Croydon Station Upgrade

Review of Environmental Factors

SEPTEMBER 2015

NSW GOVERNMENT | Transport for NSW

Croydon Station Easy Access Upgrade Review of Environmental Factors

Transport Access Program
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Contents

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Figures

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Abbreviations

Term	Meaning
AEP	Annual Exceedance Probability
AHIMS	Aboriginal Heritage Information Management System
ASA	Asset Standards Authority (refer to Definitions)
CCTV	Closed Circuit TV
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997*
CNVMP	Construction Noise and Vibration Management Plan
CPTED	Crime Prevention Through Environmental Design
CTMP	Construction Traffic Management Plan
DBH	Diameter Breast Height
DDA	*Disability Discrimination Act 1992* (Commonwealth)
DSAPT	*Disability Standards for Accessible Public Transport (2002)*
ECM	Environmental Controls Map
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development (refer to Definitions)
ETS	Electronic Ticketing System
FM Act	*Fisheries Management Act 1994*
Heritage Act	*Heritage Act 1977*
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009).
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007*

Term	Meaning
LEP	Local Environmental Plan
LGA	Local Government Area
LoS	Level of Service
NES	National Environmental Significance
Noxious Weeds Act	*Noxious Weeds Act 1993*
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	NSW Office of the Environment and Heritage
PA system	Public Address system
PM	Photomontage
POEO Act	*Protection of the Environment Operations Act 1997*
PSNC	Proposal Specific Noise Criteria
RailCorp	Rail Corporation of NSW
RBL	Rating Background Level
REF	Review of Environmental Factors (this document)
Roads Act	*Roads Act 1993*
Roads and Maritime	NSW Roads and Maritime Services (formerly Roads and Traffic Authority)
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
TCP	Traffic Control Plan
TfNSW	Transport for NSW
TPZ	Tree Protection Zone
TSC Act	*Threatened Species Conservation Act 1995*
UDLP	Urban Design and Landscaping Plan
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*

Definitions

Term	Meaning
Annual Exceedance Probability	The Annual Exceedance Probability is the chance or probability of a natural hazard event (usually a rainfall or flooding event) occurring annually and is usually expressed as a percentage. For example, a 2% AEP rainfall event has a 2% chance of occurring in a year, so once in every 50 years.
Asset Standards Authority	The ASA is an independent body within TfNSW, responsible for engineering governance, assurance of design safety, and ensuring the integrity of transport and infrastructure assets. Design Authority functions formerly performed by RailCorp are now exercised by ASA.
Concept Design	The Concept Design is the preliminary design presented in the REF, which would be refined by the Contractor (should the Proposal proceed) to a design suitable for construction (subject to TfNSW acceptance). TfNSW contracts a single entity (the Contractor) to further develop the design to a level suitable for construction. The Contractor therefore becomes responsible for all work on the project.
Design and Construct Contract	A method to deliver a project in which the design and construction services are contracted by a single entity known as the Contractor. The Contractor completes the project by refining the Concept Design presented in the REF (subject to TfNSW acceptance) to be suitable for construction. The Contractor is therefore responsible for all work on the project, including both design and construction.
Disability Standards for Accessible Public Transport	The Commonwealth *Disability Standards for Accessible Public Transport 2002* ("Transport Standards") (as amended) are a set of legally enforceable standards, authorised under the Commonwealth *Disability Discrimination Act 1992* (DDA) for the purpose of removing discrimination 'as far as possible' against people with disabilities. The Transport Standards cover premises, infrastructure and conveyances, and apply to public transport operators and premises providers.
Ecologically Sustainable Development	As defined by clause 7(4) Schedule 2 of the EP&A Regulation. Development that uses, conserves and enhances the resources of the community so that ecological processes on which life depends are maintained, and the total quality of life, now and in the future, can be increased.
Feasible	A work practice or abatement measure is feasible if it is capable of being put into practice or of being engineered and is practical to build given project constraints such as safety and maintenance requirements.
Interchange	Transport interchange refers to the area/s where passengers transit between vehicles or between transport modes. It includes the pedestrian pathways and cycle facilities in and around an interchange.
Noise sensitive receiver	In addition to residential dwellings, noise sensitive receivers include, but are not limited to, hotels, entertainment venues, pre-schools and day care facilities, educational institutions (e.g. schools, TAFE colleges), health care facilities (e.g. nursing homes, hospitals), recording studios and places of worship/religious facilities (e.g. churches).

Term	Meaning
NSW Trains	From 1 July 2013, NSW Trains became the new rail provider of services for regional rail customers.
Opal card	The integrated ticketing smartcard being introduced by TfNSW, as part of the Electronic Ticketing System.
Proponent	A person or body proposing to carry out an activity under Part 5 of the EP&A Act - in this instance, TfNSW.
Rail possession	Possession is the term used by railway building/maintenance contractors to indicate that they have taken possession of the track (usually a block of track) for a specified period, so that no trains operate for a specified time. This is necessary to ensure the safety of workers and rail users.
Reasonable	Selecting reasonable measures from those that are feasible involves making a judgment to determine whether the overall benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the measure.
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
Sydney Trains	From 1 July 2013, Sydney Trains replaced CityRail as the provider of metropolitan train services for Sydney.
Tactiles	Tactile tiles or Tactile Ground Surface Indicators (TGSIs) are textured ground surface indicators to assist pedestrians who are blind or visually impaired. They are found on many footpaths, stairs and train station platforms.
The Proposal	The construction and operation of the Croydon Station Easy Access Upgrade.
Vegetation Offset Guide	The TfNSW guide that applies where there is vegetation clearing proposed, and where the impact of the proposed clearing is not deemed 'significant' for the purposes of section 111 of the EP&A Act. The Guide provides for planting of a minimum of eight trees for each large tree with a diameter at breast height (DBH) of more than 60 cm, four trees where the DBH is 15-60 cm, or two trees where DBH is less than 15 cm.

Executive summary

Overview

Transport for NSW (TfNSW) is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the Croydon Station Easy Access Upgrade (the Proposal).

The Proposal is part of the Transport Access Program which is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

This Review of Environmental Factors (REF) has been prepared to assess the environmental impacts 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 key features of the Proposal are summarised as follows:

- replacement of the existing station footbridge with a new raised and wider pedestrian bridge that would extend north to a new station entrance at Hennessy Street
- installation of new stairs to each platform and three lifts to provide access to the station platforms
- new canopies installed at both station entrances and along the new pedestrian bridge, stairs, lift landings and platforms
- widening of a section of the Paisley Road footpath and upgrade of the Paisley Road/Meta Street station entry plaza
- provision of two accessible parking spaces and up to three kiss and ride spaces in Paisley Road
- installation of new undercover bicycle racks installed on both sides of the station
- new station operations building at concourse level of the Paisley Road station entrance with new Family Accessible Toilet
- ancillary works including platform resurfacing/re-grading, services diversion and/or relocation, station power supply upgrade (including new substation), minor drainage works, adjustments to lighting, new ticketing facilities including additional Opal card readers, modifications to station communication and security systems with new or relocated infrastructure (including CCTV cameras and Passenger Information Displays) and wayfinding signage.

Subject to approval, construction is expected to commence in late 2015 and take approximately two years to complete.

A detailed description of the Proposal is provided in Chapter 3 of this REF.

Need for the Proposal

Improving transport customer experience is the focus of the NSW Government transport initiatives. Transport interchanges, train stations and commuter car parks are important gateways to the transport system and as such play a critical role in shaping the customer experience and perception of public transport.

The upgrades are designed to drive a stronger customer experience outcome, to deliver improved travel to and between modes, encourage greater public transport use and better integrate interchanges with the role and function of town centres. The Proposal would also assist in responding to forecasted growth in the region and as such would support growth in commercial and residential development.

The Proposal fulfils the Transport Access Program objectives and would provide:

- improved accessibility for customers at Croydon Station by providing an accessible route to station platforms through the provision of accessible parking, upgraded footpaths, a new pedestrian bridge and lifts
- improved connections to the surrounding pedestrian networks through the new pedestrian bridge that would provide an alternate access route across the railway and connect to Hennessy Street, along with a new wider station entrance at Paisley Road to improve passenger circulation and to support growth in patronage
- improved customer amenity and facilities at the station with canopies for weather protection, a new Customer Information Window and Family Accessible Toilet at concourse level, Passenger Information Displays and wayfinding signage
- improved transport interchange facilities with a new formalised kiss and ride area in Paisley Road and additional undercover bicycle parking facilities on both sides of the station.

The Proposal is also consistent with planning strategies in NSW, including *NSW 2021 – Making NSW Number One* (Department of Premier and Cabinet, 2011) and the *NSW Long Term Transport Master Plan* (TfNSW, 2012a).The Proposal would also ensure that Croydon Station would meet legislative requirements under the *Disability Standards for Accessible Public Transport 2002* (DSAPT).

Design options considered

Options for improving the access to, and amenity of, Croydon Station were developed following a succession of workshops between TfNSW, relevant stakeholders and the project design team.

Three concept design options were initially developed to address accessibility and customer experience needs and other design principles, while a fourth option was added at a later stage during the process. Improvements which were common to all options included new accessible parking and kiss and ride spaces, upgraded footpaths to the station, additional bicycle parking facilities, new ticketing facilities, platform works and ancillary activities like power supply upgrade, wayfinding signage, adjustment to lighting and CCTV cameras. The key differences focused on an alternate station entrance and platform access arrangements and are summarised below:

- Option 1 proposed the retention of the existing footbridge, refurbishment of existing stairs (along with new canopies) and new lifts, a new station operations building at concourse level, and a new widened station entry at Paisley Road
- Option 2 proposed the replacement of the existing footbridge with a new wider and longer pedestrian bridge that would also be raised to create level access from both sides of the station and Meta Street along with new canopies and new lifts. This option also proposed new stairs and a new station operations building at concourse level
- Option 2b was similar to Option 2 except that the new pedestrian bridge would be located further to the east
- Option 3 proposed the replacement of the existing footbridge with a new, longer pedestrian bridge raised to street level and connected to the Meta Street road bridge to create a single consolidated bridge, which would accommodate one entrance from the south side (from Meta Street/Paisley Road), and a new northern station entrance along with new canopies and new lifts. This option also proposed new stairs and a new station operations building at concourse level.

Option 2 was selected as the preferred option to progress to the next phase of design and planning, as it provides a new station entrance at Hennessy Street that would provide a safer and more convenient entrance/exit addressing major pedestrian desire lines between the station and the school. Option 2 would also relieve congestion on the footpath of the road bridge and the station entrance off Meta Street by providing an alternate route for pedestrians travelling to or from the north. More information on the options assessment and justification for the preferred option is provided in Section 2.3 and Section 2.4.

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 TfNSW, which do not require development consent under the EP&A Act.

The *State Environmental Planning Policy (Infrastructure) 2007* (the Infrastructure SEPP) is the primary environmental planning instrument relevant to the proposed development, and is the key environmental planning instrument which determines that this Proposal is permissible without consent and therefore is to be assessed under Part 5 of the EP&A Act.

Clause 79 of the Infrastructure SEPP allows for the development of 'rail infrastructure facilities' by or on behalf of a public authority without consent on any land. Clause 78 defines 'rail infrastructure facilities' as including elements such as 'railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms', 'public amenities for commuters' and 'associated public transport facilities for railway stations'.

As TfNSW is a public authority and the proposed activity falls within the definition of rail infrastructure facilities under the Infrastructure SEPP, the Proposal is permissible without consent. Consequently the environmental impacts of the Proposal have been assessed by TfNSW under Part 5 of the EP&A Act.

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 section 111 of the EP&A Act, TfNSW, 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.

Chapter 6 of this REF presents the environmental impact assessment for the Croydon Station Easy Access Upgrade, in accordance with these requirements.

Community and stakeholder consultation

Under the Infrastructure SEPP, consultation is required with local councils or public authorities in certain circumstances, including where Council-managed infrastructure is affected. Consultation has been undertaken with Burwood Council, Ashfield Council, Sydney Trains and the Heritage Division of the Office of Environment and Heritage (OEH) during the development of design options and the preferred option. Consultation with these stakeholders would continue through the detailed design and construction of the Proposal.

TfNSW is also proposing to undertake the following consultation for the Proposal:

- direct notification to community stakeholders
- public display of the REF.

Community consultation activities for the Proposal would be undertaken during the public display period of this REF. The REF would be displayed for a period of approximately four weeks. Further information about these specific activities is included in Section 4.5 of this REF.

During this period, the REF would be available for viewing at Burwood Council, Ashfield Council, Burwood Library, Ashfield Library and the TfNSW Community Information Centre, at 388 George Street, Sydney. The REF would also be available to download from the TfNSW website[1] and a Project Infoline (1800 684 490) would be available for members of the public to make enquiries.

TfNSW would review and assess all feedback received during the public display period, prior to determining whether or not to proceed with the Proposal.

Should the Proposal proceed to construction, the community would be kept informed throughout the duration of the construction period. Figure 1 presents an overview of the consultation and planning process and the current status of the Proposal.

[1] http://www.transport.nsw.gov.au/projects

Figure 1 Planning approval and consultation process for the Proposal

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:

- temporary changes during construction to parking and vehicle/pedestrian movements along Paisley Road, Meta Street and Hennessy Street including alternative access to the station further east from Paisley Road
- temporary noise and vibration impacts during construction
- removal of approximately three short term parking spaces on Paisley Road to allow for new accessible parking and up to three long term parking spaces for the new kiss and ride
- removal of trees/vegetation that would require planting offsets
- impacts to heritage fabric through the removal of the existing footbridge
- introduction of new elements such as the new station operations building, pedestrian bridge, canopies, lifts, and stairs into the visual environment.

Further information regarding these impacts is provided in Chapter 6 of the REF.

Conclusion

This REF has been prepared having regard to sections 111 and 112 of the EP&A Act, and clause 228 of the EP&A Regulation, to ensure that TfNSW takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The detailed design of the Proposal would also be designed in accordance with the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a) taking into account the principles of ecologically sustainable development (ESD).

Should the Proposal proceed, any potential associated adverse impacts would be appropriately managed in accordance with the mitigation measures outlined in this REF, and the Conditions of Approval imposed in the Determination Report. 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 impacts and proposed mitigation measures outlined in this REF, the Proposal is unlikely to significantly affect the environment including critical habitat or threatened species, populations, ecological communities or their habitats.

1 Introduction

Transport for NSW (TfNSW) was established in 2011 as the lead agency for integrated delivery of public transport services across all modes of transport in NSW. TfNSW is the proponent for the Croydon Station Easy Access Upgrade (the Proposal), to be delivered by the Infrastructure and Services Division.

1.1 Overview of the Proposal

1.1.1 The need for the Proposal

The NSW Government is committed to facilitating and encouraging use of public transport, such as trains, by upgrading stations to make them more accessible, and improving interchanges around stations with other modes of transport such as bicycles and cars.

Croydon Station and the interchange area do not currently meet key requirements of the *Disability Standards for Accessible Public Transport 2002* (DSAPT) or the Commonwealth *Disability Discrimination Act 1992* (DDA). Currently there is no ramp or lift access to station platforms and there are non-compliant paths of travel from the surrounding footpath and roads. In addition, the station entrance is narrow, and there is no weather protection over the existing footbridge and stairs.

The Croydon Station Easy Access Upgrade is required to provide safe and equitable access to the station and across the railway to the surrounding pedestrian network and would also improve customer facilities and amenity. The improvements would in turn assist in supporting the growth in public transport use and would provide an improved customer experience for existing and future users of the station.

The expected increase in customers has been taken into consideration during the design development. The 2014 barrier counts indicated a daily patronage of 4,750 trips which is expected to increase by approximately 27 per cent to 6,055 in 2036. The Proposal has been designed to cater for a minimum daily patronage forecast of 6,963 (which is the 2036 daily patronage + 15 per cent).

1.1.2 Key features of the Proposal

The key features of the Proposal are summarised as follows:

- replacement of the existing station footbridge with a new raised and wider pedestrian bridge that would extend north to a new station entrance at Hennessy Street
- installation of new stairs to each platform and three lifts to provide access to the station platforms
- new canopies installed at both station entrances and along the new pedestrian bridge, stairs, lift landings and platforms
- widening of a section of the Paisley Road footpath and upgrade of the Paisley Road/Meta Street station entry plaza
- provision of two accessible parking spaces and up to three kiss and ride spaces in Paisley Road
- installation of new undercover bicycle racks installed on both sides of the station
- new station operations building at concourse level of the Paisley Road station entrance with new Family Accessible Toilet

- ancillary works including platform resurfacing/re-grading, services diversion and/or relocation, station power supply upgrade (including new substation), minor drainage works, adjustments to lighting, new ticketing facilities including additional Opal card readers, modifications to station communication and security systems with new infrastructure (including CCTV cameras and Passenger Information Displays) and wayfinding signage.

Subject to planning approval, construction is expected to commence in late 2015 and is anticipated to take approximately two years to complete.

A detailed description of the Proposal is provided in Chapter 3 of this Review of Environmental Factors (REF).

1.2 Location of the Proposal

The Proposal would involve upgrade works to Croydon Station which is located approximately nine kilometres west of Sydney's Central Station in the suburb of Croydon (refer Figure 2). The station straddles the Local Government Area (LGA) boundaries of Burwood and Ashfield Councils with the western portion of the station situated in the Burwood LGA and the eastern portion within the Ashfield LGA.

Croydon Station is serviced by the T2 Airport, Inner West and South Line which is operated by Sydney Trains, while the T1 North Shore, Northern and Western Line services pass through the station without stopping. Croydon Station is the 107th busiest station on the Sydney Trains network with an average patronage of 4,750 trips per weekday (NSW Bureau of Transport Statistics barrier counts, 2014).

The Proposal would involve works to Croydon Station which is located on land owned by RailCorp and operated and maintained by Sydney Trains. Works would also be undertaken along the footpath and road reserves of Hennessy Street (in the area owned and managed by Burwood Council) and Paisley Road (in areas owned and managed by Burwood Council and Ashfield Council). Refer to Figure 5 (page 40) for a map of the proposed work areas.

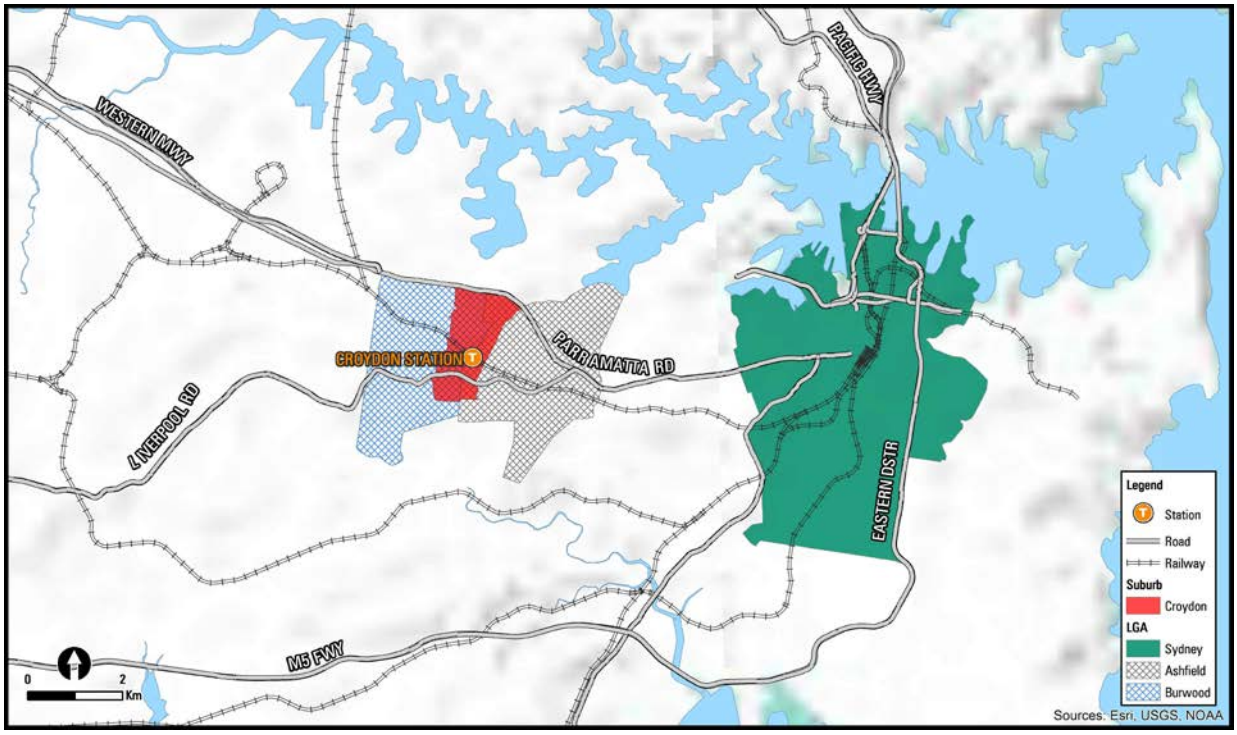


Figure 2 Regional context

1.3 Existing infrastructure and land uses

A mix of shops, small businesses and café/restaurants surround the station on Paisley Road, The Strand and Hennessy Street, including an outdoor café directly opposite the Paisley Road entrance. The Presbyterian Ladies College is located north of the station off Meta Street and Croydon Public School is located north of the college, while the Montessori Academy (child care for 2-6 year olds) and private residences are located immediately south and south-west of the station along Paisley Road and other surrounding streets (refer Figure 3).

Access to the station is via a level entrance on Paisley Road, or down stairs from the Meta Street road bridge, with no public access from the northern side on Hennessy Street (pedestrians from the north must travel along a narrow footpath on the road bridge to access the station). Customers then pass through a station building that contains a booking office with ticket window, ticket machine, unisex toilet (and staff facilities) and a retail concession (now closed). From here, customers then access an uncovered footbridge and stairs that extend down to one platform (Platform 5) and two island platforms (Platforms 3/4 and 1/2). There is also a disused side stairway at the most northern extent of the station, immediately adjacent to Hennessy Street, which is now inaccessible and dilapidated, but was previously accessed when the footbridge once extended all the way across the railway.

There are six tracks passing through the station with no current scheduled train services stopping at Platforms 1, 2 and 3 each day. The tracks include:

- the Up Main and Down Main that extend along the northern extent of the station with only the Down Main accessible from Platform 1
- the Up Suburban and Down Suburban that extend through the middle of the station accessible from Platform 2 and Platform 3 respectively
- the Up Local and Down Local that extend along the southern extent of the station accessible from Platform 4 and Platform 5 respectively.

Throughout the day, there is a minimum of four trains departing Croydon Station in both directions every hour with the exception of an extra city bound service per hour between 3pm and 5pm. City-bound trains depart from Platform 4 while trains from Platform 5 service the west.

On each platform there is a building with awnings that provides weather protection. In addition there is a waiting room on Platform 5, a station building on Platform 3/4 which comprises accessible toilet, male and female toilets and communications equipment room, and a waiting room on Platform 1/2.

Existing transport interchange arrangements available at Croydon Station include:

- bicycle racks (uncovered) for nine bikes located near the Paisley Road entrance
- parking along nearby streets which is mostly time-restricted on roads closest to the station with the exception of unrestricted parking in Paisley Road that is typically utilised by rail customers
- a time-restricted council car park located to the west which comprises 26 parking spaces
- formalised kiss and ride on Hennessy Street (informal kiss and ride has been observed on Paisley Road)
- there are no daytime bus stations located within 500 metres of the station, however there is one inbound and one outbound nightrider bus stop, immediately south-west of the station on The Strand and one school bus stop is located outside the Presbyterian Ladies College on Young Street

- there are no formal taxi stands in the station precinct.

Photographs of the existing station are provided in Images 1 to 4.

Image 1 View from intersection of Meta Street and Hennessy Street looking south-east towards Croydon Station (note there is no existing direct access to the station from this side)

Image 2 View from Paisley Road looking south- east (in area where new accessible parking and sheltered bicycle racks would be established)

Image 3 View from Platform 5 looking north towards existing footbridge and stairs (to be replaced)

Image 4 View of Meta Street entrance looking south- east down the stairs into the existing booking office (to be replaced with new street-level station entrance)

Figure 3 Site locality map

1.4 Purpose of this Review of Environmental Factors

This REF has been prepared by TfNSW to assess the potential impacts of the Croydon Station Easy Access Upgrade. For the purposes of these works, TfNSW is the proponent and the determining authority under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to describe the Proposal, to assess the likely impacts of the Proposal having regard to the provisions of section 111 of the EP&A Act, and to identify mitigation measures to reduce the likely impacts of the Proposal. This REF has been prepared in accordance with clause 228 of the Environment Planning and Assessment Regulation 2000 (the EP&A Regulation).

This assessment has also considered the relevant provisions of other relevant environmental legislation, including the *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act) and the *Roads Act 1993* (Roads Act).

Having regard to the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), this REF considers the potential for the Proposal to have a significant impact on matters of National Environmental Significance (NES) or Commonwealth land, and the need to make a referral to the Commonwealth Department of the Environment for any necessary approvals under the EPBC Act. Refer to Chapter 4 for more information on statutory considerations.

2 Need for the Proposal

Chapter 2 discusses the need and objectives of the Proposal, having regard to the objectives of the Transport Access Program and the specific objectives of the Proposal. This chapter also provides a summary of the options that have been considered during development of the Proposal and why the preferred option has been chosen.

2.1 Strategic justification

2.1.1 Overview

Improving transport customer experience is the focus of the NSW Government's transport initiatives. Transport interchanges and train stations are the important gateways to the transport system and as such play a critical role in shaping the customer's experience and perception of public transport.

The Croydon Station Easy Access Upgrade, the subject of this REF, forms part of the Transport Access Program. This program is designed to drive a stronger customer experience outcome to deliver seamless travel to and between modes, encourage greater public transport use and better integrate station interchanges with the role and function of town centres within the metropolitan area and developing urban centres in regional areas of NSW.

The Proposal is consistent with the NSW Government's commitment to deliver an efficient and effective transport system around Sydney and NSW as detailed in *NSW 2021 – A Plan to Make NSW Number One* (Department of Premier and Cabinet, 2011).

NSW 2021 is the NSW Government's ten year plan to guide budget and decision making in NSW. *NSW 2021* includes the following goals, targets and priority actions relevant to the Proposal:

- reduce travel times
- minimise public transport waiting times for customers
- improve co-ordination and integration between transport modes
- grow patronage on public transport
- improve public transport reliability
- improve customer experience with transport services.

The NSW Government has developed a *Long Term Transport Master Plan* (TfNSW, 2012a). This plan provides a comprehensive strategy for all modes of transport across NSW over the next 20 years, while also delivering on current commitments.

Data forecasts indicate that there would be significant growth in population and employment up to 2036 in the area within the Croydon Station catchment and the proposed upgrade would help to accommodate this growth and changing travel patterns.

The *Disability Action Plan 2012-2017* (TfNSW, 2012b) was developed by TfNSW, in consultation with the Accessible Transport Advisory Committee, which is made up of representative from peak disability and ageing organisations within NSW. The Plan discusses the challenges, the achievements to date, the considerable undertaking that is required to complete the program and provide a solid and practical foundation for future progress over the next five years. The Proposal has been developed in consideration of the objectives outlined in this Plan.

Public transport is viewed as critical to urban productivity, expanding employment opportunities by connecting people to jobs, reducing congestion, and supporting delivery of urban renewal. Further details of the application of NSW Government policies and strategies are discussed in Section 4.5 of this REF.

2.1.2 Objectives of the Transport Access Program

The Transport Access Program is a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure. The program aims to provide:

- stations that are accessible to those with disabilities, the ageing and parents with prams
- modern buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers
- safety improvements including extra lighting, help points, fences and security measures for car parks and interchanges, including stations, bus stops and wharves
- signage improvements so customers can more easily use public transport and transfer between modes at interchanges
- other improvements and maintenance such as painting, new fencing and roof replacements.

2.1.3 Objectives of the Proposal

The specific objectives of the Croydon Station Easy Access Upgrade are to:

- provide a station that is accessible to those with a disability, the ageing and parents/carers with prams
- improve customer safety and enhance pedestrian network links by creating more open entrances and wider paths of travel, along with a new station entrance from Hennessy Street
- improve customer experience and amenity through improved facilities including canopies for weather protection, a new Customer Information Window and Family Accessible Toilet at concourse level, Passenger Information Displays and new wayfinding in and around the station
- improve the transport interchange facilities with new accessible parking, kiss and ride and additional bicycle parking facilities.

2.2 Design development

Cardno Pty Ltd was engaged by TfNSW to develop a concept design for an easy access upgrade at Croydon that would improve accessibility in and around the station, and meet key architectural, engineering and urban design objectives. The design development also accommodated the forecast Sydney Trains patronage growth (which is the estimated 2036 daily customer patronage + 15 per cent) and changing travel patterns.

An assessment of Croydon Station and surrounds was undertaken to identify key deficiencies and opportunities with regards to accessibility and customer experience. The findings of the assessment were presented in Cardno's *Croydon Station Precinct Accessibility Upgrade – Concept Design Report* (Cardno, 2014) and are summarised below:

- lack of an accessible path of travel from public domain footpaths to the station entrance including the narrow footpath between Paisley Road and The Strand; and the stairs leading down from the Meta Street road bridge
- no direct access to the station from Hennessy Street – customers travelling from the north must cross a narrow footpath along the Meta Street road bridge to access the existing station entrance on the south side (this also creates congestion at the entrance and pedestrian conflict between school children exiting the station and commuters entering the station during the morning peak)
- lack of an accessible path of travel from the station entrance to platforms – access is via stairs and there are no lifts/ramps to the platforms
- no weather protection along the existing footbridge and stairs
- lack of accessible facilities at the station – this includes a lack of accessible ticketing facilities and in addition there is a non-accessible unisex toilet located in the booking office, while an existing family accessible toilet is located on Platform 3/4 (but is not currently accessible for those in wheelchairs as access is via stairs only)
- no accessible parking near the station
- no formal kiss and ride on the southern side of the station
- opportunity to install additional bicycle parking facilities on both sides of the station
- a number of Crime Prevention Through Environmental Design (CPTED) issues were also identified (e.g. station entrance is obscured from the view of most customers).

The needs and opportunities for Croydon were then considered in the development of options for the concept design (refer to Section 2.3).

2.3 Alternative options considered

Options for improving the access to, and amenity of, Croydon Station were developed following a succession of workshops between TfNSW, relevant stakeholders (including Sydney Trains, Burwood Council, Ashfield Council and the Heritage Division) and the project design team.

Three concept design options were initially developed to address accessibility and customer experience needs and other design principles, while a fourth option was added at a later stage during the process. Improvements which were common to all options included new accessible parking and kiss and ride spaces, upgraded footpaths to the station, additional bicycle parking facilities, new ticketing facilities, platform works and ancillary activities like power supply upgrade, wayfinding signage, adjustment to lighting and CCTV cameras. The key differences focused on an alternate station entrance and platform access arrangements and are summarised below:

- Option 1 proposed the retention of the existing footbridge, refurbishment of existing stairs (along with new canopies) and new lifts, a new station operations building at concourse level, and a new widened station entry at Paisley Road
- Option 2 proposed the replacement of the existing footbridge with a new wider and longer pedestrian bridge that would also be raised to create level access from both sides of the station and Meta Street along with new canopies and new lifts. This option also proposed new stairs and a new station operations building at concourse level
- Option 2b was similar to Option 2 except that the new pedestrian bridge would be located further to the east

- Option 3 proposed the replacement of the existing footbridge with a new, longer pedestrian bridge raised to street level and connected to the Meta Street road bridge to create a single consolidated bridge which would accommodate one entrance from the south side (from Meta Street) and a new northern station entrance along with new canopies and new lifts. This option also proposed new stairs and a new station operations building at concourse level.

2.3.1 The 'do-nothing' option

Under a 'do-nothing' option, existing access to the station and other transport modes would remain the same and there would be no changes to the way the station and interchange areas currently operate.

