NSW GOVERNMENT

Transport Access Program

Thornleigh Station Upgrade

Review of Environmental Factors

Artist's impression of the proposed Thornleigh Station Upgrade, subject to detailed design

February 2021

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1 Biodiversity Impact Assessment – EMM Consulting

2 Noise and Vibration Impact Assessment – EMM Consulting

3 Visual Impact Assessment – Spackman Mossop Michaels (SMM)

Document control	
Status:	Final
Date of issue:	February 2021
Version:	4.0
Document author:	Brendan Rice, Lia Zwolinski
Document reviewers:	Aaron Bowden, Louisa Rebec
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Abbreviations

Term	Meaning
AHIMS	Aboriginal Heritage Information Management System
ALR Act	*Aboriginal Land Rights Act 1983* (NSW)
AS	Australian Standard
ASA	Asset Standards Authority (refer to Definitions)
ASS	Acid Sulfate Soils
BCA	Building Code of Australia
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BS	British Standard
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CCTV	Closed Circuit Television
CHL	Commonwealth Heritage List under the EPBC Act
CLM Act	*Contaminated Land Management Act 1997* (NSW)
CM Act	*Coastal Management Act 2016* (NSW)
CNVMP	Construction Noise and Vibration Management Plan
CNVS	Construction Noise and Vibration Strategy
CTMP	Construction Traffic Management Plan
D&C	Design & Construct
DBH	Diameter Breast Height
DDA	*Disability Discrimination Act 1992* (Cwlth)
DoEE	Commonwealth Department of the Environment and Energy
DP&E	NSW Department of Planning and Environment
DSAPT	*Disability Standards for Accessible Public Transport (2002)*
ECM	Environmental Controls Map
EMS	Environmental Management System
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPL	Environment Protection Licence
ESD	Ecologically Sustainable Development (refer to Definitions)
FM Act	*Fisheries Management Act 1994* (NSW)
GHL	Glenhaven Hydrogeological Landscape
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	*Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009).

Term	Meaning
ILUA	Indigenous Land Use Agreements
Infrastructure SEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
IS rating	Infrastructure Sustainability rating under ISCA rating tool (v 2.0)
ISCA	Infrastructure Sustainability Council of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
NATA	National Association of Testing Authorities
NES	National Environmental Significance (refers to matters of National Environmental Significance under the EPBC Act)
NHL	National Heritage List under the EPBC Act
NML	Noise Management Level
NNTT	National Native Title Tribunal
NorBE	Neutral or Beneficial Effect
NPfL	Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
NT	National Trust of Australia
OEH	Former NSW Office of the Environment and Heritage
PDP	Public Domain Plan
PoEO Act	*Protection of the Environment Operations Act 1997* (NSW)
RNE	Register of the National Estate
REF	Review of Environmental Factors (this document)
Roads Act	*Roads Act 1993* (NSW)
Roads and Maritime	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SREP	Sydney Regional Environmental Plan
SW Act	*Sydney Water Act 1994* (NSW)
TPZ	Tree Protection Zone
UDP	Urban Design Plan
WARR Act	*Waste Avoidance and Resource Recovery Act 2001* (NSW)
WM Act	*Water Management Act 2000* (NSW)

Definitions

Term	Meaning
Concept design	The concept design is the preliminary design presented in this REF, which would be refined by the Contractor (should the Proposal proceed) to a design suitable for construction (subject to Transport for NSW acceptance).
Contractor	The entity appointed by Transport for NSW to undertake the construction of the Proposal. The Contractor is therefore responsible for all work on the proposal, both design and construction.
Determining authority	A Minister or public authority on whose behalf an activity is to be carried out or public authority whose approval is required to carry out an activity (under Division 5.1 of the EP&A Act).
Disability Standards for Accessible Public Transport	The Commonwealth Disability Standards for Accessible Public Transport 2002 (as amended), authorised under the Commonwealth *Disability Discrimination Act 1992* (DDA).
Ecologically Sustainable Development	As defined by clause 7(4) of Schedule 2 to the EP&A Regulation.
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.
Out of hours work	Defined as work undertaken *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.
The Proposal	The construction and operation of the Normanhurst Station Access Program work.
Rail possession / shutdown	Shutdown is the term used by railway building/maintenance contractors to indicate that they have taken possession of the track (usually a section of track) for a specified period, where no trains operate for a specified time. This is necessary to ensure the safety of workers and rail users.
Sensitive receivers	Land uses which are sensitive to potential noise, air and visual impacts, such as residential dwellings, schools and hospitals.
Vegetation Offset Guide	The Transport for NSW guide that applies where there is vegetation clearing proposed, and where the impact of the proposed clearing is not deemed 'significant' for the purposes of section 5.5 of the EP&A Act. The Guide provides for planting of a minimum of eight trees for each large tree with a diameter at breast height (DBH) of more than 60 cm, four trees where the DBH is 15-60 cm, or two trees where DBH is less than 15 cm.

Executive summary

Overview

The NSW Government is improving accessibility at Thornleigh Station. This proposal is being delivered as part of the Transport Access Program, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure.

As part of this program, the Thornleigh Station Upgrade (the Proposal) would aim to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams, and customers with luggage.

The Proposal would provide:

- three new lifts to provide access to the station platforms
- weather protection screens and canopies at lift entries
- improved access to waiting rooms
- a new family accessible toilet and unisex ambulant toilet
- upgrades to the bus stop and seating on The Esplanade
- new accessible pedestrian pathways throughout the station and entrances
- new accessible parking spaces in the commuter car park
- a new accessible parking space and kiss and ride bay on Railway Parade
- upgraded bicycle hoops
- new canopy coverage over Boarding Assistance Zone (BAZ)
- improvements to CCTV, lighting and wayfinding signage
- electrical upgrades to accommodate new infrastructure

Transport for NSW is the government agency responsible for the delivery of major transport infrastructure proposals in NSW and is the proponent for the Proposal.

This Review of Environmental Factors (REF) has been prepared to assess all matters affecting or likely to affect the environmental by reason of 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 mid 2021 and take up to two years to complete. A detailed description of the Proposal is provided in Chapter 3 of this REF, while an overview of the Proposal is shown in Figure 1.

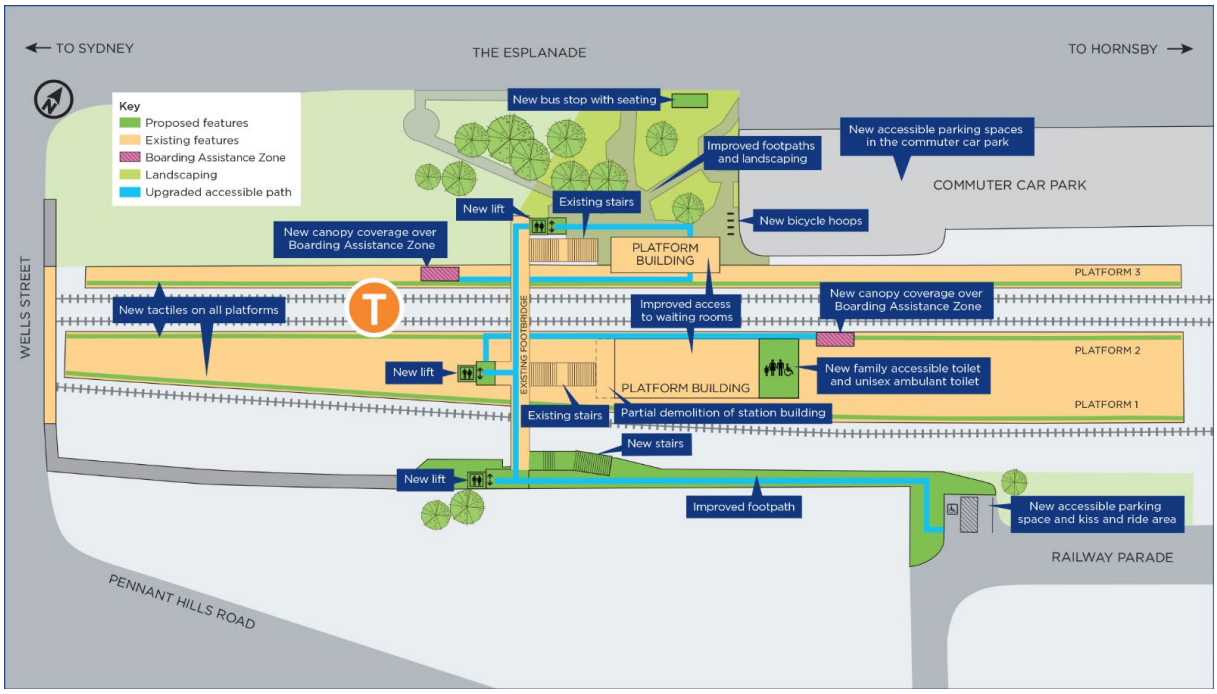


Figure 1 Key features of the Proposal (subject to detailed design)

Need for the Proposal

The Proposal would ensure that Thornleigh Station would meet legislative requirements under the *Disability Discrimination Act 1992* (DDA) and the *Disability Standards for Accessible Public Transport 2002* (DSAPT).

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

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

Transport for NSW undertook early engagement on the concept design to help understand what is important to customers and the community.

Feedback on the concept design was invited over two weeks from Monday 7 December to Monday 21 December 2020. A mix of notification to local residents, advertisement (on Facebook) and station posters helped to promote the engagement period and encourage the community to provide their feedback. Face to face engagement in the form of information sessions were not conducted due to social distancing requirements associated with COVID-19.

A total of 52 comments were received during the engagement period. Key themes of the community feedback included:

- support for the station to become more accessible
- consideration of improved pedestrian access from Pennant Hills Road to Railway Parade and the station platforms
- consideration for improved pedestrian access from the commuter car park to the station including a lift within the car park and covered walkways

- consideration for more commuter parking spaces
- consideration for the location of proposed accessible parking spaces
- consideration for minimal tree removal in the area
- consideration for improved station amenities including more canopies on platforms, better station announcement systems, toilet on Platform 3, Opal card readers on all platforms, more seating and community information display stands.

Further community consultation activities for the Proposal would be undertaken during the public display period of this REF and the public invited to submit feedback to help Transport for NSW 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 5.3 of this REF.

During the public display period a Proposal 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 the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP), consultation is required with local councils and/or public authorities in certain circumstances, including where council managed infrastructure is affected. Consultation has been undertaken with Hornsby Shire Council during the development of the concept design and other key stakeholders during the development of design options and the preferred option. Consultation with stakeholders would continue through the detailed design and construction of the Proposal.

Feedback can be provided by:

- emailing proposals@transport.nsw.gov.au
- completing the feedback form at www.transport.nsw.gov.au/thornleigh
- writing to Transport Access Program – Thornleigh
  Associate Director Environmental Impact Assessment
  Transport for NSW
  PO Box K659
  Haymarket NSW 1240

Transport for NSW 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 2 shows the planning approval and consultation process for the Proposal.

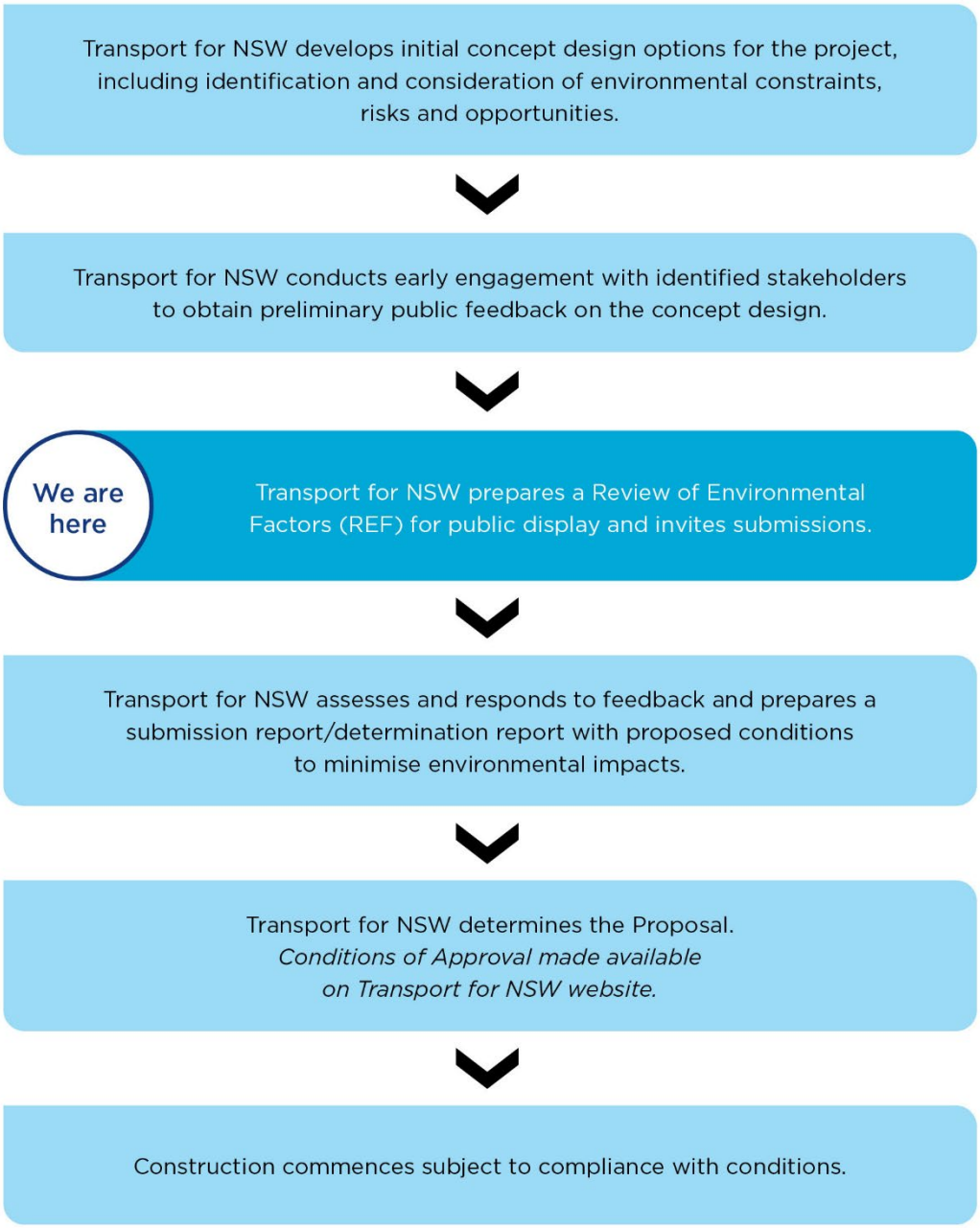


Figure 2 Planning approval and consultation process for the Proposal

Environmental impact assessment

This REF identifies the potential environmental benefits and impacts of the Proposal and outlines the mitigation measures to reduce the identified impacts.

The Proposal would provide the following benefits:

- a station that is accessible to people with a disability, limited mobility and parents with prams
- buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers.

