NSW GOVERNMENT

More Trains, More Services

Hurstville Crossover Project

Review of Environmental Factors

October 2019

(blank page)

Contents

Figures

Tables

Abbreviations

Term	Meaning
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
ARI	Average Recurrence Interval
ASA	Asset Standards Authority (refer to Definitions)
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
BC Act	*Biodiversity Conservation Act 2016* (NSW)
CBD	Central Business District
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CLM Act	*Contaminated Land Management Act 1997* (NSW)
CNVMP	Construction Noise and Vibration Management Plan
CNVS	Construction Noise and Vibration Strategy (TfNSW, 2019g)
CPTED	Crime Prevention Through Environmental Design
DBH	Diameter at Breast Height
DBYD	Dial Before You Dig
DDA	*Disability Discrimination Act 1992* (Cwlth)
DEE	Commonwealth Department of the Environment and Energy
DPC	Department of Premier and Cabinet
DPC Heritage	Department of Premier and Cabinet Heritage
DPIE	Department of Planning, Industry and Environment
ECM	Environmental Controls Map
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)

Term	Meaning
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development (refer to Definitions)
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	Interim Construction Noise Guideline (Department of Environment and Climate Change, 2000)
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
ISCA	Infrastructure Sustainability Council of Australia
kV	kilovolt
LEP	Local Environmental Plan
LGA	Local Government Area
LV	Low Voltage
MNES	Matters of National Environmental Significance
NCA	Noise Catchment Area
NML	Noise Management Level
NPfI	Noise Policy for Industry (Environment Protection Authority, 2017)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
OEH	(former) NSW Office of the Environment and Heritage
OHW	Overhead Wiring
OLB	Over Line Bridge
OOHW	Out of Hours Works
PA system	Public Address System
PDP	Public Domain Plan
PMST	Protected Matters Search Tool
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
RailCorp	(former) Rail Corporation of NSW
RBL	Rating Background Level

Term	Meaning
REF	Review of Environmental Factors (this document)
RING	Rail Infrastructure Noise Guideline (Environment Protection Authority, 2013)
RMS	(former) Roads and Maritime Services (now part of Transport for NSW)
Roads Act	*Roads Act 1993* (NSW)
ROL	Road Occupancy Licence
SDS	Safety Data Sheet
SEPP	State Environmental Planning Policy
SHR	State Heritage Register
SoHI	Statement of Heritage Impact
TCP	Traffic Control Plan
TEC	Threatened Ecological Community
TfNSW	Transport for NSW
TfNSW (former RMS)	Transport for NSW (former Roads and Maritime Services)
TGSI	Tactile Ground Surface Indicators (“tactiles”)
TMP	Traffic Management Plan
TPZ	Tree Protection Zone
UDP	Urban Design Plan
VDV	Vibration Dose Values
V	Volt
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)

Definitions

Term	Meaning
Average Recurrence Interval	The likelihood of occurrence, expressed in terms of the long-term average number of years, between flood events as large as or larger than the design flood event. For example, floods with a discharge as large as or larger than the 100-year ARI flood will occur on average once every 100-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.
Cess	The area either side of the track which is kept at a lower level in order to provide for drainage away from the rail track.
Concept design	The concept design is the preliminary design presented in this REF, which would be refined by the Construction Contractor (should the Proposal proceed) to a design suitable for construction (subject to TfNSW acceptance).
Construction Contractor	The organisation(s) engaged by TfNSW to undertake the design and construction of the Proposal.
Crossover	A short section of track which creates a path for a train to cross from one line to another. A turnout is installed at each end of a crossover to link with the respective train lines.
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 Construction Contractor. The Construction Contractor completes the project by refining the concept design presented in the REF and completing the detailed design so that it is suitable for construction (subject to TfNSW acceptance). The Construction Contractor is therefore responsible for all work on the project, both design and construction.
Detailed design	Detailed design broadly refers to the process that the Construction Contractor undertakes (should the Proposal proceed) to refine the concept design to a design suitable for construction (subject to TfNSW acceptance).
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.
Down (direction)	The railway direction away from Sydney (Central) in NSW. Down is also referred to as 'Country'.
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.

Term	Meaning
Feasible	In terms of addressing noise impacts, 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.
Fouling point	A point of a switch turnout where a car or locomotive on one track obstructs movements on the adjacent track
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).
NSW Trains	From 1 July 2013, NSW Trains became the new rail provider of services for regional rail customers.
Out of hours works	Defined as works *outside* standard construction hours (i.e. outside of 7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work on Sundays/public holidays).
Proponent	A person or body proposing to carry out an activity under Division 5.1 of the EP&A Act - in this instance, TfNSW.
(the) Proposal	The construction and operation of the Hurstville Crossover.
Rail possession	Possession is the term used by railway building/maintenance personnel to indicate that they have taken possession of the track (usually a section 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	In terms of addressing noise impacts, 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
Transport for NSW (former Roads and Maritime Services)	The former Roads and Maritime Services was amalgamated into Transport for NSW on 1 July 2019.
Turnout	A short section of rail track which enables the divergence of one rail line into two rail lines, or the convergence of two rail lines into one rail line.
Up (direction)	The railway direction towards Sydney (Central) in NSW. Up is also referred to as 'City'.

(blank page)

Executive summary

Overview

Transport for NSW (TfNSW) proposes to deliver service improvements on Sydney's busiest rail lines including the T4 Illawarra Line, South Coast Line and T8 Airport and South Line. These improvements are part of the More Trains, More Services program (the Program) that over the next ten years will transform the rail network and provide customers with more reliable, high capacity turn up and go services.

As part of the Program, Hurstville to Bondi Junction all station services will swap operation from the Illawarra Local tracks to the Illawarra Main tracks to optimise the capacity of the T4 corridor. The Hurstville crossover Proposal (the Proposal) would introduce a crossover on the City (i.e. eastern) side of Hurstville Station to enable all station services operating on the Down Illawarra Main track to terminate at Platform 4 and commence a service in the Up direction on the Up Illawarra Main track.

TfNSW is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the Proposal. The main features of the Proposal are:

- construction of a new crossover (approximately 100 metres in length) between the existing Up and Down tracks of the Illawarra Main including minor adjustments to the vertical and horizontal elevation of the tracks
- modification and addition of overhead wiring (OHW) structures, including new OHW supports beneath the existing bridge
- installation of new signals, turnouts and associated trackside equipment
- modification of the existing combined services route to accommodate the new signalling infrastructure
- minor modification of an existing drainage channel.

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 Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Subject to approval, construction is expected to commence in late 2020 and take around one year to complete. A detailed description of the Proposal is provided in **Chapter 3** of this REF.

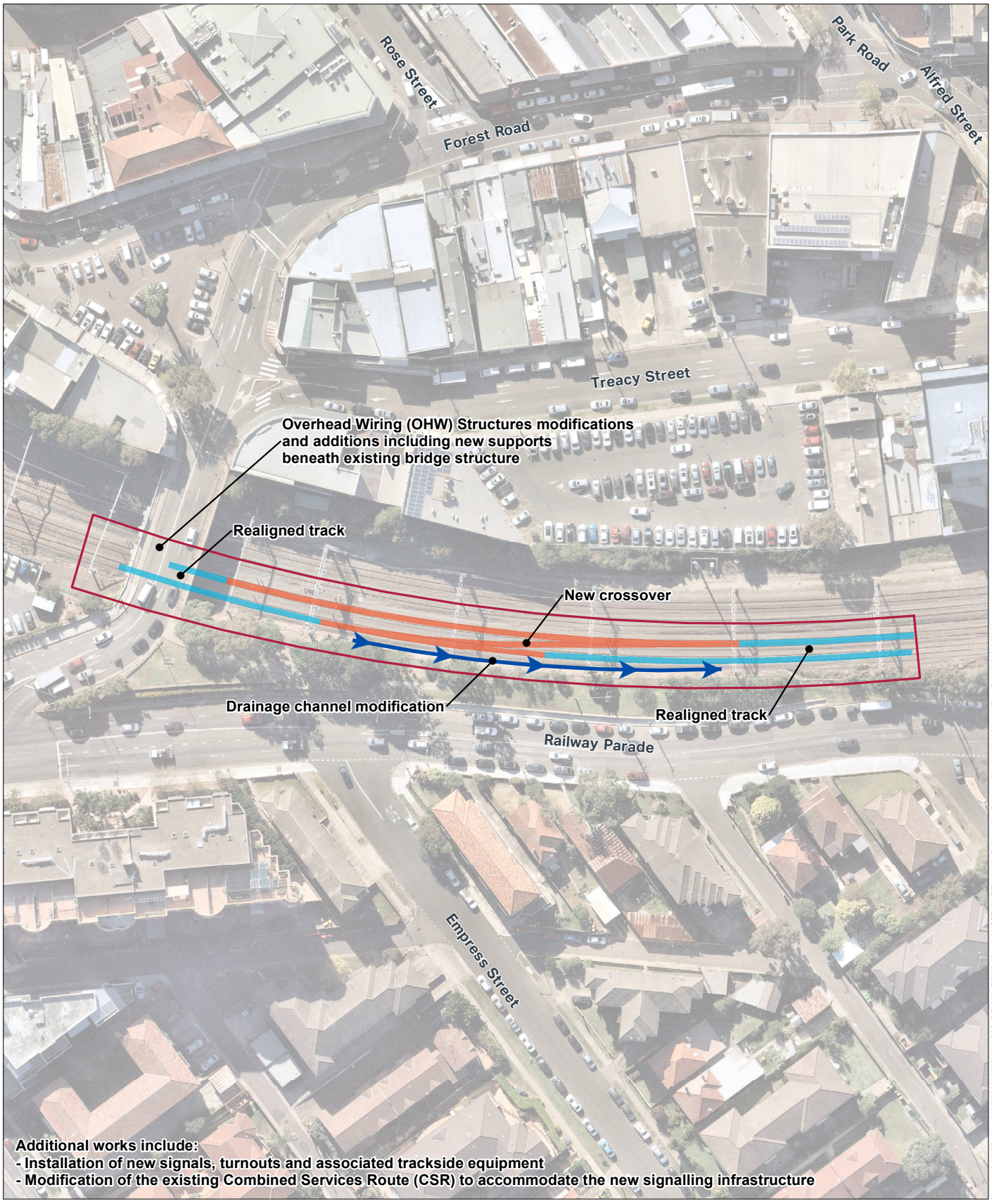

FIGURE E-1: PROPOSED WORKS

AECOM

N

0 20 40 m

Legend

- Extent of proposed works
- New crossover
- Realigned track
- Drainage channel modification

Source: Imagery © Nearmap, 2019.

Need for the Proposal

Sydney's population is growing and the city's rail network is one of the busiest in the southern hemisphere, with a record 400 million trips each year. Over the past five years there has been unprecedented customer demand on the Sydney Trains network, with rail patronage increasing by 30 per cent. Even after the full commencement of Sydney Metro in 2026, the heavy rail network will continue to carry 80 percent of all rail passengers, and around 60 percent of all peak hour transport travel (TfNSW, 2017).

In parallel with the new metro train system, the Program will simplify the rail network and create high capacity, turn up and go services for customers. While More Trains, More Services will eventually deliver benefits to the entire network, TfNSW propose to start by targeting improvements on Sydney's busiest lines. The first lines to benefit from the Program will be the T4 Eastern Suburbs and Illawarra Line, the South Coast Line and the T8 Airport and South Line. These are some of the busiest lines on the Sydney Trains network, catering for 410,000 return trips in a typical day and representing around one third of all Sydney Trains daily customers.

As part of the Program, Hurstville to Bondi Junction all station services will swap operation from the Illawarra Local tracks to the Illawarra Main tracks to optimise the capacity of the T4 corridor. The Hurstville crossover Proposal (the Proposal) would introduce a crossover on the City side of Hurstville Station to enable all station services operating on the Down Illawarra Main track to terminate at Platform 4 at Hurstville Station and commence service back towards the city on the Up Illawarra Main track.

Chapter 2 of this REF further describes the need for the Proposal and outlines the options considered in developing the design.

Community and stakeholder consultation

Community consultation activities for the Proposal would be undertaken during the public display period of this REF. During this time the public are invited to submit feedback to help TfNSW understand what is important to customers and the community. The REF would be displayed for a period of two weeks. Further information about these specific consultation activities is included in Section 5 of this REF.

During the display period a Project Infoline (1800 684 490) and email address (projects@transport.nsw.gov.au) would also be available for members of the public to make enquiries.

In accordance with the requirements of *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), consultation is required with local councils and/or public authorities under certain circumstances. This includes where infrastructure managed by a council or other public authority is affected by the Proposal. Initial consultation has been undertaken during the development of design options with Sydney Trains. Consultation would continue throughout the detailed design and construction of the Proposal.

View the plans:

The REF can be viewed at:

- transport.nsw.gov.au/projects/mtms
- nsw.gov.au/improving-nsw/haveyoursay
- Oatley Public Library, 26 Letitia Street, Oatley
- Georges River Service Centre, Corner MacMahon and Dora Streets, Hurstville
- Transport for NSW, 241 O'Riordan Street, The Gateway, Mascot

Feedback can be sent to:

- projects@transport.nsw.gov.au
- More Trains, More Services Program – Hurstville Crossover Project
  Associate Director, Environmental Impact Assessment
  Transport for NSW
  Locked Bag 6501
  St Leonards NSW 2065

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 E2 shows the planning approval and consultation process for the Proposal.

Figure E2 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 mitigation measures to reduce the identified impacts.

The following key impacts have been identified should the Proposal proceed:

- temporary changes to vehicle movements to, from and around the Proposal Area during construction
- temporary noise and vibration impacts during construction.

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

Conclusion

This REF has been prepared having regard to sections 5.5 and 5.7 of the EP&A Act, and clause 228 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation). These require 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 seek to achieve an 'Excellent' rating in accordance with version 1.2 of the Infrastructure Sustainability Council of Australia's Infrastructure Sustainability Rating Scheme by taking into account the principles of ecologically sustainable development.

The impact assessment undertaken within this REF indicates that the Proposal would not result in a significant impact upon the environment, including areas of outstanding biodiversity value, threatened species, populations, ecological communities or their habitats.

Impacts associated with the key issues outlined above would be temporary during construction or of a low magnitude during operation. As such none of these impacts would be significant.

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.

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 Hurstville Crossover (the Proposal).

1.1 Overview of the Proposal

1.1.1 The More Trains, More Services Program

Over the next ten years the More Trains, More Services program will simplify and modernise the rail network, creating high capacity and turn up and go services for many customers. Customers will experience more frequent train services, with reduced waiting times and less crowding on a simpler, more reliable network. More Trains, More Services is a program of staged investments that will progressively transform the rail network into a modern and reliable system using world class technology.

The More Trains, More Services program is about building a modern and up to date rail system that will play its part in making Sydney a more productive and liveable city. The NSW Government's *Future Transport Strategy 2056* (TfNSW, 2018a) identifies More Trains, More Services as a priority initiative and is a commitment to the state's transport and infrastructure needs.

More Trains, More Services is key to enabling Greater Sydney Commission's vision for the Greater Sydney Region Plan, *A Metropolis of Three Cities*, where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.

The Program is already delivering better customer outcomes through timetable enhancements and the integration of the Sydney Metro Northwest with the existing heavy rail network.

While More Trains, More Services will eventually deliver benefits to the entire network, the Program will start by targeting improvements on Sydney's busiest lines. The first lines to benefit from the program will be the T4 Eastern Suburbs and Illawarra Line, the South Coast Line and the T8 Airport and South Line.

These services will be enabled by upgrading and modernising signalling and control systems and using digital technology that, when combined with other infrastructure upgrades, will deliver major increases in the capacity and reliability of the network.

1.1.2 The need for the Proposal

Sydney's population is growing and the city's rail network is one of the busiest in the southern hemisphere, with a record 400 million trips each year. Over the past five years there has been unprecedented customer demand on the Sydney Trains network, with rail patronage increasing by 30 per cent. Even after the full commencement of Sydney Metro in 2026, the heavy rail network will continue to carry 80 percent of all rail passengers, and around 60 percent of all peak hour transport travel (TfNSW, 2017).

In parallel with the new metro train system, the More Trains, More Services program will simplify the rail network and create high capacity, turn up and go services for customers.

While More Trains, More Services will eventually deliver benefits to the entire network, TfNSW propose to start by targeting improvements on Sydney's busiest lines. The first lines to benefit from the Program will be the T4 Eastern Suburbs and Illawarra Line, the South Coast Line and the T8 Airport and South Line. These are some of the busiest lines on the Sydney Trains network, catering for 410,000 return trips in a typical day, representing around one third of all daily Sydney Trains customers.

Future stages of More Trains, More Services will deliver a 30 per cent increase in peak services on the T4 Illawarra Line, and an 80 per cent increase at stations between Green Square and Wolli Creek, meaning trains at least on average every four minutes instead of every six.

As part of the Program, Hurstville to Bondi Junction all station services will swap operation from the Illawarra Local tracks to the Illawarra Main tracks to optimise the capacity of the T4 corridor. The Hurstville crossover Proposal (the Proposal) would introduce a crossover on the City side of Hurstville Station to enable all station services operating on the Down Illawarra Main track to terminate at Platform 4 at Hurstville Station and commence back towards the city on the Up direction on the Up Illawarra Main track.

1.1.3 Key features of the Proposal

The key features of the Proposal are summarised as follows:

- construction of a new crossover (100 metres in length) between the existing Up and Down tracks of the Illawarra Main including minor adjustments to the vertical and horizontal elevation of the tracks
- modification and addition of overhead wiring (OHW) structures, including new OHW supports beneath the existing bridge
- installation of new signals, turnouts and associated trackside equipment
- modification of the existing combined services route to accommodate the new signalling infrastructure
- minor modification of an existing drainage channel.

Subject to planning approval, construction is expected to commence in late 2020 and take around one year 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 is located around 170 metres east of Hurstville Station, in the Suburb of Hurstville, NSW. The proposal area is located around 14 kilometres south-west of the Sydney Central Business District (CBD) and within the Georges River local government area (LGA). The rail line in this location largely follows Railway Parade and bisects the suburb in an east-west direction. The Proposal is serviced by the T4 Eastern Suburbs and Illawarra Line and South Coast Line. The Proposal Area covers the Illawarra Down and Up main lines, drainage channels and vegetation cover on the northern and southern boarders of the railway. The location of the Proposal in context of the region is shown in **Figure 1.1**.

The Proposal Area, which includes the crossover location and associated construction compounds and laydown areas, extends from approximately 150 metres west of Hurstville Station to approximately 500 metres east of Hurstville Station. The Proposal is bounded by the Hurstville CBD to the north and residential premises to the south. Overall, the Proposal Area occupies around 1.05 hectares (ha).