The NSW Government has identified the need for improving the accessibility of transport interchanges, train stations and commuter car parks across NSW as a priority under the Transport Access Program.

The 'do nothing' option was not considered a feasible alternative as it is inconsistent with NSW Government objectives and would not help encourage the use of public transport and would not meet the immediate needs of the Croydon community.

2.3.2 Assessment of identified options

The four options were presented to an internal stakeholder workshop and assessed as part of a multi-criteria analysis that included consideration of factors such as customer experience, accessibility, engineering constraints, modal integration and cost to select a preferred option to be taken forward for refinement and further development.

2.4 Justification for the preferred option

Option 1 was inferior to the other options as it did not allow for a new station entrance which would address safety and pedestrian congestion issues and would provide a positive customer experience. In addition, the existing footbridge is likely to require replacement within the design life of the Proposal and any subsequent replacement works would be difficult to undertake around the new lifts while maintaining customer access to/from the station.

Options 2, 2b and 3 all rated highly as they would create a new station entrance at Hennessy Street that would provide a safer and more convenient entrance/exit for school students and other rail customers addressing major pedestrian desire lines between the station and the nearby school. The new entrance and pedestrian bridge would also relieve congestion on the footpath of the road bridge and the station entrance off Meta Street by providing an alternate route for pedestrians travelling from the north. In addition, replacing the ageing footbridge would also ensure that the new pedestrian bridge would be structurally sound for the duration of the Proposal's design life.

Option 2 was selected as the preferred option as it represented best value for money while providing the benefit of creating a new station entrance at Hennessy Street. Option 3 would incur high construction costs associated with addressing the numerous regulatory and engineering constraints required to connect to the Meta Street road bridge. Option 2b was discounted due to the longer travel distances for pedestrians during operation.

A description of the Proposal (Option 2 including subsequent design refinements) is presented in Chapter 3.

3 Description of the Proposal

Chapter 3 describes the Proposal and summarises key design parameters, construction method, and associated infrastructure and activities. The description of the Proposal is based on the concept design and is subject to further development in the detailed design phase.

3.1 The Proposal

As described in Section 1.1, the Proposal involves an easy access upgrade of Croydon Station as part of the Transport Access Program, which would improve accessibility and amenities for customers.

The Proposal would provide a number of improved features to provide an accessible station and improved interchange facilities. The Proposal would include the following key elements:

- replacement of the existing station footbridge with a new raised and wider pedestrian bridge that would extend north to a new station entrance at Hennessy Street
- installation of new stairs to each platform and three lifts to provide access to the station platforms
- new canopies installed at both station entrances and along the new pedestrian bridge, stairs, lift landings and platforms
- widening of a section of the Paisley Road footpath and upgrade of the Paisley Road/Meta Street station entry plaza
- provision of two accessible parking spaces and up to three kiss and ride spaces in Paisley Road
- installation of new undercover bicycle racks installed on both sides of the station
- new station operations building at concourse level of the Paisley Road station entrance with new Family Accessible Toilet
- ancillary works including platform resurfacing/re-grading, services diversion and/or relocation, station power supply upgrade (including new substation), minor drainage works, adjustments to lighting, new ticketing facilities including additional Opal card readers, modifications to station communication and security systems with new infrastructure (including CCTV cameras and Passenger Information Displays) and wayfinding signage.

Figure 4 shows the general layout of key elements for the Proposal.

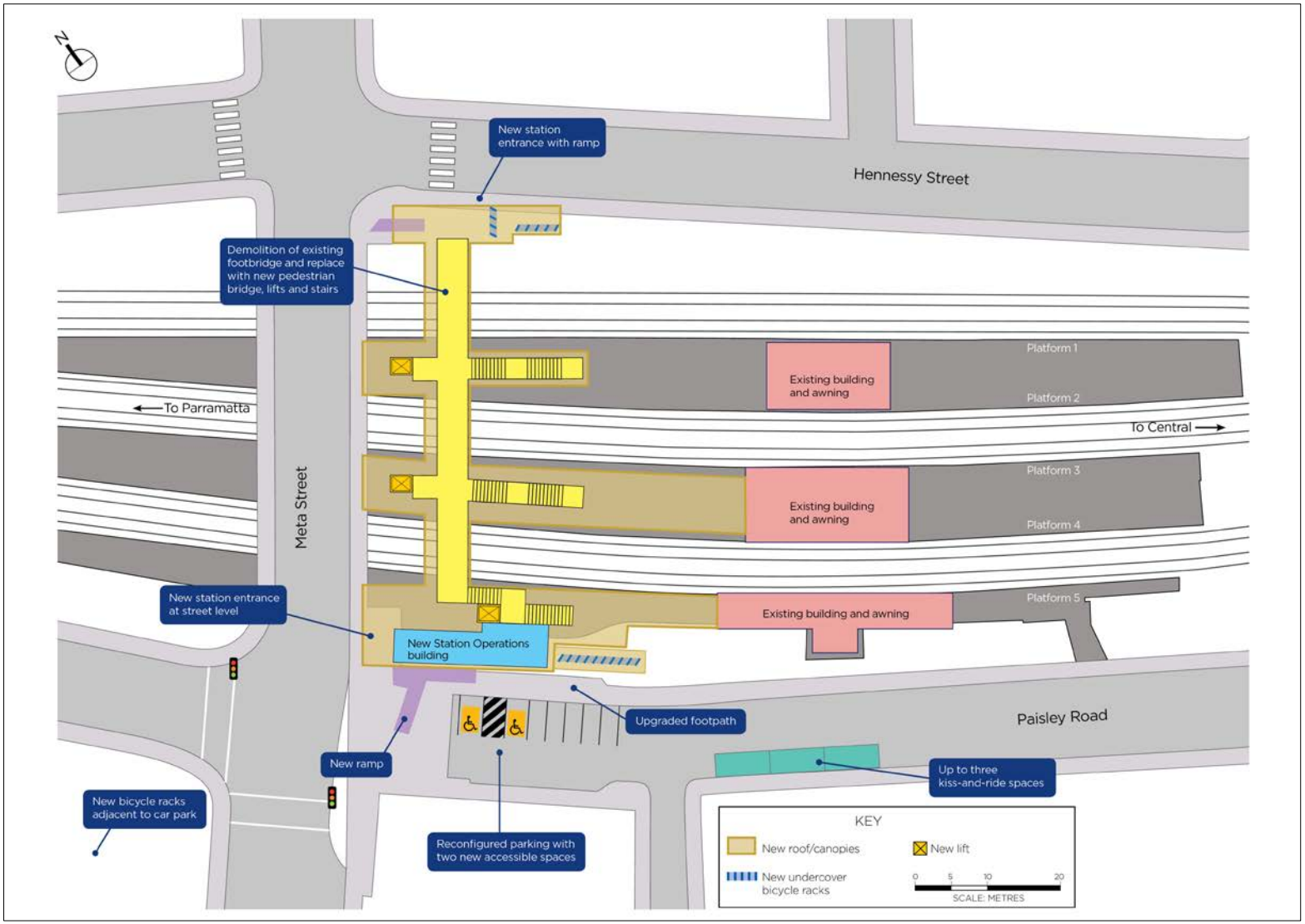


Figure 4 Plan view of the key elements of the Proposal

(Indicative only, subject to detailed design)

3.1.1 Design features

Station structures, building works and services provision

Details of the proposed works to take place at the station to improve accessibility and customer experience are provided below:

- temporary works (where required) during construction in order to maintain existing level of service such as installation of a temporary pedestrian bridge at the eastern end of the station platforms, a temporary booking office and ticketing facilities
- service relocation including relocating the existing overhead wiring attached to the existing footbridge to new supports and the undergrounding of a section of High Voltage electrical cables on the southern side of the station
- demolition of the existing footbridge (including concrete supports/trestles) and stairs, and construction of a new replacement pedestrian bridge and stairs to station platforms (with tactiles). The pedestrian bridge would be installed in approximately the same alignment and would also be wider, raised to street level and extended north to create a new station entrance at Hennessy Street
- construction and installation of three new lifts and associated landings and support structures to provide access from the pedestrian bridge to the station platforms
- new canopies for weather protection installed above both station entrances and along the new pedestrian bridge/stairs, lift landings and station platforms to connect to station buildings (for Platforms 3/4 and 5 only); anti-throw screens would also be installed on the pedestrian bridge/stairs
- construction of new station operations building at concourse level that would include a multi-purpose staff office and amenities (including ambulant toilet and meal room), a Customer Information Window and a Family Accessible Toilet for customers
- upgrade of the communications equipment room in the existing station building on Platform 3/4 (including demolition of internal wall)
- existing platforms would be re-graded to provide compliant crossfalls (i.e. transverse slope) of maximum 1 in 40 (where required)
- other platform modifications including resurfacing, new tactiles (where required) and relocation/replacement of seats etc. to ensure compliant accessible paths of travel
- station power supply upgrade works including a new substation installed in the southern part of the rail corridor in the vicinity of the existing substation (to be removed) and earthing/bonding provisions (specific requirements to be determined during detailed design)
- services adjustments including for drainage, lighting and communications systems (e.g. Passenger Information Displays, PA system and CCTV)
- adjustment to station ticketing facilities including new Opal card readers and ticketing machines at both station entrances
- adjustment to boundary fencing and landscaping works for areas affected by the works.

Interchange facilities

Details of the proposed works to take place at the station to improve accessibility and customer experience are provided below:

- new/upgraded accessible footpath along Paisley Road and wider station entry plaza with stairs and ramps
- modified stairs and footpath and new access ramp at Hennessy Street entrance
- additional bicycle parking facilities including:
    - sheltered bicycle parking for minimum 10 bicycles on the northern side of the station on Hennessy Street
    - sheltered bicycle parking for minimum 20 bicycles on the southern side of the station on Paisley Road
    - bicycle parking for 10 bicycles on The Strand adjacent to the car park
- reconfiguration of parking in Paisley Road to provide two accessible parking spaces in proximity to the station entrance
- up to three kiss and ride spaces on the southern side of Paisley Road east of the intersection with Paisley Lane
- new wayfinding signage and provision of other signage including statutory/regulatory signage.

Materials and finishes

Materials and finishes for the Proposal would be selected based on the criteria of durability, low maintenance and cost effectiveness, in accordance with heritage requirements, to minimise visual impacts, and to be aesthetically pleasing.

Availability and constructability are also important criteria to ensure that materials are readily available and the structure can be built with ease and efficiency. Materials are also selected based on their suitability to meet the design requirements.

The general design life of the pedestrian bridge structure would be 100 years with other components having various design life periods. Each of the upgraded or new station facilities would be constructed of a range of different materials, with a different palette for each architectural element. Subject to detailed design, the following is proposed:

- station operations building would comprise rendered masonry walls at lower levels and steel framed construction with tiled wall finish to upper concourse level
- new pedestrian bridge would comprise concrete base and steel frame. The external structure would include a steel frame with a combination of pre-finished aluminium panels, steel mesh, glazing, and louvers
- lifts would be constructed with a concrete base with steel columns and frame, with some glazing and ceramic tile cladding
- stairs would be precast concrete with painted structural steel framing and would be enclosed with steel frames with mesh infill panels
- roofs and canopies would comprise of painted steel framed structure with Colorbond roof sheeting. There would also be stainless steel gutters and downpipes to all new roofs and canopies.

The design would be submitted to TfNSW's Urban Design and Sustainability Review Panel at various stages for comment before being accepted by TfNSW. An Urban Design and Landscaping Plan (UDLP) would also be prepared by the Contractor and accepted by TfNSW.

3.1.2 Engineering constraints

There are a number of constraints which have influenced the development of the design of the proposed upgrade.

Existing structures: the placement and integrity of existing structures needed to be considered during the development of the design – these structures included the platforms, station buildings, and the Meta Street road bridge.

Sydney Trains requirements: modifications for existing structures and new structures within the rail corridor must be designed and constructed with consideration of train impact loads, structural clearances to the track, and safe working provisions.

Utilities: A Dial Before You Dig (DBYD) search and Sydney Trains services search have identified a number of utilities in the vicinity of the proposed works including:

- electrical services (aboveground and underground)
- telecommunication services (underground)
- gas
- stormwater
- water and sewer
- cables and conduits for Roads and Maritime traffic signals at nearby intersections
- rail utilities, including signalling cabling and overhead wiring.

Heritage: Croydon Station is listed on the State Heritage Register, RailCorp's Section 170 Heritage and Conservation Register and the heritage schedules of the *Burwood Local Environmental Plan 2012* and *Ashfield Local Environmental Plan 2013* – in particular the Proposal would include the replacement of the existing footbridge which is of heritage significance as it is one of the first in Sydney to use reinforced concrete for the deck, trestles and piers.

An investigation into the structural intactness of the footbridge and options for remedial repair/demolition was undertaken and included a site inspection and concrete testing. The investigation found that while demolition of the footbridge would result in loss of heritage fabric, the removal was the most appropriate option given the chemical condition of the concrete. The testing indicated that the concrete is no longer providing the alkaline environment required to protect the reinforcement from corrosion (Mott McDonald, 2014a/b). The findings of this assessment were supported in a peer review (Hyder, 2015).

Other station elements considered to be significant as part of the heritage listing include the station platforms and the three station buildings located on each and a palm tree on Platform 1/2. The existing booking office was relocated and rebuilt in 1994 and there are no original features incorporated as part of the booking office. The Meta Street road bridge also forms part of the heritage listing.

Other considerations:

- the station is located within a six metre deep rail cutting and station platforms are lower than street level. Natural ground levels around the station slope (by approximately 5.5 per cent) from a higher elevation to the west to a lower elevation to the east and this gradient, particularly on the northern side of the station, is a constraint to providing a compliant accessible path of travel
- preliminary geotechnical information which indicated weathered shale bedrock is present

- the existing configuration of the Paisley Road station entry plaza and booking office is constrained with congestion and circulation issues
- there is limited space immediately around the station to create accessible parking/kiss and ride and/or with an accessible path of travel along with the need to minimise the impact to existing parking
- Platform 1/2 is not used for normal scheduled passenger services and this arrangement is unlikely to change as part of future timetabling changes in 2018. This was a consideration during the development of the design for the canopies and given the infrequent use of Platform 1/2 it was decided there was an opportunity to minimise the potential visual/heritage impacts by providing canopies for discrete areas only to this platform (i.e. lift landing and stairs).

3.1.3 Design standards

The Proposal would be designed having regard to the following:

- *Disability Standards for Accessible Public Transport* (2002) (issued under the Commonwealth *Disability Discrimination Act 1992*)
- Building Code of Australia
- relevant Australian Standards
- Asset Standards Authority standards
- Sydney Trains standards
- *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a)
- *Guidelines for the Development of Public Transport Interchange Facilities* (Ministry of Transport, 2008)
- Crime Prevention Through Environmental Design (CPTED) principles
- Council Standards where relevant to streetscape works.

3.1.4 Sustainability in design

The development of the concept design for the Proposal has been undertaken in accordance with the project targets identified in TfNSW's Environmental Management System (EMS) and the *NSW Sustainable Design Guidelines - Version 3.0* (TfNSW, 2013a) which groups sustainability into seven themes:

- energy and greenhouse gases
- climate resilience
- materials and waste
- biodiversity and heritage
- water
- pollution control
- community benefit.

Within each theme, potential initiatives are prioritised into two categories of requirements:

- **compulsory** – the initiative is required to be implemented when applicable to the project as they refer to a corporate target, or are fundamental to the delivery of sustainable assets)

- **discretionary** – the initiative has benefits to be implemented, however may not be the most appropriate.

A shortlist of compulsory initiatives has been developed by TfNSW specifically for Transport Access Program projects, which includes the Croydon Station Easy Access Upgrade. These compulsory initiatives have been reviewed and incorporated into the concept design (unless otherwise justified) and documented in a Sustainability Checklist that was approved by TfNSW (a summary of the initiatives is provided in Appendix C). The Sustainability Checklist and the initiatives contained within would be reviewed again at the detailed design and construction phases, and submitted for approval by TfNSW.

3.2 Construction activities

3.2.1 Work methodology

Subject to approval, construction is expected to commence in late 2015 and take approximately two years to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Contractor in consultation with TfNSW.

The proposed construction activities for the Proposal are identified in Table 1. This staging is indicative and is based on the current preliminary design and may change once the detailed design methodology is finalised, and is also dependent on the Contractor's preferred methodology, program and sequencing of the work.

Table 1 Indicative construction staging for key activities

Stage	Activities
Site establishment and enabling works	• establishment of site compound (erect fencing, tree protection zones, site offices, amenities and plant/material storage areas etc.) • temporary booking office fitted with equipment and staff facilities at the eastern end of the station and accessed from Paisley Road • temporary station entrance and access path to maintain existing level of service from Paisley Road to allow public access to the station and platforms • removal of trees and vegetation • services relocation, including section of the High Voltage electrical cables that provide power to the station (adjacent to Paisley Road) • overhead wiring adjustment works
Temporary pedestrian bridge construction	• temporary pedestrian bridge and stairs, including foundations, steel supports, bridge installation, lighting, CCTV and Opal card readers

Stage	Activities
Pedestrian bridge, lift and stairs construction	• demolition of existing structures • construction of footings for pedestrian bridge columns/lift shafts • construction of bridge columns • construction of new pedestrian bridge spanning form Paisley Road to Hennessy Street • construction of retaining walls and stormwater drainage works • construction of lifts (shaft and lift base) • installation of lifts (fit out) • construction of stairs, canopies, balustrades and anti-throw screens
Platform/building works	• platform resurfacing and re-levelling/re-grading • construction of new staff operations building and amenities at concourse level (Paisley Road entrance) and required services • upgrade of communications equipment room in existing station building on Platform 3/4 (including demolition of internal wall) • installation of fixtures, lighting, PA system, CCTV cameras for affected areas
Interchange works	• reconfiguration of sections of Paisley Road for accessible parking spaces, car parking spaces, loading zone to accommodate existing capacity, kerb adjustments, accessible footpath, ramps, undercover bicycle racks and landscaping • reconfiguration of parking in Paisley Road, east of the intersection with Paisley Lane with up to three kiss and ride spaces • reconfiguration of sections of Hennessy Street footpath (i.e. the southern side between the back of the kerb and the RailCorp property boundary and the Burwood/Ashfield Council boundary) – including accessible footpath, ramps and undercover bicycle racks
Finalisation	• installation of new bicycle racks on both sides of the station • installation of wayfinding signage • electrical and power supply upgrade works • adjustment of all boundary fencing and pedestrian fencing, where required • upgrade or installation of new station services and systems • replanting and landscaping • mechanical fit out/electrical fit out and drainage works
Testing and commissioning	• various activities to test and commission power supply, lifts, lighting, new/modifications to station services, ticketing systems and communication and security systems
Decommissioning of temporary facilities and site demobilisation	• removal of temporary pedestrian bridge and booking office • removal of temporary site facilities including site sheds

3.2.2 Plant and equipment

The plant and equipment likely to be used during construction includes:

- trucks
- semi-trailers/low loaders
- chainsaw
- mulcher
- generator
- bobcat
- excavators
- demolition saw
- jackhammers
- grinder
- piling rigs
- concrete pump
- concrete trucks
- concrete vibrator
- under bore construction plant
- loader crane (hiab)
- 200-300 tonne crane
- manitou
- scissor lift
- elevated work platform
- franna crane
- asphalt placing plant & equipment
- wacker packers
- vibratory roller
- power float (for smoothing concrete)
- balloon wheel dump trucks
- hi rail trucks
- coring machine
- rattle gun/impact wrenches
- hand tools
- lighting towers.

3.2.3 Working hours

The majority of works required for the Proposal would be undertaken during standard (NSW) Environment Protection Authority (EPA) construction hours, which are as follows:

- 7.00 am to 6.00 pm Monday to Friday
- 8.00 am to 1.00 pm Saturdays
- no work on Sundays or public holidays.

Certain works may need to occur outside standard hours and would include night works and works during track possessions (which are scheduled closures that would occur regardless of the Proposal, when part of the rail network is temporarily closed and trains are not operating).

Out of hours works are required in some cases to minimise disruptions to customers, pedestrians, motorists and nearby sensitive receivers; and to ensure the safety of railway workers and operational assets. It is estimated that at least 14-18 track possessions would be required to facilitate activities including the following:

- detailed site survey, services investigations and geotechnical investigation works within and around the tracks
- installation of temporary demarcation fencing/hoardings etc. to allow works to be undertaken during non-possession periods
- placement of temporary pedestrian bridge and other temporary facilities on platform using cranes
- relocation of underground services to accommodate new/adjusted infrastructure
- demolition and construction of new replacement pedestrian bridge and construction of foundations for lift shafts

- installation of lift structural components, elevated landings and canopy components using cranes
- platform re-grading (if required) and installation of tactiles where plant or personnel are required to work near the platform edge
- testing and commissioning of station communications and security systems and equipment including augmentation of station CCTV, ticketing and passenger information systems
- testing and commissioning/cutover of new lifts and upgraded station power supply.

Out of hours works may also be scheduled outside possession periods. Approval from TfNSW would be required for any out of hours work and the affected community would be notified as outlined in TfNSW's *Construction Noise Strategy* (TfNSW, 2012c) (refer to Section 6.3 for further details).

3.2.4 Earthworks

The Proposal would require a small amount of earthworks. Excavations and earthworks would generally be required for the following:

- the foundations for the temporary pedestrian bridge to be located at the eastern end of the station platforms
- the foundations for the replacement pedestrian bridge and pits for the proposed lift shafts, which would require open cut excavation through the station platforms and excavation into soils/fill and sandstone rock up to a depth of approximately two metres
- subject to ground conditions, the foundations for the bridge column and lift shafts would likely require bored in situ piles
- the construction of upgraded footpath areas and entry plaza areas, and kerb realignment works
- other minor civil works including footings and foundations for structures, drainage/stormwater works (including retaining walls), and trenching activities for service adjustments and relocations.

Excavated material would be reused onsite where possible or disposed of in accordance with relevant legislative requirements.

3.2.5 Source and quantity of materials

The source and quantity of materials would be determined during the detailed design phase of the Proposal, and would consider the requirements of the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a). Materials would be sourced from local suppliers where practicable. Reuse of existing and recycled materials would be undertaken where practicable.

3.2.6 Traffic access and vehicle movements

Traffic and transport impacts associated with the Proposal are assessed in Section 6.1 of this REF. The potential traffic and access impacts expected during the construction of the Proposal include:

- impacts to pedestrians and rail customers:
  - longer walking distances as a result of the alternate entry further east on Paisley Road with access to station platforms via a temporary pedestrian bridge
  - potential higher levels of platform congestion arising from restricted access to certain areas of the platforms
  - higher road safety risk levels associated with construction vehicle-pedestrian interactions
- interruptions to the traffic flow on Paisley Road, The Strand, Meta Street and Hennessy Street
- temporary loss of parking on Paisley Road (potentially up to 27 (time and untimed) parking spaces to be affected, however, where possible the number of spaces to be affected would be minimised as much as practicable).

A detailed construction methodology and associated management plans (such as a Construction Environmental Management Plan (CEMP)) would be developed during the design phase of the Proposal to manage impacts.

3.2.7 Ancillary facilities

A temporary construction compound would be required to accommodate a site office, amenities, laydown and storage area for materials. A construction compound would likely be established in the road corridor of Paisley Road which is owned and managed by Burwood/Ashfield Councils (refer Figure 5). Impacts associated with utilising this area have been considered in the environmental impact assessment including requirements for rehabilitation.

3.2.8 Services adjustments

An upgraded electrical supply for the station is required to accommodate new infrastructure (e.g. new lifts) and it is proposed to install a new substation in the southern part of the rail corridor and would be in the vicinity of the existing substation off Paisley Road (to be removed).

The existing overhead wiring attached to the underside of the existing footbridge (which provides power for the trains) would need to be removed and supported by a new structure prior to the demolition of the footbridge.

High Voltage aboveground electrical cables (which provide the power supply to the station) are located on the southern side of the station and run partially above the existing booking office and embankment to connect to a power pole and substation in the rail corridor adjacent to Platform 5. This overhead wiring would need to be undergrounded to allow for construction of the Proposal. Rail services within the rail corridor may also need to be located to avoid being impacted during excavation works.

A range of other utilities are located on or adjacent to the Proposal site. A utility investigation has been undertaken during the concept design stage and is discussed in Section 3.1.2. The Proposal has been designed to avoid relocation of services where feasible, however further investigation may be required. It is likely some services may require relocation, including existing electrical infrastructure or rail utilities, but such relocations are unlikely to occur

outside of the footprint of the works assessed in this REF. In the event that works would be required outside of this footprint, further assessment would be undertaken. The appropriate utility providers would be consulted during the detailed design phase.

3.3 Property acquisition

TfNSW does not propose to acquire any property as part of the Proposal.

3.4 Operation management and maintenance

The future operation and maintenance of the upgraded station and surrounds is subject to further discussions with Sydney Trains, TfNSW, Burwood Council and Ashfield Council. Structures constructed under this Proposal situated on RailCorp land would be maintained by Sydney Trains.

It is expected that the Paisley Road entry plaza (including footpaths and ramps on council land), adjacent parking spaces/signage and kerbs/gutters (including kiss and ride) would be maintained by the relevant council.

Figure 5 Proposed works area

4 Statutory considerations

Chapter 4 provides a summary of the statutory considerations relating to the Proposal including a consideration of NSW Government polices/strategies, NSW legislation (particularly the EP&A Act), environmental planning instruments, and Commonwealth legislation.

4.1 Commonwealth legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

The (Commonwealth) EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - defined in the EPBC Act as 'matters of National Environmental Significance (NES)'. The EPBC Act requires the assessment of whether the Proposal is likely to significantly impact on matters of NES or Commonwealth land. These matters are considered in full in Appendix A.

The Proposal would not impact on any matters of NES or on Commonwealth land. Therefore a referral to the Commonwealth Minister for the Environment is not required.

4.2 NSW legislation and regulations

4.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the system of environmental planning and assessment in NSW. This Proposal is subject to the environmental impact assessment and planning approval requirements of Part 5 of the EP&A Act. Part 5 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which do not require development consent under Part 4 of the Act.

In accordance with section 111 of the EP&A Act, TfNSW, 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 Proposal.

Clause 228 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) defines the factors which must be considered when determining if an activity assessed under Part 5 of the EP&A Act has a significant impact on the environment. Chapter 6 of the REF provides an environmental impact assessment of the Proposal in accordance with clause 228 and Appendix B specifically responds to the factors for consideration under clause 228.

4.2.2 Other NSW legislation and regulations

Table 2 provides a list of other relevant legislation applicable to the Proposal.

Table 2 Other legislation applicable to the Proposal

Applicable legislation	Considerations
Contaminated Land Management Act 1997 (CLM Act) (NSW)	Section 60 of the CLM Act imposes a duty on landowners to notify the Office of Environment and Heritage (OEH), and potentially investigate and remediate land if contamination is above EPA guideline levels. The site has not been declared under the CLM Act as being significantly contaminated (refer Section 6.8).
Crown Lands Act 1987 (NSW)	The Proposal does not involve works on any crown land.
Disability Discrimination Act 1992 (DDA) (Commonwealth)	The Proposal would be designed having regard to the requirements of this Act.
Heritage Act 1977 (Heritage Act) (NSW)	• Sections 57 and 60 (approval) where items listed on the State Heritage Register are to be impacted. • Sections 139 and 140 (permit) where relics are likely to be exposed. • Section 170 where items listed on a government agency Heritage and Conservation Register are to be impacted. Croydon Railway Station is listed on the State Heritage Register, RailCorp's Section 170 Heritage and Conservation Register and the heritage schedule of the Burwood and Ashfield LEPs. The Proposal aims to ensure equitable access outcomes are achieved in a way that conserves important heritage values and minimises impacts on heritage significance. An approval under Section 60 of the Heritage Act would be required prior to any works proceeding. The heritage assessment has indicated that the station has moderate archaeological potential. In particular, the proposed service trenches in the eastern end of the platform and tracks may encounter relics associated with the former subway. It is recommended that detailed design be undertaken to avoid these impacts by modifying the route and/or depth of the trenches. Should impacts be anticipated following detailed design, a review of the approvals would be undertaken and a modification sought, if necessary. If archaeological artefacts are uncovered during construction, all work in the immediate vicinity of the find would cease and appropriate advice sought.
National Parks and Wildlife Act 1974 (NPW Act) (NSW)	Sections 86, 87 and 90 of the NPW Act require consent from OEH for the destruction or damage of Indigenous objects. The Proposal is unlikely to disturb any Indigenous objects (refer Section 6.4). However, if unexpected archaeological items or items of Indigenous heritage significance are discovered during the construction of the Proposal, all works would cease and appropriate advice sought.
Noxious Weeds Act 1993 (NSW)	Six noxious weeds were identified to the north of the Meta Street road bridge but were not identified within the proposed work area. Appropriate management methods would be implemented during construction (refer Section 6.7).

Applicable legislation	Considerations
Protection of the Environment Operations Act 1997 (PoEO Act) (NSW)	The Proposal does not involve a 'scheduled activity' under Schedule 1 of the PoEO Act. Accordingly, an environment protection licence (EPL) is not required for the Proposal. However, in accordance with Part 5 of the PoEO Act, TfNSW would notify the EPA of any pollution incidents that occur onsite. This would be managed through the CEMP to be prepared and implemented by the Contractor.
Roads Act 1993 (Roads Act) (NSW)	Section 138 of the Roads Act requires consent from the relevant road authority for the carrying out of work in, on or over a public road. However, clause 5(1) in Schedule 2 of the Roads Act states that public authorities do not require consent for works on unclassified roads. The Proposal would involve works on Paisley Road and Hennessy Street all of which are local roads under the control of Burwood and Ashfield Councils. Consent under the Roads Act is not required however Road Occupancy Licence/s would be obtained from council for temporary road closures. Refer to Section 6.1 for more information.
Sydney Water Act 1994 (NSW)	The Proposal would not involve discharge of wastewater to the sewer.
Threatened Species Conservation Act 1995 (TSC Act) (NSW)	The site does not contain suitable habitat for any listed threatened species or community and is unlikely to have a significant impact on any threatened species or community (refer Section 6.7).
Waste Avoidance and Resource Recovery Act 2001 (WARR Act) (NSW)	TfNSW would carry out the Proposal having regard to the requirements of the WARR Act. A site-specific Waste Management Plan would be prepared.
Water Management Act 2000 (NSW)	The Proposal would not involve any water use from a resource, water management works, drainage or flood works, controlled activities or aquifer interference.

4.3 State Environmental Planning Policies

4.3.1 State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP is the key environmental planning instrument which determines the permissibility of the Proposal and which part of the EP&A Act an activity or development may be assessed.

Clause 79 of the Infrastructure SEPP allows for the development of 'rail infrastructure facilities' by, or on behalf of, a public authority without consent on any land (i.e. assessable under Part 5 of the EP&A Act). Clause 78 defines 'rail infrastructure facilities' as including elements such as '*railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms', public amenities for commuters' and 'associated public transport facilities for railway stations'*.

Consequently, development consent is not required for the Proposal which is classified as a rail infrastructure facility, however the environmental impacts of the Proposal have been assessed under the provisions of Part 5 of the EP&A Act.

Part 2 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other agencies prior to the commencement of certain types of development. Section 5.2 of this REF discusses the consultation undertaken under the requirements of the Infrastructure SEPP.

It is noted that the Infrastructure SEPP prevails over all other environmental planning instruments except *where State Environmental Planning Policy (Major Development) 2005*, *State Environmental Planning Policy No 14 – Coastal Wetlands* or *State Environmental Planning Policy No 26 – Littoral Rainforest* applies. The Proposal does not require consideration under these SEPPs and therefore do not require further consideration as part this REF.

4.3.2 State Environmental Planning Policy 55 – Remediation of Land

SEPP 55 provides a State-wide approach to the remediation of contaminated land for the purpose of minimising the risk of harm to the health of humans and the environment.

