered where relevant to accessibility issues only). These design standards contain specific requirements for accessible features in station buildings. They can either compliment or exceed the requirements contained elsewhere in DDA related regulations.

- *Transport / Sydney Trains / NSW Train Link Stations Components Guide* (for Guidance only as relevant to DDA interpretation) Version 1.0 dated June 2017

1.3 Limitations of Report

The report is subject to the following limitations:

- The assessment is limited to the proposed project scope only as depicted in the assessed information referred to in Section 1.1 of this report, and does not consider the existing building compliance or precinct compliance beyond that specified in the project scope. The existing building may/will contain existing non-compliances that are not necessarily addressed by this project scope.

- Some accessibility requirements are recognised as being interpretive in nature. Where these matters are encountered, interpretations are made in accordance with Matt Shuter &

Associates (MSA) policy. Specific relevant interpretations relevant to this assessment are included in Section 2.3 “DDA Interpretation”.

- The Disability Discrimination Act, 1992 is complaints-based legislation. Compliance with the recommendations of this report does not assure or guarantee compliance with the provisions of the DDA and is limited to technical assessment of the proposed project scope only.

- The information provided to MSA as nominated in Section 1.2 is accepted in good faith as accurate and correct.

2.0 Building Characteristics

2.1 Building Description

2.1.1 Mount Colah Station

The building is the existing **Mount Colah Station** located between Pacific Highway to the west and Pierre Close to the east at Mount Colah NSW.

The proposed works include the demolition of the existing footbridge and stair located at the northern end of the platform and the erection a new footbridge located centrally along the platform with various precinct works. The proposed works seek to provide improved accessibility to the station with the provision of new lifts, stairs and accessible paths between new and existing interchange facilities.

Refer to separate Architectural Design Report for full extent of proposed works under scope.

2.2 BCA Assessment Data

The following BCA assessment data is relevant to the proposal under the current BCA:

Table 2.2 BCA Assessment Data

BCA Clause		Existing (Overall Building)	Proposed (Overall Building)
A1.1	Classification	Class 5 (Offices) Class 9b (Station Passenger Use Areas)	Class 5 (Offices) Class 9b (Station Passenger Use Areas)
A3.2	Rise in Stories	2	2

2.3 BCA & Access Interpretation Notes:

- *Assembly Building* – means a building where people may assemble for transit purposes including a bus station, railway station, airport of ferry terminal

- *BCA Classification* – the building is considered to be a Class 9b "Assembly building", which by BCA definition includes a building 'where people may assemble for transit purposes including a railway station'.

- *Passenger Use Areas* – public areas of the station must comply with the enhanced access provisions of BCA, being Part H2 "Public Transport Buildings". Where there is a difference between the requirements of Part H2 and those of Part D3, the provisions of Part H2 prevail.

- *Back-of-House / Staff Areas* – must comply with the standard access provisions, being Part D3 "Access for People with Disabilities", except where exempt under BCA D3.4

- *Adoption of Accessibility Australian Standards* - BCA Part H2 references Australian Standards that have been superseded in part (AS1428.2-**1992**). The requirements of AS1428.2-1992 have generally been adopted, except where the newer AS1428.1-2009 requirements now supersede the AS1428.2-1992 requirements. In these circumstance, the AS1428.1-2009 requirements have been adopted to be in-line with accessibility best practice. In summary AS1428.1-2009 requirement have been adopted for:

    - Stair Nosings
    - Step & Kerb Ramps
    - Door Threshold Ramps
    - Door Circulation & Widths
    - Accessible Toilet Dimensions
    - Accessible Toilet Signage Requirements
    - Controls

- *Essential* **–** are recommendations that are specifically required to meet relevant technical access legislation including Premises Standard, DSAPT, BCA or Australian Standards when considered against the scope.

- *Desirable* **–** are recommendations that are considered DDA Best Practice (though not necessarily detailed in any specific technical standard) and are also intended to assist in minimising the risk of potential DDA claims and promote enhanced access for all including those with disabilities.

3.0 Access Assessment & Recommendations

The following DDA Compliance Schedule details the relevant requirements and provides recommendations to provide for appropriate and compliant accessibility with regard to the project scope. Table 3.0 is a summary of requirements only and referenced documents and standards should always be referred to for full dimensions and requirements. The following notations are made in the below table:

Status	Description
Complies	The design documentation demonstrates compliance with the relevant accessibility / DDA requirements as relevant to the project scope
Can Readily Comply	The matter can readily comply with the relevant accessibility / DDA requirement though further detail may be required to demonstrate full compliance.
NA / Informational	The matter is not applicable to the item of the project scope or the clause is informational only
Does Not Comply	The existing station does not comply with the accessibility requirement or the design documentation does not demonstrate compliance with the relevant accessibility / DDA requirements as relevant to the project scope. Plan or specification changes may be necessary
BCA / DDA Performance Solution Required	A BCA Performance Solution Report will be necessary to support the matter under the performance requirements of the BCA as the development will not meet the "Deemed-To-Satisfy" provisions associated with the accessibility requirement. Further assessment required
Design Cert Required	A certificate is required from the relevant designer &/or design engineer to certify their design is compliant with detailed requirements of the relevant accessibility requirements. This design certificate will typically accompany their design plans or specifications prior to final certification by the DDA consultant.
Essential	Are recommendations that are specifically required to meet relevant requirements of the brief in relation to technical access legislation including Premises Standard, DSAPT, BCA or Australian Standards when considered against the scope
Desirable	Are recommendations that are considered DDA "Best Practice" to provide for equitable and dignified access for people with disabilities (though not necessarily detailed in any specific accessibility technical standard). These recommendations are also intended to assist in minimising the potential of DDA claims and promote enhanced access for all including those with disabilities

Table 3.0 – DDA Compliance Schedule

DDA Requirement	Recommendation / Comment	Status
Mode Interchange Facilities		
Bus-Stops *DSAPT* Bus stops affected by the development scope should provide: • Boarding point to bus must be firm and level (8.1 of DSAPT) • Where a kerb is installed it must be 150mm higher than the road surface (8.1 of DSAPT) • Directional stripe of tactiles indicating the location of the bus head (600mm wide directional tactiles across the footpath leading to a 600 x 600mm square of hazard tactiles located 300mm back from the kerb edge) (18.3 of DSAPT & AS1428.4.1) • Located within 50m of the station entrance where possible (Desirable) • Where waiting areas are provided, they should contain: - Shelter for sun and rain (Desirable, Essential if otherwise provided for able bodied) - A minimum of 2 seats or 5% of the seats must be identified as accessible and comply with 27.2 of AS1428.2 (7.1 of DSAPT) - A level allocated space measuring 800mm x 1300mm must be provided outside of ordinary pedestrian paths, where possible (7.2 of DSAPT) • An accessible path to the station entry / platform boarding points must be provided	There are 1 x bus stops located on Pacific Highway. The bus stop is provided with a shelter however, the existing bench seat is not provided with accessible armrests and there is no undercover wheelchair waiting space (800mm x 1300mm). The development proposes to provide an accessible path to the existing footpath which leads to the bus stop, but no works are proposed to the footpath or the bus shelter. It is a *desirable* recommendation the existing footpath leading to the bus stop be upgraded, the existing seating be upgraded with accessible seating, a wheelchair waiting space be provided under the shelter and directional tactile bands be installed to identify the bus head locations The extent of works to the existing footpath and bus stop to be confirmed during future design stages.	**Details Required** *Desirable Recommendionl*
Taxi Ranks *DSAPT* Taxi ranks affected by the development scope should provide: • A minimum of one accessible sized taxi rank with cross fall of 1:40 (1:33 bitumen) should be provided to meet AS2890.6-2009 (Desirable): - *Parallel* - 7.8m length x 3.2m width with 1600mm wide side share zone - *Angled* - 5.4m x 2.4m with a 2.4m wide adjacent shared zone • Where waiting areas are provided, they should contain: - Shelter for sun and rain (Desirable, Essential if otherwise provided for able bodied) - A minimum of 2 seats or 5% of the seats must be identified as accessible and comply with 27.2 of AS1428.2 (7.1 of DSAPT) - A level allocated space measuring 800mm x 1300mm must be provided outside of ordinary pedestrian paths, where possible (7.2 of DSAPT) • An accessible path to the station entry must be provided • A kerb ramp should be provided to connect any accessible taxi rank/s to the footpath • An accessible path to the station entry / platform boarding points must be provided	NA – there is no existing or proposed taxi ranks	**NA**

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DDA Requirement	Recommendation / Comment	Status
Kiss 'n Ride Bays *DSAPT* Kiss n Ride Bays affected by the development scope should provide: • A minimum of one accessible sized Kiss n' Ride bay with cross fall of 1:40 (1:33 bitumen) should be provided to meet AS2890.6-2009 (Desirable): - *Parallel* - 7.8m length x 3.2m width with 1600mm wide side share zone - *Angled* - 5.4m x 2.4m with a 2.4m wide adjacent shared zone • Where waiting areas are provided, they should contain: - Shelter for sun and rain (Desirable, Essential if otherwise provided for able bodied) - A minimum of 2 seats or 5% of the seats must be identified as accessible and comply with 27.2 of AS1428.2 (7.1 of DSAPT) - A level allocated space measuring 800mm x 1300mm must be provided outside of ordinary pedestrian paths, where possible (7.2 of DSAPT) • A kerb ramp should be provided to connect any accessible kiss n ride bay/s to the footpath • An accessible path to the station entry / platform boarding points must be provided	An accessible kiss 'n Ride Bay is proposed in Pierre Close. The KnR space can readily comply subject to confirmation of dimensions, levels, gradients and crossfalls throughout the accessible path to the station entrance. It is a *desirable* recommendation that a waiting area be provided with a shelter, wheelchair waiting area and accessible bench seat.	**Can Readily Comply** *Subject to Detail*
Accessible Carparking *DSAPT / AS2890.6* • Where parking is provided, accessible car spaces should be provided at the rate of 1 per 50 (BCA D3.5) • Accessible car spaces must be provided to meet AS2890.6-2009 as follows: - *Parallel* - 7.8m length x 3.2m width (if parallel) with 1600mm wide side share zone - *Angled* - 5.4m x 2.4m with a 2.4m wide adjacent shared zone • Carspaces should be placed in close proximity to the station accessible entrances, within 50m where possible • A kerb ramp should be provided to connect any accessible carspace to the footpath • An accessible path to the station entry / platform boarding points must be provided	1 x parallel accessible car space is proposed in Pierre Close. The accessible carparking space can readily comply subject to confirmation of dimensions, levels, gradients and crossfalls throughout the accessible path to the station entrance.	**Can Readily Comply** *Subject to Detail*

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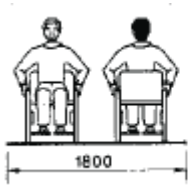
DDA Requirement	Recommendation / Comment	Status
Accessways		
Accessways – Extent of Access *BCA H2.2, AS1428.2* All parts of a class 9b station building that are ordinarily used by the occupants are required to be accessible. An accessible path should ultimately be provided throughout all passenger use areas: • extending from relevant interchange facilities to accessible station entry points (lifts or ramps) • extending from all pedestrian points of entry from the property boundary to the accessible station entry points (lifts or ramps) • through the principal pedestrian entrance to the station • lead to and within all passenger use areas of the station concourse, footbridge & platform levels including waiting rooms, ticketing, toilets, telephones, vending machines, help points and water fountains etc • lead to nominated accessible boarding points on each platform	*Informational – any compliance issues have been identified elsewhere in this report for their specific location.*	**Informational**
Accessways – General Details • Accessways should generally be 1800mm wide as a minimum (1200mm minimum) pathways, a crossfall no greater than 1:40, and clear height of no less than 2000mm.  (d) To allow two wheelchairs to pass comfortably, a clear width of 1800 mm is required • If an accessway braches into two or more parallel tracks: - the ends of each track must be on the main pedestrian traffic routes and - the parallel tracks must have equal convenience and be as close as practicable to the main pedestrian branch • Where the accessway is less than 1800mm, passing bays of at least 1800mm width x 2000mm depth must be provided at least every 6m to allow wheelchairs to pass. • If there is a change in level a compliant walkway, ramp or lift should be provided	*Informational – any compliance issues have been identified elsewhere in this report for their specific location.*	**Informational**

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<table>
<tr><th>DDA Requirement</th><th>Recommendation / Comment</th><th>Status</th></tr>
<tr><td>Accessways - Circulation Space for Turns
Circulation space to allow a wheelchair maneuvering turns as follows:
- 90 degree turn - 1500mm x 1500mm
- 180 degree turn - 2070mm x 1540mm
- 360 degree turn – 2250mm x 2250mm (2450mm x 2450mm preferred/desirable)</td><td>Informational – any compliance issues have been identified elsewhere in this report for their specific location.</td><td>Informational</td></tr>
<tr><td colspan="3">Floor Surfaces</td></tr>
<tr><td>Floor Surfaces & Mats
cl. 7 of AS1428.1
Provide a smooth transition between abutting surfaces (including recessed mats). A construction tolerance of 3mm for vertical differences is allowable or 5mm where edges are rounded or beveled. Gaps must not exceed 5mm in width.</td><td>All accessways from interchange facilities to the station and along the platform must ensure a smooth surface finish including at the abutment of any new and existing surfaces.</td><td>Can Readily Comply
Subject to Detail</td></tr>
<tr><td>Floor Grates
cl.7.5 of AS1428.1
Surface grates must have circular openings not greater than 13mm, or slotted openings not greater than 13mm traverse to the direction of travel.</td><td>All existing (or proposed) stormwater grates in accessible paths must be upgraded with appropriate ‘heel-guard’ gauze or similar to provide compliant aperture size for accessibility (<13mm)</td><td>Can Readily Comply
Subject to Detail</td></tr>
<tr><td>Slip Resistance
The following slip resistance levels must be met per AS4586-2013
<table><tr><th rowspan="2">Application</th><th colspan="2">Surface Conditions</th></tr><tr><th>Dry</th><th>Wet</th></tr><tr><td>Ramp steeper than 1:14</td><td>P4 (W)or R11</td><td>P5 (V) or R12</td></tr><tr><td>Ramp steeper than 1:20 but not steeper than 1:14</td><td>P3 (X) or R10</td><td>P4 (W) or R11</td></tr><tr><td>Tread or Landing Surface</td><td>P3 (X) or R10</td><td>P4 (W) or R11</td></tr><tr><td>Nosing or landing edge strip</td><td>P3 (X)</td><td>P4 (W)</td></tr><tr><td>General Colonnade / Concourse / Platform</td><td>P3(X) or R10</td><td>P4 (W) or R11</td></tr></table></td><td>Floor surfaces of all accessways must comply with the relevant specified slip resistance levels.</td><td>Can Readily Comply
Subject to Detail</td></tr>
</table>

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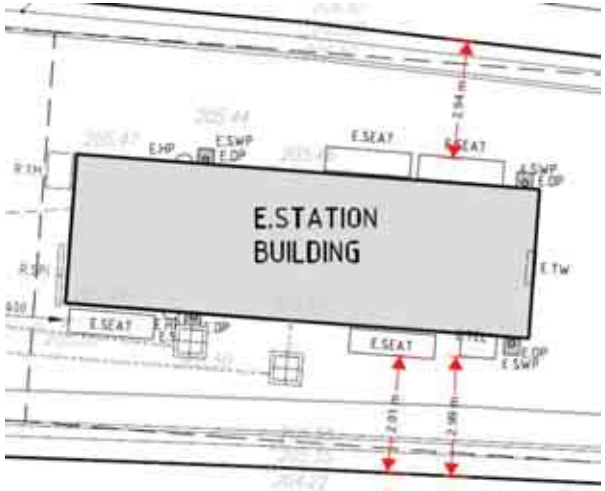
DDA Requirement	Recommendation / Comment	Status
Station Entrances		
Station Entrances Station Entrances are subject to the following requirements: • Lift or ramp access must be provided at each of the station entrances to access the station, footbridge underpass or platform (BCA Clause D3.2 & H2.2). • Lift or ramp access should be within 50m of any non-accessible entry, less is preferred (BCA D3.2) • Stairs must not be the sole means of access, meaning lift or ramp access must always compliment stairs (Part 14 of DSAPT) • Existing main points of pedestrian entry shall be made DSAPT compliant. Where this cannot be achieved then an equivalent accessible entrance shall be provided. (Essential Scope Requirement, BCA Performance Solution may be required)	**Station Entry 1 – Pacific Highway** The development proposes to provide new lift access from this entry to the new footbridge as well as new stair with accessible features.	**Can Readily Comply** *Subject To Detail*
	Station Entry 2 – Pierre Close The development proposes to provide new lift access from this entry to the new footbridge as well as new stair with accessible features.	**Can Readily Comply** *Subject To Detail*
Access within Station Building		
Passenger Use Areas *BCA Clause H2.2 & AS1428.2* Access is required to be provided to and within the passenger use areas in accordance with the enhanced access requirements of BCA Part H2 "Public Transport Buildings" and AS1428.2-1992. including throughout the concourse, footbridge or underpass.	An accessible path should be provided from all station entries to the accessible boarding points on the platforms and all accessible features of the building used by the public (lifts, FATs, ticketing, toilets etc) Specific requirements for accessways is discussed for the specific locations below in this report.	**Informational**
Access Between Platforms *BCA Clause H2.2 & AS1428.2* An accessible path must be provided between platforms by way of lift or ramp or at-grade accessible path.	An accessible path is provided between the platforms by way of the platform resurfacing. Compliance achievable subject to confirmation of platform crossfalls throughout accessible paths.	**Can Readily Comply** *Subject to Detail*

DDA Requirement	Recommendation / Comment	Status
Footbridges, Concourses or Underpasses *BCA Clause H2.2 & AS1428.2* Footbridges, concourses or underpasses must generally contain: • Accessways that are a minimum of 1800mm in width, clear of handrails • Crossfalls of no greater than 1:40 for accessible use • Handrails to both sides to provide additional guidance and support • An accessible linkage between all accessible street entrances and platforms (ramps or lifts) • Sufficient lift landings of minimum 2250mm x 2250mm • Where provided, stairs connecting to footbridges and underpasses should comply with BCA and DDA requirements. See also "Stairs" of this report. • Canopy cover must be provided to the accessible path where the non-accessible path is covered (essential), canopy cover is generally recommended for all accessible paths (desirable).	The existing footbridge is proposed to be demolished. The proposed new footbridge indicates general compliance as required.	**Can Readily Comply** *Subject to Detail*
Staff / Back-Of-House Areas *BCA Part D3 & AS1428.1* Where affected by the development, all new, altered or re-purposed staff offices, mealrooms etc are required to be accessible to and within under BCA Part D3 and .AS1428.1-2009. However, staff need not comply with the enhanced requirements of BCA Part H2 and AS1428.2 as this is limited to passenger use areas only.	The staff areas are not affected by the proposed works.	**NA**
Service & Maintenance Rooms *BCA Clause D3.4* BCA Clause D3.4 states that access to and within any of the following areas need not comply with the accessibility provisions of BCA Part D3 • An area where access would be inappropriate because of the particular purpose for which the area is used. • An area that would pose a health or safety risk for people with a disability. The concessions of BCA D3.4 "Exemptions" could be reasonably applied to services / maintenance rooms due to the nature of the equipment and specific hazards of the area.	There are no new or existing service rooms affected under the proposed works.	**NA**

DDA Requirement	Recommendation / Comment	Status
Platforms & Boarding		
Extent of Accessible Path on Platform *BCA H2.2, Section * of DSAPT and ASA* An accessible path along the platform meeting AS1428.2 must: • Extend from the accessible entry points to the platform (lift or ramp) along the platform to any designated accessible boarding point and to any room required to be accessible that is accessed from the platform (waiting room, accessible toilet, ticketing, telephone, water fountain etc.). (Essential) • ASA recommends that the entire platform is provided with a compliant crossfall of 1:40-1:100 and that platforms slope away from the platform edge (ASA). It is recommended that compliance is considered where site constraints allow. (Desirable)	Informational -specific non-compliances are discussed in other sections of the report as relevant. Where accessible facilities are to remain on the northern side of the platform building (operational ticket counter, information boards, ticketing machines etc), it is recommended the accessible path between the platform building and 1500mm platform edge safety zone be upgraded to achieve compliance. This may require the relocation of existing facilities such as the seating and telephone. 	**Desirable Recommendation**
Horizontal Obstructions from the Platform Edge / Platform Clear Width *BCA H2.2 & AS1428.2* • The minimum clear width of an *open* edge platform should be 3300mm to allow for a compliant 1500mm deep safety zone and 1800mm wide accessible path to allow two wheeelchairs to pass at any time. • This platform edge width can locally reduce to 2700mm minimum for a lateral distance of no more than 6m to allow wheeelchairs to pass every 6m per BCA H2.2 • Greater widths may be required where platform facilities are installed such as benches, bins, vending machines and water fountains.	The plans appear to comply as required for new works. It is recommended platform edge setback lines of 2700mm and 3300mm be indicated on the platform floor plan to allow further detailed assessment of the accessible paths and platform obstructions.	**Can Readily Comply** *Subject to Detail*

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DDA Requirement	Recommendation / Comment	Status
Accessible Boarding Points (Boarding Assistance Zone) *Section 8 of DSAPT, 6.4 of Station Components Guide 2017* Stations shall contain at least one nominated boarding point on each platform such that assisted boarding via portable ramp is possible. Boarding point markings shall be in accordance with Station Component Guide. (Essential) Boarding assistance zones must be located so they: • are clear of any obstructions, including but not limited to, seating, bins, building structures etc (2800mm clear from platform edge) • are undercover • are approximately 112m from the eight car marker in the direction of travel • allow sufficient wheelchair circulation space • They must also have the international symbol for access installed on the platform. • Boarding assistance zones should be agreed with all stakeholders.	The existing portable boarding ramp is located on the wall of the existing toilet/platform building near the base of the proposed platform stair. It is proposed to be relocated on the side of the new platform stair The platform accessible boarding point locations and portable ramp cabinet locations should be agreed with the relevant stakeholders and indicated on plan to allow detailed assessment.	**Informational**
Portable Boarding Ramps *Clause 3.3.3.6 of ASA / ESB003, 5.25 of Station Components Guide 2017* Passenger Train Boarding ramps are typically required to meet the following: • Ramp cabinet location must be centrally located or align with the most likely position of the train guard on a typical train service and as close as practical to the boarding assistance zone. (5.25 of Sydney Trains Components Guide). *Please seek advice on cabinet location from Sydney Trains Workplace Health and Safety Team.* • DSAPT typically allows an 800mm wide ramp to serve a maximum gradient of 1:4 for assisted access and to otherwise comply with Part 6 & 8 of DSAPT. • Three types are currently deployed at train stations (per 5.25 of Station Components 2017): - Stepless Lite Ramp (Health Care Lifting Specialist) 1250mm – this is 1250mm long and is for use on stations without exceptionally large gaps or platform-carriage height differential - Stepless Lite Ramp (Health Care Lifting Specialist) 1550mm – this is 1550mm long and - is for use on stations with larger gaps or platform-carriage height differentia - RITON Ramp – this is 1500mm long and is for use on Endeavour trains.Located on the platform, in locked cabinets adjacent to the location of the guard's compartment on the train. The boarding ramp type is determined by the station platform configuration. *Please contact Station Development Unit, Sydney Trains for the type required.* • Designed for maximum loading of 300kg	The existing portable boarding ramp is located on the wall of the existing toilet building near the base of the proposed platform stair. Portable Boarding Ramp types and locations should be agreed with relevant stakeholders as relevant to the particulars of the station. The Portable Boarding Ramp type and location should be indicated on plan in a convenient location to the accessible boarding points (boarding assistance zone) for detailed assessment by MSA.	**Informational**

DDA Requirement	Recommendation / Comment	Status
• Electrically neutral, to prevent the transfer of stray current from the 1500v system connected to the train to elements of the station platform. (Currently ramps are made of fiberglass) • Installed on all stations. • A gradient of 1:6 is the preferred maximum angle of deployment for assisted access in accordance with AS/NZS 3856.1 (1998). This enables the negotiation of a step of up to 250mm for 1500mm ramps and up to 200mm for 1200mm ramps, with direct assistance • A gradient of 1:8 is the maximum angle of deployment for unassisted access in accordance with AS/NZS 3856.1 (1998) and AS1428.1. This enables the negotiation of a step of up to 187mm for 1500mm ramps and of up to 150mm for 1200mm ramps, without assistance. • ASA / Railcorp's procedures for deployment of the boarding ramps means that ASA / Railcorp station staff (on staffed stations) and train guards (on un-staffed stations) deploy boarding ramps for disabled passengers, when given appropriate notification. • Station platform design should enable the manoeuvring of both wheelchairs and powered buggies on the platform to enable access to the ramp, when deployed. A distance of nominally 2.8m is required from the platform edge for a 1500mm ramp and 2.5m for a 1200mm ramp.		
Platform Crossfalls *BCA H2.2 & AS1428.2* The crossfall of platforms should be between 1:40-1:100 to allow for compliant accessible paths leading between the platform entry points (lift or ramp) to the station facilities used by the public and the nominated boarding points on the platform (Essential) or along its entirety (Desirable)	Platform upgrade works are generally beyond the scope of the subject development – however it is noted that where local upgrading works are proposed – that compliance must be achieved. Platform crossfalls must be upgraded to any new or relocated accessible feature including the relocated ticket machine.	**Informational**
Tactiles to Platform Edge *BCA H2.2, AS1428.4.1-2009, AS1428.4-1992 & ASA* The platform edge shall be provided with a safety zone along the entire platform edge consisting of the following: • 800mm wide white coping • Plus 100mm wide yellow safety line • Plus 600mm wide contrasting coloured tactile ground surface indicator (TGSI)" (3.2.2.3 of RailCorp ESB003) • TGSI are recommended to achieve a minimum LRV contrast of 30% if tiles, 45% if discrete (individually drilled domes) or 65% where composite discrete tactiles are used.	Platform upgrade works are generally beyond the scope of the subject development	**Informational**

DDA Requirement	Recommendation / Comment	Status
Accessible Seating & Waiting Areas		
Seating for Rest *Clause 5.1 of DSAPT & AS1428.2* Seating should be provided along accessible paths at intervals no greater than 60m and at key waiting areas to allow for sufficient rest points. Seating must comply with Clause 27.2 of AS1428.2, which in summary requires: • Seat 400mm-450mm high and deep • Backrest 105 degrees to seat & 750mm-790mm total height • Armrests must be provided 260 +/- 40mm above seat • Setback at least 500mm from accessible paths • Contrast 30% to background	Accessible benches should be provided to ensure a suitable rest point is provided every 60m as required by Clause 5.1 of DSAPT. Can readily comply, subject to seating details meeting AS1428.2 as specified in the adjacent column.	**Can Readily Comply** *Subject to Detail*
Accessible Seating in Waiting Areas *Clause 7.1 of DSAPT* Where waiting areas are provided, a minimum of 2 seats or 5% of the area must be identified as available for people with accessible needs.	New waiting rooms are beyond the scope of the subject development	**Informational**
Allocated Space for Wheelchairs in Waiting Areas *Clause 7.2 of DSAPT* Where waiting areas are provided, wheelchair waiting spaces (of dimensions 800mm x 1200mm) must be available at a rate of 2 spaces or 5% of the area.	It is recommended 2 undercover wheelchaiur waiting spaces be identified on the platform as well as 1 at the new kiss 'n ride bay as required. Details of proposed dimensions meeting the adjacent requirements to be indicated on plan.	**Can Readily Comply** *Subject to Detail*
Enclosed & Covered Waiting Rooms *Clause 7.1 of DSAPT* Where the station is provided with enclosed &/or covered waiting rooms, those rooms must be made accessible by way of: • Step free accessible entry complying with AS1428.1 • Minimum 850mm wide clear door opening • Door circulation space to meet AS1428.1 for wheelchair access around entry door/s	There do not appear to be any enclosed waiting rooms affected by the development.	**NA**

DDA Requirement	Recommendation / Comment	Status
• Accessible door hardware • Lighting meeting Clause 19.2 of AS1428.1 • A minimum of 2 seats or 5% of the area must be identified as available for people with accessible needs • Allocated space (wheelchair, pram) of dimensions 800mm x 1300mm must be available at a rate of 2 spaces or 5% of the area		
Walkways		
Walkways *BCA H2.2 & Cl8 of AS1428.2 & Cl.10 of AS1428.1* Walkways must comply with Clause 8 of AS1428.2 and 10 of AS1428.1, which in summary requires: • Gradients not steeper than 1:20 • Landings 1200mm deep every 15m for 1:20 grades (and every 25m for 1:33) • 1800mm width, or passing bays every 6m where less • Crossfalls to shed water up to 1:40 max • Provided with the following to protect the sides: - A Kerb being 65-75mm or >150mm, or - A Kerb & Handrail, or - Wall >450mm, or - Surface adjacent to the walkway must be firm & at the same gradient at least 600mm either side	Compliance generally achievable for the proposed new works subject to detailed dimension and gradients at later design stage. Where accessible facilities are to remain on the northern side of the platform building (operational ticket counter, information boards, ticketing machines etc), it is recommended the accessible path between the platform building and 1500mm platform edge safety zone be upgraded to achieve compliance. This may require the relocation of existing facilities such as the seating and telephone. Details to be confirmed.	**Can Readily Comply** *Subject to Detail*
Ramps		
Accessible Ramps *BCA Clause H2.3, 3.3.3.3 of ASA / ESB003* A ramp (including step or kerb ramp) forming part of an *accessway* must comply with clause 8 of AS 1428.2 & Clause 10 of 1428.1-2009, which in summary requires: • Used for level changes up to 2m (ASA restriction only) • Gradient between 1:14 and less than 1:20 • 1200mm landings at least every 6m where gradient is 1:14 • 1800mm width, or passing bays every 6m where less • Crossfall no greater than 1:40	*Informational – all new or affected ramps to comply. Specific compliance matters have been identified elsewhere in this report for the specific location.*	**Informational**

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DDA Requirement	Recommendation / Comment	Status
• Landings at changes in direction being 1500mm x 1500mm for 90 degrees and 2070mm x 1540mm for 180 degrees • Landings at doors at least the size of the required circulation space • Accessible handrails with 300mmm extensions • Kerb / Wall 65-75mm or >150mm in height to both sides (can *not* be 75mm-150mm in height) • Tactile Indicators to the top and bottom • Setback to avoid handrails and tactiles protruding into traverse paths		
Step, Kerb & Threshold Ramps *BCA Clause H2.3 & 10.5, 10.6, 10.7 of AS1428.1* • Step ramps must not exceed 1:10 and 1900mm in length and provided with 45 degree splay or side kerb/handrail/wall • Kerb Ramps must not exceed 1:8 and 1520mm in length • Threshold ramps must not exceed 1:8, 35mm in RL change and 280mm in length	Compliance generally achievable subject to detailed dimension and gradients at later design stage	**Can Readily Comply** *Subject to Detail*
Handrails & Grabrails		
Handrails & Grabrails – Passenger Use Areas *BCA Clause H2.4, cl.10.1 of AS1428.2, cl.12 of AS1428.1* • Accessible handrails must comply with clause 10.1 of AS 1428.2 & Clause 12 of AS1428.1-2009 (35-50mm diameter provided to both sides of all accessible stairs and ramps with required extensions & terminations). They can also be considered to walkways in conjunction with a kerb. • Handrails must be 900mm in height above the ramp, landing or stair nosing (ASA) • Handrails must be placed along an *accessway* wherever passengers are likely to require additional support or passive guidance. • A grabrail must comply with clause 10.2 of AS 1428.2. • A grabrail or handrail must be provided at fixed locations where passengers are required to pay fares.	Handrail details to be supplied during further design stages.	**Can Readily Comply** *Subject to Detail*

DDA Requirement	Recommendation / Comment	Status
Doorways & Doors		
Doorways & Doors *BCA Clause H2.5* Doorways and doors in accessible paths must comply with BCA H2.5 & Clause 11 (except clause 11.5.2) of AS 1428.2, which in summary requires the following: • Circulation space around the door in accordance with Section 13 of AS1428.1-2009 (latch side and hinge side clearances) • Landings at doorways to be equivalent size to the required circulation space and be max 1:40 • Luminance Contrast of door, jamb, wall of 30% provided to identify the door per 13.1 of AS1428.1 • Minimum 850mm clear opening (920mm door) • Accessible door hardware 900-1100mm above FFL (or auto) • Double leaf doors must have one compliant active leaf at least 850mm wide	There are no new or existing accessible doors affected by the project scope	**NA**
Lifts		
Lifts & Lift Cars *BCA Clause H2.6 & Part E3, AS1735.12 & 3.3.3.9 of ASA ESB003* Pedestrian lifts should meet the following requirements: • Minimum 1700mm x 1400mm internal lift car dimensions for accessibility (BCA E3.6 & AS1428.2). *Note: "Skinny" or "Through Lifts" can be reduced in width by require support by BCA Performance Solution if proposed..* • Minimum 2000mm (deep) x 600mm (wide) internal lift car portion to allow for stretcher facilities (Desirable / ASA) • Minimum clear 900mm door opening (AS1735.12) • Lifts at station entrances should be provided as close as possible to the main pedestrian entrances, typically within 10m where site constraints allow and never >50m (Desirable) • Lifts should be used where there is a change in level of over 2m (Desirable / ASA) • Otherwise meet BCA Part E3 and AS1735.12 requirements *Note: Scope requirements may exceed DDA benchmarks*	The internal lift car dimensions and lift details are required for review.	**Can Readily Comply** *Subject to Detail*

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DDA Requirement	Recommendation / Comment	Status
Lift Landings • 1:40 maximum crossfall for lift landings • Minimum 2070mm (d) x 1540mm (w) clear circulation space to allow 180 degree turn (2250mm x 2250mm for a 360 degree turn preferred) • Minimum 800mm(w)x 1300mm(d) wheelchair waiting space provided to the side of the lift door opening at lift landings (can overlap with other circulation spaces, but should be clear of pedestrian paths) • Minimum 500mm clearance of any lift call button from an internal corner	Circulation space of 2250mm x 2250mm at each lift landing and a 800mm(w) x 1300mm (d) wheelchair waiting bay is required to the side of the door opening at each lift landing on the same side as the lift call buttons. The above circulation spaces can overlap with each other, but should generally be provided outside of cross pedestrian flow. Fully dimensioned plans indicating the above circulation spaces to be provided during later design stages for review.	**Can Readily Comply** *Subject to Detail*
Stairs		
Stairways & Landings New and upgraded stairs in passenger use areas must meet: - ASA/ ESB 003 Clause 3.3.3.7 - BCA D2.13, BCA H2.7 - Relevant parts of AS1428.1 & AS1428.2 In summary, this requires: • Not more than 18 and not less than 2 risers in each flight • Constant 300mm goings and 150mm risers (ASA/AS1428.2) • Bottom riser may vary when meeting a public road only • Closed / Opaque risers • No winders • Accessible handrails to both sides of the stair (11.2 of AS1428.1) • Risers must be offset at any mid-landings to avoid vertical sections in handrails • Mid landings at least 1500mmm deep and preferred to be the width of the stair • Landings at the top and bottom no steeper than 1:50 for a depth of no less than 900mm (to allow TGSI installation on the flat) • Setback so the accessible handrails do not protrude into pedestrian crossflow generally • Setback 900mm at property boundaries so tactiles also do not protrude past boundary • Where height of stair rises above 5.3m a minimum of 2 mid landings are required (ASA) • Provide an equal number of treads for each flight, or as close as possible (ASA)	The development proposes the following in relation to stairs: • Demolition of the existing footbridge stairs • Provide new stairs to Princes Highway entry • Provide new stairs to Pierre Close entry • Provide new stairs to the platform All new stairs must comply with current accessibility requirements listed in the adjacent column. Details to be provided. The following specific issues must be addressed in future design stages. 1. Stairs are to be provided with a centre double handrail where the stair width is over 2m to comply with ESB cl3.3.3.7. Centre handrail to be raised with the client to confirm.	**Can Readily Comply** *Subject to Detail* *Centre Handrail Details to be confirmed with stakeholders*

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DDA Requirement	Recommendation / Comment	Status
Stair Nosings *BCA H2.11, AS1428.1 7 AS1428.2* • An "AS1428.1-2009 compliant nosing" is recommended being a 50-75mm strip contrasting 30% and within 15mm of the stair edge and returning no more than 10mm down the vertical face. • Note: BCA H2.7 still calls up AS1428.2-1992 which requires a minimum 25mm return of the contrasting colour on the vertical face, which is not recommended as it can cause issues picking up the leading edge of the stair. • Stair nosings shall not project beyond the face of the riser and the riser may be vertical or have a splay backwards up to a maximum 25 mm • Stair nosings profiles with a sharp intersection, max 5mm bevel or chamfer	BCA Clause H2.7 still calls up AS1428.2-1992 type nosings which is a minimum 25mm return of the contrasting nosings on the vertical face. This style of nosings is no longer considered best practice as AS1428.1-2009 now limits the contrasting return on the vertical face to no greater than 10mm to allow the leading edge of the stair to be better identified and also specifies a minimum 30% contrast is achieved. The use of an AS1428.1-2009 compliant nosing on new or upgraded stairs is considered the most appropriate nosing design to provide for consistency and familiarity across the station network, but its use in lieu of AS1428.2-1992 compliant nosings will require support by **BCA Performance Solution** due to BCA H2.7 still calling up the Part 2 standard.	**BCA Performance Solution Required**
Stairs in Consecutive Flights Where consecutive flights contain *more* than 36 risers in a Class 9b building, the stair must contain a minimum 30 degree change in direction. *Note: Where a stair is required to have more than 36 risers in total a straight stair is preferred to ensure good passenger orientation and comprehensibility. Additional landing(s) should be provided at every 13-14 risers to enable more regular rest points to facilitate customer comfort and mitigate risk. (ASA Requirement, a BCA Performance Solution is required to support a straight stair with more than 36 risers)*	Stairs 2 to platform contains more than 36 risers in consecutive flights without a minimum 30 degree change in direction and will require a BCA Performance Solution to support the non-compliance with BCA D2.13. *Refer to MSA BCA Report in relation to the number of consecutive risers without a change in direction (Performance Solution Proposed)*	**Does not comply** *BCA Performance Solution Required* *Refer separate BCA Report by MSA*
Sanitary Facilities		
Passenger Unisex Accessible Toilet Facilities *BCA Clause H2.8 (and BCA F2.3 & F2.4), 2.5.3.3 of ASA / ESB002* Where toilets are provided for passenger use: • There must be at least one unisex accessible toilet without an airlock that complies with AS 1428.1 clause 10, sanitary facilities • An accessible unisex sanitary compartment must contain a closet pan, washbasin, shelf or bench top and adequate means of disposal of sanitary towels • Where two or more of each type of accessible unisex sanitary facility are provided, the number of left and right handed mirror image facilities must be provided as evenly as possible • Patron toilet numbers are not specified under BCA Table F2.3 and are at the discretion or requirements of the operator for Public Transport buildings	NA - There are no affected toilet facilities under the development.	**NA**

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DDA Requirement	Recommendation / Comment	Status
• Staff and patrons can share toilets under BCA F2.3 for Class 6 or 9b buildings (including stations)		
Location of Accessible Toilets *BCA Clause H2.9* Accessible Toilets must be in the same location as other toilets / banks.	NA - There are no affected toilet facilities under the development.	**NA**
Passenger Ambulant Toilets *BCA F2.4(c)* At each bank of toilets where there is one or more toilets in addition to an accessible unisex sanitary compartment at that bank of toilets, a sanitary compartment suitable for a person with an ambulant disability in accordance with Section 16 of AS 1428.1 must be provided for use by males and females. In summary this requires: • Separate male and female ambulant toilets (unisex requires a BCA Performance Solution) • 900mm-920mm between side walls • Grabrails to both sides • 720mm cubicle doors • Clear 900mm x 900mm space in front of the pan &/or clearances around door swings	NA - There are no affected toilet facilities under the development.	**NA**
Staff Sanitary Facilities Where separate toilet facilities are provided for staff, the toilet facility is required to be accessible to satisfy BCA Clause F2.4. Where it is proposed to provide a non-accessible or ambulant toilet facility only for staff use, a BCA Performance Solution is required.	There are no staff toilet facilities proposed or affected by the development.	**NA**

DDA Requirement	Recommendation / Comment	Status
Wayfinding Signage		
Symbols & Signs *BCA Clause H2.10* • The international symbols for accessibility and deafness in accordance with clauses 14.2 and 14.3 of AS 1428.1 must be used to identify an *accessway* and which facilities and boarding points are *accessible*. • Signs must be placed in accordance with clause 17.4 of AS 1428.2. • The size of accessibility symbols must comply with Table 1 of AS 1428.2. • The symbol for accessibility must incorporate directional arrows and words or, if possible, pictograms, to show passengers the way to *accessible* facilities such as toilets. • Signs must comply with clause 17.1 and Figure 30 of AS 1428.2. • If a sign incorporates raised lettering or symbols, they must be at least 0.8 mm above the surface of the sign. • If an operator or provider supplements a notice with braille characters, they must be placed to the left of the raised characters. • *Note: Scope wayfinding and signage requirements may exceed DDA*	Wayfinding signage and signage to identify accessible features including sanitary facilities, station entry points and hearing augmentation must be provided. Provide detail.	**Can Readily Comply** *Subject to Detail*
Tactile Ground Surface Indicators		
Tactile Ground Surface Indicators (TGSIs) *BCA Clause H2.11 (BCA D3.8 & RailCorp ESB)* TGSI are a valuable wayfinding tool for those with vision impairment. TGSIs provide a distinct tactile cue to alert people with vision impairment when they are approaching hazardous situations and to provide directional guidance. There are two types of TGSIs currently used in Australia: • Warning TGSIs • Directional TGSIs	*Informational – see below*	**Informational**

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DDA Requirement	Recommendation / Comment	Status
Warning Tactile Ground Surface Indicators Are a series of truncated domes which alert vision-impaired people to impending hazards that could not be reasonably expected or anticipated and are typically installed at: • Stair Approaches • Ramp Approaches(1:20-1:14) • Top of step and kerb ramps • To indicate overhead obstructions below a height of 2000mm • Where accessways approach a vehicular way • Railway Platform Edges (setback 900mm from the platform edge behind the yellow line) • Tactiles are typically a 600mm deep pad extending the width of the hazard. (BCA H2.11, BCA D3.8)	Warning tactile ground surface indicators are required to be indicated on plan in accordance with the adjacent locations. Details to be provided.	**Can Readily Comply** *Subject to Detail*
Directional Tactiles *BCA H2.11 & AS1428.4, 3.3.3.7 of ASA / ESB003* Are typically required at the following locations: • Bus Stop Heads - a 600mm stripe of directional tactile indicators (with 300mm x 300mm hazard pad on kerb side) should be provided perpendicular to the kerb, setback 300mm from the kerb edge and bus sign post to indicate the location of the bus-head • Directional Tactile Ground Surface Indicators must be installed in accordance with AS 1428.4 on an accessway and must indicate a required change of direction in accordance with clause 18.1 of AS 1428.2.	Directional tactiles should be provided in accordance with AS1428.4.1-2009 where key change of direction occur where there is not an adequate shoreline (noting this is the newer Australian Standard not yet called up by BCA/DSAPT but recommended by TfNSW). As a minimum, MSA recommends the following is provided to meet TfNSW TGSI Guidelines: - Identifying the main entrance points to the station from street - Between platform level, Opal Card Readers and stairs (not lifts)	**Can Readily Comply** *Details to be confirmed with stakeholders*
Contrast of Tactiles *BCA H2.11, AS1428.4.1-2009 & AS1428.4-1992* TGSIs are recommended to have a Luminance Reflective Value (LRV) contrast dependant on the type of tactiles used as follows: - Pad / Tile Tactiles – minimum 30% to surrounding surface - Discrete / Individual Tactiles – minimum 45% contrast to the adjacent path of travel - Composite Colour (Two toned) Discrete Tactiles – 60% contrast to adjacent path of travel - *Note: There is a concession to allow TGSI's to comply with AS1428.4-1992 which allows a minimum 30% LRV, though it is recommended that the above contrasts are instead met to achieve DDA best practice.*	Details of LRV of the tactile and the surrounding surface will be needed to ascertain the correct contrast of 30% (pad), 45% (discrete) or 65% composite will be achieved.	**Can Readily Comply** *Subject to Detail*

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DDA Requirement	Recommendation / Comment	Status
Lighting		
Lighting BCA Clause H2.12 requires that lighting meet the requirements of clause 19.1 of AS 1428.2 for passenger use areas of buildings. Entrances Passageways and walkway ≥150 lx Stairs 150 lx Ramps 150 lx Lifts See AS 1735.12 Toilet and locker rooms 200 lx Counter tops 250 lx General displays 200-300 lx Telephones 200 lx Further *TfNSW Infrastructure Lighting Standard T HR SS 80001 ST* contains further specific lighting requirements for infrastructure areas beyond the building and must also be met, including requirements for: • Table 2 – Illumination levels for public enclosed or covered station areas • Table 3 – Illumination levels for public open station areas • Table 4 – Illumination levels for station commuter car parks and precincts • Table 5 – Illumination levels for TNSW staff areas • Table 6 – Illumination levels for sidings, stabling yards, depots and workshops	Lighting levels to be confirmed by the electrical engineer as meeting the minimum lux levels of BCA Clause H2.12, Clause 19.1 of AS1428.2 and relevant parts of TfNSW Infrastructure Lighting Standard T HR SS 80001 ST.	**Design Cert Required** *Certificate from Design Engineer Required*
Passenger Information		
Station Passenger Information (SPI) Systems *Part 27 of DSAPT* Electronic Passenger Information Systems provide updated train running and disruption information to customers and staff. These may be found on entering the station, at interchange points, at decision points and whilst waiting on a platform. This service is particularly important to customers with hearing impairments. The systems should be located in accessible locations (typically 2070mm x 1540mm clear circulation in front) and capable of supplementing any audio announcement with visual information.	Design Engineer to certify all new or affected SPIs are in accordance with the project scope requirements.	**Design Cert Required** *Certificate from Design Engineer Required*

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DDA Requirement	Recommendation / Comment	Status
Public Address Systems (PA) systems deliver audio information to assist customers, especially those with vision impairment. The system should be capable of supplementing any visual information with an audio announcement. PA systems should cover station platforms, concourse areas and enclosed footbridges and subways. Evacuation or emergency announcements to station office, public toilet and waiting areas should be covered by Emergency Warning Intercommunication Systems where installed.	Design Engineer to certify all new or affected PA systems are in accordance with the project scope requirements.	**Design Cert Required** *Certificate from Design Engineer Required*
Hearing Augmentation *BCA Clause H2.13 & Cl 21.1 of AS1428.2* Where a public address system is installed, a listening system to aid hearing-impaired people shall be installed or made available (AFILS / Hearing Loop) to cover: • A minimum of 10% of passenger use areas • A minimum of 80% of any enclosed waiting room • At any careened ticket or information counter	To meet BCA Clause H2.13 a hearing augmentation / audio frequency induction loop system (AFILS) is required to at least 10% of the area to complement the public-address system throughout the public areas and identified with appropriate identification signage. Any existing hearing augmentation / AFILS system is to be suitably adjusted where affected by the proposed development. Design Engineer to review and confirm requirements.	**Design Cert Required** *Certificate from Design Engineer Required*
Hearing Augmentation Signage *Clause 16 & 17 of AS1428.2 & Clause 5.1 & 5.2 of AS1428.5* Signage must be provided to identify the hearing augmentation system and area as follows: • *Signs at Entry* - Signage should be at every public entry indicating the type of system provided and assistance in its use. • *Signs at Location* - Further signage should be provided at the location the hearing loop is provided. • *Signs Should Detail How to Use* - Signage should provide assistance to use the hearing loop such as “Switch to T-Mode” or words to that effect • *Signs Should Include Block Plan* - Signage should be supplemented with floor / block plan showing the part area that is served	Details of hearing augmentation signage is to be provided by the wayfinding consultant meeting the adjacent requirements and to the satisfaction of MSA as the DDA Consultant.	**Can Readily Comply** *Subject to Detail*

DDA Requirement	Recommendation / Comment	Status
Emergency Warning Systems *BCA Clause H2.14* • *Flashing Lights* - If an emergency warning system is installed, it must comply with clause 18.2.1, 18.2.2 and 18.2.3 of AS 1428.2. That is compliant audible alarms and flashing visual alarms must be provided (audible alarms >75dB(A) and exceeding noisiest background by 15dB(A) averaged over 60secs and visual alarms to flash in conjunction with the emergency alarm, at approx.1Hz frequency). • *Audible Assistance to Locate Egress Path* - Provision must be made for people with vision impairment to locate the exit path in the event of an emergency (eg exit signs to sound audible signal when the fire alarm sounds), as per requirements of AS2220-1989.	Where existing emergency warning systems are proposed or affected, audible and visual alarms must be installed to comply with this requirement. Design Engineer to review and confirm.	**Design Cert Required** *Certificate from Design Engineer Required*
Controls		
Controls *BCA H2.15* Controls must comply with clause 11 of AS 1428.12001, which provides requirements for the design of: - Door handles & hardware - Switches & GPOs - Water taps - Refer to AS1428.1-2001 for full details.	Informational – all door hardware, switches and GPOs and Water Taps must meet AS1428.2 requirements where installed.	**Informational**
Ticketing		
Ticket Windows *cl.24 of AS1428.2* Where ticket windows are provided, they must be accessible (generally 700-850mm in height) with a circulation space in front of 2070mm x 1540mm (2250mm x 2250mm preferred). Ticket window/s (where screened) must have an audio hearing loop provided (BCA D3.7)	NA – there is no work proposed to the existing ticket window and is understood to be outside of project scope.	**NA**

DDA Requirement	Recommendation / Comment	Status
Ticket Vending Machines / Opal Machines *BCA H2.15 & AS1428.2* TVM and Opal Machines to be provided with: • 2070mm x 1540mm circulation space in front (2250mm x 2250mm preferred) and a maximum 1:40 crossfall • TVMs should have 1250mm maximum reach heights and buttons at least 500mm clear of side walls (AS1428.2)	The relocated TM appear to be capable of compliance. Any new or affected TVMs / Opal Machines under this development must ensure compliance.	**Can Readily Comply** *Subject to Detail*
Other Accessible Fittings, Features & Fixtures		
Canopies " Equivalent Cover for Accessible Paths" *DSAPT* Station Entrances, Footbridges & Platforms - Where a non-accessible path is covered along, ie stairs (or leading to general toilet facilities), the equivalent / alternative accessible path must be covered ie: ramps or alternative accessways (Essential to meet "DDA Test of Equivalence")	Accessible paths are generally covered to the extent required by this consideration subject to confirmation of platform accessible boarding point locations. Final extent of canopy works to be agreed with stakeholders and further reviewed by MSA.	**Can Readily Comply** *Details to be confirmed with stakeholders*
Canopies - General Canopies are recommended to be provided over all accessible paths, allocated accessible seating, wheelchair waiting areas and boarding points, where possible (Desirable)	Canopy cover is generally provided to the extent required by this consideration, subject to confirmation of platform accessible boarding points. Full canopy cover of the platform is recommended for best practice. (Desirable)	**Can Readily Comply** *Subject to Detail*
Telephones *DSAPT & AS1428.2* Where public payphones are provided, at least one must be accessible and comply with Section 30 of AS1428.2-1992, which requires: • 800mm(w) x 1300mm(d) clear in front of phone • Volume control and a built in coupler • Push button controls • Controls generally between 900mm-1100mm • 2070mm x 1540mm circulation space in front (2250mm x 2250mm preferred) and a maximum 1:40 crossfall	The existing payphone is located in a position on the side of the existing platform building. Where the payphone forms part of the project scope, it is recommended that the payphone be relocated to an accessible position on the platform. Details of any new or upgraded accessible telephone/s to be provided demonstrating compliance with the adjacent requirements.	**Can Readily Comply** *Subject to Detail*

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DDA Requirement	Recommendation / Comment	Status
Water Fountains *DSAPT & AS1428.2* Where provided, at least one water fountain must be suitable for accessible use in accordance with Clause 27.3 of AS1428.2, which in summary requires: • Top of Basin at 695mm-700mm • Spout located as close to front as possible • Controls centrally at front of unit or *both* sides at 80-100mm above top of basin / spout • 2070mm x 1540mm circulation space in front (2250mm x 2250mm preferred) and a maximum 1:40 crossfall	NA – there are no new of existing water fountains affected under the project scope	**NA**
Help Points *BCA H2.15 & DSAPT* Emergency help points should be located in conspicuous accessible locations, with: • A mounting height of 900-1200mm above floor level for controls • 2070mm (d) x 1540mm (w) clear area and level (1:40 max) in front for manoeuvring. • Any side obstruction should be at least 500mm from the controls	The existing help points are located on the walls of the existing station building between the station building and the platform edge. Where these locations are no longer accessible (subject to confirmation of setback and circulation at later design stage) it is a desirable recommendation that an additional help point be provided in close proximity to the new platform entrance. Details of any new or upgraded help points to be provided demonstrating compliance with the adjacent requirements.	**Can Readily Comply** *Subject to Detail*
General Vending Machines *BCA H2.15 & AS1428.2* General Vending Machines to be provided with: • 2070mm x 1540mm circulation space in front (2250mm x 2250mm preferred) and a maximum 1:40 crossfall • TVMs should have 1250mm maximum reach heights and buttons at least 500mm clear of side walls (AS1428.2)	Details of any new or upgraded general vending machine to be provided demonstrating compliance with the adjacent requirements.	**Can Readily Comply** *Subject to Detail*
Projections into Accessways *BCA Clause H2.2* Poles, columns, stanchions, bollards and fixtures must not project into an accessway	All seating, columns, lightpoles and other obstructions should be setback from the accessible paths.	**Can Readily Comply** *Subject to Detail*

DDA Requirement	Recommendation / Comment	Status
Contrasting Obstructions Adjacent to Accessways *BCA Clause H2.2* Obstructions adjacent to accessways - where adjacent to the accessible path, such obstructions must be 30% contrasting to the background colour to ensure they are identifiable to those with vision impairment.	All obstructions adjacent to accessways should contrast 30% to background including structural columns, street poles, bollards and bins. Details to be provided.	**Can Readily Comply** *Subject to Detail*
Emergency Egress for People with Disabilities		
Emergency Egress for People with Disabilities – Entries / Exits *Clause 2.5.2.3 of ASA / ESB 002 (Desirable)* Where there are multiple entrances to a station, all entrances should be accessible where possible and useable by people with disabilities, especially during emergency procedures.	The overall station building entrances are generally accessible allowing egress via each of them in an emergency.	**Design Cert Required** *From Fire Engineer*
Emergency Egress for People with Disabilities – Safe Evacuation *Clause 2.5.3.8 of ASA / ESB 002 (Desirable)* General requirements for egress and emergency evacuation include: • Dedicated refuge areas within fire rated egress stairs, outside of the required circulation space with a communications system that enables visual and voice communication devices to benefit people with hearing and visual impairments • Appropriate lifts, with UPS • A BCA Performance Solution must be developed to demonstrate appropriate emergency egress for people with disabilities is achieved in the subject station / development design.	The Fire Engineer is to consider emergency evacuation of people with disabilities in any BCA Performance (Fire Engineering) Report for the development. Any recommendations of the fire engineer must be implemented in the design.	**Design Cert Required** *From Fire Engineer*

4.0 Conclusion

This report has assessed the **Reference Level Design** for the proposed **New Footbridge, Stairs and Lifts at Mount Colah Station** under the relevant requirements relating to "Access for People with Disabilities".

The primary purpose of the report is to assess the design documentation against the relevant accessibility provisions and to provide suitable recommendations to ensure the design will meet the appropriate accessibility requirements for specified scope works. The existing building may/will contain existing non-compliances that are not necessarily addressed by the project scope.

Subject to the recommendations of this report, the development demonstrates an ability to comply with the relevant provisions of access and facilities for people with disabilities for the new works that are specified under the scope.

Significant Recommendations are summarised in **Table 1.0** of the Executive Summary and **Table 3.0** contains further detailed requirements.

The design is to be subject to further detailed DDA assessment throughout subsequent design phases where more design detail will be available for assessment.

DRAWING LIST

ARCHITECTURAL	DESCRIPTION
30012921-AR-001	COVER SHEET
30012921-AR-002	NOTES & LEGENDS
30012921-AR-003	EXISTING/PROPOSED SITE ANALYSIS PLAN
30012921-AR-101	EXISTING SITE / DEMOLITION PLAN
30012921-AR-102	SITE PLAN
30012921-AR-103	PLATFORM / STREET PLAN
30012921-AR-104	FOOTBRIDGE PLAN
30012921-AR-105	ROOF PLAN
30012921-AR-201	ELEVATION & LONG SECTION SHEET 1
30012921-AR-202	ELEVATION & LONG SECTION SHEET 2
30012921-AR-203	ELEVATION & LONG SECTION SHEET 3
30012921-AR-204	SECTIONS

Attachment B – Target Dates for Access ible Features in Public Transport Buildings

The following is an extract from the Disability (Access to Premises Buildings) Standards 2010 detailing the target dates for various accessible features in public transport buildings:

Part 3 Requirements of Standards

3.1 Building certifiers, developers and managers to ensure buildings comply with the Access Code

(1) A building certifier, building developer or building manager of a relevant building (other than an existing public transport building) must ensure that the building complies with the Access Code.

(2) A building certifier, building developer or building manager of an existing public transport building must comply with subsection (3) if:

(a) the building certifier, building developer or building manager is an operator or provider within the meaning of the Transport Standards; and

(b) the existing public transport building is provided for passenger use as part of a public transport service provided by the building certifier, building developer or building manager and is still in use on the target date mentioned in an item in the table in this section.

(3) The building certifier, building developer or building manager must ensure that the public transport service meets the performance requirements of the Access Code that apply to it for each aspect of the public transport building mentioned in an item of the following table, on and after the target date mentioned in the item, to at least the level of compliance mentioned in the item.

Item	Target date	Aspect	Level of compliance
1	1 May 2011	(a) symbols and signs (b) lighting (c) hearing augmentation (d) emergency warning systems	100%
2	1 May 2011	(a) accessways (b) manoeuvring areas (c) passing areas (d) ramps (e) doorways and doors (f) lifts (g) stairways (h) toilets (i) tactile ground surface indicators (j) controls	25%
3	31 December 2012	(a) surfaces (b) handrails and grabrails	100%

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Attachment B – Target Dates for Access ible Features in Public Transport Buildings

Item	Target date	Aspect	Level of compliance
4	31 December 2012	(a) accessways (b) manoeuvring areas (c) passing areas (d) ramps (e) doorways and doors (f) lifts (g) stairways (h) toilets (i) tactile ground surface indicators (j) controls	55%
5	31 December 2017	(a) accessways (b) manoeuvring areas (c) passing areas (d) ramps (e) doorways and doors (f) lifts (g) stairways (h) toilets (i) tactile ground surface indicators (j) controls	90%
6	31 December 2022	all aspects applicable to public transport buildings	100%

Note The level of compliance in this table is expressed as a percentage of existing public transport buildings provided by the building certifier, building developer or building manager for passenger use as part of that type of public transport service that are still in use on the target date.

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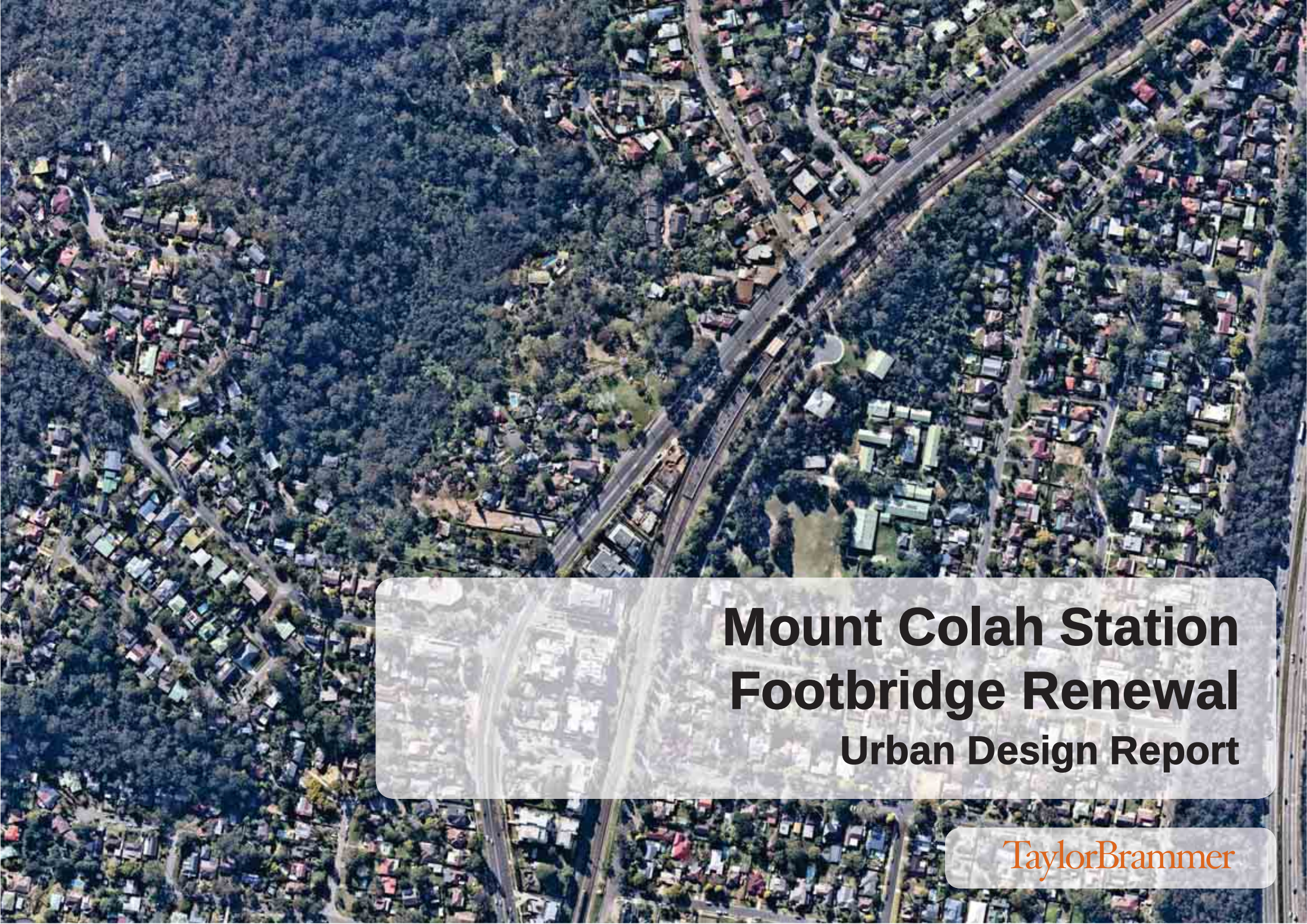
Appendix G Urban Design Report



Mount Colah Station Footbridge Renewal

Urban Design Report

TaylorBrammer

Contents

Amendment register

DOCUMENT TITLE	REVISION	DATE	STATUS	REVIEWED	CHECKED	VALIDATED
URBAN DESIGN REPORT	P1	20.08.2020	PRELIMINARY	DMT	AL	DMT
URBAN DESIGN REPORT	A	10.12.2020	FINAL	DMT	AL	DMT

Prepared by

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View of Mount Colah Platform from existing footbridge looking south
TBLA, July 2020

Introduction

01

Project Vision, Context and Background

The footbridge upgrade of Mount Colah Railway Station involves a range of improvements to provide equitable access to and from the platforms. In conjunction to these enhancements, minor works within the public domain are required to improve connections from the existing station facilities to the neighbouring suburban areas.

Project Location

The scope of this report relates to the Eastern and Western aspects of the existing Mount Colah Railway Station, and improve the general appearance of the station at the public domain interface.

The Mount Colah Station is wholly located within the Hornsby Shire Local Government Area, with residential dwellings and Public Recreation zoning adjoining all immediate boundaries of the station corridor. This zoning generates a high volume of pedestrian and vehicular traffic in and around the pedestrian lift and connection areas.

Purpose of this Report

The purpose of this urban design report and accompanying public domain plan is to identify the proposed impacts to the urban form due to the access improvements, mitigate any potential negative impact on the existing urban character, and provide a suitable public domain outcome. This report will review existing conditions, urban patterns, and propose materials and vegetation types to achieve the objectives of maintaining an appropriate urban character within the affected area.

Referenced documents

- Crime Prevention Through Environmental Design (CPTED); NSW Police
- Hornsby Shire Council, LEP
- Design documents - Caldis Cook Group
- TfNSW - Around the Tracks urban design for heavy and light rail
- TfNSW - TAP Urban Design Plan Guidelines

Project Context; Nearmaps.com.au, August 2020

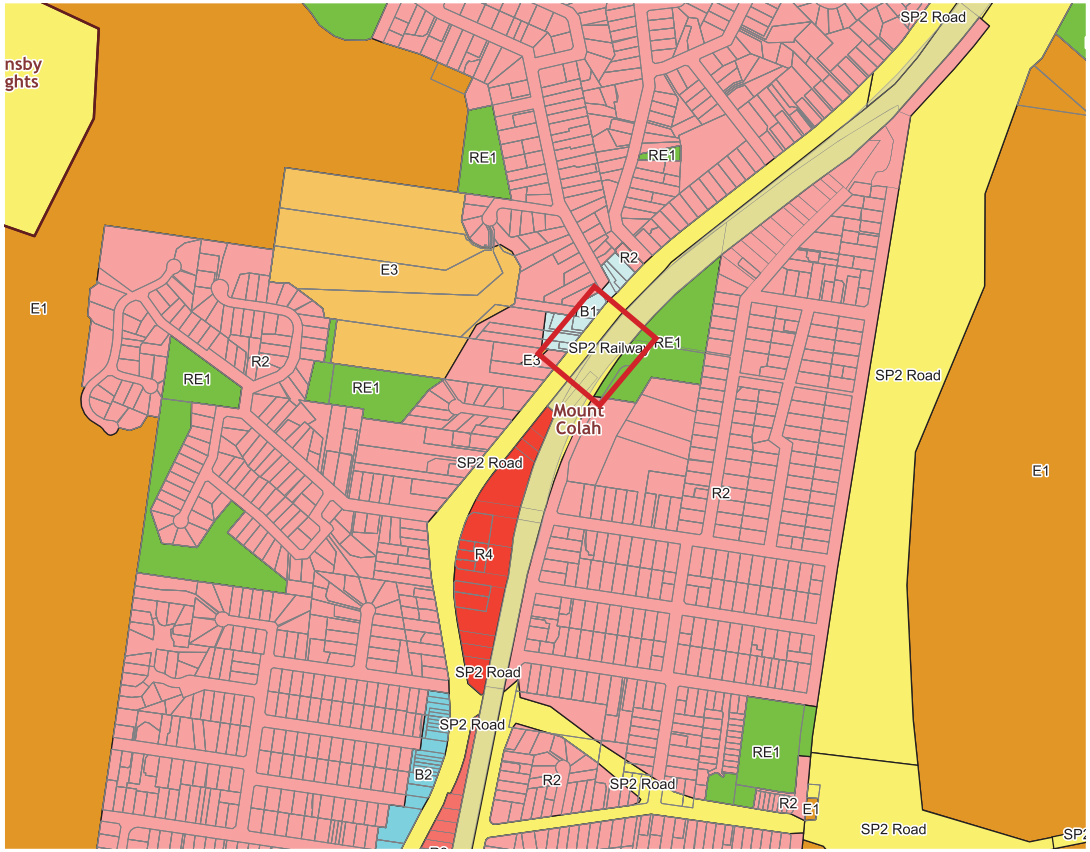
Site Analysis

02

Land use and Character

The land use of the surrounding areas to the existing Mount Colah Railway Station is predominantly RE1, R2, and B1 zoning, with the R4 high residential zoning further to the south of the site. The character of the surrounding residential area can be summarised as single dwelling free standing homes disbursed with low rise residential flat buildings to a maximum 2 stories high. Further to the south, numerous buildings can be found under construction within the R4 zone.

West of the rail corridor is the NSW State road, and the Pacific Highway, a two lane each way main road. To the east, vehicular access is provided to the station from Pierre Close with an existing kiss and drop. See images 01 on page 9.



Land Zoning Map, Mount Colah Land Zoning 2013

Legend

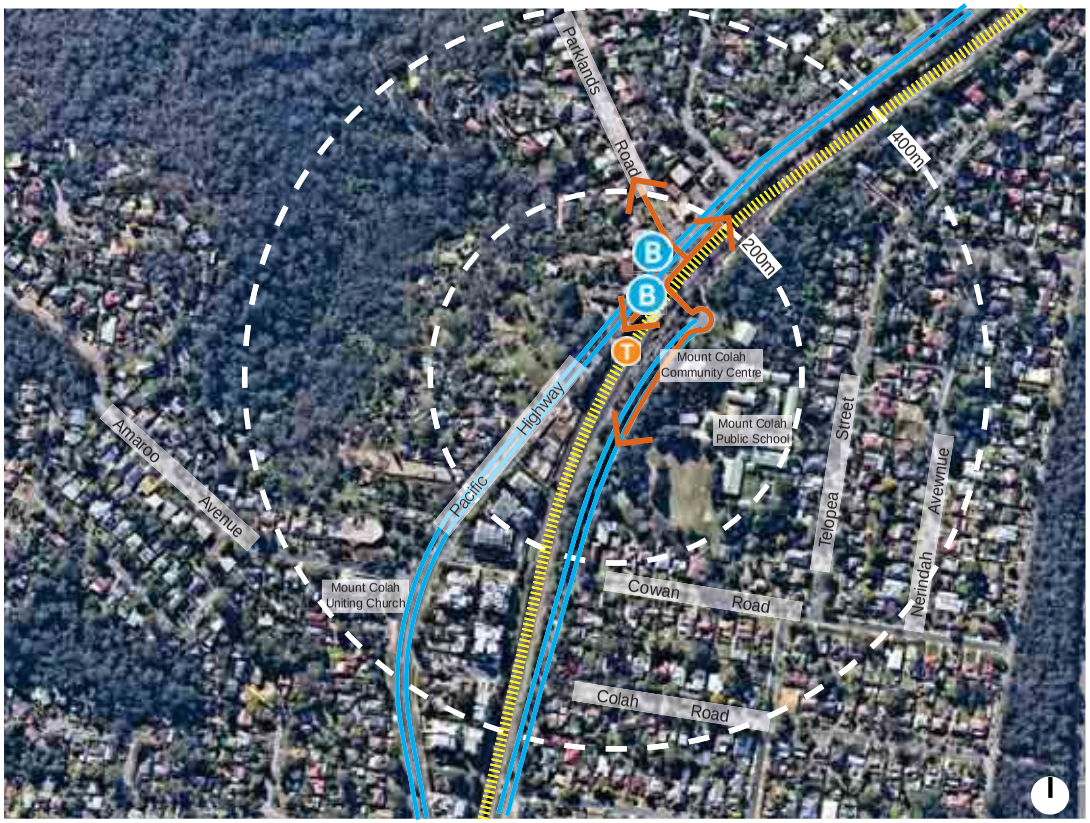
- Project location
- B1 Neighbourhood Centre
- B2 Local Centre
- E1 National Parks and Nature Reserves
- E3 Environmental Management
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- SP2 Infrastructure

Access and Movement

The Northern Rail line and Railway Station is located centrally within the suburb boundaries of Mount Colah. The railway corridor and Pacific Highway alike create a vehicular barrier, focusing most cross pedestrian activity to one focused location opposite Parklands road

The existing footbridge crossing from Pierre Close to the Pacific Highway is the only point of access onto the Mount Colah Railway Station platform. This overpass provides pedestrian connectivity to the educational and residential facilities on the on the east of the station, to the commercial and retail facilities on the west. Existing bus stops are located on north and south directions of Pacific highway at Parklands Road

Vehicular access to the station is available from Pierre Close, providing an existing 'Kiss & Drop' zone at the end of a cul-de-sac on the Eastern Side, and no parking on the Pacific Highway to the West.