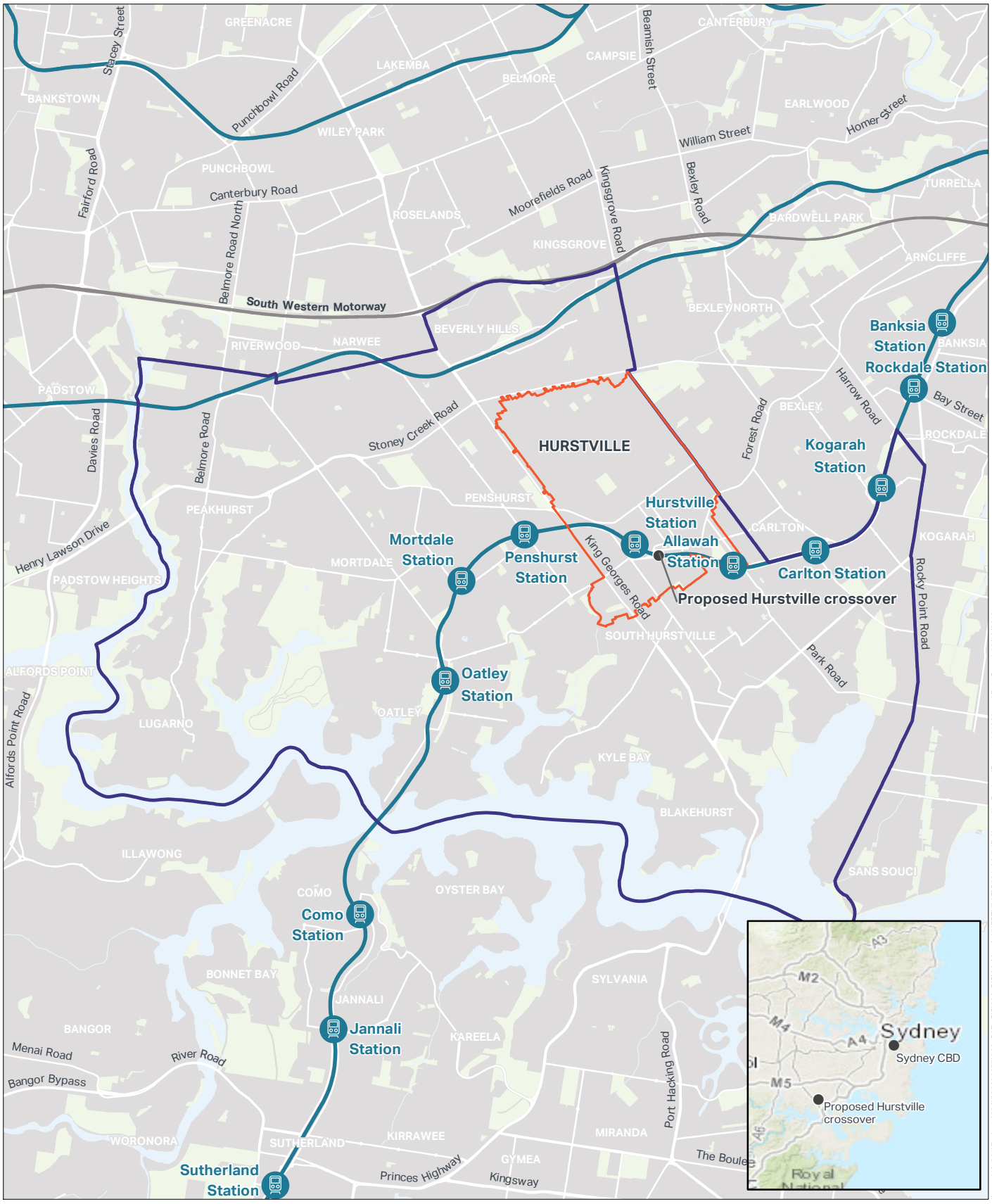

FIGURE 1-1: REGIONAL CONTEXT

AECOM

N

0 1 2 km

Legend

- Suburb boundary
- Georges River LGA
- Park/Reserve
- Railway station
- Railway
- Motorway

Source:

1.3 Existing infrastructure and land uses

Hurstville Station is a major stop for trains travelling on the T4 Eastern Suburbs and Illawarra Line and the South Coast Line. The station consists of two island platform areas serving four platforms in total. The station contains public and staff amenities, and features facilities including a wheelchair accessible toilet, kiss and ride stopping area, taxi rank, bike racks, a payphone and an emergency help point.

The Proposal Area is currently located within the Georges River LGA, however the applicable land zoning for the Proposal is under the *Hurstville Local Environmental Plan 2012* (Hurstville LEP) and the *Kogarah Local Environmental Plan 2012* (Kogarah LEP). This is due to the railway line forming the boundary between those LGAs prior to their amalgamation into Georges River Council. The Proposal is located within an area zoned SP2 – Railway (Hurstville LEP) and SP2 Rail Infrastructure Facilities (Kogarah LEP). Land zones nearby the Proposal are comprised of the following:

- B4 – Mixed use immediately to the north and south of the station
- B3 – Commercial Centre beyond the B4 land zone to the north
- R2 – Low Density Residential to the south west
- R3 – Medium Density Residential to the south east
- a small area of land zoned R4 – High Density Residential to the south east
- a small area of land zoned RE1 – Public Recreation to the south east.

The surrounding land uses conform to their land zones and include educational establishments, public recreation spaces, commercial businesses and low, medium and high density residential areas.

There is a town centre located approximately 50 metres to the north which provides general amenities. Clement Art School Hurstville is located approximately 90 metres to the north. Other sensitive receivers such as educational and religious facilities near the Proposal include:

- Woniora Road School approximately 285 metres to the south west
- Lily Music School approximately 205 metres to the north west
- Clavier Music and Art School approximately 190 metres to the north
- St George's Hurstville Anglican Church approximately 155 metres to the north.

The closest main road is King Georges Road (approximately 600 metres to the south west) which links to the M5 East Motorway.

Figure 1.2 shows the location of the Proposal and the land zonings/uses around the Proposal, while **Figure 1.3**, **Figure 1.4** and **Figure 1-5** provide photos of the existing site and surrounds.

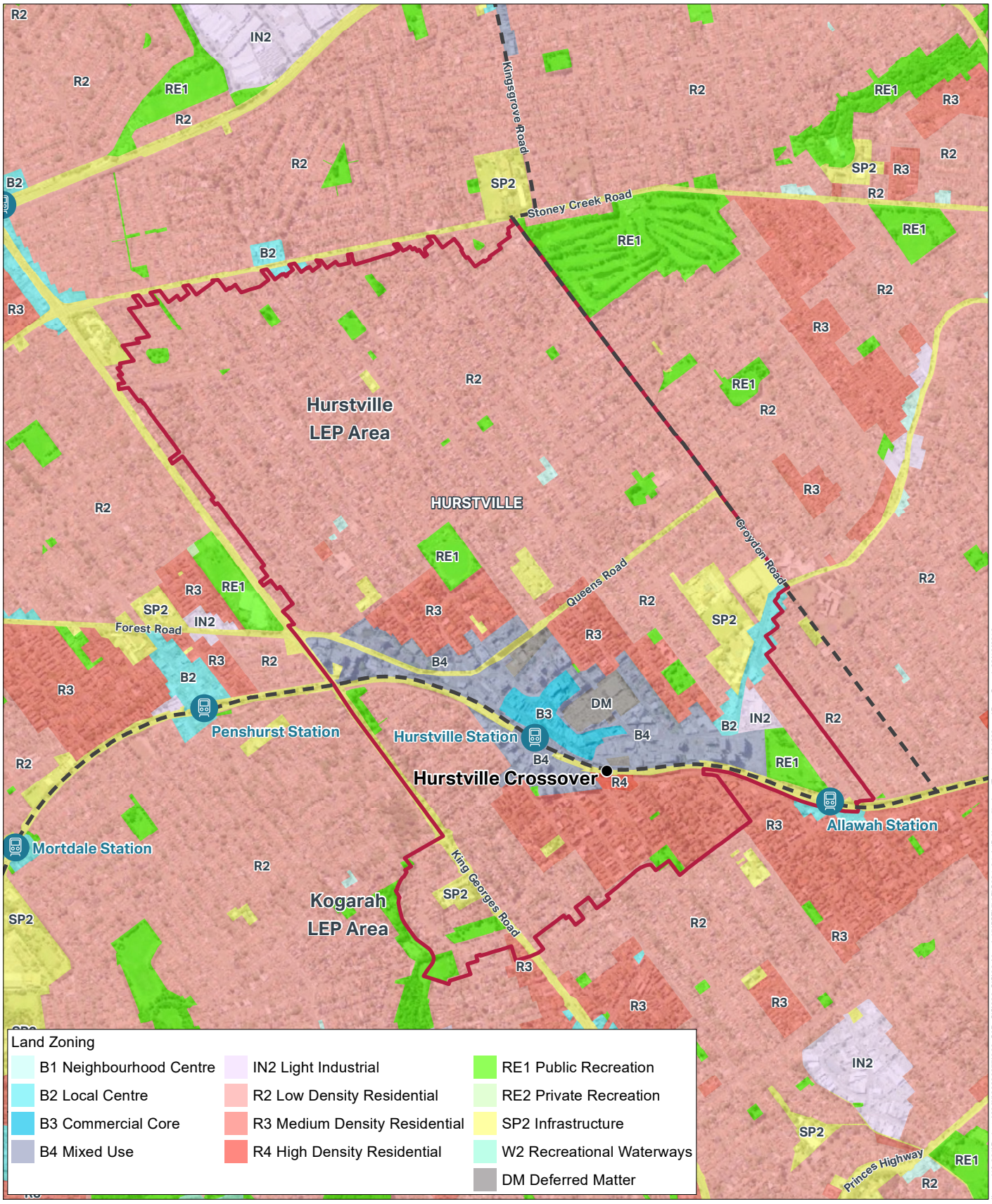

FIGURE 1-2: LAND USE

AECOM

N 0 0.25 0.5 km

Legend

- Railway station
- Suburb boundary
- LEP boundary

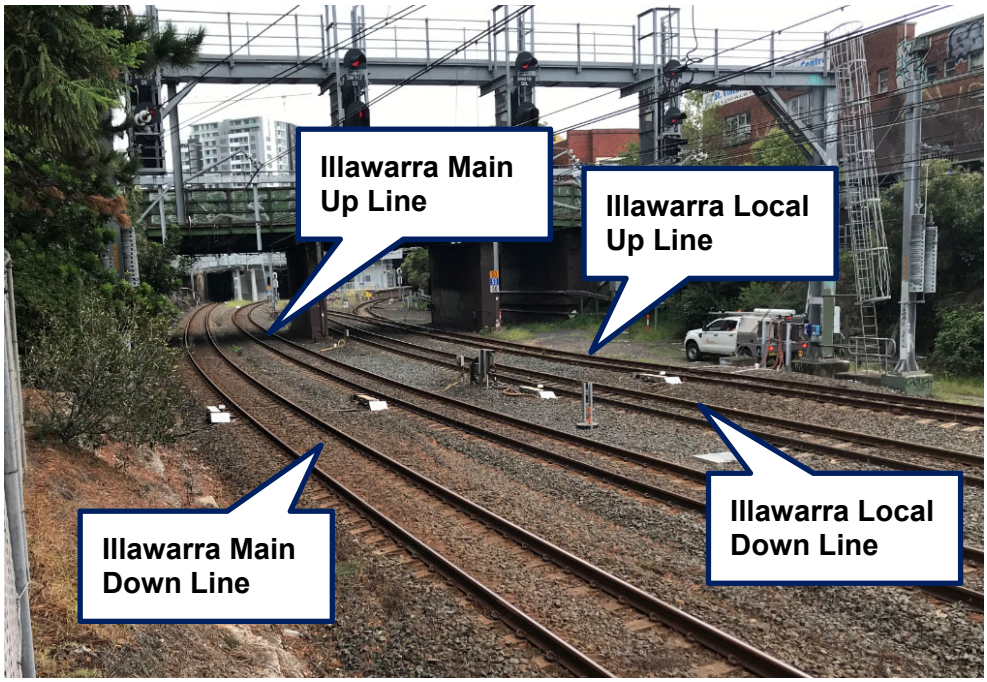

Figure 1.3 View from the eastern extent of the Proposal Area looking west. The Up and Down tracks of the Illawarra Main are the two tracks in the foreground.

Figure 1.4 View from the eastern extent of the Proposal Area looking east. The Up and Down tracks of the Illawarra Main are the two tracks in the foreground.

Figure 1.5 View from the southern boundary around the central point of the Proposal Area looking south towards Railway Parade.

1.4 Purpose of this Review of Environmental Factors

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 5.5 of the EP&A Act, and to identify mitigation measures to avoid, reduce, mitigate or offset the likely adverse impacts. This REF has been prepared in accordance with clause 228 of the EP&A Regulation. For the purposes of this Proposal, TfNSW is the proponent and the determining authority under Division 5.1 of the EP&A Act.

This assessment has also considered the relevant provisions of other relevant environmental legislation, including the *Biodiversity Conservation Act 2016* (BC 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 (MNES) or Commonwealth land. It also considers the need to make a referral to the Commonwealth Minster for the Environment should the action have the potential to result in a significant impact on MNES. 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 Program. 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

The NSW Government's *Future Transport Strategy 2056* (TfNSW, 2018) identifies the More Trains More Services Program as a 'priority initiative for investigation' that will provide modern and reliable 'turn up and go' services to customers.

Over the next 40 years, it is expected that the rail network in Sydney will need to cater for 28 million trips a day and double the current metropolitan freight capacity. By 2026, it is expected that the heavy rail network will carry around 80 percent of peak hour rail travel and 60 percent of all peak hour transport travel.

More Trains, More Services is key to enabling the Greater Sydney Commission's vision for the Greater Sydney Region Plan, *A Metropolis of Three Cities,* where most residents live within 30 minutes of their jobs, education and health facilities, services and great places.

More Trains, More Services is a program of staged investments that will progressively transform the rail network into a modern and reliable mass transit system using world class digital technology. The Program is already delivering better customer outcomes through timetable enhancements and integration of Sydney Metro North West with the heavy rail network. The current stage of More Trains, More Services will focus on delivering greater capacity, reliability and connectivity for customers on the T4 Eastern Suburbs and Illawarra Line, South Coast Line and T8 Airport and South Line.

These services will be enabled by upgrading and modernising signalling and control systems and using digital technology that, when combined with other infrastructure upgrades, will deliver major increases in the capacity and reliability of the network.

2.1.2 Objectives of the More Trains, More Services Program

The objectives of the More Trains, More Services Program are to:

- maintain connectivity and support efficient functioning of urban and regional centres
- meet future mass transit demand on the T4 and T8 Lines
- improve travel experience for each customer passenger group
- reduce complexity on the heavy rail network
- meet freight customer needs.

2.1.3 Customer outcomes of More Trains, More Services Program

Customer outcomes of the More Trains, More Services Program are to:

- provide additional train and station capacity for T4 and T8 customers in line with forecast peak demand
- provide dedicated intercity services on the South Coast Line that improve the customer in-vehicle experience and provides a service consistent with other intercity lines

- improve off-peak services on the T4 and South Coast lines to align with customer requirements
- provide regular freight opportunities on the Illawarra corridor which maintains (and where possible enhances) the network capacity for freight services
- reduce network complexity on the T4 and T8 lines through simplified service routes, stopping patterns and asset utilisation
- minimise the impact on other lines that may be affected by service changes on the T4, T8 and South Coast lines.

2.1.4 Objectives of the Proposal

The specific objectives of the Proposal are to:

- allow for local services to terminate and commence at platform 4 instead of platform 2
- minimise cost and maximise benefits of the project requirements
- minimise impacts to current rail operations during implementation
- ensure that safety is maintained throughout the delivery of the Proposal
- ensure that project works are delivered to TfNSW high standards of safety, quality, stakeholder engagement and environmental management.

2.2 Design development

The concept design for the proposal has been developed with consideration of the following objectives:

- separation of intercity services from suburban traffic allowing a higher number of all stops services without impeding through trains
- allowing suburban services to operate on the Illawarra Main line between the City and Hurstville
- providing high frequency operations, with the ability to turn back trains (i.e. where a train terminates and then departs in the opposite direction) at Hurstville on platforms 3 and 4
- maintain signal locations and minimise extent of signalling works.

2.3 Alternative options considered

2.3.1 The ‘do-nothing’ option

Under a ‘do-nothing’ option, the railway track, OHW structures, signals, combined services route and drainage channel would remain the same and there would be no changes to the way the T4 and South Coast lines operate.

The NSW Government has identified the More Trains, More Services as a ‘priority initiative for investigation’ that will deliver the 10-year vision of the *Medium Term Rail Development Plan* to provide modern and reliable turn-up-and-go services to customers.

The ‘do nothing‘ option was not considered a feasible alternative as it is inconsistent with NSW Government objectives. Further, it would not assist in facilitating the increased numbers of intercity services and suburban services that would operate on the T4 and South Coast lines as without the crossover, the amount of through train services would be limited by the operations of all stops and other suburban services.

2.3.2 Option 1 – Crossover between Hurstville Station and Treacy Street Over Line Bridge

This option involves locating a new crossover between Hurstville Station and the Treacy Street Over Line Bridge (OLB). This would allow a train service to terminate in the Down direction on Platform 4 at Hurstville Station and recommence a service in the Up direction (i.e. 'turning back the train'), using the crossover to connect to the existing Illawarra Main Line Up track.

In addition to the crossover, this option would involve the following works:

- installation of a fixed anchor underneath the existing overhead wiring structure
- the existing portion of track for the proposed crossover location is likely to require a track circuit type conversion
- the existing fixed red signal located on the Up side of Platform 4 would be required to be replaced with a new starter signal
- signalling equipment that would encroach the fouling point of the new crossover would need to be relocated
- warning lights may be required to allow the safe maintenance of the turnouts if the crossover is installed in this location.

The key risk of this option is that works near the Treacy Street OLB may not meet overhead clearance requirements, which may trigger a full upgrade of the bridge structure.

2.3.3 Option 2 (a and b) – Crossover on the eastern side of Treacy Street OLB

This option involves locating a new crossover on the eastern (City) side of the Treacy Street OLB. Similar to Option 1, this would allow a service to terminate in the Down direction on Platform 4 at Hurstville Station and recommence a service in the Up direction, using the crossover to connect to the existing Illawarra Main Up track.

This option was split into two sub-options:

- Option 2a: locating the crossover approximately 140 metres to the east of the Treacy Street Bridge
- Option 2b: locating the crossover approximately 10 metres to the east of the Treacy Street Bridge

In addition to the crossover, this option(s) would involve the following works:

- new overhead wiring above the new crossover
- the existing fixed red signal located on the Up side of Platform 4 would be required to be replaced with a new starter signal
- new signals would be required at the new crossover
- warning lights may be required to allow the safe access for maintenance of the turnouts if the crossover is installed in this location

The key risk of this option would be encountered in Option 2b. The key risk is that works near the Treacy Street OLB may not meet overhead clearance requirements, which would trigger a full upgrade of the bridge structure.

2.3.4 Option 2 (c) Crossover on the eastern side of the Treacy Street OLB between 10 metres and 140 metres from the bridge

Following on from the initial investigations and stakeholder workshops Option 2c was identified for further development. Option 2c is a hybrid of options 2a and 2b. A key consideration in selecting

Option 2c is to minimise the distance to Hurstville Station to achieve the required turnback train capacity from Hurstville.

This option would also require the following works:

- installation of new signals, turnouts and associated trackside equipment
- modification of the existing combined services route to accommodate the new signalling infrastructure
- minor modification of an existing drainage channel

Options 1, 2a, 2b and 2c are demonstrated on Figure 2.1.

2.3.5 Option 3 Crossover located further to the east (preferred option)

Following the exploration of Options 1 – 2(a, b and c), a further options assessment was carried out to determine the exact and most appropriate location of the crossover between 10 and 140 metres from the Treacy Street OLB.

This option involved:

- modification and addition of OHW structures, including new OHW supports beneath the existing bridge
- installation of new signals, turnouts and associated trackside equipment
- modification of the existing combined services route to accommodate the new signalling infrastructure
- minor modification of an existing drainage channel

Along with those works, this option involved the construction of a new crossover, with the location of the crossover being further towards the Down direction to move the crossover outside of the transitions (but still located on the Eastern side of Treacy Street OLB). The distance of the crossover from the Treacy Street OLB in this option is approximately 76 metres. Option 3 is shown on **Figure 3.1**.