In accordance with Clause 7(1) of SEPP 55, a consent authority must not consent to the carrying out of development on any land unless:

> *'(a) it has considered whether the land is contaminated.*
>
> *(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or would be suitable, after remediation) for the purpose for which the development is proposed to be carried out.*
>
> *(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land would be remediated before the land is used for that purpose.'*

Section 6.8 of this REF contains an assessment of the potential contamination impacts of the Proposal. It is unlikely that any large-scale remediation (Category 1) work would be required as part of the Proposal. The proposed land use does not differ to the existing use and is, therefore, unlikely to be affected by any potential contaminants that exist within the rail corridor.

4.4 Local environmental planning instrument and development controls

The Proposal is located within the Burwood and Ashfield LGAs. The provisions of the Infrastructure SEPP mean that Local Environmental Plans (LEPs) prepared by councils for an LGA, do not apply. However, during the preparation of this REF, the provisions of both the Burwood and Ashfield LEPs were considered.

4.4.1 Burwood Local Environmental Plan 2012

The *Burwood Local Environmental Plan 2012* (Burwood LEP) is the governing plan for the Burwood LGA, including part of Croydon. Table 3 summarises the relevant aspects of the Burwood LEP applicable to the Proposal.

Figure 6 shows the relevant section of the zoning map from the Burwood LEP, with the indicative location of the Proposal.

Table 3 Relevant provisions of the Burwood LEP

Provision description	Relevance to the Proposal
Clause 2.3 – Zone objectives and Land Use Table	Under the Burwood LEP: • the rail corridor is zoned SP2 Infrastructure – Railway • shops and businesses along The Strand, Paisley Road and Hennessy Street are zoned B1 Neighbourhood Centre • there are two small areas zoned RE1 Public Recreation including the plaza outside the station entrance on Paisley Road • beyond the station local streets are zoned R1 General Residential or R2 Low Density Residential. The Proposal is consistent with the objectives of the SP2 Infrastructure, B1 Neighbourhood Centre and RE1 Public Recreation.
Clause 5.9 – Preservation of trees or vegetation	Clause 5.9 is aimed at the preservation of trees and development consent is required for tree removal is most instances. However by virtue of clause 5(3) and 79 of the Infrastructure SEPP, the clearing of vegetation for the Proposal is permissible without development consent and would be approved under Part 5 of the EP&A Act. Trees would be retained where possible along Paisley Road. More detailed information on trees and vegetation is included in Section 6.7.
Clause 5.10 – Heritage conservation	The Burwood LEP aims to conserve heritage significance of heritage items within the LGA. Croydon Railway Station is listed under Schedule 5 – Environmental Heritage of the Burwood LEP. Other heritage items/conservation areas in the immediately vicinity of the Proposal area include the Malvern Hill heritage conservation area (C13), the Presbyterian Ladies College (I156), the Cintra Estate Conservation Area (C6) and the Croydon Sewer Vent (I158). A discussion of potential impacts to local heritage is discussed in Section 6.5.
Clause 6.1 – Acid Sulfate Soils	The objective of this clause is to ensure that development does not disturb, expose or drain acid sulfate soils and cause environmental damage. The Proposal is located on land mapped as Class 5, and is not located within 500 metres of any land that is mapped as Class 1-4 and would not require consent.

4.4.2 Ashfield Local Environmental Plan 2013

The *Ashfield Local Environmental Plan 2013* (Ashfield LEP) is the governing plan for the Ashfield LGA, including part of Croydon. Table 4 summarises the relevant aspects of the Ashfield LEP applicable to the Proposal.

Figure 6 shows the relevant section of the zoning map from the Ashfield LEP, with the indicative location of the Proposal.

Table 4 Relevant provisions of the Ashfield LEP

Provision description	Relevance to the Proposal
Clause 2.3 – Zone objectives and Land Use Table	Under the Ashfield LEP: • the rail corridor is zoned SP2 Infrastructure – Rail Infrastructure • shops and businesses along Paisley Road and Hennessy Street are zoned B2 Local Centre • further south on Paisley Road and beyond the station local streets are zoned R2 Low Density Residential. The Proposal is consistent with the objectives of the SP2 Infrastructure, B1 Neighbourhood Centre and R2 Low Density Residential.
Clause 5.9 – Preservation of trees or vegetation	Clause 5.9 is aimed at the preservation of trees and development consent is required for tree removal is most instances. However by virtue of clause 5(3) and 79 of the Infrastructure SEPP, the clearing of vegetation for the Proposal is permissible without development consent and would be approved under Part 5 of the EP&A Act. Some trees would need to be removed from Paisley Road and more information on this and tree replanting is provided in Section 6.7.
Clause 5.10 – Heritage conservation	The Ashfield LEP aims to conserve heritage significance of heritage items within the LGA. Croydon Railway Station is listed under Schedule 5 – Environmental Heritage of the Ashfield LEP. Other heritage items/conservation areas in the immediately vicinity of the Proposal area include the Edwin Street North heritage conservation area (C28). A discussion of potential impacts to local heritage is discussed in Section 6.5.
Clause 6.1 – Earthworks	The objective of this clause is to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, waterways and riparian land, neighbouring uses, cultural or heritage items or features of the surrounding land. By virtue of clause 5(3) and 79 of the Infrastructure SEPP, the Proposal is permissible without development consent and would be approved under Part 5 of the EP&A Act. Consideration of earthworks for the Proposal is outlined in Section 6.8.
Clause 6.2 Flood planning	This clause is aimed at minimising adverse flood impacts and development consent is required for works in a flood planning level area. While the Ashfield section of the Proposal area is located in a flood planning level area, by virtue of clause 5(3) and 79 of the Infrastructure SEPP, the Proposal is permissible without development consent and would be approved under Part 5 of the EP&A Act. Consideration of flooding for the Proposal is outlined in Section 6.9.

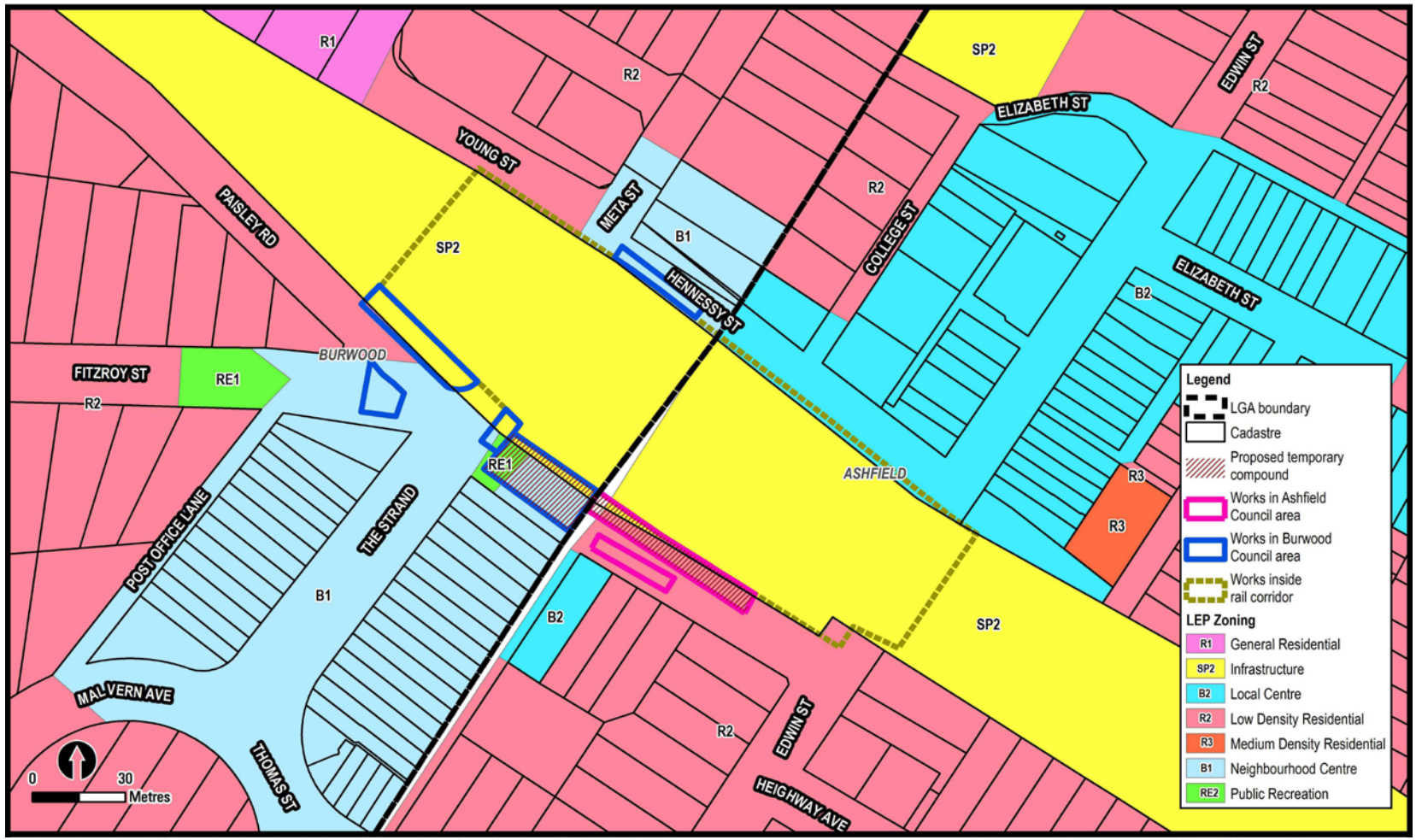


Figure 6 Burwood and Ashfield LEP zoning map

4.5 NSW Government policies and strategies

Table 5 provides an overview of other NSW Government policies and strategies

Table 5 NSW Government policies and strategies applicable to the Proposal

Policy/Strategy	Commitment	Comment
NSW 2021 – A Plan to Make NSW Number One (Department of Premier and Cabinet, 2011)	*NSW 2021 – A Plan to Make NSW Number One* is a ten-year plan developed in 2011 and outlines the high level strategic priorities and associated goals for government and its respective agencies. A key aspect in the transport strategy includes: • the return of quality transport and community services • building infrastructure that improves people's lives and • strengthening our local environments. NSW 2021 includes the following goals, targets and priority actions relevant to the Proposal: • reduce travel times • minimise public transport waiting times for customers • improve co-ordination and integration between transport modes • grow patronage on public transport • improve public transport reliability • improve customer experience with transport services.	The Proposal is consistent with the NSW Government's commitment to: • grow patronage on public transport, and • improve customer experience with transport services. In particular, it is consistent with *Goal 7 – Reduce travel times*, and *Goal 20 – Build liveable centres.* The Proposal also contributes to *Goal 14 – Increase opportunities for people with a disability, by improving transport access.* The Proposal also supports active transport by contributing to the development of bicycle facilities as part of an integrated local network.
Rebuilding NSW – State Infrastructure Strategy 2014 (NSW Government, 2014)	*Rebuilding NSW* is a plan to deliver $20 billion in new productive infrastructure to sustain productivity growth in our major centres and regional communities. *Rebuilding NSW* will support overall population growth in Sydney and NSW. Public transport is viewed as critical to urban productivity, expanding employment opportunities by connecting people to jobs, reducing congestion, and supporting delivery of urban renewal.	The Proposal supports investment in rail infrastructure, and aligns with the reservation of $8.9 billion for urban public transport to support Sydney's population, that is expected to reach almost six million by 2031.

Policy/Strategy	Commitment	Comment
NSW Long Term Transport Master Plan (TfNSW, 2012a)	The *NSW Long Term Transport Master Plan* identifies a planned and co-ordinated set of actions to address transport challenges and will guide the NSW Government's transport funding priorities over the next 20 years. The Master Plan would meet a number of challenges to building an integrated transport system for Sydney and NSW, including: • customer-focussed integrated transport planning • integrated modes to meet customer needs • getting Sydney Moving Again • sustaining Growth in Greater Sydney. The Master Plan links to NSW 2021, the Metropolitan Strategy for Sydney, the State Infrastructure Strategy, regional and sub-regional strategies, and national plans.	The Proposal implements the following key themes in the Master Plan: • improving customers' journey experience • making better use of existing assets providing accessible transport to help address social exclusion.
A Plan for Growing Sydney (Department of Planning and Environment, 2014)	*A Plan For Growing Sydney* superseded the draft *Metropolitan Strategy for Sydney 2036.* The Plan provides information on the strategies to accommodate an additional 664,000 homes and 689,000 jobs by 2031, which in part will be helped by a more integrated transport network. The Proposal is located in the Central subregion and the priorities relevant to the Croydon area include Burwood as a strategic centre and an urban renewal corridor along the railway corridor.	The Proposal would be consistent with the aims of *Goal 1 – A competitive economy with world-class services and transport* and *Goal 3 – A great place to live with communities that are strong, healthy and well connected.* And in particular, *Direction 3.3 -creating healthy built environments* that aims to encourage walking and cycling to public transport and local centres through improved footpath connections and additional bicycle parking.
Disability Action Plan 2012-2017 (TfNSW, 2012b)	The *Disability Action Plan 2012-2017* was developed by TfNSW in consultation with the Accessible Transport Advisory Committee, which is made up of up of representatives from peak disability and ageing organisations within NSW. The Plan discusses the challenges, the achievements to date, the considerable undertaking that is required to finish the job, and provides a solid and practical foundation for future progress over the next five years.	The Proposal has been developed with consideration of the objectives outlined in this Plan and seeks to improve and provide equitable access to public transport facilities.

Policy/Strategy	Commitment	Comment
Sydney's Walking Future - Connecting people and places (TfNSW, 2013b)	*Sydney's Walking Future* outlines the NSW government's efforts to: • promote walking for transport • connect people to places through safe walking networks around activity centres and public transport interchanges.	The Proposal would facilitate walking by providing an alternate access to the station and across the railway from Hennessy Street to the north.
Sydney's Cycling Future - Cycling for everyday transport (TfNSW, 2013c)	*Sydney's Cycling Future* outlines the NSW government's commitment to a safe and connected network of bicycle paths as an important part of Sydney's integrated transport system. The government wants to make bike riding a convenient and enjoyable option by improving access to towns and centres, and investing in bicycle facilities at transport hubs.	The Proposal supports the government's Bike and Ride initiative that better integrates bicycle riding with other modes of transport, making it convenient to ride to transport hubs, park bicycles securely and transfer to public transport as part of longer transport journeys. In addition to the existing bicycle rack (with capacity for nine bicycles) on the southern side of the station, the following would be provided • sheltered bicycle parking for minimum 10 bicycles on the northern side of the station on Hennessy Street • sheltered bicycle parking for minimum 20 bicycles on the southern side of the station on Paisley Road • bicycle parking for 10 bicycles on The Strand adjacent to the car park. In total, there would be capacity for approximately 49 bicycles around the station once the Proposal is operational.
Burwood 2030 Strategic Community Plan (Burwood Council, 2013)	*Burwood 2030* links to the goals of NSW 2021 and aims to ensure the diversity and prosperity of Burwood is embraced and celebrated into the future. It is the community's 20 year plan which will provide a blueprint for Council's activities and set clear directions for the future of Burwood. The plan outlines the community's vision and aspirations for the area into the future.	The Proposal is consistent with the objectives of the Burwood Community Plan, in particular with the following actions: • Action 4.2.2 Install ramps and lifts to improve accessibility of the town centre for seniors, people with a disability and parents with prams • Action 4.3.1 Design footpaths to increase pedestrian only spaces for improved pedestrian access and safety.

Policy/Strategy	Commitment	Comment
Ashfield 2023 – Our Place, Our Future (Ashfield Council, 2015)	Ashfield's Community Strategic Plan was exhibited at the beginning of 2015 and also links to NSW 2021. The Plan includes a number of priorities moving forward, including a focus on promoting sustainable living and improving pedestrian routes, cycleways and an active transport network that will connect people with the places they live, work and relax. There is also a focus on reducing the reliance on private cars.	The Proposal is consistent with the objectives of the Ashfield Community Strategic Plan and would look to facilitate an active and accessible transport network by providing equitable access to the station, upgraded footpath and station entrances and additional bicycle racks.

4.6 Ecologically sustainable development

TfNSW is committed to ensuring that its projects are implemented in a manner that is consistent with the principles of ecologically sustainable development (ESD). The principles of ESD are generally defined under the provisions of clause 7(4) of Schedule 2 to the EP&A Regulation as:

- the precautionary principle – If there are threats of serious or irreversible damage, a lack of full scientific uncertainty should not be used as a reason for postponing measures to prevent environmental degradation
- intergenerational 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
- conservation of biological diversity and ecological integrity – the diversity of genes, species, populations and their communities, as well as the ecosystems and habitats they belong to, should be maintained or improved to ensure their survival
- improved valuation, pricing and incentive mechanisms – environmental factors should be included in the valuation of assets and services.

The principles of ESD have been adopted by TfNSW throughout the development and assessment of the Croydon Station Easy Access Upgrade. Section 3.1.4 summarises how ESD would be incorporated in the design development of the Proposal. Section 6.13 includes an assessment of the Proposal on climate change and sustainability, and Section 7.2 lists mitigation measures to ensure ESD principles are incorporated during the construction phase of the Proposal.

5 Community and stakeholder consultation

Chapter 5 discusses the consultation undertaken to date for the Proposal and the consultation proposed for the future. This chapter discusses the consultation strategy adopted for the Proposal and the results of consultation with the community, relevant government agencies and stakeholders.

5.1 Stakeholder consultation during concept design

As part of the development of concept design options, TfNSW has consulted with Sydney Trains, the Heritage Division (OEH), Burwood Council and Ashfield Council. Sydney Trains were involved in the TfNSW workshops to identify key issues and decide on a preferred option while discussions have been held with the Heritage Division regarding the potential heritage impacts to Croydon Station.

A number of meetings have been held over the Proposal's development with Burwood Council and Ashfield Council since 2013 and included a meeting with Burwood Council on 16 September 2013, a meeting with Ashfield Council on 30 September 2013 and combined council meetings on 1 November 2013, 17 October and 11 December 2014. The following key issues were raised by the councils for consideration:

- Ashfield and Burwood Council streetscape improvements have been undertaken along Paisley Road, Hennessy Street, and Edwin Street North (the remaining sections of Paisley Road and Hennessy Street would be undertaken once the Proposal is complete). Discussions have been had regarding design and interface considerations
- a proposal by the Presbyterian Ladies College to expand, with potential changes to traffic operations in Boundary Street, was noted but not considered a key concern as most vehicle traffic is focused to the north of the school, away from the station. The Proposal would facilitate any increase in enrolments from the school by creating a safer and more convenient access path to the station
- recent parking studies indicated that Paisley Road is in demand for commuter parking as most parking is restricted around the town centres
- flooding occurs at the corner of Hennessy Street and Edwin Street North
- the heritage value of the station was noted and there is interest in the proposed treatment for the northern disused stairs
- there are no major zoning changes planned and the area is to be retained as a local/neighbourhood centre
- Ashfield Council noted that a new northern station entrance at the eastern end of the platforms would help to activate the Edwin Street North businesses.

The issues raised by both Councils during the various meetings have been considered during the development of the concept design. However, a station entrance option further east was discounted as it would not meet key pedestrian desire lines for pedestrians from The Strand/Paisley Road catchment and the two schools to the north of the station off Meta Street. However creating an additional public access path across the railway would help to connect and activate both sides of the station.

5.2 Consultation requirements under the Infrastructure SEPP

Part 2, Division 1 of the Infrastructure SEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Clauses 13, 14, 15 and 16 of the Infrastructure SEPP require that public authorities undertake consultation with councils and other agencies, when proposing to carry out development without consent.

Table 6 provides details of consultation requirements under the Infrastructure SEPP for the Proposal.

Table 6 Infrastructure SEPP consultation requirements

Clause	Clause particulars	Relevance to the Proposal
Clause 13 | Consultation with Councils – development with impacts on council related infrastructure and services	Consultation is required where the Proposal would result in: • substantial impact on stormwater management services • generating traffic that would place a local road system under strain • involve connection to or impact on a council owned sewerage system • involve connection to and substantial use of council owned water supply • significantly disrupt pedestrian or vehicle movement • involve significant excavation to a road surface or footpath for which Council has responsibility.	The Proposal includes works that would: • disrupt pedestrian and vehicle movements • impact on road pavements under Council's care and control • impact on Council-operated footpaths. Consultation with Burwood and Ashfield Councils would be undertaken concurrently with the REF display, and would continue throughout the detailed design and construction phases.
Clause 14 | Consultation with Councils – development with impacts on local heritage	Where railway station works: • substantially impact on local heritage item (if not also a State heritage item) • substantially impact on a heritage conservation area.	Croydon Railway Station is listed on the heritage schedules of the Burwood and Ashfield LEPs. The Proposal is also being undertaken close to other local heritage items and conservation areas. Consultation with Burwood and Ashfield Councils would be undertaken concurrently with the REF display, and would continue throughout the detailed design and construction phases.
Clause 15 | Consultation with Councils – development with impacts on flood liable land	Where railway station works: • impact on land that is susceptible to flooding – reference would be made to *Floodplain Development Manual: the management of flood liable land.*	The Proposal is located on land in the Ashfield LGA that is susceptible to flooding. Consultation with Ashfield Council would be undertaken concurrently with the REF display, and would continue throughout the detailed design and construction phases.

Clause	Clause particulars	Relevance to the Proposal
Clause 16 | Consultation with public authorities other than Councils	For *specified development* which includes consultation with the OEH for development that is undertaken adjacent to land reserved under the *National Parks and Wildlife Act 1974*, and other agencies specified by the Infrastructure SEPP where relevant. Although not a specific Infrastructure SEPP requirement, other agencies TfNSW may consult with could include: • Roads and Maritime • Sydney Trains • OEH.	The Proposal is not located adjacent to land reserved under the *National Parks and Wildlife Act 1974*. Accordingly, consultation with the OEH on this matter is not required.

5.3 Consultation strategy

Ensuring the community and key stakeholders are fully informed and given the opportunity to provide feedback during the planning process is fundamental to the success of a project.

The consultation strategy for the Proposal was developed to encourage stakeholder and community involvement and foster interaction between stakeholders, the community and the project team. The consultation strategy that was developed, having regard to the requirements of the planning process ensures that stakeholders, customers and the community are informed of the Proposal and have the opportunity to provide input.

The objectives of the consultation strategy are to:

- provide accurate and timely information about the Proposal and REF process to relevant stakeholders
- raise awareness of the various components of the Proposal and the specialist environmental investigations
- ensure that the directly impacted community are aware of the REF and consulted where appropriate
- provide opportunities for stakeholders and the community to express their view about the Proposal
- understand and access valuable local knowledge from the community and stakeholders
- record the details and input from community engagement activities
- build positive relations with identified community stakeholders
- ensure a comprehensive and transparent approach.

5.4 Public display

The REF display strategy adopts a range of consultation mechanisms, including:

- public display of the REF at various locations
- distribution of a project update at the station, and to local community and rail customers outlining the Proposal and inviting feedback on the REF
- advertisement of REF public display in local newspapers with a link to the TfNSW website that includes a summary of the Proposal and information on how to provide feedback
- consultation with Burwood Council, Ashfield Council, Sydney Trains, and other non-community stakeholders.

Community consultation activities for the Proposal would be undertaken during the public display of this REF. The display period of the REF would be advertised in the week that the public display commences. The REF would be displayed for a period of approximately four weeks and would be placed on public display at the following locations:

1. Burwood Council, Suite 1, Level 2, 1-17 Elsie Street, Burwood
2. Ashfield Council, Customer Service Centre, 260 Liverpool Rd, Ashfield
3. Burwood Library, 2 Conder Street, Burwood
4. Ashfield Library, Level 3, 260 Liverpool Road, Ashfield
5. Transport for NSW Community Information Centre, Ground Floor, 388 George Street, Sydney.

The REF would also be available on the TfNSW website[2]. Information on the Proposal would be available through the Project Infoline (1800 684 490) or by email[3]. During this time feedback is invited. Following consideration of feedback received during the public display period, TfNSW would determine whether to proceed with the Proposal and what conditions would be imposed on the project should it be determined to proceed.

5.5 Aboriginal community involvement

The Croydon area forms part of a landscape that was used by the Wangal people for many thousands of years prior to European contact. A basic search of the Aboriginal Heritage Information System (AHIMS) database was undertaken on 9 September 2015 and an area within a 200 metre buffer around the station was searched in order to gain information on the archaeological context of the area, and to ascertain whether there are any previously recorded Indigenous sites.

No Aboriginal sites have been recorded within or in the vicinity of the Proposal site, and the Proposal site is not located within a landscape feature likely to indicate the presence of Aboriginal objects in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (OEH, 2010).

The Proposal is located in an area that has been highly modified for a range of uses associated with the railway, and it is considered therefore unlikely that any Indigenous heritage items would be located in or in the vicinity of the Proposal area, due to this past history of

[2] http://www.transport.nsw.gov.au/projects
[3] projects@transport.nsw.gov.au

disturbance. Therefore, it was not considered necessary to undertake specific Aboriginal consultation.

5.6 Ongoing consultation

At the conclusion of the public display period for this REF, TfNSW would acknowledge receipt of feedback from each respective respondent. The issues raised by the respondents would be considered by TfNSW before determining whether to proceed with the Proposal (refer Figure 1, page 14).

Should TfNSW determine to proceed with the Proposal, the determination report would be made available on the TfNSW website and would summarise the key impacts identified in this REF, demonstrate how TfNSW considered issues raised during the public display period, and include a summary of mitigation measures proposed to minimise the impacts of the Proposal.

Should TfNSW determine to proceed with the Proposal, the project team would keep the community, councils and other key stakeholders informed of the process, identify any further issues as they arise, and develop additional mitigation measures to minimise the impacts of the Proposal. The interaction with the community would be undertaken in accordance with a Community Liaison Plan to be developed prior to the commencement of construction.

6 Environmental impact assessment

Chapter 6 of the REF provides a detailed description of the likely environmental impacts associated with the construction and operation of the Proposal. For each likely impact, the existing environment is characterised and then an assessment is undertaken as to how the Proposal would impact on the existing environment.

This environmental impact assessment has been undertaken in accordance with clause 228 of the EP&A Regulation. A checklist of clause 228 factors and how they have been specifically addressed in this REF is included at Appendix B.

6.1 Traffic and transport

A Traffic, Transport and Access Impact Assessment has been undertaken by GTA Consultants for the Proposal (GTA, 2015). The assessment included a desktop analysis and site inspection. Detailed traffic counts or modelling were not considered necessary as the Proposal is focused on the station area and is unlikely to have major impacts on the surrounding road network. The findings of the assessment are summarised in this section.

6.1.1 Existing environment

Croydon Station

Croydon Station is located between Ashfield Station and Burwood Station and serviced by the T2 Airport, Inner West and South Line which is operated by Sydney Trains, while the T1 North Shore, Northern and Western Line services pass through the station without stopping. Croydon Station is the 107th busiest station on the Sydney Trains network with an average patronage of 4,750 trips per weekday (NSW Bureau of Transport Statistics barrier counts, 2014).

There are six tracks passing through the station with no current scheduled train services stopping at Platforms 1, 2 and 3 each day. The tracks include:

- the Up Main and Down Main that extend along the northern extent of the station, with only the Down Main accessible from Platform 1
- the Up Suburban and Down Suburban that extend through the middle of the station accessible from Platform 2 and Platform 3 respectively
- the Up Local and Down Local that extend along the southern extent of the station accessible from Platform 4 and Platform 5 respectively.

Throughout the day, there is a minimum of four trains departing Croydon Station in both directions every hour with the exception of an extra city bound service per hour between 3pm and 5pm. City-bound trains depart from Platform 4 while trains from Platform 5 service the west.

Croydon Station is busiest during the morning and afternoon peak periods, which reflects its primary use as both a commuter station to/from the Sydney and Parramatta business districts, together with school student activity and off peak use as a local station.

Within the station area there are a number of existing facilities for customers including a ticket window, ticket machine and a unisex toilet at the existing booking office along with Opal card readers, and family accessible toilet, male and female toilets on Platform 3/4.

The key transport facilities around the station are explained in more detail in this section and illustrated in Figure 7.

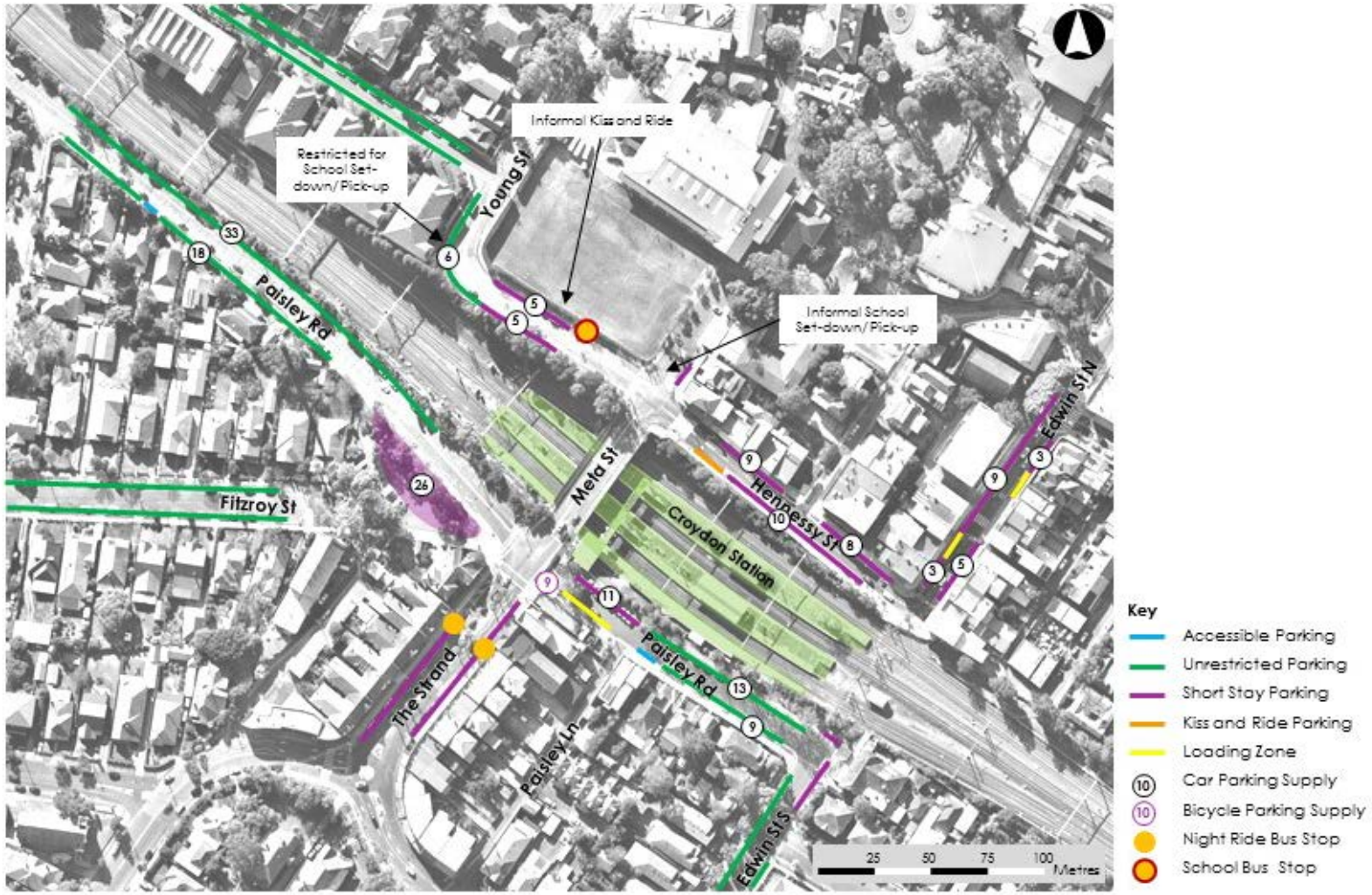


Figure 7 Existing transport facilities (GTA, 2015)

Road network and traffic

Croydon Station is bounded by Hennessy Street and Young Street to the north and Paisley Road to the south, while the Meta Street road bridge extends across the railway and across the station platforms. The eastern section of Paisley Road extends to a cul-de-sac at the station entry plaza preventing through access to the signalised intersection of the The Strand and the western section of Paisley Road, which are classified as regional roads and provide a connection to the nearby Burwood town centre. Motorists travelling on the eastern section can connect back to The Strand by travelling south-west along Paisley Lane (which is one-way).