Project Context; Nearmaps.com.au, August 2020

Legend

- Subject Railway Station
- Main Northern Rail Line
- Walking catchment (white)
- Existing Bus stop
- Existing Roads directly Adjacent Platform with Access to Station
- Existing pedestrian route
- Existing Bus stop

Local Context and Setting

The local context of the railway station is generally of a urban and residential nature, dominated by vegetation in the form of large native trees, shrubbery, road, and paving. Immediately to the east of the rail line, the existing character consists of parkland and vegetation as part of local community recreational and educational facilities, with large trees and shrubbery providing a visual buffer of the station.

The Character directly to the West is contains the commercial and retail hub of the suburb, facilitated by the main road and pedestrian network that consists of street trees and vegetation on either side of the pacific highway.

Due to the residential nature of the immediate surroundings, limited formal commuter carparks are located around the station. Those that exist can be found along Pierre close around the allocated times. A commercial chain wire fence provides the edge treatment to the east and western sides of the station, and is easily obscured by the existing edge planting.

Minimal lighting is provided on the Pierre close access point of the existing overpass due to the isolated nature of the street, with two lights on either side of access points. Substantial lighting can be seen on the existing overpass with six overhead lights provided, and one directly adjacent on the Pacific Highway.

Vegetation

The landscape of the commercial, recreational, and educational facilities directly surrounding throughout the adjoining areas have consistent canopy throughout the length of the Mount Colah railway in the form of street trees of a native character.

T Mount Colah Railway Station

B Existing Bus stop

P Existing Commuter Car Parking (Street parking only)

Existing pedestrian path

Existing on road pedestrian route

Existing pedestrian footbridge

Site photos

View of 'Kiss n Drop', and vegetation from Pierre Close facing south demonstrating dense screening of platform and railway line

TBLA July 2020

Mount Colah station, platforms 1 and 2 viewed from footbridge generally obscured from Pierre close and the Pacific Highway

TBLA July 2020

Existing turning circle and parking bays at Cul de sac of Pierre Close providing good access and mobility to existing footbridge

TBLA July 2020

Mount Colah Station Platform View of significant tree providing shade and amenity

TBLA July 2020

Eastern view of embankment and vegetation buffer of low ecological value

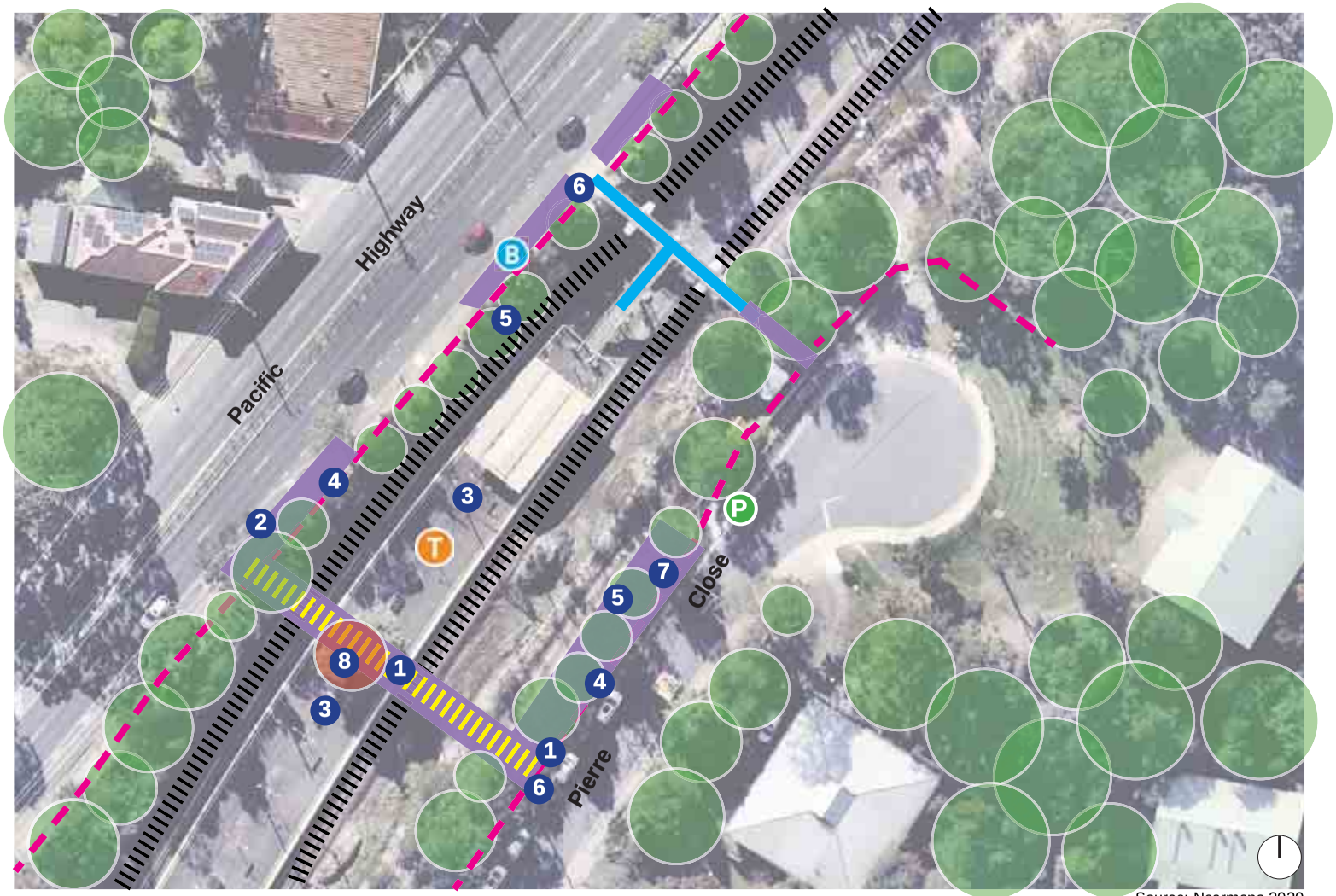
TBLA July 2020

Southern view of significant existing tree overhanging proposed new location of footbridge providing good visual buffer to railway lines

Google Street view July 2020

Opportunities and Constraints

1. **Improved Access to Station Platform**
   Opportunity to provide a more contemporary and equitable access to the station platform in the form of a new overpass
2. **Lighting**
   Opportunity to integrate lighting into new revised pedestrian access and surroundings.
3. **Urban furniture**
   Existing urban furniture in poor condition, new furniture required .
4. **New planting**
   Opportunity to provide new planting offering shade, shelter and visual identity to new works from residential areas
5. **Existing vegetation**
   Opportunity to maintain and supplement existing planting
6. **Existing & New Signage**
   Existing Signage in good condition, to be reused and additional Signage to be provided where necessary
7. **Improved Footpath Access**
   Opportunity to improve existing narrow footpath access from Pacific Highway, and Pierre Close Drop off zone
8. **Existing Vegetation on Platform**
   Existing tree on platform to be removed due to damage done by roots to concourse



Source: Nearmaps 2020

Legend

- Key areas
- Existing pedestrian footbridge
- Existing boundary fence
- Subject Railway Station
- Existing Bus stop
- Existing Commuter Street Parking
- Existing vegetation
- Existing vegetation to be removed
- Proposed Location for new Overpass

Urban Design

03

Urban Design Principles

The approach to the design of the public spaces associated with the footbridge upgrade considers the urban design principles as outlined in the '*Around the Tracks urban design for heavy and light rail*' publication. In conjunction with these published guidelines, best practice design principles are introduced in addition to the functional requirements of the publication.

A quality, valuable and appropriate urban outcome will be facilitated through the implementation of the following design principles;

- Provide value-for-money design solutions that achieve high quality low maintenance architectural and urban design outcomes that have longevity
- Provide connectivity and permeability for pedestrians
- Integrate the project with the surrounding area
- Maximise the amenity of the public domain
- Maximise positive view opportunities.
- Design an efficient and functional transport solution which enhances and contributes to local amenity and prosperity
- protect and enhance existing heritage features amd significant trees (None onsite)

Design Approach

Design Framework

Using the Urban Design Principles framework, an appropriately detailed urban design analysis has been undertaken. The Landscape Design approach provides for functional and aesthetic connectivity and ease of access to the surrounding area. The proposal acknowledges the existing urban character, materiality, architectural styles and planting character.

The proposal improves the existing amenity through upgrading access, and additional planting and finishes to the areas at the base of the footbridge. Proposed built forms provide a functional solution whilst minimising visual impact through the installation of a new tree and associated planting.

Urban Furniture

A number of urban elements exist on the site. They include bike racks, bins, bollards and other ancillary structures some of which requires replacement. It is proposed that where appropriate, these elements are retained, relocated and or removed for re-use as required.

Pavement

As required and following existing urban typology of the surrounding areas, new pavements will be of a concreteand brick nature. Broom finish or an alternative comparable hard wearing finish will be required to suitably complement the existing landscape character.

Vegetation

The existing vegetation from both the Pacific Highway and Pierre Close entrances to the station provide good shade, shelter, amenity, and a good visual buffer of the railway line. The planting of native trees, shrubs and ground covers will soften the visual impact of the proposed works. Proposed planting will comprise of low maintenance species.

Low planting to improve amenity and retain sight lines

In situ Concrete pathway and feature brick paving

Irrigation

It is recommended that a sub surface drip irrigation system is installed as part of the landscaping works. This low cost and automatically operated system is vital to the establishment and longevity of planting stock and will ensure the anticipated outcome is reached.

Materiality

The materiality and surface treatment of retaining walls and lift shafts are designed to deter graffiti and allow for easy graffiti removal.


Corymbia ficifolia


Lomandra Longifolia


Callistemon viminalis ‘Green John’


Syzygium ‘Cascade’


Dodonaea viscosa


Leptospermum polygalifolium


Westringia fruticosa


Callistemon ‘White Anzac’


Gazania ‘Kiss White’


Carpobrotus glaucescens


Hardenbergia violacea


Hakea laurina

Appendix H Geotechnical Technical Memorandum

Member of the Surbana Jurong Group

local people
global experience

Technical Memo

Technical Memo No	30012921-GT-MEM-002	**Date of Issue**	27/11/2020
Subject/Title	100% Reference Design of Mt Colah Footbridge		
Project Name	Mt Colah Footbridge	**Project Number**	30012921
Discipline	Geotechnical		
Revision Details	Rev 0		
Designed by	Brendan Fu		
Checked by	Shadi Jafarpisheh		
Verified by	Chenhui Lee		
Prepared for	Sydney Trains		
Attachments	None		

1 Introduction

SMEC Australia Pty Ltd (SMEC) has been engaged by Sydney Trains to undertake a reference design for a replacement footbridge at Mount Colah Station. This memo documents the geotechnical aspect of the works for the 100% reference design submission.

2 Scope of Works

The current scope of geotechnical works is as follows:

- Review of existing geotechnical data and identification of any further investigations that may be warranted in detailed design.
- Undertake geotechnical interpretation and develop ground parameters for structural modelling (including bearing capacity, vertical and lateral stiffness spring) for foundation design for footbridge, associated lifts and stairs and overhead wiring structures.
- Develop geotechnical models and parameters for footbridge, lifts, stairs, ramp and overhead wiring foundations based on the available geotechnical investigations as well as past project experience in similar ground conditions.
- Prepare geotechnical memo for foundation design for footbridge and associated lifts, access ramp and stairs, overhead wiring structures and discussions and recommendations for the design.
- Provide geotechnical input into feasibility and constructability of proposed 11kV routing based on the available geotechnical investigations as well as past project experience in similar ground conditions.

3 Information

The following information has been used in the preparation of this memo:

- *Mount Colah Station Footbridge Renewal Geotechnical and Contamination Investigation (Draft)*, produced by GHD Pty Ltd, dated June 2020
- *Geotechnical Investigation Report – Mt Colah HV Feeder, Condemned Poles,* produced by AECOM Australia Pty Ltd, document number 60605415, dated 29 August 2019

- *Preliminary Geotechnical Assessment: 554 & 556-558 Pacific Highway, Mount Colah, NSW,* produced by Martens Consulting Engineer, document number P1504601JR01V01, dated 13th February 2015
- *Mount Colah Footbridge Final Design Report*, produced by Jacobs, document number NB98036-RP-002, dated 5 November 2014

4 Geotechnical Interpretation

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 (First Edition, 1983) indicates the site is underlain by Hawkesbury Sandstone of the Wianamatta group. This generally comprises medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

The available geotechnical investigations in the vicinity include thirteen boreholes drilled to a maximum depth of 9.9 m and are tabulated in Table 4-1.

Table 4-1: Geotechnical Investigations undertaken in vicinity

Borehole Name	Easting (56 MGA94)	Northing (56 MGA94)	Approximate RL	Max Depth
BH01 (AECOM,2019)	325123.2	6272454.7	203.00	5.30
BH02 (AECOM, 2019)	325290.4	6272767.0	207.00	4.22
BH01 (GHD, 2020)	325198.2	6272647.1	207.65	6.00
BH01A (GHD, 2020)	325201.7	6272649.1	207.64	1.00
BH02 (GHD, 2020)	325218.3	6272647.2	205.30	5.90
BH02A (GHD, 2020)	325215.2	6272642.0	205.45	0.40
BH03 (GHD, 2020)	325236.5	6272633.7	206.88	6.00
BH03A (GHD, 2020)	325241.8	6272640.2	207.10	1.56
BH1 (Jacobs, 2014)	325283.7	6272699.8	207.00	9.90
BH2 (Jacobs, 2014)	325260.4	6272703.4	203.80	8.60
BH101 (Martens Consulting, 2015)	-	-	206.00	5.30
BH102 (Martens Consulting, 2015)	-	-	205.75	6.00
BH103 (Martens Consulting, 2015)	-	-	204.00	5.50

Note: Easting and Northings were not provided for BH101, BH102 and BH103 which were undertaken by Martens Consulting. These boreholes were conducted as part of the development being undertaken at 554 & 556-558 Pacific Highway, Mt Colah.

Generally, site investigation recorded varying layers of fill (up to 2.0 m) was overlying residual soils of medium dense consistency or better (up to 1.3 m) which overlies sandstone bedrock at the borehole location. Refer to Section 4.1 for more details.

The investigations relevant to the foundation design of each structure are summarised in Table 4-2.

Table 4-2: Relevant Geotechnical Investigations

Structure	Relevant Geotechnical Investigations
Lift, pier and stair foundations adjacent to Pacific Highway (Lift 1 and Pier 1)	BH01 (GHD,2020). BH01A (GHD,2020)
Lift, pier and stair foundations on Station Platform (Lift 2 and Pier 2)	BH02 (GHD,2020). BH02A (GHD,2020)
Lift, pier and stair foundations adjacent to Pierre Close (Lift 3 and Pier 3)	BH03 (GHD,2020). BH03A (GHD,2020)

4.1 Subsurface Profile

The adopted geotechnical subsurface profiles at lift, pier and stair locations is summarised in Table 4-3, Table 4-4 and Table 4-5 and are as per the geotechnical models developed by GHD in the Mount Colah Station Footbridge Renewal Geotechnical and Contamination Investigation (Draft) report unless otherwise noted.

Table 4-3: Adopted Subsurface profile at Lift 1 and Pier 1 (Lift, Pier and stair foundations adjacent to Pacific Highway)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
207.65	207.15	0.5	Fill (Clayey Sand)
207.15	205.97	1.18	Residual Soil (Medium Dense Sand)
205.97	205.75	0.22	Sandstone Class V (SAN-V)
205.75	204.08	1.67	Sandstone Class IV (SAN-IV)
204.08	Not Proven	-	Sandstone Class III (SAN-III)

Table 4-4: Adopted Subsurface profile at Lift 2 and Pier 2 (Lift, Pier and stair foundations on Station Platform)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
205.30	205.05	0.25	Fill (Sand)
205.05	204.80	0.25	Residual Soil (Medium Dense Clayey Sand)
204.80	204.75	0.05	Residual Soil (Stiff Clay)
204.75	204.13	0.62	Sandstone Class V (SAN-V)
204.13	Not Proven	-	Sandstone Class IV (SAN-IV)[Note 1]

Note 1: Class IV Sandstone has been adopted from RL199.84 rather than Class III Sandstone specified in GHD report based on defect spacing and estimated strength.

Table 4-5: Adopted Subsurface profile at Lift 3 and Pier 3 (Lift, Pier and stair foundations adjacent to Pierre Close)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
206.88	206.38	0.5	Fill (Sand)
206.38	205.30	1.08	Residual Soil (Medium Dense Clayey Sand)
205.30	204.26	1.04	Sandstone Class V (SAN-V)
204.26	201.15	3.11	Sandstone Class III (SAN-III)[Note 1]
201.15	Not Proven	-	Sandstone Class V (SAN-V)

Note 1: Class III Sandstone has been adopted for this layer rather than Class II Sandstone specified in GHD report based on defect spacing.

Based on the existing geotechnical investigations the subsurface profile beneath the proposed overhead wiring structures is assessed to be similar with generally varying layers of fill (up to 2.0 m), overlying residual soils of medium dense consistency or better (up to 1.3 m) which overlies sandstone bedrock.

4.2 Groundwater

No free groundwater was observed in the boreholes used in the interpretation of subsurface profiles at the proposed lift, pier and stair foundation locations.

Groundwater was only observed in boreholes BH101 and BH103 undertaken by Martens Consulting. These boreholes were conducted as part of the development being undertaken at 554 & 556-558 Pacific Highway, Mt Colah. Groundwater was observed at 2.45 m below ground level in BH101 and 1.23 m below ground level in BH103. The observed groundwater levels are within the residual soil at both borehole locations and near the interface of soil and bedrock.

It is assessed that groundwater may rise to near the interface of soil and bedrock particularly after heavy rainfall events. Groundwater levels may also fluctuate over time due to seasonal and climatic variations.

For the purposes of the design, groundwater has been assumed to be at the interface of soil and bedrock.

4.3 Geotechnical Parameters

Geotechnical units have been developed for the purpose of the geotechnical design. Geotechnical design parameters have been developed based on the results of the in situ and laboratory testing of selected samples undertaken as part of the existing geotechnical investigations, values documented in the literature (e.g. Pells, et al., 1998) and previous experience in similar materials and engineering judgement. Soil parameters have not been provided as the foundations will be founded within rock and the benefits of the foundation within soil should be ignored. The design parameters are summarised in Table 4-6.

Table 4-6: Pell's rock classification (1998) geotechnical design parameters for rock

Material	Unit Weight (kN/m3)	c' (kPa)	ϕ' (°)	Elastic Modulus (MPa)	Poisson's Ratio	Ultimate End Bearing, qb (MPa)	Serviceability End Bearing, qs (MPa)	Ultimate Shaft Adhesion (kPa)	Modulus of Subgrade Reaction (kN/m3)
Class V Sandstone	22	10	35	50	0.25	3	1	150	50,000
Class IV Sandstone	22	100	35	100	0.25	4	1	250	100,000
Class III Sandstone	23	200	36	350	0.2	20	3.5	800	350,000
Class II Sandstone	24	400	37	900	0.2	60	6	1500	900,000

1. Ultimate end bearing values occur at large settlements (>5% of minimum foundation dimensions)
2. Clean socket of roughness category R2 or better
3. Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 2 pile diameters
4. Horizontal and vertical modulus of subgrade reaction values is assumed as equal for rock

5 Proposed Design Methodology

5.1 Design Methodology

Based on anticipated loads and ground conditions, pile foundations have been considered.

The foundation design for the piled foundations has been undertaken in accordance with AS2159-2009. The piles have been checked for compression, tension and lateral capacity under ultimate limit state (ULS) loads.

Settlements of piles under serviceability limit state (SLS) loads is expected to be less than 10mm. The actual settlement shall be assessed in the final detailed design.

A verified in-house Excel spreadsheet has been used which allows the design of the piles for compressive and tensile loads using the design principles described above.

5.2 Geotechnical Strength Reduction Factor

The geotechnical strength reduction factor (ϕg) has been assessed based on the procedures outlined in AS 2159-2009 and has been calculated to be 0.56.

5.3 Slope and Pile interaction

The foundations on the Pacific Highway side and Pierre Close side are located adjacent to the existing sandstone cutting. The ultimate lateral capacity of rock socketed pile on a cut face is typically controlled by the presence of adverse rock mass discontinuity, which can result in the formation of rock wedges and reducing the ultimate lateral capacity of pile. At the time of writing, information on the rock mass discontinuity is not available and therefore wedge stability assessment has not been completed.

The current 100% reference design assumed that no adverse rock wedges (and no reduction in lateral capacity due to the foundations are located beyond a 1H:1V influence zone) and a proper assessment should be conducted as part of the detailed design with rock mapping undertaken to gather information on rock mass characteristics such as bedding, seams and joints which may affect pile lateral capacity. The nature and orientation of defects is currently not known and in sandstone can be variable.

6 Pile Design Loading

Ultimate Limit State (ULS) design loadings acting at the top of the pile are shown in Table 6-1 for the bridge elements shown in Figure 1. The design loading for each of the elements has been provided by the Structural Engineer.

Figure 1: Bridge Diagram

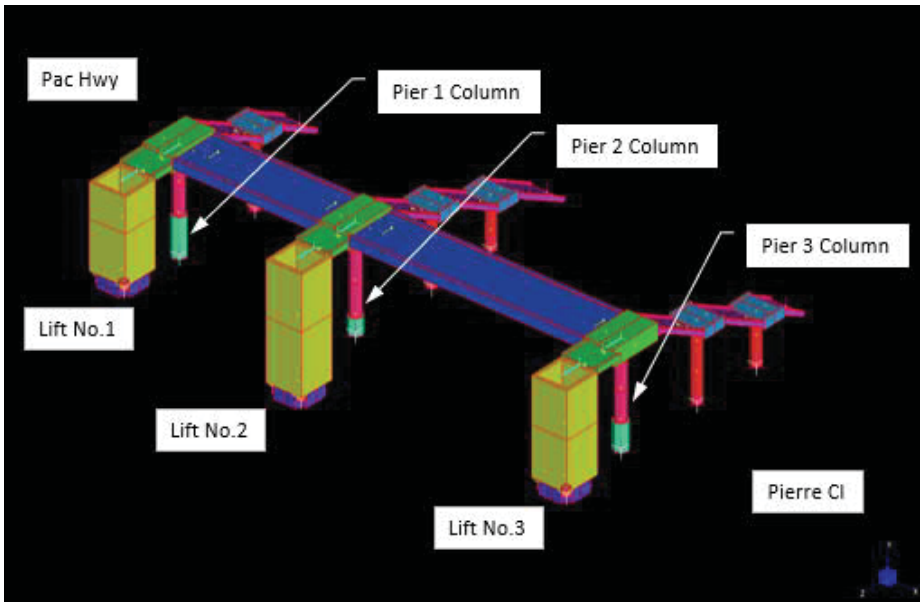


Table 6-1: Summary of ULS design loading at top of rock socket

Element	Axial Compression (kN)	Axial Tension (kN)	Bending Moment (kNm)	Shear Force (kN)
Lift Piles	2168	1897	0	0
Pier Piles	1024	-	4111	1567
Stair Support Piles	265	-	1097	229

7 Geotechnical Pile Design Results

The geotechnical design of bridge pile foundations has been carried out using the limit state design principles in accordance with AS2159–2009 to satisfy to satisfy ultimate limit state design criteria.

A summary of the key calculations and findings is presented in Table 7-1.

Table 7-1: Geotechnical pile foundation information

Element	Pile No	Pile Diameter (mm)	Top of Rock Socket RL (m AHD)	Minimum Rock Socket Length (m)	Design Socket Length (mm) / Material	Founding Material	Pile Toe Reduced Level (m AHD)
Lift 1	P1 – P4	750	205.97	3.6	200/SAN-V 1700/SAN-IV 1700/SAN-III	SAN-III	202.37
Lift 2	P5 – P8	750	204.75	7.5	700/SAN-V 6800/SAN-IV	SAN-IV	198.95

Element	Pile No	Pile Diameter (mm)	Top of Rock Socket RL (m AHD)	Minimum Rock Socket Length (m)	Design Socket Length (mm) / Material	Founding Material	Pile Toe Reduced Level (m AHD)
Lift 3	P9 – P12	750	205.30	3.2	1100/SAN-V 2100/SAN-III	SAN-III	202.10
Pier 1	P13	1200	205.97	3.0	200/SAN-V 1700/SAN-IV 1100/SAN-III	SAN-III	202.97
Pier 2	P14	1200	204.75	5.7	700/SAN-V 5000/SAN-IV	SAN-IV	199.05
Pier 3	P15	1200	205.30	2.7	1100/SAN-V 1600/SAN-III	SAN-III	202.60
Stair 1	P16	1050	205.97	2.1	200/SAN-V 1700/SAN-IV 200/SAN-III	SAN-III	203.87
Stair 2	P17 – P18	1050	204.75	2.7	700/SAN-V 2000/SAN-IV	SAN-IV	202.05
Stair 3	P19 – P20	1050	205.30	1.8	1100/SAN-V 700/SAN-III	SAN-III	203.50

8 Proposed 11kV Route and Overhead Wiring Structures

No further geotechnical investigation is planned during the reference design stage and based on existing geotechnical information, it is assumed that standard embedment depths and standard footings will be adopted for the proposed 11kV routing and overhead wiring structures.

9 Discussions and Recommendations

- Temporary works do not form part of the reference design. Temporary work shall be included as part of the detailed design to ensure adjacent utilities or structures are not impacted during the construction of the footbridge. It is assessed that a temporary retention system may be required for the excavation of the lift pit on the Pacific Highway side to ensure the Sydney Water main and Pacific Highway are not impacted.
- The current site investigations undertaken for the proposed footbridge foundations are assessed to be meeting the minimum site investigation stipulated in AS5100.3-2017 i.e. minimum of one borehole per abutment or pier for bridges with bridge width less than 10m. However, as the piles on the Pacific Highway side are located at close proximity to the cut face, further site investigation or geological mapping of the rock cuttings shall be included as part of the detailed design to investigate the presence of rock mass discontinuities, bedding, seams and joints which could affect pile lateral capacity as well as the potential for kinematic failures due to loading from foundations e.g. OHWS foundations.
- Slope stability does not form part of the reference design and should be included as part of the detailed design.
- Further investigation may be required during the detailed design stage pending the final location of OHWS foundations as well as the final route of the 11kV cable.

- While the geotechnical model presented in Table 1 is suitable for pile design, it should be noted that the interpreted boundaries between the layers is based on the available geotechnical information. Local variations in the subsurface profile may exist and shall be verified during construction by a suitably qualified geotechnical engineer or geologist to assess the suitability of the socket and founding material.
- The construction of bored piles should be supervised by a qualified geotechnical engineer/engineering geologist to assess that the ground materials meet the design requirements and assess the pile length and cleanliness
- Temporary casing from ground level to the top of the bedrock (Class V Sandstone) may be required. This is to reduce the risk of granular materials collapsing into the pile hole and limit the potential for groundwater seepage (should it be encountered).

Appendix I Power Supply Technical Memorandum

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Technical Memo

Technical Memo No	30012921-EL-MEM-002	**Date of Issue**	3 November 2020
Subject/Title	Backup Supply Options Assessment		
Project Name	Mount Colah Footbridge Reference Design	**Project Number**	30012921
Discipline	Electrical		
Document Number	30012921-EL-MEM-002		
Revision Details	B		
Author	[redacted]		
Reviewed by	[redacted]		
Approved by	[redacted]		
Prepared for	Sydney Trains	**Attention to**	[redacted]
Attachments	-		

Contents

1 Purpose

The purpose of this note is to provide Level 3 ASP Engineering Advice about the proposed electricity supply arrangements and options relating to the refurbishment of the Mount Colah Station Backup Supply. This note outlines the supply arrangement that can be provided from the local electricity distributor (Ausgrid).

2 Existing Supply Arrangement

Mt Colah Station has a three-phase overhead supply fed from Ausgrid network. The existing point of supply (POS) is on a private pole located within the station boundary, which is fed from Ausgrid Pole MC-2343 on Pacific Highway via an aerial bundle of three-phase overhead service main cables.

Refer to Figure 1 and Figure 2.

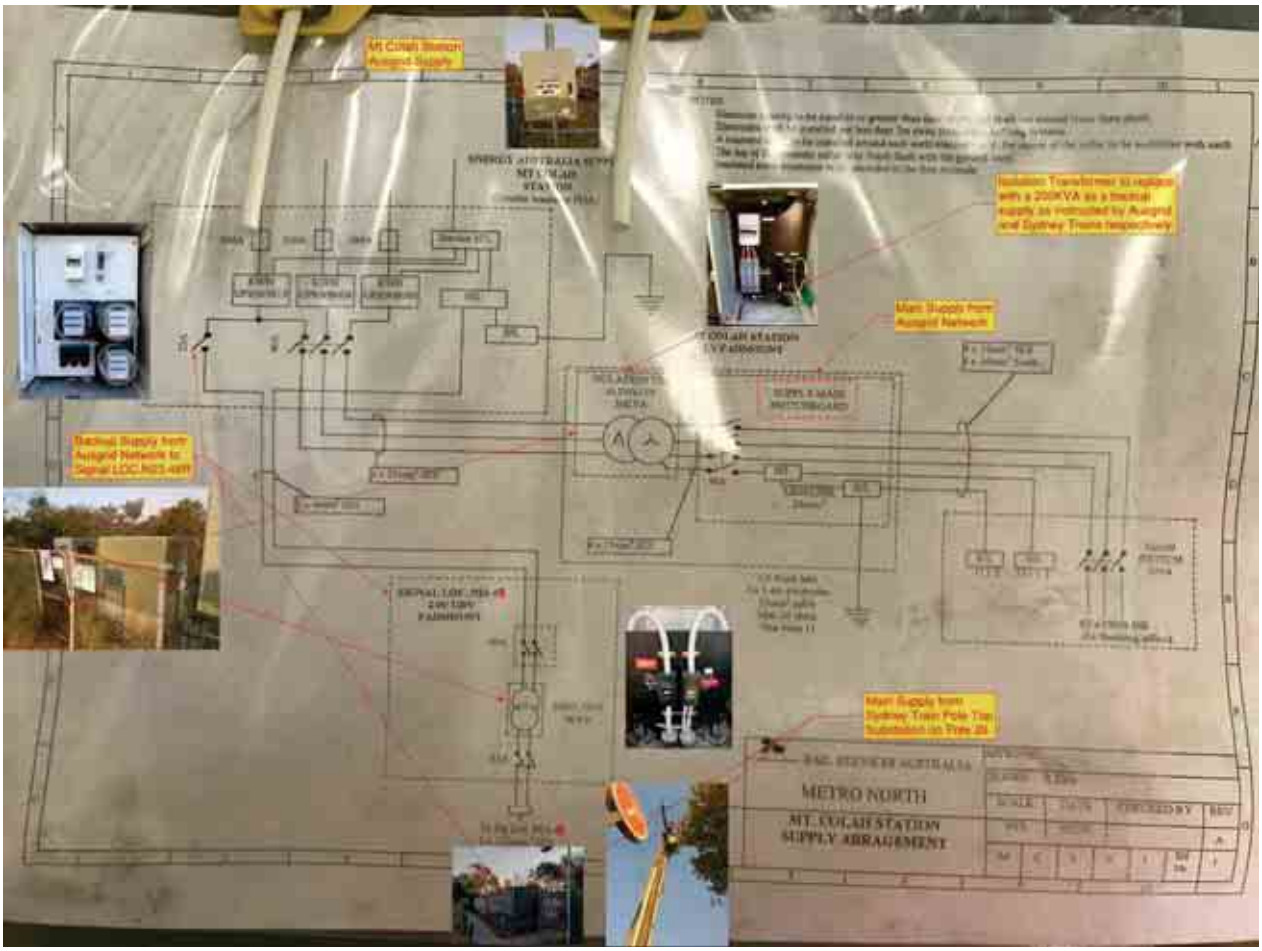


Figure 1 Overview of the existing Ausgrid Electricity Supply on Pacific Highway to Mt Colah Station

Figure 2 Existing Ausgrid Supply via a private pole fed from Ausgrid Pole MC-2343 on Pacific Highway

2.1 Mt Colah Station Supply

The existing Ausgrid supply appears to be 100A three-phase and supplies power for the station loads and a backup for the signalling location N23.48R. Mt Colah Station Main Switchboard (MSB) is currently fed from a 30KVA 415/415V three-phase delta/wye Isolation Transformer.

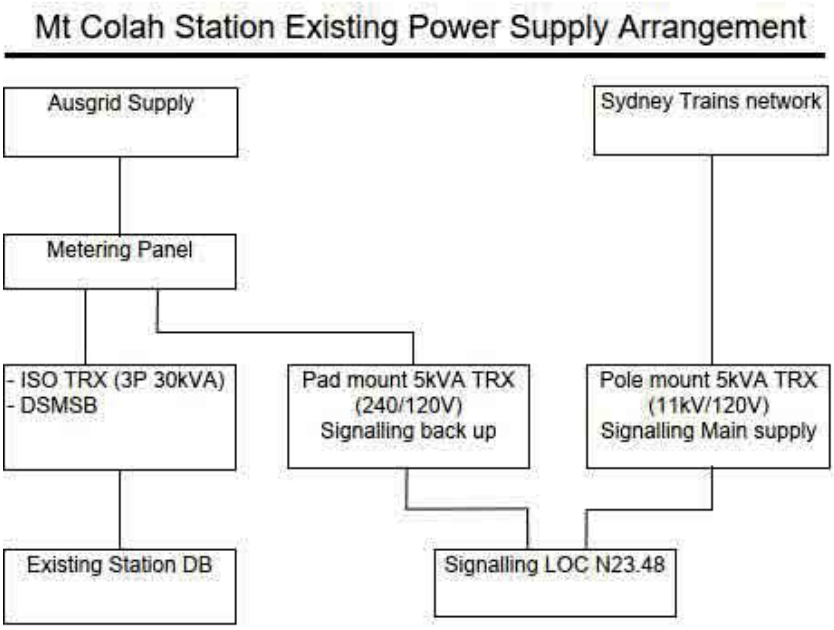


Figure 3 Mt Colah Station Existing Power Supply Arrangement

Refer to Figure 4, Figure 5 and Appendix A.

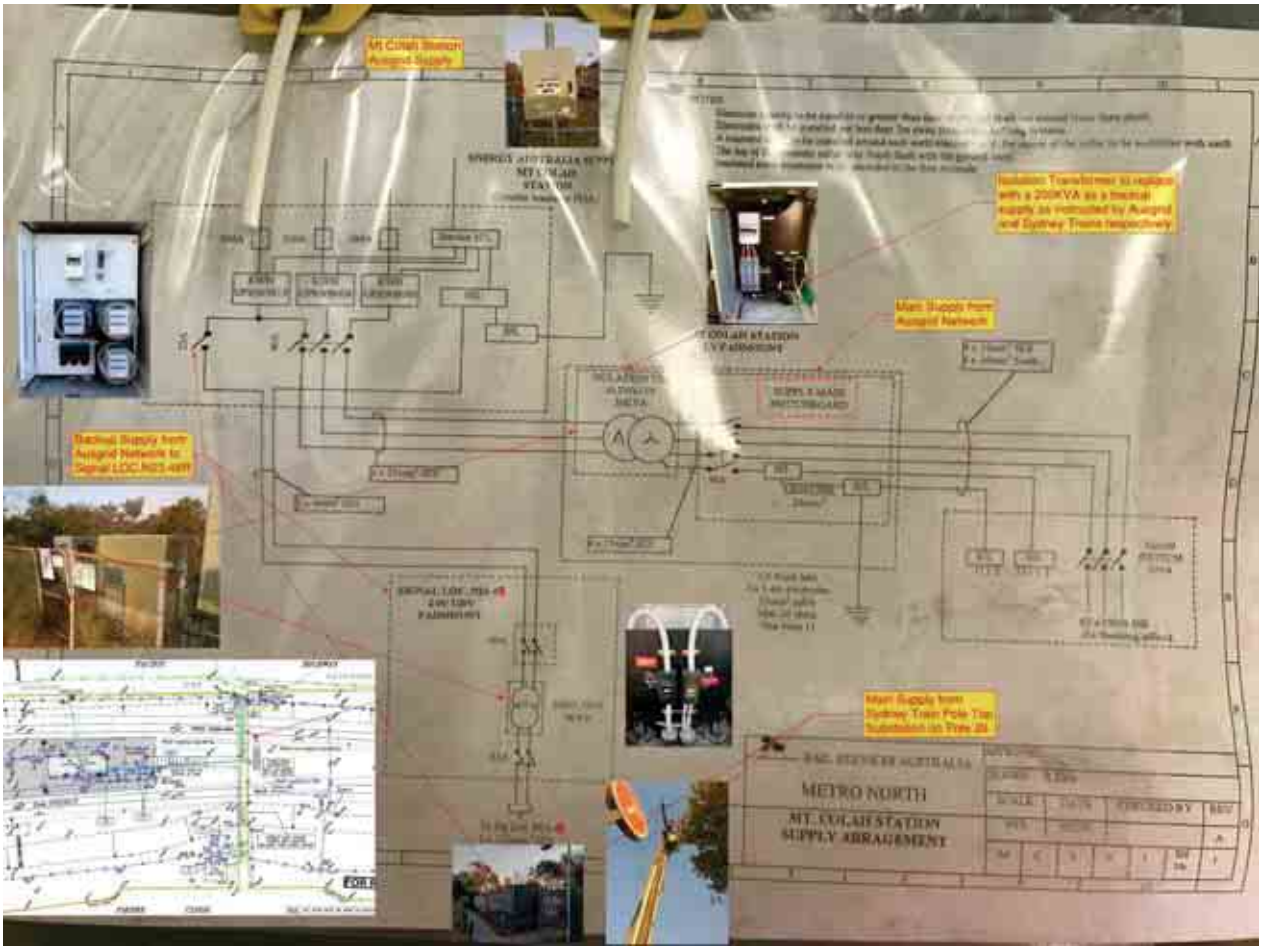


Figure 4 Existing Mt Colah Station Supply Arrangement fed from Ausgrid Network

Figure 5 Private Padmount Isolation Transformers for Main Station and Backup Signalling Loads

2.2 Signal Loc N23.48R

Referring to Figure 3 and Figure 4, signalling is currently fed from Ausgrid network for backup supply on the Pacific Highway side of the Station and then brought across the corridor to the signalling hut. The Main Supply is from a Private Pole Mounted Substation installed on Sydney Train Pole 26 within the rail corridor.

Mt Colah Station Signal Loc N23.48R is located at Pierre Close side of the station. Refer to Figure 6.

Figure 6 Mt Colah Station Signal Loc N23.48R

3 New Electrical Infrastructure Arrangement

Figure 7 shows an overview of the proposed supply for the refurbished Mt Colah Station. The refurbishment plan is to demolish the existing bridge, construct a new bridge towards city side and the associated new three lifts, install new lights and communication systems. The refurbishment work triggers the requirement to upgrade the existing supply. Based on the new Maximum Demand, the required supply is 180A three-phase (123.5kVA including 30% spare capacity), refer to Table 1.

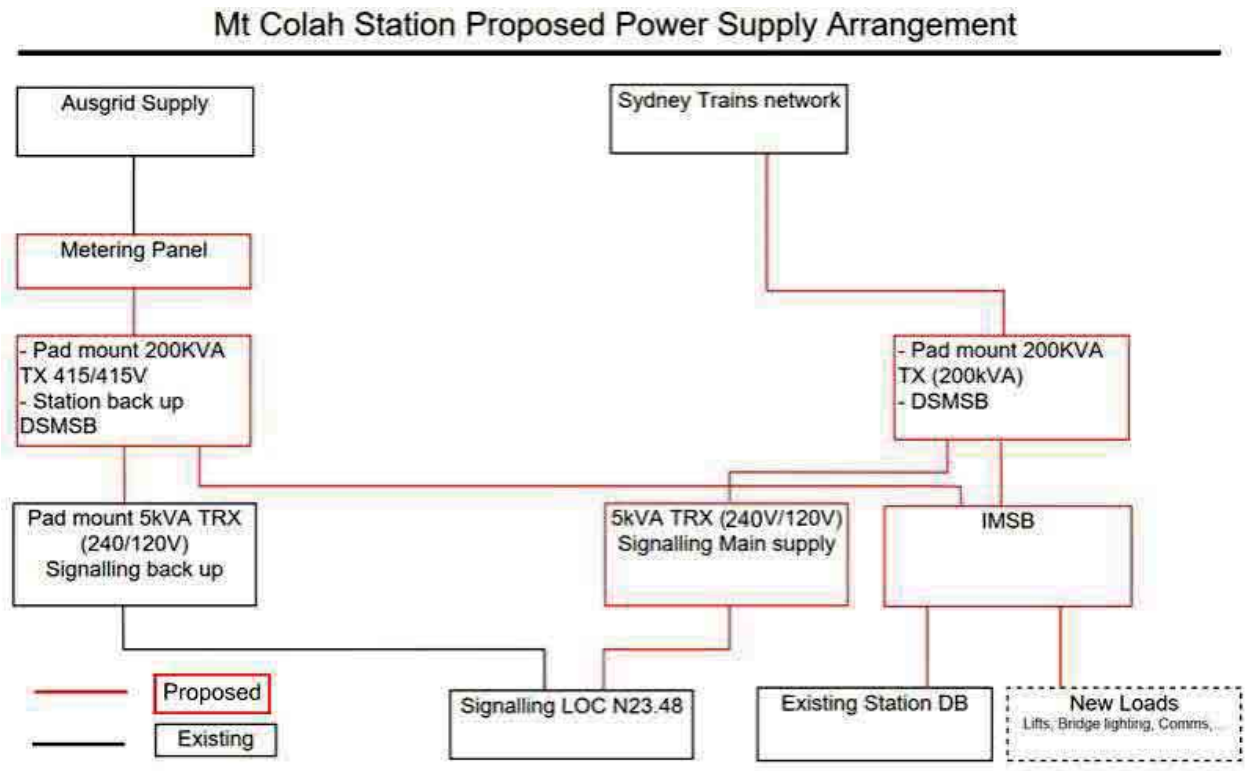


Figure 7 Mt Colah Station Proposed Supply Arrangement

Table 1 Summary of the Maximum Demand Calculation

Item	Load	kVA	A
1	New loads (Lifts, Lighting, Communications)	60	87
2	Existing station loads excluding signalling	30	44
3	Signalling	5	21(1ϕ)
4	Upgraded demand including New + Existing loads (sub-total)	95	138
5	30% spare capacity	29	42
TOTAL	Mount Colah Station Loads	124	180 (3ϕ)

4 Ausgrid Proposed Supply Solutions

The following solutions have been investigated further based on Ausgrid preliminary advice in response to the SMEC submitted Connection Application 0148207 dated on 14/09/2020. Refer to Attachment 1 for more information.

Ausgrid Network will be utilised as a backup supply for Mount Colah Station. Mount Colah Station main supply arrangement is agreed to be fed from Sydney Train private HV network and therefore is excluded from this technical note.

The existing 30KVA 415/415V Padmount Isolation Transformer is required to be replaced by a larger Padmount Isolation Transformer to suit the new loading demand, specifically requested by Ausgrid. The closest standard Isolation Transformer rate matching to the proposed Maximum Demand is 200KVA 415/415V three-phase Padmount Isolation Transformer as per Transport for NSW Specification T-HR-EL-17002-SP (Ver.1), Table 2.

SMEC will update Ausgrid with the revised Maximum Demand Calculation. Since the current application is based on 170A loading demand. Refer to Table 1.

4.1 Option 1 – Modification to Ausgrid LV Network on Pacific Highway

This option is modification to Ausgrid LV Network on Pacific Highway. Refer to Figure 8, Figure 9 and Appendix B for more detailed information.

Mt Colah Station is currently fed from Distributor 2 of Pole Mounted Substation PT2211 rated at 400KVA-11kV/415V.

A new Kiosk Substation is supposed to be installed on Pacific Highway at south western side of the station with some spare capacity under Ausgrid contestable project AN-13537 (estimated completion and being commissioned in Feb 2021). Note, Ausgrid has no control over the completion time frame, which would be a key risk for this supply option, if AN-13537 fails to deliver.

The scope of work would involve transfer of 150A (less than the requested 170A demand) loading from Distributor 2 of Pole Mounted Substation PT2211 to the newly established substation and another adjacent substation by installation/relocation of OH LV links along Pacific Hwy. In addition, the existing Overhead LV Main between Pole MC-2318 and Pole MC-2343 is required to be replaced by 2x95ABC as a minimum or 1x150ABC.

The existing 30KVA Padmount Isolation Transformer is to be replaced with a new 200KVA-415/415V Padmount Isolation Transformer, as required by Ausgrid. For the new Padmount Isolation Transformer, some ground remedial works (due to the existing limitation of space) and minor footprint relocation would be required to accommodate the new 200KVA-415/415V Padmount Isolation Transformer in addition to achieve compliance to the relevant standards. Detailed location of the backup Padmount Isolation Transformer will be provided at 100% reference design report provided selection of this option.

SMEC will liaise with Ausgrid to request additional loading of 30A to seek approval for 180A loading demand dedicated to Mt Colah Station as per the revised Maximum Demand Calculation. Refer to Table 1.

Note, SMEC has already requested 170A loading demand based on the previous Maximum Demand Calculation. Ausgrid will further investigate about the feasibility of additional loading of 30A after acceptance of Ausgrid Supply Offer. Refer to Attachment 1- Ausgrid Application 0148207.

Figure 8 Overview of Option 1

Figure 9 Street view of Option 1

4.2 Option 2 – Modification to Ausgrid LV Network on Telopea St North

This option is modification to Ausgrid LV Network on Telopea St North. Refer to Figure 10 and Appendix C for more detailed information.

There is apparently sufficient capacity available in Kiosk Substation S49943 on Wonga Rd. Existing Overhead and Underground reticulations from Kiosk Substation S49943 to Pole MC-1766 are already in place and operational. The scope of work would involve upgrading Overhead Mains from Pole MC-1766 located at the junction of Wonga Road and Telopea St to either Pole MC-1405 or MC-1406 on Pierre Close using 2x95 LV ABC. A new Private Pole is also required to be installed on Pierre Close to extend a new Overhead Service Main cable from the new Point of Common Coupling which is either on Pole MC-1405 or MC-1406.

A new 200KVA-415/415V Padmount Isolation Transformer is to be installed, as required by Ausgrid, as a replacement of the existing 30KVA Pad Mounted Isolation Transformer. The proposed location would be downside of the rail corridor in the proximity of the new Private Pole on Pierre Close.

The existing Ausgrid Supply locating on Pacific Highway side of the Train Station including Overhead Service Main, Private Pole and 30KVA Pad Mounted Isolation Transformers are to be decommissioned and removed.

SMEC will update Ausgrid with the revised Maximum Demand Calculation to request additional loading of 10A. Since the current application is based on 170A loading demand. Refer to Table 1.

Existing Ausgrid overhead LV reticulation route on Telopea St from Pole MC-20351 to MC-1493 is currently under the existing Sydney Train 66KV Overhead Transmission Line Feeder 829. Ausgrid and Sydney Train conductors appear to be well-segregated. Sydney Train Pole 195 is a shared Pole attached with Ausgrid LV and Telco assets.

Figure 10 Overview of Option 2

4.3 Option 3 – Modification to Ausgrid LV Network on Telopea St South

This option is modification to Ausgrid LV Network on Telopea St South. Refer to Figure 11 and Appendix D for more detailed information.

There is apparently sufficient capacity available in existing Kiosk Substation S46651 within Mt Colah Public School boundary on Telopea St.

The scope of work would involve LV underground reticulation from Kiosk Substation S46651 to the new UGOH Pole MC-1489, upgrading Overhead Mains from Pole MC-1493 (with a new LV OH Link) located at the junction of Telopea St and Mountside Ave to either Pole MC-1405 or MC-1406 on Pierre Close using 1x150 LV ABC. A new Private Pole is also required to be installed on Pierre Close to extend a new Overhead Service Main cable from the new Point of Common Coupling which is either MC-1405 or MC-1406.

A new 200KVA-415/415V Padmount Isolation Transformer is to be installed, as required by Ausgrid, as a replacement of the existing 30KVA Pad Mounted Isolation Transformer. The proposed location would be downside of the rail corridor in the proximity of the new Private Pole on Pierre Close.

The existing Ausgrid Supply locating on Pacific Highway side of the Train Station including Overhead Service Main, Private Pole and 30KVA Pad Mounted Isolation Transformers are to be decommissioned and removed.

SMEC will update Ausgrid with the revised Maximum Demand Calculation to request additional loading of 10A. Since the current application is based on 170A loading demand. Refer to Table 1.

Figure 11 Overview of Option 3

5 High level cost estimation

Syscon as a Grade A ASP1/2 has been engaged and instructed to price the backup power supply options at this stage. However, they would welcome the opportunity to price the main and backup power supply upgrade works as a single package, if instructed.

Syscon has also priced the new 200KVA Isolation Transformer but without a detailed Single Line Diagram the price range is quite large and therefore they have gone towards the top end to ensure having enough allowance should the project proceed. This can be refined as the job moves closer to a formalised design.

Syscon cost estimations are summarised as follows:

Refer to Appendix E for more information.

5.1 Option 1

The estimated construction cost for this option would be $ 246,013 (GST exclusive). Refer to Appendix E.

5.2 Option 2

The estimated construction cost for this option would be $ 247,845 (GST exclusive). Refer to Appendix E.

5.3 Option 3

The estimated construction cost for this option would be $ 263,895 (GST exclusive). Refer to Appendix E.

6 Options comparison

Comparing the options investigated above and the key issues outlined in detail the following summary has been made:

	Option 1	Option 2	Option 3
Constructability	Feasible	Feasible	Feasible
Maintenance	By Ausgrid	By Ausgrid	By Ausgrid
Cost	Reasonable	Reasonable	Reasonable

6.1 Risks & Implications

There are some risks and implications associate with the proposed options as follows:

6.1.1 Option 1

- Completion of Ausgrid contestable project AN-13537 (estimated completion in Feb 2021). Since, Ausgrid has no control over the completion time frame. Refer to Section 4.1.
- Ausgrid approval of additional 30A loading for a total loading demand of 180A three-phase. Refer to Section 4.1.
- Possibility of having an extended and staging outage periods associated with the nearby customers in addition to higher amount of Ausgrid outage fee in order of $10K.
- There is limited space on Pacific Highway side of the station. The new Padmount Isolation Transformer needs more space. Potential complexity of some ground remedial works (due to the existing limitation of space) for the new Padmount Isolation Transformer would be the case. Relocation of the Padmount footprint for about 30m towards the countryside would be required. Relocation will assist to fit the new 200KVA-415/415V Padmount Isolation Transformer in addition to achieve compliance to the relevant standards. Detailed location of the backup Padmount Isolation Transformer will be provided at 100% reference design report provided selection of this option.
- Potential limited maintenance access with higher level of safety cautions to the proposed Sydney Train owned electrical assets including LV cables and new 200KVA Padmount Isolation Transformer.
- Construction staging in rail corridor may be required. Any potential supply interruption could be addressed by using generators.

6.1.2 Option 2

- Possibility of replacing few LV Poles along the overhead reticulation, if required. However, this risk will be assessed and investigated further during Level 3 design process to be undertaken by the nominated Level 3 ASP. Consideration of $6.5K for each LV pole replacement (any of the 6 poles) would be a reasonable ballpark figure.
- Limited access to 4 poles along Mountside Ave footway (pathway). Therefore, some construction work will be performed from ladders in lieu of EWP which incurs additional labour costs. Refer to Appendix E, option 2 description.
- Ausgrid approval of additional 10A loading for a total loading demand of 180A three-phase.

6.1.3 Option 3

- Possibility of replacing few LV Poles along the overhead reticulation, if required. However, this risk will be assessed and investigated further during Level 3 design process to be undertaken by the nominated Level 3 ASP. Consideration of $6.5K for each LV pole replacement (any of the 8 poles) would be a reasonable ballpark figure.
- Limited access to 4 poles along Mountside Ave footway (pathway). Therefore, some construction work will be performed from ladders in lieu of EWP which incurs additional labour costs. Refer to Appendix E, option 2 description.
- Ausgrid approval of additional 10A loading for a total loading demand of 180A three-phase.

6.2 Advantages & Disadvantages

6.2.1 Option 1

6.2.1.1 Advantages

- Least contestable construction works including minimum overhead assets upgrade works.
- Existing Ausgrid Supply location and configuration will remain unchanged.

6.2.1.2 Disadvantages

- Dependence on Ausgrid contestable project AN-13537 completion (estimated completion in Feb 2021). Refer to 6.1.1.
- Ausgrid approval of additional 30A loading for a total loading demand of 180A three-phase.
- Potential implications to accommodate the new 200KVA Padmount Isolation Transformer in the same location of the existing 30KVA Padmount Isolation Transformer which is to be removed. The implications consist of limited space for access, maintenance and or any other potential departures from standard design, where applicable. Refer to Rail Corp Drawings EL 0455387 Rev C and EL 0474159 Rev A.
- Complexity of LV reticulation within the rail corridor.
- Intensive vegetation clearing requirement to accommodate the new 200KVA Padmount Isolation Transformer and LV reticulation route towards the new MSB.
- Potential limited access with higher level of safety cautions to the proposed Sydney Train owned electrical assets including LV cables, new 200KVA Padmount Isolation Transformer and Sydney Trains HV aerial line for maintenance access requirements on Pacific Highway rail corridor.

6.2.2 Option 2

6.2.2.1 Advantages

- Reduce extent of de-vegetation for cabling route and accommodation of the new Padmount Isolation Transformer compared to option 1.
- Increase safety for construction, operation, and maintenance access to avoid steep cliff cuttings compared to option 1.
- Eliminate the requirement to modify existing gate/fencing arrangements for access to Sydney Train Pole 26 on Pacific Highway.
- Eliminate the requirement to complete main supply and the associated (buried) cable routes prior to construction of the new backup supply. In other words, power supplies (main and backup) can be completed and commissioned independently from existing footbridge demolition.
- Provide improved diversity for main and backup power supplies in terms of locations and cable routes.

6.2.2.2 Disadvantages

- Upgrade of about 315m Ausgrid overhead LV mains with the possibility of LV pole replacements to merely facilitate a backup supply for the station.

- Possibility of replacing few LV Poles along the overhead reticulation, if required.

6.2.3 Option 3

6.2.3.1 Advantages

- As per 6.2.2.1

6.2.3.2 Disadvantages

- Upgrade of about 215m Ausgrid overhead LV mains with the possibility of LV pole replacements in addition to the installation of about 95m underground LV reticulation to merely facilitate a backup supply for the station.

7 Conclusion and Recommendations

In general, both options 1 & 2 appear to be suitable to this case contestable-wise and Rail Corp-wise, respectively.

Option 2 appears to be the safest, most suitable, and reliable solution Rail Corp-wise. However, this option may have some additional contestable works compared to option 1.

Option 1 would also be recommended contestable-wise as to have the most feasible and simplest contestable method of supply provided having an approval for the additional loading demand. However, option 1 may have some complexities Rail Corp-wise in terms of safety, access, maintenance and construction staging.

Further contestable-related technical advice can be sought from Ausgrid after selection of the most preferable option and obviously acceptance of the Supply Offer, as per Ausgrid advice.

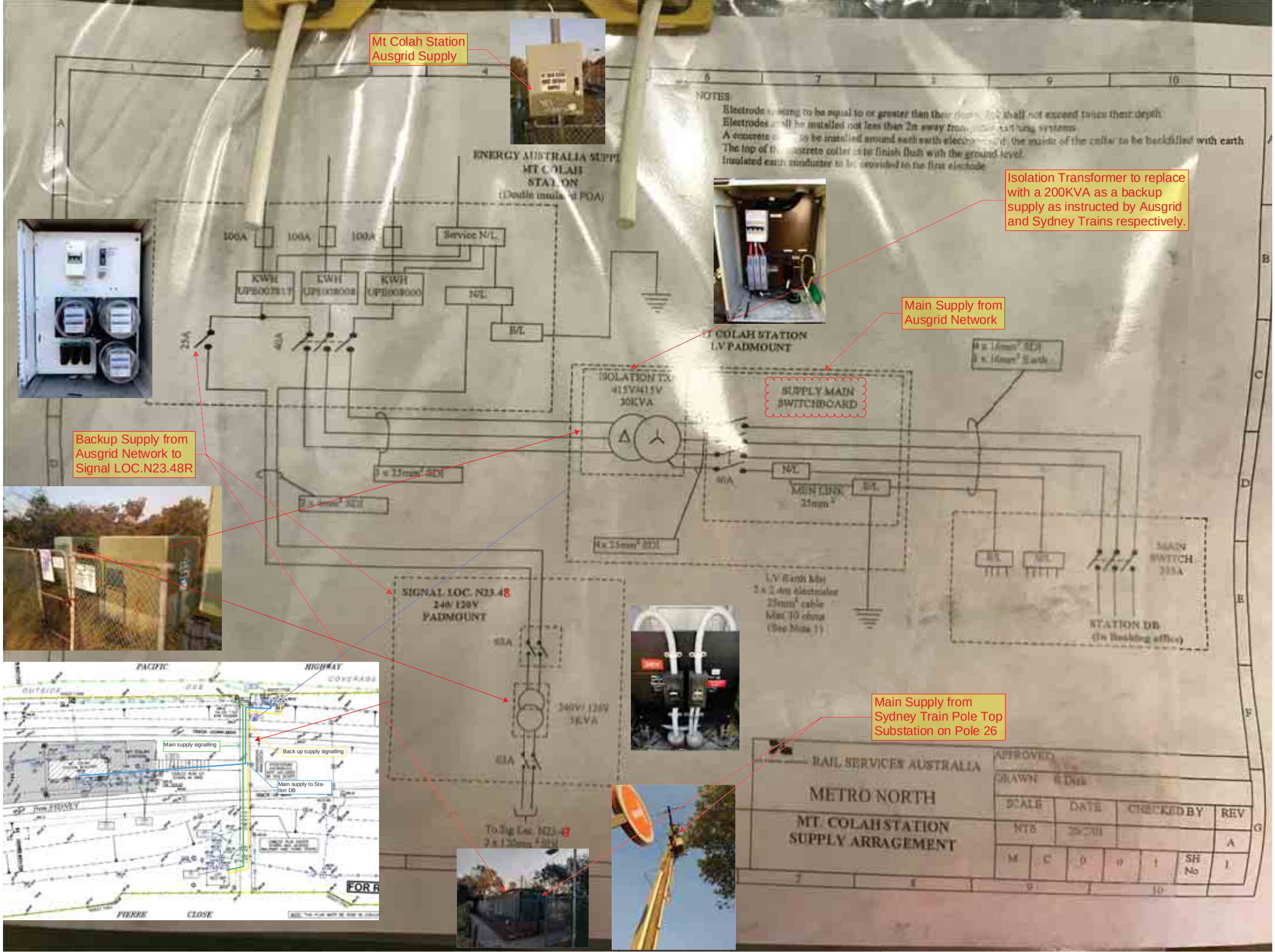
8 Exclusions

New Mount Colah Station main supply arrangement is agreed to be fed from Sydney Train private HV network and therefore is excluded from this technical note.

9 References

- WebGIS CAD information-Ausgrid
- Metromap images
- Rail Corp Drawing EL 0455387 Rev C
- Rail Corp Drawing EL 0474159 Rev A
- Transport for NSW Specification T-HR-EL-17002-SP (Ver.1)

Appendix A Existing Mt Colah Station Ausgrid Supply Arrangement


Mt Colah Station
Ausgrid Supply
Isolation Transformer to replace with a 200KVA as a backup supply as instructed by Ausgrid and Sydney Trains respectively.
Main Supply from Ausgrid Network
Backup Supply from Ausgrid Network to Signal LOC.N23.48R
Main Supply from Sydney Train Pole Top Substation on Pole 26
ENERGY AUSTRALIA SUPPL
MT COLAH
STATION
(Double insulated POA)
MT COLAH STATION
LV PADMOUNT
ISOLATION TX
415V/415V
30KVA
SUPPLY MAIN
SWITCHBOARD
SIGNAL LOC. N23.48
240/ 120V
PADMOUNT
240V/ 120V
3KVA
STATION DB
(In Booking office)
Main supply signalling
Back up supply signalling
Main supply to Station DB
PACIFIC
HIGHWAY
PIERRE
CLOSE
RAIL SERVICES AUSTRALIA
METRO NORTH
MT COLAH STATION
SUPPLY ARRAGEMENT

Appendix B Option 1 – Modification to Ausgrid LV Network on Pacific Highway

Ausgrid preliminary proposed option 1:

Modification to Ausgrid LV Network on Pacific Highway

Pole Mounted Substation PT2211 400KVA-11kV/415V

Pole MC-2343 likely to replace

Upgrade Overhead LV Main to 1x95ABC as a minimum or 1x150ABC with the possibility of replacing the end poles TBC later on as part of detailed design.

Option 1. Network Augmentation on Pacific Hwy pending completion of a contestable project AN-13537 (estimated completion in Feb 2021). Note that Ausgrid has no control over the completion time frame, which would be a key risk for this supply option if AN-13537 fails to deliver.
The scope of works would involve transfer of 150amp to the newly established substation and another adjacent substation by installation/relocation of OH LV links along Pacific Hwy.

NB 179A may be possible to obtain after accepting Ausgrid offer to investigate further by Ausgrid arranged by the nominated ASP3.

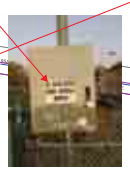
Distributor 2

Pacific Highway

Mt Colah Station

Replace the existing 30KVA padmount isolation transformer with a 200KVA-415/415V padmount isolation transformer, as required by Ausgrid.

Existing Connection Point on a Private Pole



Pole MC-2343 likely to replace

Exsisting Service Main Cable (size unknown)

PUMS for T-Signal on Pole MC-2343

Pole MC-2343 likely to replace

Pole MC-2318 to replace

New substation under contestable project AN-13537 capable of being transferred some loading from PT2211 to free up capacity in order of 150A 3-phase.SMEC will liaise with Ausgrid to increase loading demand to 179A 3-phase.

Site Overview

Appendix C Option 2 – Modification to Ausgrid LV Network on Telopea St North

Ausgrid preliminary proposed option 2:

Modification to Ausgrid LV Network on Telopea St North

Option 2. Upgrade of OH mains from MC-1766 located at the junction of Wonga Road and Telopea St up to pole MC-1405 or MC-1406 in Pierre Cl using 2x95 LV ABC. There is sufficient capacity available in S.49943.

Decommission and remove existing Ausgrid supply and ST padmount isolation trasformer

Proposed location of a private pole as a new point of connection (close to LOC N23.48R).

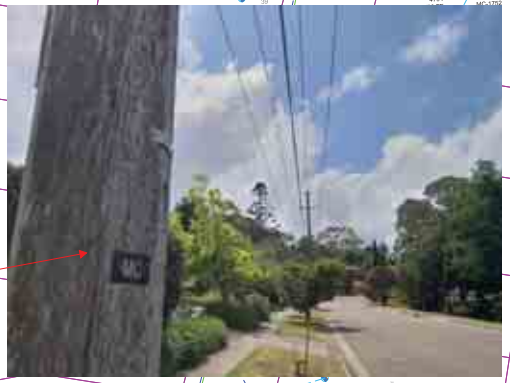
Potential limited access to the overhead assets route along Mountside Ave (narrow pathway).

Existing LOC N23.48R

Install a new padmount isolation transformer 200KVA-415/415V next to the private pole, as required by Ausgrid

Mt Colah Station

Pacific Highway



Appendix D Option 3 – Modification to Ausgrid LV Network on Telopea St South

Ausgrid preliminary proposed option 3:

Modification to Ausgrid LV Network on Telopea St South

Decommission and remove existing Ausgrid supply and ST padmount isolation trasformer

Proposed location of a private pole as a point of connection (close to LOC N23.48R).

Mt Colah Station

Potential limited access to the overhead assets route along Mountside Ave (narrow pathway).

Pacific Highway

Direction of the taken picture

Direction of the taken picture

Existing LOC N23.48R

Install a new padmount isolation transformer 200KVA-415/415V next to the private pole, as required by Ausgrid

Option 3. Install a new LV distributor UG cable from S.46651 to new UGOH pole MC-1489, install an LV OH Link on pole MC-1493 and upgrade LV OH Mains between MC-1493 and MC-1405 to 150LV ABC.

Direction of the taken picture

Appendix E Construction Cost Estimation

Electrical Infrastructure Solutions

Estimate No. C01349_3

SMEC
Mt Colah Train Station
Back Up Supply Upgrade

BACK UP SUPPLY UPGRADE

DATE: **26th October 2020**

ATTENTION: [redacted]

SYSCON REF No.: **C01349_3**

PROJECT LOCATION: **Mt Colah Train Station**

EXECUTIVE SUMMARY

Thank you for the opportunity to provide a quotation for your proposed works. Please find below details of our offer for your consideration.

Established in 1998, Syscon is a highly experienced high voltage electrical infrastructure installation, repair and maintenance contractor with in-house capabilities to manage and deliver projects from concept to completion. Our quotation is customized and outlines a scope of work that represents our understanding of your requirements and our capabilities to deliver your project in a safe, on time, within budget, high-quality standard.

Our focus is to maintain clear Customer communication to ensure a mutually beneficial outcome.

Our team is committed to operating incident and injury free and to support this vision we have ISO accredited health, safety and environmental management systems embedded across our business.

Why Syscon…

- ✓ *Syscon is a **Grade A ASP1**, we have achieved this rating based on quality, safety and environmental management. This grading can also provide discounts in construction fees from the Power Utility on certain projects.*
- ✓ *Syscon is also an **Accredited ASP2** allowing service connections to be performed as part of a turnkey solution.*
- ✓ *Syscon's in-house asset protection officer is dedicated to identifying and protecting all existing infrastructure. All assets indicated on the DBYD information are scanned and positively identified prior to any work crew commencing on site. A video of the job site/assets identified are recorded and this forms part of the daily site risk assessment to mitigate project risk and zero harm*
- ✓ *Syscon operates an integrated scheduling and plant tracking system for all employees and plant to enable reporting of site duration and vehicle statistics should detailed reporting be required*
- ✓ *All works are completed by in-house staff and plant, we control the timeframes based on clients' needs*
- ✓ *Syscon has an extensive warehouse and stocks a wide range of components to assist in difficult delivery situations*

We trust that this offer meets with your approval; however, should you require further clarification, or wish to proceed, please do not hesitate to contact either of the undersigned.

Yours sincerely

[redacted]

[redacted]

BACK UP SUPPLY UPGRADE

DESCRIPTION: [redacted]

Our budget price is based on the specified design/s as listed below and is for the Customer Funded works and the Network Utility funded component.

- Drawing/s:
  - Ausgrid Preliminary Proposed Options 1-3

OPTION 1

Base price includes for the following scope of work:

- Installation of new overhead conductor from Pole MC-2318 to Pole MC-2343 to 1x95ABC under traffic-controlled conditions
- Installation of new overhead conductor from Pole MC-2318 to Service Pole to LV 1x95ABC under traffic-controlled conditions

Optional Considerations:

- Replace Pole MC-2318
- Replace Pole MC-2343
- Decommission 30kVA 415/415V Pad Mounted Isolation Transformer. Supply and Install new 200kVA 415/415V Pad Mounted Isolation Transformer and associated Switchgear. Complete interconnecting cable from the Ausgrid Network to the incoming side of the Isolation Transformer Unit. This item is a PC Sum as the Transformers internal arrangement has not been finalised.

OPTION 2

Base price includes for the following scope of work:

- Upgrade of overhead conductor from Pole MC-1766 located at the junction of Wonga Road and Telopea St up to Pole MC-1405 in Pierre Close using LV 2x95ABC conductor.
- Due to limited access in Pierre Close some work will be performed from ladders in lieu of EWP's which incurs additional labour costs

Optional Considerations:

- Supply and Install new 200kVA 415/415V Pad Mounted Isolation Transformer and associated Switchgear. Complete interconnecting cable from the Ausgrid Network to the incoming side of the Isolation Transformer Unit. This item is a PC Sum as the Transformers internal arrangement has not been finalised.
- Decommission and remove existing Ausgrid supply including service main, private pole, 30kVA Pad Mounted Isolation Transformers on Pacific Highway side of Train Station.

OPTION 3

[redacted] Base price includes for the following scope of work: [redacted]

- Install new LV Distributor via underground cable from Kiosk Substation S.46651 to a new UGOH Connection at Pole MC-1489
- Install an LV Overhead Link on Pole MC-1493
- Upgrade of overhead conductor from Pole MC-1493 to Pole MC-1405 in Pierre Close using LV 1x150ABC conductor.
- Due to limited access in Pierre Close some work will be performed from ladders in lieu of EWP's which incurs additional labour costs

Optional Considerations:

BACK UP SUPPLY UPGRADE

- Supply and Install new 200kVA 415/415V Pad Mounted Isolation Transformer and associated Switchgear. Complete interconnecting cable from the Ausgrid Network to the incoming side of the Isolation Transformer Unit. This item is a PC Sum as the Transformers internal arrangement has not been finalised.
- Decommission and remove existing Ausgrid supply including service main, private pole, 30kVA Pad Mounted Isolation Transformers on Pacific Highway side of Train Station.