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

- temporary construction noise which exceed NMLs at a number of residential and commercial assessment locations
- vibration risks to commercial façades immediately adjacent to the station entrance on Railway Parade and Pennant Hills Road
- temporary impacts on local traffic flow associated with construction of the existing interchange zone at the bus stop on The Esplanade
- loss of five parking spaces on Railway Parade
- impacts to the visual environment from the introduction of new elements, such as the lifts and station access point upgrades
- temporary disruptions to station facilities and amenities during construction, including potential weekend closures of the Station
- temporary changes to vehicular, bus, bicycle and pedestrian access to, through and movements around the station
- potential temporary loss of time-restricted parking on nearby streets
- potential sediment mobilisation, dust generation and erosion risk during construction.
- removal and trimming of some vegetation around the station to facilitate the work
- impacts to the visual environment from the introduction of new elements, such as the lifts and upgrades to the station entrances.

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 to 5.7 of the EP&A Act and clause 228 of the EP&A Regulation, to ensure that Transport for NSW takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the Proposal.

The detailed design of the Proposal would also be designed in accordance with the Transport for NSW Infrastructure Sustainable Council of Australia (ISCA) Infrastructure Sustainable (IS) Rating Tool (v 1.2) taking into account the principles of ecologically sustainable development (ESD).

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

In considering the overall potential impacts outlined in this REF, the Proposal is unlikely to significantly affect the environment including critical habitat or threatened species, populations, ecological communities or their habitats.

Figure 3 Photomontage of the Proposal (subject to detailed design)

1. Introduction

Transport for NSW is responsible for strategy, planning, policy, procurement, regulation, funding allocation and other non-service delivery functions for all modes of transport in NSW including road, rail, ferry, light rail, point to point, cycling and walking. Transport for NSW is the proponent for the Thornleigh Station Upgrade (the 'Proposal').

1.1. Overview of the Proposal

1.1.1. Need for the Proposal

The Proposal is to provide accessibility upgrades to Thornleigh Station to achieve Disability Standards for Accessible Public Transport (DSAPT) compliance. The current layout of Thornleigh Station does not achieve compliance.

The upgrade to Thornleigh Station is being delivered as part of the Transport Access Program, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure across the state. As part of the program, the upgrade to Thornleigh Station aims to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams and customers with luggage.

More than $2 billion has been invested in the Transport Access Program since 2011 to fund accessibility upgrades at stations, create better transport interchanges and build commuter car parks.

Almost 90 per cent of transport customer journeys begin from locations now accessible to people with a disability, those with limited mobility and parents with prams. Other upgrades have been undertaken to support an integrated transport network and seamless transfers for all customers.

1.1.2. Key features

The key features of the Proposal are summarised as follows:

- three new lifts to provide access to the station platforms
- weather protection screens and canopies at lift entries
- improved access to waiting rooms
- a new family accessible toilet and unisex ambulant toilet
- upgrades to the bus stop and seating on The Esplanade
- new accessible pedestrian pathways throughout the station and entrances
- new accessible parking spaces in the commuter car park
- a new accessible parking space and kiss and ride bay on Railway Parade
- upgraded bicycle hoops
- new canopy coverage over Boarding Assistance Zone
- improvements to CCTV, lighting and wayfinding signage
- electrical upgrades to accommodate new infrastructure

Subject to planning approval, construction is expected to commence in mid-2021 and take up to two years to complete.

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

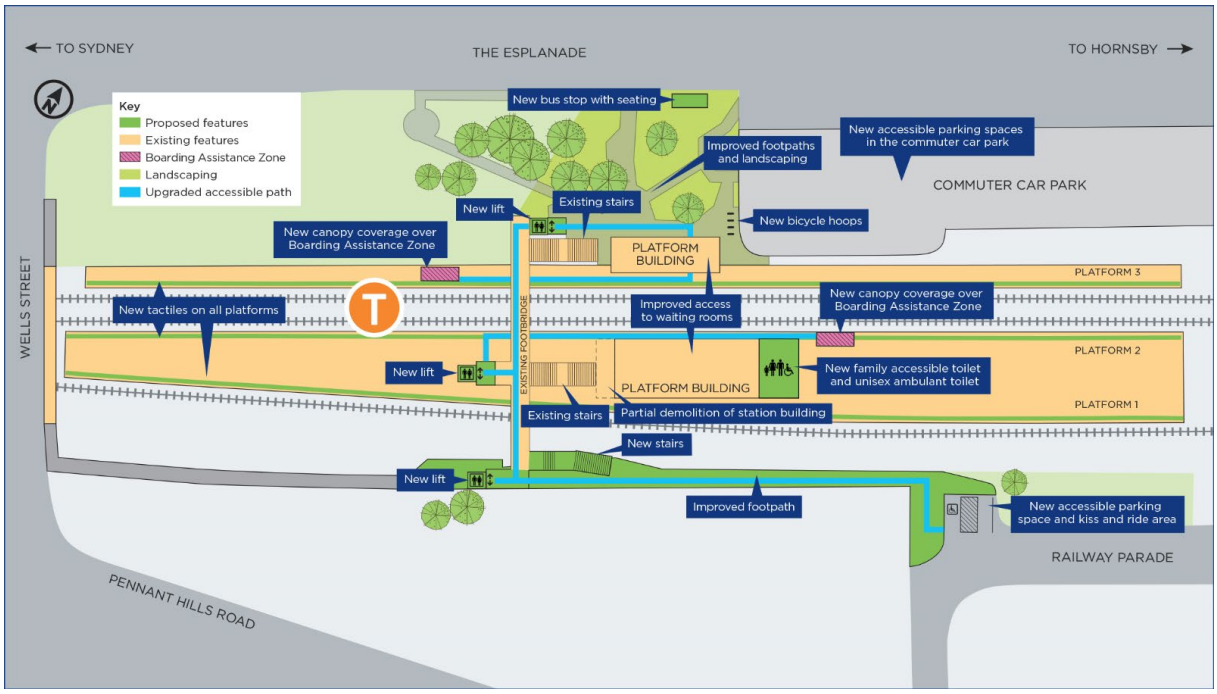


Figure 4 Key features of the Proposal (subject to detailed design)

1.2. Location of the Proposal

The Proposal is located in the suburb of Thornleigh, NSW, approximately 20 kilometres north-west of the Sydney Central Business District (CBD) within the Hornsby local government area (LGA). Thornleigh Station was first opened in 1886.

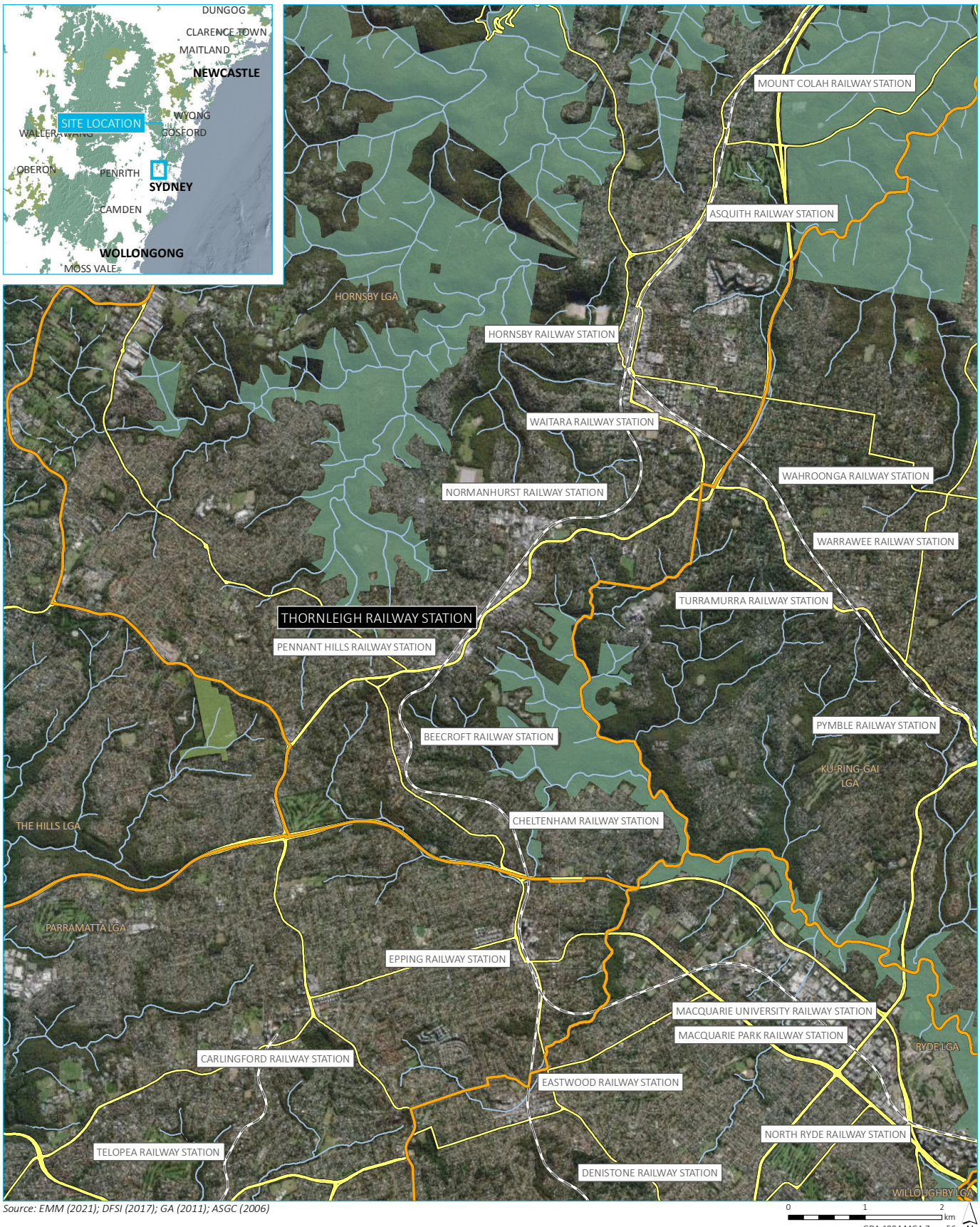
Thornleigh Station consists of a side and single island platform, which is serviced by the T9 Northern Line of the Sydney Trains network. It is bound by The Esplanade to the north and the Wells Street walkway to the South. A footbridge crosses the rail corridor to provide pedestrian access to the single island platform.

The proposal includes upgrades to Thornleigh Station on land owned by NSW Transport Asset Holding Entity and managed by Sydney Trains within the station precinct. Some work is also proposed along the station entrances on The Esplanade and Railway Parade which are managed by Hornby Shire Council.

The local and regional context of Thornleigh Station is shown in Figure 7 Regional context and Figure 8.

Figure 5 Thornleigh Station entrance – The Esplanade

Figure 6 Thornleigh Station entrance – looking North to Wells Street



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006)

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GDA 1994 MGA Zone 56

N

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KEY

- Thornleigh station
- Train station
- Rail line
- Major road
- Named watercourse
- Watercourse/drainage line
- Local government area

INSET KEY

- Main road
- NPWS reserve
- State forest

Regional context

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 7

EMM
creating opportunities

Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006)

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GDA 1994 MGA Zone 56

N

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KEY

- Thornleigh station
- Train station
- Rail line
- Major road
- Local road
- Named watercourse
- Watercourse/drainage line
- Local government area
- NPWS reserve

Local context

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 8

EMM
creating opportunities

1.3. Existing infrastructure and land uses

1.3.1. Thornleigh Station

Thornleigh Station is bound by The Esplanade to the north (The Esplanade turns into Yarrara Road immediately west of the station), the northern rail line to the east, the Wells Street walkway and commercial businesses to the south which address Pennant Hills Road and the northern rail line and Wells Street bridge to the west.

Thornleigh Station is accessed by a footbridge between The Esplanade and the Wells Street walkway which connects Railway Parade, Wells Street and Thornleigh Station. This footbridge provides a link to the single island platform (Platforms 1 and 2) and the side platform on The Esplanade (Platform 3). Platform 2 provides city bound services to Central Station via Epping and Strathfield and Platform 3 provides services to Hornsby. Platform 1 services a relief track which is used to allow trains to overtake and is rarely used for passengers getting on and off the train.

The island platform contains the main station building which contains two bathrooms, a staff room and staff toilet, storeroom, communication room and a customer waiting room. Bench seating is provided around the building and along the platform. A second building is located on the western side of the island platform and is used as a relay room.

The third station building is located on Platform 3 and includes a waiting room which faces the track and a kiosk which faces The Esplanade.

A bus stop is located at The Esplanade station entrance. A multi-level commuter car park is also located at The Esplanade station entrance. The carpark provides all day parking for commuters and is accessed via a set of traffic lights on The Esplanade, opposite Eddy Street. Timed parking spaces are available on both sides of The Esplanade.

The southern entrance to the station is via a walkway which connects to both Wells Street and Railway Parade. The end of this walkway is about 30 metres from the Pennant Hills Road pedestrian overpass which provides pedestrian access to the southern side of Thornleigh. Timed parking spaces are available on Railway Parade near the footbridge however these are used by customers of the nearby businesses.

Thornleigh Station is not listed on RailCorp's Section 170 Heritage and Conservation Register nor considered to hold local significance under Schedule 5 of the Hornsby Local Environmental Plan 2013 (Hornsby LEP).

Construction access to the station would be via the existing station entry on The Esplanade for work on the Platform 3 (northern) side of the tracks, while the work on the southern side would be accessed via commercial carparks on Pennant Hills Road, and via Railway Parade. Further discussions would be held with existing landholders to gain temporary access to the carpark for site access. Figure 8 shows the local context of the site of the Proposal.

1.3.2. Surrounding area

The suburb of Thornleigh is bounded to the north by Waitara Creek and to the south by the Lane Cove National Park. Thornleigh borders the suburbs of Normanhurst, Hornsby, Wahroonga, Westleigh and Pennant Hills. Of these surrounding suburbs Westleigh is the only suburb without a train station.

The suburb contains primarily low-density residential dwellings and includes pockets of medium and high-density development, areas of commercial land uses, industrial land uses and recreational areas. A range of businesses are located next to the southern station entry, including Giant Bicycle Store, Domino's Pizza and other various commercial businesses and restaurants.

Pennant Hills Preschool is located approximately 400 metres south-west of Thornleigh Station on Yarrara Road. Multiple churches are located within proximity to Thornleigh Station on Yarrara Road and Pennant Hills Road.

Under the Hornsby Local Environmental Plan 2013 (Hornsby LEP), Thornleigh Station is zoned SP2 Rail Infrastructure Facility. Land north of Thornleigh station including The Esplanade is zoned R2 Low Density Residential. The shopping precinct south of Thornleigh Station is zoned B2 Local Centre, which extends northwards along Pennant Hills Road to land zoned B6 Enterprise Corridor.

The topography of the suburb varies greatly with many established residential areas built around bushland settings and into the hills.

1.4. Purpose of this Review of Environmental Factors

This REF has been prepared by EMM Consulting Pty Ltd (EMM) on behalf of Transport for NSW to assess the potential impacts of the Thornleigh Station Upgrade. For the purposes of this work, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of this REF is to describe the Proposal, to assess the likely impacts of the Proposal having regard to the provisions of section 5.5 of the EP&A Act, and to identify mitigation measures to reduce the likely impacts of the Proposal. This REF has been prepared in accordance with clause 228 of the *Environment Planning and Assessment Regulation 2000* (EP&A Regulation).