On the northern side of the station Hennessy Street serves as a traffic route connecting Croydon Road/Frederick Street to the arterial routes along Parramatta Road/Liverpool Road. Roads around the station are one lane in each direction and have a posted speed limit of 50 km/hr (and a school zone of 40 km/hr along Meta Street, Hennessy Street and Young Street). A loading zone is located on the southern side of Paisley Road opposite the station entrance.

GTA Consultants completed a sample of traffic movement counts (AM/PM on a weekday) to understand traffic constraints through the area. Paisley Road (east of The Strand) accommodates a high number of kiss and ride vehicle movements and this, combined with commuter parking, service vehicles, school set-down/pick-up activity, as well as the geometrical constraints of Paisley Road, results in a congested local road environment during the peak periods.

Further to the above, peak period traffic congestion typically occurs along The Strand, with the Hennessy Street pedestrian crossing identified as a key contributor, particularly outside of the school peak periods (i.e. outside when the crossing is supervised).

Parking

No designated commuter car parking is provided at Croydon Station. However, on site observations confirmed that unrestricted parking surrounding the station is often used by commuters. This includes 22 spaces located along Paisley Road east of The Strand and 50 spaces located along Paisley Road between The Strand and Reed Street to the west – noting that unrestricted parking along Paisley Road (west) generally extends to Burwood Station (about one kilometre to the west). At the time of the site visit, the 72 parking spaces specified above reached capacity by around 8am, which is indicative of the strong commuter parking activity surrounding Croydon Station.

Other parking around the station includes time-restricted parking on local streets adjacent to the station, a council car park (with capacity of 26 parking spaces) located west of the station and one accessible parking space on Paisley Road outside the Croydon Medical Practice. These parking areas are shown in Figure 7.

Taxi/kiss and ride facilities

A formal kiss and ride area for two vehicles is provided on the southern side of Hennessy Street with informal kiss and ride activity observed on the eastern side of Paisley Road and to a lesser extent on The Strand. There are no formalised kiss and ride areas to the south of the station.

There are no formal taxi stands in the station precinct.

Bus operations

There are no local bus services accessible from Croydon Station. The closest bus stops are located approximately 500 metres away on Liverpool Road to the south, and Frederick Street to the east, with the exception of the Night Ride bus stops located on The Strand and school bus stops located in the vicinity of the station.

Pedestrian network

Access to the station platforms is provided via stairs from Meta Street and the primary access from the southern side of the station via the Paisley Road plaza. There is no existing access to the station from the north on Hennessy Street.

The key pedestrian desire lines for the station are primarily via the established footpaths along Meta Street, The Strand, Hennessy Street and Paisley Road however it is noted that the northern footpath on Paisley Road is narrow and does not typically meet peak period pedestrian demand. There is also pedestrian fencing along both sides of the Meta Street road bridge which restricts pedestrian crossing. There are a number of marked pedestrian or zebra crossings at nearby intersections including directly opposite the proposed northern station entrance across Hennessy Street.

Pedestrian activity around the station was observed during the AM and PM peak periods in August 2015 with an 80:20 split of those entering and those exiting the station during the morning peak (8am to 9am) with a major component of the total pedestrian volumes attributable to school students. The PM peak pedestrian activity was approximately 60 per cent of that observed during the morning peak which is likely due to school student activity occurring before the evening peak (i.e. earlier than 4pm).

Bicycle network and facilities

A bicycle rack (with capacity for nine bicycles) is located at the southern station entry plaza on Paisley Road with no bicycle parking provided on the northern side of the station. Hennessy Street, Fitzroy Street and Young Street are recognised as on-road cycle routes by Burwood and Ashfield Councils, with bicycle symbols regularly positioned on the road pavement. Additional wayfinding signage is also provided to promote the cycling connections.

6.1.2 Potential impacts

a) Construction phase

Construction routes

Figure 8 illustrates the likely access routes to be used by construction vehicles to access the Proposal site, which would include access to the existing rail corridor access points on Paisley Road/Edwin Street South and Hennessy Street/Edwin Street North. Local roads around the station link to the wider regional approved Restricted Access Vehicle Routes as identified by Roads and Maritime Services, including:

- Parramatta Road
- Liverpool Road/Hume Highway
- Frederick Street.

Locally, the main construction access route for the Proposal would be via Thomas Street and Edwin Street South to link with Paisley Road. Smaller construction vehicles could egress the site via Paisley Lane, to access Thomas Street and onto Frederick Street.

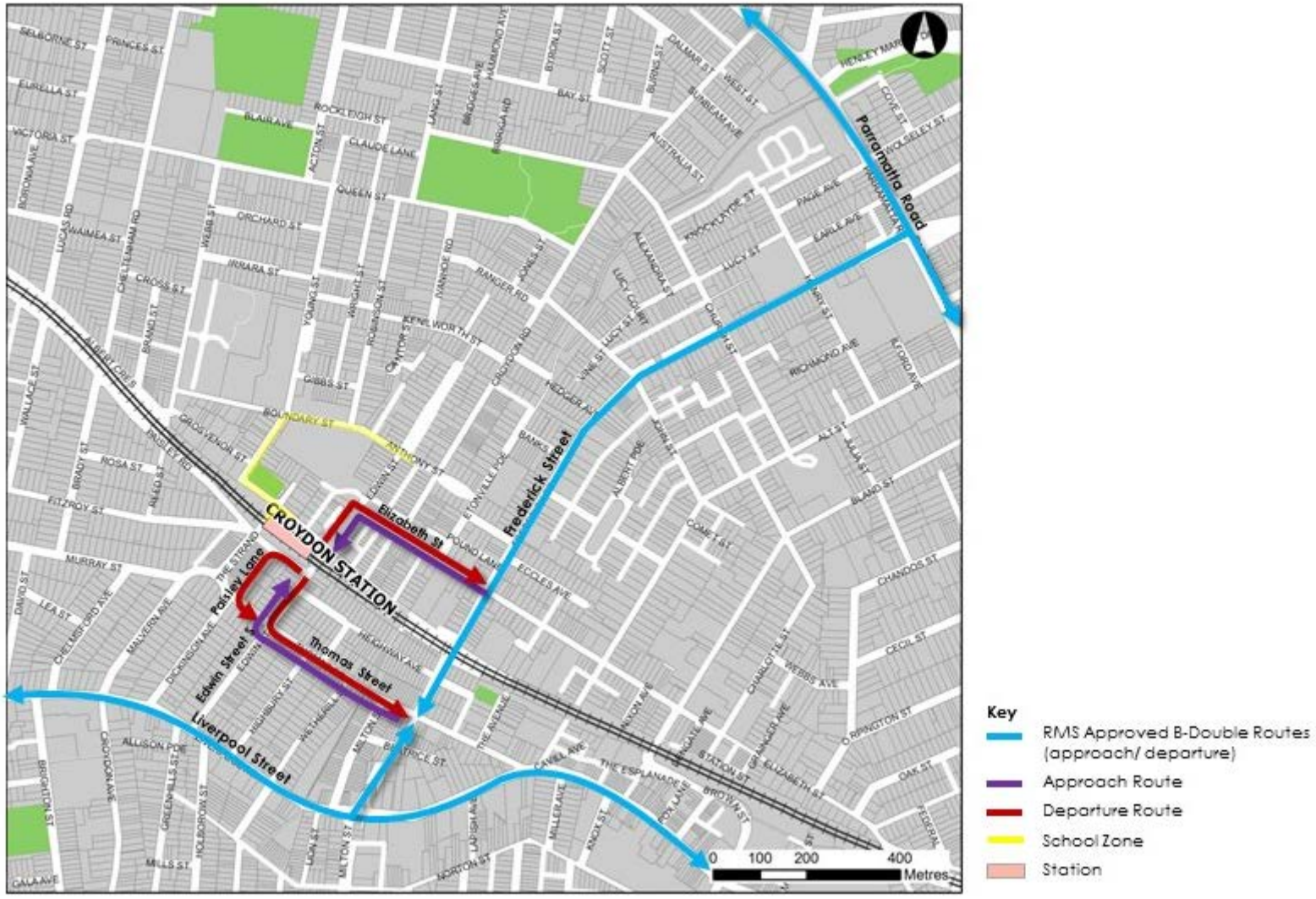


Figure 8 Potential construction vehicle routes (GTA, 2015)

Traffic impacts

Traffic generated by construction activities includes construction worker light vehicles (including utility vans), as well as heavy vehicles for periodic delivery and removal of materials, and construction plant and equipment. Vehicle types and sizes would vary depending on the required use, but typically include medium and large rigid vehicles and articulated vehicles for import of bulk materials or spoil removal, as well as concrete trucks. The amount of fill material or spoil/demolition spoil would be minor due to the limited extent of excavation required for the Proposal. Specific oversize vehicles may be required for precast elements such as pedestrian bridge spans and prefabricated sections/structures.

The traffic generated by construction activities is unknown at this stage. However, while the overall traffic impacts arising from the Proposal during construction are expected to be manageable and have minimal impacts on existing traffic conditions, construction site access via Paisley Road would have the potential for moderate impacts to two sensitive land uses at the southern side of the station precinct, in particular the Croydon Medical Practice and the Montessori Academy.

Parking impacts

The construction stage would have some localised impacts to parking, but likely limited to the Paisley Road car parking spaces and loading zone only (i.e. potentially up to 27 parking spaces affected). The construction activities are anticipated to have only minor or negligible impacts beyond this section of Paisley Road.

Given that parking is generally in high demand in the local area, construction workers would be encouraged to car pool and/or make use of the available public transport for travel to and from the station and the work sites.

Pedestrian access and other impacts

Construction works in the vicinity of any pedestrian and cyclist desire lines would need to be managed and controlled at all times to ensure that there is no impact to public safety. A temporary pedestrian bridge and stairs, including lighting and CCTV and other temporary station facilities would be provided to ensure pedestrian access to all of the platforms is accommodated via Paisley Road. The existing pedestrian level of service would be maintained throughout construction under this scenario however the following impacts to pedestrians/rail customers are anticipated to arise from construction activities:

- longer walking distances as a result of the alternate entry further east on Paisley Road with access to station platforms via a temporary pedestrian bridge
- potential higher levels of platform congestion arising from restricted access to certain areas of the platforms
- higher road safety risk levels associated with construction vehicle-pedestrian interactions.

Access to all properties surrounding the stations would be maintained, with negligible traffic impact on surrounding properties expected during construction.

b) Operational phase

It is not considered that the Proposal would have significant impacts on bus or rail operations and would likely bring about positive impacts in terms of contributing towards making railway transport more accessible to the community. A summary of the operational traffic, transport and access impacts is summarised below.

Customer and public access

The Proposal would provide the following improvements:

- the new pedestrian bridge, lifts, stairs and canopies would present pedestrian benefit and improve the user experience and amenity
- the provision of lifts to the station platforms, with accessible paths of travel linking Hennessy Street and Paisley Road would accommodate mobility impaired persons accessing the station platforms (noting that mobility impaired access is not currently available at Croydon Station). These would also provide improved access for the elderly and people with prams or luggage, etc.
- provision of a direct pedestrian connection linking the station with Hennessy Street (to the north) would accommodate a major pedestrian desire line, particularly during the school peak periods. It is noted that access to the new pedestrian bridge is proposed to be open to the general community and not restricted to rail customers only thereby facilitating a broader pedestrian link away from traffic
- the new pedestrian bridge would also contribute towards further reducing safety risks and improve overall experience for pedestrians and rail customers by facilitating additional pedestrian movement capacity between Hennessy Street and Paisley Road
- formalising interchange facilities on Paisley Road would positively contribute towards the overall pedestrian and cycling environment.

The Proposal has been designed to cater for a minimum daily patronage forecast of 6,963 (which is the estimated 2036 daily patronage + 15 per cent) and which represents approximately a 47 per cent increase from the 2014 patronage levels. Therefore, a focus of the Traffic, Transport and Access Impact Assessment was to consider if the proposed pedestrian bridge would adequately cater for the projected increase in customers in terms of pedestrian flows.

To assess the pedestrian Level of Service (LoS), GTA Consultants adopted Fruin's Pedestrian Flow Rate criteria, which is the number of pedestrians that pass a point during a specific period of time for a given level of service, which is a qualitative measure of pedestrian comfort and crowding tolerance level. Fruin defined six levels of crowding for queuing areas, walkways and stairways, and are expressed in terms of Levels of Service (LOS) which range from 'A' (best level) to 'F' (worst level). The LOS for the proposed pedestrian bridge with a minimum clear width of four metres has been assessed as 'A' and would improve pedestrian flows and interaction in and around the station.

Traffic generation and road safety

Given that the proposed station upgrade provides a higher level of station accessibility and usability, the improved customer experience and upgraded facilities are likely to attract greater use. As a result, traffic activity is anticipated to marginally increase, albeit with a negligible impact on the surrounding road network. It is anticipated that the greatest impact would be along Paisley Road, with kiss and ride activity anticipated to increase in-line with growth in future patronage demand.

The Traffic, Transport and Access Impact Assessment recommended that further consideration be given to vehicle circulation and access to Paisley Road, as well as the pedestrian interactions and connections. The placement of the Paisley Road Loading Zone and its necessity should be further considered, noting that the location is undesirable from a pedestrian safety perspective, as well as geometrically unsuitable with insufficient manoeuvring area for a loading vehicle to complete the required turning movements.

Parking

The Proposal is not expected to increase the level of car parking demand. However, it is noted that that the proposed improvements would reduce the amount of kerbside parking along Paisley Road.

Overall, the positive impacts arising from improved accessibility and upgraded facilities at Croydon Station would outweigh the potential negative impacts of a slight reduction in the capacity of timed car parking spaces in the precinct.

The Proposal includes minor changes to car parking in Paisley Road, including provision of two 90-degree angled accessible spaces on Paisley Road and reinstatement of short stay parking spaces, resulting in an overall loss of three existing short stay spaces. It is noted that these existing spaces are used heavily during the AM and PM peak periods, particularly for school set-down/pick-up.

Provision of a formal kiss and ride facility on Paisley Road would also result in a loss of on-street parking, noting that the Traffic, Transport and Access Impact Assessment recommended that the kiss and ride replace long stay parking instead of the existing accessible parking space to maintain accessibility to Croydon Medical Practice. It is anticipated that any loss of unrestricted parking for the kiss and ride could be supported by the broader road network, with commuters observed to park within the surrounding residential streets.

Kiss and ride

The Proposal includes provision of additional formalised kiss and ride facilities, including capacity for up to three vehicles on Paisley Road, where a high level of peak period informal kiss and ride activity is currently occurring.

The provision of the kiss and ride to the east of Paisley Lane would encourage vehicles to use Paisley Road and Paisley Lane as a one-way loop, offering benefits for the overall operation of Paisley Road and in particular pedestrian-vehicle interactions, resulting from a reduction in the number of mid-block U-turn manoeuvres occurring during periods of high pedestrian activity.

Bicycle facilities

Additional bicycle parking would be provided in addition to the existing bicycle rack (with capacity for nine bicycles) located at the Paisley Road entry plaza and includes:

- sheltered bicycle parking for minimum 10 bicycles on the northern side of the station on Hennessy Street
- sheltered bicycle parking for minimum 20 bicycles on the southern side of the station on Paisley Road
- bicycle parking for 10 bicycles on The Strand adjacent to the car park

In total, the Proposal would increase the available bicycle parking capacity by 40 bicycles (total capacity for a minimum of 49 bicycles), which would be adequate to cater for the current and likely future demands. It is anticipated that provision of new facilities at the station access points is likely to increase awareness of such facilities, potentially with an associated increase in the cycling mode share to and from the station precinct.

Property access

The Proposal is not expected to have any impact on existing access to properties in the vicinity of the station. It is anticipated that the provision of a formalised kiss and ride facility would reduce the number of people using existing property accesses along Paisley Road to set-down/ pick-up passengers and turn around.

6.1.3 Mitigation measures

Further consideration would be given to vehicle circulation and access to Paisley Road, as well as the pedestrian interactions and connections (e.g. potential for a Shared Zone and/or a one way flow (forming a loop with Paisley Lane, i.e. access via Paisley Road and egress via Paisley Lane only), and consideration of the existing loading zone). The need to retain the existing accessible parking space outside the Croydon Medical Practice would also be investigated during detailed design.

A Construction Traffic Management Plan (CTMP) would be prepared by the Contractor in consultation with TfNSW, and provided to Burwood Council and Ashfield Council (and Roads and Maritime, as required). The CTMP would be the primary management tool to manage potential traffic impacts associated with construction. The CTMP, at a minimum, would include:

- procedures for preparing and implementing Traffic Control Plans (TCPs) and in particular for detours and traffic control to manage temporary disruptions on local roads
- final construction traffic approach and departure routes
- location of access to and from the local road network and contractor parking
- scheduling of works/deliveries to avoid peak times (e.g. school pick up/drop off times, where practicable)
- measures to:
    - manage potential impacts to sensitive receivers (including Montessori Academy and Croydon Medical Practice)
    - limit temporary parking losses
    - maintain customer access to and from the station at all times
    - maintain private property access unless otherwise agreed
- details of traffic controllers, construction signage and other community notification.

Refer to Table 16 for a list of proposed mitigation measures.

6.2 Urban design, landscape and visual amenity

A Visual Impact Assessment was undertaken by Envisage Consulting for the Proposal (Envisage Consulting, 2015). The findings of this assessment are summarised in this section. The assessment included desktop analysis, site inspection and creation of photomontages to provide an indication of what the Proposal may look like once complete.

6.2.1 Existing environment

Visual impact assessments usually classify locations in terms of factors such as visual character (the main ‘look’ of the area) and visibility (how often and easily a site is seen).

Visual character

The dominant character of the area surrounding Croydon Station is urban and consists of a neighbourhood shopping centre that services the surrounding low density residential area. The buildings along the main street of The Strand, and those across the railway corridor around the intersection of Meta Street and Hennessy Street, are of a low height and overall scale, with most comprising two storeys.

The Presbyterian Ladies College at the corner of Meta Street and Young Street dominates the northern side, with the four storey school the tallest nearby building, which is setback from Young Street by a large sporting field.

The Strand shopping street has a distinct character that is formed from elements that include a central median of native Cabbage Tree Palms and two storey, small-scale retail shops and cafés along each side topped with flats. There is also a consistent presence of dark brick along the upper storey on both sides, with a series of pitched roofs along the western side emanating a cottage-like character. The northern end of The Strand, at the station entry, has a strong visual character created by the combination of The Strand Café, heritage post office and existing station building.

On the northern side, along Hennessy Street, is a secondary commercial area that extends along the northern side of the street down to Edwin Street North, where another smaller shopping area runs perpendicular to the railway corridor. This area has an attractive streetscape and tree planting.

The station entry and Meta Street road bridge are situated on a slight rise, with the landform falling away gently to the north and south. The topography allows for some views toward the main Sydney skyline, which can be seen at a distance to the north-east.

The Strand also creates a local view corridor that focuses views from the shopping area down to the south and a number of Federation-like houses with pitched roofs which terminate this vista.

Visibility

The Proposal has a relatively confined area of visibility due to a large part being confined within the rail cutting with views generally only possible when in close proximity. The solid wall along the existing road bridge, which would not be altered as part of the proposed works, also blocks potential views of the station.

Potential areas of visibility include the main shopping area along The Strand, the Meta Street road bridge, the front of the Presbyterian Ladies College, the commercial area along Hennessy Street and from within the station.

6.2.2 Potential impacts

a) Construction phase

While construction activities would tend to be more visible than the operational stage of the Proposal, the construction activities would be temporary and transient in nature. Temporary elements likely to be introduced into the visual environment include:

- temporary footbridge located at the eastern end of the platform
- temporary booking office adjacent to temporary station access from eastern end of Paisley Road
- temporary fencing and hoardings
- road barriers and signage
- cranes and other construction plant
- scaffolding
- pedestrian fencing
- temporary site office and amenities.

Some construction activities, such as night works would require lighting installation for operational, safety and security purposes. Lighting installations would be placed to avoid light spill to adjoining road corridors and residential areas.

b) Operational phase

Visual impact assessments generally focus on two main types of visual effects or impacts:

- **effect on visual character** – which considers the visual changes to the character of the general area and takes into account the magnitude of the change and aspects such as the difference in the scale of new structures, compatibility with existing visual character, contrast in colour, heritage considerations, vegetation loss and change to any views to landmarks or vistas
- **effect on key viewpoints** – the general relationship of the two factors of visual sensitivity and the magnitude of visual change together determine the likely effect, or 'level of impact' on existing key viewpoints (and can range from insignificant, low, moderate, high to very high).

Effect on visual character

The Proposal incorporates a number of key measures which have been designed to mitigate potential visual impacts. In particular, these measures respond to the existing height and scale of the main street and are intended to enhance the visual outcome:

- the new main station operations building is of a similar height, scale and dimension to the existing building which currently relates well to the main street
- the integration of the three lift shafts into the concourse canopy to prevent protrusions higher than the canopy and thus minimise the height above the existing wall of the road bridge
- the use of butterfly roof features at either side of the concourse to delineate the entrance, yet these structures have been designed to not overwhelm the surrounding scale and character
- design of the station stairway and platform canopies to be of a height as low as possible and be integrated into the concourse in a seamless way, while also reducing the canopy length on Platform 1/2 (not used for normal scheduled passenger services)
- retention of the heritage station buildings on each of the platforms, with those buildings contributing to the attractive and pedestrian-like scale of the station.

As noted above, the new station operations building is of a similar height, scale and dimension to the existing building which currently relates well to the main shopping street of Croydon. This similarity would allow the new building to continue as a compatible element of the established triangle of buildings with the historic Croydon Post Office and The Strand Café.

As is intended, there would be a more contemporary station operations building and concourse to replace the existing structures, with the design visually delineating these from the heritage elements. Yet, the design has specifically focussed on retaining the key essence of the built character and the relationship of the station to the main street.

On the northern side, at the corner of Meta and Hennessy Streets, there would be a change to the existing character as the new concourse and entry opens up direct access to the station. Although the new built elements would be visually obvious, they would be of a scale compatible with the surrounding buildings along Hennessy Street.

It is acknowledged that the new station and concourse would represent a distinct change to this part of Croydon which would contrast somewhat with the existing character when it is first

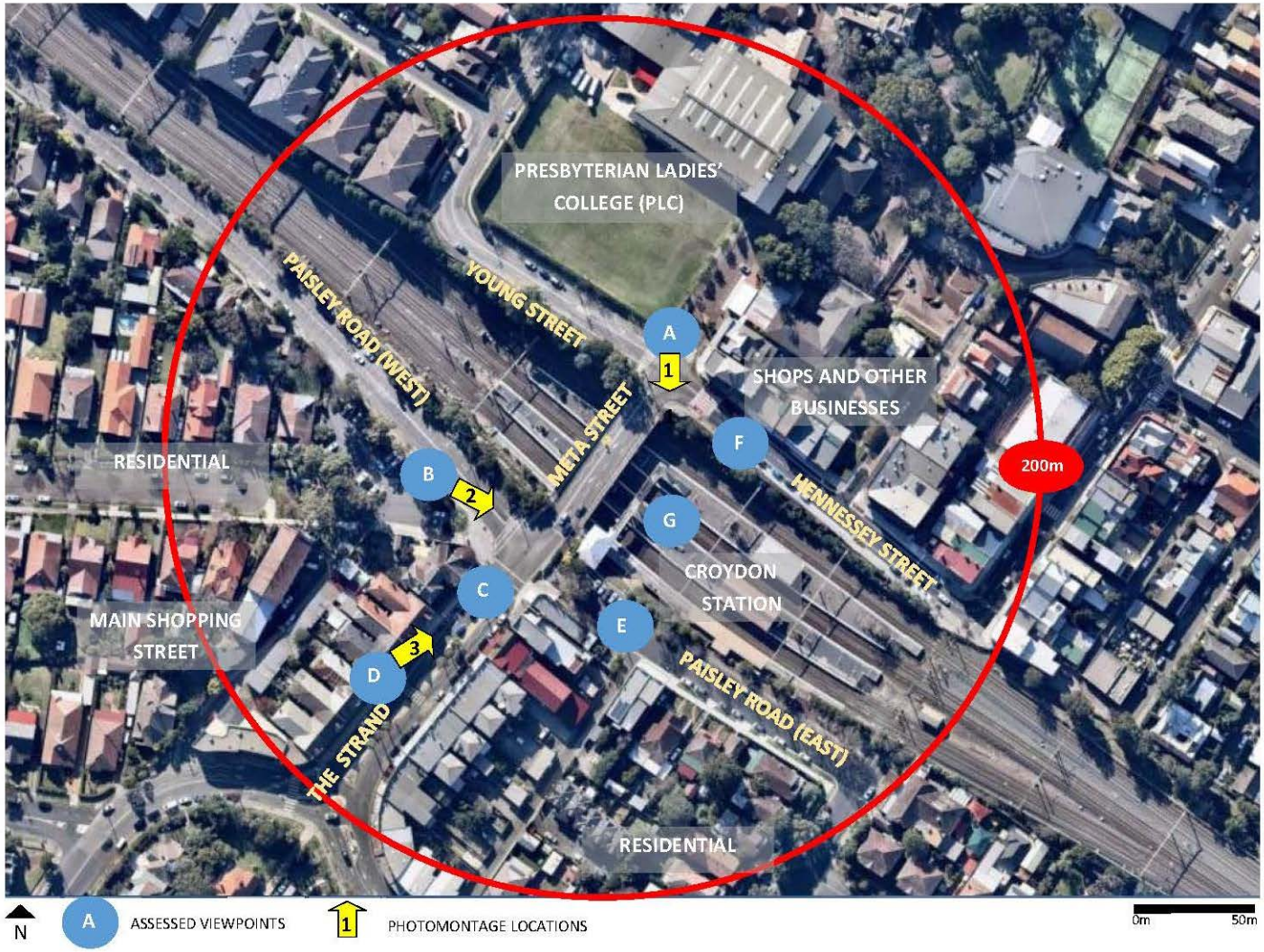
constructed. However, over time, as viewers become more familiar with the changes, it is suggested that it would become a more integrated and compatible part of the overall character and one appreciated as a modern public facility.

Effect on key view points

Envisage Consulting has undertaken an assessment from seven different receiver locations around the station to determine the overall visual impact from each location (ranging from insignificant, low, moderate, high or very high). The location of the receivers included in the assessment is shown in Figure 9 and the results of the assessment are summarised in Table 7.

To inform the visual assessment, digital photographs were taken during the course of the fieldwork from three different locations to illustrate existing views in the vicinity and then a model of the Proposal was rendered to show indicative elements of the Proposal, where relevant to provide an indication of the potential visual changes. Refer to Figure 10, Figure 11, Figure 12, Figure 13, Figure 14 and Figure 15 for existing and proposed views.

The majority of receiver locations, including residential dwellings, road corridors and public spaces around the station precinct have been determined to have an overall low-moderate visual impact with regard to the Proposal and its associated infrastructure.



KEY VIEWPOINTS AND PHOTOMONTAGE LOCATIONS

Figure 9 Key view points and photomontage locations (Envisage Consulting, 2015)

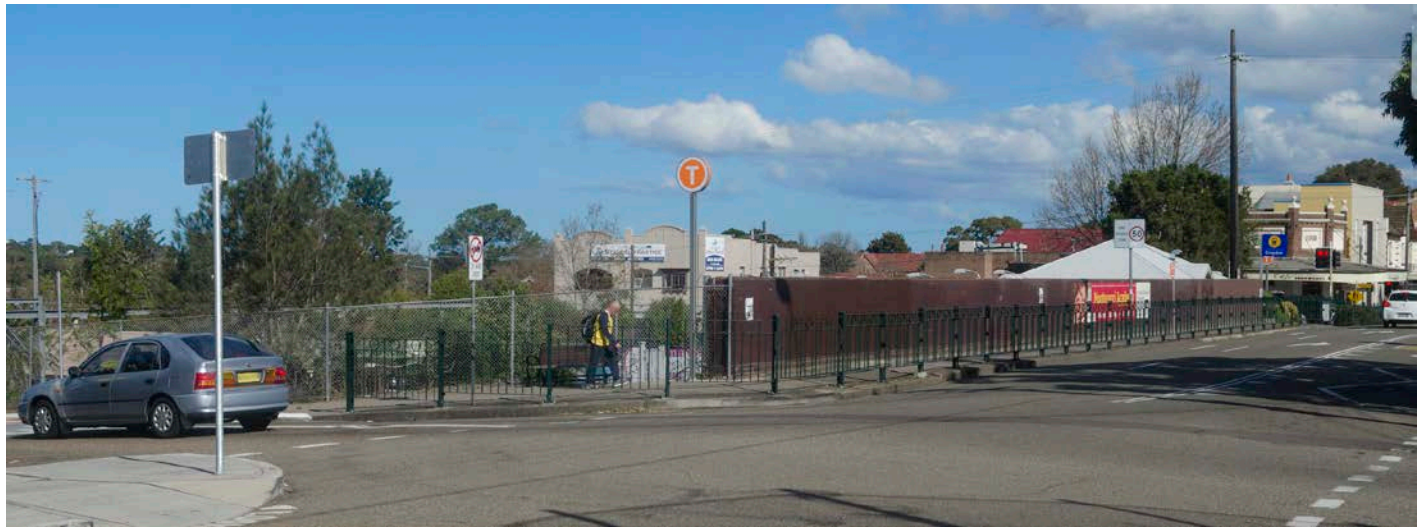


Figure 10 Existing view from corner of Meta Street and Presbyterian Ladies College (Envisage Consulting, 2015)

Figure 11 View of Proposal from corner of Meta Street and Presbyterian Ladies College (Envisage Consulting, 2015)

Artist's impression only – subject to detailed design

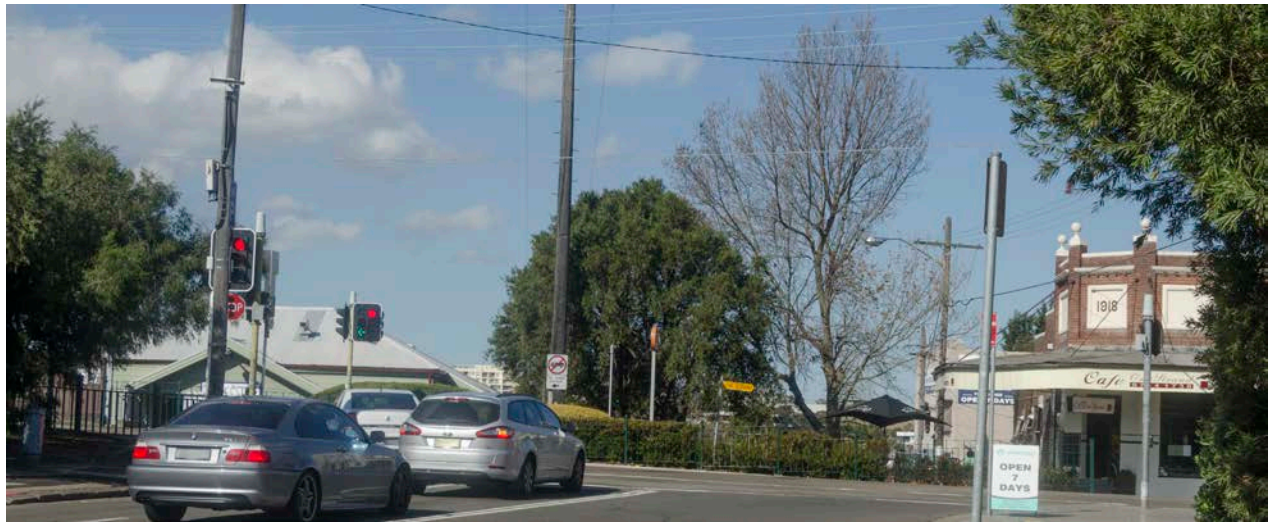


Figure 12 Existing view from Paisley Road (Envisage Consulting, 2015)

Figure 13 View of Proposal from Paisley Road (Envisage Consulting, 2015)

Artist's impression only – subject to detailed design

Figure 14 Existing view from The Strand (Envisage Consulting, 2015)

Figure 15 View of Proposal from The Strand (Envisage Consulting, 2015)

Artist's impression only – subject to detailed design

Table 7 Summary of visual impacts

Public viewpoint	Approximate distance	Visual sensitivity	Magnitude of visual change	Overall visual impact	Recommended further mitigation
Viewpoint A: Corner of Meta Street and Presbyterian Ladies College (PM1)	0-25 m	High	Moderate	Moderate	There may be an opportunity to provide some landscape planting near the street corner to soften this area.
Viewpoint B: Paisley Road (post office side**)** (PM2)	0-50 m	Moderate	Moderate	Moderate	Ensure an attractive public space, that acknowledges both The Strand Café and station entrance and includes landscape improvements (paving, street trees, seating), is achieved.
Viewpoint C: The Strand (upper)	0 – 20 m	High	Moderate	Moderate	Ensure an attractive public space, that acknowledges both The Strand Café and station entrance and includes landscape improvements (paving, street trees, seating), is achieved.
Viewpoint D: The Strand (mid to lower) (PM3)	75-120 m	Moderate	Low	Low	None required.
Viewpoint E: Paisley Road (eastern side)	10-120 m	Low	Moderate	Low	Ensure minimal effect on existing trees. Proposed lopping of Plane Trees (branches below 3 m) appears excessive and the proposed removal of two Plane Trees is particularly negative and alternatives should be further investigated.
Viewpoint F: Hennessy Street	0-5 m	Moderate	Low	Low	None required.
Viewpoint G: from station	0 m	High	Moderate	Moderate	None required.