General Notes:

- The Road Occupancy Permit from TfNSW will outline the working hour requirements at this location, however at this time Syscon has allowed to complete the work during night shift for Option 1
- Decommissioned Assets to be stored on site for removal by others
- Option 2 & 3 have PC Sum installation costs as the exact location has not yet been defined, however it is assumed that the Transformer will be on the Pierre Close side of the train station

PRICING:

OPTION 1

Item	Description	Value
1	ASP1 Construction Works (incl. Traffic Control)	$ 27,368.00
	OPTIONAL CONSIDERATIONS	
2	Replace Pole MC-2318	$ 17,880.00
3	Replace Pole MC-2343	$ 6,500.00
4	Decommission 30kVA 415/415V Pad Mounted Isolation Transformer	$ 5,765.00
5	Supply & Install new 200kVA 415/415V Pad Mounted Isolation Transformer (PC Sum)	$ 188,500.00
	TOTAL:	**$ 246,013.00**

[redacted]

[redacted]

BACK UP SUPPLY UPGRADE

OPTION 2

[redacted]

Item	Description	Value
1	ASP1 Construction Works (incl. Traffic Control)	$ 49,900.00
	OPTIONAL CONSIDERATIONS	
2	Supply & Install new 200kVA 415/415V Pad Mounted Isolation Transformer (PC Sum)	$ 188,500.00
3	Decommission and remove existing Ausgrid supply including service main, private pole, 30kVA Pad Mounted Isolation Transformers	$ 9,445.00
	TOTAL:	**$ 247,845.00**

OPTION 3

Item	Description	Value
1	ASP1 Construction Works (incl. Traffic Control)	$ 65,950.00
	OPTIONAL CONSIDERATIONS	
2	Supply & Install new 200kVA 415/415V Pad Mounted Isolation Transformer (PC Sum)	$ 188,500.00
3	Decommission and remove existing Ausgrid supply including service main, private pole, 30kVA Pad Mounted Isolation Transformers	$ 9,445.00
	TOTAL:	**$ 263,895.00**

[redacted]

[redacted]

BACK UP SUPPLY UPGRADE

QUALIFICATIONS:

[redacted]

Please find below an explanation of commonly used terms for reference throughout the project, should you have any questions please do not hesitate to ask prior to contract execution.

1. **Access to Site:** It is assumed that the Client will provide a clear and unrestricted heavy vehicle access track to the specific work areas as outlined within the certified design. It has been assumed that all work will be within a standard construction site with a suitable site induction only being required.
2. **Construction Works:** All works carried out to Ausgrid Network Standards and Service and Installation Rules of New South Wales.
3. **Council Permits:** Syscon will coordinate any submissions required for road and/or footway access and will nominate the Principal as the interested party which will need to be signed off prior to work commencing.
4. **Temporary Fencing:** Temporary fencing has been allowed for any open excavation created by Syscon.
5. **Traffic Control:** Traffic control for the construction work has been included in this quotation.
6. **Excavation:** Where excavation works for the project will be carried out by Syscon, a location survey will be required to be carried out by your surveyors to identify the location or poles, easements, boundary's and underground cable routes wherever relevant to the project.
7. **Trench Profiles**: Trench profiling has been allowed to comply with specifications set out in Ausgrid Network Standard NS130 and the certified design issued.
8. **Non-Destructive Excavation:** Should the use of a Vac truck or the removal of its collected spoil be required for any task (such as working near live cables that cannot be safely and economically hand dug), it will form a contract variation.
9. **Third Party Observation or Spotting:** has not been allowed for in this quotation. This includes, but is not limited to Electrical Transmission Lines, High Pressure Gas, Fibre Optic, NBN, High Pressure Water or any service, within "close proximity" as deemed by the relevant authority's asset. Syscon will manage and pass on associated additional works as a contract variation.
10. **Removal of Spoil:** Where spoil removal is included and specifically itemised within our scope of works, Syscon have allowed for the removal of VENM or ENM for the specified quantity only. Removal, handling or classification of contaminated spoil will be charged as a contract variation.
11. **Removal or Reinstatement:** Syscon has not allowed to carry out any vegetation removal, replacement of any landscaping materials, removal of redundant assets or permanent reinstatement including gardens, roads, footpaths or driveways. Pedestrian footways and roads will be required to be sealed with a thin layer of bitumen as a minimum for a temporary measure only as soon as practically reasonable to eliminate any potential sediment or environmental issues. Unless specifically included within this quotation it will remain the responsibility of the Client.
12. **Third Party Assets Requiring Relocation:** The Client is made responsible for the notifying of any Third Party where an asset not forming part of the Electrical Network needs to be removed, relocated or isolated during the Works. This includes but is not limited to, telecommunications cabling and equipment. Syscon makes no allowance for the time and costs associated with the relocation of above items.
13. **Power Pole Cylinders:** Should power pole cylinders be required in Non-Cohesive Ground Material as an additional measure, the additional work will be charged as a contract variation.
14. **Power Pole Removal:** All power poles are to be cut 300mm below ground level and removed from site due to possible damage of surrounding underground services. An attempt can be made in some locations to remove the power pole but is not guaranteed.
15. **Rock Excavation:** Any excavation in rock will be charged at the Schedule of Rates which also may include the use of a specialist sub-contractor as a contract variation.
16. **Latent Ground Conditions:** Where excavation is included within our scope of work Syscon have allowed to conduct mechanical excavation with a 5.5T Excavator in cohesive ground only; any section of excavation within what is classed as non-cohesive ground will warrant a variation to our contract.

    Note - Non-cohesive ground may include unstable ground conditions, contaminated grounds, grounds congested by third party services not correctly detailed on DBYD site plans, water charged ground or unidentified structures buried within our excavation path.

17. **Kiosk Substation:** As outlined in the offer, it includes for the procurement, delivery, unloading and installation of specified Kiosk Substation as per the certified design.
18. **Earthing:** As outlined in [redacted] design, all earthing requirements for Kiosk and Pole Substations and/or certain Power Poles, for both high and low voltage earth groups. Syscon allowed to construct the site-specific earthing groups, in cohesive ground only with the use of a portable hydraulic handheld drive unit. If non-cohesive ground (i.e. rock, rubble, unstable fill) is encountered additional charges will apply, including the use of a specialist drilling rig as required.

    Note - After installation of the specified earth groups, the earth readings will be tested. If the readings fail to meet the design criteria, additional earthing electrodes and / or groups will be installed until the required high and low voltage earth groups meet the site specific earthing design as set out by the Power utility and additional costs will be charged as a contract variation.
19. **Power Utility GIS Recording:** Syscon has included a complete GIS recording of the project as outlined in the certified design, which will be submitted to the Power Utility 2 weeks prior to the Outage on the Client's behalf.
20. **Survey Works:** Lot, Boundary and Redline of Easements (including property rights negotiations with effected Landowners) have not been included in this quotation.
21. **Registration and Lodgement of Easements:** Any associated documentation required to be lodged with the NSW Land Registry Service (LPI), in favour of the Power Utility remain responsibility of the Client or their authorised representatives. Lodgement of easements must be receipted by LPI a minimum of 2 weeks prior to energisation of the project.
22. **Network Connection:** A System power isolation or "Outage" will be arranged for the final network connection of the project to the power utilities network. The outage will be requested by Syscon in alignment with the milestones and guidelines set out by the NECF flowchart (attached for reference). The Power Utility will specify the date and time of the outage depending on their schedule and resources available at the time of request.

    Note - Activities outside of normal working hours will be a contract variation. Syscon has allowed for a single outage for this project
23. **Notifications:** Power isolation notifications to affected customers: We have allowed to notify up to one hundred (100) customers, for the power isolation to make the final connection. Additional power isolations and/or customers may incur additional charges as per the Schedule of Rates.
24. **Maintenance of Electricity Supply during the Outage**: During the network connection of the project to the power utilities network, the power to the adjacent areas may be isolated. The design has not indicated as to extent of the affected customers or special customers in the area requiring power during these isolations, therefore Syscon has not allowed to supply temporary power during the power isolations. If required, Syscon will at additional costs arrange & connect Generators as required. Any additional costs relating to maintenance of supply will be subject to prior approval from the Client.
25. **Safety or Construction Breach:** (Where relevant) The Client indemnifies and warrants Syscon for any safety breach or non-conformance, both construction and/or environmental, issued by the Power Utility to Syscon for works undertaken by the Client on behalf of Syscon.

BACK UP SUPPLY UPGRADE

SCHEDULE OF RATES:

ID	Description	Units	Normal	Time & Half	Double Time	Extra Over
	Labour Rate - Normal Time					
PM	Project Manager	/hr	$165.00	$165.00	$165.00	
CA	Contract Administration	/hr	$79.00	$104.20	$129.40	
EE	Electrical Design Engineer	/hr	$145.00	$145.00	$145.00	
CE	Civil Design Engineer	/hr	$145.00	$145.00	$145.00	
CD	CAD Designer / Drafter	/hr	$117.50	$117.50	$117.50	
SUP	Supervisor / Leading Hand	/hr	$115.00	$152.00	$188.00	$73.00
EL	Electrician / Cable Jointer / Protection Officer	/hr	$106.50	$140.00	$175.00	$68.50
TR	Overhead Linesman Worker	/hr	$106.50	$140.00	$175.00	$68.50
CW	Civil Worker	/hr	$88.50	$117.00	$145.00	$60.50
SPO	Specialist Plant Operator	/hr	$94.50	$125.00	$155.00	$60.50
GIS	GIS Technician	/hr	$136.50	$136.50	$136.50	
	Power Outage Notifications >100 customers	ea	$4.95			
	Plant (excludes operator)					
LB	Vertical Auger Rock Boring up to 20mpa (over and above)	/hr	$460.00			
EX	Rock Excavation with Ripper or Hammer (over and above)	/hr	$325.00			
EWP	EWP (up to 17m)	/hr	$135.00			
LB	Lifter Borer	/hr	$155.00			
KAN	Earth Rod Drilling Machine including air compressor ➢ Site Establishment ➢ Drilling Rate	/Unit /m	$1245.00 $225.00			
LV	Light Vehicle	/hr	$30.00			
TH	Truck with Hiab Crane	/hr	$110.00			
TIP	Truck with Tipper Body	/hr	$99.00			
TT	Tool Truck	/hr	$85.00			
SV	Service Truck	/hr	$65.00			
1.8	1.8 Tonne Excavator	/hr	$85.50			
3.5	3.5 Tonne Excavator	/hr	$95.00			
5.5	5.5 Tonne Excavator	/hr	$107.00			
6.0	Supplier/Subcontractors	Cost +	15%			

Additional Notes:

- Normal work hours are Monday to Friday between the hours of 6am to 4pm up to 8 hours per day.
- Saturday and Night works are calculated at Time and Half for the first 2 hours and Double Time thereafter
- Night works completed during the week attract a stand down charge of 8 normal hours per man at the completion of shift. All night works attract a 25% productivity loading.
- Sunday works are at Double Time
- All variations are charged from depot until return.

BACK UP SUPPLY UPGRADE

TERMS AND CONDITIONS:

[redacted]

To assist in your evaluation of our offer please note the following terms and conditions upon which this offer is based:

1. **Order Acknowledgement:** Final confirmation of this quotation will be made after receiving the approved certified electrical design, utility associated documentation, and/or its subsequent amendments.
2. **Working Hours:** All works have been allowed to be completed during normal working hours, Monday to Friday, 0630hrs - 1530hrs, unless specified otherwise.
3. **Validity:** This proposal remains valid for a period of thirty (30) days after which time it is subject to revision or confirmation.
4. **GST:** All pricing is exclusive of GST.
5. **Variations:**
    a. Variations are defined as work required or requested to be done outside the scope of works, not on the certified design, not allowed for in our quotation and/or arising as a result of any direction or requirement by Principle and/or Statutory Authority
    b. A fixed sum variation will be submitted for any requested change in scope of works for approval by the Principal
    c. Should the work be undefined or minor works (<$5k) then Schedule of Rates will apply:
        i. Syscon's Schedule of Rates have been included in this quotation.
        ii. All costs for materials or subcontractors will be charged at cost plus 15% margin
6. **Site Specific:** Inductions specific to the site have been allowed for up to a maximum of two hours per person within this quotation. Inductions that exceed two hours will be charged per the Schedule of Rates provided. No allowance has been made for a Building & Construction Industry Levy, any site-specific allowances or awards. All pricing is based on Syscon's current Workplace Agreement.
7. **Associated Fees & Charges:** Syscon has not include for any third-party fees and charges. These include but are not limited to Power Utilities and Local Councils
8. **Delays:** Our offer excludes any direct or indirect costs associated with delays outside of Syscon's control e.g. delays caused by Authorities, Principal or Others
9. **Warranty**: Syscon maintains a Perpetual Warranty Bond with the Power Utility and warrants our works with them for the warranty period of 3 years. Syscon will build the Network Augmentation on behalf of Ausgrid under this contract and will deal directly with them should any non-conformances from the Network Standards be determined. As such, Syscon will not agree to any retention for any period for the contract.
10. **Liquidated Damages**: Are capped at $1.00 AUD unless otherwise discussed
11. **Force Majeure:** The Client indemnifies Syscon for expenses, damages or penalties in the event of a force majeure event that would otherwise disrupt the delivery of the project within the agreed or contractual timeframe.
    a. Note - This could include but not limited to; rain, flood, electrical storm, industrial action, supplier shortage, war, terrorism, or cancelation of works by the Power Utility
12. **Liability:**
    a. For claims in respect of or arising out of death or personal injury – Unlimited
    b. For loss of rent, income (other than arising out of death or personal injury) and the opportunity to earn profits and indirect or consequential loss – $1.00
    c. For all other claims whatsoever – 10% Contract Sum
    d. The respective limits apply to the sum of the respective claims and not to each other.
13. **Standard Payment Terms:**
    a. Monthly progress claims based on ordered materials and a percentage of completion of works
    b. Payment for progress invoices provided by Syscon is due and payable within 30 days from end of month
    c. Final payment (including all outstanding invoices) must be made on 'Practical Completion' (as directed by Network Authority, 2 weeks prior to final commissioning outage). Final payment must be received prior to outage works being confirmed
    d. In the event that final payment of all monies owed to Syscon is not made before the final commissioning outage then Syscon may, at its discretion, delay or cancel the outage unless suitable arrangements as to payment are in place
    e. In the event where your overdue account is referred to a collection agency and/or law firm, you will be liable for all costs which would be incurred as if the debt is collected in full, including legal demand costs
    f. Overdue accounts will be subject to interest at the rate of 13% p.a., calculated for the period the account is due until the date it is paid

[redacted]

[redacted]

Appendix F Ausgrid Application 0148207 & Preliminary Assessment

New Connection Above 100 AMP

Reference Code : 0148207

New Connection

LOCATION

Property Name
Mt Colah Station
Property Type
Other (Train Station)
Land Title Type
Public
Lot/DP Number
1/1172693
Location Address
Pierre Close, Mount Colah, 2079
Land Zoning
Urban
Location Diagram

File name	Ausgrid filename reference	Size
Location Diagram and Plan.pdf	LocationAttachmentFilePath_2	0.233 MB

APPLICANT

Applicant Type
Asp On Behalf Of A Retail Customer Or Real Estate Developer
Full Name
Mr Reza Seyedi
Email Address
Reza.Seyedi@smec.com
ABN/ACN
47065475149
Company Name
Smec Australia Pty Limited
Floor Number
5
Street Number/RMB
20
Nearest Cross Street
Pacific Highway
Applicant Address
Berry Street North Sydney 2060
Phone Number
0299255409
Other Number
0299255555
Asp Number
2140
Asp Level

Level 3

CUSTOMER

Customer Type
Retail Customer
Full Name
Ms Sue Robinson
Email Address
susan.robinson@transport.nsw.gov.au
Phone Number
0434858157

LOAD DETAILS

Proposed Point Of Common Coupling
Pole
Proposed Asset Identifier
Mc-2343
Proposed Connection Point
Private Pole
Proposed Service Length
11
Proposed Service Type
Overhead
Service Voltage
Low Voltage 230/400v
Service Size
200 Amps

Proposed Maximum Demand	Number Of Phases:	Phase A:	Phase B:	Phase C:
	3	170	170	170

Proposed Maximum Demand Calculation

File name	Ausgrid filename reference	Size
MD.pdf	WFAMaxDemandCalc_1	0.064 MB

Are You Intending To Connect Controlled Load At This Premises?
No

ADDITIONAL DEVELOPMENT DETAILS

COMMERCIAL

Number Of Commercial Premises:	1
Total Number Of Premises:	1

I Will Be Installing Equipment At The Premises That May Result In Non Linear / Fluctuating Loads
No

Construction Of The Premises Connection Assets Will Commence
31-Mar-2022
When Do You Wish To Electrify The Premises?
31-Aug-2022
Ausgrid Has Provided A Certified Design Number(Cdn) For A Network Augmentation Project Associated With The Premises
No
Asp 1 Has Been Appointed
No
Do You Have Development Consent (Da) For Your Proposal?
No

Do You Wish To Underground / Relocate Electricity Assets In Conjunction With This Connection Application?

No

Comments

The Intention Of This Application Is To Request Ausgrid To Assess If Option 2 Of The Attached Report (Or Any Other Options) Is Feasible With Minimum Works? Otherwise, Option 4 Would Be More Suitable To This Job. Nb St Has Requested Smec To Investigate If There Is Any Capacity In Ausgrid Lv Network To Upgrade The Existing Supply From 100a To 170a With Minimum Works Otherwise St Private Network Will Be Used For Main And Probably Ausgrid For Backup. In Other Words, St Preference Is To Use Their Existing Ausgrid Lv Infrastructure With Minor Upgrade, Where Possible.

Please attach any documents that are relevant to your connection for example Proposed Design, sketch of the building, Photos etc

File name	Ausgrid filename reference	Size
30012921-EL-MEM-002-A (compressed).pdf	AdditionalAttachment_1	4.526 MB

EXPEDITED CONNECTION

Do you want to expedite your connection offer for all premises? ○ Yes ● No

Ausgrid will send you an offer that meets your supply requirements.

DECLARATION

Applicant Name

Mr Reza Seyedi

Application Date

14-Sep-2020

Price Description	Price Including GST
Above 100 Amps Connection Offer - Technical Assessment required 1 x 464.36	AUD $464.36
Total Price	AUD $464.36

Terms and Conditions:

In submitting this application you are engaging Ausgrid to provide you with a connection offer. Once submitted the fee charged is consumed. Ausgrid will aim to provide you with a written response within 10 business days. If additional work and/or fees are required, we will contact you to advise prior to providing the response.

Where this application requests an expedited connection, I declare that I have read and understood the terms and conditions of the connection offer and agree that if the connection is expedited that a contract based on that offer will be formed with Ausgrid on the date that Ausgrid receives the application. Where this application is being made on behalf of a retail customer or real estate developer, I declare that I have obtained the authority of that person to make this application of their behalf, including where applicable, making a request for expedition of the connection application.

*I acknowledge the terms & conditions. ☑

[redacted]

This Message Is From an External Sender
This message came from outside your organization.

Dear Reza,

Thank you very much for submitting an application for connection concerning Mt Colah Train Station.

Ausgrid has reviewed the information you have provided and wish to recommend the following supply options.

Option 1. Network Augmentation on Pacific Hwy pending completion of a contestable project AN-13537 (estimated completion in Feb 2021). Note that Ausgrid has no control over the completion time frame, which would be a key risk for this supply option if AN-13537 fails to deliver.
The scope of works would involve transfer of 150amp to the newly established substation and another adjacent substation by installation/relocation of OH LV links along Pacific Hwy.

Option 2. Upgrade of OH mains from MC-1766 located at the junction of Wonga Road and Telopea St up to pole MC-1405 or MC-1406 in Pierre Cl using 2x95 LV ABC. There is sufficient capacity available in S.49943.

Option 3. Install a new LV distributor UG cable from S.46651 to new UGOH pole MC-1489, install an LV OH Link on pole MC-1493 and upgrade LV OH Mains between MC-1493 and MC-1405 to 150LV ABC.

Would you be able to consider the above supply options and advise the preferred option?

Please be advised that this application is on hold until above required information is received.

Feel free to ring should you wish to discuss. Thanks.

Kind Regards,

[redacted]

Ausgrid Connecting communities, empowering lives

[redacted]

Please consider the environment before printing this email.

[redacted]

This Message Is From an External Sender
This message came from outside your organization.

Hi Reza,

Thank you very much for the call earlier today.

As discuss, Ausgrid's previous advised was done based on the required load of 177Amps. If the supply is expected to go up to 290amps, we need to look at this site again and find a few options for you to consider. To do so, I trust a Preliminary Enquiry is required, and that way you would have sufficient information to prepare proposed scope of works for the station.

In saying so, your application for 1900101989 is still open. We are waiting for you to provide us a response for issuing a connection offer to you.

Please do not hesitate to ring if you have any questions. Thank you.

Kind Regards,

[redacted]

Ausgrid Connecting communities, empowering lives

[redacted]

From: Reza SEYEDI <Reza.Seyedi@smec.com>
Sent: Friday, 16 October 2020 9:35 AM
To: Shanming Zhou <SZhou@ausgrid.com.au>
Subject: RE: Request for More Information - 20200916 - 1900101989 - 148207 - MOUNT COLAH

Hi Shanming,

Referring to Ausgrid proposed option 1 shown below, could you please advise if it is possible to have 290A 3ϕ supply (equivalent to the new isolation transformer rating of 200KVA) even though the calculated Max Demand indicates 177A 3ϕ including 30% spare capacity is sufficient?

Would you please return my call to discuss more once you have a chance? I will then explain the reason behind this query from ST.

Appendix J Soil Resistivity Test Report and Lightning Risk Assessment

Member of the Surbana Jurong Group

local people
global experience

Technical Memo

Technical Memo No	30012921-EL-MEM-001	**Date of Issue**	24 November 2020
Subject/Title	Soil Resistivity Testing Report		
Project Name	Mount Colah Footbridge Replacement Reference Design	**Project Number**	30012921
Discipline	Electrical – Earthing and Bonding		
Document Number	30012921-EL-MEM-001		
Revision Details	A		
Author	[redacted]		
Reviewed by	[redacted]		
Approved by	[redacted]		
Prepared for	Sydney Trains	**Attention to**	
Attachments	See table of content below.		

Contents

1 Purpose

SMEC Australia Pty Ltd (SMEC) has been engaged by Sydney Trains to undertake soil resistivity testing for Mount Colah Footbridge Replacement Reference Design project. This note details the methodology used in obtaining the soil resistivity model that will be used for the 11kV/415V padmount substation and UGOH pole earthing design outlined in the design report, 30012921-GE-R-01. The soil resistivity model is a major factor in determining the achievable earth grid impedance, surrounding soil voltage profiles and safety criteria when a surface layer is considered.

2 Testing Methodology

2.1 Testing Locations

The soil resistivity testing has been conducted on the 21/08/2020, three locations were chosen to perform the soil resistivity testing, however access into Location 2 was unauthorised due to RMS land, therefore only two testing locations were done, refer to Figure 1, Figure 2 and Figure 3 for illustration of soil resistivity test locations.

- **Test location 1 –** Adjacent to Mt. Colah Station outside Mount Kuring-gai Scout Group building
- **Test location 2 –** Adjacent to Belmont Parade overbridge (No access to land at time of testing)
- **Test location 3 –** Berry Park

Figure 1:Testing location 1

Figure 2: Proposed test Location 2 – No access to land

Figure 3: Testing location 3

Two traverses perpendicular to each other were measured at Test location 1 and 3, the testing traverses have been measured up to a spacing of 16m (due to space constraints) and 32m to determine the soil resistivity at different depths and therefore identify layers of similar resistivity. Refer to Section 3 for testing results and analysis.

2.2 Testing Methodology

The 'Wenner 4-pin' testing method will be applied. Under this configuration, four electrodes are installed in an evenly spaced straight line. These electrodes are in the form of spikes, which are pushed into the soils, similar to a tent peg. No excavation of the soil is required. The electrodes are fully removed at the end of the testing.

A test current will be passed between the outer current electrodes (labelled 'C' in Figure) which will allow for the resistance to be calculated as a result of the potential difference observed between the inner voltage electrodes (P). The apparent resistivity for a particular spacing is determined using the following location:

$$\rho = 2\pi aR$$

Equation 1

Where;	ρ	=	Apparent soil resistivity (Ω m)
	a	=	Electrode spacing (m)
	R	=	Measured resistance at spacing 'a' (Ω)

Measurements are undertaken over a range of electrode spacings (typical spacing would be 0.5m, 1m, 2m, 4m, 8m, 16m, 32m) to determine the soil resistivity at different depths and therefore identify layers of similar resistivity.

The test electrodes are to be driven into the ground with a hammer to a maximum depth of 5% of the probe spacing, however the typical maximum depth will not exceed 200mm if in close proximity with existing underground services to prevent disturbance and damage to the asset.

The test electrodes are then removed and repeated for the next measurement. The probe depth is to make sure that most of the current will flow through the expected depth of soil.

In addition, the topography of the surrounding area and ambient weather conditions will be noted at each test location prior testing.

The time and GPS coordinates of the centre point at each traverse will also be recorded upon commencement of each measurement. Measurements will be plotted at the time recordings are taken.

It should be noted that if there are any sudden changes in apparent resistance, more refined probe spacing increments will be added to the test schedule at the location of the abnormality to have additional test data that is important for soil profiling.

Figure 4: Wenner 4 Pin Method

For further information on the testing methodology used, the Wenner 4-pin method is described in IEEE Std 81 '*Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System'.*

The apparent soil resistivity profile will then be analysed using specialized earthing software (in this case the RESAP calculation module within CDEGS) where the profile is converted into a layered soil model. While it is possible to derive other types of soil models (e.g. with vertical faults), uniform soil models and models consisting of multiple horizontal layers are by far the most commonly encountered soil structures.

2.3 Measurement Device

The soil resistivity measurements are to be conducted using an AEMC 6472 Multi-Function Ground Resistance Tester. This device has a maximum output voltage of 48V, generates a switched DC waveform with selectable frequency between 94Hz and 128Hz and has a measurement range of 0.01Ω to 99.9kΩ. The device used for soil resistivity measurement will be checked for its calibration test certificate.

2.4 Dial Before You Dig

DBYD was conducted for each of the proposed testing sites and results were analysed to identify any metallic services which may influence the test results. For details see Table 1.

Table 1: DBYD Summary for both locations

Authority Name	Impact on Test Results
Ausgrid	**No impact.**
Jemena Gas North	**No impact.**
NBN	**No impact.**
Nextgen	**No impact.**
Optus	**No impact.**
RMS	**No impact.**
Sydney Waters	**No impact.**
Telstra	**No impact.**

2.5 Weather Conditions

Test was conducted in sunny/overcast weather and the soil was moist and damp.

3 Soil Testing Results and Analysis

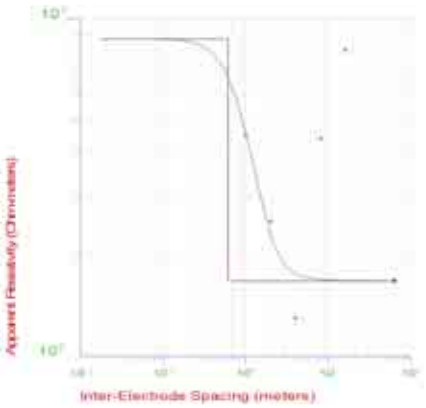
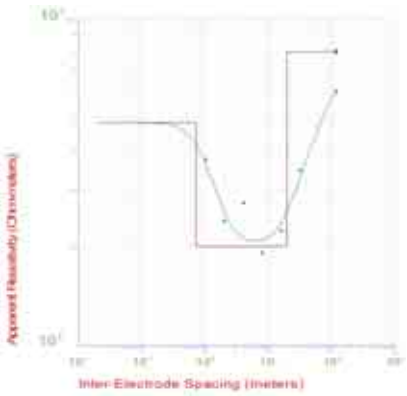
Measurements were taken over a range of electrode spacings to determine the soil resistivity at different depths, and therefore identify layers of similar resistivity. Refer to Table 2 for a summary of the measured data, with Table 3 and Table 4 summarising the calculated resistivity.

Table 2: Soil testing measurements

Test Electrode Spacing (m)	Resistivity (Ωm)			
	Location 1		Location 3	
	Traverse 1	Traverse 2	Traverse 1	Traverse 2
1	452	371	444	465
2	252	243	501	513
4	130	273	613	603
8	441	193	769	737
16	807	226	830	840
32	-	344	674	-

The soil resistivity measurements are presented graphically in Table 3 and Table 4 respectively. The soil resistivity curve (line of best fit) has been computed using the RESAP module of CDEGS and the resultant soil model.

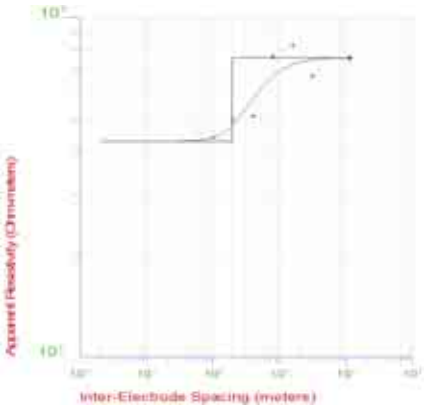
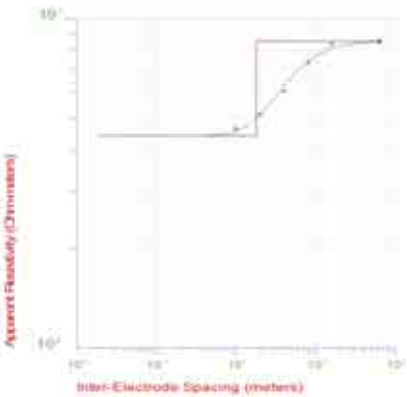
Table 3: Soil test measurement Location 1 – Traverse 1 (left) and Traverse 2 (right)

Location 1	
Traverse 1	**Traverse 2**
	
Soil Resistivity Model for Traverse 1 (RMS Error = 47.73%)	Soil Resistivity Model for Traverse 2 (RMS Error = 10.28%)

Layer	Resistivity (Ωm)	Thickness (m)
1	870	0.61
2	167	∞

Layer	Resistivity (Ωm)	Thickness (m)
1	482	0.7
2	202	18.8
3	798	∞

Table 4: Soil test measurement Location 3 – Traverse 1 (left) and Traverse 2 (right)

Location 3	
Traverse 1	**Traverse 2**
	

<table>
<tr><th colspan="2">Location 3</th></tr>
<tr><th>Traverse 1</th><th>Traverse 2</th></tr>
<tr><td>Soil Resistivity Model for Traverse 1
(RMS Error = 10%)
<table><tr><th>Layer</th><th>Resistivity (Ωm)</th><th>Thickness (m)</th></tr><tr><td>1</td><td>432</td><td>1.9</td></tr><tr><td>2</td><td>761</td><td>∞</td></tr></table></td><td>Soil Resistivity Model for Traverse 2
(RMS Error = 2.435%)
<table><tr><th>Layer</th><th>Resistivity (Ωm)</th><th>Thickness (m)</th></tr><tr><td>1</td><td>441</td><td>1.8</td></tr><tr><td>2</td><td>855</td><td>∞</td></tr></table></td></tr>
</table>

Soil Resistivity Model Analysis

It should also be noted that the soil test was not carried out at Location 2 (property owned by RMS) as access into the land was not authorised at time of testing. It is recommended that a soil test to be conducted at this location or an applicable location nearby to justify the soil profile.

The soil resistivity measurements have shown inconsistency in both test traverses at Location 1. However, it can be seen the measured soil resistivity for Traverse 2 from Location 1 and Traverse 1 from Location 3 are found to be consistent in the underlying layer in the order of 761-798 Ωm but show a huge discrepancy in the top layers.

As part of the reference design, a high-level earthing design of the 11kV/415V padmount substation, 415V/415V padmount substation (isolating transformer) and UGOH poles have been conduct. The soil resistivity results at Location 3 – Traverse 1 was used for the earthing design of the proposed padmount substations and UGOH poles.

4 Conclusion

The test results at Location 3 – Traverse 1 was used for the earthing design of the proposed 11kV/415V padmount and UGOH poles. The proposed soil model is documented in Table *5*.

Table 5: Design soil model for the padmount substations and UGOH poles

Layer	Resistivity (Ωm)	Thickness (m)
1	432	1.9
2	761	∞

It is recommended that additional soil resistivity tests to be conducted nearby the test locations to justify the soil profile which is to be used for the earthing design of the substations and UGOH poles in the detailed design stage.

Risk Assessment for Lightning Protection

Standards Australia Version 3.0 Date: 28/1/2006

Structure Identification: Mt. Colah Station Lift Structure

Structure Dimensions

Length (m)	2.5
Width (m)	2.5
Height (m)	8.3

Structure Attributes

Risk of Fire or Physical Damage	Low
Risk of Dangerous Discharge	Low
Internal Wiring Type	Screened

Service Lines

Power Line

Service	Underground
Cable Type	Screened
Transformer at Structure	No Transformer

Other Overhead Services

Number	0
Cable Type	Unscreened

Other Underground Services

Number	2
Cable Type	Unscreened

Loss Categories

Category 1 - Loss of Human Life

Special Hazard	1	Fire Damage Factor	0.05	Overvoltage Damage Factor	0

Category 2 - Loss of Essential Services

Fire Damage Factor	0	Overvoltage Damage Factor	0

Category 3 - Loss of Cultural Heritage

Fire Damage Factor	0

Category 4 - Economic Loss

Fire Damage Factor	0.4	Acceptable Risk of Economic Losses	1.E-01
Overvoltage Damage Factor	1.E-03	Step & Touch Potential Damage Factors	0.01

Environment

Ground Flash Density	2
Environmental Factor	Isolated
Service Line Density	Suburban

Protection Measures

Efficiency of Building Protection	0	Surge Protection at Point of Entry	No
Fire Protection	None	Surge Protection on All Equipment	No

Overall Risk

	Calculated Risk (R)	Acceptable Risk (R_a)	Direct Strike Risk (R_d)	Indirect Strike Risk (R_i)
Loss of Human Life	4.55E-07	1.0E-05	2.27E-07	2.28E-07
Loss of Essential Services	0.00E+00	1.0E-03	0.00E+00	0.00E+00
Loss of Cultural Heritage	0.00E+00	1.0E-03	0.00E+00	0.00E+00
Economic Loss	6.01E-03	1.0E-01	6.19E-06	6.01E-03

Appendix K Ausgrid Correspondence

Appendix L Signal Power Calculations

JMDR

Mt COLAH FOOTBRIDGE RE-LOCATION

POWER CALCULATIONS

Job Number: **S20224**

Version Date: **23/11/20**

	DATE	NAME		SIGNED
DESIGNED	23/11/20	Naga Addala		
DRAWN	23/11/20	Naga Addala		
INDEPENDENTLY REVIEWED	24/11/20	Krishnan R		
APPROVED				

Voltage Drop Calculation & Cable Usage

Project No.:	AA745	Power Location:	N23.48R	Version Date:
Project	Mt COLAH FOOTBRIDGE RE-LOCATION	Title:	Feeder Cable loading	23/11/2020

Location		Load Power	Load Current	Accumulative	Accumulative	Distance from		Cable Size	Voltage Drop	Voltage				Selected cable (YES)
From	To	(VA)	(A)	Load (VA)	Load (A)	Feeder in Mtrs.				Feed End	Drop	% Drop	Recv End	
North														
5KVA/120v TO N23.48R														
5KVA/120V	N23.48R	5000.0	41.7	5000.0	41.7	50	Mtrs	7/1.70 (16 mm2)	2.52	120.00	5.25	4.38%	114.75	YES
-	-							19/1.78 (50 mm2)	0.852		1.78	1.48%	118.23	
								37/1.78 (95 mm2)	0.428		0.89	0.74%	119.11	
South														
5KVA/120v TO N23.48R														
5KVA/120V	N23.48R	5000.0	41.7	5000.0	41.7	220	Mtrs	7/1.70 (16 mm2)	2.52	120.00	23.10	19.25%	96.90	
-	-							19/1.78 (50 mm2)	0.852		7.81	6.51%	112.19	YES
								37/1.78 (95 mm2)	0.428		3.92	3.27%	116.08	

19/1.78 (50 mm2) cable is adviced to use when using the New cable Route.

Notes:

Any changes to any tab sheet may require formula updates for the correct source to ensure accurate figures

Distance and Kilometrages are only estimates and may vary depending on final site positioning

All cable sizes shown are preferred cable sizes as per the Signalling Power Systems Standard spg-0729. Cables not included will require manual entry.

Distance from Feeder measurements include an extra 50m of cable estimated for ULX's and route variations at each point (worst Case Scenario)

See cell comments for more information about entries

Appendix M Vertical Transportation Services Report

30012921–VT–RPT-00000
REFERENCE DESIGN

MT COLAH

MAIN NORTH LINE 37.635 KM

RAILWAY STATION FOOTBRIDGE RENEWAL

VERTICAL TRANSPORTATION SERVICES

JHA

JHASERVICES.COM

This report is prepared for the nominated recipient only and relates to the specific scope of work and agreement between JHA and the client (the recipient). It is not to be used or relied upon by any third party for any purpose.

DOCUMENT CONTROL SHEET

Project Number	200251
Project Name	Mt Colah Footbridge Renewal
Description	Vertical Transportation Services Report
Key Contact	Con Serban

Prepared By

[redacted]

Revision History

Issued To	Revision and Date						
[redacted] SMEC	REV	1 – 30%					
	DATE	09/09/2020					
[redacted] SMEC	REV	2 – 100%					
	DATE	25/11/2020					
	REV						
	DATE						

CONTENTS

1 INTRODUCTION

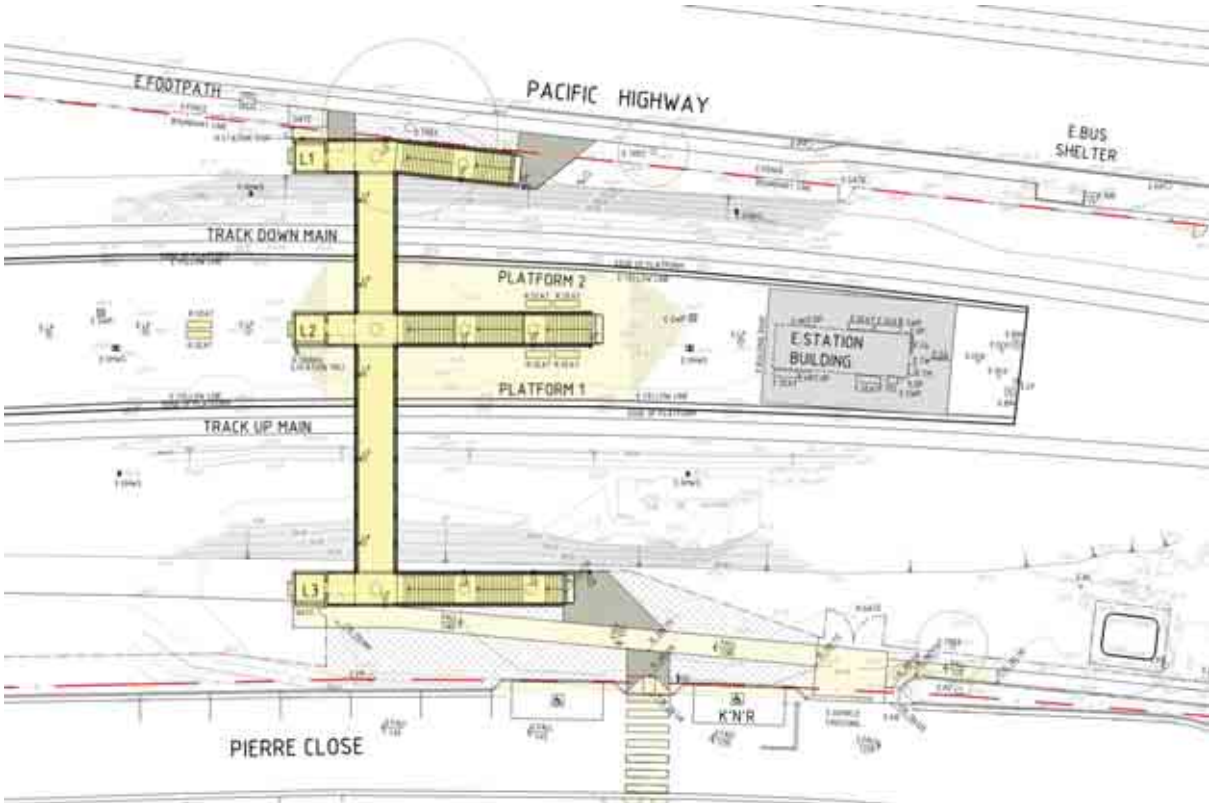
1.1 PROJECT DESCRIPTION

As part of the program of accessibility upgrades to transport infrastructure, Transport for New South Wales (TfNSW) is providing upgraded access to transport services for people with disability, limited mobility and people travelling with children and/or luggage. The main objective of the Transport Access Program (TAP) 3 project is to achieve a higher level of Disability Standards for Accessible Public Transport (DSAPT) compliance across a number of stations throughout New South Wales.

The primary scope of works at Mt Colah Station associated with TAP 3 upgrade works is to provide a new pedestrian crossing and three lifts for access to/from boarding points from Pacific Hwy and Pierre Close to the station platform.

The new footbridge will replace the existing bridge which is currently located at the Country platform end.

The secondary role of the project is to improve access to and from car parks and Kiss and Ride drop off locations, bus stop etc., and upgrade station facilities, in order to improve the overall experience for customers using the station while maintaining and improving the level of safety. Refer bellow to proposed new footbridge crossing and lift access scheme.



2 VERTICAL TRANSPORTATION SERVICES

2.1 GENERAL

It is the intent of this document to represent a sign-off of the project's Vertical Transportation Services provided for the client by JHA.

The proposed vertical transportation scope of work will include:

- Three (3) off new electric passenger lifts

2.2 STANDARDS AND REGULATIONS

Australian Standards	Lifts, Escalators and Moving Walks, General Requirements	AS 1735.1
	Fire Rated Landing Doors	AS 1735.11
	Facilities for persons with disabilities	AS 1735.12
Authorities	National Construction Code	2019
Other relevant Codes and Standards	Electrical Installations (known as the Australian/New Zealand Wiring Rules). Wiring requirements for lift installations;	AS/NZ 3000
	Electrical Installations – Selection of Cables – Cable sizes for lift installations	AS/NZ 3008
	Quality Systems (Manufacturers shall provide evidence of accreditation)	ISO 9001
	WHS Act and WHS Regulation	
Additional Requirements	Appendix J Lift Specification Niagara Park	Version 1.0 10/09/2019

3 DESIGN

3.1 SUSTAINABILITY

The lift installation will be designed with minimal power consumption and impact on the environment. All Lifts shall include:

- Variable Voltage Variable Frequency (VVVF) motor drives.
- High efficiency permanent magnet gearless motors.
- LED down lights.
- Motion sensing / timing devices to turn off car lighting and ventilation fans when not in use.

3.2 LIFT SECURITY

All lifts shall be fully integrated with the access security control system and include the following provisions where required:

- Provision for CCTV cabling within the lift car trailing cables

3.3 MAINTENANCE REQUIREMENTS

All equipment shall be of latest technology with a proven reliability and serviceability under the anticipated traffic loads and environment. Particular attention shall be afforded to the design and layout of equipment to make provisions for suitable maintenance access in line with safe working practices.

3.4 LIFTWELL VENTILATION

Liftwell ventilation will be designed in accordance with TfNSW Lift Specification and NCC 2019 Spec E3.1 Clause 4 below:

a) ensure that the dry bulb air temperature in the liftwell does not exceed 40°C; and

b) if the cooling is by a ventilation system, be provided with an air change rate determined using a temperature rise of no more than 5 K.

Refer to Mechanical Drawings listed below for details

- 30012921-ME-001
- 30012921-ME-002
- 30012921-ME-100

3.5 LIFT EMERGENCY COMMUNICATION

Provision for a 4G fixed wireless module. It must have:

- Dual network/sim, to provide primary and secondary communication pathways,
- Backup battery capable of standby operation in the event of a power outage for a minimum of four (4) hours, including one (1) hour of talk-time, and
- Constant self-monitoring ability.

3.6 CAR OPERATING PANEL (COP)

Two Car Operating Panels to be provided, one on each side wall and have the following features

COP Features	Main COP	Aux COP
Car Indication	✓	✓
Floor destination buttons	✓	✓
Alarm / Communication button	✓	✓
Emergency Communication	✓	✓
Door Open button	✓	✓
Door Close button	No	No
Fire Service keyswitch	✓	-
Exclusive / Priority Service keyswitch	✓	-
Fan keyswitch	✓	-
Light keyswitch	✓	-

Table 1: COP features.

3.7 LANDING CALL STATION (LCS)

Figure 1: LCS

One riser of Landing Call Stations located adjacent to the lift entrance on the lobby wall.
All LCS

- have a faceplate and buttons to call the lift,
- are flush mounted and fixed in position with vandal proof fixings.

Surface mounted labels are placed above the LCS and are engraved with the words:

"DO NOT USE LIFT IF THERE IS A FIRE"

The LCS on terminal floors have a single button whilst the intermediate floors have two buttons.
The main floor will also include fire service keyswitch.

3.8 LANDING INDICATION (LI)

Figure 2: LI

One riser of Landing Indication located adjacent the lift entrance on the lobby wall.
All LI

- have a faceplate,
- are flush mounted and fixed in position with vandal proof fixings,
- lantern displaying direction of travel,
- adjustable audible arrival tone

3.9 CAR FINISHES

Car interior is based on having customised finishes on the walls and ceiling. Walls are 5WLtextured stainless steel (304) whilst the side walls also have framed glass panel.

Floor is stainless steel (304) checker-plate.

3.10 CAR VENTILATION AND AIR CONDITIONING

All lift cars shall include cooled mechanical ventilation to operate when the temperature inside the lift car exceeds 21C and be of sufficient capacity that the maximum temperature in the lift car interior does not exceed 25C when the temperature in the lift shaft is 34C.

The ventilation shall have an air handling capacity to change the volume of air in the lift car in less than 1 min.

3.11 RIDE COMFORT AND NOISE

Noise and vibration levels in the car under acceleration, deceleration, and at maximum lift car speed in the cycle shall not exceed the values indicated in Table 2 below.

Lift Speed, in m/s	*Maximum Acceleration, in m/s^2*	*Maximum Jerk, in m/s^3*	*Maximum Lateral Vibration, in mg*	*Maximum Vertical Vibration, in mg*	*Maximum Noise in Car, in dB(A)*
0.10 – 1.60	0.80	0.80	6	15	50

Table 2: Maximum noise and vibration level in lift car.

The maximum vibration levels specified are the maximum peak-to-peak values using the ISO 18738-1:2012 ride quality filter during measurements, measured within the lift car during acceleration, deceleration, full speed sequences and stopping.

3.12 CONTROLLER CABINET LOCATED AT THE TOP FLOOR

For each lift, the lift's controller cabinet will be located at the top floor served and will require a clear working space of 500mm wide x 700mm deep x 2100mm high. Also note that technicians will require access for maintenance and emergency purposes so, there must be a clear access at all times. A false wall can be built in front of the wall with a joinery door to improve aesthetics provided it does not impede the controller door from opening more than 90°.

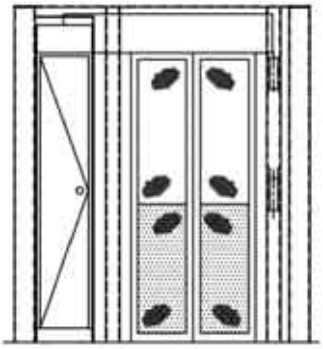


Figure 3: View of lift controller cabinet at top floor.

3.13 LIFT LOBBY EXPOSED TO THE WEATHER

Where lift equipment such as lift control panel, landing controls and entrances are located externally, provide protection from direct / indirect weather and water ingress to the liftwell.

3.14 LIFTWELL

The liftwell shall be designed to accept the loads imposed by the lift. The liftwell shall not be used for any purpose other than the lift. Conduits, ducts, and other equipment not associated with the lift shall not be installed in the liftwell. Services risers joined to the liftwell, to be fire rated. Changes to liftwell design to be approved by Liftronic Pty Ltd.

4 NEW LIFT DESIGN

4.1 LIFT 1 – PACIFIC HWY

A total of one (1) new machine room less *(MRL)* electric passenger lifts will be specified. The table below details the passenger lift design also refer to the architectural drawings for location of lifts, openings, and further details.

Passenger Lift		
Description	**Details**	**Notes**
Number of lifts	One (1)	Lift 1
Capacity	1,275 kg *nom.*	
Passenger rating	17	
Service classification	Passenger	
Control System	Microprocessor Full Collective	
Machine type	Gearless Overhead Traction	
Power / drive system	Variable Voltage, Variable Frequency (VVVF)	
Group Operation	Simplex	
Speed	1.0 m/s	
Travel	4,070 mm TBC	
Motor starts / hour	240 *min.*	
Levels served	Two (2)	Floors: Ground, Bridge
Total number of entrances	Front Two (2)	Floors: Ground, Bridge
	Rear Nil	Floors: -
Car Details:		
Clear internal car width	1,450 mm	Measured to wall finishes
Clear internal car depth	1,950 mm	Measured to wall finishes
Clear internal car height	2,300 mm	Clear to underside of suspended ceiling
Entrance Details:		
Number of car entrances	One (1)	
Clear door opening width	1,000 mm	
Clear door opening height	2,100 mm	
Door protection	Infrared Light Beam	
Door type / configuration	Two Panel Centre Opening	2PC
Door frames	Box Frame	Reveals by Builder
Certified landing door FRL	-/ 60 / -	

Fixture Details:	
Car Operating Panels (COP)	Two (2) per lift, refer to Section 3.6 for details
Car Indication (CI)	Colour LCD screen, located in the main COP displaying lift car position and direction of travel, vandal resistant.
Oral announcements	Yes, English, female voice
Landing Call Station (LCS)	Surface mounted on adjacent wall, mounted with concealed fixings
Car & landing button type	Dewhurst US91, compact round metal, tactile with black pressel face, green/white illumination, vandal proof
Landing Indication (LI)	Lanterns with stainless steel faceplate with adjustable audible arrival tone recess mounted with concealed fixings
Liftwell Details:	
Well construction	Fully enclosed, steel structure with cladding
Well width	2,500 mm
Well depth	2,500 mm
Headroom height	4,300 mm
Pit depth	1,400 mm
Machinery space location	Overhead in well
Levelling accuracy	±3 mm
Electrical Details:	Contractor to confirm
Mains supply voltage	3Ø, 415 Volts AC, 50 Hz
Nominal line current	30 A
Acceleration	47 A
Cable size	16 mm^2
Motor output power	10.0 kW
Fault level	6 KA
Thermal losses	1.5 kW
Lift Car Finish Details:	
Walls & ceiling	5WL textured stainless steel (304) with framed glass in top half or side walls
Door finishes	Stainless steel framed full-length glass with privacy film
Door frames	Stainless steel (304)
Floor	Stainless steel (304) checker plate
Special Requirements	• Compliance with AS1735.12 Facilities for Persons with Disabilities • Emergency battery drive for automatic evacuation to nearest floor in the event of main power failure • Provision for installation of CCTV • Provision for installation of 3rd-party swipe card reader • Lift car to include air conditioner on roof

4.2 LIFT 2— PLATFORM

A total of one (1) new machine room less *(MRL)* electric passenger lifts will be specified. The table below details the passenger lift design also refer to the architectural drawings for location of lifts, openings, and further details.

Passenger Lift		
Description	**Details**	**Notes**
Number of lifts	One (1)	Lift 2
Capacity	1,275 kg *nom.*	
Passenger rating	17	
Service classification	Passenger	
Control System	Microprocessor Full Collective	
Machine type	Gearless Overhead Traction	
Power / drive system	Variable Voltage, Variable Frequency (VVVF)	
Group Operation	Simplex	
Speed	1.0 m/s	
Travel	6,270 mm TBC	
Motor starts / hour	240 *min.*	
Levels served	Two (2)	Floors: Platform, Bridge
Total number of entrances	Front Two (2)	Floors: Platform, Bridge
	Rear Nil	Floors:
Car Details:		
Clear internal car width	1,450 mm	Measured to wall finishes
Clear internal car depth	1,950 mm	Measured to wall finishes
Clear internal car height	2,300 mm	Clear to underside of suspended ceiling
Entrance Details:		
Number of car entrances	One (1)	
Clear door opening width	1,000 mm	
Clear door opening height	2,100 mm	
Door protection	Infrared Light Beam	
Door type / configuration	Two Panel Centre Opening	2PC
Door frames	Box Frame	Reveals by Builder
Certified landing door FRL	-/ 60 / -	

Fixture Details:	
Car Operating Panels (COP)	Two (2) per lift, refer to Section 3.6 for details
Car Indication (CI)	Colour LCD screen, located in the main COP displaying lift car position and direction of travel, vandal resistant.
Oral announcements	Yes, English, female voice
Landing Call Station (LCS)	Surface mounted on adjacent wall, mounted with concealed fixings
Car & landing button type	Dewhurst US91, compact round metal, tactile with black pressel face, green/white illumination, vandal proof
Landing Indication (LI)	Lanterns with stainless steel faceplate with adjustable audible arrival tone recess mounted with concealed fixings
Liftwell Details:	
Well construction	Fully enclosed, steel structure with cladding
Well width	2,500 mm
Well depth	2,500 mm
Headroom height	4,300 mm
Pit depth	1,400 mm
Machinery space location	Overhead in well
Levelling accuracy	±3 mm
Electrical Details:	Contractor to confirm
Mains supply voltage	3Ø, 415 Volts AC, 50 Hz
Nominal line current	30 A
Acceleration	47 A
Cable size	16 mm^2
Motor output power	10.0 kW
Fault level	6 KA
Thermal losses	1.5 kW
Lift Car Finish Details:	
Walls & ceiling	5WL textured stainless steel (304) with framed glass in top half or side walls
Door finishes	Stainless steel framed full-length glass with privacy film
Door frames	Stainless steel (304)
Floor	Stainless steel (304) checker plate
Special Requirements	• Compliance with AS1735.12 Facilities for Persons with Disabilities • Emergency battery drive for automatic evacuation to nearest floor in the event of main power failure • Provision for installation of CCTV • Provision for installation of 3rd-party swipe card reader • Lift car to include air conditioner on roof

4.3 LIFT 3—PIERRE CL

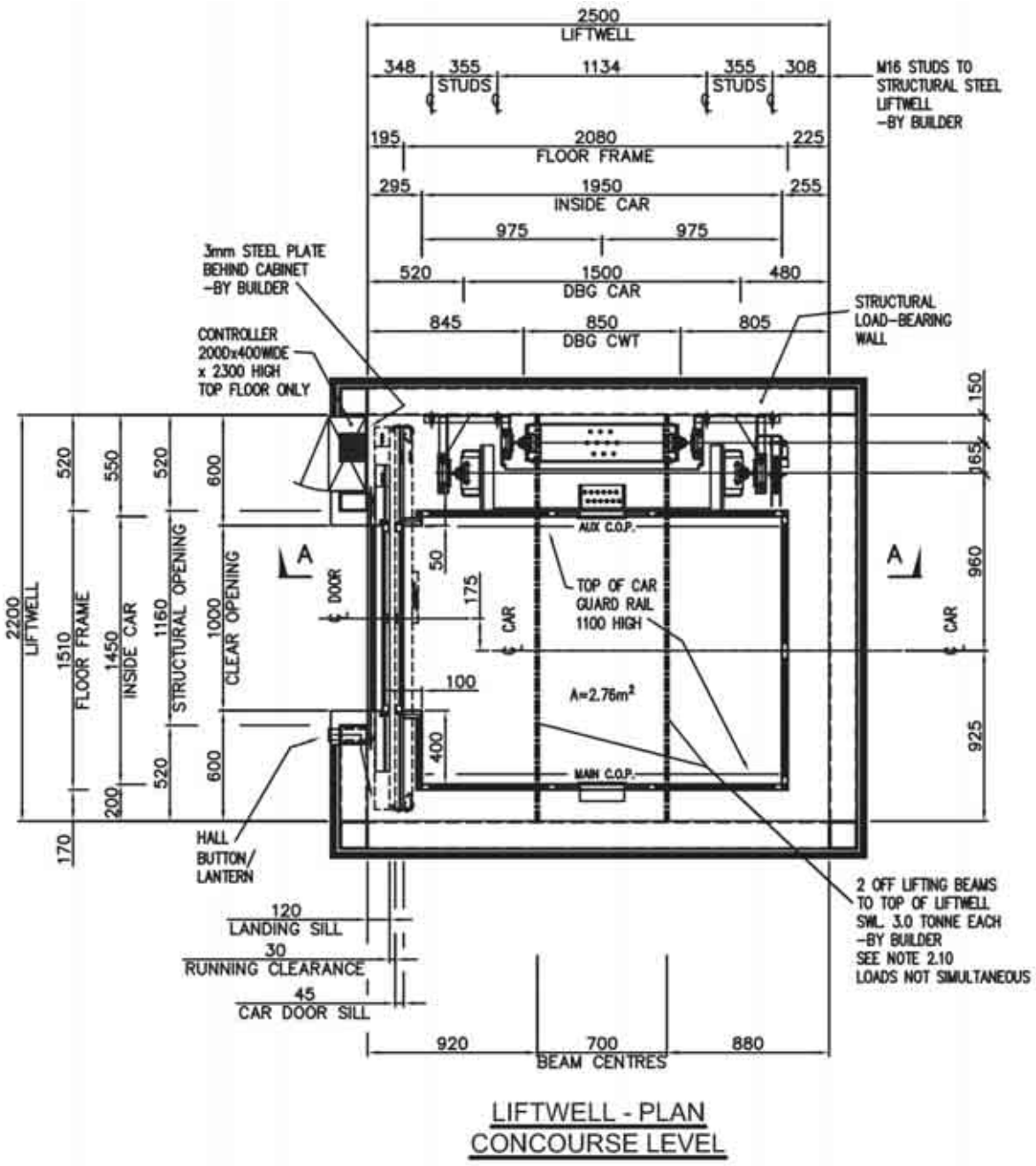
A total of one (1) new machine room less *(MRL)* electric passenger lifts will be specified. The table below details the passenger lift design also refer to the architectural drawings for location of lifts, openings, and further details.

Passenger Lift		
Description	**Details**	**Notes**
Number of lifts	One (1)	Lift 3
Capacity	1,275 kg *nom.*	
Passenger rating	17	
Service classification	Passenger	
Control System	Microprocessor Full Collective	
Machine type	Gearless Overhead Traction	
Power / drive system	Variable Voltage, Variable Frequency (VVVF)	
Group Operation	Simplex	
Speed	1.0 m/s	
Travel	4,960 mm TBC	
Motor starts / hour	240 *min.*	
Levels served	Two (2)	Floors: Ground, Bridge
Total number of entrances	Front Two (2)	Floors: Ground, Bridge
	Rear Nil	Floors: -
Car Details:		
Clear internal car width	1,450 mm	Measured to wall finishes
Clear internal car depth	1,950 mm	Measured to wall finishes
Clear internal car height	2,300 mm	Clear to underside of suspended ceiling
Entrance Details:		
Number of car entrances	One (1)	
Clear door opening width	1,000 mm	
Clear door opening height	2,100 mm	
Door protection	Infrared Light Beam	
Door type / configuration	Two Panel Centre Opening	2PC
Door frames	Box Frame	Reveals by Builder
Certified landing door FRL	-/ 60 / -	

Fixture Details:	
Car Operating Panels (COP)	Two (2) per lift, refer to Section 3.6 for details
Car Indication (CI)	Colour LCD screen, located in the main COP displaying lift car position and direction of travel, vandal resistant.
Oral announcements	Yes, English, female voice
Landing Call Station (LCS)	Surface mounted on adjacent wall, mounted with concealed fixings
Car & landing button type	Dewhurst US91, compact round metal, tactile with black pressel face, green/white illumination, vandal proof
Landing Indication (LI)	Lanterns with stainless steel faceplate with adjustable audible arrival tone recess mounted with concealed fixings
Liftwell Details:	
Well construction	Fully enclosed, steel structure with cladding
Well width	2,500 mm
Well depth	2,500 mm
Headroom height	4,300 mm
Pit depth	1,400 mm
Machinery space location	Overhead in well
Levelling accuracy	±3 mm
Electrical Details:	Contractor to confirm
Mains supply voltage	3Ø, 415 Volts AC, 50 Hz
Nominal line current	30 A
Acceleration	47 A
Cable size	16 mm^2
Motor output power	10.0 kW
Fault level	6 KA
Thermal losses	1.5 kW
Lift Car Finish Details:	
Walls & ceiling	5WL textured stainless steel (304) with framed glass in top half or side walls
Door finishes	Stainless steel framed full-length glass with privacy film
Door frames	Stainless steel (304)
Floor	Stainless steel (304) checker plate
Special Requirements	• Compliance with AS1735.12 Facilities for Persons with Disabilities • Emergency battery drive for automatic evacuation to nearest floor in the event of main power failure • Provision for installation of CCTV • Provision for installation of 3rd-party swipe card reader • Lift car to include air conditioner on roof

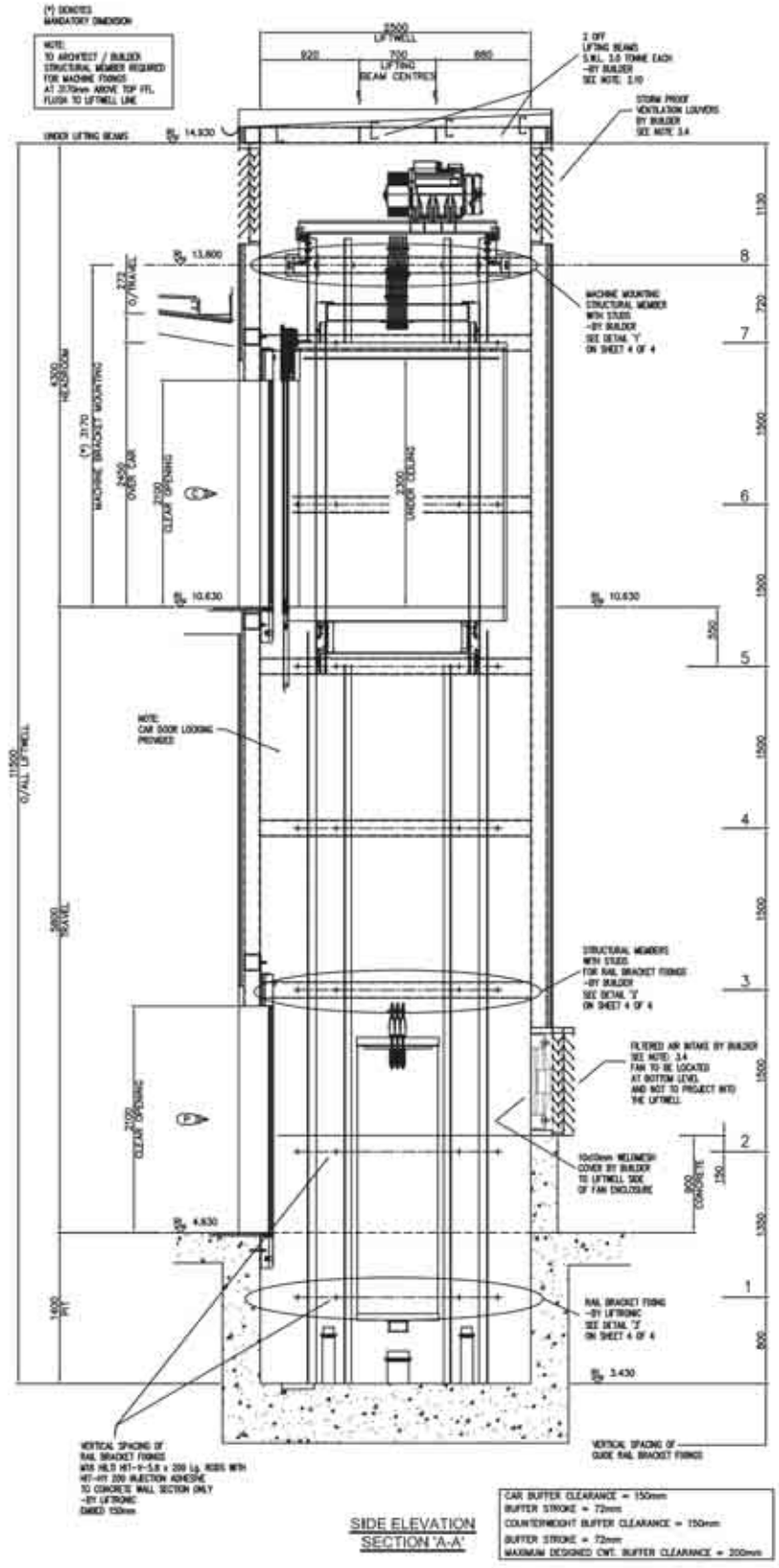
5 TYPICAL LIFT DRAWING VIEWS

5.1 LIFTWELL PLAN VIEW



LIFTWELL - PLAN
CONCOURSE LEVEL

5.2 LIFTWELL SECTION VIEW



Appendix N Electrical Functional Specification

Design Production

Electrical Functional Specification

Mount Colah Footbridge Reference Design – New padmount SS and 11kV feeder modifications

CCR Number: 14382

Document No.: 30012921-EL-S-01

Version: 02

Date of Issue: 01 December 2020

ESI – Design Production

[redacted] – Electrical

Table of Contents

1. Project Description

1.1 Project Background

Mount Colah Railway Station is situated in the North Sydney suburb of Mount Colah, within the local government area of Hornsby Shire Council. The station is on the Main North Line at approximately 37.7 km, between Asquith and Mount Kuring-gai Station. The station consists of an island platform (Platform 1 and 2) which services the electrified Down Main to the west of and electrified Up Main to the east. The lines are used for both passenger and freight movement.

The island platform is currently accessed via a two-span steel trestle bridge that is located at the northern end of the station, constructed circa 1909. The existing footbridge also provides cross corridor access between Pacific Highway on the Downside and Pierre Close on the up side. Mount Colah Railway Station (including the existing footbridge) is not listed on any local, state or commonwealth heritage registers. The existing footbridge was previously assessed by Arup in 2010 to be in poor condition. Having exceeded its design life, the footbridge has been prioritised by Sydney Trains for replacement.

1.2 Project Objectives

Sydney Trains engaged SMEC in June 2020 to complete the reference design for the footbridge replacement, based on the past concept options developed by GHD and AECOM.

Sydney Trains' main objective for this project is to provide a reference design for the footbridge replacement to enable Sydney Train to proceed to a detailed design and construct tender.

The aim of reference design is to minimise project risk in relation to scope, cost and time by integrating the 11kV Feeder 649 modification and new footbridge as a single project.

2. Project Scope of Works

The Reference Design for the Mount Colah Footbridge replacement consists of the following main scope items:

- Design of new footbridge, with three lifts and stairs (based on preferred GHD Option 1)
- Design of additional Station Services required for the upgrade to station footbridge
- Relocation of the existing 11kV feeder 649 and installation of a new padmount 11kV/415V distribution substation
- Relocation/Protection of existing services (owned and 3rd Party) impacted by construction of the new footbridge and demolition of the existing footbridge.
- Decommissioning and demolition of the existing footbridge
- Realignment of OHW impacted by the decommissioning and demolition of the existing footbridge

3. Electrical Scope of Works

3.1 Existing Electrical Assets in the Project Area

There are the following electrical assets in the project area which will be affected by the proposed works:

1. Ausgrid supplied 3P 30kVA padmount isolation transformer on down main supplying the station distribution board
2. Sydney Trains 5kVA 11kV/120V pole mounted transformer on pole 26 on down main supplying the signalling location N23.48R on up main
3. Ausgrid supplied 5kVA padmount isolating transformer on down main as back-up supply for signalling location N23.48R on up main
4. Pole mounted air break switch on pole 27 on down main
5. Station distribution board on platform

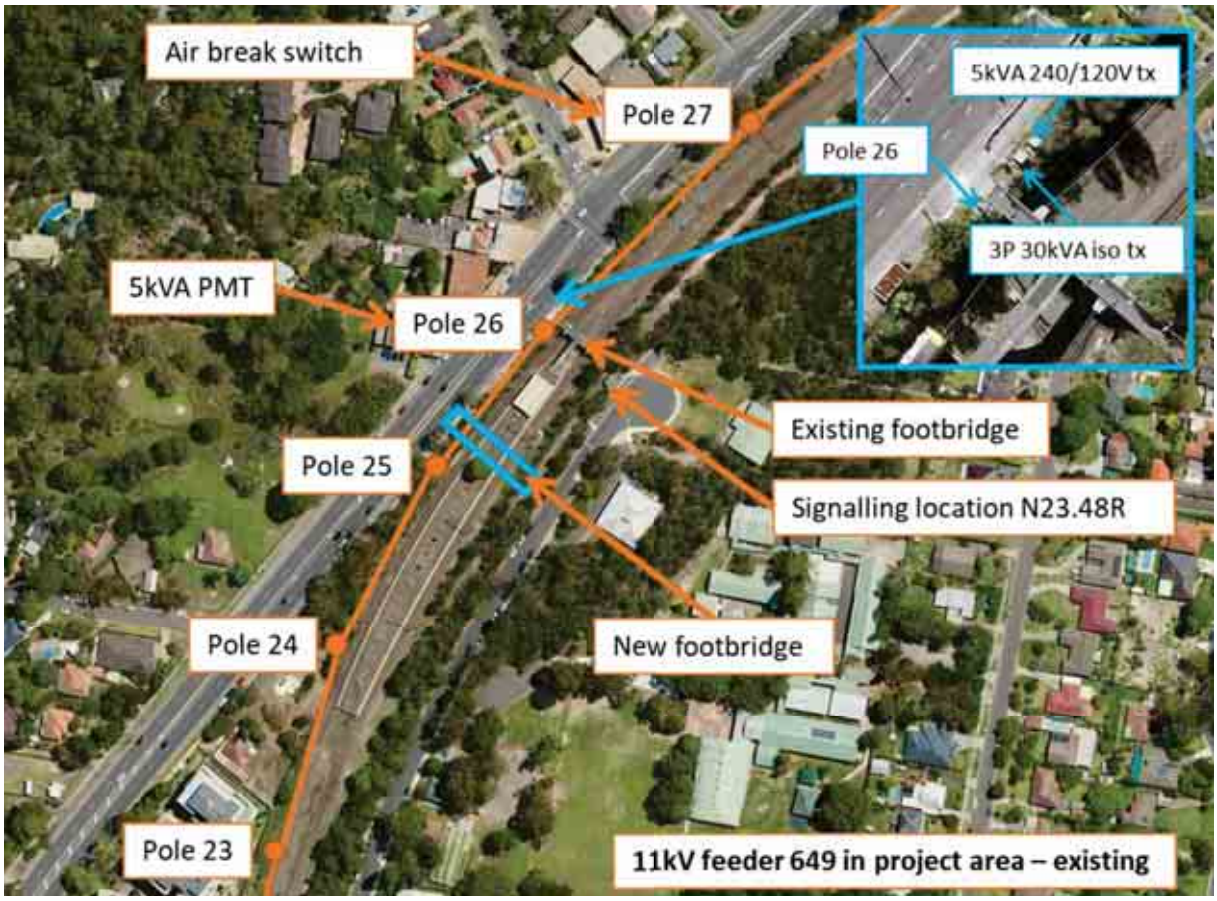


Figure 1: Existing 11kV feeder 649 arrangement

3.2 Proposed Changes

The proposed changes to the 11kV feeder are as following:

1. **Undergrounding a section of the 11kV feeder across the new footbridge (between poles 23 and 25):**
   Pole 23 is proposed to be replaced with an UGOH pole and a cable section (combination of underground and GST) is proposed to run to proposed UGOH pole 25 on country side of the new footbridge.
2. **Installation of a new padmount substation supplied by Sydney Trains 11kV network to cater for increased station maximum demand:**
   Padmount substation with RMU, 11kV/415V Tx and DSMSB is proposed between the two new UGOH transitions on the down main. Substation is proposed to supply station loads, new lifts and the signaling location N23.48R. Access to the padmount substation will be via the existing access gate from Pacific Highway.
3. **Decommissioning of pole mounted transformer supplying LOC N23.48R on pole 26**:
   The Sydney Trains pole mounted 11kV/120V transformer is proposed to be decommissioned and the supply for the signaling location is proposed to be from the new padmount substation via a new 240/120V padmount transformer.
4. **Provision of Ausgrid backup supply to the station and LOC N23.48R:**
   Currently the station is fed from an Ausgrid supply via an isolating transformer with no redundancy. In the proposed configuration, the DSMSB will have a backup supply from Ausgrid. The same Ausgrid supply will also back-up the signaling location.
5. **Decommissioning air break switch on pole 27:**
   With the new RMU in the proposed padmount substation, the function of the air break switch on pole 27 becomes redundant and thus it is proposed to be decommissioned.