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 (NES) or Commonwealth land, and the need to make a referral to the Commonwealth Department of the Environment and Energy for any necessary approvals under the EPBC Act. Refer to Chapter 4 for more information on statutory considerations.

2. Need for the Proposal

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

2.1. Strategic justification

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

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

Table 2.1 provides an overview of NSW Government policies and strategies relevant to the Proposal.

Table 2.1 Key NSW Government policies and strategies applicable to the Proposal

Policy/strategy	Overview	How the Proposal aligns
Future Transport Strategy 2056 (Transport for NSW, 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. *Future Transport 2056* identifies 12 customer outcomes to guide transport investment in Greater Sydney. These outcomes include transport providing convenient access, supporting attractive places and providing 30-minute access for customers to their nearest centre by public transport.	The Proposal would deliver on the customer focus and accessible services outcomes. The Proposal would support accessible services (outcome 5) by improving connectivity and accessibility to public transport and creating travel options for more customers. Additionally, by encouraging public transport use the Proposal would support the sustainability objective (outcome 6) by improving affordability for customers and reducing the number of cars on the roads, resulting in less emissions.
Disability Inclusion Action Plan (2018-2022) (Transport for NSW, 2017a)	The *Disability Inclusion Action Plan 2018-2022* was developed by Transport for NSW in consultation with the Accessible Transport Advisory Committee, which consists of representatives from peak disability and ageing organisations within NSW. The Disability Plan identifies the challenges, the achievements to date, the considerable undertaking that is required to finish the job and provides a solid and practical foundation for future progress over the next five years.	DSAPT compliant kiss and ride bays and accessible parking spaces would be provided as part of the Proposal. The pathways connecting the commuter car parking to nearby bus stops and Thornleigh Station would ensure an accessible path of travel between modes of public and private transport.

Policy/strategy	Overview	How the Proposal aligns
A Metropolis of Three Cities – Greater Sydney Region Plan (Greater Sydney Commission, 2018a)	The *Greater Sydney Region Plan* is the NSW Government's 40-year land use plan for Sydney. It establishes a vision for a metropolis of three cities – the Eastern Harbour City, Central River City and Western Parkland City. Thornleigh is located in the Eastern Harbour City, as part of the North District. The plan is designed to complement the *Future Transport 2056* plan and State Infrastructure Strategy by aligning land use, transport and infrastructure planning. It aims to reshape Greater Sydney as three unique but connected cities. The Plan provides information on the strategies to meet the needs of a growing and changing population.	The Proposal particularly supports Direction 6 of the Three Cities Plan, which is to create 'a well-connected city' by ensuring services and infrastructure meet communities' changing needs.
North District Plan (Greater Sydney Commission, 2018b)	The North District Plan applies to the Ryde, Hornsby, Hunters Hill, Ku-ring-gai, Lane Cove, Mosman, North Sydney, Northern Beaches and Willoughby LGAs. The plan describes the planning priorities and actions for to improve liveability and achieve a productive and sustainable future for the District. The plan is developed to support the objectives of the Greater Sydney Plan.	Thornleigh is identified as a local centre under the Northern District Plan, which requires infrastructure to support future development. Of the 24 planning priorities identified in the District Plan, the Proposal particularly supports the following: • Planning Priority N1: Planning for a city supported by infrastructure • Planning Priority N3: Providing services and social infrastructure to meet people's changing needs • Planning Priority N9: Delivering integrated land use and transport planning and a 30-minute city.
Building Momentum – State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018)	The *State Infrastructure Strategy 2018-2038* makes recommendations for each of NSW's key infrastructure sectors including transport. The strategy sets out the Government's priorities for the next 20 years, and combined with the Future Transport Strategy 2056, the Greater Sydney Region Plan and the Regional Development Framework, brings together infrastructure investment and land-use planning for our cities and regions.	The Proposal supports investment in rail infrastructure and aligns with the need to continue to provide urban public transport to support Sydney's increasing population. The Proposal is also consistent with overall aims and objectives of the *Future Transport Strategy 2056* to improve transport infrastructure across NSW.

Policy/strategy	Overview	How the Proposal aligns
NSW Premier's Priorities and State Priorities *https://www.nsw.gov.au/improving-nsw/premiers-priorities/*	In June 2019, 14 new Premier's Priorities were announced that would allow the Government to measure and deliver in areas where NSW can do better. The key policy priorities, include the following: • a strong economy • highest quality education • well-connected communities with quality local environments • putting customer at the centre of everything we do • breaking the cycle of disadvantage	The Proposal would assist in meeting the key priority to develop well connected communities with quality local environments by investing in transport infrastructure and improving connectivity to public transport and encouraging greater use of public transport.
Hornsby Local Strategic Planning Statement (LSPS) *(Hornsby Shire Council, 2020)*	The Hornsby LSPS sets up the 30-year vision for land use in the Hornsby area and outlines how this change would be managed. The key priorities emphasised in the Hornsby LSPS relevant to the Proposal include: • P3 - responding to climate change with an active strategy to reduce carbon emissions and manage energy, waste and water efficiently • P5 - revitalising the Hornsby Town Centre • P8 - supporting sustainable economic growth based on the Shire's built and natural assets, infrastructure and locational advantages • P10 - promoting the '30-minute City' by improving the walkability, connectivity and accessibility of our centres and neighbourhoods. Within the Hornsby LSPS, Thornleigh is identified as a local centre.	The Proposal is aligned with the Hornsby LSPS as it responds to key priorities and implementation actions by: • P3 - increasing the accessibility of Thornleigh Station and the railway services to all persons as a mode of travel, which is a lower producer of carbon emissions than private motor vehicles • P5 - investing in rail infrastructure at Thornleigh Station and providing active transport facilities to promote the use of active transport to and from Hornsby town centre • P8 - investing in rail infrastructure accessible to all as a sustainable method of travel as opposed to private vehicle usage • P10 – improving bicycle parking and DA compliant disability parking spaces at the station.
Community Strategic Plan 2018-2028 (Hornsby Shire Council, 2018)	The Hornsby Shire Community Strategic Plan 2018-2028 sets out the broad strategic direction of the Council. This includes specific community outcomes identified through community consultation and organised under four key themes of liveable, sustainable, productive and collaborative.	Under the plan, a main community outcome beneath the theme of 'liveable' is 'infrastructure meets the needs of the population'. As noted in the plan, a key indicator to meet this community outcome is providing adequate aged care and disability services and facilities. The proposal meets this community outcome as it would directly provide adequate facilities for elderly and disabled community members.

Policy/strategy	Overview	How the Proposal aligns
Disability Inclusion Action Plan 2017-2020 (Hornsby Shire Council, 2017)	The Hornsby Shire Disability Inclusion Action Plan 2017-2020 provides outcomes and strategies, which were identified through community consultation, to ensure social, cultural and economic facilities within the LGA are fully accessible to community members of all ages and abilities.	The Proposal meets 'Outcome 2 (Liveable Communities)' of the action plan, specifically: • provide and maintain accessible paths, kerb ramps, crossings and toilets to support independent travel across the Shire • improve the accessibility of buildings and public spaces across the Shire.

2.2. Objectives of the Transport Access Program

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

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

2.3. Objectives of the Proposal

The specific objectives of the upgrade to Thornleigh Station are to:

- provide a station that is accessible to people with a disability, limited mobility, parents/carers with prams and customers with luggage
- improve customer experience, by providing better interchange and customer access facilities
- integrate the Proposal with the surrounding area
- improve customer safety
- improve wayfinding in and around the station precinct
- maximise the amenity of the public domain
- improve pedestrian connectivity between the commuter car park, station, and the retail centre along Pennant Hills Road
- provide an efficient and functional solution which enhances and contributes to local amenity and prosperity.

2.4. Alternative options considered

To develop a preferred option for the accessibility upgrade at Thornleigh Station that addressed the proposal objectives and identified issues, a multi-criteria assessment process was undertaken. Two upgrade options were developed and considered by key stakeholders to address access issues and deficiencies.

A number of general improvements were applicable to both options that would enhance the customer experience and support the interchange between transport modes, which included:

- provision of equitable access to the station platforms
- upgrading of accessible parking spaces
- upgrading the footpaths
- provision of kiss and ride bays
- upgrading the existing stairs to the platform with compliant features.

A summary of the differences between the proposed options and a 'do-nothing' option are summarised as follows.

2.4.1. The 'do nothing' option

Under a 'do nothing' option, existing access to the platforms would remain the same and there would be no changes to the way the station currently operates.

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

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

2.4.2. Option 1 – Lifts to existing footbridge (preferred option)

Option 1 is the preferred option and generally reflects the Proposal.

Key features of the preferred option are further detailed in Section 3.0 and include:

- construction and installation of three new passenger lifts including lift landings with canopies for weather protection at the waiting areas
- modifications to the existing footbridge and stairs to accommodate new lift landings, including upgrades to tactiles, nosings, stair treads and handrails as required on Platforms 1/2 and Platform 3
- new stairs to enable lift construction on the pathway from Railway Parade, including demolition of existing stairs
- new interchange zone on Railway Parade including walkway regrading, kerb widening, an accessible car parking space and an accessible kiss and ride
- construction of an accessible kiss and ride bay and one accessible car space on Railway Parade
- improved footpaths for pedestrian access from both Railway Parade and The Esplanade entrances
- a proposed interchange zone including new bus stop and shelter at The Esplanade, seating and bike hoops
- provision of accessible parking spaces in the commuter car park
- Boarding Assistance Zone canopy on Platform 3

- lowering of the floors of the waiting areas in the Platforms 1/2, and Platform 3 station buildings
- provision of a Family Accessible Toilet and unisex Ambulant Toilet on Platform 1/2
- ancillary work including services relocation and/or adjustments, including lighting and communications systems (e.g. CCTV), stormwater drainage, line marking, retaining walls, and overhead wiring
- electrical upgrades
- landscaping and revegetation throughout the site area.

2.4.3. Option 2 – New Footbridge

The key features and differences of Option 2 from the preferred option included:

- demolition of the existing footbridge and stairs
- construction of a new footbridge and lifts to the north of the existing footbridge and platform buildings, connecting the existing commuter carpark and Railway Parade
- work would involve acquisition of the café site and demolition of the building, and alterations to the existing car park for the construction of the stairs and footbridge
- new stairs constructed at Railway Parade, Platform 1/2 and Platform 3.

2.5. Justification for the preferred option

The design options were assessed in a multi-criteria analysis that included consideration of factors such as customer experience, accessibility, safety, engineering constraints, modal integration and cost to select a preferred option. A series of design workshops were also undertaken in 2019 and 2020.

Option 2 would result in changes to the commuter car park and Railway Parade resulting in additional traffic impacts and would not necessarily achieve any additional accessibility benefits over the preferred option. Existing electrical infrastructure also makes this option difficult to achieve as high voltage powerlines would need to be relocated which would delay works from being undertaken. Land acquisition may also have been required which would result in significant impact to the landowners.

Option 1 was selected as the preferred option as it would:

- achieve DSAPT compliance
- have no major impact on existing services
- result in minimal impact on existing vegetation
- provide direct access from the existing bus stops and pedestrian crossing to the station entrance.

As part of the stakeholder workshops, the preferred concept design underwent a process of further refinement in consultation with Transport for NSW and the Contractor and it was subsequently determined that Option 1 would be further developed as the preferred concept design.

3. Proposal description

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 a concept design and is subject to detailed design.

3.1. The Proposal

As described in Section 1.1, the Proposal would improve accessibility of Thornleigh Station in line with the requirements of the *Commonwealth Disability Discrimination Act* 1992 (DDA) and the *Disability Standards for Accessible Public Transport 2002* (DSAPT).

The Proposal would include the following key elements:

- three new lifts to provide access to the station platforms
- weather protection screens and canopies at lift entries
- improved access to waiting rooms
- a new family accessible toilet and unisex ambulant toilet
- upgrades to the bus stop and seating on The Esplanade
- new accessible pedestrian pathways throughout the station and entrances
- new accessible parking spaces in the commuter car park
- a new accessible parking space and kiss and ride on Railway Parade
- upgraded bicycle hoops
- new canopy coverage over Boarding Assistance Zone
- improvements to CCTV, lighting and wayfinding signage
- electrical upgrades to accommodate new infrastructure
- new stairs to enable lift construction on the walkway from Railway Parade, including demolition of existing stairs

Figure 4 shows the general layout of key elements for the Proposal. A photomontage is shown in Figure 3.

3.2. Scope of work

Details of the proposed work to take place at the station to improve accessibility are provided below.

3.2.1. Station upgrades

The proposed work to take place at Thornleigh Station includes:

- construction and installation of three new passenger lifts and lift landings connecting to the existing footbridge. This work would include:
    - installation of a lift at the station entrance on The Esplanade
    - installation of a lift at the station entrance on Railway Parade walkway
    - installation of a lift on Platform 1/2
    - alterations to the existing footbridge to allow connection of the footbridge to the new lifts, including removal of southern stairs, areas of the balustrade and small parts of the footbridges concrete footing
    - installation of protection screens to the lifts and stairs

    - lift landings with canopies for weather protection at the waiting areas.
- minor work to existing stairs on Platform 1/2 to meet compliance including adjustments to handrails, nosings and TGSIs
- alterations to the existing station building on Platforms 1/2 including demolition of the existing toilets to improve circulation space at the bottom of the existing stairs
- refurbishment of existing platform features for the construction of a new Family Accessible Toilet (FAT) and unisex Ambulant Toilet on Platforms 1/2 at the northern end of the existing platform building under the existing canopy. These works include:
    - demolition of existing toilets
    - refurbish the roof above the existing toilets
    - bathroom fixtures including toilets, sinks and a changing table in the FAT
    - internal fit-out features such as walls and tiles,
    - internal plumbing
    - removal of existing doors within the station building
- lowering of the floor of the waiting area on Platforms 1/2, and Platform 3 for level access
- Boarding Assistance Zone upgrade including line marking, and new canopy on Platform 3.

3.2.2. Railway Parade

The proposed work to take place on Railway Parade includes:

- new stairs to enable lift construction on the path from Railway Parade. This involves widening of the existing path to the new stairs and lift at this location, demolition of the existing stairs and construction of stairs facing east, to join the pathway towards Railway Parade. These works include repaving and installation of additional lighting and CCTV cameras along the pedestrian walkway to increase public safety and security;
- removal of five timed parking spaces and construction of one kiss and ride bay and one accessible parking space on Railway Parade in the existing parking zone
- associated walkway and footpath work for pedestrian access to the Railway Parade entrance. This work includes widening of the existing path to create a small forecourt localised to the existing stairs to the footbridge, modifications to fencing, installation of new lighting and regrading work.

3.2.3. The Esplanade

The proposed work to take place on The Esplanade includes:

- new line markings to create two accessible car spaces in the existing commuter car park at The Esplanade
- regrading work for pedestrian access to The Esplanade entrance. This work includes widening of the existing path, landscaping, upgrades to fencing, installation of new lighting and regrading work
- provision of an interchange zone including a new bus stop and associated canopy on The Esplanade, seating and bike hoops.