Other impacts

The Proposal would include the installation of lighting for operational, safety, security and maintenance purposes. Night lighting would include building and pole mounted directional spot lighting and pole mounted pedestrian lighting. The majority of infrastructure areas associated with the Proposal would be unlikely to require additional lighting, or lighting that would result in a direct line of sight from surrounding view locations. Light installations would be installed in accordance with the *AS 4282:1997 Controlling the Obtrusive Effects of Outdoor Lighting*, and avoid light spill to adjoining road corridors and residential areas.

6.2.3 Mitigation measures

Measures to mitigate visual impacts during construction would be included in a CEMP for the Proposal and would include measures such as minimising light spill during night works, screening of compounds and minimising tree removal (in particular along Paisley Road). Refer to Table 16 for a list of proposed mitigation measures.

The overall visual significance of the Proposal has been determined as low to moderate for surrounding receiver locations, and mitigation measures should be considered to minimise the level of residual visual impacts. The detailed design of the Proposal would be undertaken with reference to the recommendations included in the Visual Impact Assessment (Envisage Consulting, 2015) which is included in the list of proposed mitigation measures in Table 16. Opportunities for mitigation include:

- progressing the detailed design of the Paisley Road entrance with regard for the current setting and character as far as possible, and include improvements such as effective landscaping, seating and quality paving. The detailed design should also consider opportunities for a hedge at the Meta Street/Paisley Road entrance to visually separate the road edge from the pavement (similar to the existing)
- increasing the existing avenue of Plane Trees along Paisley Road with new street trees planted near the new car parking area
- providing some landscape planting and furniture such as seating close to the entrance to increase the attractiveness and general amenity of the Hennessy Street entrance and avoid excess fencing.

6.3 Noise and vibration

An environmental Noise and Vibration Impact Assessment has been undertaken by GHD for the Proposal (GHD, 2015). The findings of the assessment are summarised in this section.

6.3.1 Existing environment

Sources of noise in the vicinity of the Proposal are typical of a suburban centre affected by road and rail traffic. Existing sources of vibration in the immediate area would most likely be attributable to trains passing through the station. Sensitive receivers within close proximity to the Proposal include:

- residences along Paisley Road, Paisley Lane, Edwin Street North/South, Heighway Avenue, Thomas Street, Malvern Avenue, Fitzroy Street, Grosvenor Street, Meta Street, Young Street, Hennessy Street, College Street, Hordern Parade, Railway Street and Elizabeth Street
- commercial receivers on The Strand, Meta Street and Hennessy Street
- Presbyterian Ladies College north of the station, the Montessori Academy at the eastern end of Paisley Road, and the KU Croydon Preschool to the west on Railway Street
- Croydon Medical Practice on Paisley Road and Croydon Medical Centre on The Strand.

Additionally, transient receivers (such as customers and pedestrians generally transiting along The Strand, Meta Street and Hennessey Street) would have the potential to be impacted for short periods from construction noise.

GHD conducted continuous unattended noise monitoring for a period of a week in November 2014 on the southern side of Croydon Station (refer Figure 16). The noise measurements taken at this location were considered representative of the background noise level for neighbouring residential receivers and these levels have been used to inform the construction noise assessment.

As per the procedures outlined in the *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009), background noise monitoring results were used to establish a Rating Background Level (RBL) for the day, evening and night time periods, which was then used for noise assessment purposes (refer Table 8). The existing ambient noise level (L_{Aeq}) represents the average noise level over the monitoring period. The background noise level (L_{A90}) represents the noise level exceeded for 90 per cent of the monitoring period and is also referred to as the RBL.

Table 8 Existing background and ambient noise levels

Location	Period	Rating Background Level (L_{A90})	Ambient noise level (L_{Aeq})
Croydon Station (corner of Edwin Street South and Paisley Road)	Daytime	45 dBA	61 dBA
	Evening	41 dBA	59 dBA
	Night time	34 dBA	59 dBA

Note: Daytime 7am to 6pm (or 8am to 6pm Sundays and public holidays), Evening 6pm to 10pm and Night 10pm to 7am (or 10pm to 8am Sundays and public holidays).

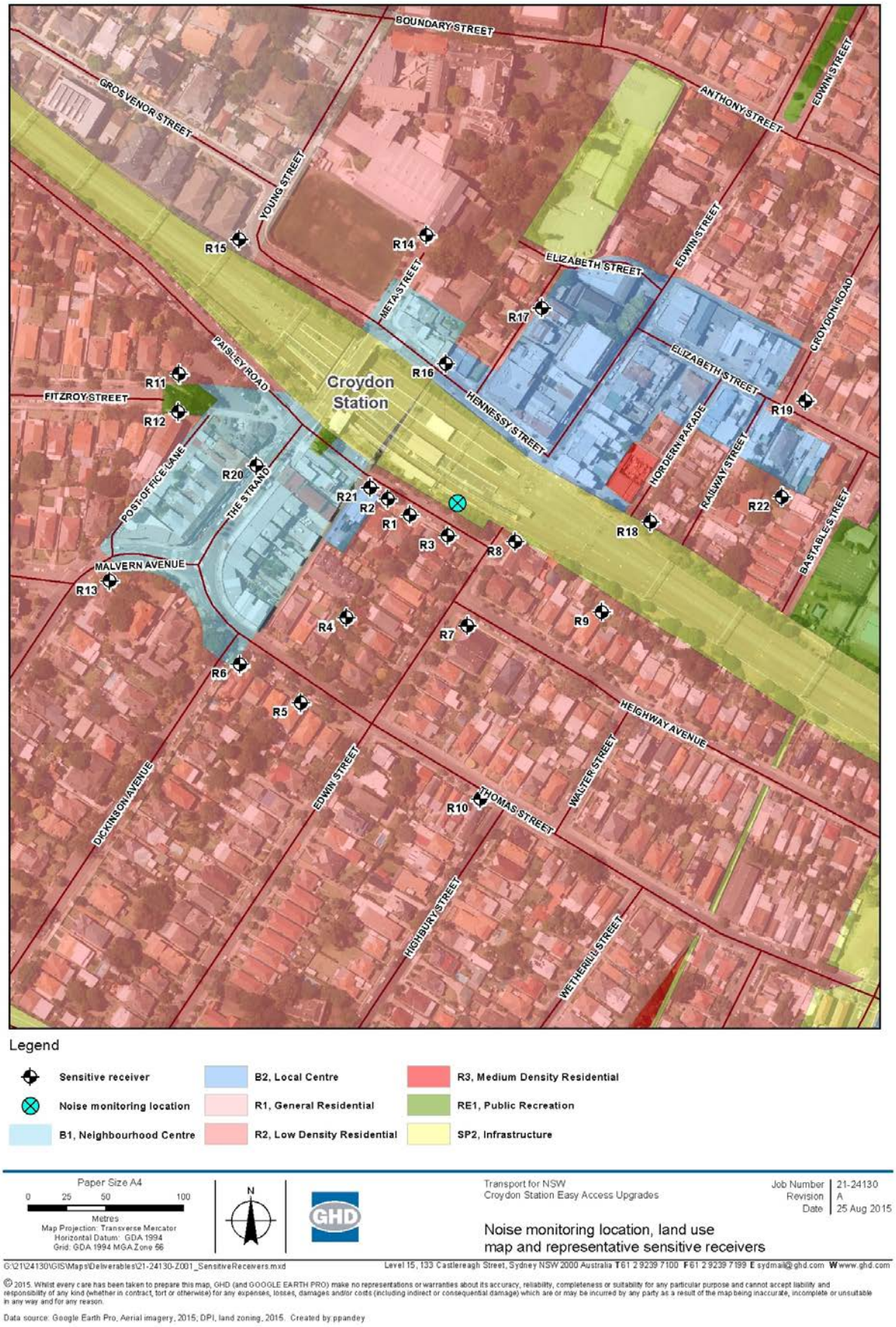


Figure 16 Noise monitoring location and sensitive receivers (GHD, 2015)

6.3.2 Potential impacts

a) Construction phase

Noise

Proposal specific noise criteria

Proposal specific noise criteria (PSNC) have been determined for receivers as per the procedures in the ICNG. The ICNG prescribes noise management levels for non-residential receivers such as commercial, schools and medical centres, while noise management levels for residential receivers are calculated based on the RBL + 10 dBA (for daytime periods) or the RBL + 5 dBA (for evening and night time periods). In addition, a 'highly noise affected' level of 75 dBA for residential receivers represents the point above which there may be strong community reaction to noise. The PSNC for the Proposal are outlined in Table 9 and Table 10.

Sleep disturbance noise goals have also been established for residential receivers which are based on the *NSW Road Noise Policy* (Department of Environment, Climate Change and Water, 2011). Based on the Policy, the sleep disturbance criterion for residential receivers is a screening level of 49 dBA L_{Amax} (external) which is calculated from the background night time noise level + 15 dBA.

For traffic noise, the criterion applied on public roads generated during the construction phase of a project is an increase in existing road traffic noise of no more than 2 dBA.

Table 9 Proposal specific noise criteria – residential receivers

Period	Standard hours PSNC ($L_{Aeq, 15\ min}$)	Out of hours PSNC ($L_{Aeq, 15\ min}$)
Daytime	55 dBA	50 dBA
Evening	N/A	46 dBA
Night time	N/A	39 dBA

Table 10 Proposal specific noise criteria – non-residential receivers

Receiver type	PSNC – when in use ($L_{Aeq, 15\ min}$)
Classrooms at the Presbyterian Ladies College, Montessori Academy and KU Croydon Preschool	55 dBA*
Croydon Medical Centre and Croydon Medical Practice	55 – 60 dBA*
Commercial premises (including offices, retail outlets)	70 dBA

*Management levels are based on a 45 dBA internal noise management level and a 10 dB reduction through an open window.

Noise modelling

Construction of the Proposal would be undertaken over a period of approximately two years in various stages (refer Chapter 3 for more detail). Modelling of noise sources (trucks, excavators, grinders etc.) for fifteen overarching stages/scenarios was undertaken by GHD to allow for a 'worse-case' assessment.

The modelling takes into account the likely construction staging of when certain construction plant may be operational and the known Sound Power Levels for each item of plant to calculate a predicted noise level at a receiver location. A total of 22 indicative receiver locations around the station were selected for the assessment and are shown in Figure 16. The predicted noise level is then compared with the PSNC for that receiver to determine whether there might be exceedances during construction.

During construction, it is unlikely that all machinery would be operational at the same time during a particular stage or activity (like the modelling assumes), but taking a 'worse case' scenario approach helps to identify where noise impacts are likely to be a concern and assists in the formulation of mitigation measures.

Summary of noise impact during standard hours

From the assessment, it is likely that there would be exceedances of the daytime PSNC for residential receivers during most of the construction stages. In particular, there may be exceedances at or above the highly noise affected level of 75 dBA for residential receivers along Paisley Road and the northern end of Edwin Street South (R1, R2 and R3 in Figure 16) and Hennessy Street (R16) during vegetation removal, demolition and for road and interchange works (reconfigured parking, bicycle racks etc). Other residential receivers on nearby streets (R4-R7, R9-R13, R15, and R17-R19) may also experience noise impacts from the more noise-intensive construction activities (e.g. demolition and construction of the new station operations building and amenities at concourse level).

There may also be exceedances of the PSNC for non-residential receivers:

- the Montessori Academy (R8) is likely to be most impacted by site establishment activities, vegetation removal, demolition, construction of the new station operations building and amenities at concourse level and interchange works
- the Presbyterian Ladies College (R14) is likely to be most impacted by demolition and construction of the new station operations building and amenities at concourse level
- the Croydon Medical Centre on The Strand (R20) is likely to be most impacted by demolition and construction of the new station operations building and amenities at concourse level and interchange works
- the Croydon Medical Practice on Paisley Road (R21) is likely be most impacted by vegetation removal, demolition, construction of new structures (pedestrian bridge, lifts etc.), construction of the new station operations building and amenities at concourse level, installation of fixtures (lighting, CCTV cameras etc.) and road and interchange works
- there would not be exceedances of the PSNC for the KU Croydon Preschool (R22) during standard hours
- noise levels are also predicted to exceed the noise affected PSNC of 70 dBA at commercial receivers (when in use) directly adjacent to the works along Paisley Road and Hennessy Street.

In relation to construction traffic noise, the construction movements associated with the Proposal are considered to be an insignificant additional contribution to the ambient noise environment.

Summary of noise impacts during out of hours periods

Out of hours works would be required during track possessions that typically extend 24-hours a day over a weekend. Around 14-18 track possessions would occur during the construction period and the following activities are likely to be required during possessions or out of hours periods:

- detailed site survey, services investigations and geotechnical investigation works within and around the tracks
- installation of temporary demarcation fencing/hoardings, etc. to allow works to be undertaken during non-possession periods
- placement of temporary pedestrian bridge and other temporary facilities on platform using cranes
- relocation of underground services to accommodate new/adjusted infrastructure
- demolition and construction of new replacement pedestrian bridge and construction of foundations for lift shafts
- installation of lift structural components, elevated landings and canopy components using cranes
- platform re-grading (if required) and installation of tactiles where plant or personnel are required to work near the platform edge
- testing and commissioning of station communications systems and equipment including augmentation of station CCTV and ticketing systems
- testing and commissioning/cutover of new lifts and upgraded station power supply.

The modelling has indicated that there would be exceedances of the out of hours PSNC for all representative receiver locations (including levels above the sleep disturbance criteria). The most affected receivers would be those on Paisley Road and Hennessy Street and the most noise intensive activities are likely to be demolition and platform resurfacing/re-grading, which may result in noise levels above the highly affected noise level of 75 dBA. The medical practices and schools would not be operational during out of hours periods and therefore would not be impacted by noise at these times.

It is important to note that such out of hours works would only comprise a number of weekends or evening/night time periods over the two year construction period and are primarily required for rail safety, constructability and traffic reasons.

Management measures such as alternative accommodation would be considered under appropriate circumstances in accordance with TfNSW's *Construction Noise Strategy* (TfNSW, 2012c). A range of other notification methods would be implemented for other receivers likely to be affected by noise.

Any out of hours works would be assessed in more detail and subject to approval by TfNSW along with appropriate community notification and mitigation measures in place, in accordance with TfNSW's *Construction Noise Strategy* (TfNSW, 2012c).

Vibration

When assessing vibration there are two categories of vibration criteria, one related to the impact of vibration on building structures, and one relating to human comfort. The *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006) provides vibration criteria for human comfort. For intermittent vibration (like that which could result from construction machinery) the criteria is based on a concept of a vibration 'dose'. The maximum criteria level is 0.4 $m/s^{1.75}$ for residences during the daytime and 0.26 $m/s^{1.75}$ during the night time. For educational facilities (when in use) the maximum criteria is 0.8 $m/s^{1.75}$.

The German Standard *DIN 4150 1999-02 Standard Structural Vibration – Effects of vibration on structures* provides guidelines for vibration levels for building structures. For dwellings the Standard recommends a maximum allowable vibration velocity of 5 mm/s, and for commercial buildings a maximum allowable vibration velocity of 20 mm/s.

The Noise and Vibration Impact Assessment provided safe working buffer distances for vibratory rollers, wacker packers, hydraulic hammers, jack hammers and a bored piling rig which would be used during the construction of the Proposal – these distances are displayed in Table 11.

The assessment stated that the expected magnitude of ground vibrations should not be sufficient to cause damage to buildings within 15 metres of the works however this would depend on the size of the equipment used. If smaller equipment or work methods that do not generate significant vibration emissions are to be used (such as a two tonne vibratory roller and jack hammer) then the safe working distance could be reduced to around two metres.

Where reasonable and feasible, smaller equipment (such as vibratory rollers less than four tonnes) must be considered for works around heritage structures (i.e. station platform buildings and the Meta Street road bridge) where those works are required within the safe working buffer distances prescribed in Table 11. There is also potential for some human comfort impacts at some nearby receivers.

Table 11 Vibration safe working buffer distances

Plant	Human comfort	Structural damage (standard dwelling)	Structural damage (heritage building/structure)
Vibratory roller (7-13 t)	100 m	30 m	15m
Vibratory roller (4-6 t)	40 m	24 m	12 m
Vibratory roller (2-4 t)	20 m	12 m	6 m
Vibratory roller (1-2 t)	15 m	10 m	5 m
Wacker packer	15 m	10 m	5 m
Small hydraulic hammer	7 m	4 m	2 m
Jack hammer	Avoid contact	2 m (nominal)	1 m (nominal)
Piling (bored)	-	4 m (nominal)	2 m (nominal)

b) Operational phase

Operational activities at Croydon Station are not proposed to significantly change and as a result the existing noise and vibration levels are unlikely to change.

Plant expected to be associated with the operation of the Proposal would include three lifts, modifications to the PA system, lighting and new station operational equipment. Mechanical plant required for operation of the lifts and modifications to the PA system would be identified during detailed design and would be selected in order to achieve the acceptable noise levels identified in the *NSW Industrial Noise Policy* (EPA, 2000) and would be free from annoying sound characteristics such as tonality, low frequency, impulsive and intermittent noise.

Additional traffic on the local road network due to the car park changes has been assessed and would produce an insignificant increase in noise levels and would not impact on nearby sensitive receivers.

6.3.3 Mitigation measures

Prior to commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Construction Noise Strategy* (TfNSW, 2012c) and the Noise and Vibration Impact Assessment (GHD, 2015).

The CNVMP would be the key management document that would prescribe specific mitigation measures to help reduce the impacts of construction noise and vibration. The measures would focus on contractor inductions, the efficient operation of plant and equipment, along with prescribing safe working distances for vibration intensive equipment and detailing procedures for noise and vibration monitoring, and for obtaining TfNSW approval for out of hours works.

The CNVMP would also be supported by the Community Liaison Plan to be prepared for the Proposal, which would detail community notification requirements and mitigation measures which can range from letter box drops, phone calls to offers of alternative accommodation.

Refer to Table 16 for a list of proposed mitigation measures.

6.4 Indigenous heritage

6.4.1 Existing environment

The Croydon area forms part of a landscape that was used by the Wangal people for many thousands of years prior to European contact. A basic search of the Aboriginal Heritage Information System (AHIMS) database was undertaken on 9 September 2015 and an area within a 200 metre buffer around the station was searched in order to gain information on the archaeological context of the area, and to ascertain whether there are any previously recorded Indigenous sites.

No Aboriginal sites have been recorded within or in the vicinity of the Proposal site, and the Proposal site is not located within a landscape feature likely to indicate the presence of Aboriginal objects in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (OEH, 2010).

The Proposal is located in an area that has been highly modified for a range of uses associated with the railway, and it is considered therefore unlikely that any Indigenous heritage items would be located in or in the vicinity of the Proposal area, due to this past history of disturbance.

6.4.2 Potential impacts

a) Construction phase

Construction of the Proposal would involve some minor excavation and other ground disturbance activities which has the potential to impact Indigenous sites, if present. As no known Indigenous heritage items are located in the vicinity of the Proposal site and the potential for unknown items is considered to be low, the Proposal is unlikely to affect Indigenous heritage during construction.

b) Operational phase

There would be no risks to Indigenous heritage from the operation of the Proposal.

6.4.3 Mitigation measures

If unforseen Indigenous objects are uncovered during development, work should cease in the vicinity of the find and the TfNSW Project Manager and TfNSW Environment and Planning Manager are to be notified immediately to assist in co-ordinating next steps which are likely to involve consultation with an archaeologist, the OEH and Local Aboriginal Land Council. If human remains are found, work should cease, the site should be secured and the NSW Police and the OEH should be notified.

If changes are made to the Proposal that may result in impacts to areas not covered by this assessment, further archaeological assessment would be required.

Refer to Table 16 for a list of proposed mitigation measures.

6.5 Non-Indigenous heritage

A Statement of Heritage Impact (SoHI) has been prepared by AECOM for the Proposal which included a desktop assessment and site inspection of the Proposal area which was undertaken on 31 August 2015. The findings of the SoHI are summarised in this section.

6.5.1 Existing environment

Historical context

As part of the early settlement, 100 acres of land (including the station) was initially granted to Augustus Alt in 1794 and was later sold to John Palmer in 1802, and does not appear to have been heavily cultivated. By 1820, Palmer's land had been incorporated into Ashfield Park Estate and then was later subdivided in 1858.

Meanwhile the Main Western Line was opened on 26 September 1855 and sought to connect Sydney with the rural railways under construction across the Blue Mountains to Bathurst and across the Southern Highlands to Goulbourn. The original intention of the line was not to serve the suburban population however local petitions were raised for additional stations along the line.

Croydon was successful in securing a platform which opened under the name of Five Dock on 7 January 1875. The name Croydon Station came into use late in August 1876. Since then, the station had undergone additional modifications and expansions including:

- 1883: vertically curved footbridge is constructed at the western end of the platform
- 1892: quadruplication of the line
- 1922/23: existing footbridge and original booking office (subsequently demolished and replaced in 1995) are constructed
- 1926: sextuplication of the line and the 'Standard Eddy' shelter relocated from Platform 3/4 to its current position on Platform 5.

Statutory context

A search of historic heritage registers including the World Heritage List, National Heritage List, the Commonwealth Heritage List, the Register of the National Estate (non-statutory archive), the NSW State Heritage Register, RailCorp's Section 170 Heritage and Conservation Register and the heritage schedules of the Burwood LEP and Ashfield LEP was undertaken for the Proposal area and surrounds. In addition, a desktop review of existing parish maps, historical plans, aerial photography and other historical records was undertaken by AECOM to inform the assessment.

Croydon Railway Station Group (refer Figure 17) is listed on the State Heritage Register (#01125), Section 170 Heritage and Conservation Register (#4801110) and the heritage schedules of the Burwood LEP (I149) and Ashfield LEP (363). Heritage items/areas located adjacent to the Proposal site are listed in Table 12.

The statement of significance from the State heritage listing is reproduced below (Heritage Division, 2010):

> *Croydon Railway Station has State significance as the existing station arrangement with railway structures dating from the 1892 quadruplication and 1927 sextuplication of the line is illustrative of the expansion of the railways in the late 19th and early 20th century undertaken to accommodate suburban development along the line and to the west. Designed under the direction of Commissioner Edward Eddy, the extant 1890s platform building is largely intact and it demonstrates the first use of island platforms in NSW and is one of four extant examples of this type of station building design, known as the 'Standard Eddy'. The 1920s 'initial island' building and 1940s 'Railway Stripped Functionalist' building have aesthetic significance and together are able to demonstrate the shift in the architectural styles employed by the railways during the first half of the 20th century.*
>
> *The 1890s footbridge is significant and relatively uncommon in terms of its overall form and construction technique as it was one of the first footbridges in the Sydney Metropolitan region which has reinforced concrete employed for its piers and columns. The 1920s palm tree is significant as it provides insight into the landscaping patterns that existed at Croydon station and others stations along the line during the early 20th century.*

Despite the listing being in error regarding the date of construction of the footbridge (research having confirmed that it was not constructed in the 1890s, but rather in the 1920s) it remains one of the earliest examples of a reinforced concrete footbridge in the Sydney metropolitan rail network. Therefore, while the dates in the listing are incorrect, the significance assessment is upheld in relation to the technical and rarity values ascribed to it.

Likewise, the listing is in error with regard to the overhead booking office. The earlier 1923 booking office was replaced in 1995. This element of the significance assessment has not been used in the impact assessment.

Table 12 Heritage items/areas in the vicinity of the Proposal

Heritage list	Item/area
Ashfield LEP	Edwin Street North Conservation Area (C28)
Burwood LEP	Presbyterian Ladies College (I156)
Burwood LEP	Malvern Hill Conservation Area (C13)
Burwood LEP	Cintra Estate Conservation Area (C6)
State Heritage Register Burwood LEP	Croydon Sewer Vent (#01639 and I158)

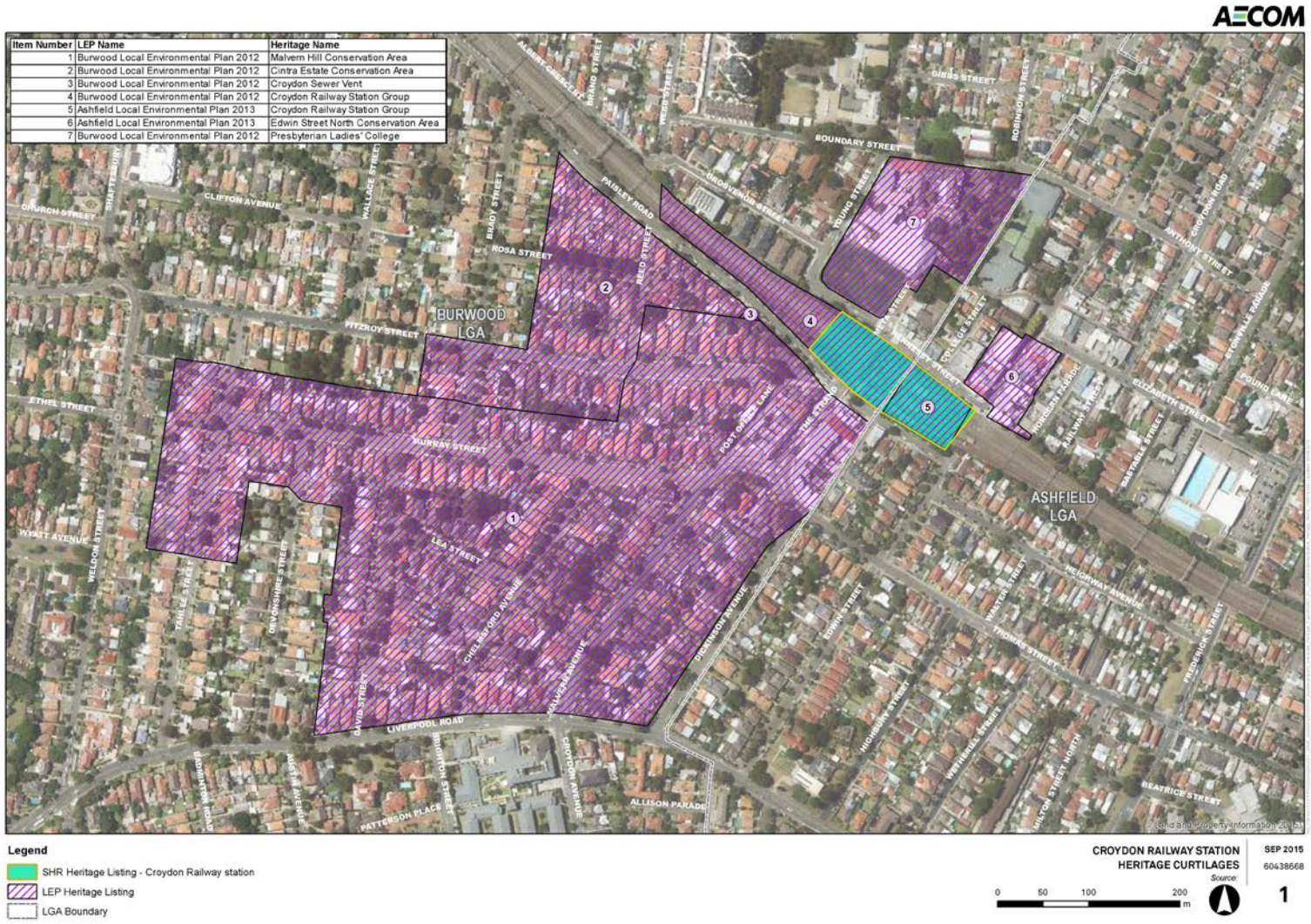


Figure 17 State heritage curtilage of Croydon Station and nearby heritage items/areas (AECOM, 2015)

Physical description

Detailed information on the physical description for each of the heritage elements of the station is provided in the SoHI. In particular, a summary of the description of the existing footbridge is provided below given it would be impacted by the proposed works (also refer Image 3, page 19). Also of relevance is the interior of the Platform 3/4 building which would also be affected through an upgraded communications equipment room.

Mott MacDonald prepared a structural assessment of the existing footbridge, using the layout definitions defined in Figure 18 and used throughout the following description. The footbridge in general consists of a series of reinforced concrete trestles comprising four columns connected by double arches at the top. The spans are cantilevered rolled steel joists with a concrete deck.

The footbridge can be divided into two parts: the western portion, consisting of TR 1, 3 and 2A together with stairs 2, 3 and 4 which is still in active use; and the eastern portion, being TR 1A, 1B and 2B and stair 1 that are no longer in active use. The use of these elements has been disabled through the removal of the span between TR 1A and 2A in 1995 and the earlier demolition of a previous overhead booking office and unpaid passenger concourse supported by TR 2B and 1B. Trestle 1B consists of a single arch, rather than the four columned trestles represented by the other trestles. As such, it lacks cross-bracing and in addition exhibits significant spalling.

The stairs are supported on concrete piers with steel beams and stringers, the steps are of reinforced concrete. The balustrades on the footbridge and stairs are a mixture of timber intermediate posts with vertical steel railings. Some original sections remain, including the cast iron newel posts at the bottom of stair 2, 3 and 4 (circa 1923), together with the safety balustrades and guards over tracks 2 and 3 (circa 1926) and a small section of original cast iron spiked capping over Platform 2 (circa 1923) (Hyder Consulting, 2015).

The internal space of the Platform 3/4 building is divided into six spaces, including two store rooms, a communications room that includes an annex that appears to have formerly been used as a cleaner's room, a male toilet, female toilet and Family Accessible Toilet. The toilets have been recently renovated and have been extensively modified and contain no historical/original fabric or features. The two store rooms at the northern end of the building retain original or very early mini-orb corrugated iron ceiling.