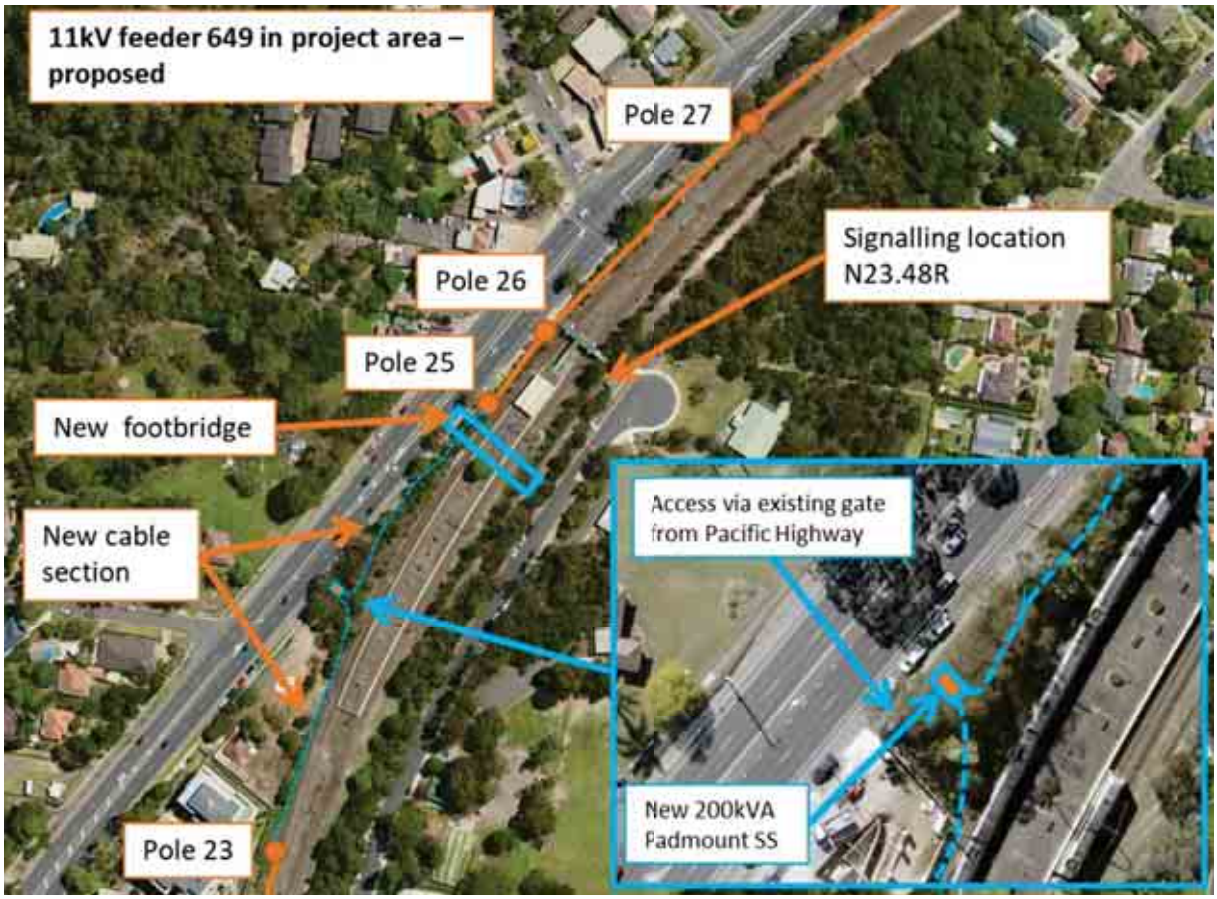


Figure 2: Proposed 11kV feeder 649 arrangement

4. List of "In Force" Operating Diagrams

Table 1: List of "In Force" Operating Diagrams

DRAWING NUMBER	TITLE
sy536_S2	Metropolitan area Hornsby SS to Hawkesbury SS 11kV system diagram
rt115_K2	Metropolitan area Hornsby to Ourimbah HV reticulation diagram

5. List of Proposed Operating Diagrams

Table 2: List of Proposed Operating Diagrams

DRAWING NUMBER	TITLE
30012921-EL-011	MT COLAH STATION FOOTBRIDGE RENEWAL – PROPOSED 11kV SYSTEM DIAGRAM - FINAL
30012921-EL-012	MT COLAH STATION FOOTBRIDGE RENEWAL – PROPOSED HV RETICULATION DIAGRAM - FINAL

6. Commissioning Dates

The estimated commissioning date is the 13th June 2022. Note that the project is at reference design, hence the timeline for construction and commissioning stages is not yet finalised.

7. Interfaces for the Project

Internal interfaces within the project are:

- **Combined service route –** for HV cable route
- **Overhead wiring –** obstructions for HV cable and aerial line route
- **Structural –** obstructions for HV cable and aerial line route
- **Geotechnical –** constrains for HV cable route
- **Environmental –** vegetation removal for proposed infrastructure
- **Architectural –** approval for visual impact of 11kV feeder modifications

External interfaces of the project regarding the 11kV network modifications are:

- **Ausgrid –** interface for relocation of their pilot wire supported by Sydney Trains 11kV poles in this area and for upgrade of the backup supply
- **Council –** interfaces with the local council need to be managed specifically related to vehicular and pedestrian access near the proposal site during construction, testing and commissioning stages.
- **Signalling –** acceptance from Sydney Trains signalling committee required for proposed change of supplies for existing signalling location N23.48R

8. Critical dependant activities such as interface with other supply authorities, possession details, HV feeder works

Construction of Proposed Footbridge

The 11kV feeder modifications between poles 23 and 26 are required to be completed prior to the construction of the proposed footbridge as the existing aerial lines clash with the proposed footbridge.

Ausgrid Backup Supply

The proposed back-up supply for the new station DSMSB and existing signalling location N23.48R from Ausgrid will require works to the Ausgrid connection. These works need to be completed prior to the completion of the proposed ST 11kV feeder modifications.

Staging of Decommissioning

The decommissioning of the pole mounted transformer on pole 26 and the air break switch on pole 27 can only occur after the construction and commissioning of the underground cables and padmount substation.

Construction of Cable Route in proximity to Track

Due to space constraints, the proposed HV cable route near pole 23 is in the vicinity of the tracks. For this portion, the construction can only occur during possession.

9. HV protection compromises or non-standard arrangements

The proposed changes do not introduce non-standard arrangements. No HV protection compromises are expected.

10. Requirement for ASA type approvals or concessions

No type approval or concession is required.

11. Integrated Support Requirements

Only type approved equipment will be used. Integrated support requirements are not applicable.

12. Identification of Risks that can result in either the 1500V DC or HV Network being compromised

Feeder 649 is in a bushfire prone area, even though the proposed changes to the 11kV feeder are in a relatively built area. Two spans of the feeder will be converted to underground cable; hence the project does not worsen the bushfire risk profile. Also, vegetation around the proposed padmount substation will be sufficiently cleared.

The changeover of the 11kV feeder from the existing aerial line to the new cable section between poles 23 and 25 should occur during a weekend possession. The cable is proposed to be installed and tested prior to modification and decommissioning of aerial lines.

A power study of the 11kV feeder 649 has been completed by Sydney Trains and it confirms that the network can support the proposed 200kVA padmount substation.

See power study attached in Appendix A. The conclusions of the power study are:

- Existing 11kV system has adequate capacity to accommodate the proposed 200kVA Mt Colah Station SS on Feeder 649.
- The high-level analysis at normal feeding arrangement indicates the harmonics are unlikely to affect the proposed installation.

13. Residual risks that are transferred to Sydney Trains at the end of the Project

At this stage, there are no residual risks identified that will be transferred to Sydney Trains.

14. Contingency plan if the project is not completed

Scenario 1 – New RMU or new cable section
The air break switch on pole 27 is proposed to be maintained until the new feeder section has been commissioned and put into service. This is to maintain the ability to isolate the feeder between pole 27 and Hornsby SS until the RMU or cable section is fully operational.

Note that all loads supplied by this feeder section between pole 27 and Hornby SS (signalling HY134 and LOC 23.48) have backup supplies from Ausgrid.

Scenario 2 – New padmount transformer
One or a combination of the following two mitigation precautions can be taken:

- Diesel generator to supply the new station DSMSB
- Ausgrid back-up supply fully operational to supply the new station DSMSB

15. Stakeholder register

Table 3: Stakeholder register

Stakeholders Identified as at 09/11/2020		
Name	**Project role**	**Involvement**
[redacted]	Design Management	Sydney Trains contact person
	Design Management	Overseeing and monitoring progress, undertaking high-level design review
	Design Engineer – Distribution	undertaking high level design reviews
	Project Engineer MWD	providing information on the construction sequencing & high-level design reviews
	Project Engineer Test & Commissioning – Signals	undertaking high-level reviews of proposed signals relocation, providing information on testing and commissioning
	Technical Specialist HV Aerials and cables	undertaking high level design reviews
	Technical Specialist – Earthing and Bonding	undertaking high level design reviews
	Regional Engineering Electrical	providing information / reports on pole inspection & maintenance, high level design review

Appendix A 11KV POWER STUDY – MT COLAH STATION SS UPGRADE REV. 1.0

POWER SYSTEMS – Modelling & Analysis **11kV Power Study** – Mt Colah Station SS Upgrade Rev. 1.0				
Date	23/11/2020			
Network Directory Location	\1.1-PowerSystemStudies\1.1.4-11kVPowerStudies\CurrentStudies\Mt Colah Station 200kVA	**Prepared By**	[redacted]	
		Checked By		
		Approved By		

1. Introduction & Background

As part of Mt Colah Station footbridge upgrade project, 23.48R pole-top SS on Feeder 649 is planned to be upgraded to a 200kVA pad-mount SS to provide supply for Mt Colah station facilities (e.g. lift installation). The purpose of this study is to assess the feasibility of supplying the proposed load increase from Sydney Trains 11kV network.

2. Assumptions & Methodology

Load Flow simulations were undertaken using ETAP software version 19.5.0.

The following loading assumptions are made for the simulation:

- Proposed Mt Colah Station SS is simulated at 100% loading of 200kVA
- All other existing 11kV loads (other than specified above) simulated at 20% loading.

Normal and backup feeding scenarios are simulated to assess the voltage drop and current loading on the feeders. High level assessment of harmonic distortions is also conducted to understand the impact on proposed new installations.

3. Feeding Scenarios

The following scenarios are assessed in this study

1. Normal feeding arrangement – proposed Mt Colah Station SS on Feeder 649 fed by Hornsby SS

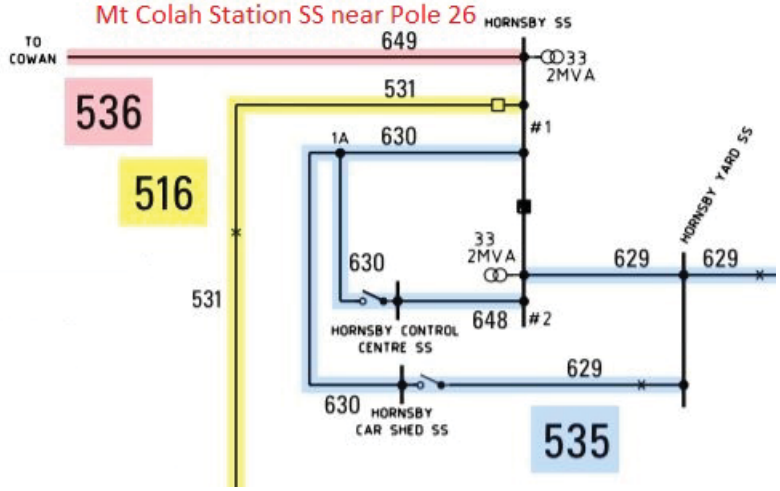


Figure 1: Normal feeding arrangement

2. Backup feeding arrangement – proposed Mt Colah Station SS on Feeder 649 fed by St Leonards SS when both 33/11kV Tx at Hornsby SS are Out-of-service (OOS).

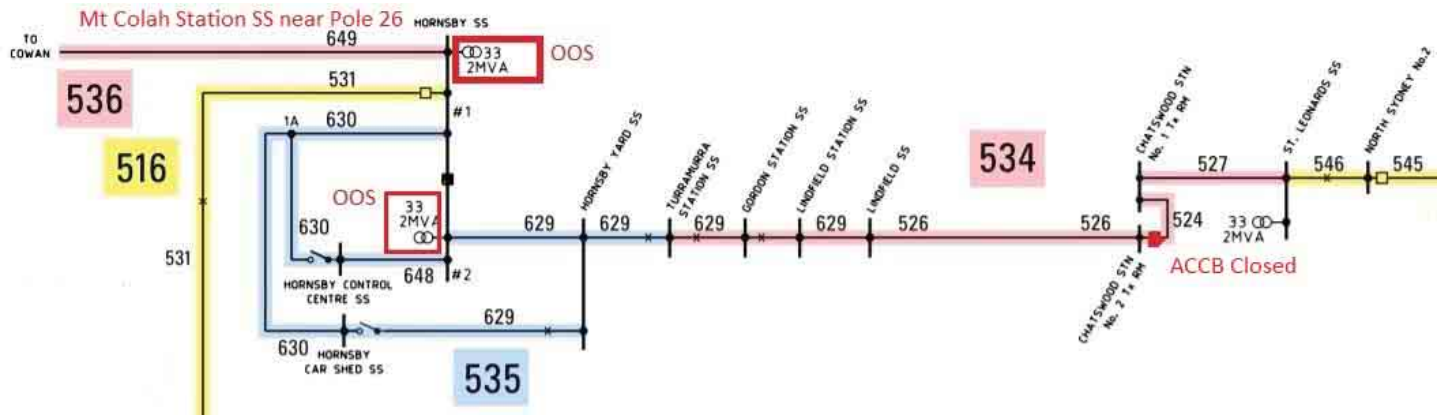


Figure 2 – Backup feeding arrangement – Hornsby 33/11kV Tx OOS

3. Backup feeding arrangement – proposed Mt Colah Station SS on Feeder 649 fed by Gosford South SS when Hornsby SS 11kV bus is OOS

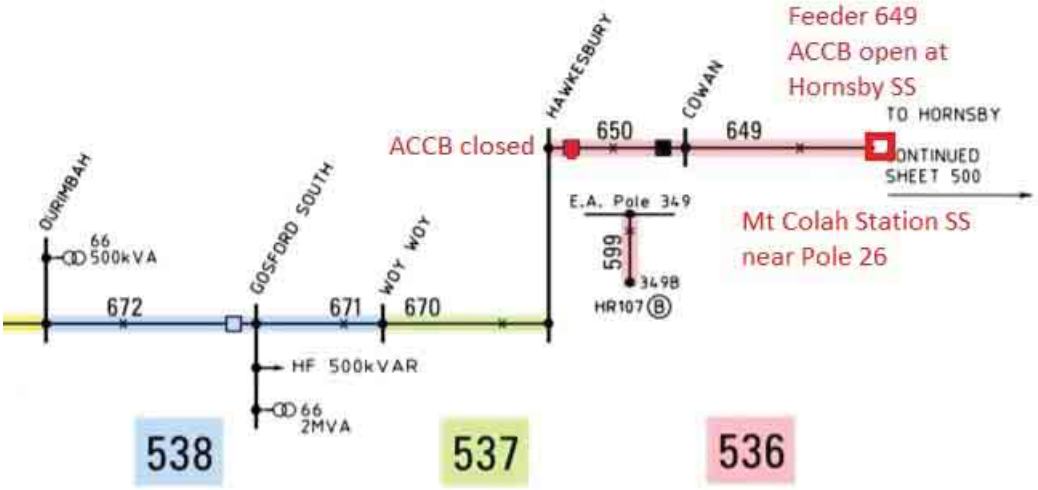


Figure 3 – Backup feeding arrangement – Hornsby SS 11kV bus OOS

4. Results Summary

The following table shows the loadings on relevant feeders and the worst case voltage (furthest from supply source).

Table 1 – Simulation Results Analysis

Scenario	Source	Loadings (Max)	Ratings	Voltage (Min)	Comment
1	Hornsby 33/11kV Tx	649 – 18.5A 33/11kV Tx – 1.49 MVA	649 – 50 A 33/11kV Tx – 2 MVA	99.56% At Long Island Comms Room SS (Feeder 650)	Acceptable
2	St Leonards 33/11kV Tx	527 – 86.9 A 524 – 75.5A 526 – 64.9A 629 – 64.8A 33/11kV Tx – 1.93 MVA	527 – 305 A 524 – 305 A 526 – 305 A 629 – 190A 33/11kV Tx – 2 MVA	95.0 % At Long Island Comms Room SS (Feeder 650)	Acceptable
3	Gosford South 33/11kV Tx	671 – 20.3A 670 – 19.1A 650 – 17.2A 649 – 13.8A 33/11kV Tx – 0.51 MVA	671 - 50 A 670 – 100A 650 – 100A 649 – 100A 33/11kV Tx – 2 MVA	92.31% At Mt Colah Station SS 11kV bus (Feeder 690)	Acceptable

It can be concluded that the 11kV feeders and 33/11kV transformers loadings are acceptable with voltage regulations achieving the minimum requirements (as per ASA standards EP 90 10 00 02 SP) for all scenarios.

High level harmonic analysis was performed in the simulation for the normal supply arrangement. The voltage Total Harmonic Distortion (THD) is below 8% limit at proposed Mt Colah Station SS 11kV bus, thus unlikely to cause any issue. The frequency response curve at proposed Mt Colah Station SS 11kV bus is shown in Figure 4 below.

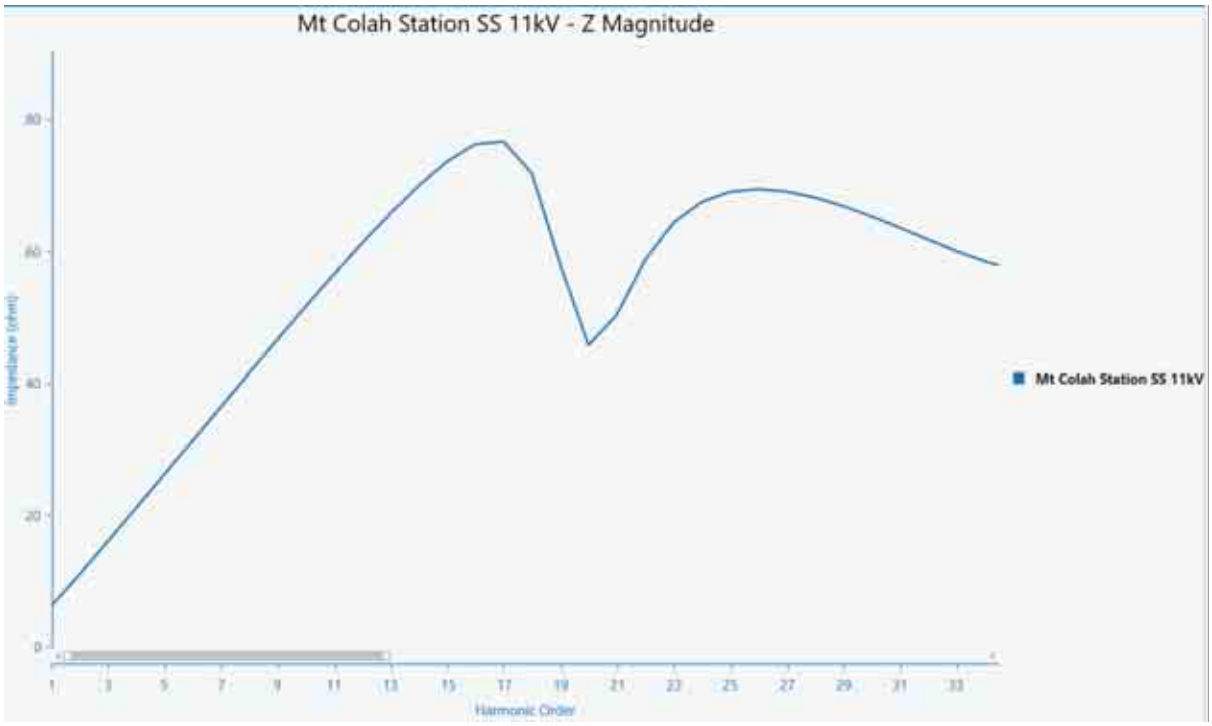


Figure 4 – Frequency response up to 33rd order harmonics

The frequency response graph above indicates that there are resonances at the 16th and 26th order harmonic. These are not characteristic harmonics of the network, but are close to other characteristic harmonic (e.g. 17th order). However it is unlikely to affect the proposed installations at the station given that the proposed loads on the feeder are very low (less than 20A). Futhermore, there is no known harmonic distortion issue for station power supplies in this area.

Please note that this is a high level desktop assessment without implementing the detailed harmonic analysis as stated in AS/NZS 61000.2.2:2003(2013) which would require onsite measurement.

5. Conclusion

The simulation results indicate that the existing 11kV system has adequate capacity to accommodate the proposed 200kVA Mt Colah Station SS on Feeder 649.

The high level analysis at normal feeding arrangement indicates the harmonics are unlikely to affect the proposed installation at Mt Colah Station.

Appendix O Safety in Design

Appendix O1 – Safety in Design Register

Hazard / Risk Information						POTENTIAL TREATMENTS OPTIONS		RISK ASSESSMENT					
Hazard Reference Number	Phase	Disciplines	Hazard Description	Potential Causes	Potential Consequence	Safety Requirements/Actions	Implemented Actions/Mitigations & Verification Evidence Reference	Likelihood	Consequence	Risk	SFAIRP Statement	Status	Risk controls (construction, operations and maintenance)
HAZ-MTCOLAH-001	Construction	Civil	Striking and/or damage to existing Sydney Water service on Pacific Highway	CA01 - Excavation for lift shaft construction at Pacific Highway CA02 - Loading from crane for girder and precast lift erection	Minor injury Disruptions to service, flooding on road	D01 - Crane lifting plan to be reviewed during detail design. D02 - Sydney Water Tap in™ application to be submitted during detail design.	30012921-GE-R-01 documents the recommended action for detail design. Further actions and verification evidence is to be developed during detail design.	L4	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Crane lifting plan to be reviewed with respect to service position during detail design. C02 - Consultation to be undertaken with Sydney Water during construction.
HAZ-MTCOLAH-002	Construction	Civil	Striking underground services during earthworks	CA01 - Services not identified during the design CA02 - Excavation near existing services	Death or injury due to exposure to electric shock Disruptions to service	D01 - Designer to undertake a DSS, ISS and DBYD check as part of design. D02 - Services to be marked on applicable drawings to be managed during construction D03 - Service locating and/or potholing to be undertaken for services not currently on DSS (e.g. Sewer and Sydney Water)	Refer to reference design drawings showing existing services (including approximate location of sewer and Sydney Water service). Further actions and verification evidence is to be developed during detail design.	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Contractor is to liaise with service authorities for works being carried out within the civinity of their assets C02 - Existing services to be located and protected and DBYD undertaken.
HAZ-MTCOLAH-003	Operation	Civil / Geotechnical	Slope instability	CA01 - Water flow from footbridge outlet entering cess loosening rocks on slope.	Disruptions to service. Serious injury to commuters and people working in rail corridor.	D01 - Footbridge graded to drain to platform. Runoff captured and discharged at pit in platform. D02 - Trench drain detailed on Pacific Highway footpath entry D03 - Adequate erosion control to be detailed for any outlet draining to the cess.	Refer to architectural drawings. Further actions and verification evidence is to be developed during detail design.	L2	C4	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-004	Construction	Structural	Collapse of existing pedestrian footpath and road at Pacific Highway	CA01 - Excavation for lift shaft construction at Pacific Highway	Major injuries to public	D01 - Temporary work requirements to be assessed and developed at detail design.	Refer to Section 5 of 30012921-GE-R-01 for anticipated construction sequence. Further actions and verification evidence is to be developed during detail design.	L4	C5	B	This hazard has been resolved for reference design through documentation of temporary work requirement in the construction sequence. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Adequate batters or retention to be provided to provide to maintain stability during excavation. C02 - Temporary road barriers and fencing to be provided along edge of excavation. Adequate signage/traffic management to be implemented for temporary road barriers.
HAZ-MTCOLAH-005	Construction	Structural	Dropping of precast elements during installation	CA01 - Heavy weight of precast elements CA02 - Inappropriate crane size CA03 - Insufficient bearing capacity	Injury to construction contractor	D01 - Standard RMS plank sizes detailed D02 - Detail design to consider lifting limits for precast elements i.e. lift shaft/stairs (if precast) D03 - Detail design to consider crane size and bearing capacities	Refer to structural design drawings for plank sizes. Further actions and verification evidence is to be developed during detail design.	L3	C4	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-006	Construction	Structural	Formwork falling onto live tracks	CA01 - Stripping formwork after curing of concrete on the footbridge over the rail corridor or at stairs adjacent to Down track.	Injury to construction contractor, disruption to rail services	D01 - Design details precast elemements (i.e. bridge girders, lift shaft). D02 - Construct the cast in-situ elements during possession (i.e. bridge deck)	Refer to Section 5 of 30012921-GE-R-01 for anticipated construction sequence and structural design drawings. Further actions and verification evidence is to be developed during detail design.	L3	C4	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Construction activities within close proximity to tracks or high risk activities are to be undertaken during track possession.
HAZ-MTCOLAH-007	Operation	Electrical	Loss of lighting	CA01 - Upstream distribution board does not have power supply available.	Injuries to public	D01 - Provide light fittings with internal battery D02 - Back up supply to the station	Refer to electrical drawings and Section 4 of 30012921-GE-R-01. Further actions and verification evidence is to be developed during detail design.	L3	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-008	Maintenance	Electrical	Maintenance at height (lighting)	CA01 - Perform maintenance activities (during maintenance of lighting) at height.	Injuries to maintenance staff	D01 - Provide tilted type lighting pole on new footbridge and stairs	Refer Section 4.8 in 30012921-GE-R-01. Further actions and verification evidence is to be developed during detail design following temporary works design.	L3	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-009	Construction/Maintenance	Electrical	Contact with live LV	CA01 - Contact with live wires during construction or maintenance	Major Injury to construction contractor and maintenance worker	D01 - Providing RCD fitted Circuit breakers C02 - SWMS to be undertaken during construction with regard to working with live wires.	N/A to design	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Providing RCD fitted Circuit breakers C02 - SWMS to be undertaken during construction with regard to working with live wires.
HAZ-MTCOLAH-010	Operation	Electrical	Fire resulting from an electrical fault	CA01 - Fire caused by arc fault, short circuit and other electrical faults	Serious or permanent Injury, and/or Significant safe working beach with immediate impact on operations on worksite	Providing relevant protection: D01 - Form of Segregation referring to AS3439.1 D02 - Providing fault trip equipment including circuit breakers and other protection equipment O&M01 - Maintenance of guards indicator light, once the sighting distance location is determined.	N/A to design	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	Providing relevant protection: C01 - Form of Segregation referring to AS3439.1 C02 - Providing fault trip equipment including circuit breakers and other protection equipment O&M01 - Maintenance of guards indicator light, once the sighting distance location is determined.
HAZ-MTCOLAH-011	Operation	Electrical	Electric shock	CA01 - Shock caused due to touch of live surfaces CA02 - step, touch and transfer potentials during HV faults CA03 - hand and touch DC potentials around station due to spark gap operation	Major injuries to public, operator and maintenance worker	D01 - Earthing conductive surfaces -RCD protection for circuits - Keeping step, touch and transfer potentials under safety threshold through HV earthing design - Design out hand and touch potential hazards around station and proposed footbridge through application of standards	To be verified once the Ref Design is complete	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-012	Operation	Electrical	Structural failure	CA01 - Corrosion due to electrolysis	Bridge/OHW collapse, major injuries to public	D01 - Follow T HR EL 12002 GU Electrolysis from Stray DC Current for E&B design and controls	To be verified once the Ref Design is complete	L3	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-013	Construction	CSR	Instability of existing platform	CA01 - Up-track ULX construction	Major injuries to maintenance workers, disruption to rail service.	~~D01 - Existing platform structure to be assessed and temporary works considered during detail design.~~ ~~C01 - ULX construction to be undertaken during track possession~~ D01 - Requirement for ULX has been removed during	Refer to 30012921-GE-R-01 and CSR drawings.	L3	C4	C	This hazard has been resolved for reference design.	Closed	N/A
HAZ-MTCOLAH-014	Operation	CSR	Electric shock (CSR - containment to comms/electrical/,etc)	CA01 - Damage to the containment	Fatality, major injuries. Disruption to services	D01 - Cable route design to consider public access. Buried route to be adopted in locations of public access/maintenance tracks.	Refer to CSR reference design drawings. Buried routes have been detailed at locations accessible to public/at access gate locations.	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-015	Maintenance	CSR	Maintenance activities for CSR Routes within the danger zone	CA01 - Section of the GST is within the danger zone	Major Injury , fatality	D01 - Design CSR routes outside the danger zone. Buried CSR routes have been specified where routes are close to track. Proposed GST for 11kV containment is temporary.	Refer to CSR reference design drawings. Buried routes have been detailed at locations accessible to public/at access gate locations.	L3	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	O&M01 - Follow ST's standard maintenance procedures for maintenance of CSR routes
HAZ-MTCOLAH-016	Maintenance	CSR	Maintenance of GST on top of the embankment	CA01 - Section of the GST is on top of the embankment	Injury to maintenance worker	~~D01 - GST has been detailed close to existing boundary fence, away from the edge of the embankment.~~ D01 - Requirement for GST has been removed with alternate supply from Pierre Close.	Refer to CSR reference design drawings.	L3	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	O&M01 - Follow ST's standard maintenance procedures for maintenance of CSR routes

Hazard / Risk Information						POTENTIAL TREATMENTS OPTIONS		RISK ASSESSMENT					
Hazard Reference Number	Phase	Disciplines	Hazard Description	Potential Causes	Potential Consequence	Safety Requirements/Actions	Implemented Actions/Mitigations & Verification Evidence Reference	Likelihood	Consequence	Risk	SFAIRP Statement	Status	Risk controls (construction, operations and maintenance)
HAZ-MTCOLAH-017	Operation	Signalling / CSR	Trip over at the Guard Indicators	CA01 - Pole mounted guard indicator on platform ~~CA02 - Cable terminations from ULX to ground on the platform.~~ CA03 - Flood and Storm water can cause electrical leaks from cable terminations along the platform, if they are mounted in floor/ platform level.	• Passenger can be hit or injured by pole / a Trip / Slip Hazard • Major injury due to electric shock to public	D01 -Poles mounting of GIs on platform to be minimised (subject to Signal Sighting Committee). Reference design proposes to mount guard indicator off lift shaft and one pole mounted GI. D02 -Cable termination boxes to safely, secured away from flood water/ rains with water tight termination boxes, avoiding any leaking or Earthing problem, by nominating a safe place for Cable Termination box during Signal Sighting	To be verified once signal sighting is completed. Further actions and verification evidence is to be developed during detail design following temporary works design.	L3	C4	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-018	Operation	OHW	Electric shock (OHWS)	CA01 - Close proximity of public using existing footbridge with new OHWS. (this is dependent on the location of the OHWS).	Fatality, major injuries.	~~D01 - Protection screens (timber or perspex on footbridge at locations near the new OHWS to eliminate touch potential.~~ D01 - Existing footbridge to be closed to public prior to OHW installation on new OHWS D02 - New OHWS proposed to be installed approximately 2.5 m away from existing footbridge.	Refer to OHW drawings and Section 5 of 30012921-GE-R-01	L3	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-019	Construction	Geotechnical	Sides of deep trenches collapse during deep excavation	CA01 - Inadequate support of trenches CA02 - Undermining of trench during construction of lift piling cap	Potential major injuries to construction workers, damage to services and disruption to rail service	D01 - Temporary works (retention) or permanent protection of Down side trench (prior to excavation for Lift 1 construction) to be designed at detail design.	Refer to Section 5 of 30012921-GE-R-01 for anticipated construction sequence. Further actions and verification evidence is to be developed during detail design following temporary works design.	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Temporary support for trenches required for trenches deeper than 1.5m C02 - Temporary protection (retention) or permanent protection to be installed prior to excavation for Lift 1 construction.
HAZ-MTCOLAH-020	Operation	Geotechnical	GST falls onto track (potential GST relocation to cutting at track level)	CA01 - Insufficient support for GST's on face of cutting	Disruption to operation service of trains, delays. Fatality	D01 - Design of GST according to ASA standard SPG 0705. C01 - Detailed design of support for GSTs on cut face with geotechnical engineer to be present on site to identify defects that may affect the stability of the GST.	Refer to CSR drawings. Further actions and verification evidence is to be developed during detail design following temporary works design.	L2	C5	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-021	Operation	Security and Comms	Obstruction of existing CCTV view along the platform	CA01 - Positioning of new footbridge lift and columns obscure current view	Security risk to commuters	D01 -Additional cameras proposed in reference design to increase the CCTV coverage past the new bridge	Refer to security and comunications drawings.	L3	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-022	Construction	Security and Comms	Services disruption along rail corridor due to relocation	CA01 - Relocation of communication and signalling services to allow for new bridge construction CA02 - Demolition of existing footbridge (which supports existing LV, comms and signalling)	Safety risk to commuters. Station systems will be down during relocation.	D01 - New service routes to be in place and commissioned prior to decommisioning and removal of existing services/existing footbridge.	Refer to Section 5 of 30012921-GE-R-01 for anticipated construction sequence.	L2	C3	D	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Relocation of services affected by the proposed new footbridge works to be executed during possession to avoid network disruption
HAZ-MTCOLAH-023	Operation	Security and Comms	Violence and crime	CA01 - The new footbridge used as thoroughfare	Security/safety risk to commuters	D01 - Additional cameras required to increase the CCTV coverage as well. Bridge design considers passive surveillance.	Refer to security and communication drawings.	L3	C3	C	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A
HAZ-MTCOLAH-024	Construction	Electrical	Striking of overhead services (aerials)	Plant or equipment working under live aerials	Serious injury or death by electrocution. Disruption to rail services	D01 - Construction sequence recommends relocation of 11kV aerials prior to bridge construction.	Refer to Section 5 of 30012921-GE-R-01 for anticipated construction sequence.	L3	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Low profile plant to be used for construction of new UGOH poles within close proximity to existing aerials C02 - Construction of new UGOHs and excavation below overhead lines to be undertaken during possession with power outs.
HAZ-MTCOLAH-025	Construction	CSR	Electrocution	CA01 - Working above/adjacent to relocated 11kV CA02 - Inadequate isolation during electrical services relocation	Serious injury or death by electrocution. Disruption to rail services	N/A	N/A to design	L4	C5	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	C01 - Position of relocated services to be clearly identified and protected during construction C02 - Temporary GST has been proposed to reduce likelihood of service strike during construction of Lift 1 C03 - Construction of new UGOHs to be undertaken during possession with power outs. C04 - [illegible]
HAZ-MTCOLAH-026	Operation	Electrical	Staff struck by train when maintaining timber poles.	CA01 - Insufficient clearance of poles to track centreline (non-compliance with ECS 215 Transit Space). - 5m from track centrelines to pole face required for poles without access path between track and pole. - 6.2m from track centrelines to pole face required for poles with access path between track and pole.	Death due to being struck by train	D01 - Remove any existing poles with non-compliant clearance to track in the project area D01 - Ensure proposed pole locations comply with ESC 215 required clearances to track centreline	D01 - Existing pole 24 is less than 5m from track centreline. This is an existing non-compliance with ESC 215. Aerial line from pole 23 to pole 25 proposed to be replaced with underground cable. This eliminates the need for pole 24, thus it will be decommissioned, removing this existing non-compliance. D02 - Proposed UGOH locations for poles 23 and 25 in accordance with table 1 of ESC 215 Transit Space.	L5	C5	A	This hazard has been resolved for reference design by removing pole 24 and proposing the new UGOH pole locations in compliance with ESC 215. This hazard has been resolved for reference design	Open	M01 - SWMS to be implemented and followed during maintenance activities.
HAZ-MTCOLAH-027	Operation	Architectural	Unauthorised access/climbing onto lift entry	Climbable elements on the footbridge i.e. horizontal ledges on handrails	Death from falling off bridge, graffiti and vandalism on lift shaft	D01 - Horizontal elements to be placed at height and ledges are to be inaccessible	Refer to architectural drawings. Further actions and verification evidence is to be developed during detail design.	L4	C4	B	This hazard has been resolved for reference design through documentation of the design recommendations specified in the design report. The controls and verification evidence are to be reviewed during the detailed design stage.	Open	N/A

Appendix O2 – Safety in Design Workshop Minutes

Appendix B – Reference Design Mt Colah Design Scope Presentation

SMEC

Member of the Surbana Jurong Group

Reference Design for Mt Colah Footbridge Replacement

SiD and Constructability Workshop

03 August 2020

Member of the Surbana Jurong Group

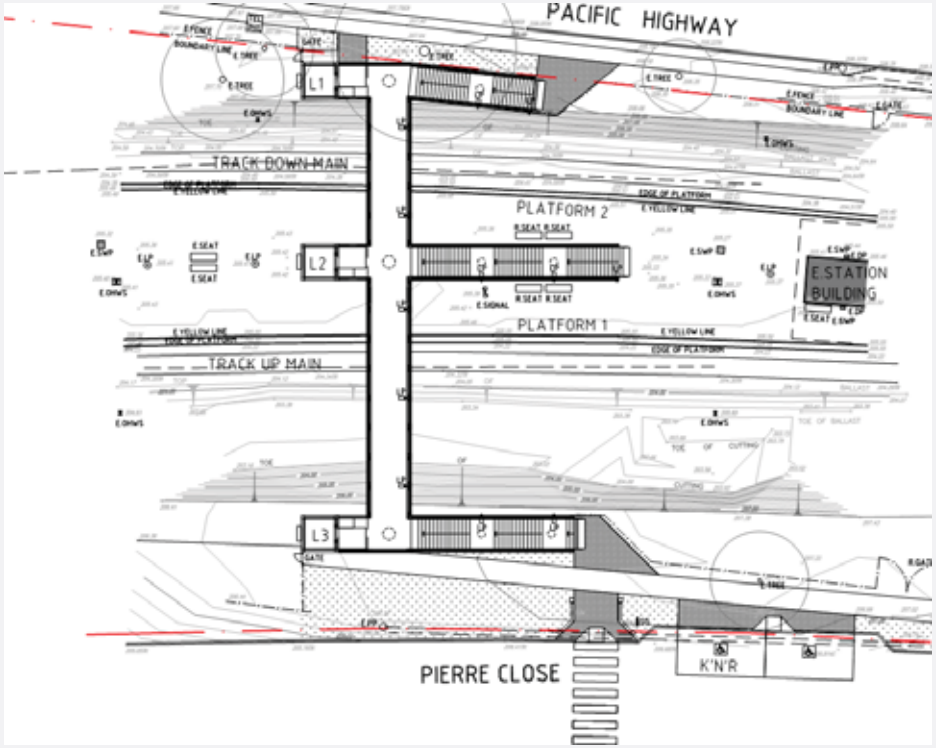
Agenda

- Introductions and overview of site layout
- Overview of design elements
- Overview of anticipated construction staging
- Safety in Design (construction, maintenance and operation)
- Wrap up

Member of the Surbana Jurong Group

Existing Site Layout

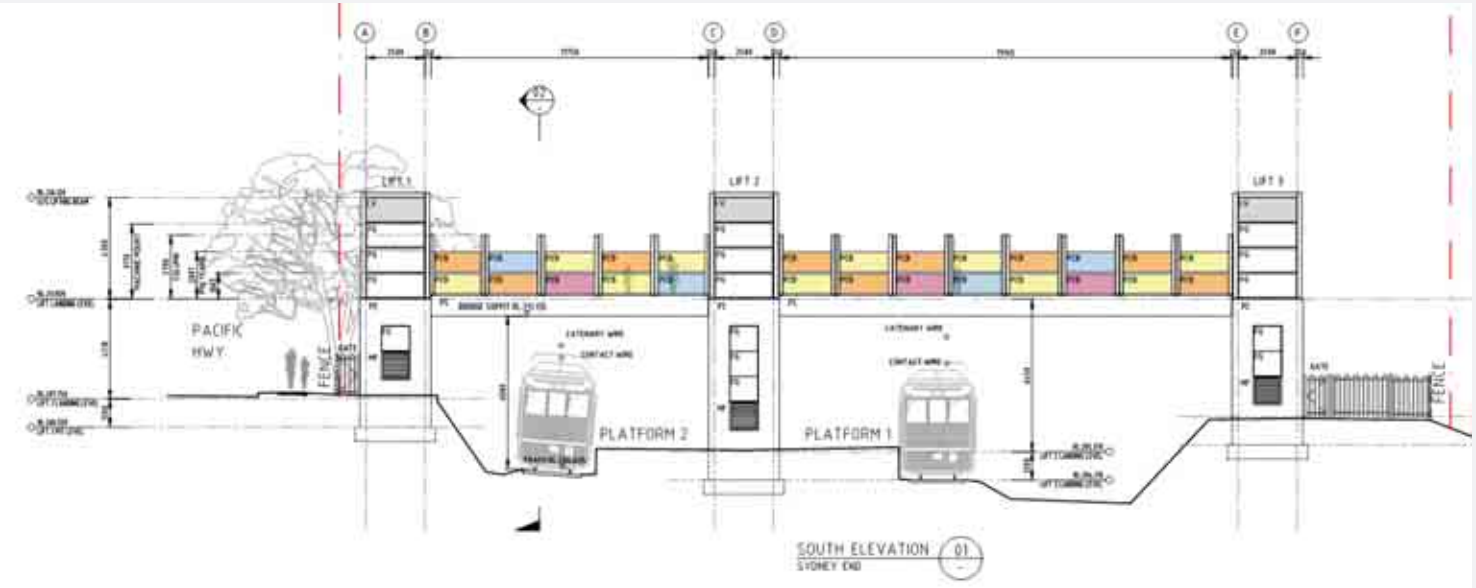
New footbridge and new OHWS



Reference Design for Mt Colah FB Replacement

Member of the Surbana Jurong Group

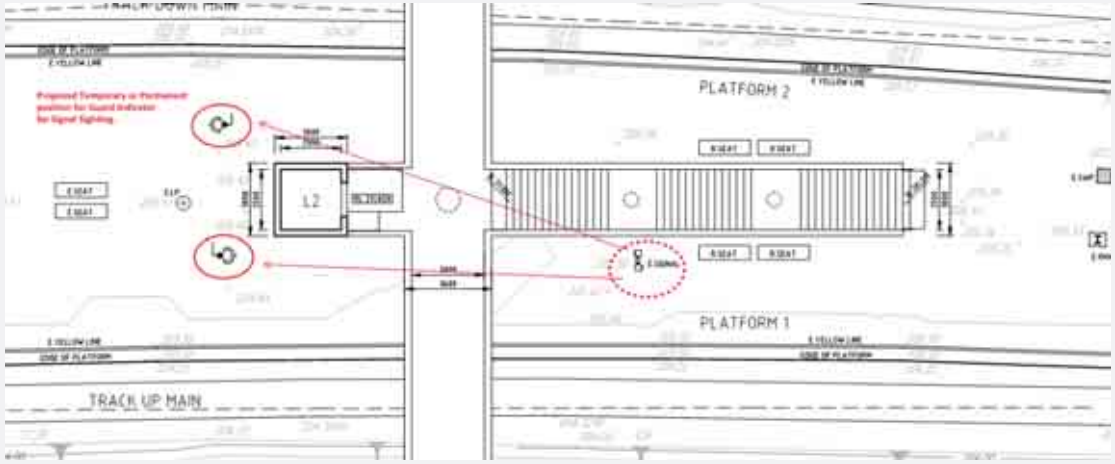
New footbridge



Reference Design for Mt Colah FB Replacement

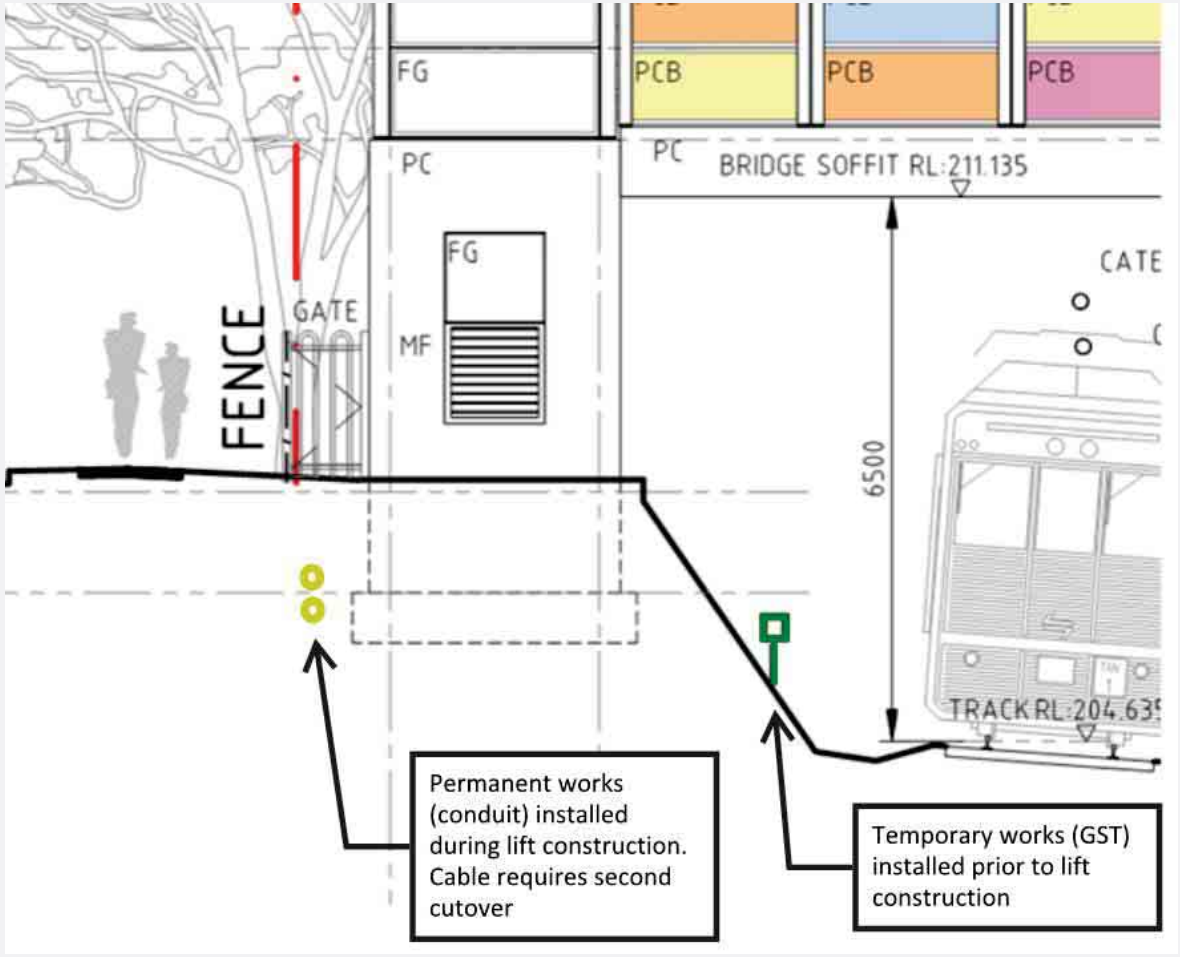
Member of the Surbana Jurong Group

Relocation of Guard Indicator



Reference Design for Mt Colah FB Replacement

Relocation of HV Feeder 649/1



New footbridge - services

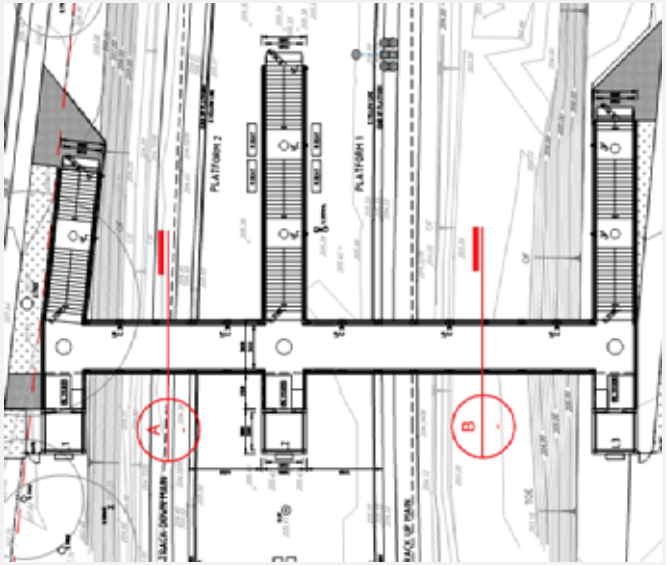
Member of the Surbana Jurong Group

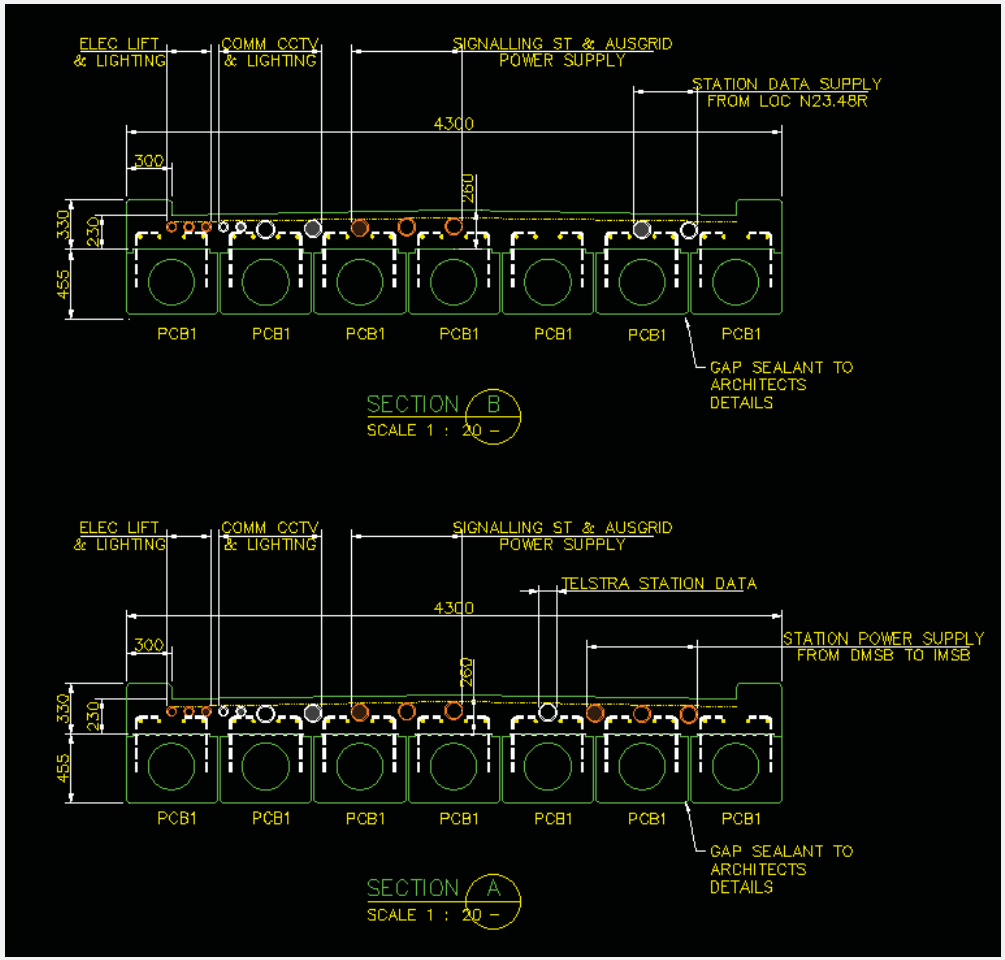
Services crossing bridge

- Signalling main and backup supply. Pole top transformer and existing Ausgrid transformers to be retained.

Services crossing bridge - to platform

- Station power supply from new 11kV/415V Padmount transformer
- LV for lift and lighting
- CCTV and 3rd party communications





Reference Design for Mt Colah FB Replacement

Member of the Surbana Jurong Group

Power supply

Reference Design for Mt Colah FB Replacement

Anticipated construction sequence

Out of possession/enabling works

- Clearing of vegetation
- Relocate Signal and Comms Service on Up side (-28-)
- Install new cable route for guard indicator and other services crossing the bridge (communications) on Up side
- Relocate existing platform lighting and platform furniture

Out of possession

- Install GSTs/buried conduits for new 11kV cable route on Down side for extents outside of danger zone
- Prepare foundation for new UGOH poles on Up Side
- Construct new 11kV/415V padmount transformer
- Install temporary works for lift shaft construction, including temporary road barriers and fencing where required
- Construct bridge pier and stair on Pierre Close/Up side. Excavate for lift shaft foundation on Pierre Close/Up Side

Out of possession – after possession 6

- Complete landscaping works
- Complete new kiss and ride and new disability parking
- Realign fencing and relocate access gates
- Commission new footbridge

Anticipated construction sequence

1st possession

- Construct new ULX crossing under Up Main and guard indicator posts and footings.
- Commission temporary guard indicators.
- Install GST/buried conduits for 11kV relocation adjacent to Down Track (for extent within danger zone)

2nd possession

- Construct new UGOH poles (2 No. off) - with traffic management on Pacific Highway
- Transfer 11kV onto new UGOHs and into new GSTs/buried conduits

3rd possession

- Excavate and prepare for construction of stair, bridge and lift shaft foundation on Pacific Highway Side
- Excavate and prepare for construction of stair, bridge and lift shaft foundation on platform, including drainage relocation

4th possession

- Construct lift shafts
- Construct bridge piers and stairs on Pacific Highway and platform.
- Construct new OHWS footings

5th possession

- Crane precast girders into position
- Install conduits for services and cast in-situ deck
- Install steelwork for new OHWS

Anticipated construction sequence

6th possession

- Install balustrades, safety and protection screens
- Relocate OHW on existing bridge to new OHWS
- Complete platform works around new footbridge (asphalting, platform furniture, lighting)
- Install new lighting poles on footbridge
- Commission new station power supply and relocated services onto new footbridge
- Install lifts
- Relocate guard indicator to final location

7th possession, pending demolition methodology

- Demolish existing footbridge and stairs

Refer to risk register

Appendix C – Safety In Design workshop presentation

Appendix D – Project Hazard Log

Appendix P Systems Requirement Specification

Appendix Q Comment Register

Appendix R Cost Estimate

Mount Colah Footbridge

Cost Plan 10th December 2020

Description	Qty	Unit	Rate	Total ($)
Site Establishment and Demobilization	1	LS	35,000	35,000
Traffic Management	1	LS	110,460	110,460
New Footbridge				
General Cranage & Attendance	1	LS	136,800	136,800
Scaffolding & Edge Protection	1	LS	29,600	29,600
Piling	1	LS	173,633	173,633
Base For Lift Shafts x 3	1	LS	45,072	45,072
Columns - Central Piers x 3	1	LS	69,291	69,291
Headstocks x 3	1	LS	102,928	102,928
Supply & Install of 455mm planks	1	LS	85,000	85,000
Supply & Install of 535mm planks	1	LS	96,000	96,000
Concrete Deck including kerb upstand for rail and safety screen	1	LS	154,347	154,347
Bearing Pads	1	LS	60,000	60,000
Elastomeric Bearing Strip	1	LS	4,800	4,800
Upstands & Safety Screens	1	LS	69,350	69,350
Lifts x 3	1	LS	2,100,000	2,100,000
Columns - Stair Cases	1	LS	62,939	62,939
Stair Cases X 3	1	LS	294,487	294,487
Handrail For Stair Cases	1	LS	73,500	73,500
Misc. Items (drainage, anti graffiti, Miscellaneous metalwork)	1	LS	27,000	27,000
Electrical Works (inside rail corridor)				
Remove OH power Poles inc wiring	1	LS	10,500	10,500
New Padmount Transformer	1	LS	250,000	250,000
New Power Poles	1	LS	20,000	20,000
New OHW inc cantilevered column structure	1	LS	30,600	30,600
Back Up Power Supply				
Syscon Works	1	LS	247,845	247,845
Relocate signaling pole mounted transformer from Pac H'Way to Pierre Close	1	LS	10,000	10,000
Relocate signaling transformer to next to new padmount transformer (pac h'way side)	1	LS	15,000	15,000
(Itemized Cost - 6 x Poles)	1	LS	39,000	39,000
Utility Works				
Protection - Sydney Water Mains (provisional quantity = 50lm)	1	LS	50,000	50,000
New - Telstra (provisional quantity = 50lm)	1	LS	27,500	27,500
Relocate Sewer Main (provisional quantity = 50lm)	1	LS	30,000	30,000
Combined Service Routes (CSR)				
Trenched SCR	1	LS	154,800	154,800
Galvanized Steel Trough (GST)	1	LS	125,400	125,400
Pits	1	LS	90,000	90,000
Security & Communications				
New CCTV Cameras	1	LS	70,000	70,000
Relocate CCTV	1	LS	3,500	3,500
(Itemized Cost - 2 x Hearing Loops)	1	LS	33,600	33,600
New PA Rack	1	LS	25,000	25,000
New PA Speakers	1	LS	20,000	20,000
Relocate PA Speakers	1	LS	4,000	4,000
Relocate Ticketing Machines	1	LS	8,250	8,250
Lighting				
LV Supply (trenched)	1	LS	36,000	36,000
3m Poles	1	LS	130,500	130,500
5m Poles	1	LS	60,000	60,000
Batten Lights	1	LS	19,500	19,500
Emergency Exit Signs	1	LS	750	750
Civil Works				
Brick Pavers	1	LS	7,700	7,700
New Footpath	1	LS	14,400	14,400
New RMS Fence (Pac H'Way Side)	1	LS	11,250	11,250
Fence Removal (Pierre Close)	1	LS	2,500	2,500
New Pedestrian Crossing	1	LS	7,500	7,500
Drainage Works (Station)	1	LS	14,220	14,220
General tidy up of Pierre close site post works	1	LS	5,000	5,000
Relocate Station Asses				
Relocate Barrier	1	LS	300	300
Relocate Bin	1	LS	600	600
Relocate Seat	1	LS	2,000	2,000
Relocate Sign	1	LS	1,500	1,500
Relocate Guard Indicator	1	LS	1,500	1,500
New Guard Indicator	1	LS	20,000	20,000
Awning Extension inc up-stand	1	LS	15,300	15,300
Allowance for 2 comms rooms	1	LS	30,000	30,000
Regrade station platform for drainage - up to 100mm thick asphalt	1	LS	17,500	17,500
Footbridge Demolition	1	LS	150,000	150,000
Landscaping	1	LS	102,000	102,000
Direct Construction Costs (December 2020)				**5,645,222**
Design @ 8%	1	LS	451,618	451,618
Surveys & Site Investigations 2%	1	LS	112,904	112,904
Testing 1%	1	LS	56,452	56,452
Work as Executed (WAE) 1%	1	LS	56,452	56,452
Design & Investigation Costs (December 2020)				**677,427**
Contractors OH,Risk & Profit (20%)	1	LS	1,264,530	1,264,530
Total Construction Cost (December 2020)				**7,587,178**
Allowance for 7 rail possessions (advice from Sydney Trains was an estimate of $250k to $500k per track possession).				
Slattery have used an average rate of $375k per track possession x 7 possessions.			2625000	2625000
Possession Cost (December 2020)				**2,625,000**
Total Construction Cost + Possession Cost (at December 2020)				**10,212,178**
Allowance for 18% project contingency based on the level of information provided (see contingency table for logic)			1,838,192	1,838,192
Deterministic P50 Allowance				**1,838,192**
Total Construction Cost + Possession Cost + Deterministic P50 Allowance (at December 2020)				**12,050,370**

This cost plan is based on reference information and therefore should be regarded as indicative only of the possible order of cost. All components of the cost plan will require confirmation once detailed design documentation is available.