3.2.4. Ancillary work

Proposed ancillary work includes:

- new fencing, where required and maintenance on existing fencing where impacted by construction activities
- ancillary work including services relocation and/or adjustments, including lighting, CCTV, stormwater drainage and retaining walls
- customer information and communication systems including wayfinding modifications, public address system modifications and hearing induction loops
- installation of wayfinding signage and other statutory/regulatory signage
- localised regrading and coping edge TGSIs as required.

As a result of the installation of lifts and subsequent changes to the station, station power supply upgrade/relocation work may be required. This work could include the relocation of high voltage (HV) aerial wiring. Additional upgrade work may also be required, pending detailed design.

3.2.5. Materials and finishes

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

Consideration has also been given to lifecycle impacts. The lifecycle impacts of a material are calculated by looking at the environmental impacts of materials from the point of extraction, through to transportation, use, operation and end of life.

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:

- lift shafts – grey concrete
- lift doors – stainless steel
- lift glass – clear
- lift canopy – consistent with the existing station entrance canopy
- lift ventilation – consistent with the existing ventilation
- lift roof – consistent with the existing station roofing
- platform – asphalt
- footpath – concrete.

The design would be submitted to Transport for NSW's Design Review Panel for comment before being accepted by Transport for NSW. An Urban and Landscaping Design Plan (ULDP) and an artist impression (if required) would also be prepared by the Contractor, prior to finalisation of detailed design for endorsement by Transport for NSW.

Design development

Engineering and environmental constraints

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

Vegetation: some vegetation in the rail corridor would need to be removed or trimmed as part of the construction work. Work has been designed to minimise footprint and retain vegetation to the greatest extent possible. This also provides limitations for construction access, and therefore access via existing disturbed areas is maximised.

- **Existing structures:** existing structures have been retained and utilised in design. The existing structures would be refitted to provide canopies, new amenities and renewed toilet facilities. Existing structures such as footbridge, stairwells and platforms would be retained with minor amendments made to improve accessibility.
- **Sydney Trains' requirements:** modifications for existing structures and new structures within the rail corridor must be designed and constructed with consideration of train impact loads, structural clearances to the track, and safe working provisions.
- **Construction access**: traffic control for the cranage and delivery of materials/equipment particularly for Railway Parade where access to the walkway and laydown area is provided. High traffic movement on Pennant Hills Road and The Esplanade is considered an engineering constraint during construction.
- **Public access**: maintaining access to the station and footbridge during construction and when the station is operational (i.e. not during a rail shutdown).
- **Future patronage:** the design for the work has taken into consideration a forecasted increase in patronage of 15% by 2036 and changing travel patterns.
- **Services and utilities:** there are a number of services and facilities which cause constructability constraints. This includes overhead powerlines on The Esplanade, the Wells Street walkway and Pennant Hills Road and any existing underground services and utilities. The location of such is required to be confirmed prior to construction of the Proposal.

3.2.6. Design standards

The Proposal would be designed having regard to the following design standards:

- *Disability Standards for Accessible Public Transport 2002* (issued under the Commonwealth *Disability Discrimination Act 1992*)
- National Construction Code/Building Code of Australia
- relevant Australian Standards
- Asset Standards Authority standards
- Sydney Trains standards
- Infrastructure Sustainability Council of Australia (ISCA) *Infrastructure Sustainability Rating Scheme* (V1.2)
- *Guidelines for the Development of Public Transport Interchange Facilities* (Ministry of Transport, 2008).
- *Crime Prevention Through Environmental Design* (CPTED) principles
- other Transport for NSW policies and guidelines
- relevant Hornsby Shire Council standards, where applicable.

3.2.7. Sustainability in design

Transport for NSW is committed to minimising the impact on the natural environment and supports ISCA and the Infrastructure Sustainability (IS) rating tool. The IS rating tool was developed and is administered by ISCA. It is an independently verified and nationally recognised rating system for evaluating sustainability across design, construction and operation of infrastructure.

The upgrade of Thornleigh Station is one of a number of proposals within the Transport Access Program that is using version 1.2 of the IS rating tool and targeting an 'Excellent' rating. The rating scheme provides an independent and consistent methodology for the application and evaluation of sustainability outcomes in infrastructure proposals. The development of the concept design for the Proposal has been undertaken in accordance with the proposal targets identified in the program wide TAP 3 Sustainability Strategy. The Sustainability Strategy sets targets across the following key issues:

- climate change adaptation and resilience
- renewable energy
- waste
- materials
- supply chain management
- community connection
- social procurement and workforce.

Key design elements and strategies developed during scoping design would be used to further develop the design and construction.

3.3. Construction activities

3.3.1. Work methodology

Subject to approval, construction is expected to commence in mid 2021 and take up to two years to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Contractor in consultation with Transport for NSW.

The proposed construction activities for 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 Contractor's preferred methodology, program and sequencing of work.

Table 3.1 Indicative construction staging for key activities

Stage	Activities
Site establishment and enabling work	• secure site perimeter boundary with temporary fencing • undertake survey to identify site boundary and mark out existing services • establish site office, amenities and plant/material laydown areas • establish temporary facilities as required (e.g. temporary pedestrian access to station, construction lights, etc.), including temporary power supply to the site compound and traffic control measures • establish other environmental controls, such as erosion and sediment controls and TPZs

Stage	Activities
Relocation of services and preparation of substructure	• identification of services for protection or relocation • relocation or protection of services (as required)
Civil and interchange Works	• concrete removal and earthworks for regrading modifications to the Esplanade and Railway Parade station entrances to create forecourt area • mark out and remove/trim vegetation as required • regrading/resurfacing at station entrances including kerb widening, to improve accessibility • upgrades to bus stop on The Esplanade to comply with DDA/DSAPT requirements • upgrades to accessible car parking in commuter car park on The Esplanade • provision of accessible car parking and accessible kiss and ride spaces at Railway Parade station entrance, including modifications to road kerb • upgrades to walkway at Railway Parade station entrance including retaining wall modifications • installation of wayfinding signage and other statutory/regulatory signage • construction of pedestrian access paths • fencing adjustments (as required) • line marking, installation of lighting and landscaping work • installation of new bike hoops (where required)
Stairs and footbridge	• excavation of topsoil and subsoil for footing construction to geotechnical and civil specifications • demolition of existing balustrades and other existing footbridge components to accommodate lifts (where required) • stair modifications including new nosings, handrails and TGSIs to meet DSAPT standards • regrading/resurfacing stair landing surfaces at footbridge, where applicable • demolition of existing stairs and provision of new stairs with footbridge connection, at Railway Parade entrance
Lift work	• widen and regrade/resurface the existing footpath (kerb modifications, line marking, etc.) to accommodate new lifts • excavation for lift pits and foundations including piling work • waterproofing (as required), installation of reinforcement, formwork and concrete to form the lift pits • installation of lift shaft and lift structures inclusive of cantilevered upper landing, glazing, louvres, roof, motor, air conditioning, and other auxiliary equipment • install canopies, anti-throw and weather protection screens (where applicable) at lift landings to match existing • installation of lift cars • architectural fit-out around lift shaft including new awning over the lift.

Stage	Activities
Station building modifications and power supply works	• general demolition works near footbridge stairs on the island platform as required • adjustments to the doorways and access provisions including the requirement to lower the floors to provide level access and the provision of remote access control • modifications to station waiting rooms to provide level access from platform • construct two new bathrooms at the eastern end of the building including installing new fittings, fixtures, finishes and services connections, to provide a new family accessible toilet and new unisex ambulant toilet • modifications to electrical HV power cables and UGOH connections to poles where required • new pad mount transformer, and upgrades to the station distribution board and circuit breakers, including new fire rated enclosure and submain connections to new power supply • upgrades to general station infrastructure including wayfinding signage, PA, AFILS, and CCTV
Platform modification work	• platform regrading/resurfacing work as required for accessible path and combined services route • installation of new tactiles • modifications to platform furniture, including boarding ramps and lighting where required • installation of new canopy sheltered area at boarding assistance zone on Platform 3 • modifications to drinking fountain and payphone (as required) • install new Opal Card reader near lift on island platform (if required)
Testing and commissioning	• various activities to test and commission power supply and lighting
Decommissioning of temporary facilities and site demobilisation	• decommissioning of temporary construction facilities and site demobilisation • removal of footpath/pedestrian management and traffic controls • removal of environmental control measures • site clean-up and tidying work

3.3.2. Plant and equipment

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

- stump grinder
- concrete pump
- chainsaw
- jack hammer
- trucks (various types and sizes e.g. skip trucks and suction trucks)
- bobcat
- excavator
- demolition saw
- hydraulic/rock saw
- power tools (e.g. drill, hammer drill, saw, nail gun, grinder torque and impact wrenches)
- lighting tower
- coring machine
- water cart
- forklift
- hi rail plant (e.g. rail mounted elevated work platform, flatbed, crane etc.)

- mulcher
- drilling and piling rigs
- mobile crane(s)
- standard carpentry and hand tools
- concrete truck
- asphalt paving machine
- rattle gun
- concrete helicopter (smoothing out concrete)
- vibratory roller
- elevated work platform
- grinder
- hand-held soil compactor or Wacker rammer

3.3.3. Working hours

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

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

Certain work may need to occur outside recommended standard hours and would include night work and work during routine rail shutdowns, which are scheduled closures that would occur regardless of the Proposal when part of the rail network is temporarily closed for maintenance and trains are not operating.

Out of hours work is required in some cases to minimise disruptions to customers, pedestrians, motorists and nearby sensitive receivers; and to ensure the safety of railway workers and operational assets. It is estimated that six rail shutdowns would be required to facilitate:

- services relocation
- site establishment and demolition work
- installation of construction hoardings
- electrical, power supply and communication upgrades
- excavation, piling, forming and concrete pouring of lift pits/foundations
- installation of lift structures
- modifications to the footbridge and stairs
- Installation of sheltered area at Platform 3 boarding assistance zone
- platform regrading/resurfacing and platform excavations for services
- modifications to the station buildings.

Out of hours work may also be scheduled outside rail shutdown periods. Approval from Transport for NSW would be required for any out of hours work and the affected community would be notified as outlined in the Transport for NSW *Construction Noise and Vibration Strategy* (Transport for NSW, 2019h) (refer to Section 6.3 for further details).

3.3.4. Earthworks

Excavations and earthworks would generally be required for the following:

- piling and excavation for lift shaft foundations and support structures
- demolition and reconstruction of existing stairs
- platform work including lowering of the floor of the waiting areas on Platforms 1/2, and Platform 3 and provision of a Family Accessible Toilet and unisex Ambulant Toilet on Platform 1/2

- regrading and tie-in work in relation to existing roads and pathways, in order to achieve the compliant grades for DSAPT compliance
- other minor civil work, including drainage/stormwater work, and trenching activities for underground service adjustments and relocations.

It is estimated that approximately 150-250 cubic metres of excavated material would be generated from the above activities. Excavated material would be reused onsite where possible or disposed of in accordance with relevant legislative requirements.

3.3.5. Source and quantity of materials

The source and quantity of materials would be determined during the detailed design phase of the Proposal and would consider the requirements of the ISCA Infrastructure Sustainability (IS) Rating Scheme (v1.2) Transport for NSW. Materials would be sourced from local suppliers where practicable. Reuse of existing and recycled materials would be undertaken where practicable.

3.3.6. Traffic access and vehicle movements

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

- additional light and heavy vehicles on the localised road network, due to the construction workforce and delivery of materials and equipment, which may impact local traffic and access
- temporary changes in pedestrian, cyclist and vehicle access and movements around Thornleigh Station during work
- temporary changes to localised road access and traffic for the construction of accessible car spaces on Railway Parade and interchange zone at the existing bus stop on The Esplanade
- potentially higher level of platform congestion arising from restricted access to certain areas of the platforms such as near the lift construction/platform extension (due to construction work or storage areas) in peak hours
- potential for construction staff to temporarily park on adjacent/nearby streets during the construction period

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

3.3.7. Ancillary facilities

A temporary construction compound would be required to accommodate a site office, amenities, laydown and storage area for materials. Construction laydown areas are proposed for the following locations (refer Figure 9):

- a previously cleared area located in the rail corridor, to the east of Platform 1/2
- a cleared area within the rail corridor between Thornleigh and Normanhurst stations, which would be utilised as a shared laydown/storage area for Thornleigh and Normanhurst station upgrade proposals.

An additional laydown/storage area in the rail corridor east of Pennant Hills Station would be utilised for laydown/storage area, should an additional area be required. Impacts associated with utilising these areas have been considered in the environmental impact assessment including requirements for rehabilitation. Access for hi-rail plant will be via existing access gates in the vicinity of the station. Temporary or permanent concrete hi-rail pads will be utilised by the contractor specific to the works.

3.3.8. Public utility adjustments

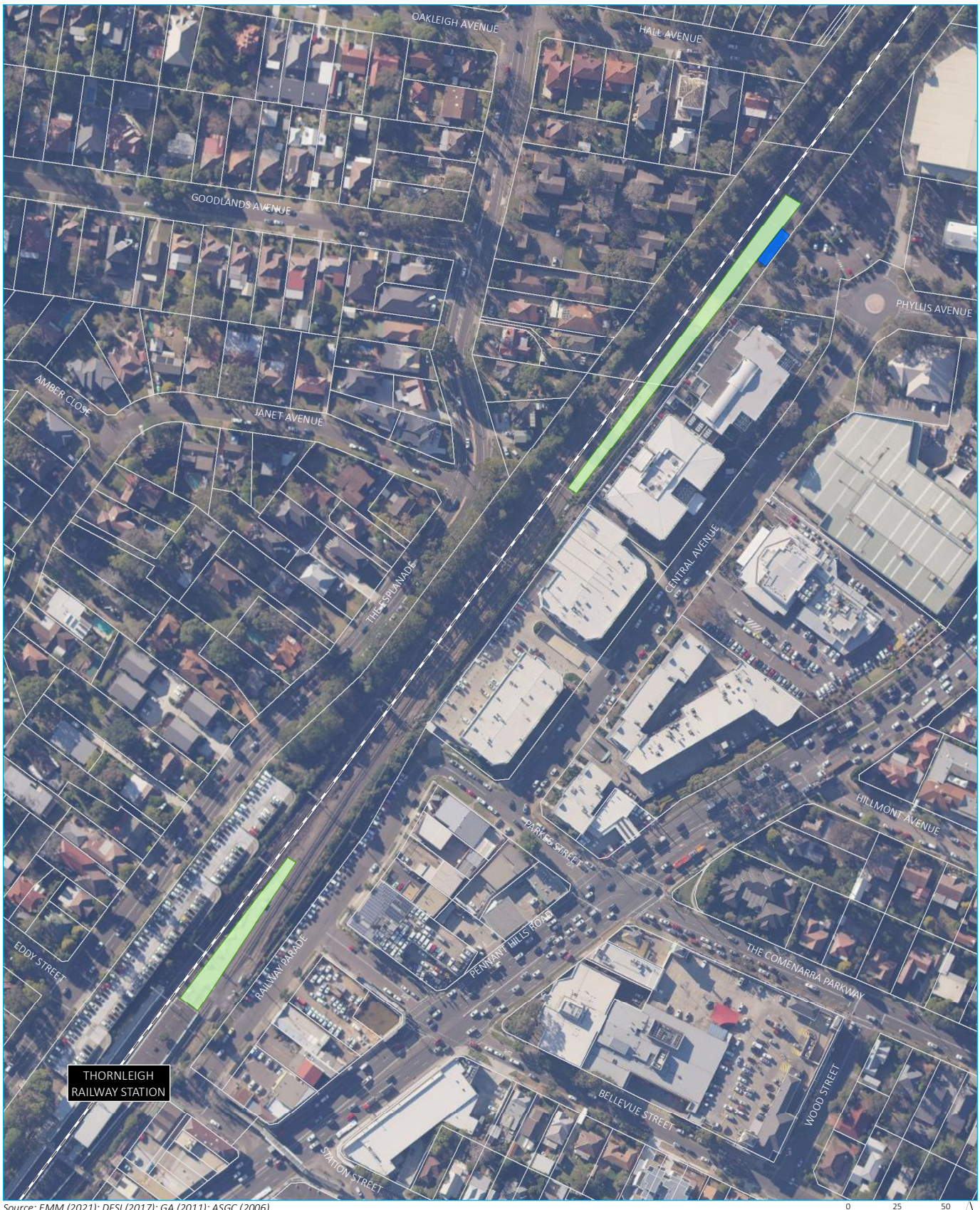
The Proposal has been designed to avoid relocation of services where feasible, however further investigation may be required. Some services may require protection or relocation, but such relocation is unlikely to occur outside of the footprint of the work assessed in this REF. In the event that work would be required outside of this footprint, further assessment would be undertaken. The appropriate utility providers would be consulted during the detailed design phase.