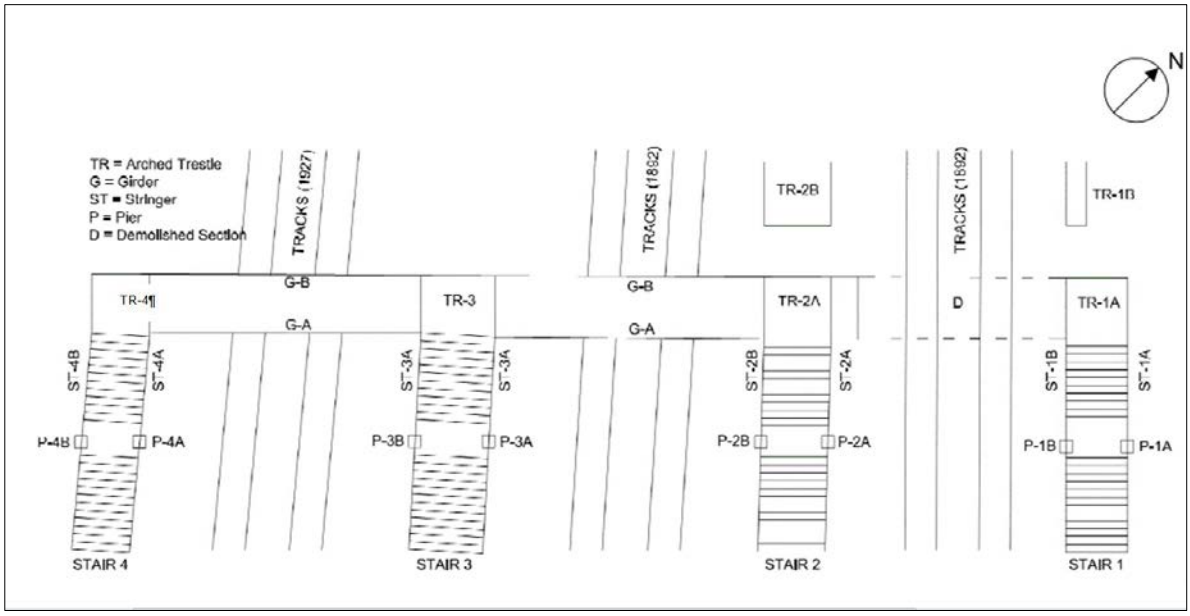


Figure 18 Current layout of the footbridge and associated stairs (Mott McDonald, 2014a)

6.5.2 Potential impacts

a) Construction phase

The construction of the Proposal would involve the following activities:

- demolition of the existing booking office, footbridge (and all trestles) and stairs including the disused stairs at northern end of station
- construction of new pedestrian bridge and stairs with three new lifts (and associated canopies) and new station operations building
- temporary enabling works to maintain the existing level of service that would include a temporary footbridge at the eastern end of the platform, temporary booking office and ticketing facilities and also crane pads for construction works
- alterations to the Platform 3/4 building to upgrade the communications equipment room which would include removal of an internal weatherboard wall, installation of internally mounted air conditioning unit, the lining of the floor and creation of general power outlets in the ceiling
- services and landscaping including relocating the overheard wiring attached to the existing footbridge, undergrounding the existing High Voltage electrical cables on the southern side of the rail corridor, removal of the existing substation on the southern side with a new pad mount substation

Impacts to heritage significance

In summary, there are components of the station that would not be impacted by the Proposal. These include the Meta Street road bridge, Platform 1/2 building and the 1920s palm tree on Platform 1/2. The demolition of the footbridge would result in impacts to the historical (criterion a), technical (criterion c), social (criterion d), research (criterion e) and rarity (criterion f) significance. It is proposed to mitigate some of this impact through heritage interpretation, as outlined in the Heritage Interpretation Strategy (refer Appendix B of the Statement of Heritage Impact, AECOM 2015), which would include pavement treatments showing the outline of the existing footbridge, together with perforated screen material and traditional text-based interpretation panels.

The construction of the proposed pedestrian bridge and lifts would impact on the aesthetic (criterion c) significance, however, this has been minimised through sympathetic design and the selection of materials and finishes and the proposed interpretation. The construction has the potential to have a positive impact on the social (criterion d) significance through increased access and the Heritage Interpretation Strategy. The temporary enabling works (e.g. temporary footbridge) would have no long-term impacts on the assessed significance. The installation of service trenches through the eastern end of the platform have the potential to impact on relics associated with the historic subway. It is recommended that impacts be avoided during detailed design.

Table 13 Assessment of impacts to heritage significance

Action	Impact to heritage significance
Historical significance State Heritage Register (SHR) criteria (a)	*Croydon Railway Station is historically significant as the existing station arrangement with extant railway structures dating from the 1892 quadruplication and 1927 sextuplication of the line is able to clearly illustrate the expansion of the railways in the late 19th and early 20th century undertaken to accommodate suburban development along the line and to the west. The extant 19th and 20th century platforms, buildings, footbridge and overbridge are collectively able to demonstrate a former era of travel.*
Demolition	The demolition of the current booking office would have no heritage impact as this structure was constructed in 1995 and is not of heritage significance. The demolition of the footbridge and trestles would remove an element identified as contributing to the significance of the station. This significance has been attributed as elements of the station demonstrate "the continual pattern of human use and occupation" (NSW Heritage Office, 2001). The removal of the 1922/3 footbridge would reduce the station's ability to demonstrate the alterations made to the station, and by extension similar stations, during the 1920s, particularly those associated with the 1926/7 sextuplication of the line. However, the station building on Platform 3/4 would be retained to indicate this phase of construction works.
Construction	The construction of the proposed pedestrian bridge, station operations building, lifts and canopies would contribute to Croydon Station's ability to demonstrate the evolution of a medium sized railway station to the changing expectations and requirements of rail passengers. It would effectively be the next layer in the pattern of human use. Within this, however, the design, materials and finishes selected have endeavoured to be as sensitive to the historical context to ensure the new layer does not obscure the existing layers. The height of the design has been kept to a minimum so that it does not overwhelm the station and surrounding buildings and has also been kept light weight through the use of open glass and mesh sides to the pedestrian bridge. This also allows views of the platform buildings to be retained.
Temporary enabling works	The temporary footbridge, booking office and other associated works would not impact on the historical significance of the station.
Services and landscaping	The landscaping would not impact on the historical significance of the station. The creation of the upgraded communications room in the former general waiting room of the Platform 3/4 station building proposes the removal of a later weatherboard wall and impacts to the original or early mini orb corrugated iron ceiling. This would remove a later modification to the building, which contributes to an understanding of the manner in which the building has been used to meet the evolving needs of staff and customers. These impacts can be mitigated through an archival recording prior to construction commencing and by attempting to reuse existing openings in the ceiling during the creation of the General Powerpoint Outlets.
Historical association significance SHR criteria (b)	No assessment provided against this criterion.
Demolition	N/A
Construction	N/A
Temporary enabling works	N/A
Services and landscaping	N/A

Action	Impact to heritage significance
Aesthetic significance SHR criteria (c)	*Croydon Railway Station has aesthetic significance with its 1890s 'Standard Eddy' building which has been altered in terms of its relocation from a typical island platform to a wayside platform, but still retains characteristic features of this type of station building namely the cantilevered awnings with wide fascia. The 1920s 'initial island' platform building has been altered internally but it retains a linear form, gable roof and integrated awnings. The 1940s 'Railway Stripped Functionalist' building with its cantilevered awnings and steel-framed windows has typical features of this type of station building and is aesthetically significant as it demonstrates a shift in the style from earlier 'initial island' platform buildings. The overhead booking office has been altered internally but it retains characteristic features of such buildings, namely the pre-cast concrete panels with weatherboard construction appearance and its location on the footbridge. The Croydon Station footbridge has technical significance as it was the first time within the Sydney metropolitan area that reinforced concrete was used for the piers and columns of a footbridge.*
Demolition	The demolition would not impact on the aesthetic significance in that it would not involve the removal of any of the platform buildings mentioned in the listing. The demolition of the footbridge would remove the technical significance, with the footbridge being an early example of the use of reinforced concrete piers and columns within the metropolitan network. It is proposed that the impact to the technical significance will be mitigated through interpretation.
Construction	The construction of the proposed station operations building and pedestrian bridge would introduce a new element into the station precinct, however, the design, together with the materials and finishes have been selected to minimise the intrusion into the heritage precinct. The design plays a fine balance between the traditional hipped roof form selected for the proposed station operations building with the more modern, but restrained, butterfly form of the canopies for the entrances.
Temporary enabling works	The temporary footbridge would intrude on the heritage precinct during construction, but as it is not a lasting form, it would have no long-term aesthetic impacts. As the temporary footbridge would be sited near the location of the 1892 footbridge, it may provide an opportunity to interpret the previous form of the station while it is in use.
Services and landscaping	The installation of the services would have an impact on the station during construction, but would not have a long-term impact.
Social significance SHR criteria (d)	*The place has the potential to contribute to the local community's sense of place, and can provide a connection to the local community's past.*
Demolition	It is unknown whether the footbridge holds esteem within the local community. However, it is considered that there is likely to be some sense of loss associated with its removal, particularly trestles 1A and 1B and stair 1 as these are evocative and highly identifiable landmarks within the rail corridor. The impact to the social significance would be mitigated through interpretation of the footbridge.
Construction	The construction of the proposed lifts would enable the elderly and those requiring equitable access to use and therefore appreciate the heritage significance of the station platform buildings. It is anticipated that the construction of new infrastructure would have a positive impact on the local community's identification with the station.
Temporary enabling works	While the rearrangement of the facilities may temporarily inconvenience some local users, this would not, in the long-term, affect the social significance of the station to the community.
Services and landscaping	The proposed services and landscaping would not impact on the social significance.

Action	Impact to heritage significance
Technical/Research significance SHR criteria (e)	*Croydon Railway Station has moderate archaeological potential. The dilapidated north-eastern platform, bordering Hennessy Street along with the discontinued and highly dilapidated section of the existing footbridge provide useful knowledge about the previous patterns of use and scale of the station complex.*
Demolition	The removal of trestles 1A and 1B and stair 1 would directly impact on the significance of the station under this criterion by demolishing the elements of the footbridge that demonstrate its previous pattern. However, this would be mitigated to some extent by the measures proposed in the Heritage Interpretation Strategy.
Construction	The construction of the replacement pedestrian bridge and new lifts would be off-set from the demolished footbridge trestle locations with the exception of the lift to Platform 1/2, which would be located within the footprint of trestle 2B. This allows the former location of the footbridge elements to be interpreted through the use of pavement markers and perforated panels displaying an image of the footbridge along the Hennessy Street cutting face, as discussed in the Heritage Interpretation Strategy.
Temporary enabling works	The temporary works are not located in areas of archaeological potential.
Services and landscaping	The proposed locations for the insertion of service trenches through the eastern section of the platforms and the possible underline crossing currently would dissect the location of the historic subway. It is unclear what, if anything, remains of the subway, however, it is recommended that this area be avoided during detailed design.
Rarity SHR criteria (f)	*The items at Croydon Railway Station which have aesthetic and technical rarity include the 'Standard Eddy' platform building, the footbridge. Croydon Station is one of the three stations including Homebush and Summer Hill, in the Metropolitan area which have extant 'Standard Eddy' platform buildings. Another extant 'Standard Eddy' platform building within NSW is at Katoomba station which is unique in terms of its curved form along the platform. The 1890s footbridge with its system of double arches and piers is relatively uncommon in the Sydney Metro region and it was the first footbridge in the Sydney area which used reinforced concrete for the arches and piers and is in terms of its style and techniques a rare example. The initial island platform building, 'Railway Stripped Functionalist' building and overhead booking office and overbridge are common types of standard railway structures.*
Demolition	The demolition of the footbridge would directly impact on the assessed rarity of the item. However, the footbridge has been determined to be highly carbonised and as such there is no viable means of conservation. The spalling of sections of concrete from the footbridge elements on to the platforms, tracks or trains poses a real threat to rail safety. It is not possible to retain the footbridge. The rarity of the station, as it relates to the 'Standard Eddy' platform building on Platform 5 and the 'Railway Stripped Functionalist' building on Platform 3/4 would not be impacted by the demolition of the proposed elements.
Construction	The proposed construction works would not impact on the rarity of the 'Standard Eddy' platform building on Platform 5 and the 'Railway Stripped Functionalist' building on Platform 3/4. There are no proposed works to these items that would impact on their rarity, integrity or intactness.
Temporary enabling works	The temporary works would not directly or indirectly impact on the elements of the station identified as being rare.
Services and landscaping	The services and landscaping would not impact on the rarity of the station.

Action	Impact to heritage significance
Representativeness SHR criteria (g)	*The platform building at Croydon Railway Station is in a largely intact condition externally and it is a good representation of the 'Standard Eddy' design. The other platform buildings are representative of standard types of railway platform buildings and are reasonably well preserved examples. The overbridge with most of its original fabric intact is also a good representative of jack-arch bridge construction.*
Demolition	The proposed demolition works would not impact on items identified as contributing to the representative significance of the station, namely the station platform buildings and the Meta Street overbridge.
Construction	The proposed construction would not impact on items identified as contributing to the representative significance of the station, namely the station platform buildings and the Meta Street overbridge.
Temporary enabling works	The temporary enabling works would not impact on the representativeness of the station while they are in place, and would have no long-term impact.
Services and landscaping	The services and landscaping would not impact on the representativeness of the station while they are in place, and would have no long-term impact.

Statement of Heritage Impact

A Statement of Heritage Impact (SoHI) has been prepared for the Proposal by AECOM to assess the heritage impact of the proposal in accordance with the *NSW Heritage Manual* (NSW Heritage Office & Department of Urban Affairs and Planning, 1996) and the NSW Heritage Office's *Statements of Heritage Impact* (NSW Heritage Office, 2002).

The guidelines pose a series of questions as prompts to aid in the consideration of impacts due to a project, based on the type of proposed works. The Proposal involves the demolition of a building or structure as well as major additions to the station, these process questions are considered in Table 14 and Table 15.

Table 14 Demolition process questions

Process question	Comment
Have all options for retention and adaptive re-use been explored?	Retention and conservation of the footbridge was explored. However, the results of the structural assessment and chemical testing of the concrete (Mott MacDonald, 2014a; Hyder Consulting, 2015) has identified that there is no feasible method to reverse or halt the extensive carbonisation of the concrete. Mott MacDonald and Hyder considered the possibility of conserving and stabilising the steel reinforcements however this is not considered to be warranted. The steel in itself is not of heritage significance – only as a means of holding together the form of the footbridge as a whole. Without the concrete, there is no heritage justification to the conservation of the steel reinforcements, particularly as they cannot be seen or appreciated.
Can all of the significant elements of the heritage item be kept and any new development be located elsewhere on the site?	The replacement pedestrian bridge could be located at the western end of the platforms, however, this does not remove the necessity for the demolition of the footbridge. Over time, the spalling of concrete would continue and creates a severe safety hazard as portions of the footbridge elements could fall onto the platforms, tracks or a train. There is no method to identify when or where in the structure this may occur (Mott MacDonald, 2014b) and it is therefore necessary from a safety perspective that the footbridge and associated elements be removed.
Is demolition essential at this time or can it be postponed in case future circumstances make its retention and conservation more feasible?	It is possible that a new conservation technique for reversing carbonation may become available, however the footbridge poses a safety threat now with no stabilisation options available. There is no potential to retain the item.
Has the advice of a heritage consultant been sought? Have the consultant's recommendations been implemented? If not, why not?	TfNSW has sought advice from a number of sources, including the structural advice and investigations provided by Mott MacDonald and Hyder and heritage advice provided by Orwell and Peter Phillips, Caldis Cook Group and AECOM.

Table 15 Major additions process questions

Process question	Comment
How is the impact of the addition on the heritage significance of the item to be minimised? Are the additions sympathetic to the heritage item? In what way (e.g. form, proportions, design?)	The impact of the new pedestrian bridge and station operations building would be minimised through design and interpretation. Caldis Cook Group has developed a Heritage Interpretation Strategy to reduce the heritage impact (provided in Appendix B of the SoHI). The intent of the design has been to minimise the visual impact of the new pedestrian bridge, lifts and station operations building by: • keeping the roof form of the replacement booking office (i.e. new station operations building) similar, i.e. hipped in form • reducing the height of the new pedestrian bridge and lift shafts to the minimum possible • selection of a simple, slim butterfly form for the awnings over the entrance portals at the Meta and Hennessy street entrances • selection of visually recessive materials and colours • the design of the new pedestrian bridge retains views out over the historic platform buildings and maintains the ability to of the community to appreciate the historical development of the station over time.
Can the additional area be located within an existing structure? If no, why not?	The existing footbridge cannot be retained as no feasible and long-term conservation methods have been identified. The existing booking office, constructed in 1995 is located below the Meta Street level and creates problematic access for those using mobility aids or prams. The Proposal involves the construction of a new wider pedestrian bridge that would be raised approximately 1.2 metres from the existing to allow for street level access from Meta Street and Hennessy Street where such access does not currently exist. The removal of the existing booking office is required to allow for the construction of the new raised pedestrian bridge, stairs and lifts to provide an accessible path of travel and to meet the required vertical clearance above the track (in accordance with Sydney Trains operational requirements). There would be major cost and constructability issues to retain the existing booking office, in addition, the existing configuration of the booking office does not meet Sydney Trains proposed requirements with respect to access and customer service.
Will the additions visually dominate the heritage item?	The design has been carefully developed to minimise the visual impact of the new elements on the heritage station precinct, without becoming a pastiche of a heritage building. This has been achieved through the use of a traditional hipped roof for the station operations building and juxtaposed with a modern butterfly form for the canopies at the Meta Street/Paisley Road and Hennessy Street entrances. The butterfly form is restrained by its angle and slim form.

Process question	Comment
Is the addition sited on any known, or potentially significant archaeological deposits? If so, have alternative positions for the additions been considered?	The new pedestrian bridge would sit adjacent to the footbridge trestles, with the exception of trestle 2B on Platform 1/2, allowing the demolished footbridge to be interpreted through pavement treatments. The remnants of the disused platform against the Hennessy Street cutting would be impacted through the insertion of nine approximately 1200 millimetre in diameter piles to a depth of five to six metres to support the proposed replacement pedestrian bridge and station entrance plaza areas. On Platforms 1/2, 3/4 and 5, the new pedestrian bridge column would be pinned to four piles up to 900 millimetre in diameter and between four and five metres deep. The location of the temporary footbridge does not coincide with an area of known archaeological sensitivity. The proposed service trenches in the eastern end of the platform and tracks may encounter relics associated with the historic subway. It is recommended that detailed design be undertaken to avoid these impacts by modifying the route and/or depth of the trenches.

Impacts to nearby heritage items/areas

Edwin Street North Conservation Area

The new pedestrian bridge would be visible from the Hennessy Street section of the conservation area. The conservation area is focused on the conservation of Edwin Street and the return onto Hennessy Street provides a buffer to the properties in Edwin Street. The glimpses of the Proposal from the Hennessy Street boundary of the conservation area would not impact on the heritage significance as laid out in Edwin Street North Conservation Area.

Presbyterian Ladies College

The significant elements of the College are Shubra Hall and the first school building constructed in 1890. These items are located at the far extent of the College and there are no views to or from these items to the station. The Proposal would therefore not impact on the heritage significance of this item.

Malvern Hill Conservation Area

The Proposal would be visible from the Paisley Road portion of the conservation area. Views from the conservation area towards the Proposal would be largely confined to the new station operations building, which would screen views of the new pedestrian bridge and lifts. As the new station operations building has been designed to largely reflect the scale, bulk, massing and roof line of the existing overhead booking office, it is anticipated that the Proposal would not alter views from the conservation area to any large degree. Views towards the conservation area along Meta Street would also not be altered by the Proposal. It is therefore concluded that the Proposal would not impact on the heritage significance of this item.

Cintra Estate Conservation Area

The Cintra Estate conservation area is located at the western extent of the station. There are no views from the southernmost point of the conservation area back towards the station. The Proposal would therefore not impact on the heritage significance of this item.

Croydon Sewer Vent

The sewer vent is located adjacent to the western extent of the station and there are no view lines between the proposed area of works and the vent. The Proposal would therefore not impact on the heritage significance of this item.

b) Operational phase

The operation of the Proposal does not present any risks to non-Indigenous heritage.

6.5.3 Mitigation measures

The detailed design and construction of the Proposal would be undertaken with consideration of the heritage values of the station and surrounds.

A Heritage Interpretation Strategy has been prepared by Caldis Cook Group as a way to consider the heritage impacts and opportunities for heritage interpretation during the design process, to mitigate the loss of the heritage fabric (i.e. footbridge). The key strategies proposed include (Caldis Cook Group, 2015):

- historical images and text placed at the approach to both station entrances
- incorporating interpretative material into the design of the anti-throw canopies (e.g. through perforated screen material)
- markers of removed elements (i.e. an outline of the concrete trestles on the platforms)
- retention of elements (e.g. retain existing Newell posts and position at base of stairs).

A key mitigation would then be the development of a Heritage Interpretation Plan for implementation during detailed design and construction.

The final design for the Proposal would need to be approved by TfNSW, in consultation with Sydney Trains, and through the submission and approval of a Section 60 application from the Heritage Council in accordance with the provisions of the *Heritage Act 1977*, prior to any works commencing. A Section 60 application is to be submitted at the same time as the public display for the REF.

It is recommended that the depth and/or path of the service trenches be modified during detailed design to avoid impacting the historic subway at the eastern end of the platforms.

As Croydon Station is listed on the heritage schedules of the Burwood LEP and Ashfield LEP, both the Burwood and Ashfield Councils would be notified of the proposed works.

Archival recording of the station as a whole prior to the commencement of construction following NSW Heritage Division guidelines *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006) and *How to prepare archival records* (NSW Heritage Office, 1998). Copies should be provided to the NSW Heritage Division, Ashfield Council, Burwood Council and Sydney Trains for future reference. In particular the following elements the following elements should be concentrated on

- existing footbridge and stairs
- the 1995 overhead booking office
- the disused platform, including the stairs along Hennessy Street cutting (and it is recommended that vegetation removal be undertaken prior to the archival recording)
- northern rooms of the Platform 3/4 station building prior to removal of the weatherboard wall.

A CEMP would be prepared by the Contractor that would prescribe mitigation measures to be implemented during the construction period. This would include identifying the heritage curtilage and heritage items/area on the Environmental Controls Map. The CEMP would also specify requirements for heritage inductions to be undertaken by all staff, and procedures for unexpected archaeological finds in accordance with TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2015a).

Refer to Table 16 for a list of proposed mitigation measures.

6.6 Socio-economic impacts

6.6.1 Existing environment

Croydon Station is located in the Burwood and Ashfield LGAs and serviced by the T2 Airport, Inner West and South Line which is operated by Sydney Trains, while the T1 North Shore, Northern and Western Line services pass through the station without stopping. Croydon Station is the 107th busiest station on the Sydney Trains network with an average patronage of 4,750 trips per weekday (NSW Bureau of Transport Statistics barrier counts, 2014).

The land use around the station comprises a mix of shops, small businesses and café/restaurants on Paisley Road, The Strand and Hennessy Street. The Presbyterian Ladies College is located north of the station off Meta Street and Croydon Public School is located north of the college, while the Montessori Academy (child care for 2-6 year olds) and private residences are located immediately south and south-west of the station along Paisley Road and other surrounding streets (refer Figure 3, page 21). Other receivers include the Croydon Medical Practice on Paisley Road and the Croydon Medical Centre on The Strand.

There are some existing CPTED considerations around the station including poor sightlines at the Paisley Road station entrance due to the booking office building orientation, plantings and stairwells which reduces opportunities for natural surveillance. Having only one station entrance also results in a 'movement predictor' which is a risk and means that customers have no alternative exit. There are also opportunities to improve lighting and sightlines for CCTV cameras.

6.6.2 Potential impacts

a) Construction phase

The construction of the Proposal has the potential to temporarily impact customers, pedestrians, residents, motorists and other receivers as a result of:

- changes to accessing station entry points, platforms and nearby footpaths
- temporary loss of parking/loading zone on Paisley Road which may affect nearby businesses and their customers and/or rail customers who use the unrestricted area for commuter parking
- construction works an changes to the station entry plaza at Paisley Road which may temporarily affect the outdoor dining area of the adjacent café
- increase in truck movements delivering site materials, plant and equipment
- construction noise, dust and visual impacts.

Access for emergency services would be maintained at all times and it is not anticipated that access to private properties would be affected during construction of the Proposal.

b) Operational phase

Overall, the Proposal would provide positive socio-economic benefits to Croydon and the Burwood and Ashfield LGAs, including:

- improved accessibility for customers at Croydon Station by providing an accessible route to station platforms through the provision of accessible parking, upgraded footpaths, a new pedestrian bridge and lifts/stairs
- improved connections to the surrounding pedestrian networks through the new pedestrian bridge that would provide an alternate access route across the railway and connect to Hennessy Street, along with a new wider station entrance at Paisley Road to improve passenger circulation and to support growth in patronage
- improved customer amenity and facilities at the station with canopies for weather protection, a new Customer Information Window and Family Accessible Toilet at concourse level, Passenger Information Displays and wayfinding signage
- improved transport interchange facilities with a new formalised kiss and ride area in Paisley Road and additional undercover bicycle parking facilities on both sides of the station
- potential increased use of public transport to and from Croydon.

The raised pedestrian bridge and station operations building to street level would help to improve sightlines, legibility and opportunities for natural surveillance. The extension of the pedestrian bridge to create a second entry point at Hennessy Street would also help to increase activity and provide an alternate exit point. The additional lighting and CCTV that would be installed at the station would also provide positive CPTED outcomes for the area.

No property acquisition would be required as a result of the Proposal.

6.6.3 Mitigation measures

Refer to Sections 6.1, 6.2 and 6.3 for discussion on the potential traffic/access, visual and noise impacts arising from construction of the Proposal and the proposed management strategies.

Table 16 provides a number of environmental safeguards to minimise these potential impacts with a particular focus on keeping the community informed and includes the following:

- sustainability criteria for the Proposal would be established to encourage construction personnel to purchase goods and services locally helping to ensure the local community benefits from the construction of the Proposal
- the Community Liaison Plan (to be developed prior to construction) would identify all potential stakeholders and the best-practice methods for consultation with these groups during construction. The Plan would also encourage feedback and facilitate opportunities for the community and stakeholders to have input into the project, where possible
- the community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Plan
- contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase.

6.7 Biodiversity

An Ecological Impact Assessment has been prepared by Biosis for the Proposal which included a desktop assessment, literature review and site inspection of the study area (shown in Figure 19) which was undertaken by a qualified ecologist on 13 November 2014. The findings of the assessment are summarised in this section.

6.7.1 Existing environment

Threatened species and communities

The results of the database searches indicate that the following threatened biota were previously recorded or predicted to occur in the locality of the Proposal (within a five kilometre radius):

- 23 threatened ecological communities listed under the TSC Act/EPBC Act
- 27 threatened flora species and one endangered plant population listed under the TSC Act/EPBC Act
- 32 threatened fauna species listed under the TSC Act, FM Act and/or EPBC Act
- 59 migratory species listed under the EPBC Act.

No threatened flora, fauna or migratory species were identified during the survey. The study area also does not contain threatened or endangered ecological communities, however two flora species were detected within the study area that were considered to be remnant elements of Sydney Turpentine-Ironbark Forest (a listed ecological community under NSW and Commonwealth legislation). Rough-barked Apple and Black Wattle were both present within the vegetation inside the northern RailCorp boundary fence adjacent to Young Street, in an area that would not be impacted by construction activities.

A small amount of potential foraging habitat for the Grey-headed Flying-fox (listed under Commonwealth and NSW legislation) and potential habitat for Eastern Bentwing-bats and Long-nose Bandicoots (listed under NSW legislation) is present within the study area.

Flora

The vegetation and fauna habitat throughout the majority of the study area has been modified by a long history of disturbances which have resulted in clearance of native vegetation and replacement by exotic trees and by infestation by noxious and environmental weeds in the ground, shrub and tree layers. Some parts of the study area have been treated as a garden or landscape area with a monoculture or as regularly spaced plantings (e.g. the south side footpath area along Paisley Road and various other parts of the study area).

The location of vegetation types and trees within the survey area is depicted in Figure 19. An assessment of each tree including suggested Tree Protection Zones according to the *AS 4970-2009 for the Protection of Trees on Development Sites* is provided in Appendix 3 of the Ecological Impact Assessment (Bioisis, 2015).

Platforms

The platforms have some trees, shrubs and other vegetation present. This vegetation occurs within discrete garden beds on each platform. The most prominent trees are a large Date Palm Phoenix species located on Platform 1/2 (tree 23) and a group of three Chinese Tallow Trees at the eastern end of Platform 1/2 (trees 24-26). The shrubs located elsewhere on the platforms are exotic species.

North side of rail corridor

East of the Meta Street road bridge and inside the RailCorp fence there is a corridor of very dense vegetation comprising garden plants and environmental weeds and a few small trees (trees 5-9). Outside the fence, a row of four Olive Trees have been planted along Hennessy Street near the intersection with Edwin Street North (trees 1-4).

West of the Meta Street road bridge and inside the RailCorp fence, there is another corridor of vegetation dominated by trees (trees 27-39). There is a mix of moderate-sized indigenous trees, non-local native trees and exotic trees in this area.

South side of rail corridor

Along the southern embankment east of the Meta Street road bridge and inside the RailCorp fence, a prostrate conifer has been used to cover a bare soil area above Platform 5 and extensive garden planting comprising six Oleanders, Coastal Rosemary, Teatrees, Bottlebrushes, Christmas Bush, Azaleas, Tuckeroo and Grevilleas. Grasses such as Bearded Oats are also present in this area.

Outside the fence, along Paisley Road, a row of ten Plane Trees has been planted along the street (trees 13-22). Close to the station entrance a large Plane Tree (tree 10) and two Bottlebrushes (trees 11-12) are present and garden beds containing low hedges.

West of the Meta Street road bridge and inside the RailCorp fence there are a variety of environmental weeds on the lower embankment, including Crofton weed but on the upper part of the embankment there are a few small Rough-barked Apples (trees 41-42). Garden areas containing Bottlebrushes, one Sweet Pittosporum, a large Brush Box, a Mugga Ironbark, one Blackwood and a small Canary Island Date Palm are also present outside the fence (trees 40, 43-45).

Weeds

Six noxious weeds (Green Cestrum, Lantana, Small-leaved Privet, Large-leaved Privet, Montpellier Broom and Blackberry), were identified in the study area inside the RailCorp boundary fencing along the northern side of the rail corridor. Additional species of noxious weeds may be present within the densely infested areas.

Fauna

Few fauna species were observed during the site inspection and little fauna habitat is present within the study area. No obvious hollows were observed in these trees during the site survey.

While no patches of intact native vegetation are present, some larger, mature trees and shrubs with fauna habitat value are present on the north side of the rail corridor which may provide foraging resources for nectivorous birds and flying foxes (including the Grey-headed Flying-fox) during flowering periods. The large Date Palm on Platform 1/2 may provide nectar when flowering, and if it is a female tree, fruit for flying-foxes. No obvious hollows were observed in these trees during the site survey.

The current steps and concourse do not appear to contain suitable cracks or holes that could be used by fauna species such as birds and micro-bats, including the threatened Eastern Bentwing-bat. However, some old disused steps have been retained inside the RailCorp boundary fence near the intersection of Meta Street and Hennessy Street and these are surrounded by dense growth of garden plants and environmental weeds. These steps could potentially have suitable cracks and hollows for birds and micro-bats, but could not be accessed. The adjoining corridor of dense vegetation could potentially be providing cover and foraging resources for common fauna such as reptiles and introduced fauna such as rats, mice and birds.