Factor influencing the Estimate	Available information on which the Scoping Estimate is based	Confidence and Reliability level			Adopted Contingency
		Highly Confident & Reliable	Reasonably Confident & Reliable	Not Confident & Not Reliable	
Project Scope	A set of well-defined project objectives and related performance criteria A design report (with all underlying assumptions and exclusions noted) A set of concept drawings (covering all the physical scope and staging)	7%	10%	16%	7%
Risk Identification	Identified significant risks (political, community, technical, financial) A detailed risk analysis A project delivery method	7%	10%	15%	10%
Constructability	A constructability, staging and construction access review A construction timetable (with appropriate start up and handover periods)	3%	5%	8%	5%
Key Dates	A set of project dates (to enable outturn cost to be assessed) Timing of the construction phase (for escalation assessment)	1%	3%	5%	1%
Project interfaces	Sufficient and documented investigation for concept design (geotechnical, heritage, environmental, technical, hydraulic) Enabling works (adequately identified & allowed in the estimate)	7%	9%	14%	7%
Project interfaces	External interfaces (identified and defined in terms of scope, access and risk) Project assessment (extended or short site and greenfield/brownfield)	5%	8%	12%	5%
Total contingency percentage to be adopted for an estimate with a 90% confidence level of not being exceeded:					35%
Total contingency percentage to be adopted for an estimate with a 50% confidence level of not being exceeded:					18%

Appendix S RFI Register

30012921: Reference Design for Mount Colah FB Renewal - RFI Register

Date printed: 09/12/20

RFI No.	RFI Description	Date issued	Issued by	Issued to	Date required	Status	Date response received
001	Request for CAD of existing survey	25/06/2020	Emaline Lim	Darshanee Nandakumar	30/06/2020	Closed	25/06/2020
002	Request for GHD CAD drawings	25/06/2020	Emaline Lim	Darshanee Nandakumar	30/06/2020	Closed	25/06/2020
003	Existing DSS and confirmation of coordinate system	25/06/2020	Emaline Lim	Darshanee Nandakumar	30/06/2020	Closed	8/07/2020; 16/07/20
004	Signalling files	26/06/2020	Emaline Lim	Darshanee Nandakumar	3/07/2020	Closed	6/07/2020
005	OHW structure diagram and layout plans	30/06/2020	Emaline Lim	Darshanee Nandakumar	7/07/2020	Closed	7/07/2020; 09/07/20
006	Design track alignment	30/06/2020	Emaline Lim	Darshanee Nandakumar	7/07/2020	Closed	30/06/2020
007	Services on existing footbridge	1/07/2020	Emaline Lim	Darshanee Nandakumar	3/07/2020	Closed	3/07/2020
008	Additional DSS	2/07/2020	Emaline Lim	Darshanee Nandakumar	9/07/2020	Closed	16/07/2020
009	Pedestrian Demand	6/07/2020	Emaline Lim	Darshanee Nandakumar	9/07/2020	Closed	9/07/2020
010	EODs rt115 and sy536 required	8/07/2020	Emaline Lim	Darshanee Nandakumar	13/07/2020	Closed	9/07/2020
011	11kV Feeder 649/1 - Pole Inspection Reports	8/07/2020	Emaline Lim	Darshanee Nandakumar	15/07/2020	Closed	08/07/20; 13/07/20; 21/07/20
012	11kV feeder 649/1 information	8/07/2020	Emaline Lim	Darshanee Nandakumar	15/07/2020	Closed	23/07/2020
013	Existing security and comms information	13/07/2020	Emaline Lim	Darshanee Nandakumar	17/07/2020	Closed	29/07/2020
014	Existing SSER Upgrade	13/07/2020	Emaline Lim	Darshanee Nandakumar	16/07/2020	Closed	14/07/2020
015	Existing Ausgrid Infrastructure	14/07/2020; updated (V1) sent on 16/07/20	Emaline Lim	Darshanee Nandakumar	23/07/2020	Closed	29/07/2020; 03/08/20
016	Emergency Egress	16/07/2020	Emaline Lim	Darshanee Nandakumar	23/07/2020	Closed	23/07/2020; backup supply provided. Fife life safety to be completed at detail design
017	Additional design track alignment	24/07/2020	Emaline Lim	Darshanee Nandakumar	30/07/2020	Closed	29/07/2020
018	Security incidents statistics	24/07/2020	Emaline Lim	Darshanee Nandakumar	31/07/2020	Closed	6/11/2020
019	REF input	10/08/2020	Emaline Lim	Darshanee Nandakumar	17/08/2020	Closed	19/08/2020
020	Ausgrid application details	11/09/2020	Emaline Lim	Darshanee Nandakumar	15/09/2020	Closed	14/09/2020
021	1500V Sectioning Diagram - Diagram 41	29/09/2020	Emaline Lim	Darshanee Nandakumar	5/10/2020	Closed	27/10/2020
022	Construction Plant and Equipment	6/10/2020	Emaline Lim	Darshanee Nandakumar	13/10/2020	Closed	23/10/2020
023	Fibre Optic Cable, Passenger Information and Security Category	6/10/2020	Emaline Lim	Darshanee Nandakumar	13/10/2020	Closed	19/10/2020; 20/10/2020; 30% comment register (RFI 23, Item b)
024	Electrical asset record/power log	7/10/2020	Emaline Lim	Darshanee Nandakumar	13/10/2020	Closed	19/10/2020
025	Power Study for 11kV network	19/10/2020	Zoe Gottstein	Darshanee Nandakumar	26/10/2020	Closed	24/11/2020
026	Construction sequence for REF	26/10/2020	Emaline Lim	Darshanee Nandakumar	5/11/2020	Closed	6/11/2020
027	Vibration Assessment for REF	4/11/2020	Emaline Lim	Darshanee Nandakumar	11/11/2020	Closed	6/11/2020
028	POD & EFS Information	9/11/2020	Emaline Lim	Darshanee Nandakumar	9/11/2020	Closed	9/11/2020
029	Cost estimation	4/12/2020	Emaline Lim	Darshanee Nandakumar	4/12/2020	Closed	8/12/2020

Appendix T Key Meeting Minutes

Meeting:

Meeting Title:	REF Kick Off Meeting	**Date:**	05 Aug 2020
Subject:	Reference Design for Mt Colah Footbridge Relocation	**Time:**	01:30 PM – 02:30 PM
Location:	Microsoft teams (Online)		
Copies:	Sydney Trains, SMEC		
Charge No:	30012921		
Attendees:	[redacted]		
Apologies:	-		

Agenda/Minutes:

Item	Item Details	Actions (by who & date)
1.0	**Welcome, Introduction of Attendees, Apologies & Meeting Agenda**	
	Meeting at SMEC's request to clarify REF scope.	-
	Format of meeting – review table of contents for the Sydney Trains REF template and scope out things that are not required.	-
2.0	**General**	
	The REF will be prepared using the 30% Reference Design, once reviewed by Sydney Trains. The REF will be prepared as one draft and one final only. Review comments from Sydney Trains will be provided to SMEC in the form of a consolidated comments register.	-
	"Proposal area" for investigation for the REF based on the designs, proposed construction compound, site access and ancillary facilities. SMEC to prepare RFI and submit to Sydney Trains. Darshanee to work with the Sydney Trains Major Works team to develop the proposal area/site boundaries including access points, site compounds and laydown areas and maximum potential construction area so SMEC can assess worst-case scenario.	SMEC
	All works would occur within Sydney Trains land. There may be temporary construction impacts on the land adjacent to the rail corridor (potentially one tree on Council land along the Pac Highway footpath, Pac Highway potential lane closures during construction, etc.). Emaline showed previous GHD survey which shows the trunk is outside of the rail corridor and in council boundary. Adrian shared sixmap showing that is it within Sydney Trian's corridor.	-
3.0	**Construction Methodology**	
	SMEC have prepared an indicative construction sequence which will be combined with the inputs from Sydney Trains for incorporation within the REF. The construction staging will be reviewed by Sydney Trains at 30% submission.	-
	SMEC will assume worst case scenario for construction plant and equipment. SMEC to develop construction methodology, plus plant and equipment for Sydney Trains review	-

	prior to inclusion in the REF.	
	SMEC to submit RFI for detail of earthworks, excavation and stockpiling. Darshanee to work with the Sydney Trains Major Works team to develop the proposal area/site boundaries	-
	SMEC to prepare a mark-up and kmz file of proposed vegetation clearing boundary. Desktop assessment of biodiversity impacts only. Adrian reviewed previous concepts and identified no listings for significant species in the area that are of concern. Anticipated this will be managed by typical controls (which is a biodiversity offset according to calculator). Tree protection where it can be prevented from removing. Arborist (lvl5) and fauna check. Sydney Trains does not see a need for a full biodiversity study due to limited footprint and no particular threatened species. SMEC will complete desktop assessment for due diligence.	-
	Source of funding is footbridge renewal program of works, which is part of the annual works program/maintenance funding. SMEC to request confirmation in RFI.	-
	Expected working hours (including justification of out of hours work, if relevant) details to be provided by Sydney Trains , likely all Possession works, staging likely to be as follows 1) enabling works, 2) construct new footbridge, 3) decommission. All anticipated to be under taken as 'Night Works', Friday 9pm-5am Monday. Short period of time doesn't generally trigger specialist study, can put in controls like intermittent reprieve.	-
4.0	**Scoping table**	
	• Landforms, geology and soil – Geotech report and previous investigations • Water quality and hydrology – scope out • Air quality – scope out. During demolition, potential lead paint on the bridge may lead to contamination issue. Air quality controls associated with decommissioning of the existing footbridge outside of the scope of this project. SMEC to note this in the REF. • Biodiversity – no specialist assessment, desktop only, supplemented by the landscape design report • Noise and vibration – Quantitative Construction and Maintenance Noise and Vibration Quantitative assessment tool. SMEC to include request for updated template in RFI. • Heritage – scope out. AHM search as due diligence. • Waste – desktop, REF to include potential lead paint on the existing bridge as mitigation measure. Adrian advised that the assessment cannot be undertaken for an unknown scope. Darshanee suggested discussion with major works on expectation around this. Adrian recommends leaving this out and they would need idea on the dates of removal. • Contaminated land and hazardous materials – no specialist assessment, desktop only • Visual aesthetics and urban design – visual impact assessment and landscape design/architects (Taylor Brammer) • Socio-economic effects – scope out. Adrian doesn't think it needs a detailed assessment as there is no major change to the area. • Traffic and access – desktop, REF to include high level assessment Details to be developed during Detailed Design (outside of the scope of this project)	-
5.0	**Close of Meeting**	
	SMEC to submit RFI with above queries.	12/08/20
	Adrian requested use of new REF template. SMEC to request for updated template in RFI.	-

Meeting:

Meeting Title:	SiD Follow up Design Meeting	**Date:**	05 Aug 2020
Subject:	Reference Design for Mt Colah Footbridge Relocation	**Time:**	03:00 PM – 04:00 PM
Location:	Microsoft teams (Online)		
Copies:	Sydney Trains, SMEC		
Charge No:	30012921		
Attendees:	[redacted]		
Apologies:	Shamal Pannila (Sydney Trains), Paul Simpson (Sydney Trains)		

Agenda/Minutes:

Item	Item Details	Actions (by who & date)
1.0	**Introductions and meeting agenda** • Proposed alternate option for relocation of 11kV on Up side • Up-side proposed ULX • Undergrounding of 11kV route on Down side • Requirement for backup supply	-
2.0	**Requirement for backup (alternate) supply** • Standards state that all stations with lifts for emergency evacuation require alternate supply. • EL/SR stated that the classification of the lift for emergency evacuation is pending the evacuation egress procedure developed by fire life safety (FLS) engineer. At this stage. EL stated that current approach is to assume alternate supply is not required and this project risk is transferred to detail design for confirmation by FLS. EL notes that previous concepts do not document alternate power supply. • SR stated that we intend to provide a list of implications in the report of the scope required should the lifts be classified as emergency evacuation e.g. 2nd supply, new transformer, ATS switch to minimize risk of transferring to detail design. • EL questioned the extent of input required from FLS. At this stage, it could just be confirmation that the lifts are not used for emergency evacuation and the evacuation plan developed at a later stage, • BP stated that from a major works perspective, it would be better to have an idea of the evacuation plan at this stage before proceeding to D&C. • VM stated that SMEC's logic make sense since it's an open-air station. It was suggested that DN contact Peter Chaney and get information from him to confirm if the lifts are to be designed as a critical service.	- - - - - DN (11/08/20)

3.0	**Proposed alternate option for relocation of 11kV on Up side** • JM queried if option has been chosen (down side or up side alignment). Option study needs to be documented in a concept options report. • DN stated that SMEC has been engaged for reference design. AECOM has done option study and their recommendation was for the down side undergrounding of 11kV. DN has been told that the upside option has been considered just prior to the meeting and discounted for some reason. SP might be able to shed light on why it was discounted. SMEC has not been engaged to develop options however, have identified this as a potential better solution. • DN requested that SMEC provide the presentation material for Sydney Trains review. Sydney Trains to advise if further investigation is required. DN notes that investigating this option will impact the reference design program. • WN stated that it would be good if the stakeholders can discount the option at the meeting to enable us to progress with the original down alignment however DN said this would not be possible. • WN presented high level alternate up side option. Aerial crossing from new pole 26A (country side of existing pole 26), buried route on up side and ULX crossing to new UGOH pole and connect aerial back to Pole 23. • JM stated that from project side and safety of project during construction this option described is better as you won't have any 11kV on pacific highway side. It will cross OHW with aerial conductor which is allowed in standard but not preferred. Preferred to have this portion as a ULX or on top of a structure. This option will increase the length of the cable compared to the down side option and will be more costly, JM thinks that technically, this option is better. Jai queried if crossing is possible on a portal. BP is not sure if there is currently a portal there. • WN agreed that underground would be a better but it'll be dependent on CAPEX. The ULX crossing would need to be further towards the country side as the area just north of the existing footbridge is in a cutting. • SMEC confirms the proposed aerial crossing won't be near existing platform. • OB stated there is an airbreak switch on pole 27. JM advised that this can be removed once the new padmount is installed. • BP stated that the reasons for why the up side was originally discounted need to be investigated. From construction perspective, there isn't any issue with this alternate option. • WN stated that original alignment is 250 m approx. in length. Alternate option is approximately 400 m. Other option will not have the cost of the ULX but this may be offset by reticulation required over bridge and the GST temporary arrangement around the footbridge lift and the second cutover required. • Both alignments will require 2 UGOHs. • BP stated that from a construction perspective, it could be difficult on the pacific highway • BP requested that DN involve someone from facilities in the follow up internal discussion. • JM stated that the cost of the whole project should be considered. If this additional cost is a small % of the total project, it should be considered. WOL cost should also be considered. • DN stated that in the long run the alternate option might be better.	- - SMEC (06/08/20) - - - - - - - - - - -
4.0	**Up-side proposed ULX** • ULX is proposed on the up-side for the guard indicator. WN presented 3 possible locations for the ULX was presented. 2 of the locations will require waterfall. Favourable position of the ULX is at the end of the maintenance track.	-

	• WN stated there is an opportunity to extend to new guard indicator location from existing connection.	-
5.0	**Undergrounding of 11kV route on Dn side** • WN noted that the sentiment from Sydney Trains from the SiD was the preference to underground as best as possible with no GST. • JM queried if the cutover is a change in the cable or joint in the cable. Joints cannot be used. Cable must be pulled through. This is another reason the UP side is reasonable. • WN stated that eliminating joints would require a rerun of the cable, which would depend on down time/construction time.	- - -
6.0	**Close of meeting and actions** • SMEC to send sketch of alternate option. WN to include alternative ULX crossing on country side for Sydney Trains' consideration. • SMEC to include high level pros/cons list for both alignments. • DN to organise internal discussion with asset and regional with ESI. Response to be provided early next week to enable design progression. • DN to obtain FLS advice.	06/08/20 06/08/20 11/08/20 11/08/20

Meeting:

Meeting Title:	Mt Colah Design Meeting – Electrical Scope	**Date:**	20 Aug 2020
Subject:	Reference Design for Mt Colah Footbridge Relocation	**Time:**	04:00-04:50
Location:	Microsoft teams (Online)		
Copies:	Sydney Trains, SMEC		
Charge No:	30012921		
Attendees:	[redacted]		[redacted]
Apologies:	N/A		

Agenda/Minutes:

Item	Item Details	Actions (by who & date)
1.0	**11kV relocation** • Sydney Trains reviewed SMEC alternate option along with AECOM Options 1 and Option 4. • Sydney Trains did not prefer AECOM Option 1 as the GST adjacent to the track provided minimal space for track maintenance personnel. Preference is Option 4. • Sydney Trains had several discussions regarding the options and has decided to retain the alignment on the down side. Reasons for this include the overhead aerial crossing of the track (which is not preferable). ULX crossing of the track will also require additional cabling to the north. The up-alignment will also require two crossings of the track. • SMEC requested clarifications on reasons behind preference for the Underbore (AECOM Option 4). Sydney Trains clarified that preference for Option 4 is to retain pole top transformer at pole 26 and the downside alignment. Underbore/trenching/GST solution would be up to SMEC as AEO to decide.	Note Note Note Note
2.0	**Padmount** • SMEC to review existing ausgrid supply and investigate if upgrade is possible as an alternative to the padmount transformer. Considerations will need to be made for: - Constructability – timing for installation/cutover - Demand and size of transformer - Available space for upgrade/location • Sydney Trains would like to retain Ausgrid supply if it can be upgraded at existing location. If this is not possible, alternate location will have to be considered and whether a Sydney Trains supply/Ausgrid is preferable. SMEC to investigate and propose suitable solution in reference design. • It was noted that existing Ausgrid is LV supply. SMEC needs to review if HV Ausgrid supply is required.	SMEC SMEC Note

	• SMEC to investigate if ASP3 design is required at this stage. Likelihood is that ASP3 design (if required) can be completed in detail design. SMEC to confirm. • If retaining existing Ausgrid supply location is not possible, SMEC to investigate new pad mount transformer which can be Sydney Trains or Ausgrid supplied.	SMEC Note
3.0	**Pole Top Transformer** • Sydney Trains' preference is to retain pole top transformer on pole 26.	 Note
4.0	**Backup supply** • Emergency supply to lift – battery supply to lifts (UPS) • Alternative supply – Sydney Trains to advise in the coming days. • SMEC to review at requirements in ESB002	 Note DN SR
5.0	**Other outstanding matters** • Signal sighting scheduled 25/08 was cancelled as Sydney Trains project engineer did not want to have 2 signal sightings. SMEC/Sydney Trains to arrange separate meeting to discuss • Sydney Trains is following on RFI 013, 015 and 018 • Item 4 above will resolve RFI016 • Architect ESI comment regarding performance solution is to be reviewed by Sydney Trains. At this stage, SMEC's understanding is to identify non-compliances and performance solutions required and have an understanding that these performance solutions are generally supportable. These are then to be developed at detail design. Sydney Trains to review and confirm if this is acceptable for now as it may be a risk. SMEC to proceed with current methodology for 30% reference design submission at this stage. • SMEC to advise availability to visit site for signal hut inspection on 25/08.	 EL DN Note Note EL
6.0	**Meeting close**	

Meeting:

Meeting Title:	Mount Colah Footbridge Signalling Discussion	**Date:**	3 September 2020
Subject:	Reference Design for Mt Colah Footbridge Relocation	**Time:**	4:00-4:30 pm
Location:	Microsoft teams (Online)		
Copies:	Sydney Trains, SMEC, JMDR		
Charge No:	30012921		
Attendees:	[redacted]		[redacted]
Apologies:	-		

Agenda/Minutes:

Item	Item Details	Actions (by who & date)
1.0	**Introduction and welcome**	
2.0	**Overview** • CA stated that Sydney Trains needs to review the signaling interface report prepared as part of GHD's concept options.	
2.0	**Existing Guard Indicator** • Meeting attendees reviewed existing signaling plan. Existing guard indicator is only for Up platform. • EL stated that the GI could be obstructed during construction however, this will be dependent on the construction methodology (extent of hoardings/fencing on platform). KR states that if signal is impacted by construction, it is likely that the existing guard indicator will need to be temporary relocated 2-3 m towards the Newcastle side. • Existing GI is non-compliant because it's back to back arrangement. • Existing GI are old incandescents. Replacement will require upgrade to LED. SMEC reference design to state this requirement. • Sydney Trains confirmed new guard indicator is not required for the Down platform as the signal is far from the end of the platform. • Sydney Train's preference is to avoid a temporary relocation of the signal and avoid 2 signal sightings. CA advised that it is preferable to mount the guard indicator at the final location and use a temporary cable via the existing route/extension of the existing cable until the new footbridge is in place for the new cable route. • EL queried the mounting of the new guard indicator. DM advised that Sydney Trains have mounted it on awnings and poles before. CA is not aware of any preference for mounting of the guard indicators. This is governed by the required position.	EL/KR/NK

3.0	**Signal Sighting** • Signal sighting was initially arranged for the 25th of August but subsequently cancelled by Sydney Trains. • CA stated that signal sighting would be formed after reference design. KR stated that this would mean the reference design would be based on assumptions. • DN queried the impacts of proceeding with assumptions (i.e. the proposed guard indicators are not at the required location). This would result in design changes and has risks as major works requires a firm reference going into D&C. Major works does not want changes going from reference to detail. • CA stated that Sydney Trains will start to convene the signal sighting committee during reference design as information on where the footbridge footings and potential obstructions are available. SMEC/JMDR is to issue the design with 'final location of guard indicator to be decided after outcome of signal sighting committee' and CA would have to return that with a certified copy. CA can make comments on the 30% design. • CA stated that the preference is to have a signal sighting committee confirmed prior to 100%. If the 100% design is issued without the signal sighting, this will not be a major hold point. Either way, Sydney Trains would need to start forming the committee following the 30% reference submission. • It was agreed that SMEC/JMDR is to proceed with assumptions and Sydney Trains will provide further direction following review of the 30% design submission.	
4.0	**Relocation of existing signal cable on Up Side**	
	• Existing -28- cable will need to be relocated as this is impacted by the new lift/bridge footing • CA stated that Sydney Trains would need to investigate the -28- and confirm what is in the cable and the equipment that would be affected by the disconnection and change over. Sydney Trains will need to work out the testing requirements and timelines of the work. • Impacts to the -28- route is not addressed in the current interface report.	CA
5.0	**Power Supply**	
	• Power supply for signaling is proposed to be from existing sources (pole mounted transformer and Ausgrid transformer) over the new footbridge. Cable route will be longer • Voltage drop calculations have been completed by JMDR. KR advised that cable sizes will need to be increased for the new route via the replacement footbridge due to the longer route and increased voltage drop. • CA advised that an electrical design will need to be undertaken to specify the requirements and cable size. If it is a 11kV, it is an electrical asset until it connects to the isolation transformer in the location cable.	EL
6.0	**Track insulation plan**	
	• Track insulation plan will be prepared by JMDR for the 100% submission and not the 30% submission.	NK/KR
7.0	**Signaling review**	
	• DN will copy CA and DM in the review of the 30% reference design submission.	DN
8.0	**Meeting Close**	

Appendix U Security Intelligence Assessment

For Official Use Only

Sydney Trains Intelligence
IAS 200 - MT Colah Railway station

Background

- An intelligence assessment of Mt Colah Station has been requested by Darshanee Nandakumar, Engineering Special Projects. The assessment is to be used to assess the security risks at the station using historical data for the financial years 2017/18 till 2019/20. Due to the low volume of reported security incidents at Mt Colah a short format assessment has been produced.
- Data relating to security incidents categorised as 'Offence *Against the Person'*, '*Anti-Social Behaviour*', '*Offences Against Property'* and '*Death / Self Harm'* at Mt Colah Station have been included in this document. Incidents in the rail corridor and on trains has been excluded.
- Rates of '*Personal Violence*' on the passenger rail network are generally ***very low***. The long term trend has steadily decreased, dropping from 5.9 incidents per million journeys in 2009 to 3.8 incidents per million journeys in 2020 (as of June 2020).
- Data used in this document has been cleansed by the removal improperly formatted and duplicated incidents and is correct as of October 27th 2020.
- Mt Colah railway station has a Protective Security Categorisation of 'D'.
- In February 2020 Mt Colah station recorded an average of 528 Opal trips per day.

Key Findings

- The number of security incidents recorded at Mt Colah station is **very low**, with a total of **24** for the three year period and an average of 7.5 incidents per year, no incidents were recorded in 2017/18. It is highly likely that the 2019/20 trend will continue to the next 6 – 12 months.
- The trend in reported security incidents at this location is in low level activity by juveniles such as loitering under the stairs inside the rail corridor, or sky larking on the platforms. Secondary trends involve young people damaging signage and indicator boards.
- There was no identified systemic trends involving violence towards staff or incidents of personal violence towards passengers at this location, future activity is likely to remain low and be sporadic in nature.
- *'Antisocial Behaviour'* (ASB) is very low with a total of **seven** incidents, five of which occurred in 2019/20. Activity is likely to remain low in the next six to 12 months.
- *'Offence Against Property'* is very low with a total of **12** incidents, seven of which occurred in 2019/20. Activity is likely to remain low in the next six to 12 months
- There is no evidence of '*Security Threats*' occurring at Mt Colah station with zero incidents involving explosive devices, firearms, weapons or sabotage of critical infrastructure reported since January 2017.
- There was a single rail fatality at Mt Colah, when a male was fatality struck by a train in an apparent '*Suicide'* in April 2020. Despite this incident Mt Colah is not considered a hot spot for rail fatalities over the three year period.

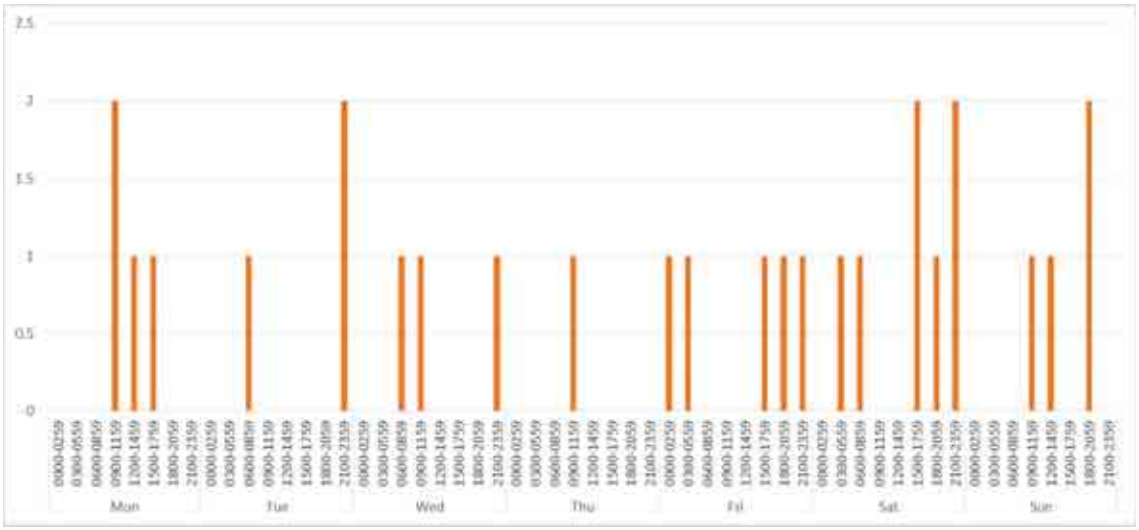
Summary

- The total number of security incidents recorded at Mt Colah station is **very low**, with a total of **23** for the three year period, with an average of 7.5 incidents per year. There is a mild upwards trend over the three period, due to an increase in reports of '*Offence Against Property*. There were no reported security incidents in 2017/18.

Transport Sydney Trains

Mt Colah Security Incidents	2017/18	2018/19	2019/20	Total
Anti-Social Behaviour	0	2	5	**7**
Offence Against Property	0	5	7	**12**
Offence Against The Person	0	0	0	**0**
Death / Self Harm	0	1	3	**4**
Annual Total	**0**	**8**	**15**	**23**

- Over all activity was slightly higher on Friday (**7**). Activity peaked between 9pm and 12am (**6**). No strong hot time was identified.



Antisocial Behaviour

- *'Antisocial Behaviour'* (ASB) is **very low** with a total of **seven** incidents over the three year period. There is a mild upwards trend over the three year period bit coming from an extremely low base. Activity is likely to continue at 2019/20 levels for the next 12 months.

Mt Colah ASB	2017/18	2018/19	2019/20	Total
Disregard For Community / Person	0	1	4	5
Misuse of Public Space	0	1	1	2
Annual Total	**0**	**2**	**5**	**7**

- ASB was more likely to occur from Friday through till Sunday (**3**), activity was higher between 3pm and 9pm (**4**). No hot time was identified.

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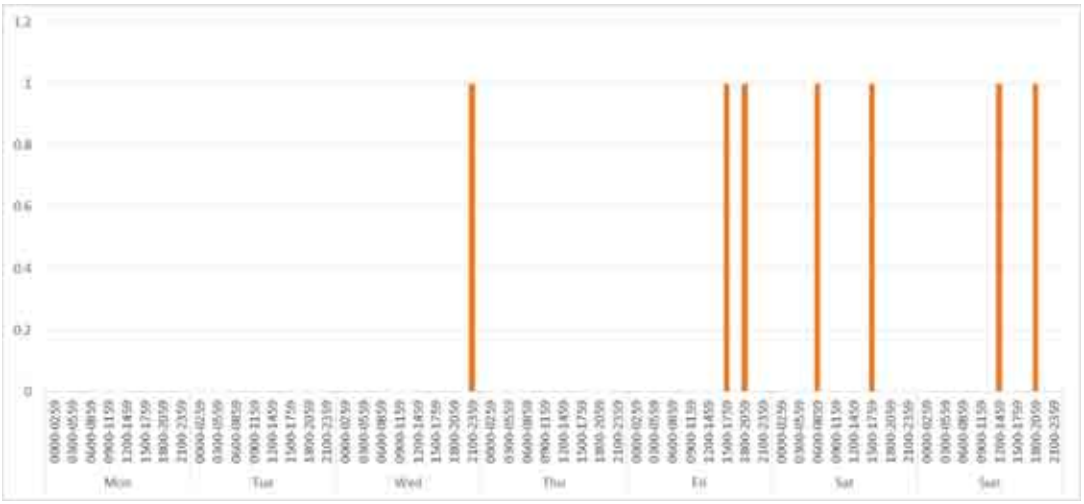


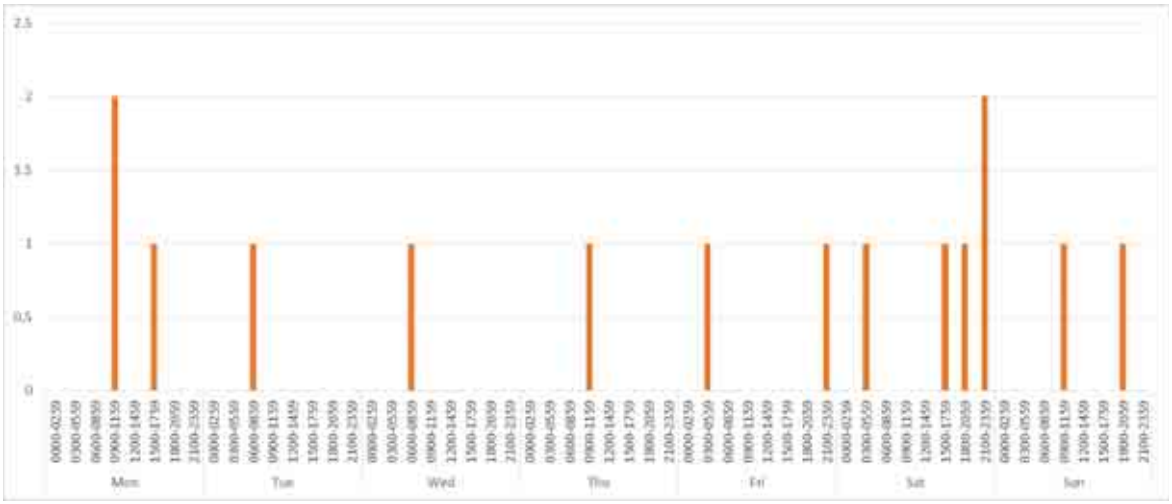
- **Antisocial Behaviour (7)** – is very low with no strong trends identified. There were two incidents that involved highly intoxicated passengers, the first in August 2018 involved an intoxicated female that was ejected from a train onto the platform by passengers in retaliation for her aggressive/offensive behaviour. The second occurred in January 2020 when a highly intoxicated female fell on the platform and was assisted by 2 juvenile males who had been smoking a water pipe in bushed on the platform. Two incidents involved juveniles engaged in skylarking behaviour such riding bicycles on the platform or play wresting. The remaining incidents included:
    a. A male shaking the Opal machine, setting off the tamper alarm.
    b. A male striking station seating and bins with a metal bar.
    c. A male urinating on the platform

Offence Against Property

- *'Offence Against Property'* at this location is **Very low** with a total of **15** incidents over the three year period. '*Trespass'* and '*Vandalism*' each accounted for 42% of *'Offence Against Property'* activity over the reporting period. There were no '*Equipment Interference'* or '*Fire / Arson'* incidents recorded. Property offences are on upwards trend, but are coming off an extremely low base, and it is likely to continue at 2019/20 levels for the next 12 months.

Mt Colah - Offence Against Property	2017/18	2018/19	2019/20	Total
Theft	0	1	1	**2**
Trespass	0	3	2	**5**
Vandalism	0	1	4	**5**
Annual Total	**0**	**5**	**7**	**12**

- Activity is slightly higher on Saturday (**5**), activity is more likely to occur between 9am and 12am (**4**). The hot times were Monday 9am till 12pm and Saturday 9pm till 12am (**2** each).



- **Trespass (5)** – accounts for 42% of activity. Three incidents involve juveniles walking off the end of the platform and loitering in the rail corridor under the stairs / pedestrian bridge while they waited for their trains. One incident involved a juvenile male that was standing on the wrong side of the platform gate at the city end of the station and the final incident involved two juvenile males who walked off the city end of the platform and threw ballast at a unit block adjacent the rail corridor
- **Vandalism (5)** – accounts for 42% of activity and was comprised of 'Graffiti' (1) and 'Malicious Damage' (4), there were no '*Object Thrown*' incidents were recorded.
    - **a.** Graffiti – the single incident involved non described graffiti being applied to the station toilets.
    - **b.** Malicious Damage – All the incidents describe damage to the indicator board/screens or station signage by small groups of adolescent males who kick or punch the screens resulting in damage.
- **Theft (2) –** activity was very low, there was a single incident that occurred on the station premises, when in January 2010 police investigated the fraudulent use of an Opal card. The remaining incident was a break and enter off railway land, police requested station CCTV in an attempt to track the POIs movements prior to the offence.

Offence Against The Person

- '*Offence Against The Person'* at this location is **very low** with no 'Steal from Person' '*Sexual Offences,*' '*Assaults'* 'or 'Robbery' incidents occurring on the station premises over the three year period.

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Death / Self Harm

- Over the reporting period there were **three** '*Threat Self-Harm'* and **one** apparent '*Suicide'* at Mt Colah station.
- **Threat Self Harm (3) –** there are no apparent links in threats of self-harm and no patients were identified in more than one incident. One incident involved a juvenile male who was taken into police custody after making threats to self-harm by jumping in front of a train. One incidents involved a juvenile female who sent messages to her family stating her intention to jump in front of a train. It is unclear if the patients in either incident ever entered the station. The third incident involved an adult male who sent text messages to his partner stating his intention to jump in front of a train, the patient was eventually located in rural NSW in the locality of Young.
- **Suicide (1) -** there was a single rail fatality that occurred in April 2020 when an adult male was fatally struck by a train in an apparent suicide after entering the rail corridor off the end of platform 2.

Document Review.

	Title	Name
Prepared By	Security Intelligence Analyst	Richard Snelson
Approved By	Manager Counter Terrorism and Security Strategy	Sean Godkin

End Notes

Criminal Incidents: Analysis of reported *'criminal*' incidents occurring on '*railway station premises*'. This information is provided by the Bureau of Crime Statistics & Research (BOCSAR) and sourced from the NSW Police Force Computerised Operational Policing System (COPS). The release of BOSCAR information occurs each quarter with the most recent release being for the period ending June 2018.
This assessment will consider the crime types which can be described as '*Personal Violence*' in nature and included the crime types of '*Assault*', '*Robbery'* and '*Unwanted Sexual Behaviour*'. Not considered was '*police generated crime*' like '*Assault Police*', '*Resist Arrest*' or '*Anti-Social Behaviour*' as these types of crime are substantially influenced by the levels of proactive policing activity and enforcement.

Security Incidents: Sydney Trains maintains two databases for reported '*security incidents*'. The '*Security Reporting System*' (SRS) came into use from 2005 and is the principle means available to staff at railway stations for reporting '*Security Incidents*'. In 2018 Sydney Trains commenced replacing the SRS system with the '*Rail Emergency Management*' (REM). Sydney Trains Security combines data from both systems to provide a consolidated analysis of reported '*security incidents*'.
Sydney Trains has employed a classification system for describing '*security*' incidents which is similar to that used by BOCSAR and the NSW Police Force when describing the nature of reported crime within the context of the broader legal framework for New South Wales. The descriptions of '*Security Incidents*' by Sydney Trains may contain less factual rigor than applied when recording '*criminal*' incidents. For the purpose of this assessment '*Security Incidents*' should be considered sufficiently reliable for describing public and employee perceptions of crime and safety.

Passenger Journeys: Identified the number of passenger journeys on the passenger rail network. This information is provided to Sydney Trains by Transport for NSW (TfNSW) and was collected using the two key ticketing systems (the new '*Opal*' Ticketing System or former RailCorp Ticket Reporting System '*TRS*').

Appendix V Issues Register

SMEC
Member of the Surbana Jurong Group

Project No. 30012921
Project Name Reference Design for Mt Colah FB Replacement
Date 9/12/2020

ISSUES / ACTIONS REGISTER

Below are a summary of key issues. Refer to reference design report 30012921-GE-R-01 for further details.

Issue & Actions Register										
No	**Issue**	**Date Raised**	**Stakeholder (if applicable)**	**Actions Required**	**When**	**Who Responsible**	**Variation / Scope Change**	**Status**	**Closeout Date**	**Closeout Comments**
1	Requirement for alternate/backup supply - requirement to be confirmed and extent i.e. is it required only for new lifts/full station.	31/07/2020	Sydney Trains	SMEC to consult with ASA on alternate supply requirements as per Clause 5.3 of T HR SS 80002 ST. Sydney Trains to confirm backup supply requirement (including consultation with FLS).	2/09/2020	SMEC/Sydney Trains	No	Closed	2/10/2020	Sydney Trains advised that full alternate/backup supply (station and lifts). Main supply to be from new 11kV/415V padmount and backup supply to be from Ausgrid.
2	Main power supply (Ausgrid vs Sydney Trains)	11/09/2020 & Tender clarification	Sydney Trains, Ausgrid	SMEC to liaise with Ausgrid and investigate scope to use Ausgrid for main supply to station/footbridge	21/09/2020	SMEC	No - as agreed in tender clarification	Closed	21/09/2020	SMEC investigated Ausgrid supply and recommended 11kV/415V padmount for the main supply. Sydney Trains agreed with proposal to use the 11kV/415V padmount for main supply.
3	Ausgrid supply options	11/09/2020 & Tender clarification	Sydney Trains, Ausgrid	SMEC to submit connection of load application to Ausgrid to confirm the 3rd party supply inputs.	2/09/2020	SMEC	**Yes - approved Variation 01**	Closed	21/09/2020	SMEC submitted application on 14/09/20. Ausgrid provided preliminary high level options on 21/09/20 via email. Options were investigated as part of reference design, with Sydney Trains choosing Option 2 as the preferred for the backup supply. Refer to Appendix I of 30012921-GE-R-01 for details.
4	Signal Sighting - Signal sighting is required to confirm position of final and temporary (if required) guard indicator	23/07/2020	Sydney Trains	Sydney Trains to arrange a signal sighting committee.	31/08/2020	Sydney Trains	No	Open	3/09/2020	Signal sighting arranged for 25/08/20 was cancelled. Subsequent meeting on 03/09/20 between SMEC/JMDR and Sydney Trains confirmed that signal sighting to be undertaken following 30% submission if possible and incorporated into the 100% if available. The signal sighting had not been undertaken during submission of 100% and final reference design. Update 12/11/2020: A non-compliance was identified with the proposed GI on the lift shaft following internal Sydney Trains Signalling review. Recommendation is to have an additional GI pointing country on a separate pole, roughly about 50- 70m towards Sydney from the new lift shaft. Final position of GI shall be determined by a signal sighting committee following completion of reference design. ST preference is to keep the existing GI at the current position and extend the GI/ bracket out towards the track to assist construction should be investigated further as part of the temporary works design. This has been documented in the 100% reference design.
5	Ausgrid supply options. *Note: Alternate power supply requirement - Sydney Trains commented on 30% reference design submission that connection to Ausgrid should account for the full capacity of the 200kVA 415/415v isolation transformer. Ausgrid application submitted on 14/09/20 by SMEC was based on required full station + footbridge load of 117 kVa (170 A)*	2/10/2020	Sydney Trains, Ausgrid	SMEC to complete optioneering on the three options provided by Ausgrid (including scoping, risks and cost estimate). SMEC to liaise with Sydney Trains and confirm requirement for back up supply capacity. Sydney Trains to nominate preferred option to be documented in 100% reference design.	3/11/2020	SMEC/Sydney Trains	**Yes - approved Variation 02**	Closed	10/11/2020	Sydney Trains advised preferred Ausgrid option for alternate power supply is Option 2 - Modifications to Ausgrid Supply on Telopea St. North. Refer to Appendix I of 30012921-GE-R-01 for details. Sydney Trains also provided the following comments on the option: • There is no need for making the back-up supply future-proof. Alternate supply to make provision for station, lift and signalling + 30% spare as required by ASA standards. • Stakeholders preferred either Option 1 or Option 2. Alternate supply from the same side where the current Signal Loc (on the Up side) is preferred. Minimising cable length to the Signal Loc is an important consideration. • Cost difference between the three options is marginal. • ATS for the Station supply to be in the Station Equipment Room and the ATS to the Signal Loc to be at the Signalling power room on the down side.
6	Existing SSER room is non-compliant	13/07/2020	Sydney Trains	RFI raised to Sydney Trains identifying non compliance and direction. Sydney Trains to provide direction. Non-compliance to be documented by SMEC in reference design submission.	16/07/2020	Sydney Trains	N/A	Open	14/07/2020; 18/11/2020	As determined by Sydney Trains, upgrades to existing SSER is outside of current reference design scope. Scope for upgrades to the SSER should be addressed by Sydney Trains and resolved by detail design team.
7	Additional CCTV cameras will likely require expansion of back end and rack capacity. Refer comment no 141 in comment register.	28/10/2020	Sydney Trains	Sydney Trains Ops Tech team to provide further clarification on scope.	18/11/2020	Sydney Trains/ Detail Designer	N/A	Open	17/11/2020	This issue shall be resolved at detailed design. The detail design should contact Steve Jaksich, CCTV Project Senior Lead Steven.Jaksich2@transport.nsw.gov.au for more details.
8	A security Risk Assessment is required to comply with T MU SY 20001 ST specifically Section 2.2	28/10/2020	Sydney Trains	Requirement to be identified in reference design report.	N/A	SMEC/Detail Designer	N/A	Open		Detailed security risk assessment should be undertaken at detail design. Detail design should ensure that Sydney Trains Security Intelligence is advised with minimum 4 week notice to provide Intelligence Assessment.
9	Biodiversity assessment for devegetation	6/07/2020	Sydney Trains	Sydney Trains has undertaken a review and have advised that no significant specifies have been listed in the area and vegetation clearing will be managed by typical controls. This assumption has been adopted for the development of the reference design. SMEC to document requirement for assessment at reference design.	N/A	SMEC/Detail Designer	N/A	Open		A specialist Biodiversity Assessment Report should be carried out at the Detailed Design stage of the works to fully assess the potential biodiversity impacts of the proposal. The Biodiversity Assessment Report will be carried out in accordance with the NSW BC Act and Biodiversity Assessment Method. Any relevant offsets would be calculated using the Sydney Trains Biodiversity Offset Calculator and Biodiversity Offset Scheme.
10	Arborist report	6/07/2020	Sydney Trains, Hornsby Council	An Arborist Report must be prepared at the Detailed Design stage of the proposal to develop a plan for any proposed tree removal or trimming. SMEC to document requirement at reference design.	N/A	SMEC/Detail Designer	N/A	Open		An Arborist Report must be prepared at the Detailed Design stage of the proposal to develop a plan for any proposed tree removal or trimming. It is likely that a Tree Clearing Permits would be required through Hornsby Shire Council *https://www.hornsby.nsw.gov.au/environment/flora-and-fauna/tree-management/application*. Any permits, notices or approvals relating to tree clearing would be managed by Sydney Trains at Detailed Design stage of the proposal

SMEC
Member of the Surbana Jurong Group

Project No. 30012921
Project Name Reference Design for Mt Colah FB Replacement
Date 9/12/2020

ISSUES / ACTIONS REGISTER

Below are a summary of key issues. Refer to reference design report 30012921-GE-R-01 for further details.

Issue & Actions Register										
No	**Issue**	**Date Raised**	**Stakeholder (if applicable)**	**Actions Required**	**When**	**Who Responsible**	**Variation / Scope Change**	**Status**	**Closeout Date**	**Closeout Comments**
1	Requirement for alternate/backup supply - requirement to be confirmed and extent i.e. is it required only for new lifts/full station.	31/07/2020	Sydney Trains	SMEC to consult with ASA on alternate supply requirements as per Clause 5.3 of T HR SS 80002 ST. Sydney Trains to confirm backup supply requirement (including consultation with FLS).	2/09/2020	SMEC/Sydney Trains	No	Closed	2/10/2020	Sydney Trains advised that full alternate/backup supply (station and lifts). Main supply to be from new 11kV/415V padmount and backup supply to be from Ausgrid.
11	Consultation with Hornsby Shire Council	24/06/2020	Sydney Trains, Hornsby Council	Sydney Trains to undertake liaison with council. Consultation with Hornsby Shire Council is required for anticipated construction works, impacts to existing footpaths and local traffic committee approval for proposed kiss 'n' ride and DDA parking on Pierre Close. SMEC to document requirement for consultation.	N/A	Sydney Trains	N/A	Open		Consultation with council shall be undertaken at detail design for proposed changes to the precinct.
12	Colour of polycarbonate screen	18/11/2020	Sydney Trains, ASA	Coloured visually transparent polycarbonate panels have been proposed at reference design. Use of colour has been queried by Sydney Trains stakeholder.	N/A	Detail Designer	N/A	Closed	7/12/2020	~~Detail design to further develop architectural design and liaise with ASA if required.~~ Polycarbonate screens have been changed to clear, colourless following 100% reference design.
13	BCA/DDA performance solutions	26/11/2020	Sydney Trains	Potential performance solutions have been identified at reference design.	N/A	Detail Designer	N/A	Open		Detail designer shall review and obtain performance solutions for proposed non-compliances. Anticipated performance solutions required for the following, based on reference design: - Fire life safety engineer to complete assessment and review egress paths - Non-compliant risers - Ventilation of lift shaft (subject to further assessment by mechanical/structural engineer at detail design) - Use of polycarbonate screening (subject to further review by fire engineer and classification by detail design BCA consultant)
14	Existing sewer in platform (not on DSS; traced on reference design drawings based on available VPR drawing)	22/08/2020	Sydney Trains/Sydney Water	SMEC to document issue in reference design report and drawings.	N/A	Detail Designer	N/A	Open		Existing sewer on platform should be located and surveyed at detail design. Detail designers should design relocation of the sewer if affected by construction works.
15	Existing non-compliant drainage system	22/08/2020	Sydney Trains	SMEC to document existing non-compliance in reference design report and drawings.	N/A	Detail Designer	N/A	Open		The existing drainage pipes have minimal cover (less than 300 mm) and the proposed regrading works to make the area DDA compliant will likely reduce this cover further. Additionally, the existing platform drainage pipes are less than 1% grade and likely to have maintenance issues due to them consisting of ageing clay pipes. The outlet arrangement should be confirmed. Based on observations from a recent site inspection, there is a possibility that the platform drainage is connected into the sewer line which would need to be rectified as part of the proposed works. It is recommended that as part of the detailed design scope, additional survey and CCTV be undertaken on the existing drainage to determine the condition and outlet arrangements which will determine the extent of upgrade works required.
16	Pulling tensions	22/08/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		All cable pulling calculations should be undertaken as part of detail design.
17	OCDN available Bandwidth.	22/08/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		OCDN available Bandwidth should be confirmed by Sydney Trains/Indra at detail design.
18	ASA Checklist	2/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		ASA checklist should be provided at completion of detail design demonstrating compliance to ASA standard requirements.
19	CCTV cameras	3/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		1. Location of cameras should be reviewed and adjusted as required during detail design 2. Additional cameras should be provided to provide compliant coverage to platform (currently out of reference design scope) 3. Comments no. 159-168 in comment register to be reviewed at detail design. This includes investigation for SSER room upgrade, rack size upgrade, consolidation of ETS into a rack, number of cameras and enabling works for temporary arrangement for cameras, UPS capacity investigation, enabling stage for TVM, streamlining of station services
20	Glazing on lift shaft	2/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Detail design should review and minimise glazing on lift shaft.
21	Louvers on lift shaft	7/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Detail design should investigate removal of louvers on the suothern side of the lift.
22	Cladding on lift shaft	2/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Detail designer should investigate removal of cladding on lift. Sydney Trains' preference is for a concrete lift shaft finish with no cladding.
23	Relocation -28- service on Up Side	8/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		As discussed with Sydney Trains 08/12/20, it was agreed that the current reference design should show separate pits for signalling and communication services to provide compliant design to ASA standards. The detail designer should investigate the reuse of the existing pits and if viable, obtain approval from ASA/Sydney Trains. Refer to comment no. 169 in the comment register for further details.
24	AFIL	3/12/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Final location and extent of AFILs to be determined at detail design,
25	Siganalling power	30/11/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Detailed signalling power calculation shall be undertaken at detail design.
26	LED GI Upgrade	30/11/2020	Sydney Trains	N/A	N/A	Detail Designer	N/A	Open		Conversion of GI to LED type will require Westlock data change. Detail Design to consider Westrace data changes as required for LED GI upgrades
27	Soil resistivity	21/08/2020	Sydney Trains, RMS	SMEC undertook soil resistivity testing on the 21/08/2020, refer to Appendix J for illustration of soil resistivity test locations and test results. Soil test could not be carried out at the proposed Location 2 (property owned by RMS) as access into the land has not been approved at time of testing. The soil resistivity measurements have shown inconsistency in both test traverses at Location 1 due to sloped terrain.	N/A	Detail Designer	N/A	Open		Additional soil resistivity testing should be undertaken by the detail designer.

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Appendix B - Biodiversity

Land Eco consulting

Flora and Fauna Impact Assessment Report

for

Mount Colah Railway Station
Footbridge Renewal
NSW 2079

13 July 2022

Report:	Flora and Fauna Impact Assessment Report for Mount Colah Railway Station Footbridge Renewal NSW 2079
Prepared for:	Sydney Trains
Prepared by:	Land Eco Consulting
Date:	13 July 2022
Version:	Final 1.0

Land Eco Pty Ltd
www.landeco.com.au

Report Certification

This report was prepared by:

Name	Company /Position	Role
[redacted]	Land Eco Consulting Ecologist	Report compilation
[redacted]	Land Eco Consulting Principal Ecologist	Field survey Report review

Document Control

Version	Document Name	Date
Draft 1.0	Flora and Fauna Impact Assessment Report for Mount Colah Railway Station Footbridge Renewal NSW 2079	4/07/22
Final 1.0	Flora and Fauna Impact Assessment Report for Mount Colah Railway Station Footbridge Renewal NSW 2079	13/07/22

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Glossary

Acronym/ Term	Definition
Activity	See definition for development below
APZ	Asset Protection Zone
BAM	Biodiversity Assessment Method (NSW)
BC Act	New South Wales Biodiversity Conservation Act 2016
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
DA	Development Application
DCP	Development Control Plan
Development	The use of land, and the subdivision of land, and the carrying out of a work, and the demolition of a building or work, and the erection of a building, and any other act, matter or thing referred to in section 26 that is controlled by an environmental planning instrument but does not include any development of a class or description prescribed by the regulations for the purposes of this definition (Environmental Planning and Assessment Act 1979).
DPIE	Department of Planning Industry and Environment
EEC	Endangered Ecological Community
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
ha	Hectares
Km	Kilometre
KTP	Key Threatening Process (as listed in the BC Act)
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	The area within a 10km radius of the Subject Land. The same meaning when describing a local population of a species or local occurrence of an ecological community.
m	Metres
mm	Millimetres
NPWS	NSW National Parks and Wildlife Services
NSW	The state of New South Wales, Australia
OEH	Office of Environment and Heritage (now the Department of Planning Industry and Environment)
Proposal	The development, activity or action proposed.
ROTAP	Rare or Threatened Australian Plants
SIS	Species Impact Statement pursuant to s. 5A of the Environmental Planning and Assessment Act 1979
Subject Land	Location of the proposed footbridge and associated works within the Subject Property.
Subject Property	Mount Colah Railway Station NSW 2079
Threatened species, populations and ecological communities	Species, populations and ecological communities specified in Schedules 1, 1A and 2 and *threatened species, population or ecological community* means a species, population or ecological community specified in any of those Schedules.
TPZ	Tree Protection Zone

1. Introduction

1.1 Background and Project Proposal

Land Eco Pty Ltd (Land Eco) was engaged by Sydney Trains to deliver a Flora and Fauna Impact Assessment Report (FFA) for the proposed Mount Colah Railway Station Footbridge Renewal situated on the Pacific Highway adjoining Lot 106 DP928591 and on Pierre Close adjoining Lot 1 DP1172693, Mount Colah, NSW 2159 **(Figure 1**). Here forward referred to as the 'Subject Property'.

The proposed development activity has been assessed in accordance with Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) as a 'Public Works Activity'. The Review of Environmental Factors (SMEC 2020) provides more information regarding the design and planning of the proposed activity.

This impact assessment examines the significance of impact of the project in accordance with section 7.2 and 7.3 of the NSW Biodiversity Conservation Act 2016 (BC Act).

Appropriate impact mitigation measures and offsets are proposed as required under "*Sydney Trains Biodiversity Offsets Calculator Environmental Management System EMS-06-WI-0177*".

1.1.1 Proposed Activity

The proposed activity includes demolition of the existing pedestrian overpass, construction of a new pedestrian overpass linking Pierre Close with a 'kiss and go' drop off and pick up, lift access to the street on the pacific highway and new landscaping (Figure 2Figure 3). The footprint of the proposed activity including the footbridge and associated infrastructure (referred to as 'the Subject Land') covers an area of 2926 m^2 (0.29 ha).

1.1.2 Proposed Impact

One threatened ecological community (TEC) listed under the NSW Biodiversity Conservation Act 2016 (BC Act) will be impacted by the proposed activity:

- Duffys Forest Ecological Community in the Sydney Basin Bioregion (Duffys Forest) Endangered Ecological Community (EEC)

This comprises a previously unmapped extent of this EEC, located on the northbound side of the Mount Colah rail corridor. The entirety of this EEC (792 m^2; 0.08 hectares) within the Subject Land is proposed for removal.

Additionally, 1786 m^2 (0.18 ha) of non-threatened remnant native vegetation belonging to Sydney North Exposed Sandstone Woodland and 348 m^2 (0.03 ha) of mixed exotic/native will be removed to facilitate the proposed activity.

Habitat for locally occurring threatened fauna species listed under the BC Act will be impacted by the activity. Two hollow-bearing trees that provide suitable roosting and possibly breeding habitat for threatened microbats will be removed for the proposed activity. A suite of threatened fauna are also likely to forage in and around the canopies of these trees and shrubs.

The proposed Mount Colah Railway Station redevelopment plans require the removal of 19 trees and shrubs on Council-managed land (Sydney Arbor Trees 2022) (**Figure 2**), however Land Eco identified an additional 45 native trees that are within the proposed development footprint that are likely to be removed, including two hollow-bearing trees (**Figure 7**).

1.1.3 Site Description and Location

The Subject Land is located in between the Pacific Highway and Pierre Close in the suburb of Mount Colah. It is the subject of an existing railway station in the centre of the Mount Colah township. Native vegetation occurs along the railway corridor though it is severely weed-infested. Most of the surrounding land holdings are low density residential land holdings and public facilities, giving way to dense remnant vegetation within Berowra Valley National Park and Ku-ring-gai Chase National Park.

1.1.4 Soils and Geology

The Subject Land occurs on the 'Lucas Heights' soil landscape (NSW DPIE 2021e). This soil landscape is described as having gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes <10%. Rock outcrop is absent. Extensively or completely cleared, dry sclerophyll low forest and woodland.

1.1.5 Hydrology

No mapped watercourses run through the Subject Land (NSW Spatial Services 2021). The nearest mapped watercourse is a tributary to Calna Creek, approximately 170m from the Subject Land.

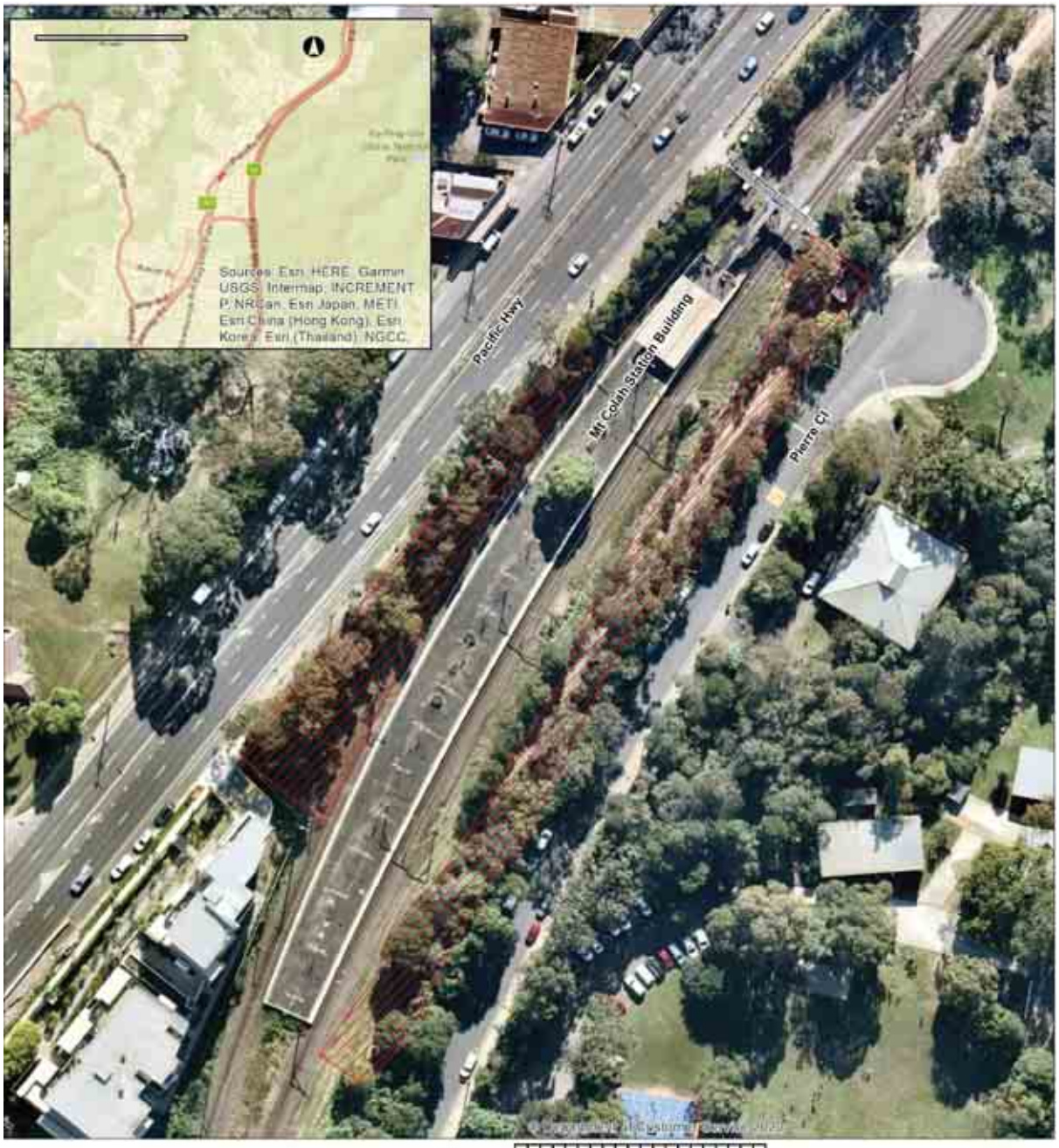
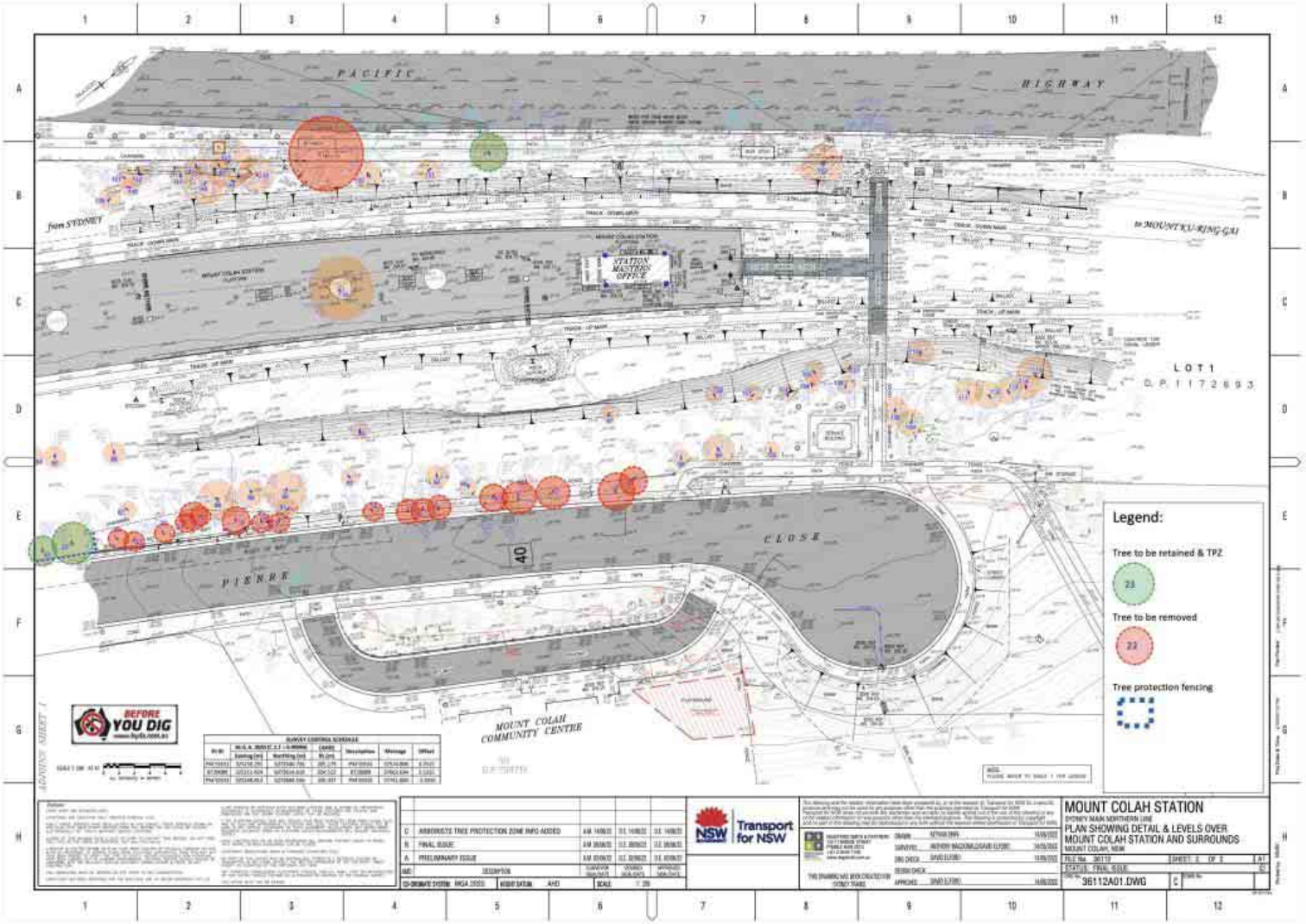


Figure 1. Location of the Subject Land in the broader landscape context



TMP01 (NOT TO SCALE)

Figure 2. Aboricultural Plan showing locations of tree removal (Sydney Arbor Trees 2022))

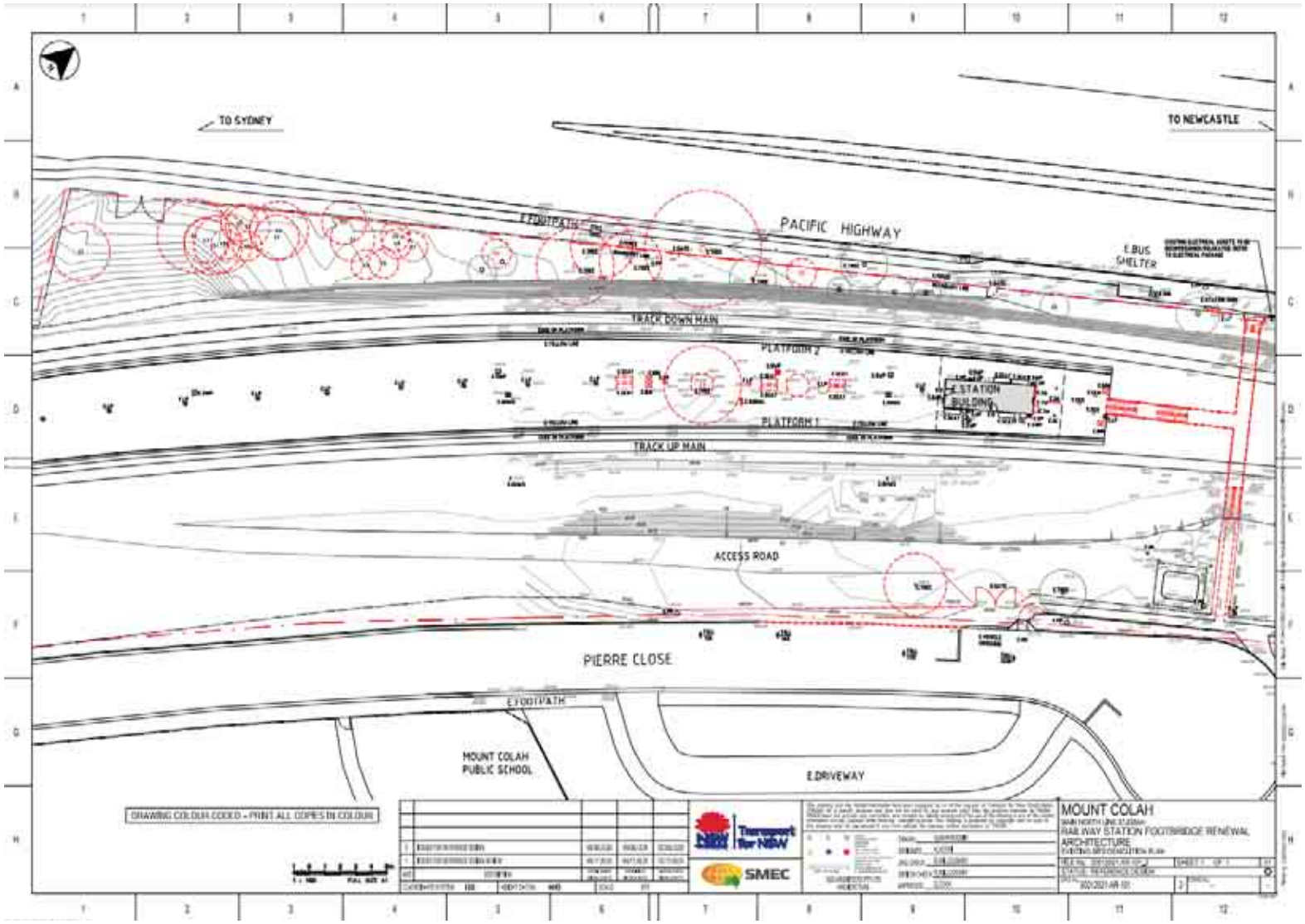


Figure 3. Development plans for the proposed activity including tree removal (CCG Architects 2020)

1.2 Matters for Consideration

The following list of legislation and policy are addressed in this report (**Table 1**).

Table 1. Relevant Legislation and Policy Addressed

Legislation/ Policy	Relevance	Triggered	Action Required
Environmental Planning and Assessment Act 1979 (EP&A Act)	The proposed activity is being assessed under Part 5 of the EP&A Act. Development consent from council is not required.	Yes	In accordance with Division 5.5 and 5.7 of the EP&A Act, Sydney Trains, as the proponent and determining authority, must examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity.
Environment Planning and Assessment Regulation 2000 (EP&A Regulation)	The proposed activity is being assessed under part 5 of the EP&A Act.	Yes	A Review of Environmental Factors has been prepared in accordance with clause 228 of the EP&A Regulation, informed by this Flora and Fauna Report.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	There are no Matters of National Significance (MNES) on the Subject Land. Berowra Valley National Park and Ku-ring-gai Chase National Park will remain unimpacted.	No	No further action.
Biodiversity Conservation Act 2016 (BC Act)	Sydney Trains have opted into their internal offset scheme and consequently will not require a BDAR to assess the impacts of this activity under the BC Act.	No	No further action required.
Biosecurity Act 2015 (Bio Act)	Seven priority weeds for Greater Sydney (*Olea europaea* subsp. *cuspidata, Lantana camara, Chrysanthemoides monilifera* subsp. *monilifera*, *Rubus fruticosus agg. Asparagus asparagoides, Asparagus aethiopicus, Senecio madagascariensis*) including six Weeds of National Significance were identified within the Subject Land (NSW Department of Primary Industries 2022).	Yes	The biosecurity duties for these species must be carried out. These species must be eradicated during bush regeneration efforts.
Water Management Act 2000 (WM Act)	The are no mapped watercourses to be impacted by the proposed development.	No	No further action.
State Environmental Planning Policy (Biodiversity and Conservation) 2021 Chapter 4 Koala Habitat Protection	The Subject Land is in a Local Government Area listed in Schedule 1, and Schedule 2 Koala use tree species are present. The Subject Land is not considered to be 'core koala habitat' as it is not considered highly suitable for koalas and is not an area of land with recent proximal koala records.	No	No further action.
State Environmental Planning Policy (Infrastructure) 2007	The activity is classified as a 'rail infrastructure facility' under Part 3 Division 15 Subdivision 1 of the SEPP (Infrastructure) 2007 and is permitted without development consent.	No	The REF (SMEC 2020) addresses the necessary and due diligence planning requirements for this activity.

1.3 State Environmental Planning Policy (Biodiversity and Conservation) 2021: Chapter 4 Koala Habitat Protection (NSW DPIE 2021f)

The Subject Land is located within a Local Government Area listed in Schedule 1 of the Koala Habitat Protection SEPP. Eight species of 'Koala Use Tree Species' (OEH 2018, NSW DPIE 2021f) were identified within and near the Subject Land, though only six with documented koala use in the Central Coast Koala Management Area (**Table 2**). A review of NSW Wildlife Atlas (BioNet) (NSW DPIE 2021c) revealed 20 koala records in the 10km locality surrounding the Subject Land. The closest record is located ~600m west of the Subject Land in 1968 near the edge of Berowra Valley National Park, while the second closest is located ~1.2km south-east of the Subject Land in 1970 in Ku-ring-gai Chase National Park. The Subject Land is not considered to be 'core koala habitat' as it is does not contain highly suitable koala habitat or have koalas recorded present in the previous 18 years.

Table 2. Koala use tree species identified on the Subject Land (OEH 2018)

Species	Documented Koala Use in Central Coast Koala Management Area
Allocasuarina littoralis	Low use
Angophora costata	Low use
Angophora hispida	No sourced evidence of use
Corymbia gummifera	Significant use
Eucalyptus haemastoma	Low use
Eucalyptus punctata	Regional high use
Eucalyptus sieberi	High use
Lophostemon confertus	No sourced evidence of use

2. Methods

2.1 Sources of Information Used

A thorough literature review of local information relevant to the locality and the Hornsby Shire Local Government Area (LGA) was undertaken. Relevant literature that was reviewed in preparation of this report included:

- Relevant State and Commonwealth Databases
  - Protected Matters Search Tool (Commonwealth of Australia Department of the Environment 2022)
  - NSW BioNet. The website of the Atlas of NSW Wildlife (DPIE 2022c)
  - Atlas of Living Australia Spatial Portal (ALA 2022)

- Vegetation and Landscape Mapping
  - eSpade Soil and Land Information (DPIE 2022f)
  - The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489 (OEH 2016)
  - Hornsby Vegetation Map Update 2017 Prepared for Hornsby Shire Council (Ecological Australia 2017)

- Council Documents
  - Hornsby Local Environmental Plan (LEP) 2013
  - Hornsby Development Control Plan (DCP) 2013
  - Flora and Fauna Assessment Guidelines for Development Applications (Hornsby Shire Council 2006)

- Additional Documents
  - Mount Colah Footbridge Review of Environmental Factors (SMEC 2020)

Online databases and literature review were utilised to gain an understanding of the natural environment and ecology of the Subject Land and its surrounds to an area of approximately 10 km². Searches utilising NSW Wildlife Atlas (DPIE 2021c) and the Commonwealth Protected Matters Search Tool (Commonwealth of Australia Department of the Environment 2021) were conducted to identify current threatened and migratory flora and fauna records within a 10km² search area centred on the Subject Land. This data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent the Subject Land and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain an understanding of the environment on the Subject Land and assist in determining whether any threatened flora or ecological communities may occur there (NSW DPIE 2022f).

2.2 Ecological Site Assessment

The following sections of this report detail the site assessments undertaken by Land Eco including the survey methods and the weather conditions experienced in the lead-up and during each assessment.

2.2.1 General Survey

Site assessment was undertaken by a Land Eco Consulting Ecologist on 26th May 2022. During the site assessment, the following activities were carried-out:

- Identifying and recording the vegetation communities present on the Subject land, with a focus on identifying any threatened ecological communities (TEC);
- Searching for threatened species, species diagnostic of threatened ecological communities and priority weeds;
- Recording opportunistic sightings of any fauna species seen or heard within the immediate surrounds of the Subject land;
- Identifying and recording the locations of threatened fauna habitat such as important nesting, roosting or foraging microhabitats;
- Targeting the habitat of any threatened and regionally significant fauna including:
    - Tree hollows (habitat for threatened large forest owls, parrots, cockatoos and arboreal mammals);
    - Caves and crevices (habitat for threatened reptiles, small mammals and microbats);
    - Termite mounds (habitat for threatened reptiles and the echidna);
    - Soaks (habitat for threatened frogs and dragonflies);
    - Wetlands (habitat for threatened fish, frogs and water birds);
    - Drainage lines (habitat for threatened fish and frogs);
    - Fruiting trees (food for threatened frugivorous birds and mammals);
    - Flowering trees (food for threatened nectarivores mammals and birds);
    - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals), and
    - Any other habitat features that may support fauna (particularly threatened) species.
- Assessing the connectivity and quality of the vegetation within the Subject land and surrounding area.
- Identifying the species and habitat values of all trees proposed to be removed.

2.2.2 Vegetation Community Assessment

Land Eco examined local satellite imagery, geological mapping, soil landscape mapping (NSW DPIE 2022e) and topographic mapping, in addition to existing vegetation mapping (NSW OEH 2016; Ecological Australia 2017); to stratify the Subject Land and guide the site assessment survey efforts.

The vegetation community was determined based on desktop and field analysis of the geomorphology and geology of the Subject Land, in addition to a quantitative analysis of the 'positive diagnostic' flora species.

3. Native Vegetation

3.1 Historical Vegetation Mapping

Historical vegetation mapping for Hornsby Shire Council (Ecological Australia 2017) mapped the following vegetation communities near the Subject Land (**Figure 4**):

- Bloodwood – Scribbly Gum Woodland
- Peppermint – Angophora Forest

Eco Logical (2017) mapped vegetation nearby the Subject Land as 'Remnant vegetation to check' but did not provide any further information.

3.2 Confirmed Vegetation

Upon examining the Subject Land, Land Eco found a weed-infested patch of native vegetation occurring in 'Remnant' (structurally complete) and 'Part Clear' (remnant native canopy absent) condition.

Land Eco identified two distinct vegetation communities within the Subject Land (**Figure 5**):

- PCT 1783: Red Bloodwood - Scribbly Gum / Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast (Sydney North Exposed Sandstone Woodland) (**Plate 1;Plate 2).**
  The canopy was dominated by *Eucalyptus haemastoma* and *Corymbia gummifera* with *Eucalyptus punctata* over a diverse suite of *Acacia spp*., as well as *Allocasuarina littoralis, Angophora hispida, Pittosporum undulatum, Banksia oblongifolia, Kunzea ambigua, Hakea dactyloides* and *Grevillea sericea.* The groundlayer was similarly diverse with a range of native grasses, forbs and herbs. The vegetation community was dominant across the eastern and northern ends of the Subject Land. The southern extent of this PCT was severely weed infested, and this infestation became less prevent further north were the soil strata was less disturbed, less nutrient enriched and more typical of a natural sandstone ridgetop soil.

- PCT 1786: Red Bloodwood - Silvertop Ash - Stringybark open forest on ironstone in the Sydney region (Duffys Forest) (**Plate 3;Plate 4;Plate 5**).
  The canopy was dominated by Silver-top Ash (*Eucalyptus sieberi*) (*incorrectly identified as 'Blackbutt' in the Arborist Report [Sydney Arbor Trees 2022]) with *Eucalyptus haemastoma* and *Angophora costata* over *Allocasuarina littoralis, Acacia longifolia, Acacia suavelons, Acacia linifolia* and *Acacia myrtifolia, Hakea dactyloides* and *Grevillea sericea.* The ground layer was dominated by a dense layer of *Pteridium esculentum* and *Imperata cylindrica* with *Xanthorrhoea media* and *Entolasia stricta* among a diverse suite of fern, forb, low shrub, grass and sedge groundcover.

All of the vegetation identified as PCT 1786 within the Subject Land qualifies as '*Duffys Forest Ecological Community in the Sydney Basin Bioregion Endangered Ecological Community'*, (Duffys Forest EEC) described as:

> *"Open-forest or woodland community dominated by Red Bloodwood Corymbia gummifera, Black Ash Eucalyptus sieberi, Smooth-barked Apple Angophora costata, and frequently a stringybark E. capitellata or E. oblonga. Other understorey species include Myrtle Wattle Acacia myrtifolia, Hairpin Banksia Banksia spinulosa, Rusty Velet-bush Lasiopetalum ferrugineum, Crinkle Bush Lomatia silaifolia, Broad-leaf Geebung Persoonia levis, Apple–berry Billardiera scandens, Wiry Panic Entolasia stricta, Twisted Mat-rush Lomandra obliqua, Micrantheum ericoides and Xanthorrhoea media.*
> *Occurs in association with shale lenses and lateritic soils in Hawkesbury Sandstone. Rock outcrops are usually absent from this community, except on the fringes, where it adjoins typical sandstone vegetation, generally characterised by extensive sandstone outcrops."* (OEH 2017).

The PCT 1786 vegetation within the Subject Land contains a range of key diagnostic species listed above across each stratum, and occurs on deep orange-red sandy clay loam with abundant orange-red Hawkesbury Sandstone laterite nodules and surface gravel/pebbles, confirming its qualification as Duffys Forest EEC as listed under the BC Act.