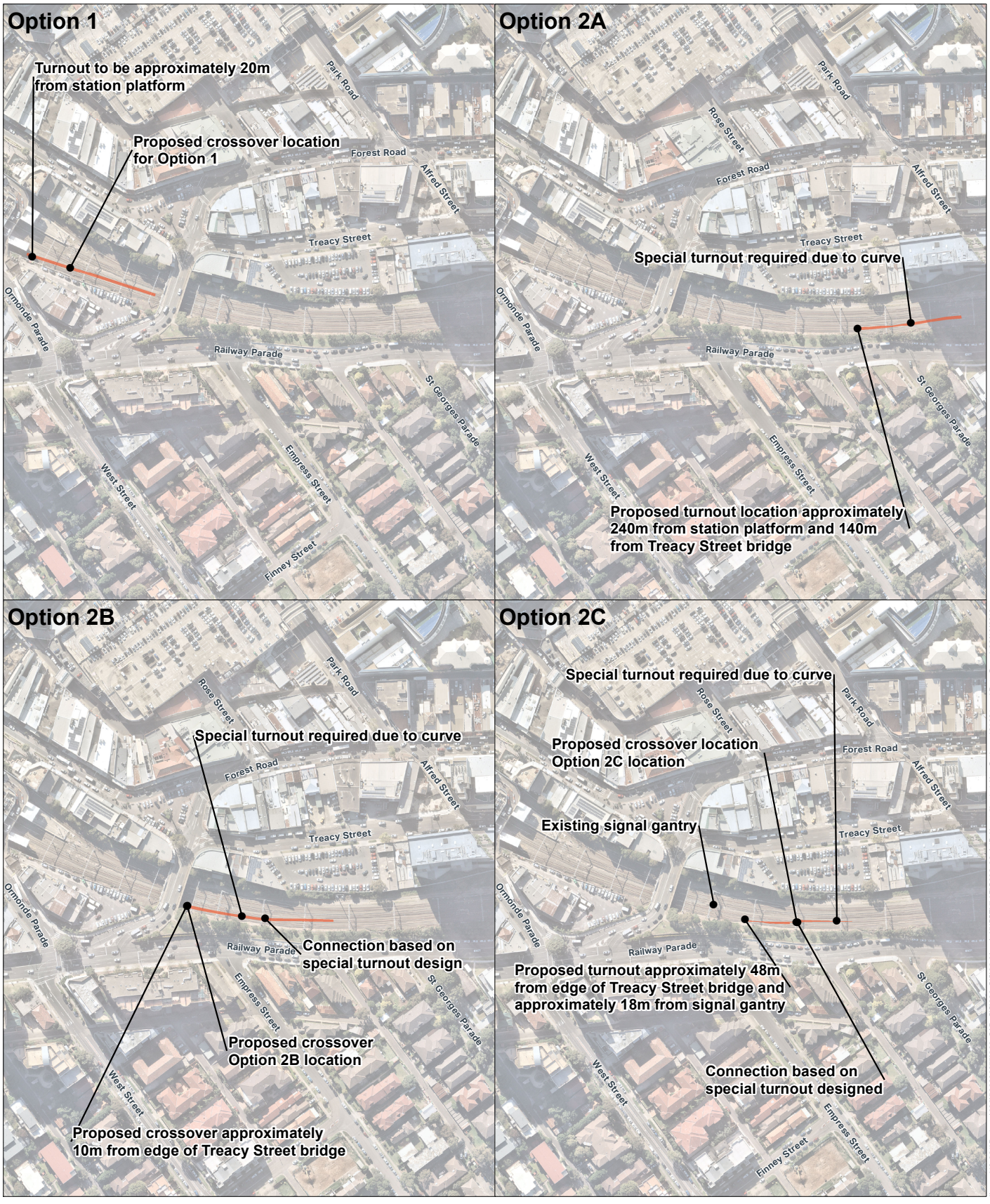

FIGURE 2: OPTIONS 1, 2A, 2B AND 2C

AECOM

N 0 20 40 m

Legend

New crossover

Source: Imagery © Nearmap, 2019.

2.4 Justification for the preferred option

The ‘do-nothing’ option was rejected as this option would not address existing overcrowding or demand issues on the T4 and South Coast lines, nor would it meet the objectives outlined in **Section 2.1.4**, nor allow for additional intercity or suburban train services on those lines.

Options 1 and 2a were not considered to be viable options as these options would have resulted in significant modifications to the Treacy Street OLB to facilitate the works. This would not have been a cost effective solution.

Option 2b was not considered to be a suitable option as the distance to Hurstville Station was considered to be too far and would not provide the required turnback train capacity from Hurstville.

Option 2c was identified as a preferable option from a track and OHW perspective, however it was not pursued due to the requirement of relocating a signal that is located on the existing gantry. The signalling advice received was that this would cause the need for the relocation of all gantry mounted signals.

Option 3, as a follow on from Option 2c, was chosen as the preferred option as it would not require the extensive relocation of signals, nor significant modifications to the Treacy Street OLB. It achieves the required turnback train capacity from Hurstville, providing a more economical and efficient solution. The new crossover, as well as the other modification works identified, would assist in meeting the broader objectives of the More Trains, More Services Program, as it would facilitate a greater capacity of services on the T4 Illawarra and South Coast lines.

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 detailed design.

3.1 The Proposal

As described in **Section 1.1**, the Proposal involves infrastructure upgrades near Hurstville Station as part of the More Trains, More Services Program. The Proposal would enable improvements in efficiency and reliability for customers.

The Proposal would include the following key elements:

- construction of a new crossover (100 metres in length) between the existing Up and Down tracks of the Illawarra Main including minor adjustments to the vertical and horizontal elevation of the tracks
- modification and addition of OHW structures, including new OHW supports beneath the existing bridge
- installation of new signals, turnouts and associated trackside equipment
- modification of the existing combined services route to accommodate the new signalling infrastructure
- minor modification of an existing drainage channel.

Figure 3.1 shows the general layout of key elements of the Proposal.

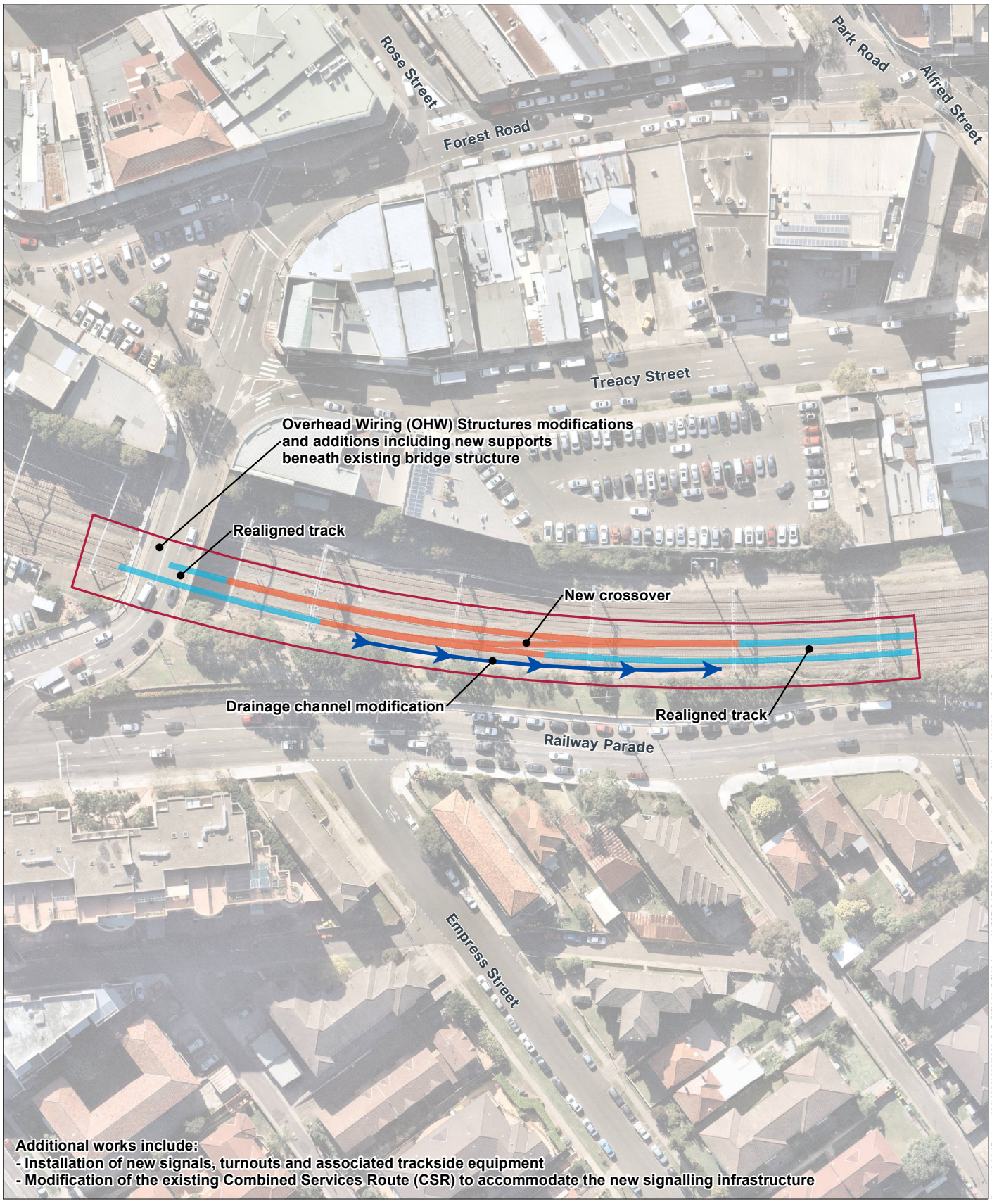

FIGURE 3-1: PROPOSED WORKS

AECOM

N 0 20 40 m

Legend

- Extent of proposed works
- New crossover
- Realigned track
- Drainage channel modification

Source: Imagery © Nearmap, 2019.

3.1.1 Scope of works

Crossover

The proposed works to construct the crossover include:

- trackwork, including the removal and replacement of existing track and installation of the crossover
- civil works to modify surrounding drainage infrastructure
- OHW adjustments
- installation of new signalling infrastructure.

Materials and finishes

Materials and finishes for the Proposal have been selected based on the criteria of durability, low maintenance and cost effectiveness and to minimise visual impacts.

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

Each of the upgraded or new facilities would be constructed from a range of different materials, with a different palette for each architectural element. Subject to detailed design, the Proposal would include the following:

- OHW – steel frames and wires
- tracks – steel with concrete sleepers
- civil works for drainage – concrete
- new signalling infrastructure – steel poles and signals.

3.1.2 Engineering constraints

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

Existing structures: the placement and integrity of existing structures was considered during the development of the design – these structures included the existing rail lines and overhead wiring, the Ormonde Parade/Forest Road/Treacy Street overbridge, the existing cutting and drainage channels.

Sydney Trains' requirements: modifications of 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.

The track realignment works are to comply with the specified construction tolerances within ASA engineering standard *ESC210 – Track Geometry and Stability*.

Utilities: A Dial Before You Dig search has identified a number of utilities in the vicinity of the proposed works which would need to be avoided or relocated.

3.1.3 Design standards

The Proposal would be designed having regard to the following:

- National Construction Code
- relevant Australian Standards

- Asset Standards Authority standards
- Sydney Trains standards
- Infrastructure Sustainability Council of Australia (ISCA)
- ASA engineering standards including ESC210 – Track Geometry and Stability
- other TfNSW policies and guidelines.

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 the Sustainability Report for More Trains More Services Program (Aurecon, 2018) and further developed in the More Trains More Services Civil Concept with Site Investigations Packages 1 & 2 Sustainability Strategy (Aurecon, 2019).

TfNSW has an ongoing commitment to sustainability through supporting project solutions that deliver environmental and social benefits whilst reducing lifecycle costs. To reinforce these sustainability goals, TfNSW have developed a set of Sustainable Design Guidelines which aim to minimise the impacts to the environment and procure, deliver and promote sustainable transport and develop, expand and manage a transport network that is sustainable and climate resilient.

As the latest version of the Sustainable Design Guidelines (SDG V4) has been designed to align more intuitively with the ISCA rating system TfNSW has taken the view that for projects with a capital cost of over $50 million TfNSW will aim to achieve an 'Excellent' rating through the ISCA rating scheme.

To achieve an Infrastructure Sustainability rating More Trains, More Services will be assessed on the following ISCA sustainability themes:

- management and governance
- using resources
- emissions
- pollution and waste
- ecology
- people and place
- innovation.

Within each theme there are multiple categories in which credits may be achieved based on how successfully the infrastructure supports or achieves sustainable guidelines. Credits then contribute to an overall score or rating out of 100, which places the infrastructure either into Commended (25 to <50), Excellent (50 to <75) or Leading (75 to 100) rating levels.

As provided in the Sustainability Strategy, TfNSW have nominated a preferred pathway to achieve an IS Rating for the More Trains, More Services program. TfNSW has proposed that the rating be achieved as an ISCA Program rating with the ISCA Rating to be obtained within the 'Excellent' rating band.

3.1.5 Construction methodology

Subject to approval, construction is expected to commence in late 2020 and take around one year to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated construction contractor in consultation with TfNSW.

The sequence of activities required to construct the Proposal are identified in **Table 3.1**. This staging is indicative and is based on the current concept design and may change once the detailed design methodology is finalised. The staging is also dependent on the construction contractor's preferred methodology, program and sequencing of work. Should the construction contractor's methodology contain substantive departures from that outlined within the REF, further assessment would be undertaken to consider any new or altered environmental or amenity impacts.

Table 3.1 Indicative construction staging for key activities

Stage	Activities
Site establishment and enabling works	• establishment of site compounds and temporary facilities (i.e. erect fencing, site offices, temporary toilets, hoarding, tree protection zones (TPZs), site offices, amenities and plant/material storage areas) • installation of environmental controls (i.e. erosion and sediment control fencing).
Utility works	• relocation of services if safe to be moved outside of a rail shutdown period • OHW adjustments • installation of new OHW structures • relocation of remaining services including excavation and modifying the drainage channel as required.
New crossover	• trenching and regrading works for new crossover route • adjustment of track super-elevation to enable installation of crossover • ballast reconstruction.
Signal post	• installation of signage as required • services and fit-out works and electrical works (including any re-directed services/utilities).
Demobilisation	• dismantling of existing site compounds/hoarding areas.
Testing and commissioning	• testing electrical, communications and signalling components.

3.1.6 Plant and equipment

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

- dump trucks
- handheld tools
- monitoring equipment
- survey equipment
- cranes and drill-rigs
- compaction plates
- concrete trucks
- excavators
- front end loader
- works trains
- rail tamper
- ballast regulator
- roller
- jackhammer
- agitator
- concrete pump
- trench roller
- lighting towers.

3.1.7 Working hours

Works required for the Proposal would be undertaken both during standard (NSW) Environment Protection Authority (EPA) construction hours, and outside of those standard hours. The standard hours 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.

Works required to be undertaken outside standard hours would include night works and works during routine rail possessions. These are scheduled closures where part of the rail network is temporarily closed, and trains are not operating. These would occur regardless of the Proposal.

It is estimated that approximately four rail possessions would be required to facilitate the following:

- delivery of oversized loads to the site such as construction plant and portable construction compound buildings, steel beams and precast concrete elements
- works to upgrade the existing overhead wiring and construction of the new crossover.

During rail possessions out of hours works (OOHW) 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.

Out of hours works may also be scheduled outside rail possession periods. The construction contractor would require approval from TfNSW for any out of hours work. The affected community would be notified and mitigation measures implemented, as outlined in TfNSW's *Construction Noise and Vibration Strategy* (TfNSW, 2019g) (refer to **Section 6.3** for further details).

3.1.8 Operating hours

Hurstville Station operates 24 hours per day, seven days a week, with most passenger services operating between 4am and 10pm. The new rail crossover would continue to operate 24 hours per day, seven days a week, including during maintenance activities.

3.1.9 Earthworks

Excavations and earthworks would generally be required for the following:

- removal of existing track
- placement of the new crossover
- installation of new signalling equipment including cabling
- regrading of drainage channel(s)
- installation of OHW structures.

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

It is estimated that the Proposal would generate approximately 300 cubic metres (m^3) of spoil.

3.1.10 Source and quantity of materials

The source and quantity of materials would be determined during the detailed design phase of the Proposal and would aim for an excellent rating as the More Trains, More Services program under the ISCA Infrastructure Sustainability (IS) Rating Tool Version 1.2 and aligning with the *Transport Environment & Sustainability Policy Framework* (TfNSW, 2015d) and the TfNSW *Environment and Sustainability Policy* (TfNSW, 2015). Materials would be sourced from local suppliers where practicable. Reuse of existing and recycled materials would be undertaken where practicable.

3.1.11 Traffic access and vehicle movements

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 traffic generated as a part of the construction works is not expected to exceed 25 light vehicles and 15 heavy vehicles per day during peak construction periods. The Proposal Area would be accessed via the northern side of the rail corridor via Jack Brabham Drive, to the east of the location of the proposed crossover.

Traffic and transport impacts associated with the Proposal are assessed in **Section 6.1** of this REF.

A detailed construction methodology, management plans (such as a Traffic Management Plan (TMP) and Traffic Control Plans (TCPs)) and a Construction Environmental Management Plan (CEMP)) would be developed prior to construction. These plans would be implemented and updated throughout construction to manage potential traffic and access impacts.

3.1.12 Ancillary facilities

Two temporary construction compounds/laydown areas are proposed to be used for the Proposal. The proposed construction compound/laydown areas are outlined in **Table 3.2** and shown in **Figure 3.2**.