The inner western Sydney population of the Long-nosed Bandicoot occurs within the local area (approximately 3-4 kilometres south-east of the station) and this population is reliant on sheltering spaces under buildings and foraging area comprising gardens, parks and lawns. There is a small possibility that the Long-nosed Bandicoot could occur within the disused part of the rail corridor within the study area along the northern side where there is dense vegetation cover, although there is little access to grassy foraging habitat and poor connectivity along the rail corridor to the known population due to several major roads, such as Frederick Street. At best, the rail corridor could provide a dispersal corridor for the nearby Long-nosed Bandicoot population.

Figure 19 Existing trees in the Proposal study area (Biosis, 2015)

6.7.2 Potential impacts

a) Construction phase

Threatened species and communities

As noted in Section 6.7.1, no threatened flora species or ecological communities were identified during the survey. A small amount of potential foraging habitat for the Grey-headed Flying-fox and potential habitat for Eastern Bentwing-bats and Long-nose Bandicoots is present within the study area but would not be impacted by the proposed works. Since no loss of habitat for this species is anticipated to occur, the impacts would be negligible and further assessment is not required.

Direct impacts

The proposed works would not impact any of the remnant elements of native vegetation identified within the study area. In addition, the proposed works would not impact on medium trees inside or outside the rail corridor adjacent to Young Street or the vegetation adjacent to Paisley Road west of the Meta Street road bridge.

Impacts to vegetation/trees would be confined to area east of the Meta Street road bridge. All the vegetation to be impacted comprises planted trees or environmental weeds and invasive non-local native tree species. In total, it is expected that approximately 12 trees (seven medium and five small) would need to be removed as part of the proposed works. Approximately nine trees may require lopping and it is not expected that this lopping would destabilise these trees.

The western end of a large patch of environmental weeds on a steep embankment adjacent to the disused staircase near Hennessy Street would be removed to allow for the new pedestrian bridge. This area contains trees 5-9 (Silky Oak, Sweet Pittosporum, She-oak, Oleander and Camphor Laurel). Following the completion of construction, affected area would be landscaped, where practicable.

At the station entrance on Paisley Road a large Plane Tree (tree 10) would need to have a limb removed, the Box and Murraya hedges would be removed and two large Bottlebrushes (trees 11-12) would also be removed.

At least two of the ten Plane Trees (trees 20 and 22) along the north side footpath of Paisley Road may need to be removed to allow the erection and operation of a crane. Trees 13-19 and 21 may be retained, but the lower limbs, up to three metres from the ground, would likely need to be removed to allow construction plant/vehicles to use the kerb side parking lane.

Inside the rail corridor adjacent to Paisley Road, patches of Christmas Bush, Azaleas, Bottlebrushes, Grevilleas and Tuckeroos east of the station building on Platform 5 would be removed, but the Oleanders, Teatrees and Bottlebrushes west of the station building would be retained.

On the platforms, planted trees (trees 24-26) and shrubs east of the Meta Street road bridge would be removed except for the large Date Palm (tree 23) which would be retained (and is also part of the heritage listing). The existing shrubs on platforms west of the Meta Street road bridge may be removed as part of the landscaping plan.

Direct trauma to native fauna is expected to be minimal as no high quality habitats would be removed.

The removal of a section of weed infested land within the rail corridor adjacent to Hennessy Street could have a very minor impact on foraging and nesting habitat for some common bird species and habitat for some common fauna such as skinks, but few birds were observed around the study area during the site inspection.

Indirect impacts

Noise, dust, light and contaminant pollution is predicted to be minimal. The mitigation measures outlined in Table 16 would ensure that these indirect impacts would be minimised.

Proliferation of weed species is likely to be the main potential impact of the works. Without appropriate management strategies, construction activities have the potential to disperse weeds including species listed as noxious under the *Noxious Weeds Act 1993*. Construction activities also have the potential to import new weed species into the study area. The mitigation measures outlined in Section 6.7.3 and Table 16 would ensure that weed and pathogen importation and spread is minimised. The Proposal has the potential to improve the ecological values of the weed infested area within the rail corridor adjacent to Hennessy Street through appropriate landscaping with suitable native species

b) Operational phase

Operational activities at Croydon Station are not proposed to significantly change and as a result there would be no increase risk to biodiversity.

6.7.3 Mitigation measures

The Contractor is required to undertake the detailed design and construction of the Proposal with regard for the trees on Paisley Road and to avoid impacts to any trees/vegetation beyond that which is assessed in the Ecological Impact Assessment (Biosis, 2015).

Tree Protection Zones (TPZ) would be established as per the recommendations in the Ecological Impact Assessment (Biosis, 2015) to protect trees during construction. An arborist would inspect trees at the commencement of excavation works, and again at the completion of all works to ascertain the percentage loss of structural root zone of trees in close proximity to the works and advise on the health of trees and any remedial actions required.

TfNSW has prepared a *Vegetation Offset Guide* (TfNSW, 2013d) to provide a framework for a consistent approach to offset impacts to vegetation on applicable TfNSW projects and allows for appropriate offsets to be applied for one tree or a group of trees that do not form part of a vegetation community, regardless of whether they are native or not.

As some trees have been identified for removal (seven medium and five small), the Ecological Impact Assessment has recommended that a minimum of 38 trees be planted to meet TfNSW's offset ratios. Any additional trees that are found to require removal during construction would also need to be offset. Such measures and procedures for tree assessment and removal would be included and implemented as part of the CEMP for the Proposal. This would also include checking trees for active nests, prior to their removal.

The CEMP would be developed in accordance with the recommendations of the Ecological Impact Assessment (Biosis, 2015) and would include a range of other weed control, tree protection, and erosion and sedimentation control measures.

Refer to Table 16 for a list of proposed mitigation measures.

6.8 Contamination, landform, geology and soils

As part of the development of the concept design Cardno Pty Ltd commissioned geotechnical and contamination investigations, undertaken by JK Geotechnics and Environmental Investigation Services respectively (Cardno, 2014).

The investigation included a desktop assessment, and establishment of five boreholes in June 2014. Samples were obtained from four of the boreholes for the purposes of laboratory testing for the contamination assessment. The findings of these investigations are summarised in this section.

6.8.1 Existing environment

Geology and soils

Croydon Station is located within a six metre deep cutting which is orientated roughly east-west and the station platforms are lower than street level. Natural ground levels around the station slope (by approximately 5.5 per cent) from a higher elevation to the west to a lower elevation. The Proposal site is not located on land mapped as containing Acid Sulfate Soils.

The *1:100,000 Geological Map of Sydney* indicates that the site is underlain by Ashfield Shale of the Winamatta Group which comprises black to dark-grey shale and laminate (Herbert, 1983).

Three boreholes (BH1, BH2 and BH3) were established up to depths of 2.53 metres through the station platform in the approximate location of the three new lifts. Two additional boreholes (BH4 and BH4A) were established at the eastern end of the platform in the approximate location of the temporary pedestrian bridge. BH1-BH4 disclosed a subsurface profile comprising asphaltic concrete platform surface and platform backfill over weathered shale bedrock. BH4A was located within a garden bed and encountered fill comprising silty sand and sandy gravel.

Based on site observations it was also considered that the following geotechnical risks exist at the southern cut slope (the northern cut slope was not assessed due to access constraints):

- erosion, spalling and/or fretting of the cut slope
- near surface instability of the cut slope, including shallow slumping.

Contamination

The preliminary soil contamination screening did not identify elevated concentrations of heavy metals, polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRHs), monocyclic aromatic hydrocarbons (BTEX – benzene, toluene, ethlybenzene, xylene), organochlorine pesticides, organophosphorus pesticides and polychlorinated biphenyls (PCBs) for commercial/industrial land use. Asbestos was not detected in the samples analysed.

In addition review of the contaminated land registers and the PoEO public register suggests Croydon Station is not listed as a contaminated site, nor has the site been subject to regulation under the *Contaminated Land Management Act 1997*.

6.8.2 Potential impacts

a) Construction phase

The Proposal would require some excavation work for the foundations and footings of the temporary and new pedestrian bridge, lift shaft pits, stairs and canopies. Other trenching or excavation may be required for footpath and road works, relocation of services, drainage works, retaining walls and tree removal.

Excavation and other civil works such as trenching can result in erosion and sedimentation if not undertaken with appropriate controls. Such impacts can also lead to an adverse effect on biodiversity such as through the introduction of sediments into waterways. Erosion and sedimentation risks for the Proposal are considered to be low-moderate, given the existing rail cutting and slope of the surrounding area however it is expected that erosion and stability risks could be adequately managed through the implementation of standard measures as outlined in the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and other erosion protection measures for the existing cutting if required (e.g. rock bolts, reinforcement mesh or strip drains).

In addition, excavation has the potential to expose contaminants, which if not appropriately managed, can present a health risk to construction workers and the community. Contaminants would also pose an environmental risk if they were to enter nearby waterways through the stormwater infrastructure. There is a low risk of contamination, however given the past land use, chemical testing and visual characterisation would be undertaken to confirm the composition and nature of excavated material intended for use or disposal offsite. Where spoil is classified as unsuitable for reuse it would be transferred to an appropriately licensed offsite facility.

During construction works, there is also the potential for soil to become contaminated through incidental chemical or fuel spills and leaks from construction plant and equipment.

b) Operational phase

There would be no operational risks to geology and soils as a result of the Proposal.

6.8.3 Mitigation measures

As part of the CEMP, a site-specific Erosion and Sediment Control Plan would be prepared and implemented in accordance with the 'Blue Book' - *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004). The Erosion and Sediment Control Plan would be established prior to the commencement of construction and be updated and managed throughout as relevant to the activities during the construction phase. Additional investigation into the stability of the rail cutting (in particular on the northern side) and the need for protection measures should be undertaken prior to construction.

An environmental risk assessment is to be undertaken prior to construction and must include a section on contamination as per the TfNSW Standard Requirements. Measures to mitigate potential impacts from any contaminated soil/materials during construction would be developed and implemented through an unexpected contamination finds procedure and Waste Management Plan as part of the CEMP. All waste would be managed in accordance with relevant legislation.

Refer to Table 16 for a list of proposed mitigation measures.

6.9 Hydrology and water quality

6.9.1 Existing environment

Surface water and ground water

The station and surrounds form part of the Parramatta Catchment. Existing walkways, platforms and stairs in the station all drain to existing track stormwater drainage systems. Surface runoff within the vicinity of the Proposal is managed by Burwood and Ashfield Council's stormwater drainage system that consists mainly of stormwater pits (at street level), connected to an underground pipe network that then connects to the Dobroyd Canal (to the east/north-east and principally managed by Sydney Water) which then flows north to the Parramatta River.

Groundwater was not encountered during geotechnical investigations (Cardno, 2014).

Flooding

The eastern part of the station and Hennessy Street, which is located in the Ashfield LGA, is mapped within a flood planning area and has the potential for overland flow (which is flooding resulting from runoff of local catchment areas, not inundation due to overflow from creeks and trunk drainage channels) for a 1% Annual Exceedance Probability (AEP) event (WMA Water,

2013). The area of the Proposal located within the Burwood LGA is not mapped as flood prone.

6.9.2 Potential impacts

a) Construction phase

Without appropriate safeguards, pollutants (fuel, chemicals or wastewater from accidental spills, and sediment from excavations and stockpiles) could potentially reach nearby stormwater drains and flow into nearby waterways.

Activities which would disturb soil during construction work have the potential to impact upon local water quality as a result of erosion and run off sedimentation.

Groundwater was not encountered during geotechnical investigations however areas of excavations may need to be dewatered as a result of rainfall runoff. Incorrect dewatering can pose risks to nearby waterways and may be in contravention with the associated legislation.

b) Operational phase

The Proposal is unlikely to impact upon the hydrology of the Proposal site or the surrounding area. New eaves and gutters would be installed for new canopies and roofs to connect to existing track or street drainage and provision would be made to safely convey overland flows for the 1% AEP.

Stormwater and drainage works would be designed and undertaken in accordance with the relevant ASA/Sydney Trains, Sydney Water and Council standards and requirements.

6.9.3 Mitigation measures

As noted in Section 6.8.3, Erosion and Sediment Control Plans would be prepared and implemented for the Proposal to manage risks to water quality. Other mitigation measures that would be required for construction include regular vehicle and equipment maintenance along with spill kits and spill response procedures. Any dewatering would be undertaken in accordance with the TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2015b).

Operational risks associated with localised flooding would be addressed during detailed design of the Proposal.

Refer to Table 16 for a list of proposed mitigation measures.

6.10 Air quality

6.10.1 Existing environment

Based on a review of the existing land uses surrounding the Proposal, the existing air quality is considered to be characteristic of an urban environment (e.g. localised vehicle emissions). Sensitive receivers in the vicinity of the Proposal include staff and customers at Croydon Station, residential and commercial properties around the station and the two nearby schools.

The OEH undertakes air quality monitoring for five key air pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and particulates less than 10 micrometres in diameter (PM_{10}), as well as providing an hourly and daily regional air quality index (which is calculated using a formula that accounts for the various pollutant types). A national air quality goal has also been set for each of the pollutants that prescribe a maximum number of days that a concentration of a particular pollutant type may be exceeded.

Burwood and Ashfield LGAs form part of the Sydney East monitoring region with air quality monitored from five fixed sites at Chullora, Rozelle, Lindfield, Randwick and Earlwood.

The *NSW Air Quality Statement 2014* (OEH, 2015) reports on exceedances of pollutants against the National Environment Protection Measures (NEPM) goals for NSW in 2014. While levels of nitrogen dioxide, sulfur dioxide and carbon monoxide continued to be below national standards – levels of ozone and particles (PM_{10} and $PM_{2.5}$) did exceed the standards from time to time.

A search of the daily regional air quality index for the Sydney East region for the last year (August 2014 to July 2015) showed that the region experienced:

- very good air quality on 8.5 per cent of days
- good air quality on 75.3 per cent of days
- fair air quality on 14.5 per cent of days
- poor air quality on 0.8 per cent of days
- very poor air quality on 0.3 per cent of days
- hazardous air quality on 0.5 per cent of days.

6.10.2 Potential impacts

a) Construction phase

The main air quality impacts that have the potential to occur during construction would be temporary impacts associated with dust particles and emissions of CO, SO_2, PM_{10}, nitrous oxides, volatile organic compounds (VOC), and polycyclic aromatic hydrocarbons (PAH) compounds associated with the combustion of diesel fuel and petrol from construction plant and equipment.

Anticipated sources of dust and dust-generating activities include:

- excavation for the foundations and footings for the pedestrian bridge/temporary pedestrian bridge, lift shaft pits, stairs, canopies
- other trenching or excavation may be required for footpath and road works, relocation of services, drainage works and tree removal
- stockpiling activities
- dust generated from the loading and transfer of material from trucks
- other general construction works.

The Proposal would have minimal impact on air quality as it would not involve extensive excavation or other land disturbance with the potential to generate significant quantities of dust.

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

b) Operational phase

Overall impacts of air quality during the operation of the Proposal are considered minimal as the Proposal would not result in a significant change in land use. Also, as the Proposal would increase access to public transport, the use of public transport would be anticipated to increase and subsequently aim to reduce the amount of private vehicle related emissions in the long term.

6.10.3 Mitigation measures

Table 16 provides a list of mitigation measures that are proposed to manage air quality issues during construction. They are aimed around maintaining and operating plant and equipment efficiently and implementing measures for dust suppression including watering, covered loads and appropriate management of tracked dirt/mud on vehicles. Such measures would be included in the CEMP to be prepared for the Proposal.

6.11 Other impacts

6.11.1 Services/utilities

The Proposal has the potential to impact services such as through direct impact from excavation activities or operation of other equipment, if services are not appropriately identified and protected or relocated.

The Proposal is located close to several underground services as identified in Section 3.1.2. An upgraded electrical supply is required to accommodate new infrastructure (e.g. new lifts) and it is proposed to install a new substation in the southern part of the rail corridor.

The existing overhead wiring attached to the underside of the existing footbridge would need to be removed and supported by a new structure prior to the demolition of the footbridge.

High Voltage aboveground electrical cables are located on the southern side of the station and run partially above the existing booking office and embankment to connect to a power pole in the rail corridor adjacent to Platform 5. This overhead wiring would need to be undergrounded to allow for construction of the Proposal. Rail services within the rail corridor may also need to be located to avoid being impacted during excavation works.

The detailed design of the Proposal would be undertaken to avoid services where feasible. Relocation or other works that may affect services would be undertaken in consultation with the respective utility authorities.

6.11.2 Waste

The construction of the Proposal would generate the following waste:

- asphalt and concrete
- civil works spoil (steel and concrete from footbridge/stairs demolition along with fill material and shale bedrock from lift and pedestrian bridge excavations)
- various building material wastes (including metals, timbers, plastics, concrete, carpeting etc.)
- general waste, including food and other wastes generated by construction workers.

Waste management would be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). A Waste Management Plan would be prepared that would identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities along with other onsite management practices such as keeping areas free of rubbish.

The application of the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a) would also result in waste management targets to be developed for the Proposal and would include reuse and recycling.

6.12 Cumulative impacts

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational activities and can result in a greater impact to the surrounding area than would be expected if each project was undertaken in isolation.

A search of the Department of Planning and Environment's Major Projects Register, the Sydney East Joint Regional Planning Panel Development and Planning Register, and the Burwood/Ashfield Council Development Application Registers on 3 August 2015 identified a number of major developments in the LGA in the planning phase such as West Connex (which if approved would include major tunnelling working approximately 1.5 kilometres north off Fredrick Street), a proposed residential development approximately 250 metres north-west on Grosvenor Street/Boundary Street and a planning proposal to rezone and develop property along College Street and Edwin Street North to create a new junior school campus and parking area for the Presbyterian Ladies College. Some streetscape improvements have also taken place in the Ashfield area of Paisley Road and Hennessy Street.

During construction, the works would be co-ordinated with any other construction activities in the area. Consultation and liaison would occur with Burwood and Ashfield Council, RailCorp/Sydney Trains, and any other developers identified to minimise cumulative construction impacts such as traffic and noise.

Traffic associated with the construction work is not anticipated to have a significant impact on the surrounding road network. Operational traffic and transport impacts would have a minimal impact on the performance of the surrounding road network.

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

The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.

6.13 Climate change and sustainability

6.13.1 Greenhouse gas emissions

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

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

Due to the small scale of the Proposal and the short term temporary nature of the individual construction works, it is considered that greenhouse gas emissions resulting from the construction of the Proposal would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in Table 16.

It is anticipated that, once operational, the Proposal may result in an increase in use of public transport and a relative decrease in use of private motor vehicles by commuters to travel to and from Croydon. A modal shift in transport usage may reduce the amount of fuel consumed

by private motor vehicles with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

6.13.2 Climate change

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

Climate change could lead to an increase in the intensity of rainfall events, whereby the rainfall expected to occur in a 100-year average recurrence interval flood event would occur more frequently. Such changes in weather in the region are unlikely to significantly impact on the operation of the Proposal, as the Proposal would not greatly increase the hardstand area and the detailed design of the Proposal would include consideration of local drainage and flooding (refer also to Section 6.9).

Climate change could lead to an increase in the frequency and severity of bushfires. The Proposal is not situated on land mapped as bushfire prone, but would be designed with appropriate fire protection measures.

6.13.3 Sustainability

The design of the Proposal would be based on the principles of sustainability, including the incorporation of the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a) and the TfNSW *Environmental Management System* (EMS). These guidelines require a number of mandatory and discretionary initiatives to be applied. Refer to Section 3.1.4 for more information regarding the application of these guidelines.

Further positive impacts in relation to climate change and sustainability associated with the Proposal include encouraging a reduction in private vehicle use, and increasing the accessibility of public transport services.

7 Environmental management

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

7.1 Environmental management plans

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

The CEMP would include at a minimum the following management plans:

- Construction Traffic Management Plan
- Construction Noise and Vibration Management Plan
- Heritage Management Plan
- Erosion and Sediment Control Plan
- Waste Management Plan.

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

7.2 Mitigation measures

Mitigation measures for the Proposal are listed below in Table 16. These proposed measures would minimise the potential adverse impacts of the Proposal identified in Chapter 6 should the Proposal proceed.

Table 16 Proposed mitigation measures

No.	Mitigation measure
	General
1.	An Environmental Controls Map (ECM) would be developed prior to commencement of construction in accordance with TfNSW's *Guide to Environmental Controls Map* (TfNSW, 2015c). The ECM would be implemented and updated for the duration of construction.
2.	A project risk assessment including environmental aspects and impacts would be undertaken prior to the commencement of construction.
3.	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate regular intervals.
4.	Prior to the commencement of construction, all contractors would be inducted on the key project environmental risks, mitigation measures and conditions of approval.
5.	Service relocation would be undertaken in consultation with the relevant authority.

No.	Mitigation measure
	Traffic and site access
6.	Vehicle circulation and access to Paisley Road, as well as the pedestrian interactions and connections (e.g. potential for a Shared Zone and/or a one way flow (forming a loop with Paisley Lane, i.e. access via Paisley Road and egress via Paisley Lane only), and consideration of the existing loading zone) would be further investigated during detailed design.
7.	The configuration of the kiss and ride in Paisley Road would be further investigated during detailed design including considering opportunities to retain the existing accessible parking space outside the Croydon Medical Practice.
8.	Prior to the commencement of construction a Construction Traffic Management Plan (CTMP) would be prepared as part of the CEMP and would include as a minimum: • procedures for preparing and implementing Traffic Control Plans (TCPs) and in particular for detours and traffic control to manage temporary disruptions on local roads • final construction traffic approach and departure routes • location of access to and from the local road network and contractor parking • scheduling of works/deliveries to avoid peak times (e.g. school pick up/drop off times, where practicable) • measures to: o manage potential impacts to sensitive receivers (including Montessori Academy and Croydon Medical Practice) o limit temporary parking losses o maintain customer access to and from the station at all times o maintain private property access unless otherwise agreed • details of traffic controllers construction signage and other community notification. Consultation with the relevant roads authorities would be undertaken during preparation of the CTMP.
9.	Heavy vehicles would be restricted to specified routes, with the aim of minimising impacts on local roads, high pedestrian areas and school zones. Where feasible, route markers would be installed for heavy vehicles along designated routes.
10.	The impacts of construction traffic on the local road network and the impacts on intersection operation would be minimised by undertaking construction vehicle traffic movements outside of peak road traffic periods and outside of school peak periods, where practicable.
11.	The queuing and idling of construction vehicles in residential streets would be minimised through staging of deliveries where practicable.
12.	Communication would be provided to the community and local residents to inform them of impacts to vehicle movements and anticipated effects on the local road network relating to site works.
13.	Access to all private properties and businesses adjacent to the works would be maintained during construction, unless otherwise agreed by relevant property owners.
14.	Should road closures be required, signage would be erected to clearly delineate alternative access and that nearby businesses would operate as normal.
15.	Pedestrian access to and from the station would be maintained at all times during construction.

No.	Mitigation measure
16.	The performance of all project traffic arrangements would be monitored during construction.
17.	Road Occupancy Licences for temporary closure of roads would be obtained, where required.
	Urban design, landscape and visual amenity
18.	The detailed design of the Proposal would be undertaken with reference to the recommendations in the Visual Impact Assessment (Envisage Consulting, 2015) including, but not limited to, the following opportunities to mitigate visual impacts: • progressing the detailed design of the Paisley Road entrance with regard for the current setting and character as far as possible, and include improvements such as effective landscaping, seating and quality paving. The detailed design should also consider opportunities for a hedge at the Meta Street/Paisley Road entrance to visually separate the road edge from the pavement (similar to the existing) • increasing the existing avenue of Plane Trees along Paisley Road with new street trees planted near the new car parking area • providing some landscape planting and furniture such as seating close to the entrance to increase the attractiveness and general amenity of the Hennessy Street entrance and avoid excess fencing.
19.	An Urban Design and Landscaping Plan (UDLP) would be prepared by the Contractor and submitted to TfNSW prior to finalisation of the detailed design.
20.	Worksite compounds would be screened with shade cloth (or similar material, where necessary) to minimise visual impacts from key viewing locations.
21.	The need for tree lopping/removal on Paisley Road as a result of construction activities should be investigated and the number of trees to be removed/impacted in this area to be kept to a minimum. Where possible, alternative construction methodologies should be considered to reduce impacts to vegetation.
22.	Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
23.	Light spill from the rail corridor into adjacent visually sensitive properties would be minimised by directing construction lighting into the construction areas and ensuring the site is not over-lit. This includes the sensitive placement and specification of lighting to minimise any potential increase in light pollution.
24.	All lighting would be designed and installed in accordance with the requirements of standards relevant to *AS 4282:1997 Controlling the Obtrusive Effects of Outdoor Lighting.*
25.	Rehabilitation planting would be undertaken as early as possible to replace vegetation that provided screening to adjacent residential properties and sensitive visual receivers.
26.	Graffiti would be removed in accordance with TfNSW's Standard Requirements.
	Noise and vibration
27.	Prior to commencement of works, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Construction Noise Strategy* (TfNSW, 2012c) and the Noise and Vibration Impact Assessment for the Proposal (GHD, 2015). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.

No.	Mitigation measure
28.	Works would generally be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). While some out of hours works would be required (e.g. during track possessions) an Out of Hours Work approval would need to be obtained from TfNSW by the Contractor.
29.	To reduce the construction noise impact from human activities, reasonable and feasible noise mitigation options should be considered, including: • regularly training workers and contractors (such as at toolbox talks) on the importance of minimising noise emissions and how to use equipment in ways to minimise noise • avoiding any unnecessary noise when carrying out manual operations and when operating plant • ensuring spoil is placed and not dropped into awaiting trucks • avoiding/limiting simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver where possible • switching off any equipment not in use for extended periods e.g. heavy vehicles engines should be switched off whilst being unloaded • avoiding deliveries at night/evenings wherever possible • no idling of delivery trucks • keeping truck drivers informed of designated vehicle routes, parking locations and acceptable delivery hours for the site • minimising talking loudly; no swearing or unnecessary shouting, or loud stereos/radios onsite; no dropping of materials from height where practicable, throwing of metal items and slamming of doors.
30.	To reduce the construction noise and vibration impacts from mechanical activities, reasonable and feasible noise mitigation options should be considered, including: • maximising the offset distance between noisy plant and adjacent sensitive receivers and determining safe working distances • using the most suitable equipment necessary for the construction works at any one time • directing noise-emitting plant away from sensitive receivers • regularly inspecting and maintaining plant to avoid increased noise levels from rattling hatches, loose fittings etc. • using non-tonal reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms for all plant used regularly onsite (greater than one day), or for any out of hours works • fitting mufflers/silencers to pneumatic tools (e.g. breakers) and use residential-grade mufflers on plant • use of quieter and less vibration emitting construction methods where feasible and reasonable.
31.	Work would be conducted behind temporary hoardings/screens wherever practicable. The installation of construction hoarding should take into consideration the location of residential receivers to ensure that 'line of sight' is broken, where feasible.
32.	Where the $L_{Aeq\ (15minute)}$ construction noise levels are predicted to exceed 75 dBA at nearby affected sensitive receivers, respite periods would be observed, where practicable. This would include restricting the hours that very noisy activities can occur.
33.	To avoid structural impacts as a result of vibration or direct contact with structures, the proposed works would be undertaken in accordance with the safe work distances outlined in the Noise and Vibration Assessment (GHD, 2015) and attended vibration monitoring or vibration trials would be undertaken where these distances are required to be challenged.

No.	Mitigation measure
	Indigenous heritage
34.	All construction staff would receive training in the recognition of Indigenous cultural heritage material as part of the project induction. This training would include information such as the importance of Indigenous cultural heritage material and places to both the Indigenous and non-Indigenous community, as well as the legal implications of removal, disturbance and damage to any Indigenous cultural heritage material and sites.
35.	If unforseen Indigenous objects are uncovered during construction, work should cease in the vicinity of the find and the TfNSW Project Manager and TfNSW Environment and Planning Manager are to be immediately notified to assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist, the OEH and the Local Aboriginal Land Council. If human remains are found, work should cease, the site should be secured and the NSW Police and the OEH should be notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained before works recommence.
	Non-Indigenous heritage
36.	A Section 60 approval under the *Heritage Act 1977* would be obtained from the NSW Heritage Council prior to works commencing and the conditions of such must be implemented.
37.	As Croydon Station is listed on the heritage schedules of the Burwood LEP and Ashfield LEP, both the Burwood and Ashfield Councils would be notified of the proposed works.
38.	A suitably qualified and experienced heritage architect will be engaged to provide input to, and review of, the detailed design of the Proposal. Modifications to the scope of works should be undertaken in consultation with the engaged heritage consultant to ensure that works may proceed in accordance with heritage best practice and the Section 60 Approval.
39.	The depth and/or path of the service trenches should be modified during detailed design to avoid impacting the historic subway at the eastern end of the platforms, where practicable.
40.	It is recommended that, where possible, existing openings be reused for the installation of the General Powerpoint Outlets in the Platform 3/4 building ceiling (if required).
41.	Wayfinding signage design to be further assessed and designed and installed in cooperation with the engaged heritage architect.
42.	A Heritage Interpretation Plan that builds on the strategies and recommendations of the Heritage Interpretation Strategy (Caldis Cook Group, 2015) must be prepared and implemented by the Contractor.
43.	A Heritage Management Plan (including detailed drawings, documentation and specifications) and Work Method Statement would be prepared as part of the Construction Environmental Management Plan (CEMP) to address heritage impacts and required management procedures to minimise risks.

No.	Mitigation measure
44.	Archival recording of the station as a whole prior to the commencement of construction following NSW Heritage Division guidelines *Photographic recording of heritage items using film or digital capture* (NSW Heritage Office, 2006) and *How to prepare archival records* (NSW Heritage Office, 1998). Copies should be provided to the NSW Heritage Division, Ashfield Council, Burwood Council and Sydney Trains for future reference. In particular the following elements the following elements should be concentrated on • existing footbridge and stairs • the 1995 overhead booking office • the disused platform, including the stairs along Hennessy Street cutting (and it is recommended that vegetation removal be undertaken prior to the archival recording) • northern rooms of the Platform 3/4 station building prior to removal of the weatherboard wall.
45.	The Contractor will submit a colour and finishes sample board prior to construction for approval by the Manager of Conservation, Heritage Division (OEH).
46.	The Contractor will submit details of the proposed heritage architect for approval by the Manager of Conservation, Heritage Division (OEH).
47.	A heritage induction would be provided to workers before construction begins, informing them of the location of known heritage items and guidelines to follow if unanticipated heritage items or deposits are located during construction.
48.	During construction, suitable measures should be put in place to ensure the retained heritage elements are protected from damage. Measures may include hoardings, use of spotters during the movement of equipment and other measures as necessary.
49.	To effectively mitigate potential impacts of vibration on the heritage platform buildings and Meta Street road bridge, activities that cause vibration would be managed in accordance with German Standard DIN 4150 – Part 3 (DIN 1999) heritage specifications. Real time vibration monitoring would be conducted at commencement of relevant works to confirm compliance with the German Standard DIN 4150. If vibration levels exceed the determined trigger level, then construction activity would cease and the heritage structure would be assessed before construction recommences.
50.	Copies of the 'as built' construction plans, photographs illustrating the completed works and the Archival Record would be lodged with RailCorp's Office of Rail Heritage as a documentary record of changes to the station.
51.	On completion of works, an update should be prepared for the State Heritage Register, with required details.
52.	In the event that any unanticipated archaeological deposits are identified within the project site during construction, works within the vicinity of the deposit would cease immediately and the TfNSW Project Manager and TfNSW Environment and Planning Manager would be immediately notified to assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist. Where it is required further, archaeological work and/or consents would be obtained for any unanticipated archaeological deposits prior to works recommencing at the location.
	Socio-economic
53.	Sustainability criteria for the Proposal would be established to encourage the Contractor to purchase goods and services locally, helping to ensure the local community benefits from the construction of the Proposal.