3.4. Property acquisition

Transport for NSW does not propose to acquire any property as part of the Proposal.

3.5. Operation and maintenance

The future operation and maintenance of the new station is subject to further discussion with Sydney Trains, Transport for NSW and Hornsby Shire Council. Structures constructed under this Proposal would be maintained by Sydney Trains. Adjacent garden/landscape areas would continue to be maintained by Hornsby Shire Council.



Source: EMM (2021); DFSI (2017); GA (2011); ASGC (2006)

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KEY

– – Rail line

Cadastral boundary

Indicative site compound and laydown areas

Site office

Material laydown

Proposed site compound and laydown areas

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 9

EMM
creating opportunities

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 *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places – defined in the EPBC Act as matters of National Environmental Significance (NES). The EPBC Act requires the assessment of whether the Proposal is likely to significantly impact on matters of NES or Commonwealth land. These matters are considered in full in Appendix A.

As the Proposal would not or is not likely to have a significant impact on any matters of NES or on Commonwealth land, a referral to the Commonwealth Minister for the Environment is not required.

4.1.2. Other Commonwealth legislation

Other Commonwealth legislation potentially impacted by the proposal are discussed in Table 4.1 below.

Table 4.1 Other Commonwealth legislation applicable to the Proposal

Applicable legislation	Considerations
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	There is an obligation on a person who discovers anything which he or she has reasonable grounds to suspect are Aboriginal remains to report that discovery to the Minister, giving particulars of the remains and their location. The Proposal does not include any previously identified sites of Aboriginal remains; however, considerations for unexpected finds further detailed in mitigation measures and applies to this Act.
Disability Discrimination Act 1992 (DDA Act)	This Act aims to eliminate as far as possible, discrimination against persons on the ground of disability in areas including access to premises and the provision of facilities, services and land. The Proposal would be designed having regard to the requirements of this Act. The key objective of the Proposal is to improve the accessibility of Thornleigh Station which is consistent with the objectives of this Act.

4.2. NSW legislation and regulations

4.2.1. Transport Administration Act 1988

The *Transport Administration Act 1988* establishes Transport for NSW as a public authority who is to exercise its functions in a manner that promotes certain common objectives, including to promote the delivery of transport services in an environmentally sustainable manner.

This REF has been prepared having regard to, among other things, the specific objectives of Transport for NSW under the *Transport Administration Act 1988*, including:

2A Objects of Act

…

a. *to provide an efficient and accountable framework for the governance of the delivery of transport services,*

b. *to promote the integration of the transport system,*

c. *to enable effective planning and delivery of transport infrastructure and services,*

d. *to facilitate the mobilisation and prioritisation of key resources across the transport sector,*

e. *to co-ordinate the activities of those engaged in the delivery of transport services,*

f. *to maintain independent regulatory arrangements for securing the safety of transport services.*

2B Common objectives and service delivery priorities of public transport agencies

…

1. ***Environmental sustainability***

To promote the delivery of transport services in an environmentally sustainable manner.

2. ***Social benefits***

To contribute to the delivery of social benefits for customers, including greater inclusiveness, accessibility and quality of life.

4.2.2. 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 specifies the environmental impact assessment requirements for activities undertaken by public authorities, such as Transport for NSW, which do not require development consent under Part 4 of the Act.

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

Clause 228 of the EP&A Regulation prescribes the minimum factors which must be considered when determining if an activity assessed under Division 5.1 of the EP&A Act has or is likely to have a significant effect 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.

4.2.3. Other NSW legislation and regulations

Table 4.2 provides a list of other relevant legislation applicable to the Proposal.

Table 4.2 Other NSW legislation applicable to the Proposal

Applicable legislation	Considerations
Biodiversity Conservation Act 2016 (BC Act)	Under Section 2.4 of the BC Act it is an offence to damage the habitat of a threatened species or threatened ecological community, as listed in Schedule 1 and 2 of the Act. Part 7, Division 2 of the BC Act specifies the requirements for biodiversity assessment. Generally, development that is likely to significantly affect threatened species is required to be accompanied by a biodiversity development assessment report (BDAR) and concurrence from the Office of Environment and Heritage. However, under section 7.8(4), an Environmental Impact Statement is not required for an activity for which a Species Impact Statement has been prepared in accordance with the BC Act if, other than the impact on protected species, the activity does not and is not likely to significantly affect the environment. Further discussion on potential biodiversity impacts is provided in Section 6.1.
Biosecurity Act 2015	Clause 22 requires 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 noxious weeds in the Hornsby LGA are identified (refer to Section 6.1).
Contaminated Land Management Act 1997 (CLM Act)	Section 60 of the CLM Act imposes a duty on landowners to notify the NSW Department of Planning, Industry and Environment (formerly Office of Environment and Heritage (OEH)), and potentially investigate and remediate land if contamination is above EPA guideline levels. The site has not been declared under the CLM Act as being significantly contaminated (refer Section 6.8).
Crown Land Management Act 2016	The Proposal does not involve work on Crown land.
Disability Discrimination Act 1992 (DDA Act) (Cwlth)	The Proposal would be designed having regard to the requirements of this Act.
Heritage Act 1977 (Heritage Act)	The following apply: • 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. No listed heritage items are located on or near the Proposal. No approvals or permits under sections 57, 60, 139 or 140 are required.
National Parks and Wildlife Act 1974 (NPW Act)	Sections 86, 87 and 90 of the NPW Act require consent from NSW Department of Planning, Industry and Environment (formerly OEH) for the destruction or damage of Indigenous objects. The Proposal is unlikely to disturb any Indigenous objects (refer Section 6.5). However, if unexpected archaeological items or items of Indigenous heritage significance are discovered during the construction of the Proposal, all work would cease and appropriate advice sought.

Applicable legislation	Considerations
Protection of the Environment Operations Act 1997 (PoEO Act)	The Proposal does not involve a 'scheduled activity' under Schedule 1 of the PoEO Act. Accordingly, an Environment Protection Licence (EPL) is not required for the Proposal. However, in accordance with Part 5.7 of the PoEO Act, Transport for NSW would notify the EPA of any pollution incidents that occur onsite. This would be managed in the CEMP to be prepared and implemented by the Contractor.
Roads Act 1993 (Roads Act)	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 approval for work on unclassified roads. The Contractor would obtain any necessary approvals or licences from the relevant roads authority (Council or Transport for NSW) under the Roads Act for kerb realignment, changes to linemarking and signage and establishment of the kiss and ride bays proposed.
Sydney Water Act 1994 (SW Act)	The Proposal would not involve discharge of wastewater to the sewer.
Waste Avoidance and Resource Recovery Act 2001 (WARR Act)	Transport for NSW 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 (WM Act)	The Proposal would not involve any water use (from a natural source, e.g. aquifer, river – only from the network), water management work, drainage or flood work, controlled activities or aquifer interference.

4.2.4. State Environmental Planning Policies

State Environmental Planning Policy (Infrastructure) 2007

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

Division 15, clause 79 of the Infrastructure SEPP allows for certain types of development to be carried out 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). Specifically, clause 79(1) of the Infrastructure SEPP states that:

> *'Development for the purpose of a railway or rail infrastructure facilities may be carried out by or on behalf of a public authority without consent on any land.'*

Clause 78 defines 'rail infrastructure facilities' as including elements such as:

> *(a) 'railway tracks, associated track structures, cuttings, drainage systems, fences, tunnels, ventilation shafts, emergency accessways, bridges, embankments, level crossings and roads, pedestrian and cycleway facilities.'*
>
> *(d) 'railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms'*
>
> *(e) public amenities for commuters*
>
> *(f) associated public transport facilities for railway stations…'*

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

The Infrastructure SEPP prevails over all other environmental planning instruments except where there is an inconsistency with State Environmental Planning Policy (State Significant Precincts) 2005 or certain provisions of State Environmental Planning Policy (Coastal Management) 2018. The Proposal does not require consideration under these SEPPs and therefore do not require further consideration as part of this REF.

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

For the purposes of determining whether the carrying out of the Proposal on land in the Sydney drinking water catchment would have a neutral or beneficial effect on water quality, the consent authority must, if the Proposal is one to which the Neutral or Beneficial Effect (NorBE) Tool applies, undertake an assessment using that Tool.

An assessment has been undertaken which concludes that the Proposal is not within the Sydney Drinking Water Catchment.

State Environmental Planning Policy No 19—Bushland in Urban Areas

A public authority shall not disturb bushland for a purpose referred to in clause 6(2) unless it has first had regard to the aims of this Policy.

The Infrastructure SEPP overrules the requirements of SEPP No.19, however, a detailed Biodiversity assessment has been completed and is included as Technical Paper 1.

State Environmental Planning Policy No 44—Koala Habitat Protection

State Environmental Planning Policy No. 44 – Koala Habitat Protection (SEPP 44) aims to encourage the proper conservation and management of natural vegetation areas that provide habitat for koalas to ensure that permanent, free living areas are maintained over their present range. The policy applies to a number of LGAs across NSW, including the Hornsby LGA. As the Proposal is to be assessed under Division 5.1 of the EP&A Act, SEPP 44 does not formally apply, however the provisions of SEPP 44 have still been considered in the preparation of this REF and a detailed Biodiversity assessment has been completed and is included as Technical Paper 1.

State Environmental Planning Policy 55 – Remediation of Land

State Environmental Planning Policy No.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 not expected that any large-scale remediation (Category 1) work would be required as part of the Proposal. The proposed land use would not differ to the existing use and is unlikely to be affected by any potential contaminants that exist within the rail corridor.

Impacts of contaminated lands and potential remediation are in Section 6.

State Environmental Planning Policy (Coastal Management) 2018

The Coastal Management SEPP replaces SEPP 14 (Coastal Wetlands), SEPP 26 (Littoral Rainforests) and SEPP 71 (Coastal Protection), and seeks to balance social, economic and environmental interests by promoting a coordinated approach to coastal management.

The Coastal Management SEPP gives effect to the objectives of the *Coastal Management Act 2016* from a land use planning perspective, by specifying how development proposals are to be assessed if they fall within the coastal zone. It defines the four coastal management areas in the Act through detailed mapping and specifies assessment criteria that are tailored for each coastal management area. Councils and other consent authorities must apply these criteria when assessing proposals for development that fall within one or more of the mapped areas.

The Proposal is not within any coastal zones identified in the Coastal Management SEPP.

Sydney Regional Environmental Plan No 20—Hawkesbury-Nepean River (No 2—1997)

The aim of this plan is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context. The Proposal is located within the Hornsby LGA, which is managed by the SREP.

The work for the Proposal would not alter existing watercourses or change flows in anyway and would therefore not impact upon the Hawkesbury-Nepean River system.

Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

The *Sydney (Sydney Harbour Catchment) Regional Environmental Plan* (Sydney REP) aims to protect, enhance and maintain the catchment, foreshores, waterways and islands of Sydney Harbour and identifies different waterway zonings. The Sydney REP is currently under review and would be consolidated with other environmental planning instruments into a new SEPP Environment.

The work for the Proposal would not alter existing watercourses or change flows in anyway and would therefore not impact upon the Sydney Harbour Catchment.

4.2.5. Hornsby Local Environmental Plan 2013

The Proposal is located within the Hornsby LGA. The Infrastructure SEPP prevails over all other environmental planning instruments (such as LEPs) except where there is an inconsistency with State Environmental Planning Policy (State Significant Precincts) 2005 or certain provisions of State Environmental Planning Policy (Coastal Management) 2018. During the preparation of this REF, the provisions of Hornsby LEP were considered (refer Table 4.3).