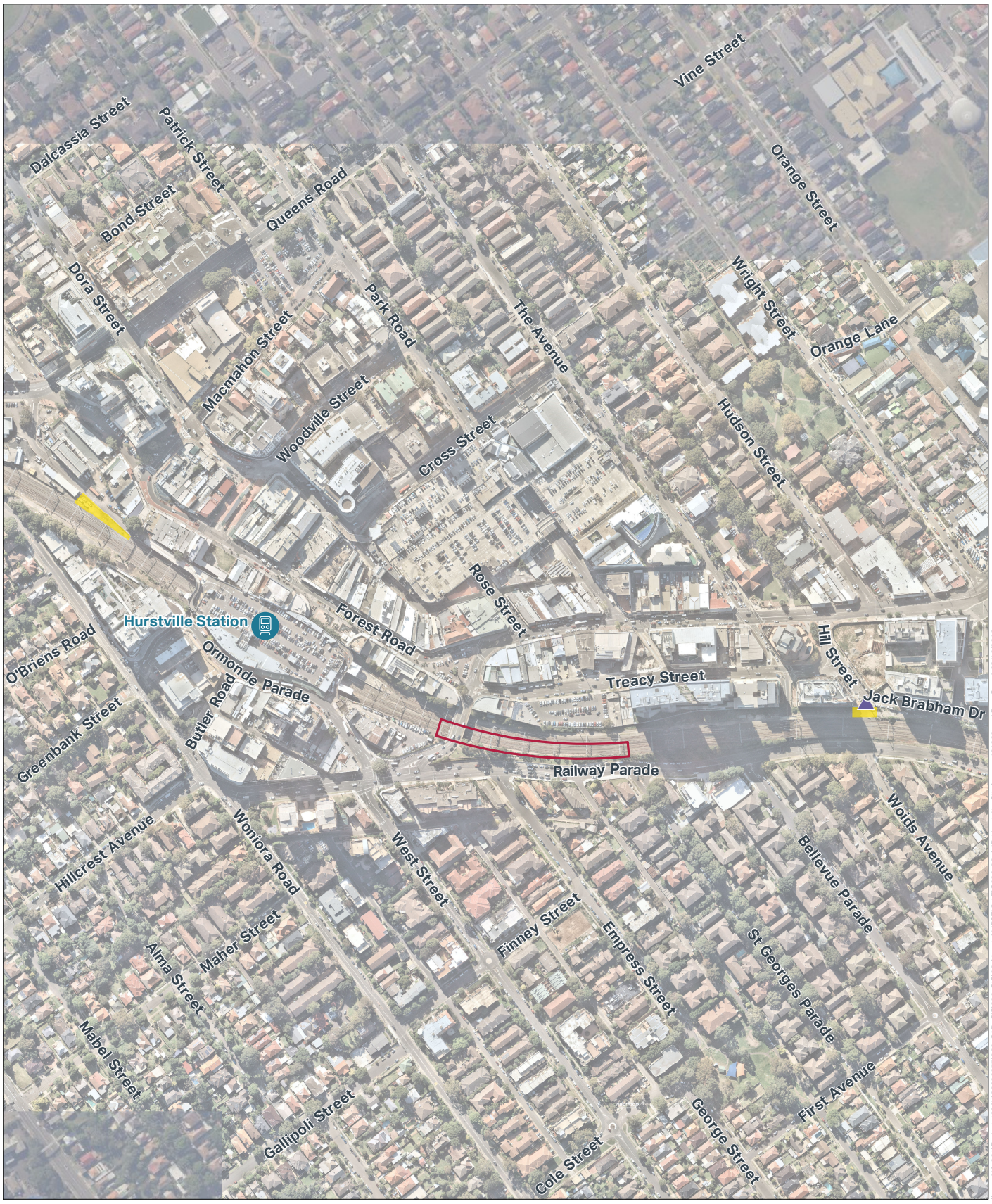

FIGURE 3-2: SITE ACCESS

AECOM

N

0 50 100 m

Legend

- Railway station
- Site access point
- Proposed works
- Potential site compound/laydown area

\\aesyd1fp001\Projects\606X\606002771900_CAD_GIS\920_GIS\02_Maps_HURSTVILLE\G006_02_A4P_Hurstville_SiteAccess_191002.mxd Date Saved: 28/10/2019

Table 3.2 Proposed construction compound/laydown areas

Number	Construction Compound/ Laydown Area	Location	Ownership
1	Construction compound/Laydown area	Approximately 90 metres west of Hurstville station, to the north of the railway line, within the rail corridor.	RailCorp
2	Construction compound/Laydown area	On the southern corner of Jack Brabham Drive and Hill Street, immediately north of the railway line, within the rail corridor.	RailCorp

Impacts associated with utilising these areas have been considered in the environmental impact assessment including requirements for rehabilitation.

3.2 Property acquisition

TfNSW does not propose to acquire any property as part of the Proposal. Works would be undertaken entirely within the existing rail corridor.

3.3 Operation management and maintenance

Upon completion of construction of the Proposal, the rail track in this location would continue to be operated and maintained by Sydney Trains. Inspections and maintenance of the crossover would be integrated into Sydney Trains' existing inspection and maintenance regime.

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 (MNES)'. The EPBC Act requires the assessment of whether the Proposal is likely to significantly impact on MNES or Commonwealth land. These matters are considered in full in **Appendix A**.

The Proposal would not impact on any MNES 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 Division 5.1 of the EP&A Act. Division 5.1 of the EP&A Act specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as TfNSW, which are permissible without development consent.

In accordance with section 5.5 of the EP&A Act, TfNSW, as the proponent and determining authority, must examine and consider to the fullest extent possible all matters affecting or likely to affect the environment by reason of the Proposal.

Clause 228 of the EP&A Regulation defines the factors which must be considered when determining if an activity assessed under Division 5.1 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 4.1 provides a list of other relevant legislation applicable to the Proposal.

Table 4.1 Other legislation applicable to the Proposal

Applicable legislation	Considerations
Biodiversity Conservation Act 2016 (BC Act) (NSW)	The Proposal is located within the rail corridor on previously disturbed ground and is unlikely to affect any threatened ecological communities or threatened flora and fauna.
Biosecurity Act 2015 (NSW)	Clause 22 requires that any person who deals with a biosecurity matter has a duty to ensure that in so far as is reasonably practicable, the potential biosecurity risk is prevented, eliminated or minimised. Appropriate management methods would be implemented during construction if declared priority weeds in the Georges River LGA are identified (refer to **Section 6.7**). Under the *Biosecurity Regulation 2017*, an owner, occupier or person in charge of a premises must notify the presence of a pest or disease listed in Schedule 1 of the Regulation. Notification must be made in accordance with Part 6 of the Regulation and within one working day after the person first suspects or becomes aware of the presence.
Contaminated Land Management Act 1997 (CLM Act) (NSW)	Section 60 of the CLM Act imposes a duty on landowners to notify the Department of Planning, Industry and Environment (DPIE), 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 Land Management Act 2016 (NSW)	The Proposal does not involve works on any Crown land.
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. The Proposal is not within the heritage curtilage of any identified heritage items.
National Parks and Wildlife Act 1974 (NPW Act) (NSW)	Sections 86, 87 and 90 of the NPW Act require consent from DPIE to have an impact upon 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. With the implementation of mitigation measures outlined in **Section 7.2** no impacts to Indigenous heritage would occur as a result of the Proposal.

Applicable legislation	Considerations

Protection of the Environment Operations Act 1997 (POEO Act) (NSW)	Schedule 1 of the POEO Act details numerous activities that are deemed to be scheduled activities and consequently require an environment protection licence (EPL) to be obtained. Clause 33 of Schedule 1 details where an EPL is required for railway activities – railway infrastructure construction.
	Railway activities – railway infrastructure construction, means *inter alia* the construction of railway infrastructure. The Proposal would involve the construction of railway infrastructure including railway tracks, sleepers and ballasts and signalling equipment. Clause 33(2) sets triggers for where an EPL is required if the construction of railway infrastructure is undertaken. An EPL is required where it results in one or more of the following:
	• the extraction or processing (over the life of the construction) of more than:
	  ○ 50,000 tonnes of materials in the case of premises in the regulated area or in the local government areas of Bega Valley, Eurobodalla, Goulburn Mulwaree, Queanbeyan-Palerang Regional or Snowy Monaro Regional, or
	  ○ 150,000 tonnes of material in any other case
	• the construction of new railway track that is:
	  ○ in the metropolitan area – 3 kilometres or more in length, or
	  ○ outside the metropolitan area – 5 kilometres or more in length
	The Proposal would not involve the extraction or processing of more than 50,000 tonnes of materials. The Proposal would not involve the construction of railway track 3 kilometres or more in length. Therefore the Proposal does not require an EPL.
	The operation of the Proposal would be regulated under the existing Sydney Trains EPL (12208).
	TfNSW must notify the EPA of any pollution incidents that occur onsite where triggered under Part 5.7 of the PoEO Act. This would be managed in the CEMP to be prepared and implemented by the Construction 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 not involve work on the surrounding road network. Consent under the Roads Act or a Road Occupancy Licence is not required.
Sydney Water Act 1994 (NSW)	The Proposal would not involve discharge of wastewater to the sewer.
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 natural source e.g. aquifer, river – only from the network), 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 under 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 Division 5.1 of the EP&A Act). Clause 78 defines 'rail infrastructure facilities' as including elements such as 'railway tracks and associated track structures'.

Consequently, development consent is not required for the Proposal which is classified as a rail infrastructure facility and the environmental impacts of the Proposal have been assessed under the provisions of Division 5.1 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** 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* or *State Environmental Planning Policy (Coastal Management) 2018* applies. The Proposal does not require consideration under these SEPPs and therefore these instruments have not been further considered as part this REF.

4.3.2 State Environmental Planning Policy 55 – Remediation of Land

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. While consent for the Proposal is not required, the provisions of SEPP 55 have still been considered in the preparation of this REF.

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 Georges River LGA. The provisions of the Infrastructure SEPP prevail over Local Environmental Plans (LEPs), prepared by councils for an LGA. However, the provisions of the applicable LEPs have been considered. Prior to the amalgamation of Kogarah Council and Hurstville Council, the railway formed the boundary between these local government areas. As a result, two LEPs are applicable: the *Kogarah LEP 2012* (Kogarah LEP) and the *Hurstville LEP 2012* (Hurstville LEP).

4.4.1 Kogarah Local Environmental Plan 2012

The Kogarah LEP is the relevant environmental planning instrument for the southern portion of the Proposal. **Table 4.2** summarises the aspects of the Kogarah LEP that are applicable to the Proposal.

Figure 1.2 shows the relevant section of the zoning map from the Kogarah LEP, including the indicative location of the Proposal.

Table 4.2 Relevant provisions of the Kogarah LEP 2012

Provision description	Relevance to the Proposal
Clause 2.3 – Zone objectives and Land Use Tables	The station and the associated rail corridor is zoned SP2 – Rail Infrastructure Facilities. Other nearby land zones include: • B4 – Mixed use immediately south of the Proposal • R2 – Low Density Residential to the south west • R3 – Medium Density Residential to the south east • A small area of land zoned R4 – High Density Residential to the south east. • A small area of land zoned RE1 – Public Recreation to the south east The Proposal is consistent with the objectives of the SP2-zoned land in which it is located. The Proposal would not substantially affect the land use objectives within other nearby zoned land.
Clause 5.10 – Heritage conservation	Clause 5.10 of the Kogarah LEP aims to: • conserve the environmental heritage of Kogarah • conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, setting and views • conserve archaeological sites • conserve Aboriginal objects and Aboriginal places of heritage significance. The Proposal is not within the heritage curtilage of any identified heritage items.
Clause 5.12 – Infrastructure development and use of existing buildings of the Crown	Clause 5.12 of the Kogarah LEP does not restrict or prohibit the carrying out of any development, by or on behalf of a public authority, which is permitted to be carried out with or without development consent. The Proposal would be undertaken by a public authority, in this case, TfNSW and is permitted without development consent.

Provision description	Relevance to the Proposal
Clause 6.2 – Earthworks	Clause 6.2 aims to ensure that earthworks for which development consent is required will not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land. Consideration of the potential impacts and mitigation measures for earthworks for the Proposal is outlined in **Section 6.8**.
Clause 6.3 – Flood Planning	Clause 6.3 of the Kogarah LEP seeks to minimise flood risks to life and property, allow compatible development with the land's flood hazard rating, including accounting for climate change and avoiding significant adverse impacts on flood behaviour. A discussion of potential impacts resulting from flooding and surface water flows is discussed in **Section 6.9**.

4.4.2 Hurstville Local Environmental Plan 2012

The Hurstville LEP is the relevant environmental planning instrument for the northern portion of the Proposal. **Table 4.3** summarises the aspects of the Hurstville LEP applicable to the Proposal. **Figure 1.2** shows the relevant section of the zoning map from the Hurstville LEP, with the indicative location of the Proposal.

Table 4.3 Relevant provisions of the Hurstville LEP

Provision description	Relevance to the Proposal
Clause 2.3 – Zone objectives and Land Use Tables	The station and the associated rail corridor is zoned SP2 – Rail Infrastructure Facilities. Other nearby land zones include: • B4 – Mixed use immediately north of the Proposal • B3 – Commercial Core to the north west of the Proposal The Proposal is consistent with the objectives of the SP2-zoned land in which it is located. The Proposal would not substantially affect the land use objectives within other nearby zoned land.
Clause 5.10 – Heritage conservation	Clause 5.10 of the Hurstville LEP aims to: • conserve the environmental heritage of Hurstville • conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, setting and views • conserve archaeological sites • conserve Aboriginal objects and Aboriginal places of heritage significance. The Proposal is not within the heritage curtilage of any identified heritage items.
Clause 5.12 – Infrastructure development and use of existing buildings of the Crown	Clause 5.12 of the Hurstville LEP does not restrict or prohibit the carrying out of any development, by or on behalf of a public authority, which is permitted to be carried out with or without development consent. The Proposal would be undertaken by a public authority, in this case, TfNSW and is permitted without development consent.

4.5 NSW Government policies and strategies

Table 4.4 provides an overview of other NSW Government policies and strategies relevant to the Proposal.

Table 4.4 NSW Government policies and strategies applicable to the Proposal

Policy/Strategy	Commitment	Comment
NSW: Making It Happen (NSW Government, 2015)	In September 2015, the NSW Government announced a series of State Priorities as part of *NSW: Making It Happen* (NSW Government, 2015). The State Priorities are intended to guide the ongoing actions of the NSW Government across the State, and guide resource allocation and investment in conjunction with the NSW Budget. *NSW: Making it Happen* focuses on 12 key 'priorities' to achieve the NSW Government's commitments. These priorities range across a number of issues including infrastructure, the environment, education, health, wellbeing and safety in addition to Government services. One of the 12 priorities identified as part of *NSW: Making It Happen* relates to investment in building infrastructure. The ongoing development and investment in transport infrastructure is identified as part of the wider building infrastructure priority.	The Proposal assists in meeting the priority by assisting in the delivery of infrastructure to support NSW population growth over the next 10 years.

Policy/Strategy	Commitment	Comment
Future Transport Strategy 2056 (TfNSW, 2018a)	*Future Transport 2056* is an update of NSW's *Long Term Transport Master Plan*. It is a suite of strategies and plans for transport to provide an integrated vision for the state. The strategy places the customer at the centre of works undertaken by TfNSW. It includes issue specific and place based supporting plans that seek to integrate transport modes. The strategy outlines six state-wide outcomes • customer focused • successful places • a strong economy • safety and performance • accessible services • sustainability.	The Proposal would support the improvement in safety and performance of train services resulting in improved customer service outcomes. The More Trains, More Services Program is specifically referenced in the strategy as an example of initiatives to be implemented.
Building Momentum State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018)	*The State Infrastructure Strategy 2018-2038* is a strategy to plan and fund the infrastructure that the NSW Government delivers over the next 20 years. Public transport is viewed as critical to productivity, expanding employment opportunities by connecting people to jobs, and reducing congestion.	The Proposal invests in public transport, which is key to supporting employment opportunities, connecting people to jobs, and reducing congestion.

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 Proposal. **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 relevant government agencies and stakeholders. **Figure 5.1** shows the planning approval and consultation process for the Proposal.

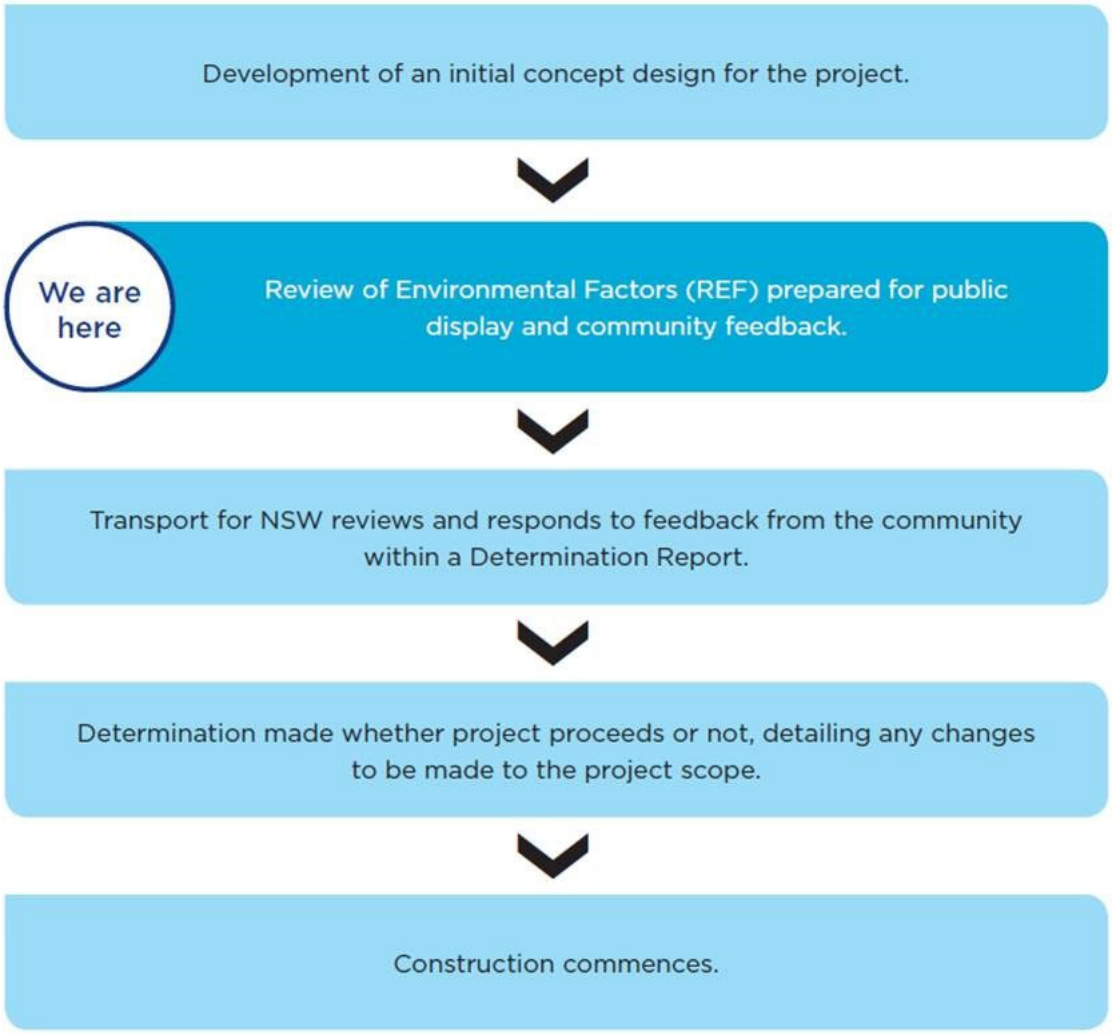

Figure 5.1 Planning approval and consultation process for the Proposal

5.1 Stakeholder consultation during concept design

During development of the Proposal concept design, TfNSW held several meetings and workshops with key stakeholders, such as Sydney Trains, to develop and discuss design options and identify a preferred option.

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, 15AA, 15A 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 5.1 provides details of consultation requirements under the Infrastructure SEPP for the Proposal.

Table 5.1 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 modifications to the existing railway drainage. This would not have a substantial impact on stormwater services. Consultation with Council is not deemed necessary.
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.	There is no proposed impact to local heritage/heritage conservation area. Accordingly, consultation with Council is not required. Refer to **Section 6.5**.
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 not located on land that is susceptible to flooding. Accordingly, consultation with Council is not required in regard to this aspect. Refer to **Section 6.9**.
Clause 15AA | Consultation with State Emergency Service development with impacts on flood liable land	Consultation is required with the NSW State Emergency (SES) where the Proposal would be developed on flood liable land, defined as the probable maximum flood extent.	The Proposal is not located on land that is mapped as being impacted by a probable maximum flood event. Accordingly, consultation with State Emergency Service is not required in regard to this aspect. Refer to **Section 6.9**.
Clause 15A | Development with impacts on certain land within the coastal zone	Consultation is required where the Proposal would be undertaken on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land.	The Proposal is not located on land identified under the Coastal Management SEPP as being within a coastal use area or proximity area to a coastal use area. The proposal is located over two kilometres from the nearest body of water, Oatley Bay of the Georges River.