This patch of Duffys Forest EEC has not been officially mapped or recognised until this study. It is believed to be the single last, structurally complete patch of Duffys Forest in Mount Colah. There is limited habitat available for Duffys Forest EEC in Mount Colah because the suburb only contains a small area of geology/soils that typically that supports the laterised Hawkesbury Sandstone geology required to support the EEC. This geology is limited to the narrow ridge-top of Mt Colah and is absent from the surrounding slopes and gullies. Most of the Mount Colah ridge was historically cleared for the existing railway line, Pacific Highway and surrounding commercial and residential development. The only known elements of Duffys Forest EEC remaining in Mount Colah (outside of the Sydney Trains land) consists of remnant scattered canopy trees including *Angophora costata, Eucalyptus capitellata, and Corymbia gummifera* over exotic dominant, planted and manicured shrub and ground layers. These trees are mostly confined to private property. There are no known patches of Duffys Forest in Mount Colah that support mature *Eucalyptus sieberi*, let alone in the density present at Mount Colah Railway station. The structural completeness of this patch (species rich and structurally complete canopy, shrub and ground layer) make this patch of Duffys Forest EEC a significant landscape remnant and an important reference of the original, remnant, native vegetation that formerly occurred over the laterised soils of the Mount Colah ridgetop.

Despite the severe weed infestations over most of the Subject Land, the Duffys Forest EEC had comparatively lower weed infestation and therefore was in good condition, especially when compared to the vegetation on the eastern (upline) side of the Subject Land which did not support Duffys Forest EEC.

Figure 4. Historical vegetation mapping of the Subject Property (Ecological Australia 2017)

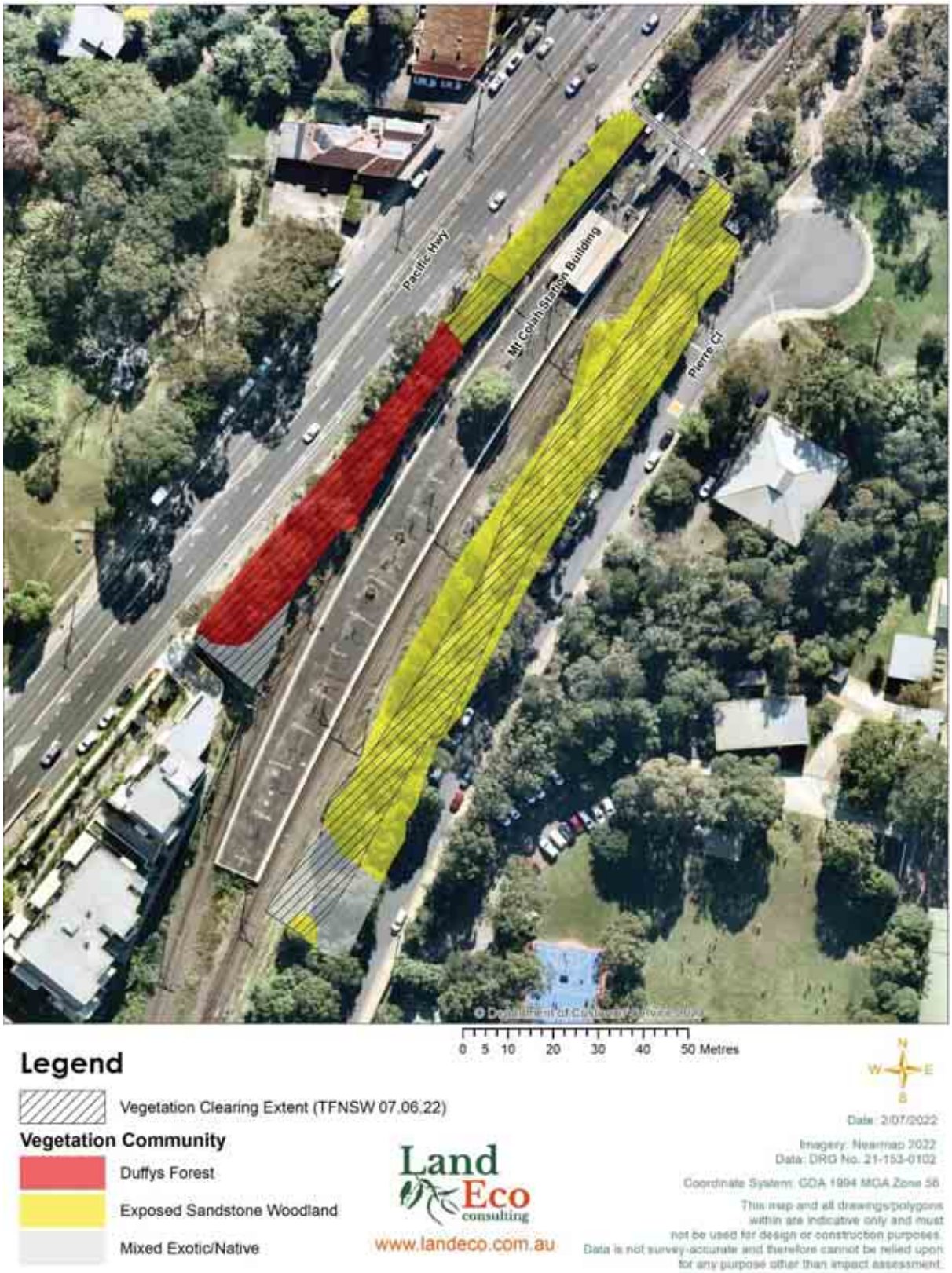


Figure 5. Updated vegetation mapping of the Subject Land

Plate 1. Sydney North Exposed Sandstone Woodland on the upline (south facing) line. Note the dense African Love Grass (*Eragrostis curvula*) and Lantana (*Lantana camara*) weeds in the background. Weed severeity was most intense in the southern extent (pictured)

Plate 2. Sydney North Exposed Sandstone Woodland on the upline (south facing) line. The extent photographed was located toward the northern portion of the upline vegetation clearing extent. Weed severeity was lower in this part of the vegetation extent.

Plate 3. Structurally complete, good condition, Duffys Forest EEC in the Subject Land. *Eucalyptus sieberi* **canopy, over** *Allocasuarina littoralis.* **Lower shrub layer contained a Proteaceae and** *Acacia spp.* **Ground cover was grassy with a diverse suite of ferns, shrubs and forbs.**

Plate 4. Location of the Duffys Forest EEC in the south-western corner of the Subject Land (downline). Note the tall canopy of the *Eucalyptus sieberi*.

Plate 5. Weathered laterised Hawkesbury Sandstone gravel and pebbles in the Subject Land. This geology is often referred to as 'Ironstone' and is typical soils that support Duffys Forest EEC

4. Threatened Species

4.1 Threatened Flora

No threatened flora species were found on the Subject Land during the site assessment by Land Eco.

The NSW Wildlife Atlas online survey tool (DPIE 2021c) was used to obtain a list of threatened flora previously recorded within a 10km radius of the Subject Land (**Table 3**). There were no historical records of threatened flora within the Subject Land. The habitat requirements of each species were assessed (DPIE 2021d) in order to determine the likelihood of species occurrence and/or impact from the proposed development.

Table 3. List of Threatened Flora that May Occupy the Subject land at Some Stage of their Lifecycles as Identified by BioNet (DPIE 2021c)

Species	BC Act	EPBC Act	Likelihood of Occurrence within the Subject Land
Acacia bynoeana	Endangered	Vulnerable	Unlikely. Suitable dry sclerophyll forest on sandy soil. No recent proximal records though recorded in the locality most recently in 2021 near St Ives Chase ~4.5km south-east of the Subject Land. Field survey in May 2022 revealed no individuals.
Acacia pubescens	Vulnerable	Vulnerable	Unlikely. Only occurs on Wianamatta shale an gravel soils of the Cumberland Plain. No recent proximal records. Field survey in May 2022 revealed no individuals.
Ancistrachne maidenii	Vulnerable	-	Unlikely. Suitable dry sclerophyll forest on sandstone soils. No recent proximal records. Recorded in 2021 in Berowara Valley National Park, ~4.5km north of the Subject Land. Field survey in May 2022 revealed no individuals.
Caladenia tessellata	Endangered	Vulnerable	Unlikely. Suitable grassy sclerophyll woodland on sandy loam. No recent proximal records. Habitat considered too disturbed to support this species. It is not likely that this sensitive orchid would persist in a viable population at this site.
Callistemon linearifolius	Vulnerable	-	Unlikely. Suitable dry sclerophyll forest. Eight records in the locality, though none in close proximity. Most recently recorded in 2018 in North Turramurra, ~ 3.5km south-east of the Subject Land. Field survey by Land Eco in May 2022 failed to locate any individuals in the Subject Land.
Cryptostylis hunteriana	Vulnerable	Vulnerable	Low. Suitable woodland habitat dominated by *Eucalyptus sieberi, Corymbia gummifera* and *Allocasuarina littoralis*. Two recent records in the locality from November 2021. Prefers less disturbed habitats. Not recorded from weed-infested roads and trainlines in the locality. It is not likely that this sensitive orchid would persist in a viable population at this site.
Darwinia biflora	Vulnerable	Vulnerable	Unlikely. Suitable sandstone ridge with *Eucalyptus haemastoma* and *Corymbia gummifera* overstorey, though highly disturbed. Over 460 records in the locality, including several records <1km from the Subject Land. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Darwinia peduncularis	Vulnerable	-	Unlikely. Suitable sandy soil though not near rocky outcrops. 40 records in the locality, none in close proximity. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Epacris purpurascens var. purpurascens	Vulnerable	-	Unlikely. Suitable dry sclerophyll forest habitat. 43 records spread across the locality, including several within 1km of the Subject Land in highly disturbed localities. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Eucalyptus camfieldii	Vulnerable	Vulnerable	Unlikely. Suitable sandy soils over Hawkesbury sandstone. 40 records in the locality, including several within 1km. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.

Species	BC Act	EPBC Act	Likelihood of Occurrence within the Subject Land
Eucalyptus nicholii	Vulnerable	-	Unlikely. Outside of the natural range of this species. One record in the locality is a planted ornamental specimen.
Galium australe	Endangered	-	Unlikely. Habitat is highly disturbed. Six records in the locality, restricted to Berowra Valley National Park. Not known from disturbed, weed-infested locations such as train lines.
Grammitis stenophylla	Endangered	-	Unlikely. Limited suitable moist habitat. Eight records spread across the locality, none proximal, most recently in 2005. Field survey by Land Eco in December 2021 did not identify any individuals in the Subject Land.
Genoplesium baueri	Endangered	Endangered	Unlikely. Subject Land contains dry sclerophyll forest, though weed-infested and not likely to support this rare herb. 16 records in the locality, all locations withheld, most recently in 2019. It is not likely that this sensitive orchid would persist in a viable population at this site.
Genoplesium plumosum	Critically Endangered	Endangered	Unlikely. No recent proximal records. Subject Land contains dry sclerophyll forest, though weed-infested and not likely to support this rare herb. It is not likely that this sensitive orchid would persist in a viable population at this site.
Grevillea caleyi	Critically Endangered	Critically Endangered	Unlikely. Commonly occurs in Duffys Forest, though outside of the current known occurrences of this species. No recent proximal records. Field survey by Land Eco in December 2021 did not identify any individuals in the Subject Land.
Haloragodendron lucasii	Endangered	Endangered	Unlikely. Suitable dry sclerophyll forest on sandy loam soils however this species typically occurs adjacent to creeks which are absent from the Subject Lans. Over 90 records in the locality, though restricted to Ku-ring-gai Chase National Park. Field survey by Land Eco in December 2021 did not identify any individuals in the Subject Land.
Hibbertia superans	Endangered	-	Low. Suitable disturbed woodland on sandstone soils. One record in the locality, recorded in 2009, though not in close proximity to the Subject Land. Not likely to occur in disturbed soils adjacent a train line. Typical survey period for this species is July to December.
Kunzea rupestris	Vulnerable	Vulnerable	Unlikely. No suitable large sandstone rock outcrops. Subject Land is heavily weed-infested and not likely to support this rare shrub. One record in the locality from Galston in 2013. *Kunzea ambigua* occurs on the Subject Land, though field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Lasiopetalum joyceae	Vulnerable	Vulnerable	Unlikely. Subject Land contains dry sclerophyll forest, though highly disturbed. Over 1400 records spread across the locality, the majority from 2018. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Leptospermum deanei	Vulnerable	Vulnerable	Unlikely. Subject Land contains dry sclerophyll forest however this species typically occurs close to creeklines which are absent from the Subject Land. No recent proximal records. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Macadamia integrifolia	-	Vulnerable	Unlikely. Outside of native range. Any local specimen was likely planted in locality for ornamental/food purposes.
Melaleuca deanei	Vulnerable	Vulnerable	Unlikely. Subject Land contains dry sclerophyll forest, though weed-infested and not likely to support this rare shrub. Over 80 records in the locality, none in close proximity, restricted to dense vegetation in the surrounding National Parks. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.

Species	BC Act	EPBC Act	Likelihood of Occurrence within the Subject Land
Persoonia hirsuta	Endangered	Endangered	Unlikely. Subject Land contains dry sclerophyll forest, though weed-infested and not likely to support this rare shrub. Recorded in 2000 ~1km south-east of the Subject land. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Persoonia mollis subsp. maxima	Endangered	Endangered	Unlikely. Subject Land contains dry sclerophyll forest weed-infested and not likely to support this rare shrub. 460 records in the locality, though largely restricted to the surrounding National Parks. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Pimelea curviflora var. curviflora	Vulnerable	Vulnerable	Unlikely. Subject Land contains dry sclerophyll forest. Two records in the locality, neither in close proximity. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Rhodamnia rubescens	Critically Endangered	-	Unlikely. No suitable wet forest or rainforest. No recent proximal records. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Syzygium paniculatum	Endangered	Vulnerable	Unlikely. No suitable wet forest or rainforest. No recent proximal records. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.
Tetratheca glandulosa	Vulnerable	-	Unlikely. The Subject Land contains dry sclerophyll forest on sandstone soil with laterite fragments. Over 240 records spread across the locality within several within 1km of the Subject Land. Field survey by Land Eco in May 2022 did not identify any individuals in the Subject Land.

4.2 Threatened Fauna

No threatened fauna were identified on the Subject Land during the site visit by Land Eco in May 2022.

The desktop analysis revealed a suite of threatened fauna species which have the potential to utilise habitat on the Subject Land during part of their lifecycles (**Table 5**) (DPIE 2021c; 2021d).

The Subject Land a range of habitat features suitable for use by threatened fauna **(Table 4; Figure 6)**.

Table 4. Threatened fauna habitat features in or adjacent to the Subject Land

Habitat component	Site values
Hollow-bearing trees, including dead stags	Two hollow-bearing trees, each containing one small hollow were identified on the Subject Land. These hollows are suitable for roosting and potentially breeding for a range of threatened microbats and small birds.
Large trees with basal cavities	Nil
Rock outcrops and bush rock	Minor exposed areas of surface rock provide shelter for common small reptiles and common frogs.
Caves, crevices and overhangs	Nil
Natural burrows	Nil
Coarse woody debris (logs)	Low densities of course woody debris spread across some parts of the Subject Land.
Wetlands, soaks and streams	Nil
Open water bodies	Nil
Nests and roosts	Nil
Sap and gum sources (feed trees for gliders)	Mature *Corymbia gummifera* showed evidence of glider feeding. The feeding marks are from the locally common Sugar Glider (*Petaurus breviceps*) and not a threatened species.
Distinctive scats or latrine sites	Brush-tailed Possum (*Trichosurus vulpecula*) scats identified on the Subject Land.
She-oak fruit (Glossy Black Cockatoo feed)	*Allocasuarina littoralis* was common across the Subject Land.
Culverts, bridges, mine shafts, or abandoned structures (microbat subterranean roosts)	There is no evidence of microbats roosting at the existing footbridge (SMEC 2020).
Decorticating bark or palm fronds suitable for microbat roosts	Moderate amounts of decorticating bark on mature *Eucalyptus sieberi*.
Flying-fox camps	Nil
Nectar-bearing trees (e.g. winter-flowering)	Several Eucalyptus trees on the subject property have the potential to act as a food source for nectarivorous animals.
Lerp-bearing trees	Several Eucalyptus trees on the subject property have the potential to be lerp-bearing, acting as a food source for flying foxes, gliders and a suite of birds.
Nectar-bearing shrubs	Several nectar bearing shrubs including abundant *Banksia spp.* and *Grevillea sericea* may provide foraging habitat for nectivorous birds.
Mistletoes	*Amyema congener* occurs in low density within the Subject Land. May forage foraging for nectarivorous birds.
Koala browse trees	There were six species of Koala (*Phascolarctos cinereus*) use trees identified on the Subject Land with documented koala use in the Central Coast Koala Management Area, including the locally significant *Eucalyptus punctata*.
Seed-bearing trees and shrubs	Several Eucalyptus trees in the Subject Property produce woody fruit and seeds may be foraged on by locally common native bird species.
Soft-fruit-bearing trees or shrubs	Abundant native and exotic fruiting shrubs may provide foraging habitat for Grey-headed Flying-fox (*Pteropus poliocephalus*).
Dense shrubbery and leaf litter	The vegetation within the Subject Land is dense in areas and severely weed-infested.
Dense grassland	Nil
Estuarine, beach, mudflats, and rocky foreshores	Nil

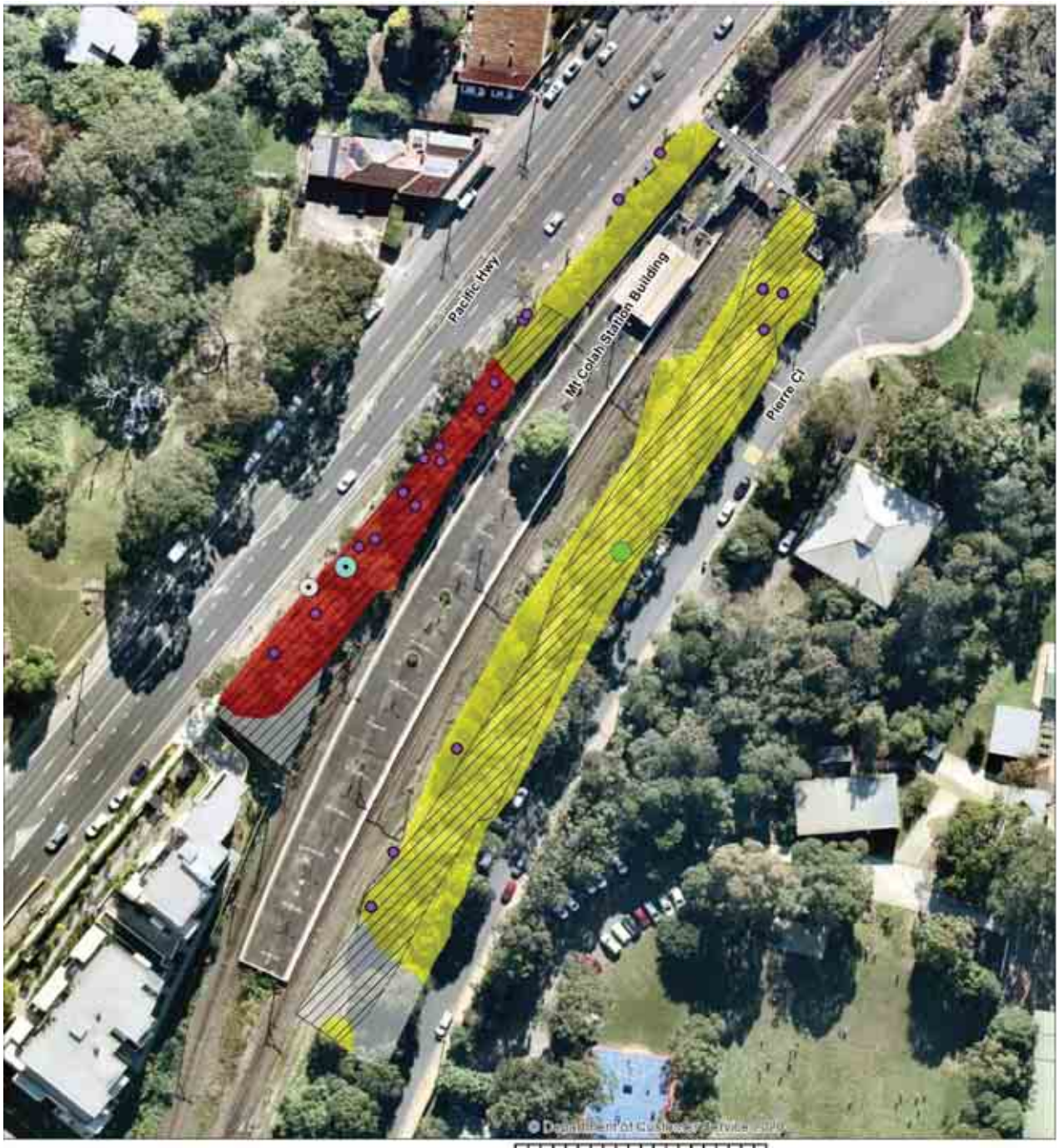


Figure 6. Habitat features within and near the Subject Land

Table 5. List of Threatened Fauna that May Occupy the Subject Land at Some Stage of their Lifecycles as Identified by BioNet (DPIE 2021c)

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable	-	Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest.	Low. Low suitability foraging habitat. On rare occasions, may pass through on return migration from southern Australia. Not likely to be utilised for breeding as habitat is too disturbed and this species does not typically breed on the Hawkesbury sandstones. Last recorded in locality in 1998.
Calidris ferruginea	Curlew Sandpiper	Endangered	Critically Endangered	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	Unlikely. No suitable coastal habitat. May occasionally be blown inland during intense storm events. No recent proximal records.
Callocephalon fimbriatum	Gang-gang Cockatoo	Vulnerable	Endangered	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. Favours old growth forest and woodland attributes for nesting and roosting.	Unlikely. *Eucalyptus spp.* provide some suitable foraging habitat, though unlikely to breed as habitat is too disturbed and no suitable large hollows. Six records in the locality, most recently in 2006. Population in the local area is presumed extinct.
Callocephalon fimbriatum – endangered population	Gang-gang Cockatoo population in the Hornsby and Ku-ring-gai Local Government Areas	Endangered population	-		
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable	-	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (*Allocasuarina littoralis*) and Forest Sheoak (*A. torulosa*) are important foods.	Likely. Potential for foraging only. A total of 17 potential feed trees spread across the Subject Land will be removed for the activity. A total of 88 Glossy Black-cockatoo records in the locality, locations withheld. Last recorded in the locality in 2020. No suitable large tree hollows for breeding.
Cercartetus nanus	Eastern Pygmy-possum	Vulnerable	-	Found in a broad range of habitats from rainforest through sclerophyll forest, but in most areas woodlands and heath appear to be preferred. Feeds largely on nectar and pollen collected from banksias, eucalypts and bottlebrushes; an important pollinator of heathland plants such as banksias; soft fruits are eaten when flowers are unavailable.	Low. Suitable foraging habitat in diverse native shrub layer. Two suitable hollows for sheltering, though unlikely to support breeding as habitat is exposed and highly disturbed by people, pets and pest fauna. It is expected that the habitat in the Subject Land supports a large population of feral *Rattus spp.* which would exclude Eastern Pygmy Possum from all areas of suitable habitat in the Subject Land. A total of 159 atlas records in the locality, though those records in close proximity to the Subject Land are

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
					more than 30 years old. Large number of records from the past 5 years, primarily in Ku-ring-gai Chase National Park.
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.	Low. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. No suitable caves for breeding occur near the Subject Land. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). Only one record in the locality, >3km south-east of the Subject Land near North Turramurra in 2018.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	Vulnerable	-	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	Unlikely. No suitable grassy woodland habitat. This species is typically sedentary. One record in the locality, likely to be erroneous misidentification of Brown Treecreeper.
Daphoenositta chrysoptera	Varied Sitella	Vulnerable	-	Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and *Acacia* woodland.	Low. Suitable foraging habitat in remnant *Eucalyptus spp*. May have occurred in the area in the past. Unlikely to forage or breed in subject property as habitat is too disturbed and dominated by aggressive birds such as Noisy Miner. This species is sedentary so will not recolonise. Four records spread across the locality in remnant vegetation, last recorded in 2012. In the local area this species is restricted to Ku-ring-gai Chase NP.
Dasyurus maculatus	Spotted-tailed Quoll	Vulnerable	Endangered	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Quolls use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites.	Low. Exposed habitat patch, highly disturbed and frequented by pet dogs and poor connectivity, surrounded by roads. Last recorded in locality in 2014. Subject Land would not form important habitat for this species.
Dermochelys coriacea	Leatherback Turtle	Endangered	Endangered	This species is a marine species. Breeds on sandy coastal locations.	Unlikely. No suitable marine habitat or sandy beaches.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Falsistrellus tasmaniensis	Eastern False Pipistrelle	Vulnerable	-	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. Breeding possible though unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). One record in the locality from 2005 ~2km north-west of the Subject Land near Galston Road.
Glossopsitta pusilla	Little Lorikeet	Vulnerable	-	Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in Angophora, Melaleuca and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Feeds mostly on nectar and pollen, occasionally on native fruits such as mistletoe, and only rarely in orchards	High. May forage on nectar (*Corymbia gummifera, Eucalyptus sieberi* or Mistletoes) or lerp-bearing eucalypts in Subject Property. Not likely to remain in the locality for extended periods as the species is nomadic and the habitat is disturbed, frequented by more dominant, aggressive species such as the Noisy Miner. No suitable breeding habitat in the Subject Land, too disturbed.
Haematopus fuliginosus	Sooty Oystercatcher	Vulnerable	-	Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide for foods such as limpets and mussels.	Unlikely. No suitable coastal habitat. May occasionally be blown inland during intense storm events. No recent proximal records.
Haematopus longirostris	Pied Oystercatcher	Endangered	-	Favours intertidal flats of inlets and bays, open beaches and sandbanks. Forages on exposed sand, mud and rock at low tide, for molluscs, worms, crabs and small fish. Nests mostly on coastal or estuarine beaches although occasionally they use saltmarsh or grassy areas.	Unlikely. No suitable coastal habitat. May occasionally be blown inland during intense storm events. No recent proximal records.
Haliaeetus leucogaster	White-bellied Sea-Eagle	Vulnerable	-	Habitats are characterised by the presence of large areas of open water. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby.	Moderate. Likely to fly over Subject Property, may hunt prey in Subject Property though unlikely to roost or breed as habitat is too open and disturbed by proximity to human activity including trains and busy roads. Last recorded in 2018 in the locality.
Heleioporus australiacus	Giant Burrowing Frog	Vulnerable	Vulnerable	Found in heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based.	Unlikely. Habitat in the Subject Land too disturbed and lacks a suitable water source for breeding, nor suitable dense shrub and groundcover over moist leaf litter that this species requires to breed. 26 records in the locality, none in close proximity, restricted to remnant vegetation in the surrounding National Parks.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Hieraaetus morphnoides	Little Eagle	Vulnerable	-	Occupies open eucalypt forest, woodland or open woodland. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	Moderate. Likely to fly over Subject Property, may hunt prey in Subject Property though unlikely to roost or breed as habitat is too open and disturbed by proximity to human activity including trains and busy roads. Last recorded in 2013 in the locality.
Hirundapus caudacutus	White-throated Needletail	Protected	Vulnerable	Migratory and usually seen in eastern Australia from October to April. Breeds in forests in south-eastern Siberia, Mongolia, the Korean Penninsula and northern Japan June-August. Most often seen in eastern Australia before storms, low pressure troughs and approaching cold fronts and occasionally bushfire. These conditions are often used by insects to swarm (eg termites and ants) or tend to lift insects away from the surface which favours sighting of White-throated Needletails as they feed. More common in coastal areas, less so inland.	High. This species is an aerial forager only. Likely to fly over the Subject Land on occasion. Not likely to utilise habitat in the Subject Land, nor will the proposed action impact upon this species.
Isoodon obesulus obesulus	Southern Brown Bandicoot (eastern)	Endangered	Endangered	Generally only found in heath or open forest with a heathy understorey on sandy or friable soils.	Low. Suitable open forest on sandy soil, though poor connectivity to other remnant vegetation, surrounded by roads and frequented by pet cats. 189 records in the locality, largely restricted to Ku-ring-gai Chase National Park, last recorded in 2021 ~3km south-east of the Subject Land. The Subject Land is too disturbed and edge-effected to support this sensitive mammal.
Lathamus discolor	Swift Parrot	Endangered	Critically Endangered	Migrates to the Australian south-east mainland between February and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations.	Moderate. May forage on nectar (*Corymbia gummifera, Eucalyptus sieberi* or Mistletoes) or lerp-bearing eucalypts in Subject Property. Not likely to remain in the locality for extended periods as the species is nomadic and the habitat is disturbed, frequented by more dominant, aggressive species such as the Noisy Miner. This species does not breed locally. Recorded in locality twice in 2020, locations withheld.
Limicola falcinellus	Broad-billed Sandpiper	Vulnerable	-	Broad-billed Sandpipers favour sheltered parts of the coast such as estuarine sandflats and mudflats, harbours, embayments, lagoons, saltmarshes and reefs as feeding and roosting habitat. Occasionally, individuals may be recorded in sewage farms or within shallow freshwater lagoons. Broad-billed Sandpipers roost on banks on sheltered sand, shell or shingle beaches.	Unlikely. No suitable coastal habitat. May occasionally be blown inland during intense storm events. No recent proximal records.
Litoria aurea	Green and Golden Bell Frog	Endangered	Vulnerable	Inhabits marshes, dams and stream-sides, particularly those containing bullrushes (Typha spp.) or spikerushes (Eleocharis spp.).	Unlikely. No suitable aquatic habitat with aquatic vegetation. One record from Wahroonga in 1998, ~3km south-east of the Subject Land.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Lophoictinia isura	Square-tailed Kite	Vulnerable	-	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Moderate. Likely to fly over Subject Property, may hunt prey in Subject Property though unlikely to roost or breed as habitat is too open and disturbed by proximity to human activity including busy roads. Last recorded in 2020 in the locality, with five records from the past five years.
Micronomus norfolkensis	Eastern Coastal Free-tailed Bat	Vulnerable	-	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. Breeding unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). Five records in the locality, all located >2km from the Subject Land, most near Wahroonga and North Turramurra.
Miniopterus australis	Little Bent-winged Bat	Vulnerable	-	Moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub. Generally found in well-timbered areas. Little Bentwing-bats roost in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Low. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. No suitable caves for breeding occur near the Subject Land. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). 14 records spread across the locality, all >2km from the Subject Land, most recently recorded in 2021.
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	-	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Maternity caves have very specific temperature and humidity regimes. At other times of the year, populations disperse within about 300 km range of maternity caves. Cold caves are used for hibernation in southern Australia.	Low. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. No suitable caves for breeding occur near the Subject Land. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). 44 records spread across the locality as recently as 2021. The nearest recorded was recorded in 2006, ~1.5km north of the Subject Land.
Myotis macropus	Southern Myotis	Vulnerable	-	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Low. No suitable aquatic foraging habitat in the Subject Land. Two small hollows suitable for shelter, though unlikely for breeding as the Subject Land is too disturbed. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). Six records in the locality, located >3km south-east of the Subject Land near Wahroonga and North Turramurra.
Neophema pulchella	Turquoise Parrot	Vulnerable	-	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	Low. Some suitable foraging habitat (native seed-bearing grasses, shrubs and herbs). Unlikely to breed in hollows as habitat is too disturbed. Only would occur as a transient vagrant. Not likely to remain in the locality for extended periods as the habitat is disturbed, frequented by more dominant, aggressive species such as the Noisy Miner, Pied Currawong and Grey Butcherbird. One record in the locality from 2017.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Ninox connivens	Barking Owl	Vulnerable	-	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. It nests in large hollows greater than 20cm in diameter in trees that are at least eight metres above ground.	Moderate. May hunt, perch or roost in trees in the Subject Property. May hunt for birds, rats or possums in the locality. No large hollow-bearing trees of suitable dimensions for breeding. Last recorded in locality in 2009.
Ninox strenua	Powerful Owl	Vulnerable	-	The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, and a number of eucalypt species.	High. Likely to hunt, perch and roost in trees in the Subject Property and adjacent bushland. Likely to hunt for birds, rats or possums in the locality. Powerful owls require hollows greater than 45 cm diameter and greater than 100 cm deep (Powerful Owl Coalition 2018). There are no large hollow-bearing trees of suitable dimensions for nesting in the Subject Property. 260 records spread across locality, recorded as recently as 2021, including a large number from the past five years.
Phascolarctos cinereus	Koala	Endangered	Endangered	Inhabit eucalypt woodlands and forests.	Unlikely. Suitable feed trees are present on the Subject Land. The Subject Property is not considered to be 'core koala habitat' as it is does not contain highly suitable koala habitat (small patch surrounded by roads) or have koalas recorded present in the last 18 years. There are 20 koala records in the 10km locality. The nearest record (~1km west) is from 1968. All records but two were recorded more than 18 years ago. The most recent sighting was recorded in 2020 in Ku-ring-gai Chase National Park, approximately 3km south-east of the Subject Land. The disturbed location of the Subject Land makes it unsuitable for Koala.
Pseudomys gracilicaudatus	Eastern Chestnut Mouse	Vulnerable	-	In NSW the Eastern Chestnut Mouse is mostly found, in low numbers, in heathland and is most common in dense, wet heath and swamps. In the tropics it is more an animal of grassy woodlands.	Low. Some suitable dense shrubbery though no moist heath. Habitat unsuitable as it is highly disturbed, frequented by people and pets. The likely presence of feral *Rattus spp.* would exclude this sensitive rodent. Two records in the locality most recently in 2000, locations withheld.
Pseudomys novaehollandiae	New Holland Mouse	-	Vulnerable	Known to inhabit open heathlands, woodlands and forests with a heathland understorey and vegetated sand dunes.	Low. Some suitable dense shrubbery though no moist heath. Habitat unsuitable as it is highly disturbed, frequented by people and pets. The likely presence of feral *Rattus spp.* would exclude this sensitive rodent. No recent proximal records.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Pseudophryne australis	Red-crowned Toadlet	Vulnerable	-	Occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping.	Unlikely. Habitat in the Subject Land too disturbed and lacks a suitable water source for breeding, nor suitable dense shrub and groundcover over moist leaf litter that this species requires to breed. Over 280 records spread across the locality, though none in close proximity, restricted to remnant vegetation in the surrounding National Parks.
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Grey-headed Flying-foxes are generally found within 200 km of the eastern coast of Australia. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Can travel up to 50 km from the camp to forage; commuting distances are more often <20 km.	High. It is considered likely that Grey-headed Flying-fox would forage in the trees in and nearby the Subject Property on fruiting shrubs and when trees are in flower. No roost camps were identified within or in close proximity to the Subject Property and no known camps nearby. 113 records in the locality, last recorded in 2021.
Ptilinopus superbus	Superb Fruit-dove	Vulnerable	-	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as figs and palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees.	Low. Only occurs locally as a vagrant. No recent proximal records.
Saccolaimus flaviventrus	Yellow-bellied Sheathtail-bat	Vulnerable	-	Roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory.	Low. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. Breeding unlikely as habitat is disturbed and this species does not typically breed in woodlands nor this far south. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). The species does not typically breed in dry woodlands. One record in the locality from 2005 ~2km north-west of the Subject Land off Galston Road.
Scoteanax rueppellii	Greater Broad-nosed Bat	Vulnerable	-	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.	Moderate. Suitable foraging habitat around tree canopies in and around the Subject Property. May temporarily shelter in tree hollows on the Subject Land. Breeding unlikely as habitat is disturbed. There is no evidence of microbats roosting at the existing footbridge (SMEC 2020). Five records in the locality, all located >2km from the Subject Land, most near Wahroonga and North Turramurra.
Tyto novaehollandiae	Masked Owl	Vulnerable	-	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. The typical diet consists of tree-dwelling and ground mammals, especially rats. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	Low. On rare occasions vagrant individuals may perch or roost in trees in the Subject Land. May hunt for birds, rats or possums in the locality. No large hollow-bearing trees of suitable dimensions for nesting occur in subject property. Last recorded in the locality in 2020.

Scientific Name	Common Name	BC Act	EPBC Act	Habitat Required (OEH Species Profiles)	Likelihood of Occurrence within the Subject Land
Tyto tenebricosa	Sooty Owl	Vulnerable	-	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Roosts by day in the hollow of a tall forest tree or in heavy vegetation; hunts by night for small ground mammals or tree-dwelling mammals such as the Common Ringtail Possum (*Pseudocheirus peregrinus*) or Sugar Glider (*Petaurus breviceps*). Nests in very large tree-hollows.	Low. On rare occasions vagrant individuals may perch or roost in trees in the Subject Land. May hunt for birds, rats or possums in the locality. No large hollow-bearing trees of suitable dimensions for nesting occur in subject property. No large hollow-bearing trees of suitable dimensions for nesting occur in subject property. Last recorded in the locality in 2008.
Varanus rosenbergi	Rosenberg's Goanna	Vulnerable	-	Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat.	Unlikely. Small patch of habitat on Subject Land with poor connectivity to surrounding habitat, surrounded by roads which significantly reduce access and viability of the habitat. The habitat is highly disturbed and frequented by pet dogs.

5. Impact Summary

This section of the report provides a summary of impacts to biodiversity resulting from the proposed development upon threatened species, populations and ecological communities listed under the BC Act.

5.1 Vegetation Effects

The Subject Property contains a severely weed-infested patch of native vegetation occurring in 'Remnant' (structurally complete) and 'Part Clear' (remnant native canopy absent) condition. Land Eco identified two distinct vegetation communities within the Subject Land:

- PCT 1783: Red Bloodwood - Scribbly Gum / Old-man Banksia open forest on sandstone ridges of northern Sydney and the Central Coast (Sydney North Exposed Sandstone Woodland)
- PCT 1786: Red Bloodwood - Silvertop Ash - Stringybark open forest on ironstone in the Sydney region (Duffys Forest)

All of the vegetation identified as PCT 1786 within the Subject Land qualifies as Duffys Forest Ecological Community in the Sydney Basin Bioregion Endangered Ecological Community.

A total of 2,926 m^2 of native vegetation will be removed for the proposed activity, including 1786 m^2 of Sydney North Exposed Sandstone Woodland and 792 m^2 of Duffys Forest EEC **(Table 6**).

Table 6. Vegetation Clearing Required for Activity

Vegetation Community	Area Cleared for Proposed Activity (m2)
Sydney North Exposed Sandstone Woodland	1,786
Duffys Forest	792
Mixed Exotic / Native	348
TOTAL	**2,926**

Development plans require the removal of 19 trees and shrubs within the domain under Council's Management (Sydney Arbor Trees 2022), however Land Eco identified an additional 45 native trees that are within the proposed development footprint that are likely to be removed including two hollow-bearing trees (**Figure 7**).

Habitat for locally occurring threatened fauna species listed under the BC Act will be impacted by the development. Two hollow-bearing trees that provide suitable roosting and possibly breeding habitat for threatened microbats may be removed for the proposed activity. A suite of threatened fauna are also likely to forage in and around the canopies of these trees and shrubs.

5.2 Threatened Species Effects

While a large number of threatened flora records occur in the locality, the Ecologists found no threatened flora in the Subject Land during the site assessment. The Subject Land is disturbed and severely weed-infested. It is unlikely that the proposed development will have a significant impact on any threatened flora such that their local occurrence will be put at risk of extinction, as substantial amounts of high quality remnant vegetation will continue to occur in Berowra Valley National Park and Ku-ring-gai Chase National Park.

The proposed activity may contribute localised effects to habitat for threatened fauna, primarily through the possible loss of two hollow-bearing canopy trees which are likely to provide roost habitat for locally common, mobile threatened fauna species, in particular vulnerable microbats. The proposed activity will also impact foraging habitat for these vulnerable microbats, as well as the Grey-headed Flying-fox, owls, raptors and other threatened birds.

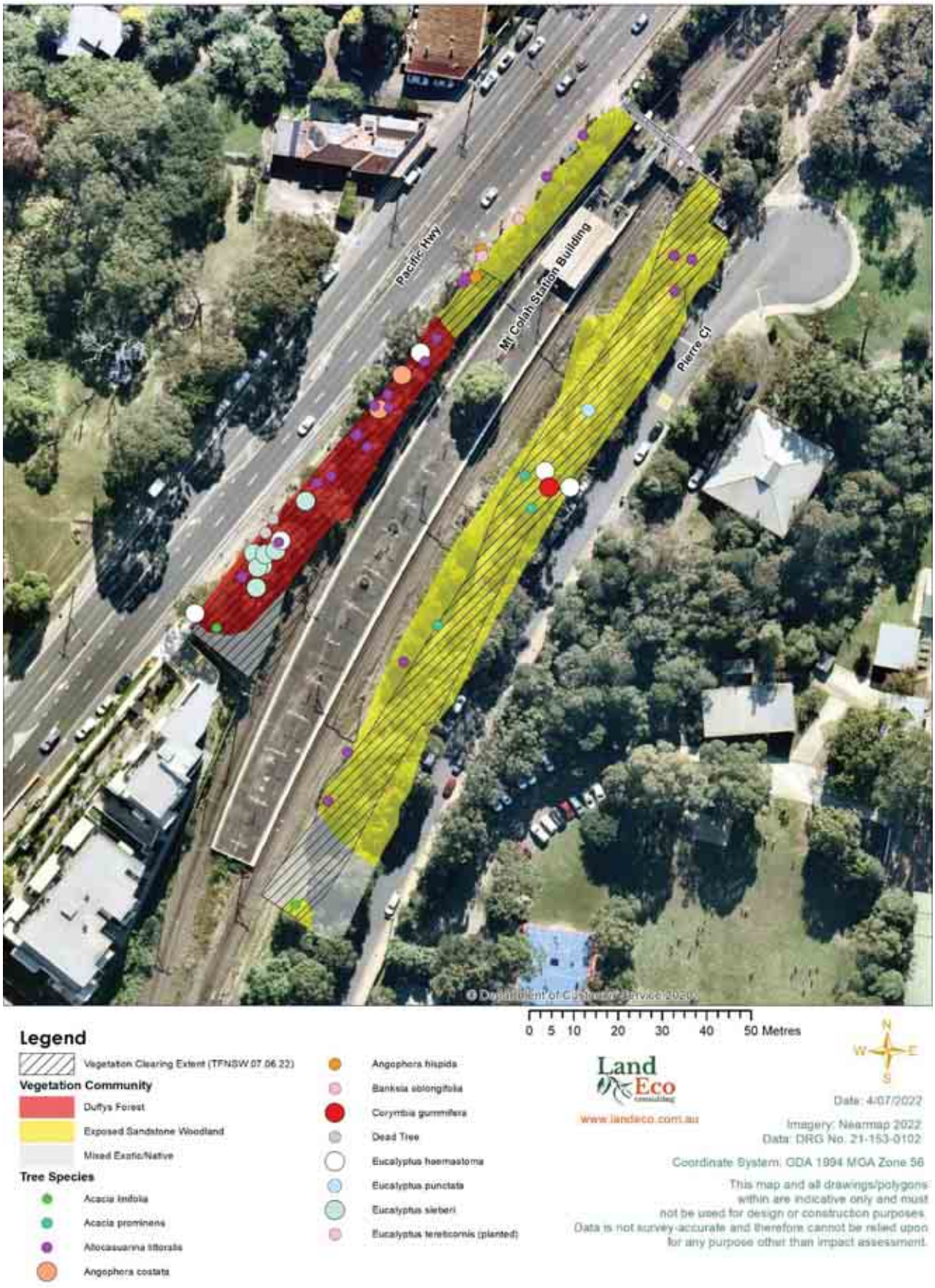


Figure 7. Trees identified within the Subject Property by Land Eco

6. Impact Mitigation Measures

A suite of impact mitigation measures are proposed in order to avoid, minimise and mitigate impacts to threatened species from the proposed development **(Table 7**).

6.1 Sydney Trains Biodiversity Offsets Calculator

The proponent, Sydney Trains, has elected to offset the impacts of the development through their internal offset scheme according to the *"Sydney Trains Biodiversity Offsets Calculator Environmental Management System EMS-06-WI-0177"*. The proposed activity will impact three items of concern:

- Item 2: Threatened Vegetation
- Item 4: Remnant Native Vegetation
- Item 5: Native Tree Removal

Based upon the areas of threatened vegetation, non-native vegetation and individual trees to be removed, Land Eco has calculated the total offset fee at **$ 152,674.00.** This total may be subject to change if the total area of native vegetation clearing, and total number of trees to be cleared can be reduced. The total was derived from the methods detailed in the following subsections.

6.1.1 Item 2: Threatened Vegetation

The vegetation to be cleared being removed accounts for more than 10% of the canopy cover within the Subject Land, and has the potential to be used by threatened fauna for shelter. As such, the proposed activity must comply with the 'Moderate' Offset Option. This stipulates that the proponent must:

"1. Where possible: Undertake bush revegetation using locally native species and targeted weed removal of the disturbed area for a minimum of 2 years AND
Revegetation to increase the area of threatened vegetation by at least 50%, using relevant species from the threatened vegetation affected, with revegetation located (where possible) to provide a buffer effect AND
Contribute $25/m² of threatened vegetation that will be disturbed to the Biodiversity Offset Fund (BOF) to rehabilitate land supporting the same threatened vegetation.

OR

2. If the above is not possible, contribute $37/m² of threatened vegetation community that will be disturbed to the BOF to rehabilitate land supporting the same threatened vegetation community"

It is recommended that 'Option 1' be pursued where possible. If this is not possible, it is recommended that the proposed activity comply with 'Option 1' where feasible, while contributing the amount stipulated in 'Option 2' to the Biodiversity Offset Fund (BOF). A total of 792m² of threatened vegetation belonging to the Duffys Forest EEC will be removed for the proposed activity. This will cost approximately **$29,304** to offset threatened vegetation impacts from the proposed activity.

6.1.2 Item 4: Remnant Native Vegetation

The vegetation to be cleared being removed accounts for more than 20% of the canopy cover within the Subject Land, and has the potential to be used by threatened fauna for shelter. As such, the proposed activity must comply with the 'Moderate' Offset Option. This stipulates that the proponent must:

"1. Where possible: Undertake bush revegetation over the entire remnant (including the disturbed areas) for a 2 year period to encourage rehabilitation of the site, using locally native species. Ensure that all weed species are targeted during the period AND
Contribute $18/m² of the native vegetation community that will be disturbed to the BOF

OR

2. If the above is not possible, contribute $25/m² of native vegetation community that will be disturbed to the BOF"

It is recommended that 'Option 1' be pursued where possible. If this is not possible, it is recommended that the proposed activity comply with 'Option 1' where feasible, while contributing the amount stipulated in 'Option 2' to the Biodiversity Offset Fund (BOF). A total area of 1786m² of remnant native vegetation belonging to 'Sydney North Exposed Sandstone Woodland' will be cleared for the proposed activity. This will cost approximately **$44,650** to offset remnant native vegetation impacts from the proposed activity.

6.1.3 Item 5: Native Tree Removal

All of the trees proposed for removal have the potential to be used by threatened fauna for breeding. The removal of these trees is likely to generate community complaints. As such, the proponent must:

"1. Where possible: Revegetation required in the same area (at least 50m² for each locally native tree removed), using locally native tree, shrub and ground cover species as per EMS-06-TP-0066 AND
Contribute $370 to the BOF for each locally native tree removed AND
If the tree contained hollows, then install 3 or more nest boxes for each tree hollow removed in adjacent trees (or nearby areas) or on posts

OR

2. If revegetation is not an option: If the locally native tree contained hollows, then install 3 or more nest boxes for each tree hollow removed in adjacent trees or on posts AND
Contribute $1,230 to the BOF for each locally native tree removed."

Up to 64 trees are proposed for removal and must be offset according to the above guidelines. This will cost up to **$78,720** for the proposed activity. Furthermore, the proponent must replace all hollows to be removed with 3 or more nest boxes and contribute the appropriate amount to the BOF depending on the option pursued.

Table 7. Measures to be Implemented Before, During and After Construction to Avoid and Minimise the Impacts of the Project

Action	Mitigation Measure / Outcome	Timing	Responsibility
Project Location and Design	The proposed activity has been located at the existing site of Mount Colah Railway Station.	Pre-construction phase	▪ Proponent
Engage Project Ecologist	A suitably qualified and experience Ecologist with a minimum of a tertiary degree in a relevant discipline, and license under the NSW Department of Planning Industry and Environment should be engaged to oversee the implementation of the relevant impact mitigation measures in this report.	Pre-construction Phase	▪ Proponent
Undertake Pre-clearing Survey and Clearing Supervision	Project Ecologist to undertake a pre-clearing survey of the Subject Land. All felling of native trees should be supervised by an Ecologist who will be available on site to capture, treat/relocate any displaced fauna.	Construction Phase	▪ Project Ecologist
Tree Protections	All trees to be retained must be protected in accordance with Australian Standard - *Protection of Trees on Development Sites* (AS-4970-2009), which outlines that a Tree Protection Zone (TPZ) is the principal means of protecting trees on development sites. It is an area isolated from construction disturbance so that the tree remains viable. Works will be avoided within the TPZ of any trees located outside of the development site that require retention. This includes trees on neighbouring properties.	Pre-construction phase	▪ Arborist and fence contractor under guidance of Arboriculturist.
Erosion and Sedimentation	Appropriate erosion and sediment control will be erected and maintained during construction. At minimum such measures will comply with the relevant industry guidelines such as 'the Blue Book' (Landcom 2004).	Construction phase	▪ Construction Contractor
Minimising Artificial Lighting Impacts	Low spill lighting or shielding should be used where possible and restrictions around night-time construction work will be enforced to minimise the impacts on nocturnal fauna using nearby habitats.	Construction phase	▪ Construction Contractor
Storage and Stockpiling (Soil and Materials)	All storage, stockpile and laydown sites will be established away from any native vegetation that is planned to be retained. Never stockpile under the 'drip zone' of a tree. Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site.	Construction phase	▪ Construction Contractor
Weed eradication and Vegetation Regeneration	Priority and High Threat Weeds must be controlled across all areas of the Subject Land including the eradication of all Weed of National Significance. Weed eradication works must be managed and supervised by a qualified Bush Regenerator with a minimum 3 years experience.	Construction phase Post-construction phase	▪ Project Ecologist ▪ Landscape Contractor
Nest Hollow Replacement	As per the Sydney Trains Biodiversity Offsets Calculator, all tree hollows removed must be replaced with an equivalent sized nest hollow at a 3:1 ratio. Hollows from felled trees can be salvaged and erected in trees elsewhere in the property. Based on the data obtained during preparation of this report, a minimum of six small (less than 5cm entry hole diameter) nest boxes should be installed into trees in suitable vegetation remaining along the railway alignment. The precise number of tree hollows is to be determined by the Project Ecologist during the tree clearing phase.	Construction phase	▪ Project Ecologist ▪ Landscape Contractor

Action	Mitigation Measure / Outcome	Timing	Responsibility
Landscaping / Replacement Plantings	The landscape plan proposes the replacement of the vegetation proposed for removal with an assemblage of native ornamental flora and cultivars that are not representative of the indigenous vegetation. In order to comply with the "Sydney Trains Biodiversity Offsets Calculator Environmental Management System EMS-06-WI-0177", the landscape plan must include 100% locally native species and increase the area of threatened vegetation by at least 50% using species representative of Duffy's Forest.	Construction phase	▪ Project Ecologist ▪ Landscape Architect ▪ Landscape Contractor

7. References

Atlas of Living Australia (ALA) (2021) Atlas of Living Australia. Spatial Portal http://spatial.ala.org.au/ [accessed 23/6/2022]

CCG Architects (2020) Mount Colah Railway Station Footbridge Renewal Architecture Site Plan

Commonwealth of Australia Department of the Environment (DotE) (2021) Protected Matters Search Tool http://www.environment.gov.au/epbc/protect/index.html

Commonwealth of Australia Department of Agriculture, Water and the Environment (DAWE) (2022) National Flying-fox Monitoring Viewer. https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf [accessed 24/6/22]

Degotardi Smith & Partners (2022) Mount Colah Station Sydney Northern Line Plan Showing Detail & Levels Over Mount Colah Station and Surrounds Mount Colah, NSW. Status: Final Issue. 14/06/2022

Ecological Australia (2017) Hornsby Vegetation Map Update 2017 Report Prepared for Hornsby Shire Council. Project Number 16NEW – 4076.

Harden, G.J . (ed) (2002) Flora of New South Wales Volume 2. NSW University Press: Sydney.

Harden, G.J. (ed) (1992) Flora of New South Wales Volume 3. NSW University Press: Sydney.

Harden, G.J. (ed) (1993) Flora of New South Wales Volume 4. NSW University Press: Sydney.

Harden, G.J. (ed) (2000) Flora of New South Wales Volume 1. NSW University Press: Sydney.

Hornsby Shire Council (2006) Flora and Fauna Assessment Guidelines for Development Applications

Hornsby Shire Council (2013a) Local Environmental Plan 2013

Hornsby Shire Council (2013b) Development Control Plan 2013

Landcom (2004) Managing Urban Stormwater: Soils and Construction 'The Blue Book', Volume 1, Fourth Edition, New South Wales Government, ISBN 0-9752030-3-7

NSW Department of Environmental Conservation (DEC) (2004) Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft), New South Wales Department of Environment and Conservation, Hurstville, NSW.

NSW Department of Environment and Conservation (DEC) (2007). Threatened Species Assessment Guidelines: The Assessment of Significance. Department of Environment and Climate Change NSW.

NSW Department of Planning Industry and Environment (DPIE) (2022a) Planning Portal ePlanning Spatial Viewer https://www.planningportal.nsw.gov.au/ [accessed 30/6/2022]

NSW Department of Planning Industry and Environment (DPIE) (2022b) Biodiversity Values Map and Threshold Tool https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap [accessed 24/6/2022]

NSW Department of Planning Industry and Environment (DPIE) (2022c) NSW BioNet. The website of the Atlas of NSW Wildlife http://www.bionet.nsw.gov.au/ [accessed 24/6/2022]

NSW Department of Planning Industry and Environment (2022d) Threatened biodiversity profile search https://www.environment.nsw.gov.au/threatenedspeciesapp/ [accessed 24/6/2022]

NSW Department of Planning Industry and Environment (DPIE) (2022e) eSpade NSW Soil and Land Information https://www.environment.nsw.gov.au/eSpade2WebApp# [accessed 23/6/2022]

NSW Department of Primary Industries (2022) NSW Weedwise. https://www.dpi.nsw.gov.au/biosecurity/weeds [accessed 1/7/22]

NSW Office of Environment and Heritage (OEH) (2016) The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489. https://datasets.seed.nsw.gov.au/dataset/the-native-vegetation-of-the-sydney-metropolitan-area-oeh-2016-vis-id-4489 [accessed 24/6/22]

NSW Office of Environment and Heritage (OEH) (2017) Duffys Forest Ecological Community in the Sydney Basin Bioregion – profile. https://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10254 [accessed 23/06/22]

NSW Office of Environment and Heritage (OEH) (2018) A review of koala tree use across New South Wales

NSW Spatial Services (2022) SIX Maps. https://maps.six.nsw.gov.au/ [accessed 23/6/22]

PlantNET (2022) The NSW Plant Information Network System, Royal Botanic Gardens and Domain Trust, Sydney. http://plantnet.rbgsyd.nsw.gov.au

Powerful Owl Coalition (2018) Protecting Powerful Owls in Urban Areas. STEP Inc, Turramurra.

SMEC Holdings (2020) Mt Colah Footbridge Review of Environmental Factors. Document Number 30012921-EN-R-01.

Sydney Arbor Trees (2022) ARBORICULTURAL IMPACT ASSESSMENT & METHOD STATEMENT Prepared for: Taras Cherkasov Gartner Rose Pty Ltd Site: Mount Colah Station (Domain) Pierre Close Mount Colah NSW 2079 Published by: Mathew Phillips Dip. Arboriculture (AQF-5) Advanced Quantified Tree Risk Assessor User Id. 6067.

Taylor Brammer Landscape Architects (2020) Landscape Architecture Plan for Mount Colah Railway Station Footbridge Renewal

8. Appendices

Appendix 1. Flora species identified within the Subject Land

Species	Stratum	Status	Sydney North Exposed Sandstone Woodland	Duffys Forest
Allocasuarina littoralis	Upper Stratum	Native Indigenous	x	x
Angophora costata	Upper Stratum	Native Indigenous		x
Cinnamomum camphora	Upper Stratum	Non-native	x	x
Corymbia gummifera	Upper Stratum	Native Indigenous	x	
Eucalyptus haemastoma	Upper Stratum	Native Indigenous	x	
Eucalyptus punctata	Upper Stratum	Native Indigenous	x	x
Eucalyptus sieberi	Upper Stratum	Native Indigenous		x
Lophostemon confertus	Upper Stratum	Native Non-indigenous	x	
Quercus robur	Upper Stratum	Non-native	x	
Acacia baileyana	Mid Stratum	Native Non-indigenous	x	
Acacia linifolia	Mid Stratum	Native Indigenous	x	x
Acacia longofolia	Mid Stratum	Native Indigenous	x	x
Acacia myrtifolia	Mid Stratum	Native Indigenous	x	x
Acacia prominens	Mid Stratum	Native Indigenous	x	
Acacia saligna	Mid Stratum	Non-native	x	x
Acacia suaveolens	Mid Stratum	Native Indigenous	x	x
Amyema congener	Mid Stratum	Native Indigenous	x	x
Angophora hispida	Mid Stratum	Native indigenous	x	
Banksia oblongifolia	Mid Stratum	Native Indigenous	x	
Brachyloma daphnoides	Mid Stratum	Native Indigenous	x	
Chrysanthemoides monilifera subsp. monilifera	Mid Stratum	Priority weed of Greater Sydney	x	x
Cotoneaster spp.	Mid Stratum	Non-native	x	x
Gleichenia dicarpa	Mid Stratum	Native Indigenous	x	
Grevillea sericea	Mid Stratum	Native Indigenous	x	x
Hakea dactyloides	Mid Stratum	Native Indigenous	x	x
Homolanthus populifolius	Mid Stratum	Native Indigenous	x	
Jacaranda mimisofolia	Mid Stratum	Non-native	x	x
Kunzea ambigua	Mid Stratum	Native Indigenous	x	x
Lantana camara	Mid Stratum	Priority Weed of Greater Sydney	x	x
Ligustrum lucidum	Mid Stratum	Priority Weed of Greater Sydney	x	x
Ligustrum sinense	Mid Stratum	Priority Weed of Greater Sydney	x	x
Micrantheum ericoides	Mid Stratum	Native Indigenous	x	
Olea europaea subsp. cuspidata	Mid Stratum	Priority Weed of Greater Sydney	x	x

Species	Stratum	Status	Sydney North Exposed Sandstone Woodland	Duffys Forest
Pittosporum undulatum	Mid Stratum	Native Indigenous	x	x
Polyscias sambucifolia	Mid Stratum	Native Indigenous	x	x
Prunus spp.	Mid Stratum	Non-native	x	x
Pyracanthea angustifolia	Mid Stratum	Non-native	x	x
Rubus fruticosus agg.	Mid Stratum	Priority Weed of Greater Sydney	x	x
Solanum mauritianum	Mid Stratum	Non-native	x	x
Xanthorrhoea media	Mid Stratum	Native Indigenous	x	x
Agave secundifolia	Ground Stratum	Non-native	x	x
Ageratina adenophora	Ground Stratum	Non-native	x	x
Anisopogon avenaceus	Ground Stratum	Native Indigenous	x	x
Aristida ramosa	Ground Stratum	Native Indigenous	x	x
Aristida vagans	Ground Stratum	Native Indigenous	x	x
Asparagus aethiopicus	Ground Stratum	Priority Weed of Greater Sydney	x	x
Asparagus asparagoides	Ground stratum	Priority Weed of Greater Sydney	x	x
Asparagus officinalis	Ground Stratum	Non-native	x	x
Bauhinia blakeana	Ground Stratum	Non-native	x	x
Bidens pilosa	Ground Stratum	Non-native	x	x
Bossiaea heterophylla	Ground Stratum	Native Indigenous		x
Cenchrus clandestinus	Ground Stratum	Non-native	x	x
Centaurea spp.	Ground Stratum	Non-native	x	x
Cheilanthes sieberi	Ground Stratum	Native Indigenous	x	
Chloris gayana	Ground Stratum	Non-native	x	x
Cymbopogon refractus	Ground stratum	Native Indigenous	x	
Dianella caerulea	Ground Stratum	Native Indigenous	x	x
Dietes grandiflora	Ground Stratum	Non-native	x	x
Digitaria didactyla	Ground Stratum	Native Indigenous	x	x
Digitaria sanguinalis	Ground Stratum	Non-native	x	x
Echinopogon caespitosum	Ground Stratum	Native Indigenous	x	x
Echinopogon ovatus	Ground Stratum	Native Indigenous	x	x
Entolasia stricta	Ground Stratum	Native Indigenous	x	x
Eragrostis brownii	Ground Stratum	Native Indigenous	x	x
Eragrostis curvula	Ground Stratum	Non-native	x	x
Glycine clandestina	Ground Stratum	Native Indigenous	x	x
Gnaphalium pennsylvanicum	Ground Stratum	Non-native	x	x
Hibbertia obtusifolia	Ground stratum	Native Indigenous		x
Hypericum gramineum	Ground Stratum	Native Indigenous	x	x
Hyparrhenia hirta	Ground Stratum	Non-native	x	x
Imperata cylindrica	Ground Stratum	Native Indigenous	x	x
Joycea pallida	Ground Stratum	Native Indigenous	x	x
Lomandra brevis	Ground Stratum	Native Indigenous	x	x
Lomandra glauca	Ground Stratum	Native Indigenous	x	
Lomandra longofolia	Ground Stratum	Native Indigenous	x	x
Lomandra obliqua	Ground Stratum	Native Indigenous	x	
Ochna serrulata	Ground Stratum	Non-native	x	x

Species	Stratum	Status	Sydney North Exposed Sandstone Woodland	Duffys Forest
Oxalis perennans	Ground Stratum	Native Indigenous	x	x
Paspalum urvillei	Ground Stratum	Non-native	x	x
Patersonia sericea	Ground Stratum	Native Indigenous	x	x
Plantago lanceolatus	Ground Stratum	Non-native	x	x
Poa affinis	Ground Stratum	Native Indigenous		x
Pteridium esculentum	Ground Stratum	Native Indigenous	x	x
Richardia brasiliensis	Ground Stratum	Non-native	x	x
Schoenus melanostachys	Ground Stratum	Native Indigenous		x
Senecio madagascariensis	Ground Stratum	Priority Weed of Greater Sydney	x	x
Setaria pumila	Ground Stratum	Non-native	x	x
Sida rhombifolia	Ground Stratum	Non-native	x	x
Soliva sessilis	Ground stratum	Non-native	x	x
Sonchus oleraceus	Ground Stratum	Non-native	x	x
Stenotaphrum secundatum	Ground Stratum	Non-native	x	x
Taraxicum officinale	Ground Stratum	Non-native	x	x
Themeda triandra	Ground Stratum	Native Indigenous		x
Verbena quadrangularis	Ground Stratum	Non-native	x	x
Verbena rigida	Ground Stratum	Non-native	x	x

Appendix 2. Fauna species identified during survey of Subject Property by Land Eco Consulting

Class	Scientific Name	Common Name	NSW Biodiversity Conservation Act 2016 Status
Aves	*Trichoglossus moluccanus*	Rainbow Lorikeet	Protected
Aves	*Sphecotheres vieilloti*	Australian Figbird	Protected
Aves	*Zosterops lateralis*	Silvereye	Protected
Aves	*Zanda funerea*	Yellow-tailed Black-cockatoo	Protected
Aves	*Grallina cyanoleuca*	Magpie-lark	Protected
Aves	*Manorina melanocephala*	Noisy Miner	Key Threatening Process
Aves	*Strepera graculina*	Pied Currawong	Protected
Aves	*Anthochaera carunculata*	Red Wattlebird	Protected
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	Protected

Class	Scientific Name	Common Name	NSW Biodiversity Conservation Act 2016 Status
Aves	*Eolophus roseicapilla*	Galah	Protected
Aves	*Sericornis frontalis*	White-Browed Scrubwren	Protected
Aves	*Hirundo neoxena*	Welcome Swallow	Protected
Aves	*Pachycephala pectoralis*	Golden Whistler	Protected
Aves	*Glossopsitta concinna*	Musk Lorikeet	Protected
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	Protected
Aves	*Cractucus torquatus*	Grey Butcherbird	Protected
Aves	*Anthochaera chrysoptera*	Little Wattlebird	Protected
Aves	*Acridotheres tristis*	Common Myna	Exotic
Mammalia	*Petaurus breviceps*	Sugar Glider	Protected
Mammalia	*Trichosurus vulpecula*	Common Brushtail Possum	Protected

Appendix 3. Biodiversity Conservation Act 2016 - Test of Significance (5 Part Test)

Duffy's Forest Endangered Ecological Community

Nomadic Nectarivorous Birds

- *Glossopsitta pusilla* **(Little Lorikeet) – vulnerable (BC Act)**
- *Lathamus discolor* **(Swift Parrot) – endangered (BC Act)**

Cockatoos

- *Calyptorhynchus lathami* **(Glossy Black Cockatoo) – vulnerable (BC Act)**

Owls

- *Ninox strenua* **(Powerful Owl) – vulnerable (BC Act)**
- *Ninox connivens* **(Barking Owl) – vulnerable (BC Act)**

Flying-foxes

- *Pteropus poliocephalus* **(Grey-headed Flying-fox) - vulnerable (BC Act)**

Microbats

- *Saccolaimus flaviventris* **(Yellow-bellied Sheathtail-bat) – vulnerable (BC Act)**
- *Micronomus norfolkensis* **(Eastern Coastal Free-tailed Bat) – vulnerable (BC Act)**
- *Miniopterus australis* **(Little Bentwing Bat) – vulnerable (BC Act)**
- *Miniopterus orianae oceanesis* **(Large Bent-wing Bat) – vulnerable (BC Act)**
- *Falsistrellus tasmaniensis* **(Eastern False Pipistrelle) – vulnerable (BC Act)**
- *Myotis macropus* **(Southern Myotis) – vulnerable (BC Act)**
- *Chalinolobus dwyeri* **(Large-eared Pied Bat) – vulnerable (BC Act)**
- *Scoteanax rueppellii* **(Greater Broad-nosed Bat) – vulnerable (BC Act)**

Raptors

- *Haliaeetus leocogaster* **(White-bellied Sea-Eagle) – vulnerable (BC Act)**
- *Hieraaetus morphnoides* **(Little Eagle) – vulnerable (BC Act)**
- *Lophoictinia isura* **(Square-tailed Kite) – vulnerable (BC Act)**