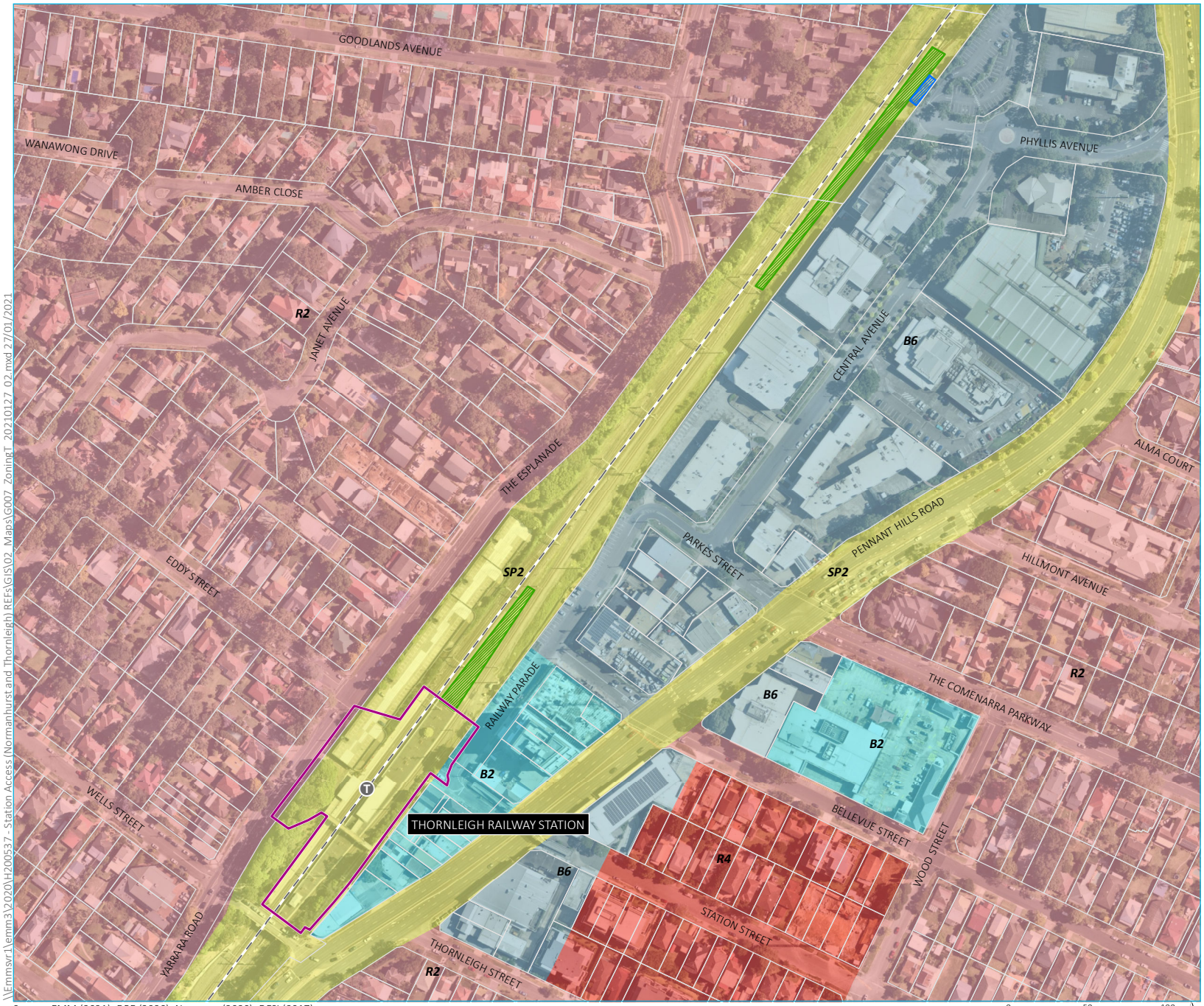
Table 4.3 Relevant provisions of the Hornsby LEP

Provision description	Relevance to the Proposal
Clause 2.3 – Zone objectives and Land Use Table	Under the Hornsby LEP, the Proposal is located in areas zoned as: • SP2 Infrastructure (Rail) for the proposed work associated with the station platform and buildings, access path work and laydown/storage areas • R2 Low Density Residential for the proposed work associated with the footpaths, bus stop and access work on The Esplanade • B2 Local Centre for the proposed disabled carparking and kiss and ride bay on Railway Parade **Zone objectives** The objectives of the applicable land zones are as follows: SP2 Infrastructure (Rail) – to provide for infrastructure and related uses and to prevent development that is not compatible with or that may detract from the provision of infrastructure

Provision description	Relevance to the Proposal

	• R2 Low Density Residential –
	  ○ to provide for the housing needs of the community within a low-density residential environment.
	  ○ to enable other land uses that provide facilities or services to meet the day to day needs of residents.
	• B2 Local centre –
	  ○ to provide a range of retail, business, entertainment and community uses that serve the needs of people who live in, work in and visit the local area.
	  ○ to encourage employment opportunities in accessible locations.
	  ○ to maximise public transport patronage and encourage walking and cycling.
	The Proposal is consistent with the objectives of these zones.
	Permissible development within land zones
	Development for the purposes of a rail infrastructure facility is permissible with consent under the provisions of the SP2 Infrastructure (Rail) zone, and road development is permissible with consent under the R2 Low Density Residential and B2 Local Centre zones.
	As the provisions of the Infrastructure SEPP prevail over the Hornsby LEP, development consent from Hornsby Shire Council is not required.

Clause 5.10 – Heritage Conservation	Clause 5.10 of the Hornsby LEP provides for the protection of items, places and archaeological sites which have been identified in the Hornsby LEP as having heritage significance. An item of heritage near the footprint of work, 80 The Esplanade (Item 723), is listed on the heritage schedule of the Hornsby LEP and is located directly across the road from the Proposal. A discussion of potential impacts to local heritage is provided in Section 6.6.
Clause 6.1 – Acid Sulfate Soils (ASS)	The Proposal site is not located on land that is mapped as having potential for ASS.
Clause 6.2 – Earthworks	Clause 6.2 of the Hornsby LEP aims to ensure that earthworks for which development consent is required would not have a detrimental impact on environmental functions and processes, neighbouring uses, cultural or heritage items or features of the surrounding land. By virtue of clauses 5(3) and 79 of the Infrastructure SEPP, the Proposal is permissible without development consent.
Clause 6.3 – Flood planning	The Proposal site is not located on land that is mapped as flood prone.
Clause 6.4 – Terrestrial biodiversity	The Proposal is not in the vicinity of land that is mapped as having terrestrial biodiversity, refer to Section 6.1 for further details of the biodiversity assessment completed for the Proposal.



KEY

- Main construction area
- Train station
- Rail line
- Cadastral boundary

Indicative site work areas

- Site office
- Material laydown

Land zone

- B2 - Local centre
- B6 - Enterprise corridor
- R2 - Low density residential
- R4 - High density residential
- SP2 - Infrastructure

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Source: EMM (2021); DPE (2020); Nearmap (2020); DFSI (2017)

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GDA 1994 MGA Zone 56

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Land zoning

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 10

EMM
creating opportunities

4.3. Ecologically sustainable development

Transport for NSW is committed to ensuring that its proposals 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 Transport for NSW throughout the development and assessment of the Proposal. Section 6.13 includes an assessment of the Proposal on sustainability, and Section 7.2 lists mitigation measures to ensure ESD principles are incorporated during the construction phase of the Proposal.

5. Community and stakeholder consultation

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

5.1. Stakeholder consultation during concept design

Key stakeholders for Thornleigh Station, comprising of Sydney Trains and Transport for NSW were engaged during development of the concept design plan to provide insights into the scope of work for the Proposal, and to also participate in the development and assessment of the station improvement options. Hornsby Shire Council were also engaged to discuss the plans proposed at the station.

Early community engagement was undertaken for a period of two weeks between Monday 7 December and Monday 21 December 2020 to provide the community an opportunity to have their say on the early concept designs. Transport for NSW advertised this early engagement period via:

- social media (Facebook)
- notifications distributed to the suburb of Thornleigh
- posters installed at the station
- a dedicated proposal web page with information on the proposal and an online feedback form to collect feedback from the community.

Notification to local residents was provided through a mix of advertisement (on Facebook) and station posters which promoted the engagement period and encouraged the community to provide their feedback. Face to face engagement in the form of information sessions were not conducted due to social distancing requirements associated with COVID-19.

A total of 52 comments were received during the engagement period. Key themes of the community feedback included:

- support for the station to become more accessible
- consideration to improved pedestrian access from Pennant Hills Road to Railway Parade and the station platforms
- consideration for improved pedestrian access from the commuter car park to the station including a lift within the car park and covered walkways
- consideration for more commuter parking spaces
- consideration for the location of proposed accessible parking spaces
- consideration for a kiss and ride bay on The Esplanade
- consideration for minimal tree removal in the area
- consideration for improved station amenities including more canopies on platforms, better station announcement systems, toilet on Platform 3, Opal card readers on all platforms, more seating and community information display stands.

The feedback received from the community was provided to the proposal team for consideration and to help inform the design, planning process and documentation.

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 13-16 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 work that would: • require connections or impacts the stormwater drainage system • temporarily disrupt pedestrian and vehicle movements • impact on road pavements under Council's care and control • impact on Council-operated footpaths • Consultation with Hornsby Shire Council has commenced and would continue throughout the detailed design and construction phases.
Clause 14 | Consultation with Councils – development with impacts on local heritage	Where railway station work: • would 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 on local heritage items/heritage conservation areas listed under the Hornsby LEP. Accordingly, consultation with Hornsby Council under Clause 14 is not required.
Clause 15 | Consultation with Councils – development with impacts on flood liable land	Where railway station work: • 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 Hornsby Council under Clause 15 is not required.
Clause 15A Consultation with Councils – development with impacts on certain land within the coastal zone	Where railway station work: • impact on land within a coastal vulnerability area and is inconsistent with certified coastal management program that applies to that land	The Proposal is not within a coastal vulnerability area. Accordingly, consultation with Hornsby Council under Clause 15A is not required.

Clause	Clause particulars	Relevance to the Proposal
Clause 15AA Consultation with State Emergency Service – development with impacts on flood liable land	Where railway station work: • impact on flood liable land -written notice must be given (together with a scope of work) to the State Emergency Services and taken into consideration any response to the notice received from the State Emergency Service within 21 days after the notice is given.	The Proposal has not been identified on the Hornsby LEP as having potential for flooding. Accordingly, consultation with State Emergency Service under Clause 15AA is not required.
Clause 16 | Consultation with public authorities other than Councils	For *specified development* which includes consultation with the DPIE (formerly OEH) for development that is undertaken adjacent to land reserved under the *National Parks and Wildlife Act 1974*, and other agencies specified by the Infrastructure SEPP where relevant. Although not a specific Infrastructure SEPP requirement, other agencies Transport for NSW may consult with could include: • Roads and Maritime • Sydney Trains • NSW TrainLink • OEH.	The Proposal is not located adjacent to land reserved under the *National Parks and Wildlife Act 1974*. Accordingly, consultation with DPIE Energy, Environment and Science Group under Clause 16 is not required.
Clause 66C | Development adjacent to pipeline corridors	Work within 20 metres of the vicinity of pipeline infrastructure and/or pipeline corridors require written notice of the applicant to the pipeline operator and take into consideration any response to the notice that is received within 21 days after the notice is given. The determining authority must be satisfied that the potential safety risks or risks to the integrity of the pipeline that are associated with the development have been identified and taken into consideration.	The Proposal is not located within 20 metres of pipeline infrastructure and/or pipeline corridors. Accordingly consultation under clause 66C is not required.
Clause 104(2A) | Traffic generating development	A public authority, or a person acting on behalf of a public authority, must not carry out development to which this clause applies that this Policy provides may be carried out without consent unless the authority or person has: *(a) given written notice of the intention to carry out the development to RMS in relation to the development, and* *(b) taken into consideration any response to the notice that is received from RMS within 21 days after the notice is given.*	The Proposal is not considered to be traffic generating development as defined under clause 104(2A). Accordingly, consultation with Transport for NSW (former Roads and Maritime Service) 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 proposal 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, early engagement feedback opportunities and REF process to relevant stakeholders
- raise awareness of the various components of the Proposal and the specialist environmental investigations
- ensure that the directly impacted community is aware of the engagement feedback opportunities and REF and consulted where appropriate
- provide opportunities for stakeholders and the community to express their view about the Proposal
- understand and access valuable local knowledge from the community and stakeholders
- record the details and input from community engagement activities
- build positive relations with identified community stakeholders
- ensure a comprehensive and transparent approach.

5.3.1. Community consultation during COVID-19

In response to the evolving Coronavirus situation, Transport for NSW is following NSW Health advice and changing the way it approaches community consultation for important transport infrastructure proposals.

It is important for the community to have their say on all transport infrastructure proposals and while this is not business as usual, Transport for NSW would ensure all appropriate community consultation is carried out.

This means consultation would be carried out in different ways, including via the Transport for NSW website, social media and video conferencing, to ensure the community can practice social distancing and limit the spread of Coronavirus.

Transport for NSW would continue to deliver proposals across NSW, while ensuring the safety of all staff and the community.

5.3.2. Public display of the REF

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

- development of a dedicated proposal webpage with an online feedback form on the Transport for NSW website – www.transport.nsw.gov.au/thornleigh
- distribution of a proposal newsletter to local community and rail customers, outlining the Proposal and inviting feedback on the REF
- advertisement of the REF public display in the local newspaper with a link to the Transport for NSW website that includes a summary of the Proposal, links to the REF and supporting documents and information on how to provide feedback
- a geo-targeted social media campaign during the public display period (Facebook)
- consultation with Hornsby Shire Council, Sydney Trains and other non-community stakeholders

- emails to members of the community who have registered to the proposal distribution contact list
- posters at the station advising customers where to view the REF and how to make a submission.

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 on the Transport for NSW website[1] and the NSW Government Have Your Say website[2]. Under normal circumstances, printed copies of the REF would be available at varying locations. However, due to the COVID-19 restrictions, these would not be available for this Proposal.

Further information on the Proposal may be requested by contacting the Proposal Infoline on 1800 684 490 or by email at projects@transport.nsw.gov.au.

During the display period feedback from the community is invited and can be submitted in the following ways:

- Email: projects@transport.nsw.gov.au
- Fill in the online feedback form at www.transport.nsw.gov.au/thornleigh
- Write to: Transport Access Program – Thornleigh Station Upgrade

  Associate Director EIA
  Transport for NSW
  PO Box K659 Haymarket NSW 1240

Following the consideration of feedback received during the public display period, Transport for NSW would determine whether to proceed with the Proposal and what conditions would be imposed on the proposal should it be determined to proceed.

5.4. Aboriginal community involvement

An Aboriginal Heritage Information Management System (AHIMS) search was undertaken for the area covered by the Proposal plus a 50 metre buffer, on 25 November 2020. No Aboriginal sites were identified in or near the Proposal site.

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.

5.5. Ongoing consultation

At the conclusion of the public display period for this REF, Transport for NSW would acknowledge receipt of feedback from each respondent. The issues raised by the respondents would be considered by Transport for NSW before determining whether to proceed with the Proposal.

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

[1] www.transport.nsw.gov.au/thornleigh
[2] www.nsw.gov.au/improving-nsw/haveyour-say/thornleigh-station-upgrade

Should Transport for NSW determine to proceed with the Proposal, the proposal team would keep the community, Council 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.

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.

Proposal specific mitigation measures are discussed in each of the sub-sections, while a full list of mitigation measures for the Proposal is provided in Section 7.2.

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 provides an overview of the desktop traffic assessment completed for the Proposal. Considering it is unlikely that traffic impacts would result from the operation of the Proposal, a specialist technical study for traffic has not been prepared at this stage.

6.1.1. Existing environment

Road network

Thornleigh Station is located approximately 20 kilometres north-west of Central Station and is bound by the Wells Street walkway and The Esplanade (refer to Figure 8). Wells Street crosses the railway corridor just south of Thornleigh Station. Railway Parade and Pennant Hills Road is directly parallel to the railway corridor. The road network is summarised in Table 6.1 and includes roads managed by Hornsby Shire Council and Transport for NSW.

Table 6.1 Road network surrounding the Proposal area

Road	Classification	Posted speed limit	School zone	Configuration
Pennant Hills Road	Highway (part of the Cumberland Highway)	70km/hr	No	Six-lane divided arterial road connecting Pacific Motorway in the north to James Ruse Drive in the south.
The Esplanade	Local - unclassified	50km/hr	No	Single lane divided road which extends parallel along the railway corridor between Yarrara Road and Duffy Avenue.
Wells Street	Local - unclassified	No posted speed limit – assumed 50km/hr	No	Single lane divided road which provides access over the railway corridor between The Esplanade and Pennant Hills Road.
Railway Parade	Local - unclassified	50km/hr	No	Unmarked road which runs parallel along the railway corridor. Access to Railway Parade from Pennant Hills Road is one way.