Clause	Clause particulars	Relevance to the Proposal
Clause 16 | Consultation with public authorities other than Councils	For *specified development* which includes consultation with DPIE for development that is undertaken adjacent to land reserved under the NPW Act, and other agencies specified by the Infrastructure SEPP where relevant.	The Proposal is not located adjacent to land reserved under the NPW Act. Accordingly, consultation with DPIE on this matter is not required.

5.3 Consultation strategy

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 specialist environmental investigations
- keep the local community and stakeholders informed of the proposed track upgrades and encourage direct communication/identification of issues, concerns or suggestions
- engage with directly impacted community near the Proposal Area and seek opportunities to minimise impacts on amenity, their properties and business operations
- provide opportunities for stakeholders and the community to express their views about the Proposal
- listen and record community and stakeholder feedback and ensure it is considered during the development of the Proposal and responded to in the Determination report
- work collaboratively with statutory regulators/authorities to facilitate the environmental approval process
- build positive relations with identified community stakeholders
- ensure a comprehensive and transparent approach
- identify and resolve issues in a timely manner.

5.4 Public display

The REF display includes:

- public display of the REF at various locations
- distribution of a project update to the local community and rail customers, outlining the Proposal and inviting feedback on the REF
- advertisement of the REF public display in local newspapers (St George and Sutherland Shire Leader) with a link to the TfNSW website that includes a summary of the Proposal and information on how to provide feedback

- consultation with Georges River 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 two weeks.

The REF would be placed on public display at the following locations:

- Oatley Public Library, 26 Letitia Street, Oatley
- Georges River Service Centre, Corner MacMahon and Dora Streets, Hurstville
- TfNSW, 241 O'Riordan Street, The Gateway, Mascot

The REF would also be available on the TfNSW website[1] and Have Your Say 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

An Aboriginal Heritage Information Management System (AHIMS) search was undertaken for the area covered by the Proposal plus a 200 metre radial buffer, on 30 April 2019. No Aboriginal heritage items or sites were identified in the search results.

The extensive landscape modification that has occurred across the Proposal Area suggests that intact evidence of Aboriginal land use is unlikely to occur within the boundaries of the Proposal Area. Similarly, the high level of disturbance would suggest that the archaeological potential of the area is low. 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 respondent. The issues raised by the respondents would be considered by TfNSW before determining whether to proceed with the Proposal (refer to **Figure 5.1**).

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 Management Plan to be developed prior to the commencement of construction.

1 https://www.transport.nsw.gov.au/projects/more-trains-more-services
2 https://www.nsw.gov.au/improving-nsw/have-your-say/
3 projects@transport.nsw.gov.au

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

This section assesses and describes the impacts of the proposal on traffic, transport and pedestrian and cyclist access surrounding the Proposal. This assessment is based on a desktop analysis. Detailed traffic counts and modelling were not considered necessary as the Proposal is focused on the area surrounding the proposed crossover and is unlikely to have a major impact on the surrounding road network.

6.1.1 Existing environment

Hurstville Station and access

Hurstville Station is on the T4 Illawarra and South Coast Line, providing Hurstville with links into the city, as well as services south to the Illawarra and beyond. It also provides people with the opportunity to access and transfer between transport modes and services including cycling and private car.

The number of rail services stopping at Hurstville Station during the week and on weekends is shown in **Table 6.1**.

The station consists of two island platforms with platforms on each side (Platforms 1-4). All platforms are currently used for train services in each direction.

The main station entrance from the southern side is from Ormonde Parade and is accessible by stairs and a lift. From the northern side the station is accessible from Forest Road via stairs or escalators. Access to the rail corridor at the Proposal Area is from the northern side of the rail corridor, off Jack Brabham Drive.

Within the station area there are a number of existing facilities for customers including wheelchair accessible lifts, ticket machines, Opal card readers, toilets including a wheelchair accessible toilet, payphone, bike racks, emergency help point, and a kiss and ride stopping area.

Table 6.1 Hurstville Station - number and frequency of train services

Service to/from	Operating days	Numbers of services per day	Service frequency
Waterfall to Bondi Junction	Monday to Friday	213	Every 15 min (approx. average) in off peak Every 5 min (approx. average) in peak
Waterfall to Bondi Junction	Weekends and Public Holidays	134	Every 15 min (approx. average)

Service to/from	Operating days	Numbers of services per day	Service frequency
Bondi Junction to Waterfall	Monday to Friday	209	Every 15 min (approx. average) in off peak Every 5 min (approx. average) in peak
Bondi Junction to Waterfall	Weekends and Public Holidays	123	Every 10 min (approx. average)
Bomaderry or Port Kembla to Bondi Junction	Monday to Friday	35	Every 60 mins (approx. average) in off peak Every 20 mins (approx. average) in peak
Bomaderry or Port Kembla to Bondi Junction	Weekends and Public Holidays	21	Every 60 mins (approx. average)
Bondi Junction to Port Kembla or Bomaderry	Monday to Friday	33	Every 60 min (approx. average) in off peak Every 30 min (approx. average) in peak
Bondi Junction to Port Kembla or Bomaderry	Weekends and Public Holidays	21	Every 60 mins (approx. average)

Road network and traffic

The Proposal Area is bound by Railway Parade to the south, Treacy Street to the north and Hill Street/Jack Brabham Drive to the north east. The closest main road is King Georges Road (to the west), which provides access to the M5 East Motorway.

Railway Parade is a local distributor road with an east-west alignment. The road follows the southern/eastern boundary of the rail corridor. The road has two lanes in each direction, one of which is occupied by on-street parking, and connects to Woniora Road to the west and Regent Street to the east.

Treacy Street is a local distributor road with one traffic lane in each direction. Treacy Street connects to Forest Road to the west and Hill Street to the east. Forest Road/Treacy Street connects via a bridge over the railway line to Railway Parade and Ormonde Parade.

Hill Street is a local road with one traffic lane in each direction. Hill Street connects to Treacy Street to the north, and becomes Jack Brabham Drive to the south.

Parking

The Hurstville Free Council car park is located to the north, adjacent to the Proposal Area. Additional public parking is located at Hurstville Station, located approximately 160 metres to the west. Neither car park would be occupied or obstructed for construction of the Proposal.

Taxi waiting areas and kiss and ride facilities

There is currently a formal taxi rank and kiss and ride area located on Ormonde Parade on the southern side of Hurstville Station.

Bus Services

Hurstville Station is located approximately 170 metres to the west of the Proposal. Allawah Station is located approximately 500 metres to the south east. Punchbowl Bus Company operates local bus routes between Hurstville Station and the following suburbs:

- Hurstville to Strathfield (route 450)
- Hurstville to Bankstown (routes 940 and 945)
- Hurstville to Lugarno (route 943)
- Hurstville to Connells Point (route 953)
- Hurstville to Hurstville Grove (route 954)
- Hurstville to Mortdale (route 955).

Bus routes are shown in Figure 6.1.

FIGURE 6-1: BUS ROUTES IN THE VICINITY OF THE PROPOSAL

AECOM

N

0 50 100 m

Legend

Railway station

Bus Routes

450
940
943
945
953
954
955

Bicycle network and facilities

There are no dedicated cycle paths near the Proposal Area, however local roads can accommodate cyclists. There are no dedicated cyclist facilities near the Proposal Area, though facilities are available at Hurstville and Allawah Stations.

Pedestrian facilities

Council-managed pedestrian footpaths are located within the vicinity of the Proposal and can be used to access Hurstville and Allawah Stations.

6.1.2 Potential impacts

Construction phase

Road network and traffic

The traffic generated as a part of the construction works is not expected to exceed 25 light vehicles and 15 heavy vehicles per day during peak construction periods. The Proposal would be accessed via the northern side of the rail corridor via Jack Brabham Drive, to the east of the Proposal. Some staff may utilise public transport to access the site.

The proposal would not require the closing or occupation of any public roads more than temporarily as vehicles access and leave the rail corridor. Minor disruptions may occur on Hill Street, Treacy Street and Jack Brabham Drive.

It may be necessary to undertake other construction activities, such as concrete pours, crane lifts and delivery of oversized materials, outside standard construction hours to minimise traffic disruption.

Traffic impacts as a result of staff traveling to and from the site are expected to be minor and is unlikely to cause a significant increase to traffic volumes within the local area.

Parking

There is the potential that construction staff may utilise existing on-street parking during the construction phase. This impact would be lower during shutdown periods where commuter services will not be running and hence public demand for parking is expected to be substantially reduced. TfNSW would endeavour to minimise impacts to on-street parking and the commuter carpark by providing parking for construction staff within the rail corridor where possible. Construction workers would also be encouraged to car-pool or utilise public transport services where and when available.

Overall, with the current availability of on-street and off-street parking surrounding Hurstville Station and the Proposal, the impact of a decrease in availability of on-street parking in the short term would be minor.

Public transport

Bus services around Hurstville Station would continue to operate normally during the construction of the Proposal. Pedestrian access to existing bus stops around the Proposal is not likely to be affected during construction of the Proposal.

Works for the Proposal are required to be undertaken during scheduled track possession periods. Carrying out the works during scheduled track possessions is necessary to allow for the works to be undertaken safely. It is estimated that approximately four scheduled track possessions would be required to undertake construction, noting that these possession periods would occur regardless of the Proposal in order to facilitate other necessary works elsewhere on the line. The scheduled track possessions would affect all train services that would ordinarily pass through the Proposal Area. During these periods bus services would replace trains.

Operational phase

A summary of the operational traffic, transport and access impacts is presented below.

Customer and public access

The Proposal would not alter the existing public access to the station.

Public transport

The Proposal does not include changes to bus/rail services as part of the works and would not impact on the operation (service operation or timetabling) of public transport in the vicinity of Hurstville Station. The Proposal would provide the capability to operate Hurstville terminating and starting services on the Illawarra Main instead of the Illawarra Local lines, increasing the efficiency of the rail network.

Parking

The Proposal would not directly alter the number of parking spaces available within or around Hurstville Station. The Hurstville free car park owned by Council would continue to be accessible. No operational impacts are anticipated.

6.1.3 Mitigation measures

The following mitigation measure would apply to the Proposal:

- a construction Traffic Management Plan (TMP) would be prepared by the construction contractor in consultation with TfNSW and provided to Georges River Council and TfNSW (former RMS). The construction TMP would be the primary tool to manage potential traffic and pedestrian impacts associated with construction. At a minimum, the construction TMP would include:
    - ensuring adequate signage at construction work sites
    - consideration of safety and accessibility for pedestrians and cyclists
    - ensuring adequate sight lines to allow for safe entry and exit from the site
    - managing impacts and changes to on and off street parking, and parking locations for construction workers
    - routes to be used by heavy construction related vehicles to minimise impacts on sensitive land uses and businesses
    - details for relocating kiss and ride, taxi ranks and rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus/taxi operators. Particular provisions would also be considered for the accessibility impaired
    - measures to manage traffic flows around the area affected by the Proposal, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the TMP
- consultation with the relevant road authorities would be undertaken during preparation of the construction TMP. The performance of all project traffic arrangements would be monitored during construction
- communication would be provided to the community, local residents and businesses to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site works

- access for emergency vehicles would be maintained in accordance with relevant requirements. Emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes.

Refer to **Table 7.1** for a list of proposed mitigation measures.

6.2 Landscape and visual amenity

Potential impacts on urban design, landscape and visual amenity are presented in this section, together with mitigation measures to manage any negative impacts.

6.2.1 Existing environment

The Proposal is located within the suburb of Hurstville, near Hurstville Station. This area is a heavily urbanised environment in Sydney's south.

The land uses in the surrounding area consist of commercial uses and residential uses that are predominantly medium density residential developments. Nearby permanent visual receivers are listed in **Table 6.2**.

Table 6.2 Nearby permanent visual receivers

Visual receivers	Approximate distance from Proposal
Residential	• 25 m south (546, 548 550, 552, 554, 556 and 558 Railway Parade) • 30 m south (560 Railway Parade) • 35 m south (564-576 Railway Parade) • 35 m north (31 Treacy Street) • 95 m north east (21 Treacy Street) • 95 m south east (540 Railway Parade)
Commercial	• 20 m north (Commercial buildings on Treacy Street) • 25 m north (St Vincent de Paul on Treacy Street) • 30 m north west (185B Forest Road) • 105 m west (Hurstville RSL Memorial Club)

Other visual receivers include pedestrians and vehicles travelling along the rail overbridge between Railway Parade and Treacy Street, and along Railway Parade between the rail overbridge and the intersection of Railway Parade and St Georges Parade. Users of the Hurstville Free Council Car Park are also likely to have views of the rail corridor, where vegetation does not impede the view.

Mature trees exist along the boundary of the rail corridor along Railway Parade. These trees disrupt the view of the rail corridor, but do not completely block the view due to their spacing. Vegetation also exists on the northern side of the rail corridor which is likely to impede views from ground level at the St Vincent de Paul building, neighbouring commercial buildings and part of the Hurstville Free Council Car Park.

6.2.2 Potential impacts

Construction phase

Construction works required for the Proposal would temporarily alter the visual landscape of the rail corridor through the introduction of construction materials, plant and equipment required to carry out the works and the storage of equipment in laydown areas. The necessity of carrying out construction works for the Proposal during night time hours would also result in

the introduction of lighting towers for the safety and visibility of construction workers. Visual receivers that would be most affected by the construction of the Proposal would be:

- south facing residential apartments at 21 – 31 Treacy Street
- north facing residential apartments at 564 – 576 Railway Parade
- north facing residential apartments at 546 to 560 Railway Parade
- persons with access to the upper floor of the St Vincent de Paul building and adjacent commercial premises on Treacy Street
- occupants of vehicles and pedestrians travelling along Railway Parade and the rail overbridge between Railway Parade and Treacy Street.

The impacts of construction work and construction materials would be temporary, which would reduce the overall visual impact resulting from the works. The initial periods of construction would likely draw attention to the works from the nearby residential receivers that have a permanent view of the rail corridor, however it is likely that this level of attention would be reduced as construction proceeds. The visual impact is considered to be a minor negative impact due to the temporary and relatively short-term duration of the construction works.

Temporary lighting would be required for night time construction works. Lighting is likely to be in the form of electric lighting towers, which have the potential to spill into adjacent areas, and would be visible by residential receivers whose view of the rail corridor is unobstructed. As the surrounding streetscape already features lighting during the night, the impacts from temporary lighting towers are not considered to result in a significant change from existing conditions around the Proposal Area. The impact from the temporary lights to facilitate construction works is therefore considered to be a minor negligible impact.

Operational phase

The Proposal would introduce the following permanent changes to the visual landscape of the railway corridor:

- amended railway track alignment
- amended OHW configurations
- new signalling infrastructure.

Although these elements change the existing visual landscape of the rail corridor, the change is considered to be a minor, and is consistent with the current use as operational rail infrastructure. The impact of these changes is considered to be negligible.

6.2.3 Mitigation measures

The following mitigation measure would apply to the Proposal:

- provide well-presented and maintained construction hoarding and/or site fencing with shade cloth (or similar material) (where necessary) to minimise visual impacts on key view points during construction and remove hoardings and/or site fencing following the completion of construction
- cut-off or directed lighting to be used with and outside of the construction site, with lighting location and direction considered to ensure glare and light spill is minimised
- construction personnel to keep the construction areas clean and tidy including refuse placed in appropriate receptacles
- measures taken to ensure no tracking of dirt and mud into public roads and other public spaces.

Refer to **Table 7.1** for a list of proposed mitigation measures.

6.3 Noise and vibration

A Noise and Vibration Impact Assessment (**Appendix C**) (AECOM, 2019) was completed for the proposal and included the following scope:

- establish the noise management levels (NMLs) and vibration limits that would apply to the Proposal
- identification of predicted noise and vibration levels at nearby residential and other sensitive receivers due to the construction and operation of the Proposal
- identification of predicted noise levels from additional off-site construction traffic generated by the Proposal
- recommend mitigation measures, where necessary, to reduce and manage noise and vibration impacts from the Proposal to comply with established NMLs and vibration limits.

The findings of this assessment are summarised below.

6.3.1 Existing environment

The Proposal Area, which includes the crossover location and associated construction compounds and laydown areas, extends from approximately 150 metres west of Hurstville Station to approximately 300 metres east of Hurstville Station. The Proposal is bounded by Hurstville CBD to the north, Hurstville Station to the west and residential premises to the south.

The acoustic environment is dominated by road traffic noise from Railway Parade and Hurstville CBD.

Residential and non-residential receivers potentially affected by the construction and operation of the Proposal are shown in **Figure 6.2**. Details about the specific locations of the receivers and their distances from the Proposal is provided in **Table 6.3**

Hurstville Crossover

Figure 6.2 Noise sensitive receivers

Table 6.3 Representative receiver addresses - residential

Receiver ID	Receiver address	Approximate distance to Proposal in metres
R1	12 Woniora Road, Hurstville	75
R2	23 Woniora Road, Hurstville	85
R3	44 Rosebank Crescent, Hurstville	100
R4	2-8 Bridge Street, Hurstville	500
R5	10 Gloucester Road, Hurstville	270
R6	12 Carrington Avenue, Hurstville	140
R7	384 Forest Road, Hurstville	100
R8	18 Woodville Street, Hurstville	180
R9	11-17 Woodville Street, Hurstville	240
R10	21 Treacy Street, Hurstville	45
R11	1 Hill Street, Hurstville	10
R12	1 Jack Brabham Drive, Hurstville	35
R13	512 Railway Parade, Hurstville	65
R14	1A Woids Avenue, Hurstville	55
R15	542 Railway Parade, Hurstville	90
R16	548 Railway Parade, Hurstville	40
R17	558 Railway Parade, Hurstville	40
R18	564-576 Railway Parade, Hurstville	60

Table 6.4 Representative receiver addresses – non-residential

Receiver ID	Receiver address	Approximate distance to Proposal in metres
N1	Col Jones Swim School Hurstville	200
N2	Southern Sydney Synagogue	110
N3	Hurstville Police Station	195
N4	Georges River Council	160
N5	Hurstville Public School	300
N6	Hurstville Library	210
N7	Hurstville Presbyterian Church	320
N8	St George's Hurstville Anglican Church	170

6.3.2 Noise Criteria

The EPA's *Interim Construction Noise Guideline* (ICNG) (Department of Environment and Climate Change, 2009) is the principal guideline for the assessment and management of construction noise in NSW. A quantitative assessment, based on likely construction scenarios, has been carried out for these works.

The ICNG recommends standard hours of construction as:

- Monday to Friday: 7am to 6pm
- Saturday: 8am to 1pm
- Sundays and public holidays: no works.

For residential receivers, the ICNG recommends that the NML resulting from construction activities not exceed the applicable rating background level (RBL) + 10 dB(A) during standard construction hours. Where NMLs are predicted to be exceeded, the ICNG recommends feasible and reasonable measures to be implemented to minimise adverse impacts. Where construction noise levels are likely to reach 75 dB(A) or more at residences (during standard construction hours), residential receivers are to be considered as 'highly noise affected'. In these circumstances, the proponent may be required to consider restricting hours of very noisy works to provide respite periods.

Outside of standard working hours, the ICNG recommends that the NMLs for residential receivers not exceed the applicable RBL + 5 dB(A).

The ICNG recommends separate NMLs for non-residential sensitive receivers, which applies when the applicable receiver is in use.