No.	Mitigation measure
54.	Feedback through the submissions process would be encouraged and facilitate opportunities for the community and stakeholders to have input into the project, where possible.
55.	A Community Liaison Plan would be prepared prior to construction to identify all potential stakeholders and best practice methods for consultation with these groups during construction. The plan would also encourage feedback and facilitate opportunities for the community and stakeholders to have input into the project, where possible.
56.	Contact details for a 24-hour construction response line, Project Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase.
57.	The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Plan to be developed prior to construction.
	Biodiversity
58.	The construction of the Proposal must be undertaken in accordance with TfNSW's *Vegetation Management (Protection and Removal) Guideline* (TfNSW, 2015d).
59.	The area around the disused stairs, adjacent to Hennessy Street, should be inspected prior to commencement of works to confirm if there is any evidence of current use by fauna including the Long-nosed Bandicoot. An ecologist should be on call during demolition/clearing to rescue any displaced fauna.
60.	All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
61.	Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. The Contractor is required to undertake the detailed design and construction of the Proposal with regard for the trees on Paisley Road with the number of trees to be removed limited to those identified in this REF, as far as practicable.
62.	Tree Protection Zones (TPZs) should be established around trees to be retained, as nominated in the Ecological Impact Assessment (Biosis, 2015). Tree protection should be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and should include exclusion fencing of TPZs.
63.	Trees to be removed as nominated in the Ecological Impact Assessment (Biosis, 2015) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed above.
64.	In the event of any tree to be retained becoming damaged during construction, an arborist would be informed immediately to inspect and provide advice on remedial action where possible.
65.	Should onsite works determine the removal or trimming of any additional trees, TfNSW's Tree Removal Application Form would need to be completed and submitted to TfNSW for approval.

No.	Mitigation measure
66.	A weed management strategy, as part of the CEMP, would be developed and implemented in accordance with the TfNSW's *Weed Management and Disposal Guide* (TfNSW, 2015e) to manage the dispersal and establishment of weeds during the construction phase of the project. This would include the management and disposal in accordance with the *Noxious Weeds Act 1993.*
67.	Vehicles and other equipment to be used onsite would be cleaned to minimise seeds and plant material entering the site to prevent the introduction of further exotic plant species.
68.	For new landscaping works, mulching and watering would be undertaken until plants are established.
69.	Offsets and/or landscaping would be undertaken in accordance with TfNSW's *Vegetation Offset Guide* (TfNSW, 2013d) and in consultation with Burwood Council, Ashfield Council and Sydney Trains. The 12 trees earmarked for removal should be offset with a minimum of 38 trees as advised in the Ecological Impact Assessment (Biosis, 2015). Any additional clearing would also require tree offset planting.
	Soils and water
70.	Additional investigation into the stability of the rail cutting (in particular on the northern side) and the need for protection measures should be undertaken prior to construction.
71.	Prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004). The Erosion and Sediment Control Plan would be implemented prior to and throughout construction and be updated and managed throughout as relevant to the activities during the construction phase. Measures would include: • stabilised surfaces would be reinstated as quickly as practicable after construction • all stockpiled materials would be stored in bunded areas, covered appropriately and kept away from waterways to avoid sediment entering the waterways • sediment would be prevented from moving offsite and sediment laden water prevented from entering any watercourse, drainage line or drainage inlet • any material transported onto pavement surfaces would be swept and removed at the end of each working day. Erosion and sediment control measures would be implemented and maintained to: • prevent sediment moving offsite and sediment laden water entering any water course, drainage lines, or drain inlets • reduce water velocity and capture sediment onsite • minimise the amount of material transported from site to surrounding pavement surfaces • divert clean water around the site.
72.	Erosion and sediment control measures would be established prior to any clearing and grubbing and site establishment activities.
73.	Erosion and sediment control measures would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality.
74.	Erosion and sediment control measures would be left in place until the works are complete and areas are stabilised.
75.	Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/ oil leaks.

No.	Mitigation measure
76.	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards and EPA Guidelines.
77.	Construction plant, vehicles and equipment would be refuelled offsite, or in a designated refuelling area.
78.	Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Management Guidelines* (TfNSW, 2015f) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in its use.
79.	The existing Sydney Trains and Councils' drainage systems would remain operational throughout the construction of the project.
80.	Should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the *Waste Classification Guidelines* (EPA, 2014) and *Water Discharge and Reuse Guideline* (TfNSW, 2015b).
81.	In the event of a pollution incident, works would cease in the immediate vicinity and the EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act.
	Air quality
82.	Methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks.
83.	Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
84.	Visual monitoring of dust would be undertaken, where visible levels of dust are high, onsite activities would be reviewed, with additional control measures and/or varied site operations implemented if required.
85.	Stockpiles would be covered when not in use.
86.	Dust would be visually monitored and where necessary the following measures implemented: • apply water (or alternate measures) to exposed surfaces that are causing dust generation. Surfaces may include unpaved roads, stockpiles, hardstand areas and other exposed surfaces (for example recently graded areas) • appropriately cover loads on trucks transporting material to and from the construction site. Securely fix tailgates of road transport trucks prior to loading and immediately after unloading.
87.	Prevent where possible, or remove, mud and dirt being tracked onto sealed road surfaces.
88.	Plant and machinery would be regularly checked and maintained in a proper and efficient condition.

No.	Mitigation measure
	Waste and contamination
89.	A Waste Management Plan would be prepared by the Contractor that would identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities along with other onsite management practices such as keeping areas free of rubbish.
90.	An appropriate Unexpected Finds Protocol, incorporating asbestos containing materials and other potential contaminants, would be included in the CEMP. This would include procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal would be undertaken in accordance with WorkCover requirements.
91.	An environmental risk assessment is to be undertaken prior to construction and must include a section on contamination as per the TfNSW Standard Requirements.
92.	All spoil to be removed from site would be tested to confirm presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility.
93.	Waste material would not to be left on site once the works have been completed.
	Climate change and sustainability
94.	The detailed design process would undertake an AS14064-2 (Greenhouse Gases - project level) compliant carbon footprinting exercise in accordance with TfNSW *Greenhouse Gas Inventory Guide for Construction Projects* (TfNSW, 2013e). The carbon footprint would be used to inform decision making in design and construction.
95.	The detailed design process would undertake a climate change impact assessment with reference to the *Climate Change Impacts and Risk Management: A Guide for Business and Government* (Department of the Environment and Heritage, 2006) and the *ISCA Guidelines for Climate Change Adaptation* (AGIC, 2011) to determine the hazards/risks associated with future climatic conditions. Issues including protecting customers and electrical equipment from wind and rain during storm events, size of guttering, cross flow ventilation, reflective surfaces etc. would be considered in the design.
96.	Detailed design of the Proposal would be undertaken in accordance with the *NSW Sustainable Design Guidelines – Version 3.0* (TfNSW, 2013a) with a view to obtaining a Silver rating or better.
	Cumulative impacts
97.	The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed and implemented as appropriate.

8 Conclusion

This REF has been prepared in accordance with the provisions of section 111 of the EP&A Act, taking into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The Proposal would provide the following benefits:

- improved accessibility for customers at Croydon Station by providing an accessible route to station platforms through the provision of accessible parking, upgraded footpaths, a new pedestrian bridge and lifts/stairs
- improved connections to the surrounding pedestrian networks through the new pedestrian bridge that would provide an alternate access route across the railway and connect to Hennessy Street, along with a new wider station entrance at Paisley Road to improve passenger circulation and to support growth in patronage
- improved customer amenity and facilities at the station with canopies for weather protection, a new Customer Information Window and Family Accessible Toilet at concourse level, Passenger Information Displays and wayfinding signage
- improved transport interchange facilities with a new formalised kiss and ride area in Paisley Road and additional undercover bicycle parking facilities on both sides of the station
- potential increased use of public transport to and from Croydon.

The likely key impacts of the Proposal are as follows:

- temporary changes during construction to parking and vehicle/pedestrian movements along Paisley Road, Meta Street and Hennessy Street including alternative access to the station further east from Paisley Road
- temporary noise and vibration impacts during construction
- removal of approximately three short term parking spaces on Paisley Road to allow for new accessible parking and up to three long term parking spaces for the new kiss and ride
- removal of trees/vegetation that would require planting offsets
- impacts to heritage fabric through the removal of the existing footbridge
- introduction of new elements such as the new station operations building, pedestrian bridge, canopies, lifts, and stairs into the visual environment.

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

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

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Appendix A Consideration of matters of National Environmental Significance

The table below demonstrates TfNSW's consideration of the matters of NES under the EPBC Act to be considered in order to determine whether the Proposal should be referred to Commonwealth Department of the Environment.

Matters of NES	Impacts
Any impact on a World Heritage property? There are no World Heritage properties in the vicinity of the Proposal.	Nil
Any impact on a National Heritage place? There are five items (Croydon Post Office, Presbyterian Ladies College, Croydon Public School, Croyden House and Wynola House) that are listed on the non-statutory archive of the Register of the National Estate and are located within 200 metres of the Proposal. The Proposal would not result in any direct or indirect impacts to these heritage items.	Nil
Any impact on a wetland of international importance? The Towra Points Nature Reserve is located within 10 kilometres of the Proposal site, however the Proposal does not drain directly to the wetland and given the nature and scale of the proposed works would not significantly affect any wetlands if international importance.	Nil
Any impact on a listed threatened species or communities? It is unlikely that the development of the Proposal would significantly affect any listed species or communities.	Nil
Any impacts on listed migratory species? It is unlikely that the development of the Proposal would significantly affect any listed migratory species.	Nil
Does the Proposal involve a nuclear action (including uranium mining)? The Proposal does not involve a nuclear action.	Nil
Any impact on a Commonwealth marine area? There are no Commonwealth marine areas in the vicinity of the Proposal.	Nil
Does the Proposal involve development of coal seam gas and/or large coal mine that has the potential to impact on water resources? The Proposal is for a transport facility and is not related to coal seam gas or mining.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The Proposal would not be undertaken on or near any Commonwealth land.	Nil

Appendix B Consideration of clause 228

The table below demonstrates TfNSW's consideration of the specific factors of clause 228 of the EP&A Regulation in determining whether the Proposal would have a significant impact on the environment.

Factor	Impacts
(a) Any environmental impact on a community? There would be some temporary impacts to the community during construction, particularly in relation to noise, traffic and access and visual amenity. Mitigation measures outlined in Chapter 7 would be implemented to manage and minimise adverse impacts.	Minor
(b) Any transformation of a locality? The Proposal is unlikely to result in the transformation of the locality and while the new pedestrian bridge (with canopy) would be higher than the existing (in part due to operational requirements to have sufficient vertical clearance above the tracks) the design has sought to reduce the height and scale of the new pedestrian bridge, station entrances and lifts as much as practicable. The Visual Impact Assessment considered the new structures within the existing visual environment and found that there would be an overall low-moderate impact to nearby receivers (based on the visual sensitivity of nearby receivers and magnitude of the impacts). The Proposal would have a positive contribution to the locality by creating new, open and accessible entrances to the station including a new entrance from the northern side (Hennessy Street).	Minor
(c) Any environmental impact on the ecosystem of the locality? The Proposal would require removal of approximately 12 (small to medium) trees but given the Proposal's location within an urbanised environment and the low habitat value of the trees to be removed, impacts to biodiversity and ecosystems are expected to be negligible.	Nil
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? There would be some temporary impacts during construction particularly in relation to noise, traffic and access and visual amenity. Approximately 12 (small to medium) trees would need to be removed from both sides of the rail corridor including two Bottle Brushes at the existing Paisley Road entrance. The number of trees to be removed would be minimised as far as possible given that the trees have a high aesthetic value contributing to the landscape character of the area. Opportunities to replant trees at the station entrances would be investigated during the detailed design.	Minor

Factor	Impacts
(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? A desktop archaeological assessment has been undertaken which determined that there is a moderate risk of encountering archaeological items/deposits and that the proposed service works at the eastern end of the platforms may expose historical archaeological relics. The Proposal requires the removal of the existing heritage-listed footbridge which includes early examples of concrete trestles. Options for retention and conservation of the footbridge were explored however the structural assessment and chemical testing of the concrete identified that there was no feasible method to reverse or halt the extensive carbonisation. While the Proposal would result in the removal of heritage fabric a Heritage Interpretation Strategy has been developed which allows for appropriate interpretation to be incorporated into the design and would help to mitigate the impacts of the bridge removal. The recommendations contained in the strategy would be further developed through the preparation and implementation of a Heritage Interpretation Plan. The impacts to the heritage-listed station as a whole as a result of the Proposal have also been considered which includes designing new elements to be visually recessive with modern and light materials to maintain focus of the heritage-listed buildings, and in the case of canopies incorporating a glass interface to provide a separation from the buildings on Platforms 3/4 and 5. On the positive side, the Proposal would have a positive contribution to the locality by creating new, open and accessible entrances to the station including a new entrance from the northern side (Hennessy Street).	Moderate
(f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The Proposal is unlikely to have any impact on the habitat of protected fauna.	Nil
(g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The Proposal is unlikely to have any impact on endangering any species of animal, plant or other form of life, whether living on land, in water or in the air.	Nil
(h) Any long term effects on the environment? The Proposal is unlikely to have any long term effects on the environment.	Nil
(i) Any degradation of the quality of the environment? The Proposal is unlikely to have any degradation on the quality of the environment.	Nil
(j) Any risk to the safety of the environment? The Proposal is unlikely to cause any pollution or safety risks to the environment provided the recommended mitigation measures are implemented.	Nil

Factor	Impacts
(k) Any reduction in the range of beneficial uses of the environment? The Proposal is unlikely to have any reduction in the range of beneficial uses of the environment.	Nil
(l) Any pollution of the environment? The Proposal is unlikely to cause any pollution or to the environment provided the recommended mitigation measures are implemented.	Nil
(m) Any environmental problems associated with the disposal of waste? The Proposal is unlikely to cause any environmental problems associated with the disposal of waste. All waste would be managed and disposed of with a site-specific Waste Management Plan. Mitigation measures would be implemented to ensure waste is reduced, reused or recycled where practicable.	Nil
(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The Proposal is unlikely increase demands on resources that are or are likely to become in short supply.	Nil
(o) Any cumulative environmental effect with other existing or likely future activities? Cumulative effects of the Proposal are described in Section 6.12. Where feasible, environmental management measures would be co-ordinated to reduce any cumulative construction impacts. The Proposal is unlikely to have any significant adverse long term impacts.	Nil
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The Proposal would not affect or be affected by any coastal processes or hazards.	Nil

Appendix C Sustainable Design Guidelines checklist

Compulsory initiatives

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
C.1 Carbon footprint	Energy and greenhouse	Undertake AS14064-2 (greenhouse gases – project level) compliant carbon footprinting exercise for all projects with a capital investment value over $10 million in accordance with Transport for NSW's Greenhouse Gas Inventory Guide for Construction Projects. The carbon footprint is to be used to inform decision-making in design and construction. Use standard carbon coefficient values for construction material and fuel usage. Monitor and report the carbon footprint every six months during construction.	DC	Yes
C.2 Building orientation and form	Energy and greenhouse	Optimise the building orientation and form to allow for maximum daylight levels (though avoiding overheating).	D	Yes
C.4 Insulation	Energy and greenhouse	Insulate covered and indoor areas. Techniques include adequate thermal mass, and insulating walls and ceilings. Also ensure that all opening are sealed.	D	Yes
C.5 Renewable Energy	Energy and greenhouse	Purchase at least 25% of site-based electricity energy needs from Green Power or renewable sources during construction of the asset.	C	Yes
C.6 Climate change impact assessment	Climate resilience	Perform a climate change impact assessment for each project worth over $10M using current scientific predictions (i.e. Intergovernmental Panel on Climate Change (IPCC), Commonwealth Scientific and Industrial Research Organisation (CSIRO) etc) to determine the hazards/risks associated with future climatic conditions. Refer to 'Climate Change Impacts and Risk Management: A Guide for Business and Government' and the 'AGIC Guidelines for Climate Change Adaptation' for guidance.	D	Yes
C.7 Design for climate change	Climate resilience	All projects with a capital investment value over $10 million to design out extreme, high and medium risks as identified in the climate change impact assessment where practicable.	D	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
C.8 Whole of life costing	Materials and waste	Use whole of life costing methodologies (e.g. Life-Cycle Cost Analysis (LCCA) Method) in line with ISO 15686-5 to inform decision-making on significant issues pertaining to project scope options (e.g. route selection) and material/technology selection (e.g. steel versus concrete bridge). Significant issues can be determined using qualitative criteria such as likely scale of environmental impact.	DC	Yes
C.9 Reduce waste to landfill	Materials and waste	Ensure at least 95 per cent of construction and demolition waste (by weight) is diverted from landfill, and either recycled or reused, for all projects with a capital investment value over $10 million.	DC	Yes
C.11 Reduce cement	Materials and waste	Reduce the absolute quantity of Portland cement by at least 30 per cent, as an average across all concrete mixes, by substituting it with supplementary cementitious materials (such as a fly ash, ground granulated blast furnace slag or alkali activated cements) subject to meeting strength and durability requirements.	DC	Yes
C.12 Biodiversity offsetting	Biodiversity and heritage	For non-significant impacts (inside or outside the rail corridor) offsetting is to be in accordance with the TPD Vegetation Offset Guide as applicable.	DC	Yes
C.13 Heritage conservation and en-hancement	Biodiversity and heritage	100 per cent of significant heritage items are identified during project development and design and are protected or beneficially reused where practical. This will require consultation with all relevant Indigenous Heritage groups (where applicable).	DC	Yes
C.14 Heritage interpretation	Biodiversity and heritage	Achieve interpretation of all applicable heritage or historic items through development and implementation of a heritage interpretation strategy (e.g. incorporate interpretive signage at the station, which provides information on the heritage of the area).	DC	Yes
C.16 Water efficient fittings	Water	Ensure onsite amenities using potable water comply with the following criteria: Toilets to be WELS (max 4.5/3 L/min) dual flush toilets; Urinals to be waterless; All taps to be WELS (max 7.5 L/min); (see Green Star Office v3). Any other water fixtures should achieve at least a 5 Star WELS rating.	DC	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
C.17 Water efficient controls	Water	Specify sensors, timers or spring loaded devices for taps where possible to reduce water loss from taps that are left running.	D	Yes
C.18 Monitor and record construction water	Water	Projects that have capital value greater than $10 million are to monitor and record water consumption at the site office, all outlets available to the construction site and other water uses such as from non -potable sources.	C	Yes
C.20 Noise management	Pollution control	Project to comply with Transport Projects Construction Noise Strategy and related conditions of approval.	DC	Yes
C.21 Community involvement in planning	Community benefit	Actively engage with stakeholders including the community during planning.	D	Yes
C.22 Planning framework		Plan and design projects to take into considerations existing planning strategies in consultation with relevant authorities.	D	Yes
C.23 Crime Prevention Through Environmental Design (CPTED)	Community benefit	Incorporate CPTED principles during design. This may include natural observation and use of CCTV. Natural observation is achieved through fence, landscape, streetscape and open space design in public or staff supervised areas. This is achieved by minimising narrow corridors, hidden corners and through the use of lighting.	D	Yes

Discretionary initiatives

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
1.2 Quantity surveyor	Energy and greenhouse	Quantity surveyor reports to include mass quantities of building materials. This will enable the carbon footprinting to be more accurate and more cost effective. Quantity surveyor reports will also include costing for capital and ongoing maintenance of sustainability initiatives that involve onsite energy generation.	DC	Yes
1.15 Light coloured finishes	Energy and greenhouse	Use light coloured finishes on floors, walls and ceilings of offices, stations and platforms to help reflect ambient light. Within car parks, consider glare and safety issues that may arise.	D	Yes
1.17 Photo-electric switches	Energy and greenhouse	Install control systems for lighting that dim or switch-off lights according to the amount of daylight the zone is receiving. The lights can also switch on in order to maintain a minimum level of lighting. Lights should be off when areas are closed or unoccupied.	D	Yes
1.18 Motion controlled switches	Energy and greenhouse	Install lighting control systems that include motion sensors to control low traffic areas.	D	Yes
1.19 Timed switches	Energy and greenhouse	Install lighting switches that turn on and off at particular times where pattern of use is known such as offices. Note: This initiative is not applicable where photo-electric switches and motion controlled switches are installed	D	Yes
1.21 Light dimming	Energy and greenhouse	Allow lighting system to use low light or switch off while meeting lighting requirements.	D	Yes
1.22 Lighting scheme	Energy and greenhouse	Prepare a lighting scheme by a suitably qualified lighting designer. Pay attention to zoning between lighting demands of different areas and strategic placement of lighting fixtures to maximise ground coverage.	D	Yes
1.25 Natural ventilation	Energy and greenhouse	Naturally ventilate structures (refer to AS1668.2-2002 (type 3)). Consider prevailing winds.	D	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
1.40 Energy efficient HVAC	Energy and greenhouse	Select and design HVAC system with prioritisation of energy efficiency. See section 4.3.1.3 of the ASA Station Design Standard Requirements for further information on air conditioning and ventilation requirements at stations. Also refer to AS1668.2 -2002.	D	Yes
1.44 Vertical transport	Energy and greenhouse	Install energy efficient vertical transport systems (e.g. ramps; variable speed drive escalators that enable a slow-mode, so that they oscillate at lower speeds when not in use and increase in speed when users step into the foot panel at the entry to the escalator. Install and variable voltage variable frequency (VVVF) control gear for lifts.	D	Yes
1.45 Stair placement to encourage use	Energy and greenhouse	Locate stairs along desire lines to encourage use. Provide stairs instead of escalators unless there is a 6 metre rise or greater, or a platform clearance or congestion issue. Maintain ramps or lifts for disabled access.	D	Yes
2.3 Passenger comfort	Climate resilience	Review levels of passenger comfort to take account of climate change (e.g. provision of additional shelter from winds and driving rain and increased shading from sun in locations where customers wait for transport).	D	Yes
2.5 Thermal comfort	Climate resilience	Select ventilation systems to provide a satisfactory environment during severe heat waves.	D	Yes
2.6 Equipment resilience to temperature	Climate resilience	Select equipment that will be resilient to increased temperature and more frequent and severe heat waves. Temperature resilient equipment will also negate or reduce need for active temperature control, reducing operational energy consumption.	D	Yes
2.8 Protection from extreme weather (sun, rain, wind)	Climate resilience	Consider design measures for protecting customers and electrical equipment from wind and rain during storm events.	D	Yes
2.9 Protect sensitive assets	Climate resilience	Protect sensitive assets (e.g. lifts, escalators) from the effects of extreme climate and weather.	D	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
3.1 Sustainable procurement	Materials and waste	Develop a sustainable procurement strategy to be implemented during construction. The strategy must include at a minimum (i) a commitment to sustainable procurement in a relevant policy and/or plan, (ii) sustainability questions and requirements in tender documentation, (iii) a process for evaluating tenderers based on sustainability criteria including per centage tender evaluation weighting on sustainability and iv) sustainability requirements in subcontracts. Project teams should be able to demonstrate that the strategy has influenced procurement decision-making and outcomes.	DC	Yes
3.2 LCA based environmental footprint	Materials and waste	Undertake ISO 14044 (Environmental Guidelines – LIfe Cycle Assessment) compliant life cycle analysis (LCA) to assess the environmental footprint of the development.	DC	Yes
3.3 Environmentally responsible suppliers	Materials and waste	Use materials certified under recognised environmental certification systems (such as EcoSpecifier, Good Environmental Choice, ECO-Buy, water efficiency labelling scheme (WELS), Energy Star, Forest Stewardship Council (FSC), Low Carbon Australia Carbon Neutral Certified).	DC	Yes
3.4 Recycled / renewable materials	Materials and waste	Maximise the recycled content of construction materials, in particular those included in the Infrastructure Sustainability Council of Australia's IS Materials Calculator available from ISCA for free at www.isca.org.au.	DC	Yes
3.5 Optimise design	Materials and waste	Optimise design to minimise material consumption, mass/volume/space use and above ground land use.	D	Yes
3.6 Re-use of structures	Materials and waste	Retain or refurbish existing structures where possible.	DC	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
3.8 Low impact concrete	Materials and waste	Make sure that the mix water for concrete contains at least 50 per cent non -potable water. Substitute aggregates to the following levels (but only if Portland cement content does not increase by more than 5 kg/m3): • At least 40 per cent of coarse aggregate is crushed concrete aggregate or alternative materials. • At least 25 per cent of fine aggregates (sand) are manufactured sand or alternative materials.	DC	Yes
3.14 Sustainable structural steel	Materials and waste	Source at least 60 per cent of structural steel (by weight) from a steel fabricator/contractor accredited by the Environmental Sustainability Charter of the Australian Steel Institute.	C	Yes
3.17 Low VOC paints and finishes	Materials and waste	Specify low volatile organic compound (VOC) paints and finishes. Refer to Green Star – Office Interiors v1.1 available online.	DC	Yes
3.18 Low VOC adhesives and sealants	Materials and waste	Specify all adhesives and sealants as low VOC. Refer to Green Star – Office Interiors v1.1 available online.	DC	Yes
3.26 On-site spoil reuse	Materials and waste	Reuse any excess spoil as a landform feature, visual screen, in concrete and/or for noise attenuation.	DC	Yes
3.27 Off-site spoil reuse	Materials and waste	Where clean spoil cannot be used on -site, prioritise off-site uses that have biodiversity or community benefit, and require minimum transport distances.	DC	Yes
3.29 Segregation of waste	Materials and waste	Enable waste segregation in the design process by including space for the collection and segregation of waste with appropriate marking (e.g. signage) and controls (e.g. lockable lids), located away from sensitive receptors (e.g. water courses). During construction, use facilities and procedures that maximise on-site separation of waste to maximise reuse/recycling.	DC	Yes
3.30 Reuse construction waste	Materials and waste	Maximise reuse of concrete, bricks, earthworks and other structural waste materials.	DC	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
3.31 Mulching	Materials and waste	Mulch all appropriate waste vegetation (no weeds) where justified by volume or send it to an off-site compost facility.	C	Yes
3.34 Prevent electrolysis	Materials and waste	Prevent or minimise the effects of stray current electrolysis from electrified railway that increase the rate of corrosion. Such as selecting suitable building materials, avoiding using metal finishes in the vicinity of high voltage electricity, using masking agents or coatings to prevent exposure of metals, and preventing direct contact between metallic parts.	D	Yes
3.35 Modular construction	Materials and waste	Use modular and replaceable finishing elements (e.g. tunnel lining).	D	Yes
3.36 Prefabricatio n	Materials and waste	Use prefabricated building and civil components (for bridges, walls (retaining, deflection, noise), culverts, platforms, level crossings and tunnel lining etc) to reduce construction waste material usage, pollution risks and travel.	DC	Yes
3.37 Low finish interiors	Materials and waste	Specify low-finish interiors (e.g. exposed brick/rock walls, unpainted galvanised steel, polished concrete walls and floors) to avoid the need for large quantities of paint and/or cement render. Consider graffiti removal in specifying surface textures.	D	Yes
3.43 Durable finishes	Materials and waste	Specify building materials and finishes to demonstrate high quality and durability.	D	Yes
4.2 Ecological value opportunities	Biodiversity and heritage	Maximise ecological values through landscape species choice, and planting density and configuration. Make sure that appropriate weed management strategies are undertaken to avoid migration or contamination on and offsite.	DC	Yes
4.4 Feral animal and weed programme	Biodiversity and heritage	Identify, control, monitor and manage feral animals and weeds.	DC	Yes
4.9 Heritage items in the vicinity	Biodiversity and heritage	Design for the interrelationship between new development/redevelopment and proximate buildings of heritage/cultural significance.	D	Yes
5.10 Planting	Water	Select plant species that require minimal or no irrigation after establishment.	DC	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
5.15 Permeable and porous surfaces	Water	Design for permeable and porous surfaces to allow for stormwater infiltration (preferably with other treatments such as vegetated swales).	D	Yes
6.4 Avoid dangerous goods and hazardous materials	Pollution control	Use Safety Data Sheets (SDS) to avoid the use of dangerous goods and hazardous materials. See the materials section in Appendix B for details.	DC	Yes
6.5 Apply noise control hierarchy	Pollution control	Apply a hierarchy of control by addressing noise at source first (e.g. orient equipment away from residential receivers), then propagation path (e.g. a noise barrier) and finally at the receiver (e.g. double glazed windows) as a last option (see Rail Infrastructure Noise Guidelines for further information).	D	Yes
6.11 Separate passenger waiting areas from noise	Pollution control	Segregate passenger waiting area from noisy areas.	D	Yes
6.12 Optimise outdoor PA systems	Pollution control	Optimise design and installation of open and semi-enclosed stations' PA systems to reduce impact on community.	D	Yes
6.16 Security and warning lights	Pollution control	Install security and warning lighting so that they are not directed at neighbouring properties or in such a way that they reflect off trains onto structures or neighbouring properties.	D	Yes
6.17 Avoid glare and light pollution	Pollution control	Minimise ambient light levels and glare towards neighbouring properties (e.g. avoid or obstruct up lighting). Refer to ASA standard 3.11.3.3 for guidance and make sure that design complies with AS4282 Control of the Obtrusive Effects of Outdoor Lighting. Do not exceed minimum requirements of AS1158 for illuminance levels for 95 per cent of outdoor spaces.	D	Yes
7.3 Public art	Community benefit	Consult with the community over potential public art proposals.	DC	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
7.7 Plan station entries	Community benefit	Plan station entries that connect directly to existing key desire lines, pedestrian routes or for the most efficient pedestrian routes.	D	Yes
7.14 Wayfinding strategy	Community benefit	Develop and implement a wayfinding strategy for the catchment area within 800 metres of the station.	DC	Yes
7.19 Kiss and ride	Community benefit	Provide for kiss and ride at the station.	D	Yes
7.20 Taxi stand and/or bus stop	Community benefit	Provide shelter for nearby taxi stands and bus stops.	D	Yes
7.28 Bicycle lockers and/ or racks	Community benefit	Provide sheltered bicycle lock ups and/or lockers in or near entrance to the station. Allow for at least 5% of staff use at maintenance facilities. See Section 3.9.3.1 of the ASA Station Design Standard Requirements for further information on bicycle parking requirements at stations.	D	Yes
7.29 Bicycle storage security	Community benefit	Locate bicycle storage area in an area with a high level of passive surveillance and/or prominent CCTV.	D	Yes
7.33 Safe pedestrian movement	Community benefit	Make sure that safe movement is promoted for pedestrians and cyclists by minimising vehicle crossings of paths, providing clear signage, and providing freedom from obstacles such as poles, trees etc.	D	Yes
7.38 Reduce vandalism	Community benefit	Minimise risks from vandalism during design, such as designing pedestrian bridges and walkways with a high degree of surveillance or railings, restrict window openings and limit to a maximum 80mm opening.	D	Yes
7.39 Reduce graffiti	Community benefit	Minimise graffiti risks such as through treatment of fencing and other surfaces with anti-graffiti paint or coatings, vegetation cover to deter graffiti or providing designated walls for graffiti.	D	Yes

Initiative	Theme	Description	Design (D) or Construct (C) interface	Under consideration
7.40 Intelligible PA systems	Community benefit	Design public address (PA) system to maximise coverage and speech intelligibility for customers and staff. Considerations are to include distributed speaker systems, announcements booths to allow clear and audible announcements, acoustic absorption materials in appropriate waiting areas and text based announcements on public displays for the hearing impaired.	D	Yes
7.41 Station furniture	Community benefit	Procure high quality and durable station furniture items within existing structures. Where a new station is proposed make sure that station furniture are durable and resistant to graffiti.	D	Yes
7.49 Wind breaks	Community benefit	Design structures and landscape to shelter passengers from prevailing winds.	D	Yes
7.50 Shading	Community benefit	Provide shade through vegetation or structures over platform, concourse, car parks and pedestrian pathway areas and work/lunch areas.	D	Yes