Pedestrian access

Pedestrian access to Thornleigh Station from Pennant Hills Road is via the Wells Street walkway which connects the station to Railway Parade and Wells Street. Direct access to Platform 3 of Thornleigh Station is available from The Esplanade.

A pedestrian bridge provides access from the Wells Street walkway and The Esplanade entrance to all three platforms of Thornleigh Station.

External to the station, to the west, pedestrian crossings are available at the set of traffic lights at the intersection of Eddy Street and The Esplanade which allows for the free movement of pedestrians from one side of The Esplanade to the other. This allows connectivity from the station to a bus stop and surrounding destinations within the suburb of Thornleigh.

The Wells Street walkway which is part of the Great North Walk is located directly parallel to the railway corridor between Wells Street and Railway Parade. It provides access to the platform building from Pennant Hills Road (the eastern side of Thornleigh Station). Access over Pennant Hills Road is available via a pedestrian overpass, located on the northern side of Railway Parade and connects to the southern side of Station Street.

The Great North Walk is a 250 kilometre path from central Sydney to Newcastle, NSW. The Great North Walk starts in Macquarie Place in central Sydney and it passes through historic locations and heritage homes in the Sydney suburbs before arriving in the Lane Cove River National Park. The Great North Walk follows this river as far as Thornleigh and then the Berowra Creek before heading through part of the Ku-ring-gai Chase National Park and north to Newcastle. Those undertaking the Great North Walk will pass along the Wells Street walkway and over the station pedestrian bridge.

Parking

A multi-level commuter carpark is located on The Esplanade directly adjacent to Thornleigh Station. There are two spaces identified as disabled parking spaces within this car park however these spaces do not currently meet DSAPT requirements. Parking within the commuter car park is untimed.

Limited street parking with a one-hour limit is located on The Esplanade and in front of Thornleigh Station between Wells Street and Eddy Street. Street parking commences again further north on The Esplanade.

Street parking with a 15 minute time limit is located on Railway Parade in proximity to the commercial premises near the Wells Street walkway. Further east along Railway Parade parking is available for a one hour limit.

Currently, there is no taxi stand or kiss and ride bays near Thornleigh Station.

Bike network and facilities

There are currently bicycle parking facilities provided at Thornleigh Station at both the Railway Parade entrance and The Esplanade car park. Dedicated cycle infrastructure, such as bicycle lanes or separated paths, are limited in the vicinity of Station. A dedicated bicycle lane is located on The Esplanade from Wells Street to Duffy Avenue to the North.

Public transport

Thornleigh Station is located on the T9 Northern Line. Platform 1 is adjacent to a relief track which is used to allow express passenger services to overtake slower freight trains and is rarely used for passengers getting on and off the train. Platform 2 receives southbound services towards Central. Access to Platform 1/2 is from a pedestrian bridge between The Esplanade and the Wells Street walkway. Platform 3 receives services northbound towards Hornsby and can be directly accessed from The Esplanade or via the pedestrian bridge.

Bus services run along The Esplanade and Pennant Hills Road. Bus stops are located northbound and southbound on The Esplanade and Pennant Hills Road directly outside the station.

Bus routes that travel via Thornleigh are as detailed in Table 6.2.

Table 6.2 Bus services available near Thornleigh Station

Number	Route	Frequency
N80	Hornsby to Sydney Town Hall via Strathfield	5 times overnight (night service) 7 days per week
586	Westleigh to Pennant Hills	9 times daily Monday-Friday
600	Hornsby to Parramatta	Approximately every 15-30 minutes and overnight, 7 days per week
589	Sydney Adventist Hospital to Parramatta	Approximately hourly 7am to midnight Monday to Saturday

6.1.2. Potential impacts

a) Construction phase

Customer and public access impacts

Construction traffic associated with the Proposal would consist of mostly light vehicles from the construction workforce. Light vehicles would be parked at the proposed laydown area.

The delivery and installation of the lifts via crane and the delivery of concrete via a concrete agitator truck would contribute to heavy vehicle movements. Any local traffic impacts associated with heavy vehicles would be temporary and localised to The Esplanade and Pennant Hills.

One of the lifts would be constructed on the eastern side of Thornleigh Station at the Wells Street Walkway. Access for construction of the lift would be required either through the car park of Giant Bike Store or adjacent businesses, which would result in temporary disruption to business owners and their customers when using these car parks.

Upgrading and implementation of accessible car parking spaces in the commuter car park on The Esplanade and street parking on Railway Parade may cause short term temporary impacts to users of the commuter car park. Impacts to road users, pedestrians and commuters are likely as a result of works required on Railway Parade. Work zones would need to be established and demarcated at Railway Parade to address impacts on surrounding road users and pedestrians/commuters during works.

There would be temporary disruption to pedestrians and cyclists during pavement upgrading, replacement of the bus shelter and bicycle parking on The Esplanade and works occurring on the single island platform. The high voltage powerlines would need to be relocated or converted to an underground cable to facilitate construction of the Proposal. Pedestrian movement may also be disturbed due to the upgrading of powerlines.

Road network and traffic

Considering a workforce of approximately 20 employees during normal work hours would be required, the associated traffic generated by construction is unlikely to impact the existing capacity of the local road network or nearby intersections. During a rail shutdown period there are likely to be up to 100 employees on site. A rail shutdown would mean trains are not operating and therefore local parking is unlikely to be in high demand in addition to the availability of the commuter carpark.

During a normal work-day, approximately two heavy vehicles and 15 light vehicles are expected to travel to and from the Proposal area. During a rail shutdown period, approximately 20 heavy vehicles and 25 light vehicles are expected to travel to and from the Proposal area.

Parking

Construction workers may contribute to a minor increase in demand for local parking and would be required to park away from the station or within the nominated construction compound and encouraged to carpool where practicable. As light vehicles would be primarily parked at the proposed laydown area, there would be negligible impact to surrounding roadside parking.

Interchange facilities

There would be temporary changes as a result of construction traffic accessing the site, or work being undertaken for the revision of public parking at the Railway Parade station entrance.

Public transport

Train services would be affected during rail shutdowns although these are not specific to this Proposal and would occur regardless for ongoing maintenance of the wider rail network. The impact on public transport is anticipated to be minor, and involve:

- increased safety risk to pedestrians and rail / bus commuters near the proposed site compound
- the bus stop adjacent to The Esplanade station entrance may be relocated on a temporary basis during construction to allow for the work on the footpath adjacent to the Esplanade station entrance
- temporary traffic management measures for work safety along The Esplanade which may slightly increase travel times for bus services
- bus services may also be delayed due to the interaction with construction vehicles entering and exiting the site compound.

Property access

Property access would be maintained during construction to minimise the impact to local residents and businesses.

b) Operation phase

The Proposal would result in an overall positive impact by contributing towards making public transport more accessible to the community.

Customer and public access impacts

The new lifts would allow for an accessible path of travel to the station platform from the station entrance and commuter car park on The Esplanade and Wells Street Walkway allowing people with reduced mobility, parents/carers with prams or customers with luggage to access the Sydney Trains network. Walkway improvements also include repaving and widening of the pedestrian footpath and installation of both CCTV and additional lighting, in order to alleviate public safety concerns.

Beyond station accessibility, enhancements to the station entrances and the footbridge would also serve to improve the connection across the rail corridor, to the station and improve user amenity.

The proposal would retain the same number of bicycle parking spaces at the station entrance on The Esplanade.

Road network and parking

The Proposal would increase accessibility to Thornleigh Station and improve the customer experience and amenity, potentially leading to a minor increase in utilisation and patronage. This may be due to customers either travelling by train where they did not before, or by changing from another nearby station.

As a result, there may be a minor decrease in traffic generation however, it is proposed to be minor and would have a negligible impact on the surrounding road network or the amenity of local residents.

A total of five 15 minute car parking spaces will be lost through the creation of the kiss and ride bay, accessible parking space and enlarged entry forecourt to the Wells Street walkway at Railway Parade. Access to these parking spaces will be temporarily removed during the construction phase at this location. Customers of local shops will lose the convenience of parking immediately adjacent to the shops and would need to find alternative parking in the area. TfNSW may negotiate with Hornsby Shire Council opportunities to reassign parking spaces to short term (15 minute) elsewhere in Railway Parade to offset this loss of parking.

The Proposal would provide one kiss and ride bay and one accessible parking space on Railway Parade and two accessible parking spaces in the existing commuter car park at The Esplanade. An accessible path of travel would be constructed between the accessible parking spaces and also the interchange zone constructed on The Esplanade and the new lifts.

A minor indirect change to parking, i.e. an increase in parking demand, may result from increased station patronage. The Proposal is not expected to have any impact on ongoing property access for residents or businesses within the vicinity of the station.

Interchange facilities

The proposal would allow for accessible movement within the station across all transport mode, in particular to and from the station platform and external road network, bus stops, accessible parking and bicycle parking.

The interchange zone would be improved on The Esplanade, including a refurbished bus stop and associated canopy, seating and bicycle parking spaces. An accessible path would be constructed between the interchange zone and the lift at the station entrance.

Improvements such as footpath regrading and widening for pedestrian access from Railway Parade to Thornleigh Station will result in a positive impact to the operational use of the station.

The accessibility enhancements at the station would improve the pedestrian movements between transport modes, including improved accessibility to the bus services at the Pennant Hills Road/Railway Parade station entrance.

6.1.3. Mitigation measures

Any impacts to arise during the construction phase of the Proposal would be managed through a construction traffic management plan (CTMP) to be prepared as part of the construction environmental management plan (CEMP) for the Proposal. The CTMP would be prepared in consideration of consultation completed with the relevant roads authorities.

The CTMP is further detailed in section 7.2. Site specific measures relating to traffic and transport mitigation include the following:

- Regarding the construction access point to the Wells Street walkway, Transport for NSW would consult with the required parties (including commercial businesses in the area) prior to the construction phase of the Proposal to ensure disturbance to car park users is minimised as much as possible.

- Suitable vehicle and pedestrian paths would be maintained throughout the construction of the proposed upgrade to ensure safe and easy access throughout the station.
- Suitable pedestrian provisions would also be made to ensure that pedestrian connectivity between various transport modes and the bus stop is not impacted as a part of the work and that suitable and safe paths are provided.
- Qualified traffic controllers would be used during construction work to ensure safe and efficient movement of vehicle and pedestrian traffic on the external road as well as in and out of the construction site and fencing and barriers would be installed between construction site and outside construction zone to ensure safe and easy navigation of pedestrians and cyclists.

6.2. Landscape and visual amenity

This section provides a summary of the Visual Impact Assessment (VIA) prepared by Spackman Mossop Michaels (SMM, 2020) and is included as Technical Paper 3.

The assessment included a desktop analysis and site inspection to identify the potential visual impacts of the Proposal on views to the station from surrounding publicly accessible areas. The VIA considers the following guidelines:

- Guideline for landscape character and visual impact assessment. Environmental impact assessment practice note EIA-N04 (EIA-N04), Centre for Urban Design, Transport for NSW 2020
- Guidance Note for Landscape and Visual Assessment, Australian Institute of Landscape Architects Queensland 2018.

It considers the Proposal's impacts on existing views, the Proposal's impact to the area's character and sense of place as identified in each landscape character zone (LCZ), and a landscape character assessment.

The assessments consider the sensitivity of the view and magnitude of change to the view as a result of the Proposal, which combined provides a rating of the visual impact based upon the visual impact grading matrix (refer Figure 11). Sensitivity refers to how sensitive the existing character of the setting is to the proposed change. It is the settings inherent capacity to absorb change. Magnitude refers to the physical size and scale of the project. This combination results in a visual impact rating of high, high-moderate, moderate, moderate-low, low or negligible.

Sensitivity	Magnitude: High	Magnitude: Moderate	Magnitude: Low	Magnitude: Negligible
High	High	High-Moderate	Moderate	Negligible
Moderate	High-Moderate	Moderate	Moderate-low	Negligible
Low	Moderate	Moderate-low	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

Figure 11 Visual impact grading matrix

Existing environment

Land use and built form

The suburb of Thornleigh is well established with extensive areas of traditional low-density suburban housing interspersed by parks and bushland corridors, as well as an employment area bounded by the rail line, Pennant Hills Road, Duffy Avenue and Wells Street. Further north of the employment area on the western side of the rail line is a small light industrial area.

The Thornleigh town centre is located on the eastern side of the rail corridor. It is a mixed-use commercial precinct, containing small shops and restaurants near the station, new residential flat buildings, commercial units, a hotel and a Bunnings Warehouse. It stretches from Wells Street to Duffy Avenue, generally between Pennant Hills Road and the rail corridor.

On the western side of Thornleigh Station, the predominate land use is traditional low density residential housing interspersed with occasional business uses.

Much of the rail corridor is framed by parallel roads, including Yarrara Road and The Esplanade on the western side and Railway Parade and Pennant Hills Road on the eastern side. Wells Street located south of Thornleigh Station provides road connectivity across the rail corridor.

Pennant Hills Road is a major arterial road providing local and regional connectivity and is identified as an urban renewal corridor.

Vegetation

Thornleigh is a leafy suburb consisting of remnants of native vegetation and planted vegetation like ornamental trees. Vegetation is important as it provides visual relief from the railway corridor and contrasts with the infrastructure corridors and dense urban development surrounding Thornleigh Station.

This character is reflected on the western side of the rail corridor which features large mature trees as street planting along The Esplanade, in private properties and within the railway corridor. This includes large mature Brush Boxes (*Lophostemon conferta*), which make an important contribution to the character, visual outlook and amenity of The Esplanade and Thornleigh Station. They constitute large shade trees that visually soften the appearance of rail infrastructure including the existing footbridge and multi-storey commuter car park north of the station.

The eastern side of the railway corridor contains minimal vegetation associated with the railway corridor, as the town centre is dominated by built form.

Vegetation lining the rail corridor provides a visual buffer between the rail corridor and adjoining land uses. Other vegetation includes two large native trees at Domino’s Pizza and boundary planting within private properties.

Thornleigh Station

The main entrance of Thornleigh Station contains a modest single-storey brick building on the western forecourt. The building contains a small convenience shop facing The Esplanade and a station waiting room facing the platform. The main entrance is set back from The Esplanade in a park-like setting characterised by mature Brush Boxes. The main station building is located on the island platform and includes a station masters office, bathroom facilities, waiting room and undercover seating. A smaller station building is located at the southern end of the island platform. A steel pedestrian bridge provides pedestrian access across the railway corridor.

Visibility of Thornleigh Station is limited to a relatively small area due to the topography, surrounding built form and vegetation. It is confined to the surrounding road system and associated footpaths.