The construction NMLs developed for the Proposal for residential and non-residential sensitive receivers are listed in **Table 6.5** and **Table 6.6**

Table 6.5 Construction NMLs – residential receivers

Period	RBL, L_{A90} dB(A)	Standard hours noise management levels, $L_{Aeq.\ 15min}$, dB(A)	Out of hours noise management levels, $L_{Aeq,\ 15mins}$, dB (A)
Day	46	56	51
Evening	45	-	50
Night	35	-	40

Table 6.6 Construction NMLs – non-residential receivers

Land use	Noise management levels, $L_{Aeq,15min}$ (applies when properties are in use)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	External noise level 65 dB(A)
Passive recreation areas (characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, for example, reading, meditation)	External noise level 60 dB(A)
Community centres	Depends on the intended use of the centre. Refer to the recommended “maximum” internal levels in AS2107 for specific uses.
Industrial premises	External noise level 75 dB(A)
Offices, retail outlets	External noise level 70 dB(A)

Sleep Disturbance Criteria

Sleep disturbance noise goals have also been established for residential receivers which are based on the *NSW Road Noise Policy* (RNP) (Department of Environment, Climate Change and Water, 2011). Based on the Policy, the sleep disturbance criteria for the Noise Catchment Area (NCA) are a screening level of 50 dB(A)$L_{A1(1\ minute)}$ and an awakening reaction level of 65 dB(A) $L_{A1(1minute)}$.

Construction Traffic Noise Criteria

To assess noise impacts from construction traffic an initial screening test should be undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A), in line with the RNP. Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is

greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected.

Construction Vibration Criteria

Vibration assessment criteria relate to human comfort (tactile vibration) and structural or building damage.

Structural damage to buildings

No Australian Standards exist for the assessment of building damage caused by vibration at present. The German standard (DIN 4150) provides recommended maximum levels of vibration that reduce the likelihood of building damage caused by vibration and are presented in **Table 6.7**. DIN 4150 states that buildings exposed to higher levels of vibration than recommended limits would not necessarily result in damage.

Table 6.7 DIN 4150: Structural damage safe limits for building vibration

Group	Type of structure	At foundation - Less than 10 Hz	At foundation - 10 Hz to 50 Hz	At foundation - 50 Hz to 100 Hz1	Vibration at the horizontal plane of the highest floor for all frequencies
1	Buildings used for commercial purposes, industrial buildings and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s	40 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s	15 mm/s
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Group 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order/heritage listed)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s	8 mm/s

Notes:

1. *At frequencies above 100 Hz, the values given in this column may be used as minimum values*

Human comfort

The assessment of intermittent vibration outlined in the *Environmental Noise Management - Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, NSW, 2006) is based on Vibration Dose Values (VDVs). The VDV accumulates the vibration energy received over the daytime and night-time periods.

Maximum and preferred VDVs for intermittent vibration arising from construction activities are listed in **Table 6.8**. The VDV criteria are based on the likelihood that a person would be annoyed by the level of vibration over the entire assessment period.

Table 6.8 Preferred and maximum vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime [1] Preferred	Daytime Max	Night time Preferred	Night time Max
Critical areas (examples include hospital operating theatres and precision laboratories where sensitive operations are occurring)	0.1	0.2	0.1	0.2
Residences	0.2	0.4	0.13	0.26
Offices, schools, educational institutions, commercial premises and places of worship	0.4	0.8	0.4	0.8
Workshops or factory environments	0.8	1.6	0.8	1.6

Notes:

1. *Day is defined as 7:00 am to 10:00 pm. Night is defined as 10:00 pm to 7:00 am*

Operational noise criteria – rail noise

The *Rail Infrastructure Noise Guideline* (RING) (EPA, 2013) provides the applicable noise trigger levels for the assessment of airborne noise. These trigger levels are considered non-mandatory and represent a point at which reasonable and feasible noise mitigation should be considered.

The RING provides noise trigger levels for both new and redeveloped rail lines. Since work associated with the Proposal comprises a redevelopment of the existing T4 Illawarra and Eastern Suburbs Line and South Coast Line, all sensitive receivers surrounding the project area are subject to the redeveloped noise criteria.

The RING trigger levels apply where redevelopment of an existing rail line increases existing $L_{Aeq(period)}$ rail noise levels by 2 dB or more, or existing L_{Amax} rail noise levels by 3 dB or more, *and* predicted rail noise levels exceed the trigger levels below.

Table 6.9 Airborne heavy rail noise trigger levels for residential land uses

Period	Noise trigger level dB(A)
Day (7am to 10pm)	65 $L_{Aeq(15hour)}$ or 85 L_{AFmax}
Night (10pm to 7am)	60 $L_{Aeq(9hour)}$ or 85 L_{AFmax}

In accordance with the RING, sensitive land uses other than residential have their own specific noise trigger levels for rail redevelopments, applicable when the facility or space is in use. These trigger levels apply where redevelopment of an existing rail line increases existing $L_{Aeq(period)}$ rail noise levels by 2 dB or more, and resulting rail noise levels exceed 45 $L_{Aeq(1hr)}$ (internal) for schools, educational institutions and child care centres and 65 $L_{Aeq(15hr)}$ (external) for 'open space – passive use'.

6.3.3 Potential impacts

Construction phase

Predicted construction noise levels

Six distinct work packages, each consisting of a number of construction activities, have been assumed for the Proposal. These work packages are listed above in **Table 3.1**.

In order to assess noise impacts from the site during construction, a noise model was created to represent reasonable worst periods of construction works. Construction noise was modelled in SoundPLAN Version 8.0, with the model being based on ground topography, ground absorption and reflection, buildings (residential and commercial), receivers (**Figure 6.2**) and from the use of plant and equipment listed in **Section 3.1.6**.

A summary of the number of residential receivers where construction noise levels are predicted to exceed NMLs during the loudest construction stages are presented for standard hours and OOHW construction activities in **Table 6.10.** Results show construction noise levels are predicted to exceed the NMLs during standard hours and OOHW for all construction work packages at the closest representative receivers with the largest number of exceedances occurring during work package 1.

The greatest exceedances of the NMLs and the greatest overall impacts are likely to be experienced at R16 and R17 (refer **Figure 6.2** and **Table 6.3**). These locations are most affected as predicted exceedances would occur during several stages of work (due to the proximity of these receivers to the proposed work areas and the duration of the works). Residential receivers R1, R2, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17 and R18 (refer **Figure 6.2** and **Table 6.3**) are predicted to experience an exceedance of the NML during at least one work package. Residential receivers R10, R11, and R15, R16, R17 and R18 (refer **Figure 6.2** and **Table 6.3**) are predicted to be 'highly affected'.

Table 6.10 Predicted construction noise impacts for residential receivers during standard construction hours

Construction scenario	NML		Number of receivers where noise levels exceed NML		Number of highly noise affected receivers where noise levels ≥75 dB(A)
	Standard Hours	OOHW	Standard Hours	OOHW	
Site establishment and enabling works	56	40	12	18	0
Utility works	56	40	6	12	1
New crossover	56	40	11	14	6
Signal post	56	40	6	11	0
Demobilisation	56	40	6	12	0
Testing and commissioning	56	40	6	11	0

In relation to non-residential receivers, eight representative non-residential receivers were assessed to determine compliance with the daytime NMLs. N1 is predicted to be exposed to

noise levels which exceed its applicable NML (refer **Figure 6.2** and **Table 6.3**). NMLs at all other non-residential receivers for all work packages would not be exceeded.

Sleep disturbance assessment

A sleep disturbance assessment has been undertaken for the proposed night works. A summary of the noise modelling results are provided in **Table 6.11** below, with the number of receivers exceeding the applicable noise criteria displayed.

A number of exceedances of the awakening reaction screening criteria have been predicted due to the night-time construction works associated with the Proposal. Residential receivers R1, R7, R10, R11, R12, R13, R14, R15, R16, R17 and R18 (refer **Figure 6.2** and **Table 6.3**) are predicted to experience an exceedance of the sleep disturbance awakening reaction criteria. Out-of-hours works are likely to be limited to the routine scheduled closures and a discrete number of other nights where out-of-hours works are unavoidable.

Table 6.11 Predicted sleep disturbance impacts at residential receivers

Construction scenario	Sleep disturbance awakening reaction $L_{A1(1min)}$ criteria, dB(A)	Number of receivers where noise levels are equal to or exceed sleep disturbance awakening criteria
Site establishment and enabling works	65	11
Utility works	65	6
New crossover	65	7
Signal post	65	6
Demobilisation	65	6
Testing and commissioning	65	4

Construction traffic assessment

An assessment of construction traffic movements was completed based on indicative numbers of construction vehicles. These have been estimated to be up to 15 heavy vehicles per day during peak construction periods. Vehicles would access the site by either Forest Road or The Avenue.

Road traffic noise levels during construction are unlikely to increase by more than 2 dB on Forest Road or The Avenue during the daytime due to the existing high volumes of traffic on these roads. Traffic noise levels may increase by more than 2 dB during the night-time, however the overall traffic noise level (including construction traffic) is expected to be less than 50 dB(A), which complies with the RNP criteria.

Vibration

Vibration intensive work has the potential to occur as part of the construction work. Work may include jackhammering and ballast tamping activities

Typical safe minimum working distances for the construction equipment that may be part of this proposal are provided in **Table 6.12**. Minimum working distances have been developed to

meet the recommended levels of vibration in British Standard 6472-1992 and DIN 4150 and are based upon the safe working distances presented in the *Construction Noise and Vibration Strategy* (CNVS) (TfNSW, 2019g) and AECOM's library of vibration data.

Minimum working distances should be adhered to when operating vibration intensive equipment near on-site buildings in order to minimise the risk of discomfort to occupants and structural damage.

Table 6.12 Recommended minimum working distances for vibration intensive equipment

Equipment	Rating/description	Safe working distance (metres)	
		Cosmetic damage	Human response
Jackhammer	Hand held	1 (nominal)	Avoid contact with structure

Note: More stringent conditions may apply to heritage or other sensitive structures

The minimum working distance presented in **Table 6.12** assume individual items of plant would be operating independently. Concurrent operation of vibration intensive equipment should be avoided, however if it is necessary to operate multiple items of equipment concurrently close to the safe working distance then vibration monitoring is recommended.

The minimum working distances for cosmetic damage are generally considered to be conservative and working within them would not necessarily result in damage. However, factors such as work practices and intervening ground conditions can affect vibration levels, so vibration monitoring is recommended within these distances and should be carried out at the beginning of the work in order to refine the safe working distances for site specific conditions.

It is unlikely that vibration intensive equipment would be used within 30 metres of sensitive receivers during construction of the Proposal.

Operational phase

Predicted operational noise levels – rail passby noise

In order to assess noise impacts from increased rail noise 'no build' (without the proposal) and 'build' (with the proposal) scenarios predicted noise levels were modelled using SoundPLAN v8.0 environmental noise modelling software. The model included ground topography, ground absorption and reflection, buildings (residential and commercial), receivers (**Figure 6.2**), terrain elevation contours, existing and future rail centrelines, train movement numbers, lengths, speeds and rolling stock types, track conditions, and rail noise source reference levels derived from TfNSW's *Rail Noise Database.*

Table 6.13 provides a summary of the predicted rail noise levels for both the 'no build' and 'build' scenarios. Detailed predicted noise levels at each assessed receiver is provided in Appendix C.

It is noted that while there are some predicted exceedances of the overall L_{Amax} criteria, the change in noise levels between the 'build' and the 'no build' scenarios remains below the 3 dB(A) threshold outlined in the RING. Therefore, there are no predicted exceedances of the applicable RING criteria due to the operation of the proposal. As a result, no further mitigation is considered necessary.

Table 6.13 Summary of predicted operational rail noise levels – in accordance with RING criteria

Scenario	Maximum daytime $L_{Aeq,15hr}$ noise level	Maximum night-time $L_{Aeq,9hr}$ noise level	Maximum L_{Amax} noise level
No build	58	58	85
Build	58	58	85

6.3.4 Mitigation measures

The following mitigation measures would apply to the Proposal:

- a Construction Noise and Vibration Management Plan (CNVMP) should be developed for the Proposal and implemented prior to commencement of construction activities. The CNVMP should include all feasible and reasonable safeguards to manage the noise emissions from the site and any complaints which may occur due to construction noise
- the CNVMP should include, as a minimum, the following:
    - identification of nearby residences and other sensitive land uses
    - description of approved hours of work
    - description and identification of all construction activities, including work areas, equipment and duration
    - description of what work practices (generic and specific) would be applied to minimise noise and vibration
    - a complaints handling process
    - noise and vibration monitoring procedures, including for heritage structures
    - overview of community consultation required for identified high impact works
- construction works should be planned and carried out during standard construction hours wherever possible. The standard mitigation measures contained within the Construction Noise and Vibration Strategy (CNVS) (TfNSW, 2019g) would be considered as mitigation measures as part of the CNVMP
- all residents and sensitive receivers impacted by noise levels from the Proposal which are expected to exceed the NML should be consulted prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works. The information provided to the receivers would include:
    - programmed times and locations of construction work
    - the hours of proposed works
    - construction noise and vibration impact predictions
    - construction noise and vibration mitigation measures being implemented on site.
- community consultation regarding construction noise and vibration would be detailed in a Community Liaison Management Plan for the construction of the Proposal and would include a 24-hour hotline and complaints management process
- TfNSW's CNVS provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from airborne noise, ground-borne noise

and vibration generated during the construction of TfNSW projects. This is managed through the application of all feasible and reasonable mitigation measures. Where exceedances are still expected to occur after standard mitigation measures have been applied, the CNVS recommends the implementation of additional mitigation measures. These mitigation measures are specified within the CNVS and presented in **Table 6.14**.

- the provision of additional mitigation is based on the predicted exceedances above RBLs and when the exceedances occur.

Table 6.14 Additional mitigation measures matrix

Construction hours	Receiver perception	dB(A) above RBL	dB(A) above NML	Additional management measures
Standard hours Monday-Friday (7am-6pm) Saturday (8am-1pm)	Noticeable	5 to 10	0	-
	Clearly audible	>10 to 20	<10	-
	Moderately intrusive	>20 to 30	>10 to 20	PN, V
	Highly intrusive	>30	>20	PN, V
	75 dB(A) or greater	N/A	N/A	PN, V, SN
OOHW Period 1 Monday-Friday (6pm-10pm) Saturday (7am-8am, 1pm-10pm) Sunday/Public Holiday (8 am-6 pm)	Noticeable	5 to 10	<5	-
	Clearly audible	>10 to 20	5 to 15	PN
	Moderately intrusive	>20 to 30	>15 to 25	PN, V, SN, RO
	Highly intrusive	>30	>25	PN, V, SN, RO, RP#, DR#
OOHW Period 2 Monday-Saturday (12am-7am, 10pm to 12am) Sunday/Public holiday (12am-8am, 6pm-12am)	Noticeable	5 to 10	<5	PN
	Clearly audible	>10 to 20	5 to 15	PN, V
	Moderately intrusive	>20 to 30	>15 to 25	PN, V, SN, RP, DR
	Highly intrusive	>30	>25	PN, V, SN, AA, RP, DR

Notes: *PN = Project notification* *SN = Specific notification, individual briefings, or phone call:* *V = Verification monitoring* *DR = Duration respite* *RP = Respite period* *RO = Project specific respite order* *AA = Alternative accommodation*

** SWLs used for the purpose of estimating noise impact shall be increased by 5 dB(A) where works will include: power saws for the cutting of timber, masonry & steel; grinding of metal, concrete or masonry; rock/line drilling; bitumen milling & profiling; jack hammering, rock hammering & rock breaking; or impact piling as a correction factor for noise with special audible characteristics.*

 # Respite periods and duration reduction are not applicable when works are carried out during OOHW Period 1 Day only (i.e. Saturday 6am-7am & 1pm-6pm, Sundays / Public Holidays 8am-6am)

6.4 Indigenous heritage

Potential impacts on Indigenous heritage are presented in this section, together with mitigation measures to manage any negative impacts.

6.4.1 Existing environment

A search of the Aboriginal Heritage Information System (AHIMS) database was undertaken on 30 April 2019. The AHIMS search provides archaeological context for the area and identifies whether any previously recorded Aboriginal sites are located within or near the Proposal Area. The AHIMS search included a 200 metre radial buffer centred on the Proposal Area. No AHIMS sites or places were identified in the search.

Certain landscape features, such as nearby waterways, sand dune systems, ridge tops, ridge lines, headlands, cliff faces and rock caves/shelters, can indicate the likely presence of Indigenous objects. None of these features are present immediately surrounding the proposed crossover and therefore the Proposal is not considered to be located within a high risk landscape for Aboriginal heritage potential. The extensive landscape modification and high level of disturbance that has occurred due to development of the rail corridor (e.g. excavation of an extensive rail cutting) suggests that the presence of culturally sensitive buried items is unlikely within the boundaries of the Proposal.

6.4.2 Potential impacts

Construction phase

Construction of the Proposal would involve some minor excavation and other ground disturbance for the following activities:

- earthworks, trenching and regrading works to accommodate the new crossover
- trenching excavation for the modification of nearby drainage.

As no known Aboriginal heritage items or high risk landscape features are located near the Proposal Area and due to the extensive landscape modification, the potential for unknown items to be present is considered to be low. The Proposal is unlikely to result in a significant impact upon Indigenous heritage during construction. The mitigation measures listed in **Section 6.4.3** would be implemented to ensure that impacts to Indigenous heritage items would remain unlikely to occur.

Operational phase

The operation of the proposal would not result in any ongoing impacts upon Indigenous heritage.

6.4.3 Mitigation measures

The following mitigation measures would apply to the Proposal:

- if unforeseen Indigenous heritage objects are uncovered during construction, the procedures contained in TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2019b) would be followed, and works within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an Aboriginal heritage consultant, DPIE and the Local Aboriginal Land Council.
- if human remains are found, work would cease, the site secured and the NSW Police and DPIE notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to works recommencing at the location.

Refer to **Section 7.2** for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.5 Non-Indigenous heritage

6.5.1 Existing environment

A desktop search of historic heritage registers was undertaken to assess the extent of known historical heritage items in proximity to the Proposal. This included the following:

- World Heritage List
- Commonwealth Heritage List
- National Heritage List
- Register of the National Estate (non-statutory archive)
- NSW State Heritage Register (SHR)
- RailCorp's Section 170 Heritage and Conservation Register
- Roads and Maritime Section 170 Heritage and Conservation Register
- Hurstville LEP 2012
- Kogarah LEP 2012.

Database results

The desktop search identified no items listed on the World, Commonwealth or National Heritage Lists or the SHR or RailCorp's Section 170 Heritage and Conservation Register within proximity of the Proposal. Local heritage items within the vicinity of the Proposal are listed in **Table 6.15**.

Table 6.15 Listed heritage items within the vicinity of the Proposal

Heritage register	Item	Distance from Proposal	Significance
Hurstville LEP 2012	Glenvale Court	55 metres north	Local
Hurstville LEP 2012	John Fretus Building	60 metres north	Local
Hurstville LEP 2012	Ht Willis & Co	80 metres north	Local
Hurstville LEP 2012	Rendered Façade Building	77 metres north	Local
Hurstville LEP 2012	Advance House	84 metres north	Local
Hurstville LEP 2012	Inter-war Art Deco Building	66 metres north west	Local

The Proposal is not within the heritage curtilage of any identified heritage items (**Figure 6.3**).

FIGURE 6-3: HERITAGE ITEMS IN THE VICINITY OF THE PROPOSAL

AECOM

N

0 50 100 m

Legend

- Railway station
- Extent of proposed works
- General heritage item

Source: Imagery © Nearmap, 2019.