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Duffys Forest ecological community in the Sydney Basin Bioregion - endangered ecological community		
Ecology **(DPIE 2021c)**	Open-forest or woodland community dominated by Red Bloodwood *Corymbia gummifera*, Black Ash *Eucalyptus sieberi*, Smooth-barked Apple *Angophora costata*, and frequently a stringybark *E. capitellata* or *E. oblonga*. Other understorey species include Myrtle Wattle *Acacia myrtifolia*, Hairpin Banksia *Banksia spinulosa*, Rusty Velet-bush *Lasiopetalum ferrugineum*, Crinkle Bush *Lomatia silaifolia*, Broad-leaf Geebung *Persoonia levis*, Apple–berry *Billardiera scandens*, Wiry Panic *Entolasia stricta*, Twisted Mat-rush *Lomandra obliqua*, *Micrantheum ericoides* and *Xanthorrhoea media*.	
Habitat Impacted by this Activity/Development	Within the Subject Land, the Duffys Forest vegetation is structurally complete with a canopy dominated by Silver-top Ash (*Eucalyptus sieberi*) with *Eucalyptus haemastoma* and *Angophora costata* over *Allocasuarina littoralis, Acacia longifolia, Acacia suavelons, Acacia linifolia* and *Acacia myrtifolia, Hakea dactyloides* and *Grevillea sericea.* The ground layer was dominated by a dense layer of *Pteridium esculentum* and *Imperata cylindrica* with *Xanthorrhoea media* and *Entolasia stricta* among a diverse suite of fern, forb, low shrub, grass and sedge groundcover. This vegetation occurs on deep orange-red sandy clay loam with abundant orange-red Hawkesbury Sandstone laterite nodules and surface gravel/pebbles. 792m² of Duffys Forest will be removed for the proposed development. This represents all the Duffys Forest within the Subject Property. Despite the severe weed infestations over most of the Subject Land, the Duffys Forest EEC had comparatively lower weed infestation and therefore was in good condition.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	N/A	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	The local occurrence is likely to be placed at risk of extinction as a result of this activity. The proposed activity will result in removal of the last known remaining, structurally complete stand of Duffys Forest EEC in the suburb of Mount Colah.
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	The proposed activity will substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. Most of the canopy trees and shrub components of the Duffys Forest EEC will be removed for the activity. This will substantially, adversely modify the composition of the ecological community. There are no proximal, similar patches in the Mount Colah area.
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	792m² of Duffys Forest will be removed for the proposed development. This represents all the Duffys Forest within the Subject Property, and likely all of the structurally complete Duffys Forest in Mount Colah.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	This patch of Duffys Forest is already isolated. Any remaining components of this EEC in the Subject Land and broader locality will become further isolated and fragmented as a result of this activity.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Duffys Forest ecological community in the Sydney Basin Bioregion - endangered ecological community		
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat to be removed, modified, fragmented or isolated is important to the long-term survival of the ecological community in the locality. Clearing of this patch as a result of the activity will remove this important habitat.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala.Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Nomadic Nectarivorous Birds • *Glossopsitta pusilla* **(Little Lorikeet)[1]** • *Lathamus discolor* **(Swift Parrot)[2]** **Status: Vulnerable[1], Endangered[2]**		
Ecology **(DPIE 2021c)**	The Swift Parrot and Little Lorikeet are nomadic nectarivorous birds which travel across New South Wales following food availability. The main sources of food are nectar from flowering Eucalyptus/Corymbia and lerp (psyllid bug exudate) on Eucalyptus/Corymbia/Angophora leaves. The Swift Parrot only breeds in Tasmania and migrates to mainland NSW in the autumn-winter months to forage. The Little Lorikeet is known to nest in smooth-barked trees.	
Habitat Impacted by this Activity/Development	The site contains tree species that may form potential foraging habitat for the Little Lorikeet and Swift Parrot, foraging on lerp or Eucalyptus trees when they are in flower. The Subject Property contains hollow-bearing trees with suitable sized hollows for these species, including two that are likely to be removed for the proposed activity, though the habitat is open and disturbed (frequented by people and pets), frequented by more dominant, aggressive species such as the Noisy Miner, making breeding unlikely for the Little Lorikeet. The Swift Parrot only breeds in Tasmania. The proposed activity will result in the removal of 0.29 ha of potential foraging habitat , however the patch size is relatively small compared to the larger, better quality habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species could be placed at risk of extinction. The Little Lorikeet and Swift Parrot are highly mobile and form large, single populations that travel across New South Wales. The Little Lorikeet breeds across its distribution in NSW and is unlikely to breed within the Subject Land due to the disturbed habitat condition, frequented by people, pets and aggressive birds such as the Noisy Miner and Grey Butcherbird. The Swift Parrot only breeds in Tasmania.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to these species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	It is not likely that an area of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development or activity. These bird species are highly mobile and known to forage across coastal NSW, and the Little Lorikeet breeds across its distribution in NSW. The proposed development will not prevent access to surrounding habitat.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of these species in the locality because the habitat is: 1. In poor condition owing to historical clearing, erosion, and weed infestation.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Nomadic Nectarivorous Birds • *Glossopsitta pusilla* **(Little Lorikeet)[1]** • *Lathamus discolor* **(Swift Parrot)[2]** **Status: Vulnerable[1], Endangered[2]**		
		2. open and disturbed (frequented by people and pets), frequented by more dominant, aggressive species such as the Noisy Miner 3. The patch is not large enough to sustain a population of Little Lorikeet or Swift Parrot. Owing to these factors, the Subject Property does not represent important habitat for the Little Lorikeet or Swift Parrot in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala. • Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive *Olea europaea subsp. cuspidata* (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Cockatoos • *Calyptorhynchus lathami* **(Glossy Black Cockatoo)** **Status: Vulnerable**		
Ecology **(DPIE 2021c)**	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Black Sheoak (Allocasuarina littoralis) and Forest Sheoak (A. torulosa) are important foods. Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	
Habitat Impacted by this Activity/Development	The site contains tree species (*Allocasuarina littoralis*) that form foraging habitat for the Glossy Black Cockatoo. There are no suitable large hollow-bearing trees within the Subject Property for breeding. The proposed activity will result in the removal of 0.29 ha of potential foraging habitat, however the patch size is relatively small compared to the larger, better quality habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species could be placed at risk of extinction as no breeding habitat is likely to impacted by the proposed development.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to these species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	It is not likely that an area of habitat will become fragmented or isolated from other areas of habitat as a result of the proposed development or activity. This bird species is highly mobile and known to forage across coastal NSW. The proposed development will not prevent access to surrounding habitat.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of these species in the locality because the habitat is: 1. In poor condition owing to historical clearing, erosion, and weed infestation. 2. The patch is not large enough to sustain a population of Glossy Black Cockatoo. Owing to these factors, the Subject Property does not represent important habitat for the Glossy Black in the locality.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
Cockatoos • *Calyptorhynchus lathami* **(Glossy Black Cockatoo)** **Status: Vulnerable**	
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners *Manorina melanocephala.* • Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Owls • *Ninox strenua* **(Powerful Owl)** • *Ninox connivens* **(Barking Owl)** **Status: Vulnerable**		
Ecology **(DPIE 2021c)**	The Barking Owl inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats (e.g. western NSW) due to the higher density of prey found on these fertile riparian soils. It nests in large hollows greater than 20cm in diameter in trees that are at least eight metres above ground. The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation comprising species such as Turpentine *Syncarpia glomulifera*, Black She-oak *Allocasuarina littoralis*, Blackwood *Acacia melanoxylon*, and a number of eucalypt species. It nests in large hollows greater than 20cm in diameter in trees that are at least eight metres above ground.	
Habitat Impacted by this Activity/Development	The site contains tree species that may form potential foraging habitat for these owls as they attract vertebrate prey items such as large birds, bats and possums, though are unlikely to breed due to a lack of large hollow-bearing trees of suitable position and dimensions to support these species. The proposed activity will result in the removal of 0.29 ha of potential foraging habitat, however the patch size is relatively small compared to the larger, better quality habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park, accessible to these highly mobile species. Indirect impacts from the development are unlikely to be substantially greater than those from existing nearby residential dwellings and roads, and the railway line.	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	These owls are large, mobile bird species capable of moving multiple kilometres in a day. The habitat to be impacted by the activity forms only a small portion of the overall habitat used by these species in the locality and available in the surrounding reserves and National Park. As no breeding habitat is being removed, it is unlikely that there will be any adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction. The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species could be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to these species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	These large birds are aerially mobile and capable of moving long distance (multiple kilometres) in a single day. Despite vegetation being lost from the Subject Property, this is unlikely to restrict their access to other existing habitat in Berowra Valley National Park and Ku-ring-gai Chase National Park, therefore no area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed activity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of these species in the locality because the habitat is:

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Owls • *Ninox strenua* **(Powerful Owl)** • *Ninox connivens* **(Barking Owl)** **Status: Vulnerable**		
		1. In poor condition owing to historical clearing, erosion and weed infestation. 2. Contains no suitable breeding habitat (e.g. tree hollows of suitable size and condition) 3. Is not in close proximity (<100m) to any known breeding hollows 4. Much greater area of foraging, roosting and breeding habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park. Owing to these factors, the Subject Property does not represent important habitat for these owl species in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala. • Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
• *Pteropus poliocephalus* **(Grey-headed Flying-fox)** **Status: Vulnerable**		
Ecology **(DPIE 2021c)**	The Grey-headed Flying-fox occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Can travel up to 50 km from their camp to forage; commuting distances are more often <20 km. Feeds on the nectar and pollen of native trees, in particular Eucalyptus, Melaleuca and Banksia, and fruits of rainforest trees and vines. Also forage in cultivated gardens and fruit crops.	
Habitat Impacted by this Activity/Development	The subject property contains fruiting shrubs (*Pittosporum undulatum, Ligustrum lucidum*) along with remnant *Corymbia spp.* and *Eucalyptus* spp. that may form potential foraging habitat for the Grey-headed Flying-fox when the trees are in flower. The proposed activity will result in the removal of 0.29 ha of potential foraging habitat, however the patch size is relatively small compared to the larger, better quality habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park. There are no known Grey-headed Flying-fox colonies on the Subject Property or in the locality (DAWE 2022).	
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	The Grey-headed Flying-fox is a mobile species, and the habitat to be impacted by the development forms only a small portion of the overall habitat available in the surrounding reserves. As roosting or breeding is unlikely to occur on the Subject Property, the life cycle of this species will largely remain unimpacted. The proposed development is not likely to have an adverse effect on the life cycle of the species such that a viable local population of the species could be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to this species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	The Grey-headed Flying-fox is mobile and capable of moving long distance between forage trees. The proposed development will not prevent access to surrounding habitat, therefore no area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development activity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of this species in the locality because the habitat is: 1. In poor condition owing to historical clearing, erosion and weed infestation. 2. Contains no known breeding colonies. 3. Represents only a small proportion of the foraging habitat available in the locality and Berowra Valley National Park and Ku-ring-gai Chase National Park. Owing to these factors it is believed the habitat in the Subject Property is not considered important to the species in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
• *Pteropus poliocephalus* **(Grey-headed Flying-fox)** **Status: Vulnerable**	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala. • Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
Microbats • *Saccolaimus flaviventris* **(Yellow-bellied Sheathtail-bat)** • *Micronomus norfolkensis* **(Eastern Coastal Free-tailed Bat)** • *Miniopterus orianae oceanensis* **(Large Bent-wing Bat)** • *Miniopterus australis* **(Little Bent-wing Bat)** • *Falsistrellus tasmaniensis* **(Eastern False Pipistrelle)** • *Myotis macropus* **(Southern Myotis)** • *Chalinolobus dwyeri* **(Large-eared Pied Bat)** • *Scoteanax rueppellii* **(Greater Broad-nosed Bat)** **Status: Vulnerable**	
Ecology (DPIE 2021c)	The Yellow-bellied Sheathtail-bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas they are known to utilise mammal burrows. When foraging for insects, they fly high and fast over the forest canopy, but lower in more open country. Breeding has been recorded from December to mid-March, when a single young is born. Seasonal movements are unknown; there is speculation about a migration to southern Australia in late summer and autumn. The Eastern Coastal Free-tailed Bat occurs in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roosts mainly in tree hollows but will also roost under bark or in man-made structures. Usually solitary but also recorded roosting communally, probably insectivorous. The Eastern False Pipistrelle prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy. The Large Bent-wing and Little Bent-wing bats both predominantly breed in complex cave systems, typically limestone systems. They also may breed in large concrete bridges and similar artificial structures. Small numbers may roost in tree hollows and building cavities, however breeding in these habitats is not likely. The Large Bent-wing hunts prey above the canopy while the Little Bent-wing forages below the canopy. The Southern Myotis Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. The Large-eared Pied Bat toosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (Petrochelidon ariel), frequenting low to mid-elevation dry open forest and woodland close to these features. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years. Found in well-timbered areas containing gullies. The Greater Broad-nosed Bat utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings.
Habitat Impacted by this Activity/Development	The Subject Land contains tree species that may form suitable foraging habitat for all eight microbat species. While two hollow-bearing trees are present in the Subject Land, species such as the Great Broad-nosed Bat, Eastern Coastal Free-tailed Bat, Yellow-bellied Sheathtail-bat, Southern Myotis, Greater Broad-nosed Bat and Eastern False Pipistrelle, that rely on hollows for breeding are unlikely to do so due to the exposed and disturbed nature of these hollows, frequented by pets and people. These hollows may be used for temporary roosting and sheltering. Two hollow-bearing trees are likely to be removed for the proposed activity. Old bridge structures have the potential to provide habitat to microbats, however an ecologist determined the existing bridge structure at Mount Colah Railway Station to be inadequate for microbats due to a lack of coverage and unsuitable materials (SMEC 2020). As such, cave dwelling microbats such as the Southern Myotis, the Large-eared Pied Bat, the Large Bent-wing Bat and the Small Bent-wing Bat are unlikely to be impacted by the proposed activity. The proposed activity will result in the removal of up to 0.29 ha of potential foraging habitat for these microbat species.There is no suitable foraging habitat for the Southern Myotis within the Subject Property. Indirect impacts from the activity are unlikely to be substantially greater than those from existing nearby residential dwellings and the existing railway.
(a) in the case of a threatened species, whether the proposed	These microbats are highly mobile, aerial species with a wide distribution. While a substantial amount of vegetation will be lost from the Subject Property, no highly suitable breeding habitat will be lost and

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Microbats • *Saccolaimus flaviventris* **(Yellow-bellied Sheathtail-bat)** • *Micronomus norfolkensis* **(Eastern Coastal Free-tailed Bat)** • *Miniopterus orianae oceanensis* **(Large Bent-wing Bat)** • *Miniopterus australis* **(Little Bent-wing Bat)** • *Falsistrellus tasmaniensis* **(Eastern False Pipistrelle)** • *Myotis macropus* **(Southern Myotis)** • *Chalinolobus dwyeri* **(Large-eared Pied Bat)** • *Scoteanax rueppellii* **(Greater Broad-nosed Bat)** **Status: Vulnerable**		
development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	additional habitat is available within Berowra Valley National Park and Ku-ring-gai Chase, thus no adverse impact on the life cycle of a viable local population is likely.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to these species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	All eight species of microbat are mobile. The habitat to be modified would form only a small portion of the overall habitat used by most of these species. Access to habitat in surrounding reserves will remain unrestricted, therefore no area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development activity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of the species or ecological community in the locality because the habitat is: 1. In poor condition owing to historical clearing, erosion and weed infestation. 2. Represents only a small proportion of foraging habitat available in surrounding reserves and National Parks. 3. While hollow-bearing trees will be lost from the Subject Land, others are present nearby in National Parks. 4. The existing footbridge has been deemed not to provide suitable habitat for microbats. Owing to these factors, the habitat is not considered important to these species in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
Microbats • *Saccolaimus flaviventris* **(Yellow-bellied Sheathtail-bat)** • *Micronomus norfolkensis* **(Eastern Coastal Free-tailed Bat)** • *Miniopterus orianae oceanensis* **(Large Bent-wing Bat)** • *Miniopterus australis* **(Little Bent-wing Bat)** • *Falsistrellus tasmaniensis* **(Eastern False Pipistrelle)** • *Myotis macropus* **(Southern Myotis)** • *Chalinolobus dwyeri* **(Large-eared Pied Bat)** • *Scoteanax rueppellii* **(Greater Broad-nosed Bat)** **Status: Vulnerable**	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala.Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
Raptors • *Haliaeetus leucogaster* **(White-bellied Sea-Eagle)** • *Hieraaetus morphnoides* **(Little Eagle)** • *Lophoictinia isura* **(Square-tailed Kite)** **Status: Vulnerable**	
Ecology **(DPIE 2021c)**	White-bellied Sea-Eagle habitat is characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. The Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. The Square-tailed Kite is found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.
Habitat Impacted by this Activity/Development	These raptor species are all likely to fly over the Subject Property searching for prey and may temporarily roost in the emergent eucalypts though they are unlikely to breed as habitat is quite open and disturbed. The proposed activity will result in the removal of 0.29 ha of potential foraging habitat, however the patch size is relatively small compared to the larger, better quality habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park, accessible to these highly mobile species.

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016		
Raptors • *Haliaeetus leucogaster* **(White-bellied Sea-Eagle)** • *Hieraaetus morphnoides* **(Little Eagle)** • *Lophoictinia isura* **(Square-tailed Kite)** **Status: Vulnerable**		
(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,	These raptors are large, mobile bird species capable of moving multiple kilometres in a day. The habitat to be impacted by the development forms only a small portion of the overall habitat used by these species in the locality and available in the surrounding reserves and National Parks. As no highly suitable breeding habitat is being removed, it is unlikely that there will be any adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	NA
	(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,	NA
(c) in relation to the habitat of a threatened species or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and	The proposed development will result in the removal of 0.29 ha of vegetation providing potential foraging habitat to these species. This represents a fraction of a percentage of the > 10,000 hectares of habitat available in Berowra Valley National Park and Ku-ring-gai Chase National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and	These three large birds are aerially mobile and capable of moving long distance (multiple kilometres) in a single day. Despite vegetation being lost from the Subject Property, this is unlikely to restrict their access to other existing habitat, therefore no area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed activity.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,	The habitat proposed to be removed, modified, fragmented or isolated is not important to the long-term survival of these species in the locality because the habitat is: 1. In poor condition owing to historical clearing, erosion and weed infestation. 2. Low suitability for breeding as the habitat is open and disturbed. 3. Represents a small proportion of the habitat available around Berowra Valley National Park and Ku-ring-gai Chase National Park. Owing to these factors, the habitat is not considered important to these species in the locality.
(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),	The development proposed is not likely to have an adverse effect on any declared area of outstanding biodiversity value, directly or indirectly.	
(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The Subject Property is already impacted by several key threatening processes including: • Invasion of native plant communities by exotic perennial grasses • Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners Manorina melanocephala. • Invasion of native plant communities by bitou bush & boneseed • Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif. • Invasion, establishment and spread of Lantana (Lantana camara L. sens. lat) • Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants • Predation by feral cats	

Test of Significance (Five Part Test) s.7.3 of the Biodiversity Conservation Act 2016	
Raptors • *Haliaeetus leucogaster* **(White-bellied Sea-Eagle)** • *Hieraaetus morphnoides* **(Little Eagle)** • *Lophoictinia isura* **(Square-tailed Kite)** **Status: Vulnerable**	
	These processes have degraded the condition of this habitat and its potential to be utilised by threatened species. Additional key threatening processes that will result from any future development include: • Clearing of native vegetation • Loss of hollow-bearing trees • Removal of dead wood and dead trees

Land Eco consulting

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Appendix C - Contamination

Search results

Your search for: **General Search** with the following criteria

Suburb - Mt Colah

returned 0 result

Search Again

For business and industry

For local government

Contact us

- 131 555 (tel:131555)
- Online (https://yoursay.epa.nsw.gov.au/epa-website-feedback)
- info@epa.nsw.gov.au (mailto:info@epa.nsw.gov.au)
- EPA Office Locations (https://www.epa.nsw.gov.au/about-us/contact-us/locations)

lh	LUCAS HEIGHTS	Residual

Source: Soil and Land Resources of the Hawkesbury-Nepean Catchment *interactive DVD*

Landscape— gently undulating crests and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes <10%. Rock outcrop is absent. Extensively or completely cleared, dry sclerophyll low forest and woodland.

Soils— moderately deep (50-150 cm), hardsetting *Yellow Podzolic Soils* and *Yellow Soloths (Dy2.41); Yellow Earths (Gn2.24)* on outer edges.

Limitations— stony soil, low soil fertility, low available water capacity.

LOCATION

Ridge and plateau surfaces on Mittagong Formation. Occurrences are most common in the Macdonald Ranges and on the Hornsby Plateau. Most extensive occurrences are located at Berowra, Forest Glen, Glenorie, Fiddletown, Dural and Glenhaven. Other examples occur at St. Ives, South Turramurra, South Gordon, Beacon Hill, Northbridge, Kogarah and Riverwood.

LANDSCAPE

Geology

Mittagong Formation— interbedded shale, laminite and fine to medium grained quartz sandstone. The Mittagong Formation is located stratigraphically between the Ashfield Shale and Hawkesbury Sandstone. It is often relatively shallow. Minor areas of Hawkesbury Sandstone and minor areas of Ashfield Shale may occur.

Topography

Gently undulating plateau, 200-1000 m in width, with level to gently inclined slope gradients of <10%. Local relief is <30 m. Rock outcrop is absent.

Vegetation

Extensively cleared to completely cleared low, eucalypt open-forest and low eucalypt woodland with a sclerophyll shrub understorey. Dominant tree species include turpentine *Syncarpia glomulifera*, smooth-barked apple *Angophora costata*, red bloodwood *Eucalyptus gummifera*, thin-leaved stringybark *E. eugenioides* and scribbly gum *E. haemastoma*. Small scattered areas of native vegetation remain. Larger undisturbed occurrences are found in Ku-ring-gai Chase National Park and Muogamarra Nature Reserve.

Land use

Rural land uses include citrus orchards, market gardens and poultry farms. Grazing of horses and dairy cattle is common on improved, kikuyu dominated pastures. Small rural subdivisions and hobby farms occur on the urban fringes of the metropolitan area. The unit has been developed for urban use at Berowra and St. Ives. Areas of natural bushland, such as Muogamarra Nature Reserve, Ku-ring-gai Chase National Park and crown lands are used for passive recreation.

Existing Erosion

Erosion on this unit is generally low. Minor gully and sheet erosion occurs occasionally along unpaved roads.

Associated Soil Landscapes

Small areas of Faulconbridge (**fb**) soil landscape occur near the edge of this unit.

SOILS

Dominant Soil Materials

lh1— Loose, yellowish-brown sandy loam. This is a loose sandy loam with apedal single-grained structure and porous sandy fabric. It usually occurs as topsoil (A1 horizon). Texture is commonly sandy loam, but may range from a loamy sand to a light sandy clay loam. Sand is usually fine. Surface condition is commonly loose, but may be friable when organic matter is common. Colour is usually dull yellowish-brown (10YR 4/3), or occasionally very dark brown (7.5YR 2/3). The pH ranges from very strongly acid (pH 4.5) to slightly acid (pH 6.5). Common inclusions are iron coated, platy, fine sandstone rock fragments and charcoal fragments. Roots are also common.

lh2— Bleached, stony, hardsetting sandy clay loam. This is a bleached, stony, sandy clay loam that has a hardsetting surface, apedal massive structure and slowly porous earthy fabric. This material commonly occurs as an A2 horizon. Textures commonly range with depth from clayey sand to fine sandy clay loam. Sand is generally fine-grained. Colour is commonly dull yellowish-brown (10YR 5/4) and is bleached when dry (10YR 7/3), but may range from brown (7.5YR 4/3) to bright yellowish-brown (10YR 6/6). Pale yellow and brown mottles are often present and are commonly associated with faunal casts and burrows. The pH ranges from strongly acid (pH 4.0) to slightly acid (pH 6.0). Fine sandstone fragments and rounded iron nodules are abundant and are often concentrated at depth. Platy, iron coated stones are stratified, reoriented and angular to subrounded. Traces of charcoal are commonly present, but roots are rare.

lh3— Earthy, yellowish-brown sandy clay loam. This is a yellowish-brown sandy clay loam with apedal massive structure and earthy porous fabric. It generally occurs as subsoil (B horizon) developed on coarse sandstone. Texture, which is commonly a sandy clay loam on the surface, may increase gradually with depth to sandy clay. Colour is commonly a yellowish-brown (2.5Y 5/6-5/8, 10YR 5/8) or bright yellowish-brown (10YR 6/6, 6/8). Orange mottles may occur with depth. The pH ranges from strongly acid (pH 4.5) to slightly acid (pH 6.0). Iron coated sandstone fragments are common. They are usually stratified and reoriented. Charcoal fragments and roots are rare.

lh4— Pedal, yellowish-brown clay. This is yellowish-brown sandy clay to heavy clay with strongly pedal sub-angular blocky or prismatic structure and smooth-faced, dense ped fabric. This material usually occurs as subsoil (B and C horizons) developed on fine-grained sandstone. Peds are smooth-faced, dense and range in size from 10 mm to 20 mm. Colour is commonly bright yellowish-brown (10YR 6/8), but may range from reddish-brown (5YR 4/6) to bright yellowish-brown (10YR 7/6). Yellow, red and orange mottles are occasionally present. The pH ranges between strongly acid (pH 4.0) and moderately acid (pH 5.0). Undisturbed, stratified bands of platy, iron coated, fine sandstone rock fragments are common. Charcoal fragments and roots are rarely present.

Occurrence and Relationships

Up to 30 cm of loose, yellowish-brown sandy loam (**lh1**) overlies 10-30 cm of bleached, stony, hardsetting sandy clay loam (**lh2**) and up to 100 cm of yellowish-brown, pedal clay (**lh4**) (Yellow Podzolic Soils and Soloths (Dy2.41)). The boundary between the soil materials is generally clear. The total soil depth is commonly <100 cm. Occasionally **lh1** material is absent.

Near the boundaries to sandstone landscapes up to 15 cm of **lh1** overlies up to 30 cm of **lh2** and up to 30 cm of earthy, yellowish-brown sandy clay loam (**lh3**) (Yellow Earths (Gn2.24)).

LIMITATIONS TO DEVELOPMENT

Urban Capability

High capability for urban development.

Rural Capability

Generally capable of supporting grazing with some localised areas capable of regular cultivation.

Landscape Limitations

Localised surface movement potential.

Soil Limitations

lh1
Stoniness
High permeability
Low available water capacity
Low fertility

lh2
High erodibility
Stoniness
Low available water capacity
Hardsetting surface
Very low fertility
Localised sodicity

lh3
Stoniness
Low available water capacity
Very low fertility
Sodicity

lh4
Low wet strength
Stoniness
Low permeability
Low available water capacity (localised)
Very low fertility
Strongly acid
High aluminium toxicity

Fertility

General fertility is low. The soils have low available water capacity and CEC as well as low to very low intrinsic nitrogen and phosphorus values. Topsoils are hardsetting and stony. The subsoils are occasionally sodic and impermeable.

Erodibility

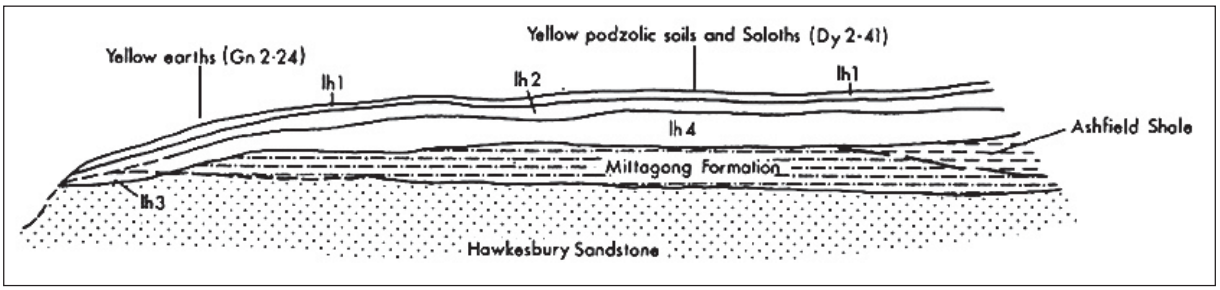
lh1 is moderately erodible as it consists of loose, fine sand grains and moderate amounts of organic matter. **lh2** is low in organic matter and has a very high erodibility rating as it consists of fine sand and some silt grains held in a clay matrix. **lh3** has a high erodibility as it has fine sand and silt grains and a low organic matter content. **lh4** is moderately erodible consisting of fine sand and clay with a very low organic matter content.

Erosion Hazard

The erosion hazard for non-concentrated flows is generally moderate, but ranges from slight to extreme. Calculated soil loss during the first twelve months of development ranges up to 103 t/ha for topsoil, and 97 t/ha for exposed subsoil. Soil erosion hazard for concentrated flows is high.

Surface Movement Potential

Soils are generally slightly reactive or moderately reactive where they exceed 1.5 m.



Schematic cross-section of Lucas Heights soil landscape illustrating the occurrence and relationship of the dominant soil materials.

Background

A strategy to systematically prioritise, assess and respond to notifications under Section 60 of the ***Contaminated Land Management Act 1997*** (CLM Act) has been developed by the EPA. This strategy acknowledges the EPA's obligations to make information available to the public under ***Government Information (Public Access) Act 2009***.

When a site is notified to the EPA, it may be accompanied by detailed site reports where the owner has been proactive in addressing the contamination and its source. However, often there is minimal information on the nature or extent of the contamination.

After receiving a report, the first step is to confirm that the report does not relate to a pollution incident. The Protection of the Environment Operations Act 1997 (POEO Act) deals with pollution incidents, waste stockpiling or dumping. The EPA also has an incident management process to manage significant incidents (https://www.epa.nsw.gov.au/reporting-and-incidents/incident-management).

In many cases, the information indicates the contamination is securely immobilised within the site, such as under a building or carpark, and is not currently causing any significant risks for the community or environment. Such sites may still need to be cleaned up, but this can be done in conjunction with any subsequent building or redevelopment of the land. These sites do not require intervention under the CLM Act, and are dealt with through the planning and development consent process. In these cases, the EPA informs the local council or other planning authority, so that the information can be recorded and considered at the appropriate time (https://www.epa.nsw.gov.au/your-environment/contaminated-land/managing-contaminated-land/role-of-planning-authorities).

Where indications are that the contamination could cause actual harm to the environment or an unacceptable offsite impact (i.e. the land is 'significantly contaminated'), the EPA would apply the regulatory provisions of the CLM Act to have the responsible polluter and/or landowner investigate and remediate the site. If the reported contamination could present an immediate or long-term threat to human health NSW Health will be consulted. SafeWork NSW and Water NSW can also be consulted if there appear to be occupational health and safety risks or an impact on groundwater quality.

As such, the sites notified to the EPA and presented in the list of contaminated sites notified to the EPA are at various stages of the assessment and remediation process. Understanding the nature of the underlying contamination, its implications and implementing a remediation program where required, can take a considerable period of time. The list provides an indication, in relation to each nominated site, as to the management status of that particular site. Further detailed information may be available from the EPA or the person who notified the site.

The following questions and answers may assist those interested in this issue.

Frequently asked questions

Why does my land appear on the list of notified sites?

Your land may appear on the list because:

• the site owner and/or the polluter has notified the EPA under section 60 of the CLM Act
• the EPA has been notified via other means and is satisfied that the site is or was contaminated.

If a site is on the list, it does not necessarily mean the contamination is significant enough to regulate under the CLM Act.

Does the list contain all contaminated sites in NSW?

No. The list only contains contaminated sites that EPA is aware of. If a site is not on the list, it does not necessarily mean the site is not contaminated.

The EPA relies on responsible parties and the public to notify contaminated sites.

How are notified contaminated sites managed by the EPA?

There are different ways the EPA can manage notified contaminated sites. Options include:

• regulation under the CLM Act, POEO Act, or both
• notifying the relevant planning authority for management under the planning and development process
• managing the site under the Protection of the Environment Operation (Underground Petroleum Storage Systems) Regulation 2014.

There are specific cases where contamination is managed under a tailored program operated by another agency (for example, the Resources & Geoscience's Legacy Mines Program).

What should I do if I am a potential buyer of a site that appears on the list?

You should seek advice from the seller to understand the contamination issue. You may need to seek independent contamination or legal advice.

The information provided in the list is indicative only and a starting point for your own assessment. Land contamination from past site uses is common, mainly in urban environments. If the site is properly remediated or managed, it may not affect the intended future use of the site.

Who can I contact if I need more information about a site?

You can contact the Environment Line at any time by calling 131 555 or by emailing info@environment.nsw.gov.au.

List of NSW Contaminated Sites Notified to the EPA

Disclaimer

The EPA has taken all reasonable care to ensure that the information in the list of contaminated sites notified to the EPA (the list) is complete and correct. The EPA does not, however, warrant or represent that the list is free from errors or omissions or that it is exhaustive.

The EPA may, without notice, change any or all of the information in the list at any time.

You should obtain independent advice before you make any decision based on the information in the list.

The list is made available on the understanding that the EPA, its servants and agents, to the extent permitted by law, accept no responsibility for any damage, cost, loss or expense incurred by you as a result of:

1. any information in the list; or
2. any error, omission or misrepresentation in the list; or
3. any malfunction or failure to function of the list;
4. without limiting (2) or (3) above, any delay, failure or error in recording, displaying or updating information.

Site Status	Explanation
Under assessment	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment. For example, the completion of management actions regulated under the planning process or *Protection of the Environment Operations Act 1997*.
Under Preliminary Investigation Order	The EPA has issued a Preliminary Investigation Order under s10 of the *Contaminated Land Management Act 1997*, to obtain additional information needed to complete the assessment.
Regulation under CLM Act not required	The EPA has completed an assessment of the contamination and decided that regulation under the *Contaminated Land Management Act 1997* is not required.

Regulation being finalised	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the *Contaminated Land Management Act 1997*. A regulatory approach is being finalised.
Contamination currently regulated under CLM Act	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation under the Contaminated Land Management Act 1997 (CLM Act). Management of the contamination is regulated by the EPA under the CLM Act. Regulatory notices are available on the EPA's Contaminated Land Public Record.
Contamination currently regulated under POEO Act	Contamination is currently regulated under the Protection of the Environment Operations Act 1997 (POEO Act). The EPA as the appropriate regulatory authority reasonably suspects that a pollution incident is occurring/ has occurred and that it requires regulation under the POEO Act. The EPA may use environment protection notices, such as clean up notices, to require clean up action to be taken. Such regulatory notices are available on the POEO public register.
Contamination being managed via the planning process (EP&A Act)	The EPA has completed an assessment of the contamination and decided that the contamination is significant enough to warrant regulation. The contamination of this site is managed by the consent authority under the *Environmental Planning and Assessment Act 1979* (EP&A Act) planning approval process, with EPA involvement as necessary to ensure significant contamination is adequately addressed. The consent authority is typically a local council or the Department of Planning and Environment.
Contamination formerly regulated under the CLM Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation under the *Contaminated Land Management Act 1997* (CLM Act). The contamination was addressed under the CLM Act.
Contamination formerly regulated under the POEO Act	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed under the *Protection of the Environment Operations Act 1997* (POEO Act).

Contamination was addressed via the planning process (EP&A Act)	The EPA has determined that the contamination is no longer significant enough to warrant regulation. The contamination was addressed by the appropriate consent authority via the planning process under the *Environmental Planning and Assessment Act 1979* (EP&A Act).
Ongoing maintenance required to manage residual contamination (CLM Act)	The EPA has determined that ongoing maintenance, under the Contaminated Land Management Act 1997 (CLM Act), is required to manage the residual contamination. Regulatory notices under the CLM Act are available on the EPA's Contaminated Land Public Record.

Appendix D - Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 1

Client Service ID : 532150

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-6-1074	Mt Colah;Twenty Four Home Sites Cave;	AGD	56	325366	6272807	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-6-1075	Mt Colah;Mod Aboriginal Cave;	AGD	56	325366	6272807	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	ASRSYS					**Permits**		

Report generated by AHIMS Web Service on 01/09/2020 for Kristen Bigland for the following area at Lot : 1, DP:DP1172693 with a Buffer of 200 meters. Additional Info : Mt Colah REF.
Number of Aboriginal sites and Aboriginal objects found is 2

AHIMS Web Services (AWS)

Note: This Excel report shows the sites found in AHIMS on the 01/09/2020. If this date is not the same as the letter.

Site ID	Site name	Datum	Zone	Easting	Northing	Context
45-6-1074	Mt Colah;Twenty Four H	AGD	56	325366	6272807	Closed sit
45-6-1075	Mt Colah;Mod Aborigina	AGD	56	325366	6272807	Closed sit

Report generated by AHIMS Web Service on 01/09/2020 for [redacted] for the following area at Lot : 1, DP:DP1172693 with a Buffer of 200 meters. Additional Info

original date of the Search Results letter obtained during the Basic Search, then the search results might be differe

Site status	Primary contact	Site features	Site types	Recorders
Valid		Art (Pigment or Engrave	Shelter with Art	ASRSYS
Valid		Art (Pigment or Engrave	Shelter with Art	ASRSYS

: Mt Colah REF. Number of Aboriginal sites and Aboriginal objects found is 2

ssion made on the information and consequences of such acts or omission.

Your Ref/PO Number : 1

Client Service ID : 532150

nt. The PDF version of this report will always coincide with the Basic Search Results

Reports	Permits	Longitude GDA94	Latitude GDA94
		151.12	-33.67
		151.12	-33.67

National Native Title Tribunal

National Native Title Register Details

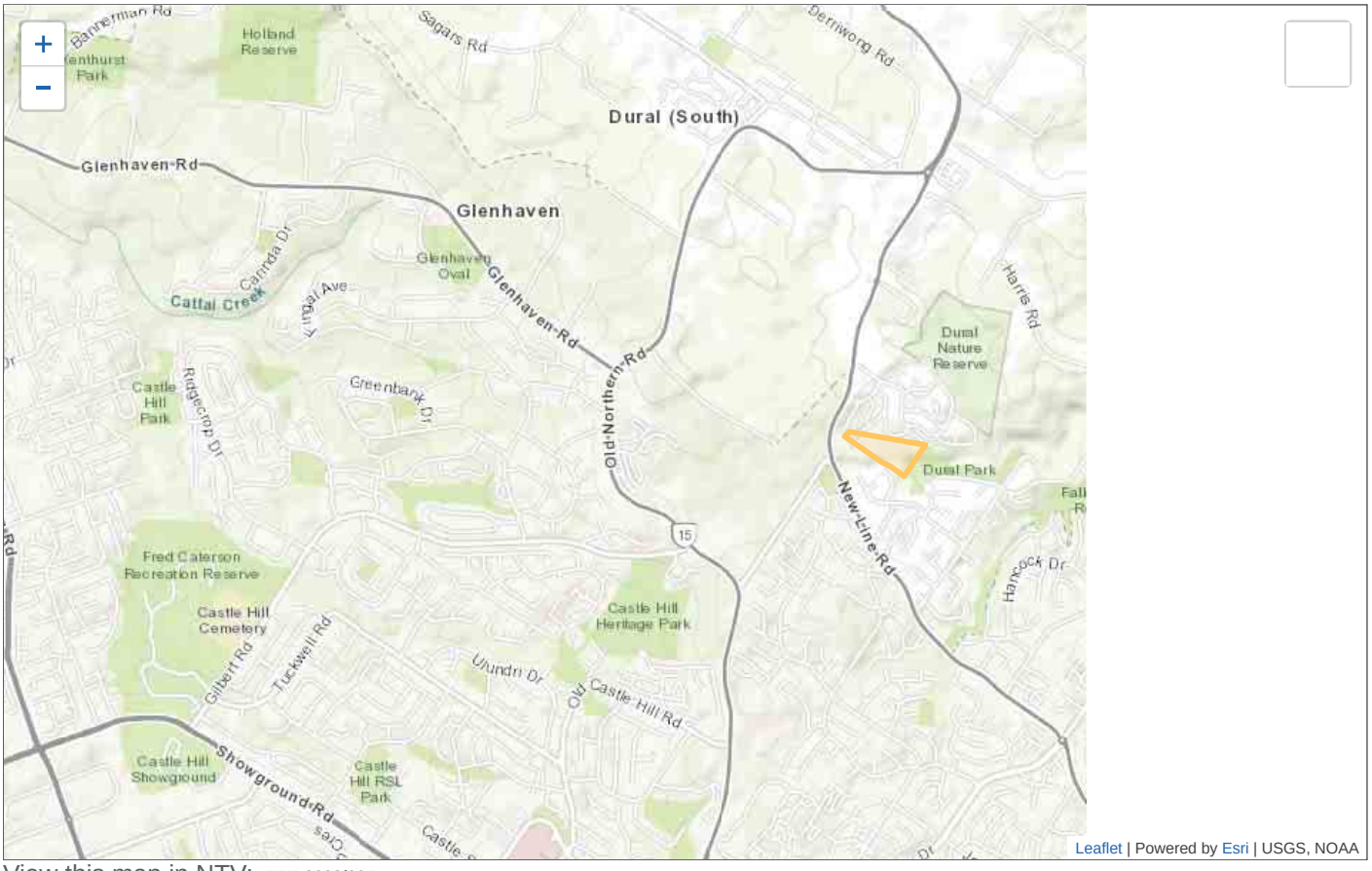
Back to search results

NND2002/001 - Metropolitan Local Aboriginal Land Council (Shire of Hornsby)

Tribunal file no.	NND2002/001
Federal Court file no(s)	NSD6003/2001
Short name	Metropolitan Local Aboriginal Land Council (Shire of Hornsby)
Case name	Metropolitan Local Aboriginal Land Council
Determination type	Non-Claimant
State or Territory	New South Wales
Legal process	Unopposed
Determination outcome	Native title does not exist
Representative A/TSI body area(s)	New South Wales
Local government area(s)	The Council Of The Shire Of Hornsby
Determination date	12/04/2002
Date/s of effect	12/04/2002
Registered on National Native Title Register	Registered

Register extract and attachments

Register extract	**NNTRExtract_NND2002_001.pdf**



View this map in NTV: **NND2002/001**

National Native Title Tribunal

Extract from the National Native Title Register

Determination Information:

Determination Reference:	Federal Court Number(s): NSD6003/2001 NNTT Number: NND2002/001
Determination Name:	Metropolitan Local Aboriginal Land Council
Date(s) of Effect:	12/04/2002
Determination Outcome:	Native title does not exist

Register Extract (pursuant to s. 193 of the *Native Title Act 1993*)

Determination Date:	12/04/2002
Determining Body:	Federal Court of Australia

ADDITIONAL INFORMATION:

Not Applicable

MATTERS DETERMINED:

There are no native title rights and interests existing in relation to portions 883 Shire of Hornsby, Parish of South Colah, County of Cumberland.

Note: The National Native Title Register may, in accordance with s. 195 of the Native Title Act 1993, contain confidential information that will not appear on the Extract.

AHIMS Web Services (AWS)
Search Result

Purchase Order/Reference : 1

Client Service ID : 531367

Kristen Bigland

5/20 Berry Street
North Sydney New South Wales 2060

Attention: Kristen Bigland

Email: kristen.bigland@smec.com

Date: 28 August 2020

Dear Sir or Madam:

AHIMS Web Service search for the following area at Lot : 1, DP:DP1172693 with a Buffer of 200 meters, conducted by Kristen Bigland on 28 August 2020.

The context area of your search is shown in the map below. Please note that the map does not accurately display the exact boundaries of the search as defined in the paragraph above. The map is to be used for general reference purposes only.

A search of the Office of the Environment and Heritage AHIMS Web Services (Aboriginal Heritage Information Management System) has shown that:

2	**Aboriginal sites are recorded in or near the above location.**
0	**Aboriginal places have been declared in or near the above location. ***

If your search shows Aboriginal sites or places what should you do?

- You must do an extensive search if AHIMS has shown that there are Aboriginal sites or places recorded in the search area.
- If you are checking AHIMS as a part of your due diligence, refer to the next steps of the Due Diligence Code of practice.
- You can get further information about Aboriginal places by looking at the gazettal notice that declared it. Aboriginal places gazetted after 2001 are available on the NSW Government Gazette (http://www.nsw.gov.au/gazette) website. Gazettal notices published prior to 2001 can be obtained from Office of Environment and Heritage's Aboriginal Heritage Information Unit upon request

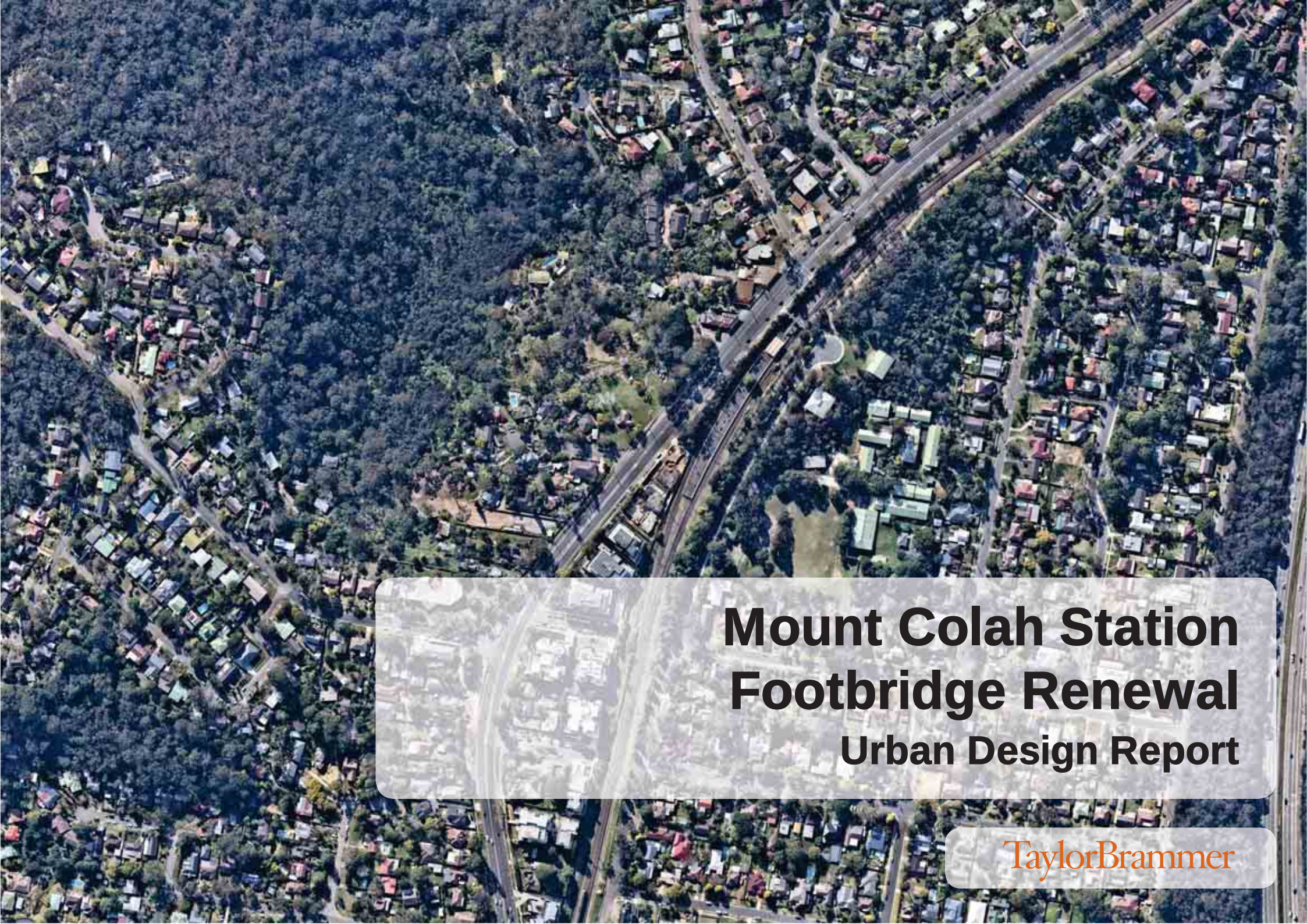
Important information about your AHIMS search

- The information derived from the AHIMS search is only to be used for the purpose for which it was requested. It is not be made available to the public.
- AHIMS records information about Aboriginal sites that have been provided to Office of Environment and Heritage and Aboriginal places that have been declared by the Minister;
- Information recorded on AHIMS may vary in its accuracy and may not be up to date .Location details are recorded as grid references and it is important to note that there may be errors or omissions in these recordings,
- Some parts of New South Wales have not been investigated in detail and there may be fewer records of Aboriginal sites in those areas. These areas may contain Aboriginal sites which are not recorded on AHIMS.
- Aboriginal objects are protected under the National Parks and Wildlife Act 1974 even if they are not recorded as a site on AHIMS.
- This search can form part of your due diligence and remains valid for 12 months.

3 Marist Place, Parramatta NSW 2150
Locked Bag 5020 Parramatta NSW 2220
Tel: (02) 9585 6380 Fax: (02) 9873 8599

ABN 30 841 387 271
Email: ahims@environment.nsw.gov.au
Web: www.environment.nsw.gov.au

Appendix E – Urban Design Report



Mount Colah Station Footbridge Renewal

Urban Design Report

TaylorBrammer

Contents

Amendment register

DOCUMENT TITLE	REVISION	DATE	STATUS	REVIEWED	CHECKED	VALIDATED
URBAN DESIGN REPORT	P1	20.08.2020	PRELIMINARY	DMT	AL	DMT
URBAN DESIGN REPORT	A	10.12.2020	FINAL	DMT	AL	DMT

Prepared by

Taylor Brammer Landscape Architects Pty Ltd

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Australia
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View of Mount Colah Platform from existing footbridge looking south
TBLA, July 2020

Introduction

01

Project Vision, Context and Background

The footbridge upgrade of Mount Colah Railway Station involves a range of improvements to provide equitable access to and from the platforms. In conjunction to these enhancements, minor works within the public domain are required to improve connections from the existing station facilities to the neighbouring suburban areas.

Project Location

The scope of this report relates to the Eastern and Western aspects of the existing Mount Colah Railway Station, and improve the general appearance of the station at the public domain interface.

The Mount Colah Station is wholly located within the Hornsby Shire Local Government Area, with residential dwellings and Public Recreation zoning adjoining all immediate boundaries of the station corridor. This zoning generates a high volume of pedestrian and vehicular traffic in and around the pedestrian lift and connection areas.

Purpose of this Report

The purpose of this urban design report and accompanying public domain plan is to identify the proposed impacts to the urban form due to the access improvements, mitigate any potential negative impact on the existing urban character, and provide a suitable public domain outcome. This report will review existing conditions, urban patterns, and propose materials and vegetation types to achieve the objectives of maintaining an appropriate urban character within the affected area.

Referenced documents

- Crime Prevention Through Environmental Design (CPTED); NSW Police
- Hornsby Shire Council, LEP
- Design documents - Caldis Cook Group
- TfNSW - Around the Tracks urban design for heavy and light rail
- TfNSW - TAP Urban Design Plan Guidelines

Project Context; Nearmaps.com.au, August 2020

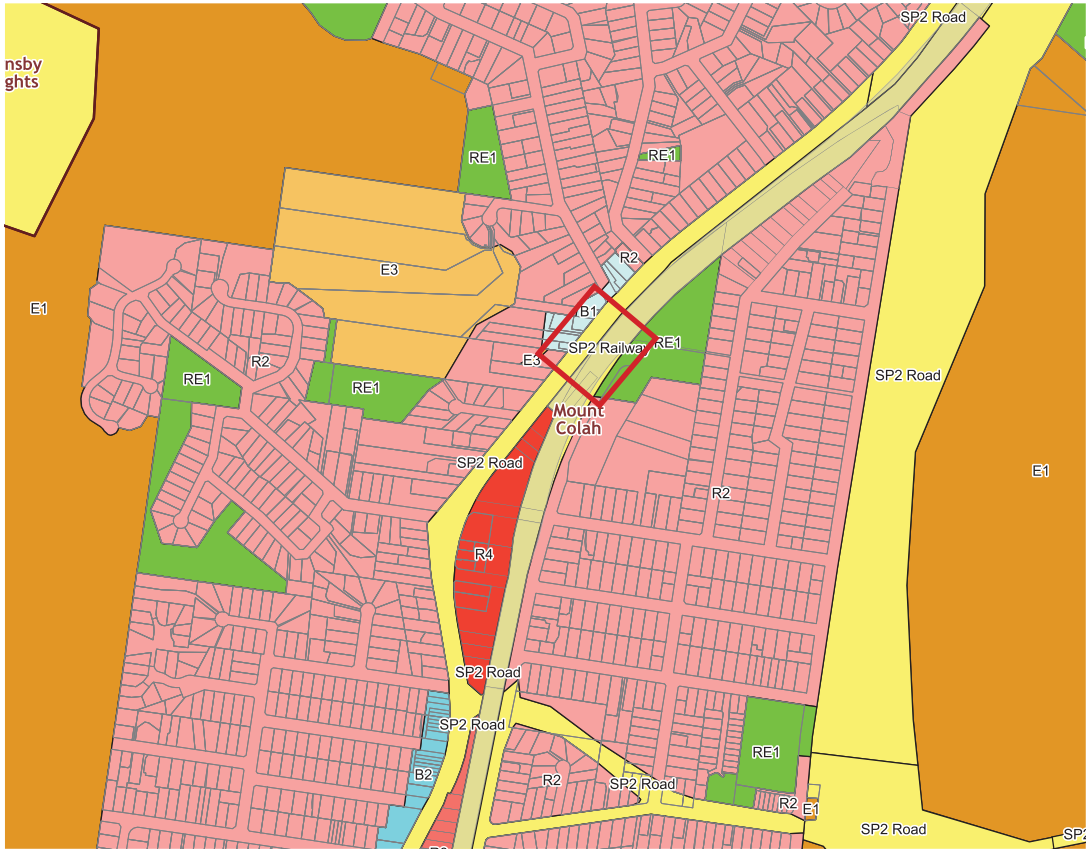
Site Analysis

02

Land use and Character

The land use of the surrounding areas to the existing Mount Colah Railway Station is predominantly RE1, R2, and B1 zoning, with the R4 high residential zoning further to the south of the site. The character of the surrounding residential area can be summarised as single dwelling free standing homes disbursed with low rise residential flat buildings to a maximum 2 stories high. Further to the south, numerous buildings can be found under construction within the R4 zone.

West of the rail corridor is the NSW State road, and the Pacific Highway, a two lane each way main road. To the east, vehicular access is provided to the station from Pierre Close with an existing kiss and drop. See images 01 on page 9.



Land Zoning Map, Mount Colah Land Zoning 2013

Legend

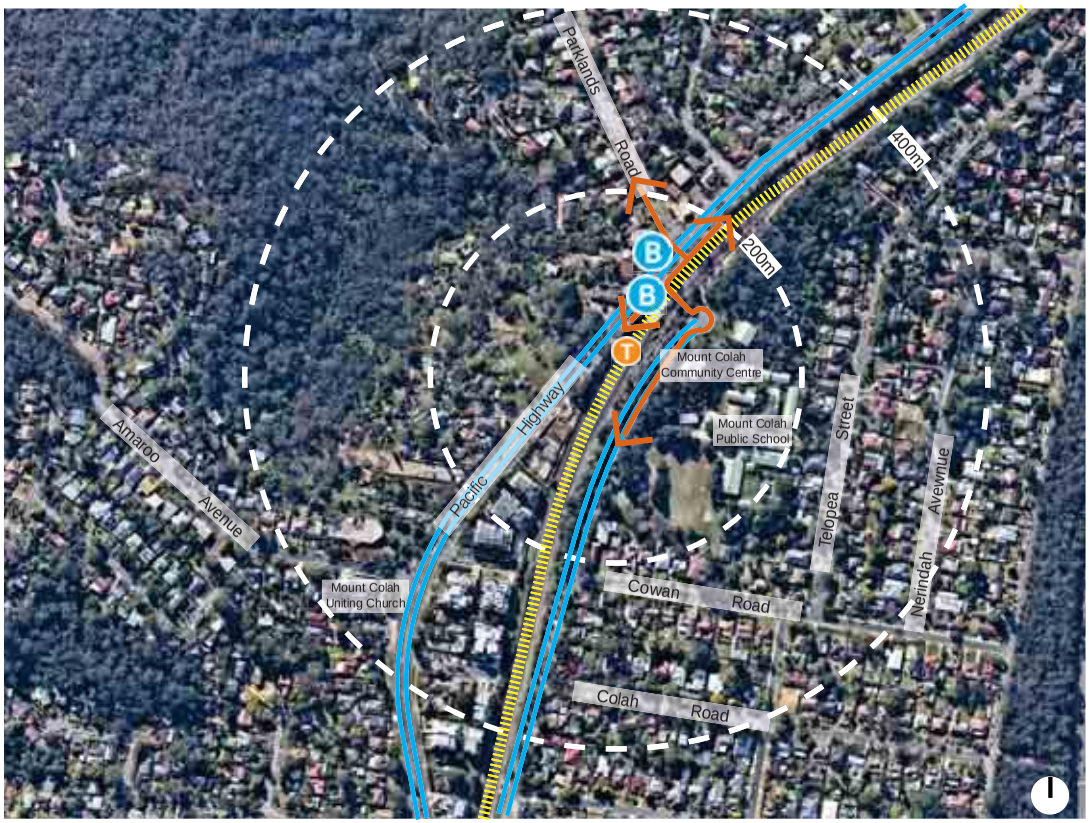
- Project location
- B1 Neighbourhood Centre
- B2 Local Centre
- E1 National Parks and Nature Reserves
- E3 Environmental Management
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- RE1 Public Recreation
- SP2 Infrastructure

Access and Movement

The Northern Rail line and Railway Station is located centrally within the suburb boundaries of Mount Colah. The railway corridor and Pacific Highway alike create a vehicular barrier, focusing most cross pedestrian activity to one focused location opposite Parklands road

The existing footbridge crossing from Pierre Close to the Pacific Highway is the only point of access onto the Mount Colah Railway Station platform. This overpass provides pedestrian connectivity to the educational and residential facilities on the on the east of the station, to the commercial and retail facilities on the west. Existing bus stops are located on north and south directions of Pacific highway at Parklands Road

Vehicular access to the station is available from Pierre Close, providing an existing 'Kiss & Drop' zone at the end of a cul-de-sac on the Eastern Side, and no parking on the Pacific Highway to the West.



Project Context; Nearmaps.com.au, August 2020

Legend

- Subject Railway Station
- Main Northern Rail Line
- Walking catchment (white)
- Existing Bus stop
- Existing Roads directly Adjacent Platform with Access to Station
- Existing pedestrian route
- Existing Bus stop

Local Context and Setting

The local context of the railway station is generally of a urban and residential nature, dominated by vegetation in the form of large native trees, shrubbery, road, and paving. Immediately to the east of the rail line, the existing character consists of parkland and vegetation as part of local community recreational and educational facilities, with large trees and shrubbery providing a visual buffer of the station.

The Character directly to the West is contains the commercial and retail hub of the suburb, facilitated by the main road and pedestrian network that consists of street trees and vegetation on either side of the pacific highway.

Due to the residential nature of the immediate surroundings, limited formal commuter carparks are located around the station. Those that exist can be found along Pierre close around the allocated times. A commercial chain wire fence provides the edge treatment to the east and western sides of the station, and is easily obscured by the existing edge planting.

Minimal lighting is provided on the Pierre close access point of the existing overpass due to the isolated nature of the street, with two lights on either side of access points. Substantial lighting can be seen on the existing overpass with six overhead lights provided, and one directly adjacent on the Pacific Highway.

Vegetation

The landscape of the commercial, recreational, and educational facilities directly surrounding throughout the adjoining areas have consistent canopy throughout the length of the Mount Colah railway in the form of street trees of a native character.

T Mount Colah Railway Station

B Existing Bus stop

P Existing Commuter Car Parking (Street parking only)

Existing pedestrian path

Existing on road pedestrian route

Existing pedestrian footbridge

Site photos

View of 'Kiss n Drop', and vegetation from Pierre Close facing south demonstrating dense screening of platform and railway line

TBLA July 2020

Mount Colah station, platforms 1 and 2 viewed from footbridge generally obscured from Pierre close and the Pacific Highway

TBLA July 2020

Existing turning circle and parking bays at Cul de sac of Pierre Close providing good access and mobility to existing footbridge

TBLA July 2020

Mount Colah Station Platform View of significant tree providing shade and amenity

TBLA July 2020

Eastern view of embankment and vegetation buffer of low ecological value

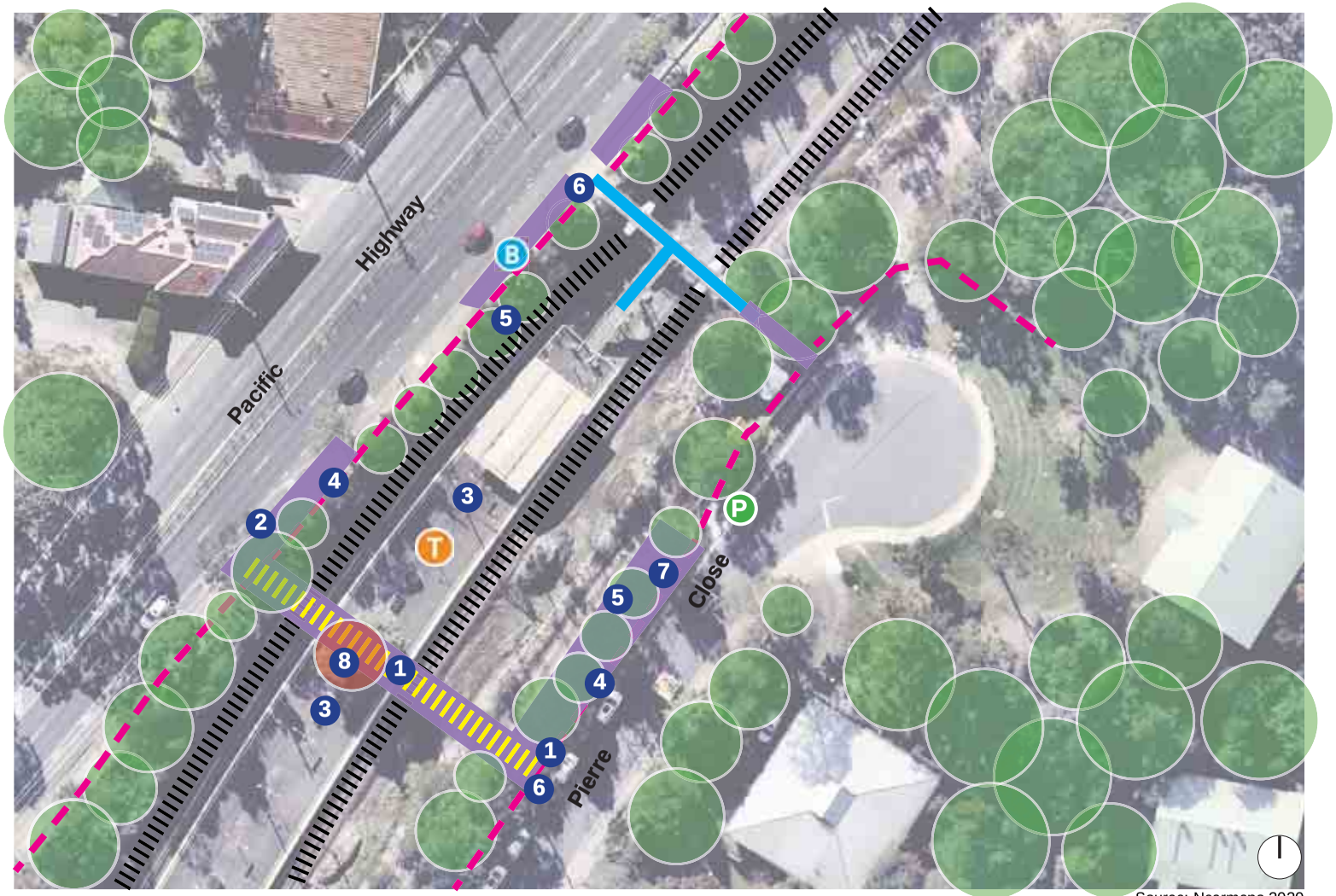
TBLA July 2020

Southern view of significant existing tree overhanging proposed new location of footbridge providing good visual buffer to railway lines

Google Street view July 2020

Opportunities and Constraints

1. **Improved Access to Station Platform**
   Opportunity to provide a more contemporary and equitable access to the station platform in the form of a new overpass
2. **Lighting**
   Opportunity to integrate lighting into new revised pedestrian access and surroundings.
3. **Urban furniture**
   Existing urban furniture in poor condition, new furniture required .
4. **New planting**
   Opportunity to provide new planting offering shade, shelter and visual identity to new works from residential areas
5. **Existing vegetation**
   Opportunity to maintain and supplement existing planting
6. **Existing & New Signage**
   Existing Signage in good condition, to be reused and additional Signage to be provided where necessary
7. **Improved Footpath Access**
   Opportunity to improve existing narrow footpath access from Pacific Highway, and Pierre Close Drop off zone
8. **Existing Vegetation on Platform**
   Existing tree on platform to be removed due to damage done by roots to concourse



Source: Nearmaps 2020

Legend

- Key areas
- Existing pedestrian footbridge
- Existing boundary fence
- Subject Railway Station
- Existing Bus stop
- Existing Commuter Street Parking
- Existing vegetation
- Existing vegetation to be removed
- Proposed Location for new Overpass

Urban Design

03

Urban Design Principles

The approach to the design of the public spaces associated with the footbridge upgrade considers the urban design principles as outlined in the '*Around the Tracks urban design for heavy and light rail*' publication. In conjunction with these published guidelines, best practice design principles are introduced in addition to the functional requirements of the publication.

A quality, valuable and appropriate urban outcome will be facilitated through the implementation of the following design principles;

- Provide value-for-money design solutions that achieve high quality low maintenance architectural and urban design outcomes that have longevity
- Provide connectivity and permeability for pedestrians
- Integrate the project with the surrounding area
- Maximise the amenity of the public domain
- Maximise positive view opportunities.
- Design an efficient and functional transport solution which enhances and contributes to local amenity and prosperity
- protect and enhance existing heritage features amd significant trees (None onsite)

Design Approach

Design Framework

Using the Urban Design Principles framework, an appropriately detailed urban design analysis has been undertaken. The Landscape Design approach provides for functional and aesthetic connectivity and ease of access to the surrounding area. The proposal acknowledges the existing urban character, materiality, architectural styles and planting character.

The proposal improves the existing amenity through upgrading access, and additional planting and finishes to the areas at the base of the footbridge. Proposed built forms provide a functional solution whilst minimising visual impact through the installation of a new tree and associated planting.

Urban Furniture

A number of urban elements exist on the site. They include bike racks, bins, bollards and other ancillary structures some of which requires replacement. It is proposed that where appropriate, these elements are retained, relocated and or removed for re-use as required.

Pavement

As required and following existing urban typology of the surrounding areas, new pavements will be of a concreteand brick nature. Broom finish or an alternative comparable hard wearing finish will be required to suitably complement the existing landscape character.

Vegetation

The existing vegetation from both the Pacific Highway and Pierre Close entrances to the station provide good shade, shelter, amenity, and a good visual buffer of the railway line. The planting of native trees, shrubs and ground covers will soften the visual impact of the proposed works. Proposed planting will comprise of low maintenance species.

Low planting to improve amenity and retain sight lines

In situ Concrete pathway and feature brick paving

Irrigation

It is recommended that a sub surface drip irrigation system is installed as part of the landscaping works. This low cost and automatically operated system is vital to the establishment and longevity of planting stock and will ensure the anticipated outcome is reached.

Materiality

The materiality and surface treatment of retaining walls and lift shafts are designed to deter graffiti and allow for easy graffiti removal.


Corymbia ficifolia


Lomandra Longifolia


Callistemon viminalis ‘Green John’


Syzygium ‘Cascade’


Dodonaea viscosa


Leptospermum polygalifolium


Westringia fruticosa


Callistemon ‘White Anzac’


Gazania ‘Kiss White’


Carpobrotus glaucescens


Hardenbergia violacea


Hakea laurina

Appendix F – Noise

Maintenance Quantitative Noise Assessment – *Mount Colah Footbridge*

Guidance information contained within EMS-10-GD-0167 Guide to Maintenance Quantified Noise and Vibration Assessment

Noise Part A: Impact Assessment

PROJECT DATA | **NOISE CALCULATIONS (dBA unless otherwise noted)**

Work Phase: Date(s)	Work Phase: Description of noisiest activity undertaken on the date(s)	Plant Category of noisiest plant	Noisiest plant to be used	Duration (days)	Receiver most likely to be affected	Distance to nearest receiver (m)	Most sensitive time of day noisiest plant will be operating[1]	Is noisiest plant used intermittently? <7 mins in any 15-min period	Reversing beepers used in phase?	Work site noise screening	Sound pressure of noisiest plant at 10m	PNL (Predicted noise level at receiver)	NML (Noise Management Level)	Noise above NML (PNL-NML)	HAL (Highly Affected Level)	Noise above HAL (PNL-HAL)	Level of risk (High, Medium, Low)	Radius of noise above NML (m)	Radius of noise above HAL (m)	Confirm if a specialist noise study is needed for Phase?	Confirm if a specialist noise study needed for Project?	Vibration assessment required for Phase?
Example	Pre-works. Clearing of site and delivery of materials	Earthworks	Bulldozer	2	Residential: Suburban	30	Standard Hours	No	Yes - Beepers used	4. Natural screening and temporary worksite screening	86	71	55	16	75	-	Medium Risk	200	20	No	No	No
1	Clearing vegetation, enabling and relocation works	Earthworks	Dump Truck, tipping fill	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	89	67	40	27	60	7	High Risk	891	89	No	No	No
2	Construction of padmount, GST, LV, CSR. Install temporary works for lift shaft. Complete excavation along Pierrer Close	Breaker	Breaker, pneumatic, 14kg standard	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	93	71	40	31	60	11	High Risk	1413	141	No	n/a	Yes
3	Temporary guard indicators, prepare foundations, install conduits, erect temporary hoardings	Piling	Bored Piling Rig	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
4	Construct new OGOH poles, transfer 11kV, install temporary/permant protection to 11kV at Lift 1	Earthworks	Compactor	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
5	Complete piling for stairs, bridge pier and lift shaft on Down Side and platform	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
6	Construct lift shafts, bridge piers and OHWS footings	Piling	Bored Piling Rig	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	82	60	40	20	60	-	Medium Risk	398	40	No	n/a	No
7	Crane precast girders, install conduits for services and steelworks for OHWS	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
8	Install balustrades and safety screens, complete platform works, install lighting poles on footbridge and install lifts, commission station	General	Mobile Crane	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	78	56	40	16	60	-	Medium Risk	251	25	No	n/a	No
9	Landscaping, kiss and ride, commission new footbridge	General	Truck	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	77	55	40	15	60	-	Medium Risk	224	22	No	n/a	No
10	Signalling and OHW reattachment	Excavator	Excavator (approx. 20 tonne)	2	Residential: Suburban	40	Night	Yes	Yes - Beepers used	4. Natural screening and temporary worksite screening	77	55	40	15	60	-	Medium Risk	224	22	No	n/a	No
											-	-	-	-	-	-	-	-	-	-	n/a	-
											-	-	-	-	-	-	-	-	-	-	n/a	-

Project Total 20 days [2]

[1] **'Standard Hours'** = 7am-6pm Mon to Fri and 8am-1pm Sat
'Shoulder hours' = 6pm-10pm Mon to Fri, 1pm-10pm Sat and 8am-10pm Sun/public holidays
'Night' = 10pm-7am Mon to Fri and 10pm-8am Sat/Sun/public holidays

Noise Part B: Impact Assessment Triggered Noise Controls

Potential Noise Controls	Triggered for project?
Contact Noise Specialist to confirm if a specialist noise study required?	No
Complete '***Vibration Impacts and Approval***' worksheet?	Yes
Recommended minimum letterbox notification distance	250 m
Communicate expected periods of particularly high noise to community in the letterbox drop?	Yes
Program in respite: Max 4 days >HAL in any 7 day period?	No
Program in respite: 2 days respite (no or all works below NML at receiver) for every 14 days?	No
Temporary work screening to be added as a control?	Yes

Noise Part C: Reasonable and Feasible Noise Mitigation Assessment (in addition to Part B)

C1: ASSESS STANDARD NOISE CONTROLS FOR PROJECT? Yes — If "No" go to Noise Part D. If "Yes" assess each of the following 5 standard controls

Noise Part C1: Assess Standard Suite of Noise Controls	Adopted (Yes/No)	If No, provide reasoning as to why it is not 'reasonable' and 'feasible' to include?
Is this project carried out during a track possession period?	Yes	Letterbox drop will be carried out as part of possession community notification process
Undertake work during 'day' hours only	No	In order to access the Down Side, proposed lift shaft locations and platform, some of the works would need to be undertaken during possessions (refer Section 2.3). This is in the interest of safety and efficiency for construction staff, plant and equipment. All possession works would occur during day shifts
Implement 1 hour respite for every 3 hour period of PNL over HAL	Yes	When possible, respite periods will be implemented. However, during track possessions, respite periods may be limited due to time constraints. The use of excavators, compactors or dump trucks will not be continuous over this period, and it is feasible to implement respite periods.
Plant used intermittently is to be throttled or shut down when not required	Yes	Equipment will be switched off when not in use
Use alternative quieter equipment	Yes	Smallest equipment is already been selected.
Use temporary screening near noisy plant and activities	Yes	Temporary screening will be erected during activities such as excavation and when using hand-held tools

C2: ASSESS ADDITIONAL NOISE CONTROLS? Yes — If "No" go to Noise Part D. If "Yes" identify and assess additional noise controls

Noise Part C2: Assess Additional Noise Controls (See EMS-10-PR-0048 Construction and Maintenance Noise and Vibration Management, Section 5)	Adopted (Yes/No)	If No, provide reasoning as to why it is not 'reasonable' and 'feasible' to include?

Reasonable : Noise (and other) benefits outweighs economic, social, environmental effects. Consider duration of noise impacts, local sensitivities and cost effectiveness.
Feasible: Can be engineered, practical within project constraints (e.g. safety / maintenance / operational constraints)

Noise Part D: Noise Assessment Approval

Approval by the Project Manager is required for all assessments. Endorsement by an Environmental Practitioner is required if any of the work scenarios are identified as High Risk.

Name and Signature	Position	Date	Additional Comments
Prepared by: Kristen Bigland	*Experienced Environmental Scientist*	**4-Nov-20**	
Endorsed by: Adrian Sexton	*Environmental Practitioner**	6-Nov-20	*[E.g. Comments on assessment, specialist studies, changes to process, etc]*
Approved by: Darshanee Nadakuma	*Project Manager*	6 Novemeber 2020	*[E.g. Confirmation that a Specialist Study is required]*

*Environment Practitioner endorsement required for High Risk Scenarios or if a specialist study is required. Endorsement indicates that the Environment Practitioner agrees that the project has identified all reasonable and feasible noise mitigation actions.