6.5.2 Potential impacts

Given the distance between the site and the nearest listed non-Indigenous heritage items (at least 55 metres), it is unlikely that the Proposal would adversely affect these items.

6.5.3 Mitigation measures

The following mitigation measures would apply to the Proposal:

- the CEMP should include stop work procedures in accordance with TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2019b) to manage activities in the unlikely event that intact archaeological relics or deposits are encountered.

6.6 Socio-economic

6.6.1 Existing environment

The Proposal is located within the Georges River LGA, within the suburb of Hurstville in the south of the Sydney metropolitan area, approximately 14 kilometres from the Sydney CBD. The Proposal is located on RailCorp owned land. The Proposal Area is located on land zoned SP2 – Railway.

The surrounding land uses include educational establishments, community facilities, commercial businesses and low and high density residential areas. Sensitive receivers such as residential, education and community facilities in the vicinity of the Proposal include:

- Residential dwellings approximately 25 metres to the south
- Woniora Road School approximately 285 metres to the south west
- Lily Music School approximately 205 metres to the north west
- Clavier Music and Art School approximately 190 metres to the north
- St George's Hurstville Anglican Church approximately 155 metres to the north
- Hurstville Medical Practice approximately 117 metres to the north
- Hurstville City Medical Centre approximately 45 metres to the north west
- Hurstville RSL Memorial Club approximately 105 metres to the west
- Teddy Bear Child Care Centre approximately 145 metres to the south west
- Clement Art School Hurstville approximately 90 metres to the north.

Hurstville Station is located approximately 170 metres west of the Proposal and Allawah Station is located approximately 645 metres south east.

A review of the Australian Bureau of Statistics 2016 census data (ABS) was undertaken for Hurstville. Hurstville has a population of 29,822 people with a median age of 32 years. Approximately half of the Hurstville population are females (50.8 per cent). The majority of people living in the suburb of Hurstville (36.9 per cent) were born in China (excludes Special Administrative Regions of China and Taiwan) and over half of the population (54.4 per cent) over the age of 15 are employed full time (ABS, 2018).

6.6.2 Potential impacts

Construction phase

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

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

- temporary disruptions to local traffic movements near the Proposal Area, including near Treacy Street, Hill Street and Jack Brabham Drive
- temporary loss of on-street parking on Hill Street and Jack Brabham Drive should the construction car park within the rail corridor reach capacity
- noise and traffic impacts associated with truck movements delivering materials and equipment and transporting waste
- construction noise, vibration, dust and visual impacts.

Access to Hurstville Station would be maintained at all times during construction, including for pedestrians and cyclists. Vehicle access to the station would also be retained and the Hurstville council car park would remain open for commuters. Access for emergency services would be maintained and it is not anticipated that access to residential properties would be significantly affected during construction of the Proposal.

The closest educational or community facility is located 45 metres north west of the construction works and is unlikely to be negatively affected by the works.

There is potential for a minor temporary increase in revenue for local businesses arising from construction workers during the works.

Operational phase

The operation of the Proposal would provide positive socio-economic benefits to the Hurstville community and the wider Georges River LGA, including:

- improved services including capacity, reliability and connectivity
- reduced crowding on train services.

6.6.3 Mitigation measures

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

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

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

6.7 Biodiversity

Potential impacts on biodiversity are presented in this section, together with mitigation measures to manage any negative impacts.

6.7.1 Existing environment

Vegetation communities

A BioNet Atlas search was undertaken on 19 September 2019 over a 10 kilometre × 10 kilometre area centred on the Proposal location. The search identified 29 threatened ecological communities (TECs) listed under the BC Act and/or the EPBC Act.

A search of the Protected Matters Search Tool (PMST) was undertaken on 19 September 2019 for the Proposal and a 1 km buffer around the Proposal. This search is provided in **Appendix D**. The search identified seven TECs listed under the EPBC Act.

The proposal is located within a disturbed area as a result of previous development and the ongoing operation of the rail corridor. Vegetation within the Proposal Area consists of a small number of planted and naturally regenerated trees and shrubs along the boundary of the rail corridor. Fencing separates the trees from the rail corridor as shown in **Figure 6.4**.There are a number of environmental weeds present within the rail corridor, including African Olive (*Olea europaea ssp. cuspidata*) and Large-leaved Privet (*Ligustrum lucidum*). Evidence of plants consistent with the TECs identified in the above databases searches is not apparent in the Proposal Area.

Figure 6.4 Vegetation in the Proposal Area

Threatened flora and fauna

The above BioNet Atlas search for threatened species listed under the BC Act and EPBC Act identified 63 threatened flora and fauna species.

The PMST search identified 25 threatened fauna species and 12 threatened flora species listed under the EPBC Act.

Fauna habitat

The Proposal Area contains minimal desirable fauna habitat as it is located within an operational rail corridor. There are fragmented patches of foraging and shelter area for fauna in the vegetated fringes of the Proposal Area, however these are not anticipated to be affected by the Proposal.

6.7.2 Potential impacts

Construction phase

The Proposal would not require the clearing of existing vegetation, though minor trimming may be required in certain places to facilitate access or for drainage upgrades.

There is the potential for construction to introduce weeds, carried on vehicles or clothing. The risk of new weed introductions in this location would be minor given the highly urbanised nature of the area. During construction, noise, dust, light and sedimentation impacts may occur upon biodiversity. Such impacts would be expected to be minimal given the highly urbanised nature of the surrounding environment and with the implementation of mitigation measures detailed in this REF.

Measures outlined in **Section 7.2** would be implemented to minimise indirect impacts on biodiversity.

Operational phase

There is no potential for further operational impacts to biodiversity as a result of the Proposal.

6.7.3 Mitigation measures

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

- works within the corridor should be consistent with the following guidelines:
  - TfNSW *Vegetation Management (Protection and Removal) Guidelines* (TfNSW, 2019c)
  - TfNSW *Weed Management and Disposal Guideline* (TfNSW, 2019d)
- ensure activities adjacent to vegetation to be retained does not alter existing drainage and existing light conditions
- no chemicals or rubbish must be allowed to escape the construction area
- all chemicals must be correctly stored within bunding
- works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained
- equipment, heavy machinery and materials must be situated in designated lay-down areas

- work vehicle access must be restricted to designated work areas and existing formed access tracks/roadways

Refer to **Section 7.2** for a full list of proposed mitigation measures. All mitigation measures are to be incorporated into the CEMP.

6.8 Contamination, landform, geology and soils

Potential impacts on contamination, landform, geology and soils are presented in this section, together with mitigation measures to manage any negative impacts.

6.8.1 Existing environment

Geology and soils

Reference to the 1:100,000 Geological Map of Sydney identified that the underlying geology of the Proposal Area consists of black to dark-grey shale and laminite (Ashfield Shale) of the Wianamatta Group. Overlying this is likely to consist of fill material and ballast as a result of the construction and ongoing maintenance of the railway corridor.

The elevation of the Proposal Area is approximately between 64 and 66 metres Australian Height Datum (AHD).

The Soil Landscape at Hurstville is located within the boundaries of the Blacktown landscape (eSPADE, 2019). The Blacktown landscape comprises gently undulating rises on Wianamatta Shale with broad crests and ridges rounded with convex upper slopes grading into concave lower slopes.

Soils within the Blacktown soil landscape, consisting of shallow to moderately deep (<100 centimetres) red and brown podzolic soils on crests, upper slopes and well-drained areas; and deep (150-300 centimetres) yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. Limitations of the Blacktown landscape include moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

Acid Sulfate Soils

Acid sulfate soil (ASS) risk maps have been obtained from the Kogarah LEP and Hurstville LEP. Based on the ASS maps, there is no known occurrence of ASS at the site.

According to the Australian Soil Resource Information System (ASRIS) map, the Proposal Area has an extremely low probability/very low confidence of containing ASS. The Proposal Area is also classified as a ‘Built up Area’.

Contamination

A search of the NSW EPA Contaminated Land Register on 7 May 2019 did not identify any contaminated sites within close proximity to the Proposal Area.

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

- hydrocarbons
- arsenic
- phenolics
- heavy metals

- nitrates and ammonia.

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

6.8.2 Potential impacts

Construction phase

Soil disturbance, erosion and sedimentation

Excavation and other earthworks, if not adequately managed, could result in the following impacts:

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

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

These impacts are considered to be minor given the limited level of ground disturbance required for the Proposal and the relatively flat surrounding topography and stability of the Proposal Area. Erosion risks can be adequately managed through the implementation of standard measures as outlined in *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) (the Blue Book).

Contamination

Excavation and other earthworks have the potential to expose contaminants, which, if not appropriately managed, can present a health risk to construction workers and the community. Contaminants can also pose an environmental risk if they are to enter nearby waterways through the stormwater infrastructure. As there is potential for on-site contamination, chemical testing and visual characterisation in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) would be undertaken to confirm the composition and nature of excavated material. Where spoil is classified as unsuitable for reuse, it would be transported to an appropriately licensed offsite facility.

Potential contamination impacts may also arise from the use of fuels, lubricants and chemicals for construction plant and equipment for the Proposal. Fuels, lubricants and chemicals have the potential to be spilled during construction and transfer offsite to adjacent properties or may contaminate the stormwater system. The storage, use and disposal of chemicals would be undertaken in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c).

Hydrocarbons and chemicals such as fuels, lubricants and oils would be stored on-site in dedicated facilities such as secure sheds, containers, storage tanks and proprietary hazardous substance cupboards, and in accordance with the applicable Safety Data Sheet (SDS).

Operational phase

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

The Proposal is not anticipated to contribute to the contamination of the site as operational activities would be undertaken in accordance with relevant legislation, standards and guidelines (refer to mitigation measures below).

6.8.3 Mitigation measures

The following mitigation measures would apply to the Proposal:

- prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the *'Blue Book' Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of works and maintained throughout construction
- erosion and sediment control measures would be established prior to any site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. These measures would be maintained and left in place until the works are complete and areas are stabilised
- vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area
- all fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c)
- prior to or during construction, further assessment and testing would be carried out to further characterise and target materials to be disturbed/excavated
- an appropriate Unexpected Finds Protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements
- all spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility
- all spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) prior to disposal
- any concrete washout would be established and maintained in accordance with TfNSW's *Concrete Washout Guideline* (TfNSW, 2019e) with details included in the CEMP and location marked on the Environmental Controls Map (ECM)

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

6.9 Hydrology and water quality

Potential impacts on hydrology and water quality are presented in this section, together with mitigation measures to manage any negative impacts.

6.9.1 Existing environment

Surface Water

The closest waterway is Poulton Creek, located approximately one kilometre south west of the Proposal Area. The Georges River is approximately 2 kilometres away, with Botany Bay located approximately 6.5 kilometres away.

Flooding

The map of areas subject to flood related development controls for Kogarah City Council indicates that the 100 year Average Recurrence Interval (ARI) flood event would not affect the site. The site is not located within a flood planning zone.

6.9.2 Potential impacts

Construction phase

Pollutants (fuel, chemicals or wastewater from accidental spills and sediment from excavations) could potentially reach nearby stormwater drains. Activities which would disturb soil during construction work also have the potential to affect local water quality as a result of erosion and run off sedimentation.

Direct impacts to the underground stormwater system may occur due to the proposed drainage modification works through damaged infrastructure and pollutants entering waterways. Appropriate controls would be detailed in the CEMP to ensure the drainage points are adequately protected during construction activities.

Heavy wet weather events may cause localised flooding which could increase the potential for soil erosion and sedimentation impacts. Works would need to ensure that the drains within the Proposal Area are kept unobstructed during construction. Dewatering activities, if required, would be undertaken in accordance with Blue Book and TfNSW's *Water Discharge and Reuse Guideline* (2019f).

Operational phase

Runoff from the modified drainage line adjacent to the crossover would continue to drain to the existing formal drainage system. No flooding or groundwater impacts to the surrounding area are anticipated as a result of the Proposal.

6.9.3 Mitigation measures

The following mitigation measures would apply to the Proposal:

- all fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c)
- water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the TfNSW *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill
- in the event of a pollution incident, works would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW

Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act

- the existing drainage systems would remain operational throughout the construction phase
- dewatering activities, if required, would be undertaken in accordance with the Blue Book and TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2019f)
- should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) and TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2019f).

Refer to **Section 7.2** for a list mitigation measures related to hydrology and water quality. All measures would be incorporated into the CEMP.

6.10 Air quality

Potential impacts on air quality are presented in this section, together with mitigation measures to manage any negative impacts.

6.10.1 Existing environment

Based on a review of the existing land uses surrounding the Proposal, existing air quality is considered to be characteristic of a typical urban environment in Sydney. There are several sources that may be contributing to the air quality in the Proposal Area. These are discussed below.

DPIE monitors air quality across NSW. Ground-level ozone (a key component of photochemical smog which appears as white haze in summer) remains an issue for Sydney and concentrations generally continue to exceed national air quality standards on a number of days each year.

A search of the National Pollutant Inventory database undertaken on 7 May 2019 for the 2017 to 2018 reporting period identified no industrial sources that have reported emissions in the Hurstville area.

A number of non-industrial sources in the study area have the potential to influence the local air quality to varying degrees. These include:

- vehicle exhaust from the surrounding road network
- domestic solid fuel burning
- railways (diesel freight).

Potentially affected receivers within the vicinity of the Proposal Area include local residents, businesses, community centres, places of worship and schools.

6.10.2 Potential impacts

Construction phase

Temporary air quality impacts that have the potential to occur during construction include minor increases in dust and emissions of carbon monoxide, sulphur dioxide, particulate matter, nitrous oxides, volatile organic compounds and other substances associated with excavation and the combustion of diesel fuel and petrol from construction plant and equipment.

Anticipated sources of dust and dust-generating activities include:

- excavation for the cross over
- other trenching and excavation for relocation and installation of services and drainage works
- stockpiling activities
- loading and transfer of material to/from trucks
- other general construction activities.

The Proposal would not involve extensive excavation or other ground disturbance with the potential to generate significant quantities of dust and other emissions. The operation of plant, machinery and trucks may lead to short term increases in exhaust emissions in the local area. Overall these impacts upon air quality would be minor.

Operational phase

The Proposal would not induce any change in land use or introduce activities that may adversely affect air quality. The continued use of public transport would be expected to lead to a relative reduction in private vehicle emissions in the long-term, contributing to an improvement in local air quality. As such the Proposal would result in a negligible operational air quality impact.

6.10.3 Mitigation measures

The following mitigation measures would apply to the Proposal:

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

Refer to **Section 7.2** for a list of mitigation measures related to air quality. All measures would be incorporated into the CEMP.

6.11 Waste

6.11.1 Potential Impacts

During construction of the Proposal the following waste materials may be generated:

- excavated spoil
- asphalt and concrete
- surplus building materials and building waste (metal, timber, plastics, etc.)
- electrical wiring and conduit waste
- hazardous waste (chemicals)
- green waste (including weeds)
- packaging waste
- oil and lubricants
- general waste, including food scraps generated by construction workers.

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

The Proposal would not result in changes to operational waste management arrangements.

6.11.2 Mitigation measures

The following mitigation measures would apply to the Proposal:

- the CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum:
    - identify all potential waste streams associated with the works and outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities
    - detail other onsite management practices such as keeping areas free of rubbish
    - specify controls and containment procedures for hazardous waste and asbestos waste
    - outline the reporting regime for collating construction waste data
- the Proposal will aim to achieve an ‘Excellent’ rating through the ISCA rating scheme. The application of the ISCA Rating scheme would also result in waste management targets to be developed for the Proposal and would include reuse and recycling.

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

6.12 Cumulative impacts

In accordance with clause 82 of the EP&A Regulation, any cumulative environmental effects of the Proposal associated with other existing and likely future activities must be considered in determining the potential impacts of the Proposal on the environment.

Cumulative impacts occur when two or more projects are carried out concurrently and in close proximity to one another. The impacts may be caused by both construction and operational

activities and can result in a greater impact to the surrounding area than would be expected if each project was undertaken in isolation. Multiple projects undertaken at a similar time/similar location may also lead to construction fatigue, particularly around noise, traffic and air quality impacts, if not appropriately managed.

6.12.1 Existing or potential projects

A search of DPIE's Major Projects Register, Development and Planning Register, and Georges River Council's Development Application Register on 1 May 2019 identified a number of proposed developments within the Hurstville area. These include:

- Major Project website –Modification to Mortdale Resource Recovery Facility– Changes to site layout including entry and exit and new loadout bay. Reduced storage bays and changes to the maximum amount of waste that can be stored in these bays. – 3.6 kilometres west of the Proposal Area.
- Major Project website – New Penshurst Public School – Demolition of all existing structures and construction of a new educational establishment to accommodate approximately 1,010 primary school students and approximately 59 staff. To be located on the corner of Arcadia Street and Forest Road, 1.6 kilometres north west of the Proposal Area.
- Georges River Council – 296 Forest Road Hurstville - new Hurstville Plaza - Landscaping works incorporating shaded public seating, pavement lighting, outdoor dining areas, a water feature, soft landscaping and an amenities unit, 250 metres north west of the Proposal Area.
- Georges River Council – Penhurst Park Sporting Hub – Stage 2 works would focus on upgrades to the field, running track, new scoreboard, passive recreation features, exercise station, public amenities, storage facilities, additional parking and a youth centre. Stage 2 is due to commence in late 2019 before proceeding to stage 3. This would be located approximately 1.3 kilometres north west from the Proposal Area.
- Georges River Council – no other major developments within 2 kilometres of the Proposal Area.

Through consultation and the implementation of mitigation measures in **Chapter 7**, cumulative impacts resulting from the Proposal and the abovementioned developments are anticipated to be negligible.

6.12.2 Mitigation measures

The following mitigation measures would apply to the Proposal:

- construction works would be coordinated with other construction activities in the area. Consultation and liaison would occur with Georges River Council, Sydney Trains, and developers, to minimise cumulative construction impacts such as traffic and noise.
- traffic associated with both construction and long-term operation of the Proposal is anticipated to have minimal impact on the surrounding road network.
- 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 nearby developments is released. Environmental management measures would be developed and implemented as appropriate.

6.13 Climate change and sustainability

6.13.1 Greenhouse gas emissions

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

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

Due to the small scale of the Proposal and the short term temporary nature of the individual construction works, it is considered that greenhouse gas emissions resulting from construction would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in **Chapter 7**.

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 change 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 excepted to occur in a 100-year ARI flood event would occur more frequently. The Proposal is not located on flood liable land or near a major water body thus it is not expected to be impacted by potential rainfall events amplified by climate change.

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

6.13.3 Sustainability

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

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

(a) Minimising impacts to the environment through design, construction and maintenance;

(b) Reinforcing inherent sustainability benefits;

(c) Driving sustainability through recognised rating tools;

(d) Maximising energy efficiency, renewables and greenhouse gas reduction;

(e) Advocating for sustainable communities; and

(f) Reporting on progress and achievements.

The contractor will (in conjunction with TfNSW) play a role in endeavouring to achieve an ISCA rating of “Excellent” (in accordance with Version 1.2 of ISCA Guidelines) for the delivery, operation and maintenance of the More Trains, More Services Program.

7 Environmental management

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

7.1 Environmental management plans

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

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

7.2 Mitigation measures

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

Table 7.1 Proposed mitigation measures

No.	Mitigation measure
	General
G1	A CEMP would be prepared by the Contractor in accordance with the relevant requirements of *Guideline for Preparation of Environmental Management Plans* (Department of Infrastructure, Planning and Natural Resources, 2004) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
G2	A project risk assessment including environmental aspects and impacts would be undertaken by the Contractor prior to the commencement of construction and documented as part of the CEMP.
G3	An Environmental Controls Map (ECM) would be developed by the Contractor in accordance with TfNSW's *Guide to Environmental Controls Map* (TfNSW, 2018b) for approval by TfNSW, prior to the commencement of construction and following any revisions made throughout construction.
G4	Prior to the commencement of construction, all contractors would be inducted on the key project environmental risks, procedures, mitigation measures and conditions of approval.
G5	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate intervals.
G6	Service relocation would be undertaken in consultation with the relevant authority. Contractors would mark existing services on the ECM to avoid direct impacts during construction.

No.	Mitigation measure
G7	Any modifications to the Proposal, if approved, would be subject to further assessment and approval by TfNSW. This assessment would need to demonstrate that any environmental impacts resulting from the modifications have been minimised.
	Traffic and site access
TT1	A construction TMP would be prepared by the construction contractor in consultation with TfNSW and provided to Georges River Council and TfNSW (former RMS). The construction TMP would be the primary tool to manage potential traffic and pedestrian impacts associated with construction. At a minimum, the construction TMP would include: • ensuring adequate signage at construction work sites • consideration of safety and accessibility for pedestrians and cyclists • ensuring adequate sight lines to allow for safe entry and exit from the site • managing impacts and changes to on and off street parking, and parking locations for construction workers • routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses • details for relocating kiss and ride, taxi ranks and rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus/taxi operators. Particular provisions would also be considered for the accessibility impaired • measures to manage traffic flows around the area affected by the Proposal, including as required regulatory and direction signposting, line marking and variable message signs and all other traffic control devices necessary for the implementation of the TMP.
TT2	Consultation with the relevant road authorities would be undertaken during preparation of the construction TMP. The performance of all project traffic arrangements would be monitored during construction.
TT3	Communication would be provided to the community and local residents to inform them of changes to parking, pedestrian access and/or traffic conditions including vehicle movements and anticipated effects on the local road network relating to site works.
TT4	Access for emergency vehicles would be maintained in accordance with relevant requirements. Emergency services would be advised of all planned changes to traffic arrangements prior to applying the changes.
	Urban design, landscape and visual amenity
LV1	Provide well-presented and maintained construction hoarding and/or site fencing with shade cloth (or similar material) (where necessary) to minimise visual impacts on key view points during construction and remove hoardings and/or site fencing following the completion of construction.
LV2	Cut-off or directed lighting to be used with and outside of the construction site, with lighting location and direction considered to ensure glare and light spill is minimised.
LV3	Construction personnel to keep the construction areas clean and tidy including refuse placed in appropriate receptacles.
LV4	Measures taken to ensure no tracking of dirt and mud into public roads and other public spaces.

No.	Mitigation measure
	Noise and vibration
NV1	A Construction Noise and Vibration Management Plan (CNVMP) should be developed for the Proposal and implemented prior to commencement of construction activities. The CNVMP should include all feasible and reasonable safeguards to manage the noise emissions from the site and any complaints which may occur due to construction noise.
NV2	The CNVMP should include, as a minimum, the following: • identification of nearby residences and other sensitive land uses • description of approved hours of work • description and identification of all construction activities, including work areas, equipment and duration • description of what work practices (generic and specific) would be applied to minimise noise and vibration • a complaints handling process • noise and vibration monitoring procedures, including for heritage structures • overview of community consultation required for identified high impact works.
NV3	Construction works should be planned and carried out during standard construction hours wherever possible. The standard mitigation measures contained within the *Construction Noise and Vibration Strategy* (CNVS) (TfNSW, 2019g) will be considered as mitigation measures as part of the CNVMP.
NV4	All residents and sensitive receivers impacted by noise levels from the Proposal which are expected to exceed the NML should be consulted prior to the commencement of the particular activity, with the highest consideration given to those that are predicted to be most affected as a result of the works. The information provided to the receivers would include: • programmed times and locations of construction work • the hours of proposed works • construction noise and vibration impact predictions • construction noise and vibration mitigation measures being implemented on site.
NV5	Community consultation regarding construction noise and vibration would be detailed in a Community Liaison Management Plan for the construction of the Proposal and would include a 24-hour hotline and complaints management process.
NV6	TfNSW's CNVS provides practical guidance on how to minimise, to the fullest extent practicable, the impacts on the community from airborne noise, ground-borne noise and vibration generated during the construction of TfNSW projects. This is managed through the application of all feasible and reasonable mitigation measures. Where exceedances are still expected to occur after standard mitigation measures have been applied, the CNVS recommends the implementation of additional mitigation measures. These mitigation measures are specified within the CNVS and presented in **Table 6.14.**

No.	Mitigation measure
	Indigenous heritage
IH1	If unforeseen Indigenous heritage objects are uncovered during construction, the procedures contained in TfNSW's *Unexpected Heritage Finds Guideline* (TfNSW, 2019b) would be followed, and works within the vicinity of the find would cease immediately. The Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an Aboriginal heritage consultant, DPIE and the Local Aboriginal Land Council.
IH2	If human remains are found, work would cease, the site secured and the NSW Police and DPIE notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to works recommencing at the location.
	Non-Indigenous heritage
NH1	The CEMP should include stop work procedures in accordance with TfNSW's *Unexpected Heritage Finds Guideline* (Transport for NSW, 2019b) to manage activities in the unlikely event that intact archaeological relics or deposits are encountered.
	Socio-economic
SE1	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.
SE2	Feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the project, where practicable.
SE3	A Community Liaison Management 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 practicable.
SE4	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.
SE5	The community would be kept informed of construction progress, activities and impacts in accordance with the Community Liaison Management Plan to be developed prior to construction.
	Biodiversity
BD1	Works within the corridor should be consistent with the following guidelines: • *TfNSW Vegetation Management (Protection and Removal) Guidelines (TfNSW, 2019c)* • *TfNSW Weed Management and Disposal Guideline (TfNSW, 2019d).*
BD2	Ensure activities adjacent to vegetation to be retained does not alter existing drainage and existing light conditions.
BD3	No chemicals or rubbish must be allowed to escape the construction area.
BD4	All chemicals must be correctly stored within bunding.

No.	Mitigation measure
BD5	Works must be stopped if any previously undiscovered threatened species or communities are discovered during works. An assessment of the impact and any required approvals must be obtained.
BD6	Equipment, heavy machinery and materials must be situated in designated lay-down areas.
BD7	Work vehicle access must be restricted to designated work areas and existing formed access tracks/roadways.
	Contamination, landform, geology and soils
CL1	Prior to commencement of works, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the 'Blue Book' *Managing Urban Stormwater: Soils and Construction Guidelines* (Landcom, 2004) and updated throughout construction so it remains relevant to the activities. The Erosion and Sediment Control Plan measures would be implemented prior to commencement of works and maintained throughout construction.
CL2	Erosion and sediment control measures would be established prior to site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the works are complete and areas are stabilised.
CL3	Vehicles and machinery would be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks. Construction plant, vehicles and equipment would also be refuelled offsite, or in a designated refuelling area.
CL4	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c).
CL5	Prior to or during construction, further assessment and testing would be carried out to further characterise and target materials to be disturbed/excavated.
CL6	An appropriate Unexpected Finds Protocol, considering asbestos containing materials and other potential contaminants, would be included in the CEMP. Procedures for handling asbestos containing materials, including licensed contractor involvement as required, record keeping, site personnel awareness and waste disposal to be undertaken in accordance with SafeWork NSW requirements.
CL7	All spoil to be removed from site would be tested to confirm the presence of any contamination. Any contaminated spoil would be disposed of at an appropriately licensed facility.
CL8	All spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) prior to disposal.
CL9	Any concrete washout would be established and maintained in accordance with TfNSW's *Concrete Washout Guideline* (TfNSW, 2019e) with details included in the CEMP and location marked on the ECM.
	Hydrology and water quality
WQ1	All fuels, chemicals and hazardous liquids would be stored away from drainage lines, within an impervious bunded area in accordance with Australian Standards, EPA Guidelines and TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c).

No.	Mitigation measure
WQ2	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 TfNSW's *Chemical Storage and Spill Response Guidelines* (TfNSW, 2018c) during the construction phase. All staff would be made aware of the location of the spill kits and be trained in how to use the kits in the case of a spill.
WQ3	In the event of a pollution incident, works would cease in the immediate vicinity and the Contractor would immediately notify the TfNSW Project Manager and TfNSW Environment and Planning Manager. The EPA would be notified by TfNSW if required, in accordance with Part 5.7 of the POEO Act.
WQ4	The existing drainage systems would remain operational throughout the construction phase.
WQ5	Dewatering activities, if required, would be undertaken in accordance with the Blue Book and TfNSW's *Water Discharge and Reuse Guideline* (2019f).
WQ6	Should groundwater be encountered during excavation works, groundwater would be managed in accordance with the requirements of the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) and TfNSW's *Water Discharge and Reuse Guideline* (TfNSW, 2019f).
	Air Quality
AQ1	Air quality management and monitoring for the Proposal would be undertaken in accordance with TfNSW's *Air Quality Management Guideline* (TfNSW, 2019a).
AQ2	Methods for management of emissions would be incorporated into project inductions, training and pre-start/toolbox talks.
AQ3	Plant and machinery would be regularly checked and maintained in a proper and efficient condition. Plant and machinery would be switched off when not in use, and not left idling.
AQ4	Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
AQ5	To minimise the generation of dust from construction activities, the following measures would be implemented: • apply *water (or alternate measures) to exposed surfaces (e.g. unpaved roads, stockpiles, hardstand areas and other exposed surfaces)* • *cover stockpiles when not in use* • *appropriately cover loads on trucks transporting material to and from the construction site and securely fix tailgates of road transport trucks prior to loading and immediately after unloading* • *prevent mud and* dirt being tracked onto sealed road surfaces.

No.	Mitigation measure
	Waste
WA1	The CEMP (or separate Waste Management Plan, if necessary) must address waste management and would at a minimum: • identify all potential waste streams associated with the works and outline methods of *disposal of waste that cannot be reused or recycled at appropriately licensed facilities* • *detail other onsite management practices such as keeping areas free of rubbish* • *specify controls and containment procedures for hazardous waste and asbestos waste* • *outline the* reporting regime for collating construction waste data.
WA2	The project will aim to achieve an 'Excellent' rating through the ISCA rating scheme. The application of the ISCA Rating scheme would also result in waste management targets to be developed for the Proposal and would include reuse and recycling.
	Cumulative impacts
CU1	Construction works would be coordinated with other construction activities in the area. Consultation and liaison would occur with Georges River Council, Sydney Trains, and developers, to minimise cumulative construction impacts such as traffic and noise.
CU2	Traffic associated with both construction work and long-term operation of the Proposal is anticipated to have minimal impact on the surrounding road network.
CU3	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 development is released. Environmental management measures would be developed and implemented as appropriate.
	Climate change and sustainability
CC1	The project will aim to achieve an 'Excellent' rating through the ISCA rating scheme.

8 Conclusion

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

The Proposal would contribute to the delivery of service upgrades on the T4 Illawarra and South Coast Lines, including capacity, reliability and connectivity improvements for customers.

The likely key impacts of the Proposal are as follows:

- temporary changes to vehicle movements to, from and around the Proposal Area during construction
- temporary noise and vibration impacts during construction.

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 or SIS is not required, nor is a referral to the Commonwealth Minister for the Environment.

The detailed design of the Proposal would be carried out in accordance with the relevant requirements of the *Infrastructure Sustainability Rating Scheme - Version 1.2* (ISCA, 2017) considering the principles of ESD.

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

References

AGIC, 2011, *Guidelines for Climate Change Adaptation,* Australian Green Infrastructure Council (now Infrastructure Sustainability Council of Australia), Sydney

Australian Bureau of Statistics, 2018, *2016 Census QuickStats – Hurstville,* NSW, Available from - https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC11964?opendocument

Bureau of Metereology, 2019, *Australian Groundwater Explorer,* Available from - http://www.bom.gov.au/water/groundwater/explorer/map.shtml

CSIRO Land and Water, 2014, *Australian Soil Resource Information System,* NSW Available from - http://www.asris.csiro.au/index.html

Department of Environment and Climate Change, 2009*, Interim Construction Noise Guideline*, Sydney

Department of Environment and Conservation, 2006, *Assessing Vibration: A Technical Guideline*, Sydney

Department of Environment, Climate Change and Water, 2011*, NSW Road Noise Policy*, Sydney

Department of Infrastructure, Planning and Natural Resources, 2004, *Guideline for Preparation of Environmental Management Plans*, Sydney

Department of Planning and Environment, 2014, *A Plan for Growing Sydney*, Sydney

Department of the Environment and Energy, 2018, *2016/2017 data within Hurstville – All Substances from All Sources,* Available from: http://www.npi.gov.au/npidata/action/load/summary-result/criteria/substance-name/All/lga/188/destination/ALL/source-type/ALL/subthreshold-data/Yes/year/2018

Department of the Environment and Heritage, 2006, *Climate Change Impacts and Risk Management; A Guide for Business and Government,* Australian Greenhouse Office, Canberra

EPA, 2014, *Waste Classification Guidelines*, Sydney

EPA, 2017, *Noise Policy for Industry,* Sydney

Infrastructure NSW (2018), *Building Momentum -State Infrastructure Strategy 2018-2038,* Sydney

Landcom, 2004, *Managing Urban Stormwater: Soils and Construction, Volume - 4th Edition*, Sydney

Ministry of Transport, 2008, *Guidelines for the Development of Public Transport Interchange Facilities*, Sydney

NSW Government, 2015, *State Priorities – NSW: Making It Happen*, Sydney

NSW Government, 2016, *NSW Rail Footbridges Heritage Conservation Strategy*, NSW Government Architect's Office, 2016

NSW Heritage Office & Department of Urban Affairs and Planning, (1996, revised 2002) *NSW Heritage Manual*, Sydney

NSW Heritage Office, 1998, *How to Prepare Archival Records of Heritage Item*, Sydney

NSW Heritage Office, 2001, *Assessing Significance for Historical Archaeological Sites and 'Relics',* Department of Planning, Sydney

NSW Heritage Office, 2002, *Conservation Management Documents – Guidelines on Conservation Management Plans and Other Management Documents*, Sydney

NSW Heritage Office, 2005, *Interpreting Heritage Places and Items Guidelines*, Sydney

NSW Office of Environment and Heritage, 2019, *eSPADE v2.0 – Blacktown Soil Landscapes,* Available from - https://www.environment.nsw.gov.au/Salis5app/resources/spade/reports/9130bt.pdf

NSW Office of Environment and Heritage, 2019, *eSPADE v2.0*, NSW, Available from https://www.environment.nsw.gov.au/eSpade2Webapp

NSW Office of Environment and Heritage, 2019, *Search for NSW heritage*, NSW Available from - https://www.environment.nsw.gov.au/heritageapp/heritagesearch.aspx#land

NSW Transport RailCorp, 2018, *Section 170 Heritage and Conservation Register*, NSW

OEH, 2010, *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW South Wales,* Sydney

OEH, 2011, *Guidelines for Consultants Reporting on Contaminated Sites*, Sydney

OEH, 2016*, NSW Guide to Surveying Threatened Plants*

RailCorp, 2010. *Engineering Standard: Stations and Buildings – Station Design Standard Requirements: ESB 003 – Station Functional Spaces*

Roads and Maritime, 2013*, Roads and Maritime Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment,* Sydney

Sydney Trains, 2015, *Movable Heritage Management Strategy 2015-2017*, Sydney Trains, Sydney

Sydney Trains, 2016, *Moveable Heritage Disposal Policy*, Sydney Trains, Sydney

TfNSW, 2013a, *Greenhouse Gas Inventory Guide for Construction Projects*, Sydney

TfNSW, 2015, *Environment and Sustainability Policy*, Sydney

TfNSW, 2018a, *Future Transport 2056*, TfNSW, Sydney

TfNSW, 2018b, *Guide to Environmental Controls Map*, Sydney

TfNSW, 2018c, *Chemical Storage and Spill Response Guidelines,* Sydney

TfNSW, 2019a, *Air Quality Management Guideline,* Sydney

TfNSW, 2019b, *Unexpected Heritage Finds Guideline*, Sydney

TfNSW, 2019c, *Vegetation Management (Protection and Removal) Guideline*, Sydney

TfNSW, 2019d, *Weed Management and Disposal Guide*, Sydney

TfNSW, 2019e, *Concrete Washout Guideline*, Sydney

TfNSW, 2019f, *Water Discharge and Reuse Guideline*, Sydney

TfNSW, 2019g, *Construction Noise and Vibration Strategy*, Sydney

Appendix A Consideration of Matters of National Environmental Significance

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

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 no National Heritage places in the vicinity of the Proposal.	Nil
Any impact on a wetland of international importance? There are no wetlands of international importance in the vicinity of the Proposal.	Nil
Any impact on a listed threatened species or communities? It is unlikely that the development of the Proposal would significantly affect any threatened species or communities.	Nil
Any impacts on listed migratory species? It is unlikely that the development of the Proposal would significantly affect any 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 rail infrastructure and does not involve development of coal seam gas or coal mining, nor is it likely to impact on water resources.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The Proposal would not be undertaken on or near 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 resulting from increased traffic, noise and reduced visual amenity during construction. Mitigation measures, as outlined in Section 7.2, would be implemented to manage and minimise adverse impacts.	Minor
(b) Any transformation of a locality?	Nil
(c) Any environmental impact on the ecosystem of the locality? Environmental impacts are anticipated to be minor and temporary in nature and would not be expected to result in adverse impacts to the ecosystem of the locality.	Nil
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? The Proposal would result in a short-term reduction in environmental quality during construction, primarily in relation to noise, traffic and visual amenity. As this reduction would be short in duration, impacts are anticipated to be minor.	Minor
(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? As the assessment has determined that there is negligible risk of encountering archaeological items and no listed heritage items would be impacted by the Proposal, impacts of cultural or historical significance are considered unlikely.	Nil
(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 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 endanger any species of animal, plant or other form of life 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 result in the degradation of the quality of the environment.	Nil

Factor	Impacts
(j) Any risk to the safety of the environment? The Proposal could result in pollution or safety risks to the environment during construction. Provided the recommended management and mitigation measures are implemented, this risk is considered unlikely.	Minor
(k) Any reduction in the range of beneficial uses of the environment? The Proposal would not result in any reduction in the range of beneficial uses of the environment.	Nil
(l) Any pollution of the environment? The Proposal could result in pollution of the environment, however provided the recommended management and mitigation measures are implemented, this risk is expected to be minor.	Minor
(m) Any environmental problems associated with the disposal of waste? The Proposal in unlikely to result in environmental problems associated with the disposal of waste. All spoil and waste would be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste* (EPA, 2014) prior to disposal. All waste would be managed and disposed of in accordance with a site-specific WMP prepared as part of the CEMP. Measures would be implemented to ensure waste is reduced, reused or recycled where practicable.	Minor
(n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The Proposal is unlikely to increase demands on resources (natural or otherwise) that are, or are likely to become, in short supply.	Nil
(o) Any cumulative environmental effect with other existing or likely future activities? Cumulative environmental effects with other activities are discussed in Section 6.12. Based on the surrounding existing and proposed developments, cumulative effects are expected to be minor and be primarily related to traffic, noise and visual amenity.	Minor
(p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? As the Proposal is not located within a coastal area, it would not impact on coastal processes and/or coastal hazards, including those under projected climate change conditions.	Nil