Appendix G – Geotechnical Technical Memo

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Technical Memo

Technical Memo No	30012921-GT-MEM-002	**Date of Issue**	27/11/2020
Subject/Title	100% Reference Design of Mt Colah Footbridge		
Project Name	Mt Colah Footbridge	**Project Number**	30012921
Discipline	Geotechnical		
Revision Details	Rev 0		
Designed by	[redacted]		
Checked by	[redacted]		
Verified by	[redacted]		
Prepared for	Sydney Trains		
Attachments	None		

1 Introduction

SMEC Australia Pty Ltd (SMEC) has been engaged by Sydney Trains to undertake a reference design for a replacement footbridge at Mount Colah Station. This memo documents the geotechnical aspect of the works for the 100% reference design submission.

2 Scope of Works

The current scope of geotechnical works is as follows:

- Review of existing geotechnical data and identification of any further investigations that may be warranted in detailed design.
- Undertake geotechnical interpretation and develop ground parameters for structural modelling (including bearing capacity, vertical and lateral stiffness spring) for foundation design for footbridge, associated lifts and stairs and overhead wiring structures.
- Develop geotechnical models and parameters for footbridge, lifts, stairs, ramp and overhead wiring foundations based on the available geotechnical investigations as well as past project experience in similar ground conditions.
- Prepare geotechnical memo for foundation design for footbridge and associated lifts, access ramp and stairs, overhead wiring structures and discussions and recommendations for the design.
- Provide geotechnical input into feasibility and constructability of proposed 11kV routing based on the available geotechnical investigations as well as past project experience in similar ground conditions.

3 Information

The following information has been used in the preparation of this memo:

- *Mount Colah Station Footbridge Renewal Geotechnical and Contamination Investigation (Draft)*, produced by GHD Pty Ltd, dated June 2020
- *Geotechnical Investigation Report – Mt Colah HV Feeder, Condemned Poles,* produced by AECOM Australia Pty Ltd, document number 60605415, dated 29 August 2019

- *Preliminary Geotechnical Assessment: 554 & 556-558 Pacific Highway, Mount Colah, NSW,* produced by Martens Consulting Engineer, document number P1504601JR01V01, dated 13th February 2015
- *Mount Colah Footbridge Final Design Report*, produced by Jacobs, document number NB98036-RP-002, dated 5 November 2014

4 Geotechnical Interpretation

Reference to the Sydney 1:100,000 Geological Series Sheet 9130 (First Edition, 1983) indicates the site is underlain by Hawkesbury Sandstone of the Wianamatta group. This generally comprises medium to coarse grained quartz sandstone with very minor shale and laminite lenses.

The available geotechnical investigations in the vicinity include thirteen boreholes drilled to a maximum depth of 9.9 m and are tabulated in Table 4-1.

Table 4-1: Geotechnical Investigations undertaken in vicinity

Borehole Name	Easting (56 MGA94)	Northing (56 MGA94)	Approximate RL	Max Depth
BH01 (AECOM,2019)	325123.2	6272454.7	203.00	5.30
BH02 (AECOM, 2019)	325290.4	6272767.0	207.00	4.22
BH01 (GHD, 2020)	325198.2	6272647.1	207.65	6.00
BH01A (GHD, 2020)	325201.7	6272649.1	207.64	1.00
BH02 (GHD, 2020)	325218.3	6272647.2	205.30	5.90
BH02A (GHD, 2020)	325215.2	6272642.0	205.45	0.40
BH03 (GHD, 2020)	325236.5	6272633.7	206.88	6.00
BH03A (GHD, 2020)	325241.8	6272640.2	207.10	1.56
BH1 (Jacobs, 2014)	325283.7	6272699.8	207.00	9.90
BH2 (Jacobs, 2014)	325260.4	6272703.4	203.80	8.60
BH101 (Martens Consulting, 2015)	-	-	206.00	5.30
BH102 (Martens Consulting, 2015)	-	-	205.75	6.00
BH103 (Martens Consulting, 2015)	-	-	204.00	5.50

Note: Easting and Northings were not provided for BH101, BH102 and BH103 which were undertaken by Martens Consulting. These boreholes were conducted as part of the development being undertaken at 554 & 556-558 Pacific Highway, Mt Colah.

Generally, site investigation recorded varying layers of fill (up to 2.0 m) was overlying residual soils of medium dense consistency or better (up to 1.3 m) which overlies sandstone bedrock at the borehole location. Refer to Section 4.1 for more details.

The investigations relevant to the foundation design of each structure are summarised in Table 4-2.

Table 4-2: Relevant Geotechnical Investigations

Structure	Relevant Geotechnical Investigations
Lift, pier and stair foundations adjacent to Pacific Highway (Lift 1 and Pier 1)	BH01 (GHD,2020). BH01A (GHD,2020)
Lift, pier and stair foundations on Station Platform (Lift 2 and Pier 2)	BH02 (GHD,2020). BH02A (GHD,2020)
Lift, pier and stair foundations adjacent to Pierre Close (Lift 3 and Pier 3)	BH03 (GHD,2020). BH03A (GHD,2020)

4.1 Subsurface Profile

The adopted geotechnical subsurface profiles at lift, pier and stair locations is summarised in Table 4-3, Table 4-4 and Table 4-5 and are as per the geotechnical models developed by GHD in the Mount Colah Station Footbridge Renewal Geotechnical and Contamination Investigation (Draft) report unless otherwise noted.

Table 4-3: Adopted Subsurface profile at Lift 1 and Pier 1 (Lift, Pier and stair foundations adjacent to Pacific Highway)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
207.65	207.15	0.5	Fill (Clayey Sand)
207.15	205.97	1.18	Residual Soil (Medium Dense Sand)
205.97	205.75	0.22	Sandstone Class V (SAN-V)
205.75	204.08	1.67	Sandstone Class IV (SAN-IV)
204.08	Not Proven	-	Sandstone Class III (SAN-III)

Table 4-4: Adopted Subsurface profile at Lift 2 and Pier 2 (Lift, Pier and stair foundations on Station Platform)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
205.30	205.05	0.25	Fill (Sand)
205.05	204.80	0.25	Residual Soil (Medium Dense Clayey Sand)
204.80	204.75	0.05	Residual Soil (Stiff Clay)
204.75	204.13	0.62	Sandstone Class V (SAN-V)
204.13	Not Proven	-	Sandstone Class IV (SAN-IV)[Note 1]

Note 1: Class IV Sandstone has been adopted from RL199.84 rather than Class III Sandstone specified in GHD report based on defect spacing and estimated strength.

Table 4-5: Adopted Subsurface profile at Lift 3 and Pier 3 (Lift, Pier and stair foundations adjacent to Pierre Close)

RL at Top of Layer (m AHD)	RL at Bottom of Layer (m AHD)	Layer Thickness (m)	Layer Description
206.88	206.38	0.5	Fill (Sand)
206.38	205.30	1.08	Residual Soil (Medium Dense Clayey Sand)
205.30	204.26	1.04	Sandstone Class V (SAN-V)
204.26	201.15	3.11	Sandstone Class III (SAN-III)[Note 1]
201.15	Not Proven	-	Sandstone Class V (SAN-V)

Note 1: Class III Sandstone has been adopted for this layer rather than Class II Sandstone specified in GHD report based on defect spacing.

Based on the existing geotechnical investigations the subsurface profile beneath the proposed overhead wiring structures is assessed to be similar with generally varying layers of fill (up to 2.0 m), overlying residual soils of medium dense consistency or better (up to 1.3 m) which overlies sandstone bedrock.

4.2 Groundwater

No free groundwater was observed in the boreholes used in the interpretation of subsurface profiles at the proposed lift, pier and stair foundation locations.

Groundwater was only observed in boreholes BH101 and BH103 undertaken by Martens Consulting. These boreholes were conducted as part of the development being undertaken at 554 & 556-558 Pacific Highway, Mt Colah. Groundwater was observed at 2.45 m below ground level in BH101 and 1.23 m below ground level in BH103. The observed groundwater levels are within the residual soil at both borehole locations and near the interface of soil and bedrock.

It is assessed that groundwater may rise to near the interface of soil and bedrock particularly after heavy rainfall events. Groundwater levels may also fluctuate over time due to seasonal and climatic variations.

For the purposes of the design, groundwater has been assumed to be at the interface of soil and bedrock.

4.3 Geotechnical Parameters

Geotechnical units have been developed for the purpose of the geotechnical design. Geotechnical design parameters have been developed based on the results of the in situ and laboratory testing of selected samples undertaken as part of the existing geotechnical investigations, values documented in the literature (e.g. Pells, et al., 1998) and previous experience in similar materials and engineering judgement. Soil parameters have not been provided as the foundations will be founded within rock and the benefits of the foundation within soil should be ignored. The design parameters are summarised in Table 4-6.

Table 4-6: Pell's rock classification (1998) geotechnical design parameters for rock

Material	Unit Weight (kN/m3)	c' (kPa)	ϕ' (°)	Elastic Modulus (MPa)	Poisson's Ratio	Ultimate End Bearing, qb (MPa)	Serviceability End Bearing, qs (MPa)	Ultimate Shaft Adhesion (kPa)	Modulus of Subgrade Reaction (kN/m3)
Class V Sandstone	22	10	35	50	0.25	3	1	150	50,000
Class IV Sandstone	22	100	35	100	0.25	4	1	250	100,000
Class III Sandstone	23	200	36	350	0.2	20	3.5	800	350,000
Class II Sandstone	24	400	37	900	0.2	60	6	1500	900,000

1. Ultimate end bearing values occur at large settlements (>5% of minimum foundation dimensions)
2. Clean socket of roughness category R2 or better
3. Adopt shaft adhesion values only where the embedded length into the relevant bearing stratum is at least 2 pile diameters
4. Horizontal and vertical modulus of subgrade reaction values is assumed as equal for rock

5 Proposed Design Methodology

5.1 Design Methodology

Based on anticipated loads and ground conditions, pile foundations have been considered.

The foundation design for the piled foundations has been undertaken in accordance with AS2159-2009. The piles have been checked for compression, tension and lateral capacity under ultimate limit state (ULS) loads.

Settlements of piles under serviceability limit state (SLS) loads is expected to be less than 10mm. The actual settlement shall be assessed in the final detailed design.

A verified in-house Excel spreadsheet has been used which allows the design of the piles for compressive and tensile loads using the design principles described above.

5.2 Geotechnical Strength Reduction Factor

The geotechnical strength reduction factor (ϕg) has been assessed based on the procedures outlined in AS 2159-2009 and has been calculated to be 0.56.

5.3 Slope and Pile interaction

The foundations on the Pacific Highway side and Pierre Close side are located adjacent to the existing sandstone cutting. The ultimate lateral capacity of rock socketed pile on a cut face is typically controlled by the presence of adverse rock mass discontinuity, which can result in the formation of rock wedges and reducing the ultimate lateral capacity of pile. At the time of writing, information on the rock mass discontinuity is not available and therefore wedge stability assessment has not been completed.

The current 100% reference design assumed that no adverse rock wedges (and no reduction in lateral capacity due to the foundations are located beyond a 1H:1V influence zone) and a proper assessment should be conducted as part of the detailed design with rock mapping undertaken to gather information on rock mass characteristics such as bedding, seams and joints which may affect pile lateral capacity. The nature and orientation of defects is currently not known and in sandstone can be variable.

6 Pile Design Loading

Ultimate Limit State (ULS) design loadings acting at the top of the pile are shown in Table 6-1 for the bridge elements shown in Figure 1. The design loading for each of the elements has been provided by the Structural Engineer.

Figure 1: Bridge Diagram

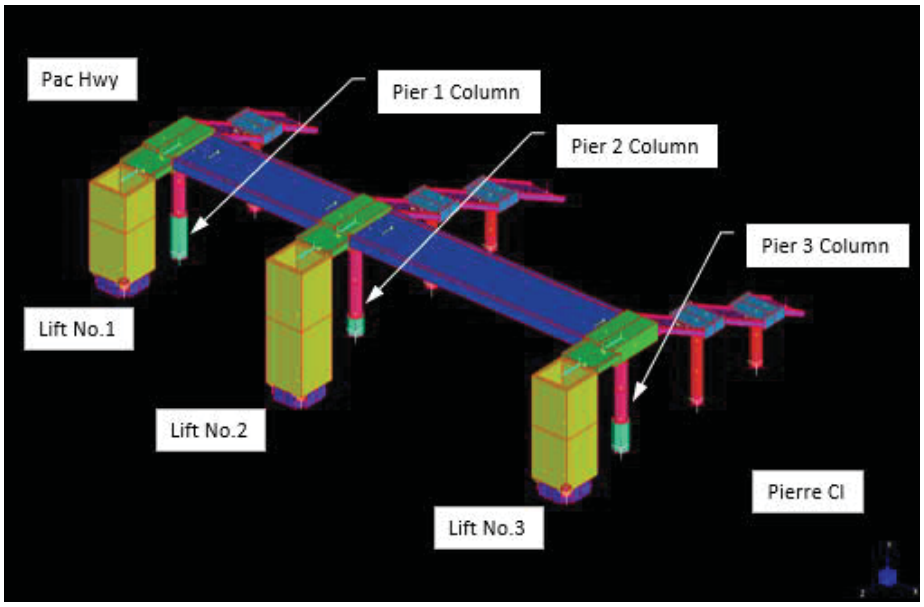

Table 6-1: Summary of ULS design loading at top of rock socket

Element	Axial Compression (kN)	Axial Tension (kN)	Bending Moment (kNm)	Shear Force (kN)
Lift Piles	2168	1897	0	0
Pier Piles	1024	-	4111	1567
Stair Support Piles	265	-	1097	229

7 Geotechnical Pile Design Results

The geotechnical design of bridge pile foundations has been carried out using the limit state design principles in accordance with AS2159–2009 to satisfy to satisfy ultimate limit state design criteria.

A summary of the key calculations and findings is presented in Table 7-1.

Table 7-1: Geotechnical pile foundation information

Element	Pile No	Pile Diameter (mm)	Top of Rock Socket RL (m AHD)	Minimum Rock Socket Length (m)	Design Socket Length (mm) / Material	Founding Material	Pile Toe Reduced Level (m AHD)
Lift 1	P1 – P4	750	205.97	3.6	200/SAN-V 1700/SAN-IV 1700/SAN-III	SAN-III	202.37
Lift 2	P5 – P8	750	204.75	7.5	700/SAN-V 6800/SAN-IV	SAN-IV	198.95

Element	Pile No	Pile Diameter (mm)	Top of Rock Socket RL (m AHD)	Minimum Rock Socket Length (m)	Design Socket Length (mm) / Material	Founding Material	Pile Toe Reduced Level (m AHD)
Lift 3	P9 – P12	750	205.30	3.2	1100/SAN-V 2100/SAN-III	SAN-III	202.10
Pier 1	P13	1200	205.97	3.0	200/SAN-V 1700/SAN-IV 1100/SAN-III	SAN-III	202.97
Pier 2	P14	1200	204.75	5.7	700/SAN-V 5000/SAN-IV	SAN-IV	199.05
Pier 3	P15	1200	205.30	2.7	1100/SAN-V 1600/SAN-III	SAN-III	202.60
Stair 1	P16	1050	205.97	2.1	200/SAN-V 1700/SAN-IV 200/SAN-III	SAN-III	203.87
Stair 2	P17 – P18	1050	204.75	2.7	700/SAN-V 2000/SAN-IV	SAN-IV	202.05
Stair 3	P19 – P20	1050	205.30	1.8	1100/SAN-V 700/SAN-III	SAN-III	203.50

8 Proposed 11kV Route and Overhead Wiring Structures

No further geotechnical investigation is planned during the reference design stage and based on existing geotechnical information, it is assumed that standard embedment depths and standard footings will be adopted for the proposed 11kV routing and overhead wiring structures.

9 Discussions and Recommendations

- Temporary works do not form part of the reference design. Temporary work shall be included as part of the detailed design to ensure adjacent utilities or structures are not impacted during the construction of the footbridge. It is assessed that a temporary retention system may be required for the excavation of the lift pit on the Pacific Highway side to ensure the Sydney Water main and Pacific Highway are not impacted.
- The current site investigations undertaken for the proposed footbridge foundations are assessed to be meeting the minimum site investigation stipulated in AS5100.3-2017 i.e. minimum of one borehole per abutment or pier for bridges with bridge width less than 10m. However, as the piles on the Pacific Highway side are located at close proximity to the cut face, further site investigation or geological mapping of the rock cuttings shall be included as part of the detailed design to investigate the presence of rock mass discontinuities, bedding, seams and joints which could affect pile lateral capacity as well as the potential for kinematic failures due to loading from foundations e.g. OHWS foundations.
- Slope stability does not form part of the reference design and should be included as part of the detailed design.
- Further investigation may be required during the detailed design stage pending the final location of OHWS foundations as well as the final route of the 11kV cable.

- While the geotechnical model presented in Table 1 is suitable for pile design, it should be noted that the interpreted boundaries between the layers is based on the available geotechnical information. Local variations in the subsurface profile may exist and shall be verified during construction by a suitably qualified geotechnical engineer or geologist to assess the suitability of the socket and founding material.
- The construction of bored piles should be supervised by a qualified geotechnical engineer/engineering geologist to assess that the ground materials meet the design requirements and assess the pile length and cleanliness
- Temporary casing from ground level to the top of the bedrock (Class V Sandstone) may be required. This is to reduce the risk of granular materials collapsing into the pile hole and limit the potential for groundwater seepage (should it be encountered).

Appendix H – Arboricultural Impact Assessment & Method Statement

ARBORICULTURAL IMPACT ASSESSMENT & METHOD STATEMENT

Prepared for:

Taras Cherkasov
Gartner Rose Pty Ltd

Site:

Mount Colah Station (Domain)
Pierre Close Mount Colah NSW 2079

Published by:

[redacted]
Dip. Arboriculture (AQF-5)
Advanced Quantified Tree Risk
[redacted]
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Registered User

Sydney Arbor Trees PTY Limited
ARBORICULTURE/CONSULTATION/HABITAT CREATION
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Document Disclaimer

This document may only be used for the purpose for which it was commissioned and in accordance with the scope between Sydney Arbor Trees PTY Limited and the client. Unauthorised use of this report in any form is prohibited.

ABBREVIATIONS

Abbreviation	Description
AQF	Australian Qualification Framework.
AS	Australian Standards.
DAB	Diameter Above Buttress.
DBH	Diameter at Breast Height.
DIA	Diameter.
ELE	Estimated Life Expectancy.
m	Metre.
mm	Millimetre.
NDRE	Non-Destructive Root Exploration.
No.	Number.
NSW	New South Wales.
QTRA	Quantified Tree Risk Assessment.
sp.	Species- *It is used when the actual **species** name cannot or need not or is not specified.*
spp.	Species- *It is used to indicate several **species**.*
SRZ	Structural Root Zone.
TPZ	Tree Protection Zone.
VTA	Visual Tree Assessment.

1 SUMMARY

The proposed development is the upgrade of Mount Colah Station which includes demolition of the existing pedestrian overpass, construction of a new pedestrian overpass linking Pierre Close with a 'kiss and go' drop off and pick up, lift access to the street on the pacific highway and new landscaping. This report is only concerned with trees situated within the domain under Councils management. Forty-one trees have been inspected with their details listed in Appendix 2.

The proposed development will necessitate the removal of eight high category trees and eleven low category trees. The remaining retained trees could potentially be adversely affected through disturbance to their TPZ's and or during phases of the development. Mitigation for the loss of these trees is through an extensive landscaping plan.

If adequate precautions to protect the retained trees are implemented through the Arboricultural method statement included within this report, the development proposal will have no adverse impact on the contribution of the retained trees.

2 TABLE OF CONTENTS

3 INTRODUCTION

3.1 Instruction

Sydney Arbor Trees PTY Limited have been instructed by Gartner Rose Pty Ltd to inspect the Council managed tree population at Mount Colah Station, Mount Colah and to provide an Arboricultural report to accompany planning approval. This report investigates the impact of the proposed development on Council managed trees situated on the Pacific Highway adjoining Lot 106 DP928591 and on Pierre Close adjoining Lot 1 DP1172693 and provides the following guidelines for the appropriate management of trees and protective measures:

- A schedule of relevant trees, including basic data and a condition assessment,
- An appraisal of the impact of the proposal on trees and any resulting impact that has on local character and amenity, and
- A preliminary Arboricultural method statement setting out appropriate protective measures and management for trees to be retained.

3.2 Purpose of this report

This report provides an analysis of the impact of the development proposal on trees with additional guidance on appropriate management and protective measures. Its primary purpose is for the consent authority to review the tree information in support of the planning submission and for its use as a basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process it will be available for inspection by people other than tree experts, so the information is presented to be helpful to those without a detailed knowledge of the subject.

3.3 Qualifications & experience

This report is based on site observations and provided information. All conclusions have been reached considering the experience and qualifications of the onsite assessor as outlined within Appendix 1.

3.4 Objectives considered

In preparing this report, the following objectives have been considered:

- *State Environmental Planning Policy (Biodiversity and Conservation) 2021,*
- *AS 4970 'Protection of Trees on Development Sites' 2009,*
- *AS 4373 'Pruning of Amenity Trees' 2007,*
- *Hornsby Local Environmental plan 2013, and*
- *Hornsby Development Control Plan 2013.*

3.5 Documents & information provided

- *Plan Showing detail & Levels Over Mount Colah Station & Surrounds. Drawing No. 36112A01.DWG (Issue C), and*
- *Railway Station Footbridge Renewal Architecture Site Plan, Drawing No. 21-153-0102 (A1)*

3.6 Scope of this report

This report is only concerned with forty-one (**41**) trees situated on Council managed land that have potential to be impacted through the proposed development. It takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise. It includes a preliminary assessment based on the site visit and the documents provided, listed in Section 3.5 above.

4 THE LAYOUT DESIGN

4.1 The TreeAZ method of tree assessment

The TreeAZ method of assessing trees is a method of tree assessment that determines the retention value of trees in the planning process.
Simplistically, trees assessed as potentially important are categorised as 'A' and those assessed as less important are categorised as 'Z'.
Further explanation of TreeAZ can be found in Appendix 2 and at www.treeaz.com
In the context of a new development, all the 'Z' trees are discounted as a material constraint in layout design. All the 'A' trees are potentially important, and they dictate the design constraints. This relatively simple constraints information is suitable for use by the architect to optimise the retention of the best trees in the context of other material considerations.

4.2 Site visit and collection of data

4.2.1 Site visit

The site was inspected on the 17th of June 2022. All observations were made from ground level without detailed investigations, all of the tree dimensions were estimated, and all observations were made from the street scape.

4.2.2 Brief site description

Mount Colah Station is within the suburb of Mount Colah (refer figure 1). The site is west of Pierre Close and zoned SP2 Infrastructure Railway. To the west of the site is the Pacific Highway and land zoned L2 'Low Density Residential'

4.2.3 Site Map

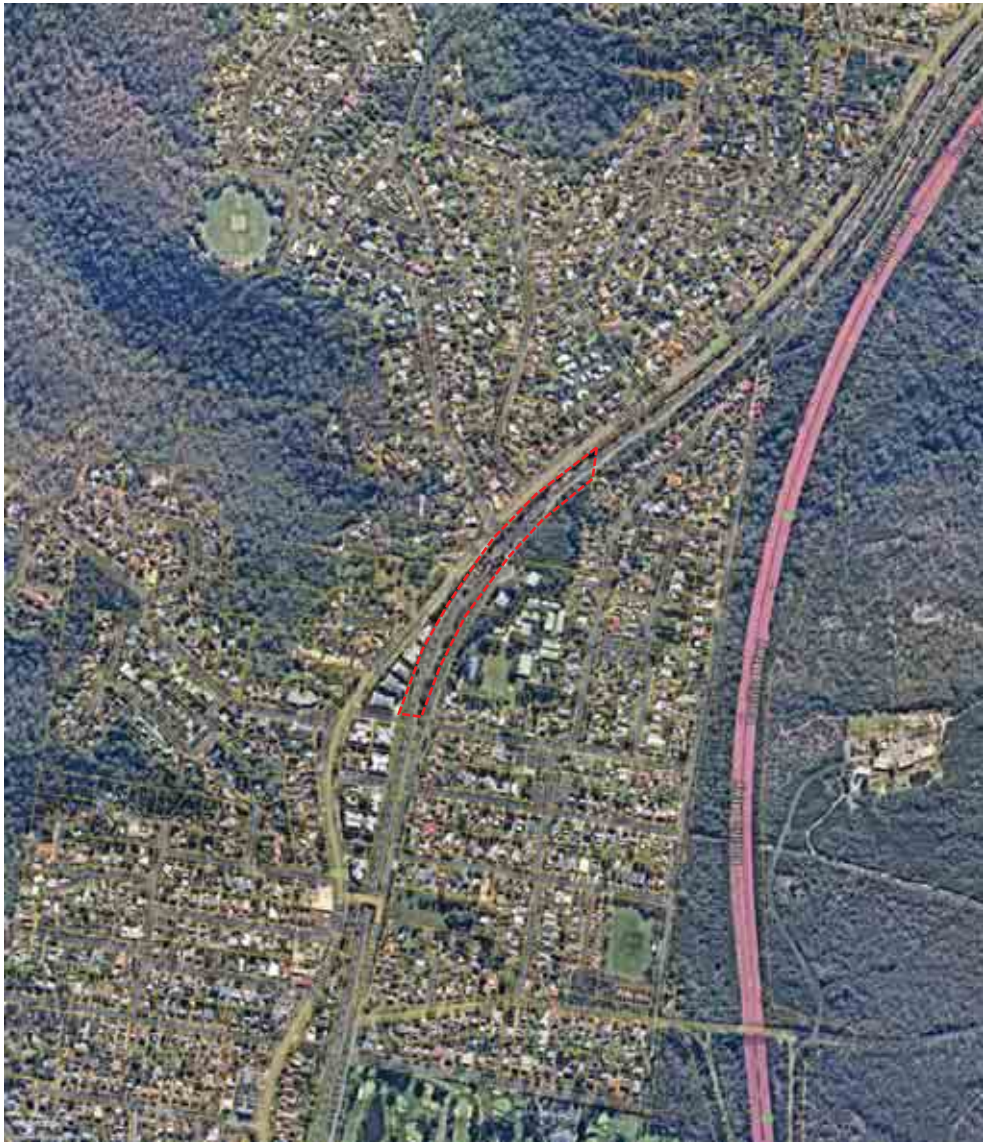

Figure 1 Shows Lot 1 DP1172693 the study site.

4.2.4 Collection of basic data

Information was collected on species, height, diameter, maturity, and potential for contribution to amenity in a development context. Each tree was then allocated to one of four categories ('AA', 'A', 'Z' or 'ZZ'), which reflected its suitability as a material constraint on development.

4.2.5 Identification and location of the trees

Identification to species level was based on broad taxonomical features present and visible from the ground level. The Tree Management Plan (Plan TMP01) included as Appendix 9, illustrates the locations of the trees and is for illustrative purposes only and should not be used for directly scaling measurements. TPZ's should be measured as a radius using the tree schedule included within Appendix 2.

4.2.6 Advanced interpretation of data

The Australian Standard *Protection of trees on development sites* (AS4970-2009), recommends that the trunk diameter measurement for each tree be used to calculate the tree protection zone (TPZ), which can then be interpreted to identify the design constraints and once a layout has been consented, the exclusion zone is to be protected by fencing.

4.2.7 The use of the information in layout design

The information listed in Appendix 2 can be used to provide constraints guidance when working within TPZ's based on the locations of all the 'A' trees. All the 'Z' trees should be removed and replaced because they were not considered worthy of being a material constraint. This guidance identified two zones of constraints based on the following considerations:

4.2.7.1 Tree Protection Zone (TPZ)

As described within AS-4970 is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. TPZ's are calculated by multiplying the diameter at breast height by 12. This result is a setback distance radially from the trunk. In some cases, it may be possible to encroach into or make variations to the theoretical TPZ.

A Minor Encroachment is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

4.2.7.2 Structural Root Zone (SRZ)

The SRZ is described in AS-4970 is the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as this may lead to the destabilisation and/or demise of the tree.

5 IMPACT ASSESSMENT

5.1 Summary of the Impact on trees

The impact on trees has been assessed by the extent of disturbance within the Tree Protection Zone (TPZ) and the encroachment of structures within the Structural Root Zone (SRZ). All trees that may be affected by the development proposal are listed in Table 1.

5.2 Table of Scheduled Trees

Impact	*Reason*	*Important Trees*		*Unimportant Trees*	
		A	*AA*	*Z*	*ZZ*
Retained trees that may be impacted through disturbance to TPZ's	*Removal of existing surfaces/structures and/or installation of new surfaces/structures.*	*1,22,23,24, 26,27,29.*		*25,28, 30,31,32,33, 34,35,36,37, 38,39,40,41, 42.*	
Trees to be removed	*Poor condition with limited ability to reach full potential.*	*2,3,4, 6,13,14,16, 19.*		*5,7,8,9, 10,11,12, 17,18,20, 21*	

Table 1

5.3 Detailed Impact Assessment

5.3.1 Category 'A' & 'AA' trees to be lost.

The proposed development will necessitate the removal of eight high category trees (Trees **2,3,4,6,13,14,16** and **19**) as they will be directly impacted by the proposed built structures, Kiss and Go on Pierre Close, the overpass and associated ramps and lifts, Low voltage installation and surfaces and landscaping. These are important mature trees located along the perimeter of the rail corridor, within the domain which is on Council managed land. These trees are the dominant mature trees visible from outside of the site, their loss will have a visual impact on local amenity or character in the wider setting. It is proposed to mitigate the loss of these trees with new plantings throughout the newly developed 'Kiss and Go' on Pierre Close and the western corridor edge and street scape on the Pacific Highway side of the study site.

5.3.2 Category 'A' & 'AA' trees with potential to be impacted through TPZ and site disturbance.

Seven category A trees (Trees **1,22,23,24,26,27** & **29**) could potentially be adversely affected through disturbance to their TPZ's as follows:
Trees 1,22,23,24,26,27 & 29 are outside the proposed footprint of the development and can be successfully isolated from the development and access to the site during the proposed works. These are all important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. These changes may cause harm if not carried out with care. I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed Arboricultural method statement.

5.3.3 Category 'Z' & 'ZZ' trees to be retained.

Seventeen low category trees (Trees **25,28,30,31,32,33,34,35,36,37, 38,39,40,41** & **42**) can successfully be retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed Arboricultural method statement.

5.3.4 Category 'Z' & 'ZZ' trees to be lost.

The proposed development will necessitate the removal of nine low category trees of low and low retention value (Trees **5,7,8,9,10,11,12,17**, **18,20 & 21**). These trees have been assessed to have poor conditions, are largely coppiced regrowth and or suckers. It is proposed to mitigate the loss of these trees with new plantings throughout the development site.

5.4 Proposal to mitigate any impact and provide ecological gain

5.4.1 Protection of retained trees

The successful retention of trees depends on the quality of the protection and the administrative procedures to ensure those protective measures remain in place whilst there is an unacceptable risk of damage. An effective means of doing this is through an Arboricultural method statement that can be specifically referred to in a planning condition. An Arboricultural method statement for this site is set out in detail in Section 6.

5.4.2 Landscape plan

A landscaping scheme is proposed with extra trees to be planted within available areas in prominent locations. The new trees will have the potential to reach a prescribed height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity, character, and site canopy cover.

5.4.3 Summary of the impact on local amenity

Through complying with the recommended mitigation measures, as set out in Section 6, the proposal is not expected to have any direct impact to the retained trees identified for retention. If adequate precautions to protect the retained trees are specified and implemented through the Arboricultural method statement included within this report, the development proposal will have no adverse impact on the contribution of the retained trees.

6 ARBORICULTURAL METHOD STATEMENT

6.1 Introduction

6.1.1 Terms of reference

The impact appraisal in Section 5 identified the impact on trees and how that affects local character. Section 6 is an Arboricultural method statement setting out management and protection details that must be implemented to secure successful tree retention. It has evolved from the Australian Standard AS4970-2009 *Protection of trees on development sites.*

6.1.2 Plan TMP01

Plan TMP01 in Appendix 9 is illustrative and based entirely on provided information. This plan can only be used for dealing with the tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre- commencement meeting before any demolition or construction activity starts. Its base is the *Plan Showing detail & Levels Over Mount Colah Station & Surrounds. Drawing No. 36112A01.DWG (Issue C)* which also shows the locations of the proposed protective measures.

6.2 Physical tree protection

6.2.1 Protection fencing

Tree protection fencing must comply with AS4970-2009 *Protection of trees on development sites* recommendations. An illustrative guide is included as appendix 4. The approximate location of the protection fencing and the TPZ's is illustrated on Plan TMP01. The precise location of the fencing must be agreed with the Arborist before any development activity starts onsite.

6.2.2 Trunk and branch protection

Trunk and or branch protection must comply with AS4970-2009 *Protection of trees on development sites* recommendations. An illustrative guide is included as appendix 4. Trunk protection must be installed to tree 1.

6.2.3 Ground protection

Any TPZ's outside the protective fencing must be covered in ground protection based on AS4970-2009 *Protection of trees on development sites* recommendations, until there is no risk of damage from the demolition and construction activity. An illustrative specification for this ground protection is included as Appendix 4. On this site, it must be installed near trees 1 where construction requires the setback of the tree protection fencing. This shall be specified by the Arborist once construction methodology has been confirmed with the developer.

6.2.4 Crown Protection

Tree crowns may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hoarding installation and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree. Where crown protection is required, it will usually be located at least one metre outside the perimeter of the crown. The erection of scaffolding may require an additional setback from the edge of the crown. Crown protection may include pruning, tying-back of branches or other measures. If pruning is required, requirements are specified in AS 4373 and should be undertaken before the establishment of the TPZ. NOTE: Pruning may require approval from the determining authority.

6.2.5 Root protection

Some approved works within the TPZ, such as regrading, installation of piers or landscaping may have the potential to damage roots. If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimized. Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability. Relocation or redesign of works may be required.

Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws, or chainsaws. Pruning wounds should not be treated with dressings or paints. It is not acceptable for roots within the TPZ to be 'pruned' with machinery such as backhoes or excavators. Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that the root zone is exposed. Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems. Seek advice from the project arborist.

6.3 Precautions when working in TPZs

Any work in TPZs must be done with care as set out in Appendix 5. On this site, special precautions must be taken near tree **1** as illustrated on Plan TMP01 and summarised below:

6.3.1 Removal and replacement of existing surfacing/structures

Tree **1** may be adversely affected by the removal of existing surfaces. Any adverse impact must be minimised by following the guidance set out in Appendix 5.

6.3.2 Installation of new services or upgrading of existing services

It is often difficult to clearly establish the detail of services until the construction is in progress. Where possible, it is proposed to use the existing services into the site and keep all new services outside TPZ's. Where existing services within TPZ's require upgrading or new services have been installed in TPZ's, great care must be taken to minimise any disturbance. Trenchless installation should be preferred option but if that is not feasible, any excavation must be carried out by hand according to the guidelines set out in Appendix 5. If services do need to be installed with TPZ's consultation must be obtained from the project Arborist and/or Council before any works are carried out.

6.3.3 Damage to street trees

Any damage to street trees as a result of erection to hoardings, scaffolding or due to the hoarding/unloading of vehicles adjacent the site must be immediately reported to the council's Tree Management Officer (TMO), in order to determine the appropriate action for maintaining the health and structural integrity of any damaged street tree.

6.4 Other tree related works

6.4.1 Site storage, cement mixing and washing points

The site offices, cement mixing and wash points shall be situated within the study site. Where there is a risk of polluted water run-off into TPZs, heavy-duty plastic sheeting and sandbags must be used to contain spillages and prevent contamination and storage within the verge of equipment may require ground protection.

6.4.2 Pruning

Any pruning that is required to accommodate hoardings, scaffolding or to accommodate the unloading of vehicles and or the installation of site offices requires council consent and shall be carried out by a qualified Arborist (AQF-3) and must be in accordance with AS4373 Australian standards '*Pruning of Amenity Trees*'.

6.5 Programme of tree protection and supervision

6.5.1 Overview

Tree protection cannot be reliably implemented without Arboricultural input. The nature and extent of that input varies according to the complexity of the issues and the resources available on site. For this site, a summary of the level of Arboricultural input that is likely to be required is set out in Appendix 7. The Arborist must be instructed to work within this framework to oversee the implementation of the protective measures and management proposals set out in this Arboricultural method statement.

6.5.2 Supervision and the discharge of planning conditions

Arboricultural planning conditions cannot be reliably or effectively discharged without supervision by an Arborist. The framework in Appendix 7 must form the basis for the discharge of planning conditions through site visits by the Arborist. These supervisory actions must be confirmed by formal letters circulated to all relevant parties, including the council. These permanent records of each site visit will accumulate to provide the proof of compliance and allow conditions to be discharged as the development progresses. The developer must instruct the Arborist to comply with the supervision requirements set out in this document before any work begins on site.

6.5.3 Phasing of Arboricultural input

Trees can only be properly budgeted for and factored into the developing work programmes if the overall project management takes full account of tree issues once consent is confirmed. The Arborist must be involved in the following phases of the project management:

1. **Administrative preparation before work starts on site:** It is normal for a development proposal to vary considerably from the expectations before consent as the detailed planning of implementation evolves. The early instruction of an Arboricultural consultant ensures that tree issues are factored into the complexities of site management and can often help ease site pressures through creative approaches to tree protection. Pre-commencement discussions between the Arboricultural consultant and the developer's team is an effective means of project managing the tree issues to maximise site efficiency within often difficult constraints.

2. **Pre-commencement site visit:** A pre-commencement meeting must be held on site before any of the demolition and construction work begins. This must be attended by the site manager and the Arborist. All tree protection measures detailed in this document must be fully discussed so that all aspects of their implementation and sequencing are understood by all the parties. Any clarifications or modifications to the consented details must be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection will be agreed and finalised by all parties, which will then form the basis of any supervision arrangements between the Arborist and the developer.

3. **Site supervision:** Once the site is active, the Arborist must visit at an interval agreed at the pre-commencement site meeting unless these intervals are specified through consent as critical milestones. The supervision arrangement must be sufficiently flexible to allow the supervision of all sensitive works as they occur. The Arborist's initial role is to liaise with the developer to ensure that appropriate protective measures are designed and in place before any works start on site. Once the site is working, that role will switch to monitoring compliance with Arboricultural conditions and advising on any tree problems that arise or modifications that become necessary.

6.6 Site management

It is the developer's responsibility to ensure that the details of this Arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents must be always kept on site and the site manager must brief all personnel who could have an impact on trees on the specific tree protection requirements. This must be a part of the site induction procedures and written into appropriate site management documents.

7 HOW TO USE THIS REPORT

7.1 Limitations

It is common that the detail of logistical issues such as site storage and the build programme are not finalised until after consent is issued. As this report has been prepared in advance of consent, some of its content may need to be updated as more detailed information becomes available once the post-consent project management starts. Although this document will remain the primary reference in the event of any disputes, some of its content may be superseded by authorised post-consent amendments.

7.2 Suggestions for the effective use of this report

Section 6 of this report, including the relevant appendices, is designed as an enforcement reference. It is constructed so the council can directly reference the detail in a planning condition. Referencing the report by name and relating conditions to specific subsections is an effective means of reducing confusion and facilitating enforcement in the event of problems during implementation. More specifically, the following issues should be directly referenced in the conditions for this site:

1.	Protection fencing	(6.2.1 and Appendix 4)
2.	Trunk protection	(6.2.2 and Appendix 4)
3.	Ground protection	(6.2.3 and Appendix 4)
4.	Removal of surfacing/structures	(6.3 and Appendix 5/14.7)
5.	Installation of new surfacing/structures	(6.3 and Appendix 5/14.9,14.10)
6.	Services	(Appendix 5)
7.	Landscaping	(6.3 and Appendix 5/14.12)
8.	Programming of tree protection	(6.5 and Appendix 7)
9.	Arboricultural supervision	(6.5 and Appendix 7)

Each of the above matters must be supervised by an Arborist and the relevant conditions can only be discharged once that supervision has been confirmed in writing to the relevant parties. The last column of the table in Appendix 7 is to be used so that the various supervision issues can be recorded as they are confirmed by supervision letter.

8 BIBLIOGRAPHY

Barrell, J (2009) Draft for Practical Tree AZ version 9.02 A+NZ Barrell Tree Consultancy, Bridge House Ringwood BH24 1EX.

Brooker M.I.H, Kleinig D.A. 2006. Field Guide to Eucalypts. Volume 1, South-eastern Australia, 3rd ed Blooming's Books, Melbourne.

Draper, B. and Richards, P., 2009. Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Harris, R.W., Matheny, N.P., and Clark, J.R., 1999. 'Arboriculture: integrated management of landscape trees, shrubs, and vines', Prentice Hall, Upper Saddle River, New Jersey.

Londsdale, D. 1999. 'Principals of Tree Hazard Assessment and Management'. Arboriculture Association. Stonehouse (UK).

Mattheck, DR. and Breloer, H. 1994. 'Field Guide for Visual Tree Assessment' Arboricultural Journal, Vol 18 pp 1-23.

Mattheck, DR. Claus R., Breloer, Helge (1995) 'The Body Language of Trees-A handbook for Failure Analysis', The Stationary Office, London. England.

Mattheck, DR. 2007. 'Updated Field Guide for Visual Tree Assessment'. Karlsruhe: Forschungszentrum Karlsruhe.

IACA 2010. IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturalists, Australia, www.iaca.org.au.

Robinson L, 2003. 'Field Guide to the Native Plants of Sydney', 3rd ed, Kangaroo Press, Kenthurst NSW.

Safe Work Australia (2016), Guide for Managing Risks of Tree Trimming and Removal Work.

Safe Work NSW (1998), Code of Practice for the Amenity Tree Industry.

Standards Australia 2007. Australian Standard: Pruning of amenity trees, AS 4373 (2007), Standards Australia, Sydney.

Standards Australia 2009. Australian Standard: Protection of trees on development sites, AS 4970 (2009), Standards Australia, Sydney.

Standards Australia 2003 Australian Standard: Soils for Landscaping and Garden Use, AS 4419 (2003), Standards Australia, Sydney.

Standards Australia 2003, Compost, Soil Conditioners and Mulches, AS 4454 (2003), Standards Australia, Sydney.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Nutri-Tech Solutions 'Life Force Gold Pellets'
https://www.nutri-tech.com.au/products/dry-mineral-fertilisers/life-force-gold

Nutri-Tech Solutions 'Black Gold'
https://www.nutri-tech.com.au/products/liquid-fertilisers/nslpgp/nutri-tech-black-gold

9 DISCLAIMER

9.1 Limitations on the use of this report

This report should be utilized in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from findings, discussions, conclusions, or recommendations made in tis report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report, or presentation.

This Assessment report was undertaken by an Arborist with AQF level V (Diploma of Arboriculture) qualification Mathew Phillips is a registered Advanced user of the Quantified Tree Risk Assessment ® (QTRA) methodology. Only registered licence holders having received training and regular updates from Quantified Tree Risk Assessment Limited are permitted to use the QTRA system.

It is important to note that the QTRA risk assessment does Not evaluate risk exposure during unexpected, unusual, unpredictable, severe, or unseasonal weather, weather at the extremes of the historical distribution. The risk assessment provided is valid for 12 months only.

This assessment was based on a comprehensive site inspection, observations made at the time of the inspection and information provided by the client and their employees. All conclusions reached, or tree works recommended, do not imply that the tree will withstand adverse natural conditions such as environmental influences, soil failure and erosion, severe storms, works carried out or near it, land development and mechanical impact, miss-management or maintenance or changes in the growing environment, may impact the validity of the conclusions.

All care has been taken to obtain all information from reliable sources. All data collected has been verified insofar as practically possible: however, the author can neither guarantee nor be responsible for the accuracy of information provided by others. Information contained herein, covers only those trees that were surveyed, examined, and scheduled and reflects the condition of those trees at the time of inspection.

This report is Not a warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future, but a professional opinion of the status and condition of the tree. Whilst all care has been taken to prepare this report, the author takes no responsibility for the continued vitality of the tree mentioned or for any damage that it may cause in the future.

If you have any questions regarding this report or require any further information, please contact me on the details below.

AQF-5 Consulting Arborist
Dip. Arboriculture
Advanced Quantified Tree Risk

ARBORICULTURAL IMPACT ASSESSMENT & METHOD STATEMENT

Prepared for:

Taras Cherkasov
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Site:

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Pierre Close Mount Colah NSW 2079

Published by:

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www.sydneyarbor.com.au

1 SUMMARY

The proposed development is the upgrade of Mount Colah Station which includes demolition of the existing pedestrian overpass, construction of a new pedestrian overpass linking Pierre Close with a 'kiss and go' drop off and pick up, lift access to the street on the pacific highway and new landscaping. This report is only concerned with trees situated within the rail corridor. One hundred and ten trees have been inspected with their details listed in Appendix 2.

The proposed development will necessitate the removal of fifty-seven high category trees and thirty low category trees. Mitigation for the loss of these trees is through an extensive landscaping plan. The remaining retained trees could potentially be adversely affected through disturbance to their TPZs and or during phases of the development.

If adequate precautions to protect the retained trees are implemented through the Arboricultural method statement included within this report, the development proposal will have no adverse impact on the contribution of the retained trees.

2 TABLE OF CONTENTS

3 INTRODUCTION

3.1 Instruction

Sydney Arbor Trees PTY Limited have been instructed by Gartner Rose Pty Ltd to inspect the tree population within the rail corridor at Mount Colah Station, Mount Colah and to provide an Arboricultural report to accompany planning approval. This report investigates the impact of the proposed development on trees situated within Lot 106 DP928591 and in Lot 1 DP1172693 and provides the following guidelines for the appropriate management of trees and protective measures:

- A schedule of relevant trees, including basic data and a condition assessment,
- An appraisal of the impact of the proposal on trees and any resulting impact that has on local character and amenity, and
- A preliminary Arboricultural method statement setting out appropriate protective measures and management for trees to be retained.

3.2 Purpose of this report

This report provides an analysis of the impact of the development proposal on trees with additional guidance on appropriate management and protective measures. Its primary purpose is for the consent authority to review the tree information in support of the proposed works and for its use as a basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process it will be available for inspection by people other than tree experts, so the information is presented to be helpful to those without a detailed knowledge of the subject.

3.3 Qualifications & experience

This report is based on site observations and provided information. All conclusions have been reached considering the experience and qualifications of the onsite assessor as outlined within Appendix 1.

3.4 Objectives considered

In preparing this report, the following objectives have been considered:

- *State Environmental Planning Policy (Biodiversity and Conservation) 2021,*
- *AS 4970 'Protection of Trees on Development Sites' 2009,*
- *AS 4373 'Pruning of Amenity Trees' 2007,*
- *Hornsby Local Environmental plan 2013, and*
- *Hornsby Development Control Plan 2013.*

3.5 Documents & information provided

- *Plan Showing detail & Levels Over Mount Colah Station & Surrounds. Drawing No. 36112A01.DWG (Issue C), and*
- *Railway Station Footbridge Renewal Architecture Site Plan, Drawing No. 21-153-0102 (A1)*

3.6 Scope of this report

This report is only concerned with one hundred and ten (**110**) trees situated within the study site that have potential to be impacted through the proposed development. It takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise. It includes a preliminary assessment based on the site visit and the documents provided, listed in Section 3.5 above.

4 THE LAYOUT DESIGN

4.1 The TreeAZ method of tree assessment

The TreeAZ method of assessing trees is a method of tree assessment that determines the retention value of trees in the planning process.
Simplistically, trees assessed as potentially important are categorised as 'A' and those assessed as less important are categorised as 'Z'.
Further explanation of TreeAZ can be found in Appendix 2 and at www.treeaz.com
In the context of a new development, all the 'Z' trees are discounted as a material constraint in layout design. All the 'A' trees are potentially important, and they dictate the design constraints. This relatively simple constraints information is suitable for use by the architect to optimise the retention of the best trees in the context of other material considerations.

4.2 Site visit and collection of data

4.2.1 Site visit

The site was inspected on the 17th of June 2022. All observations were made from ground level without detailed investigations, all of the tree dimensions were estimated, and all observations were made from the street scape.

4.2.2 Brief site description

Mount Colah Station is within the suburb of Mount Colah (refer figure 1). The site is west of Pierre Close and zoned SP2 Infrastructure Railway. To the west of the site is the Pacific Highway and land zoned L2 'Low Density Residential'

4.2.3 Site Map

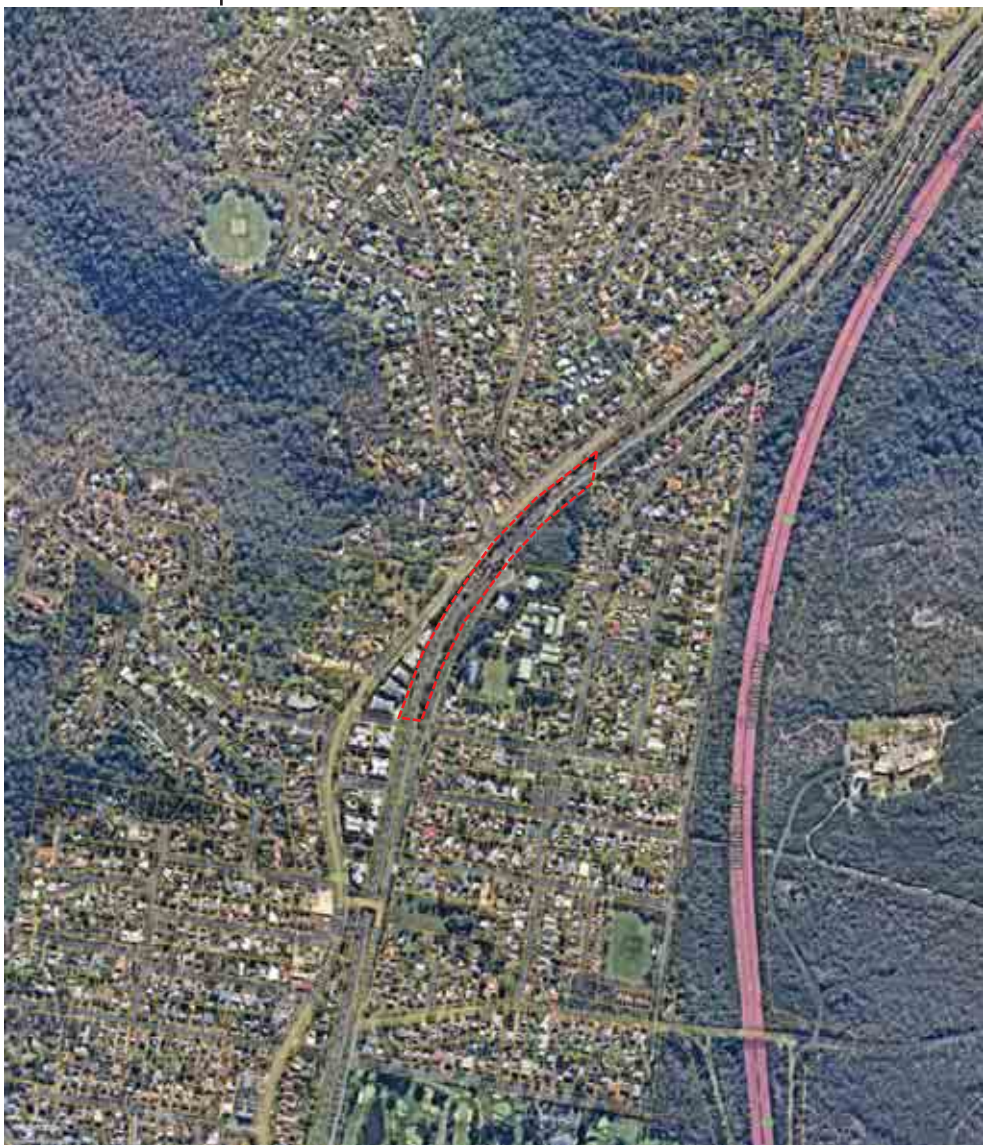

Figure 1 Shows Lot 1 DP1172693 the study site.

4.2.4 Collection of basic data

Information was collected on species, height, diameter, maturity, and potential for contribution to amenity in a development context. Each tree was then allocated to one of four categories ('AA', 'A', 'Z' or 'ZZ'), which reflected its suitability as a material constraint on development.

4.2.5 Identification and location of the trees

Identification to species level was based on broad taxonomical features present and visible from the ground level. The Tree Management Plan (Plan TMP01) included as Appendix 9, illustrates the locations of the trees and is for illustrative purposes only and should not be used for directly scaling measurements. TPZ's should be measured as a radius using the tree schedule included within Appendix 2.

4.2.6 Advanced interpretation of data

The Australian Standard *Protection of trees on development sites* (AS4970-2009), recommends that the trunk diameter measurement for each tree be used to calculate the tree protection zone (TPZ), which can then be interpreted to identify the design constraints and once a layout has been consented, the exclusion zone is to be protected by fencing.

4.2.7 The use of the information in layout design

The information listed in Appendix 2 can be used to provide constraints guidance when working within TPZ's based on the locations of all the 'A' trees. All the 'Z' trees should be removed and replaced because they were not considered worthy of being a material constraint. This guidance identified two zones of constraints based on the following considerations:

4.2.7.1 Tree Protection Zone (TPZ)

As described within AS-4970 is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. TPZ's are calculated by multiplying the diameter at breast height by 12. This result is a setback distance radially from the trunk. In some cases, it may be possible to encroach into or make variations to the theoretical TPZ.

4.2.7.1.1 Minor Encroachment

A Minor Encroachment is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

4.2.7.1.2 Major Encroachment

A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

4.2.7.2 Structural Root Zone (SRZ)

The SRZ is described in AS-4970 is the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as this may lead to the destabilisation and/or demise of the tree.

5 IMPACT ASSESSMENT

5.1 Summary of the Impact on trees

The impact on trees has been assessed by the extent of disturbance within the Tree Protection Zone (TPZ) and the encroachment of structures within the Structural Root Zone (SRZ). All trees that may be affected by the development proposal are listed in Table 1.

5.2 Table of Scheduled Trees

Impact	*Reason*	*Important Trees*		*Unimportant Trees*	
		A	*AA*	*Z*	*ZZ*
Retained trees that may be impacted through disturbance to TPZ's	*Removal of existing surfaces/structures and/or installation of new surfaces/structures and landscaping.*	*43,44,45,46,48, 49,50,51,52,55, 56,62,73,80, 81,82,84,86*		*47,58,59, 60,85*	
Trees to be removed due to disturbance to TPZ's	*Removal of existing surfaces/structures and/or installation of new surfaces/structures and landscaping.*	*53,54,57,61,64, 65,66,68,69,71, 72,79,87,88,89, 90,91,92,93,94, 95,96,97,102, 104,105,106,108, 109,110,115,116, 120,122,123,124, 128,129,130,131, 133,134,135,137, 139,140,141,142, 143,144,145,146, 147,148,149, 150,151*		*67,74,75,76, 77,78,83,98, 99,100,101, 103,107,111, 112,113,116, 117,118,119, 121,125,127, 129,132,136, 138,152*	*63,70, 114*

Table 1

5.3 Detailed Impact Assessment

5.3.1 Category 'A' & 'AA' trees to be lost:

The proposed development will necessitate the removal of fifty-seven high category trees (Trees **53,54,57,61,64,65,66,68,69,71,72,79,87,88,89,90,91, 92,93,94,95,96,97,102,104,105,106,108,109,110,115,116,120,122,123, 124,128,129,130,131,133,134,135,137,139,140,141,142,143,144,145,146, 147,148,149,150** and **151**) as they will be directly impacted by the proposed built structures, Kiss and Go on Pierre Close, the overpass and associated ramps and lifts, Low voltage installation and surfaces and landscaping. These are important mature trees located within the study site. These trees are the dominant mature trees visible from outside of the site, their loss will have a visual impact on local amenity or character in the wider setting. It is proposed to mitigate the loss of these trees with new plantings throughout the newly developed 'Kiss and Go' on Pierre Close and the western corridor edge and street scape on the Pacific Highway side of the study site.

5.3.2 Category 'A' & 'AA' trees with potential to be impacted through TPZ and site disturbance:

Eighteen category A trees (Trees **43,44,45,46,48,49,50,51,52,55,56,62,73, 80,81,82,84** & **86**) could potentially be adversely affected through disturbance to their TPZ's as follows:

These trees are outside the proposed footprint of the development and can be successfully isolated from the development and access to the site during the proposed works. These are all important trees with a high potential to contribute to amenity so any adverse impacts on them should be minimised. These changes may cause harm if not carried out with care. I have reviewed the situation carefully and my experience is that these trees could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed Arboricultural method statement.

5.3.3 Category 'Z' & 'ZZ' trees to be retained:

Five low category trees (Trees **47,58,59,60** & **85**) can successfully be retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed Arboricultural method statement.

5.3.4 Category 'Z' & 'ZZ' trees to be lost:

The proposed development will necessitate the removal of thirty low category trees of poor condition and low retention value (Trees **63**,**67,70, 74,75,76,77,78,83,98,99,100,101,103,107,111,112,113,114,117,118, 119,121,125,127,129,132,136,138** & **152**). These trees have been assessed to have poor conditions, are largely coppiced regrowth and or suckers. It is proposed to mitigate the loss of these trees with new plantings throughout the development site.

5.4 Proposal to mitigate any impact and provide ecological gain

5.4.1 Protection of retained trees:

The successful retention of trees depends on the quality of the protection and the administrative procedures to ensure those protective measures remain in place whilst there is an unacceptable risk of damage. An effective means of doing this is through an Arboricultural method statement that can be specifically referred to in a planning condition. An Arboricultural method statement for this site is set out in detail in Section 6.

5.4.2 Landscape plan:

A landscaping scheme is proposed with extra trees to be planted within available areas in prominent locations. The new trees will have the potential to reach a prescribed height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity, character, and site canopy cover.

5.4.3 Summary of the impact on local amenity:

Through complying with the recommended mitigation measures, as set out in Section 6, the proposal is not expected to have any direct impact to the retained trees identified for retention. If adequate precautions to protect the retained trees are specified and implemented through the Arboricultural method statement included within this report, the development proposal will have no adverse impact on the contribution of the retained trees.

6 ARBORICULTURAL METHOD STATEMENT

6.1 Introduction

6.1.1 Terms of reference

The impact appraisal in Section 5 identified the impact on trees and how that affects local character. Section 6 is an Arboricultural method statement setting out management and protection details that must be implemented to secure successful tree retention. It has evolved from the Australian Standard AS4970-2009 *Protection of trees on development sites.*

6.1.2 Plan TMP01

Plan TMP01 in Appendix 9 is illustrative and based entirely on provided information. This plan can only be used for dealing with the tree issues and all scaled measurements must be checked against the original submission documents. The precise location of all protective measures must be confirmed at the pre- commencement meeting before any demolition or construction activity starts. Its base is the *Railway Station Footbridge Renewal Architecture Site Plan, Drawing No. 21-153-0102 (A1)*.

6.2 Physical tree protection

6.2.1 Protection fencing

Tree protection fencing must comply with AS4970-2009 *Protection of trees on development sites* recommendations. An illustrative guide is included as appendix 4. The approximate location of the protection fencing is shown on TMP01 of *Sydney Arbor Trees 2022-Mount Colah Station Domain Arboricultural Impact Assessment dated 24th of June 2022* and the TPZ's is illustrated on Plan TMP01 Appendix 9 of this report. The precise location of the fencing must be agreed with the Arborist before any development activity starts onsite.

6.2.2 Trunk and branch protection

Trunk and or branch protection must comply with AS4970-2009 *Protection of trees on development sites* recommendations. An illustrative guide is included as appendix 4.

6.2.3 Ground protection

Any TPZ's outside the protective fencing must be covered in ground protection based on AS4970-2009 *Protection of trees on development sites* recommendations, until there is no risk of damage from the demolition and construction activity. An illustrative specification for this ground protection is included as Appendix 4.

6.2.4 Crown Protection

Tree crowns may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hoarding installation and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree. Where crown protection is required, it will usually be located at least one metre outside the perimeter of the crown. The erection of scaffolding may require an additional setback from the edge of the crown. Crown protection may include pruning, tying-back of branches or other measures. If pruning is required, requirements are specified in AS 4373 and should be undertaken before the establishment of the TPZ.

6.2.5 Root protection

Some approved works within the TPZ, such as regrading, installation of piers or landscaping may have the potential to damage roots. If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimized. Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability. Relocation or redesign of works may be required.

Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws, or chainsaws. Pruning wounds should not be treated with dressings or paints. It is not acceptable for roots within the TPZ to be 'pruned' with machinery such as backhoes or excavators. Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that the root zone is exposed. Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems. Seek advice from the project arborist.

6.3 Precautions when working in TPZs

Any work in TPZs must be done with care as set out in Appendix 5.

6.3.1 Removal and replacement of existing surfacing/structures

Retained trees may be adversely affected by the removal of existing surfaces. Any adverse impact must be minimised by following the guidance set out in Appendix 5.

6.3.2 Installation of new services or upgrading of existing services

It is often difficult to clearly establish the detail of services until the construction is in progress. Where possible, it is proposed to use the existing services into the site and keep all new services outside TPZ's. Where existing services within TPZ's require upgrading or new services have been installed in TPZ's, great care must be taken to minimise any disturbance. Trenchless installation should be preferred option but if that is not feasible, any excavation must be carried out by hand according to the guidelines set out in Appendix 5. If services do need to be installed with TPZ's consultation must be obtained from the project Arborist and/or Council before any works are carried out.

6.3.3 Damage to street trees

Any damage to street trees as a result of erection to hoardings, scaffolding or due to the hoarding/unloading of vehicles adjacent the site must be immediately reported to the council's Tree Management Officer (TMO), in order to determine the appropriate action for maintaining the health and structural integrity of any damaged street tree.

6.4 Other tree related works

6.4.1 Site storage, cement mixing and washing points

The site offices, cement mixing and wash points shall be situated within the study site. Where there is a risk of polluted water run-off into TPZs, heavy-duty plastic sheeting and sandbags must be used to contain spillages and prevent contamination and storage within the verge of equipment may require ground protection.

6.4.2 Pruning

Any pruning that is required to accommodate hoardings, scaffolding or to accommodate the unloading of vehicles and or the installation of site offices requires council consent and shall be carried out by a qualified Arborist (AQF-3) and must be in accordance with AS4373 Australian standards '*Pruning of Amenity Trees*'.

6.5 Programme of tree protection and supervision

6.5.1 Overview

Tree protection cannot be reliably implemented without Arboricultural input. The nature and extent of that input varies according to the complexity of the issues and the resources available on site. For this site, a summary of the level of Arboricultural input that is likely to be required is set out in Appendix 7. The Arborist must be instructed to work within this framework to oversee the implementation of the protective measures and management proposals set out in this Arboricultural method statement.

6.5.2 Supervision and the discharge of planning conditions

Arboricultural planning conditions cannot be reliably or effectively discharged without supervision by an Arborist. The framework in Appendix 7 must form the basis for the discharge of planning conditions through site visits by the Arborist. These supervisory actions must be confirmed by formal letters circulated to all relevant parties, including the council. These permanent records of each site visit will accumulate to provide the proof of compliance and allow conditions to be discharged as the development progresses. The developer must instruct the Arborist to comply with the supervision requirements set out in this document before any work begins on site.

6.5.3 Phasing of Arboricultural input

Trees can only be properly budgeted for and factored into the developing work programmes if the overall project management takes full account of tree issues once consent is confirmed. The Arborist must be involved in the following phases of the project management:

1. **Administrative preparation before work starts on site:** It is normal for a development proposal to vary considerably from the expectations before consent as the detailed planning of implementation evolves. The early instruction of an Arboricultural consultant ensures that tree issues are factored into the complexities of site management and can often help ease site pressures through creative approaches to tree protection. Pre-commencement discussions between the Arboricultural consultant and the developer's team is an effective means of project managing the tree issues to maximise site efficiency within often difficult constraints.

2. **Pre-commencement site visit:** A pre-commencement meeting must be held on site before any of the demolition and construction work begins. This must be attended by the site manager and the Arborist. All tree protection measures detailed in this document must be fully discussed so that all aspects of their implementation and sequencing are understood by all the parties. Any clarifications or modifications to the consented details must be recorded and circulated to all parties in writing. This meeting is where the details of the programme of tree protection will be agreed and finalised by all parties, which will then form the basis of any supervision arrangements between the Arborist and the developer.

3. **Site supervision:** Once the site is active, the Arborist must visit at an interval agreed at the pre-commencement site meeting unless these intervals are specified through consent as critical milestones. The supervision arrangement must be sufficiently flexible to allow the supervision of all sensitive works as they occur. The Arborist's initial role is to liaise with the developer to ensure that appropriate protective measures are designed and in place before any works start on site. Once the site is working, that role will switch to monitoring compliance with Arboricultural conditions and advising on any tree problems that arise or modifications that become necessary.

6.6 Site management

It is the developer's responsibility to ensure that the details of this Arboricultural method statement and any agreed amendments are known and understood by all site personnel. Copies of the agreed documents must be always kept on site and the site manager must brief all personnel who could have an impact on trees on the specific tree protection requirements. This must be a part of the site induction procedures and written into appropriate site management documents.

7 HOW TO USE THIS REPORT

7.1 Limitations

It is common that the detail of logistical issues such as site storage and the build programme are not finalised until after consent is issued. As this report has been prepared in advance of consent, some of its content may need to be updated as more detailed information becomes available once the post-consent project management starts. Although this document will remain the primary reference in the event of any disputes, some of its content may be superseded by authorised post-consent amendments.

7.2 Suggestions for the effective use of this report

Section 6 of this report, including the relevant appendices, is designed as an enforcement reference. It is constructed so the council can directly reference the detail in a planning condition. Referencing the report by name and relating conditions to specific subsections is an effective means of reducing confusion and facilitating enforcement in the event of problems during implementation. More specifically, the following issues should be directly referenced in the conditions for this site:

1.	Protection fencing	(6.2.1 and Appendix 4)
2.	Trunk protection	(6.2.2 and Appendix 4)
3.	Ground protection	(6.2.3 and Appendix 4)
4.	Removal of surfacing/structures	(6.3 and Appendix 5/14.7)
5.	Installation of new surfacing/structures	(6.3 and Appendix 5/14.9,14.10)
6.	Services	(Appendix 5)
7.	Landscaping	(6.3 and Appendix 5/14.12)
8.	Programming of tree protection	(6.5 and Appendix 7)
9.	Arboricultural supervision	(6.5 and Appendix 7)

Each of the above matters must be supervised by an Arborist and the relevant conditions can only be discharged once that supervision has been confirmed in writing to the relevant parties. The last column of the table in Appendix 7 is to be used so that the various supervision issues can be recorded as they are confirmed by supervision letter.

8 BIBLIOGRAPHY

Barrell, J (2009) Draft for Practical Tree AZ version 9.02 A+NZ Barrell Tree Consultancy, Bridge House Ringwood BH24 1EX.

Brooker M.I.H, Kleinig D.A. 2006. Field Guide to Eucalypts. Volume 1, South-eastern Australia, 3rd ed Blooming's Books, Melbourne.

Draper, B. and Richards, P., 2009. Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Harris, R.W., Matheny, N.P., and Clark, J.R., 1999. 'Arboriculture: integrated management of landscape trees, shrubs, and vines', Prentice Hall, Upper Saddle River, New Jersey.

Londsdale, D. 1999. 'Principals of Tree Hazard Assessment and Management'. Arboriculture Association. Stonehouse (UK).

Mattheck, DR. and Breloer, H. 1994. 'Field Guide for Visual Tree Assessment' Arboricultural Journal, Vol 18 pp 1-23.

Mattheck, DR. Claus R., Breloer, Helge (1995) 'The Body Language of Trees-A handbook for Failure Analysis', The Stationary Office, London. England.

Mattheck, DR. 2007. 'Updated Field Guide for Visual Tree Assessment'. Karlsruhe: Forschungszentrum Karlsruhe.

IACA 2010. IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturalists, Australia, www.iaca.org.au.

Robinson L, 2003. 'Field Guide to the Native Plants of Sydney', 3rd ed, Kangaroo Press, Kenthurst NSW.

Safe Work Australia (2016), Guide for Managing Risks of Tree Trimming and Removal Work.

Safe Work NSW (1998), Code of Practice for the Amenity Tree Industry.

Standards Australia 2007. Australian Standard: Pruning of amenity trees, AS 4373 (2007), Standards Australia, Sydney.

Standards Australia 2009. Australian Standard: Protection of trees on development sites, AS 4970 (2009), Standards Australia, Sydney.

Standards Australia 2003 Australian Standard: Soils for Landscaping and Garden Use, AS 4419 (2003), Standards Australia, Sydney.

Standards Australia 2003, Compost, Soil Conditioners and Mulches, AS 4454 (2003), Standards Australia, Sydney.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Nutri-Tech Solutions 'Life Force Gold Pellets'
https://www.nutri-tech.com.au/products/dry-mineral-fertilisers/life-force-gold

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https://www.nutri-tech.com.au/products/liquid-fertilisers/nslpgp/nutri-tech-black-gold

9 DISCLAIMER

9.1 Limitations on the use of this report

This report should be utilized in its entirety only. Any written or verbal submission, report or presentation that includes statements taken from findings, discussions, conclusions, or recommendations made in tis report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report, or presentation.

This Assessment report was undertaken by an Arborist with AQF level V (Diploma of Arboriculture) qualification Mathew Phillips is a registered Advanced user of the Quantified Tree Risk Assessment ® (QTRA) methodology. Only registered licence holders having received training and regular updates from Quantified Tree Risk Assessment Limited are permitted to use the QTRA system.

It is important to note that the QTRA risk assessment does Not evaluate risk exposure during unexpected, unusual, unpredictable, severe, or unseasonal weather, weather at the extremes of the historical distribution. The risk assessment provided is valid for 12 months only.

This assessment was based on a comprehensive site inspection, observations made at the time of the inspection and information provided by the client and their employees. All conclusions reached, or tree works recommended, do not imply that the tree will withstand adverse natural conditions such as environmental influences, soil failure and erosion, severe storms, works carried out or near it, land development and mechanical impact, miss-management or maintenance or changes in the growing environment, may impact the validity of the conclusions.

All care has been taken to obtain all information from reliable sources. All data collected has been verified insofar as practically possible: however, the author can neither guarantee nor be responsible for the accuracy of information provided by others. Information contained herein, covers only those trees that were surveyed, examined, and scheduled and reflects the condition of those trees at the time of inspection.

This report is Not a warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future, but a professional opinion of the status and condition of the tree. Whilst all care has been taken to prepare this report, the author takes no responsibility for the continued vitality of the tree mentioned or for any damage that it may cause in the future.

If you have any questions regarding this report or require any further information, please contact me on the details below.

Regards,