Viewpoints

Visual receivers are individuals and/or groups of people whose views may be affected by the Proposal. These include users of residential dwellings, commercial properties and open space and generally comprise residents, rail customers, motorists and pedestrians. Six viewpoints have been identified to represent key viewpoints to and from the Proposal. They are shown in Figure 12 and include:

- Viewpoint 1 – western side of The Esplanade opposite the entrance to the western station forecourt, looking west
- Viewpoint 2 – The Esplanade at the western station forecourt near the commuter car park, looking south
- Viewpoint 3 – Wells Street walkway approximately halfway between Railway Parade and the footbridge, looking south-west
- Viewpoint 4 – Western end of footbridge on Pennant Hills Road, looking west
- Viewpoint 5 – Pennant Hills Road on the corner of Giant Bicycle Shop's car park, looking north to the footbridge
- Viewpoint 6 – Wells Street bridge, looking north-east

Landscape character zones

Three LCZs have been identified for the Proposal. The LCZs are summarised in Table 6.3. A LCZ is defined as the collective qualities including the built form, natural elements, and the cultural and social facets that combine to provide a locale with a unique sense of place.

Table 6.3 Summary of landscape character zones

Landscape character zone	Description
LCZ 1 – Thornleigh Town Centre	This zone contains a mixed-use commercial centre between the railway corridor and Pennant Hills Road. It is characterised by intensive urban development with limited vegetation to provide visual relief. Pennant Hills Road is another defining character element of this zone.
LCZ 2 – Suburban Thornleigh	This zone contains predominantly low-density residential areas west of the railway line interspersed by a limited number of small business. It is characterised by well-established and maintained one and two storey residential homes on medium to large blocks with mature gardens including extensive tree canopy cover. This zone also incorporates the western side of the rail corridor, which includes the station forecourt that transitions into an informal, heavily vegetated reserve towards Wells Street. The northern half of this zone is comprised of the commuter car park. A key character element of this zone is the large mature Brush Box trees both north and south of the station, which complement the surrounding residential environment, offer shade and provide a visual buffer to rail infrastructure.
LCZ 3 – Rail corridor	This zone contains the eastern portion of the rail corridor and comprises rail infrastructure including rail tracks and station infrastructure. Vegetation along the eastern edge provides a visual buffer as well as visual relief to Thornleigh town centre.

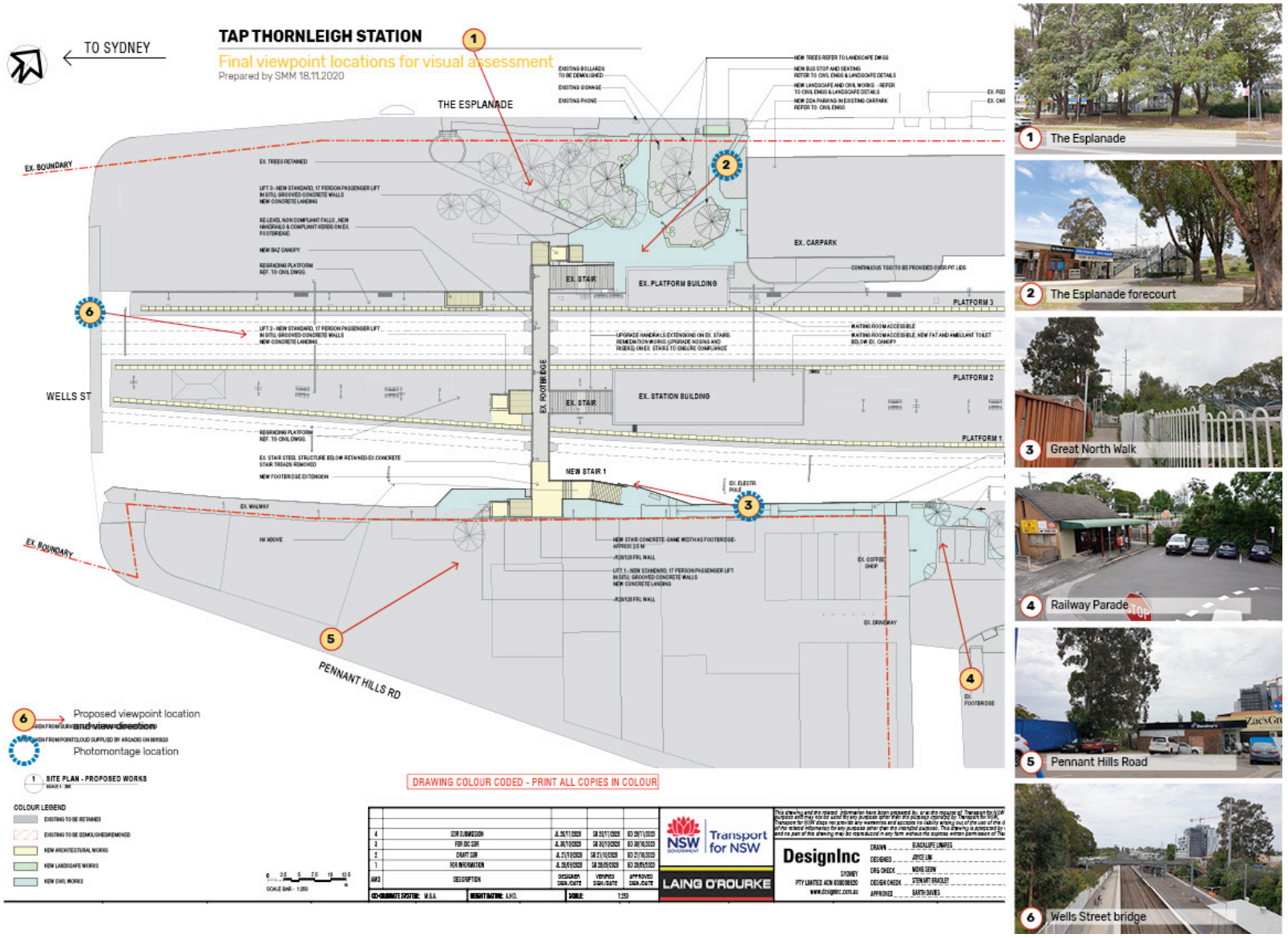


Figure 12 Viewpoints considered in the Visual Impact Assessment

6.2.1. Potential impacts

The following sections provide a description of the likely impacts resulting from the Proposal during construction and operation. The visual impact is assessed based on an assessment of the significance of the view and the magnitude of change to the view and results in a rating of high, moderate, low or negligible. Further details on how this is determined is detailed in the VIA.

a) Construction phase

The construction activities would be transient in nature. Temporary elements likely to be introduced into the visual environment include:

- fencing and hoarding
- road barriers and signage
- ground disturbance
- formwork and scaffolding
- cranes and other construction equipment
- site office and amenities including the storage of materials and equipment.

Visual impacts would result from general construction activities, the movement and operation of plant and machinery as well as the erection of temporary structures including fencing, hoarding, material laydown and storage areas and site offices. They would typically include a combination of vegetation removal or pruning, the visibility of temporary structures, machinery and plant, construction work activities and increased vehicle movements. Sources of change to the view during construction also include the operational project elements that would be constructed in the view.

Although temporary, construction would be a prominent feature of the scene and contrast the surrounding scale and character of the station. This would temporarily impact the views from passengers, motorists, and residential dwellings as the most sensitive receptors.

As described in Section 3.3, some vegetation in the rail corridor would need to be removed or trimmed as part of the construction work. Work has been designed to minimise footprint and retain vegetation to the greatest extent possible.

Where night work is required for the Proposal this would involve the use of temporary lighting for operational, safety and security purposes. Lighting installations would be placed to avoid light spill to adjoining road corridors and residential areas.

Landscape character changes during construction would derive from both proposed elements as they are being constructed and from temporary construction activities. The impacts would vary throughout the construction period depending on the construction activities being carried out at the time.

The construction impacts are summarised in Table 6.4. The visual sensitivity of the viewpoints range from low to moderate, with only viewpoint 1 having a high sensitivity to change. Otherwise, the surrounding environment is heavily urbanised with low scenic value and predominately dominated by rail and road infrastructure. The magnitude of change on the landscape during constructed is assessed as low to high. During construction, new elements such as construction plant, equipment and ancillary facilities would be visible within the viewpoints, however this would be temporary in nature. The overall sensitivity and magnitude have been combined to generate an overall impact during construction, which ranges from low to high.

Table 6.4 Summary of construction impacts to visual amenity

Viewpoint	Visual sensitivity	Elements visible during construction	Magnitude of visual effect	Visual impact
1	High	Construction activities	Low	Moderate
2	Moderate		High	High to moderate
3	Low		High	Moderate
4	Low		Moderate	Moderate to low
5	Low		High	Moderate
6	Moderate	Material laydown area north of central concourse	High	High to moderate

b) Operational impacts

An assessment of the visual sensitivity and magnitude of each viewpoint during the operational phase of the Proposal is provided in Table 6.5, utilising the impact grading system matrix in Figure 11. In summary, the Proposal would result in low to moderate impacts for the selected viewpoints. Refer to Figure 13 to Figure 18 for photographs and montages of the viewpoints.

Operational impacts to LCZs would vary according to landscape character sensitivity and magnitude of the changes. Regardless, the landscape character impacts of the Proposal on the three LCZs during operation would be low. This is reflective of the degree of consistency between the Proposal and the existing built form. Additionally, the Proposal would occupy only a minor footprint within the existing urban fabric.

Lighting would be designed in accordance with the requirements of standards relevant to *AS 1158 Road Lighting, AS 4282 Controlling the Obtrusive Effects of Outdoor Lighting* and *AS 1428 Design for Access and Mobility*, and such operational lighting impacts (such as light spill) are expected to be negligible.

Table 6.5 Summary of operational impacts to viewpoints

Viewpoint	Summary	Overall impact (sensitivity x magnitude)
Viewpoint 1 (Figure 13)	Due to the intervening effect of mature tree cover, much of the Proposal would be concealed behind existing canopies. The alignment of the lift shaft with the existing pedestrian bridge would maximise visual integration with the existing infrastructure. However, the anti-climb screen would result in a more solid, built-up appearance replacing the landscape outlook. The magnitude of the Proposal within this view would be moderate. The sensitivity of the viewpoint to change is considered high, as it comprises of mostly mature vegetation within park-like character. This view would be experienced by a number of residences arriving or leaving their home.	Moderate

Viewpoint	Summary	Overall impact (sensitivity x magnitude)
Viewpoint 2 (Figure 14)	Existing mature tree cover would conceal the installation of lift 1 and the pavement upgrades at the station entrance would reduce visual clutter. However, lift 3 would potentially require the removal of vegetation and the anti-climb screen would result in a more solid, built-up appearance replacing the landscape outlook. The magnitude of the Proposal within this view would be moderate. The view would be experienced by commuters accessing the station and those using the pedestrian overpass to cross over the rail line. These viewers would be sensitive to change in the visual character of their suburb.	Moderate
Viewpoint 3 (Figure 15)	Widening of the Wells Street walkway into the rail corridor and construction of the new stairs and Lift 1 would substantially change the left-hand portion of this view, removing vegetation and closing off the vista along the Wells Street walkway. The loss of sight lines as a result of lift installation would enclose this vista, blocking views of people entering the walk from the southern end and possibly heightening the sense of being in an enclosed space. Lift 2, while visible, would be set against the backdrop of mature Brush Boxes and would be harder to discern. Overall, the high degree of change to the foreground and central part of the view results in a high magnitude of change. The overall sensitivity of this viewpoint is considered low, as there are few visually sensitive elements, including open sky and mature vegetation in the Domino's Pizza carpark which make up a small portion of the viewpoint.	Moderate
Viewpoint 4 (Figure 16)	The removal of vegetation along the railway corridor to facilitate access to accessible parking spaces would open up views between Railway Parade and the railway corridor, altering the outlook from this view. Upgraded and widened pedestrian pavements at the station entrance would replace existing aged pavements, resulting in a beneficial change. The magnitude of change within this view would be moderate. Much of the view comprises of Railway Parade, including existing parking spaces and would have a low level of sensitivity to change. Part of the view is comprised of vegetation and has a higher level of sensitivity to change.	Moderate to low
Viewpoint 5 (Figure 17)	The trimming of lower-level branches of the mature eucalypts may open up vistas towards the rail corridor. This vista would expose the extension of the pedestrian bridge and Lift 1 to views from Pennant Hills Road. Lift 2 may also be visible above the shipping container. However, the lifts would comprise a relatively small portion of the view, constituting relatively brief glimpses for the majority of viewers driving along Pennant Hills Road. The magnitude of change to this view would therefore be moderate. The overall sensitivity of this viewpoint to change is considered low. Although it would be experienced by many commuters travelling along Pennant Hills Road, it contains few visually sensitive elements.	Moderate to low

Viewpoint	Summary	Overall impact (sensitivity x magnitude)
Viewpoint 6 (Figure 18)	The three lifts would constitute new elements in this view however would comprise only a small portion of the overall view. In addition, lifts 2 and 3 would be set against a busy background of the existing station elements, reducing their visual prominence. Similarly, existing mature trees would reduce the visual prominence of Lift 1. Vegetation removal associated with the widening of the Wells Street walkway would remove the visual buffer between the rail corridor and adjoining areas, resulting in a more urban outlook in the background of the viewpoint on the southern side of the rail line. Overall, the magnitude of change to this view would be moderate. The visual sensitivity of this viewpoint is considered moderate. although it contains mostly rail infrastructure which is considered to hold low visual sensitivity, it also contains mature vegetation which lines the rail corridor and highly sensitive to change.	Moderate

Figure 13 Viewpoint 1: Western side of The Esplanade opposite the entrance pergola to the western station forecourt, looking east

Figure 14 Viewpoint 2: side-by-side The Esplanade at the western station forecourt near the commuter car park, looking south and photomontage showing the Proposal

Figure 15 Viewpoint 3: side-by-side Wells Street walkway, approximately halfway between Railway Parade and the pedestrian bridge over the rail corridor, looking south-west, and photomontage showing the Proposal

Figure 16 Viewpoint 4: Western end of the Pennant Hills Road pedestrian overbridge, looking west towards the entry to the Wells Street walkway

Figure 17 Viewpoint 5: Pennant Hills Road on the corner of the Giant bicycle shop car park, looking north across the Giant and Domino's car park towards the existing station overbridge

Figure 18 Viewpoint 6: Side-by-side – view from the Wells Street bridge, looking north-east towards the pedestrian bridge and photomontage of the proposal

6.2.2. Mitigation measures

Mitigation measures would be reviewed where appropriate during detailed design development and construction planning to minimise the level of visual impact of the construction and operation phases of the Proposal.

The detailed design of the Proposal is to be undertaken with reference to the recommendations included in the visual impact assessment (Spackman Mossop Michaels, 2020). Key proposal-specific mitigation includes:

- tree protection:
    - develop a construction methodology for the installation of Lift 3 to minimise the extent of pruning required to existing mature Brush Boxes
    - construction of the Proposal must be carried out in accordance with the *Vegetation Management (Protection and Removal) Guideline* (Transport for NSW, 2019a)
- with regard to urban design, public domain and landscaping, reconsider the placement of the lift and stairs on the eastern walkway to achieve:
    - a direct line of sight along the walkway from the eastern entrance at Railway Parade to the Wells Street overbridge
    - investigate options to reduce the impact of the stir stringer of the existing footbridge where it extends into the proposed lift waiting area
    - enlarge waiting areas at the lift and stair to increase passive surveillance of the area
    - align the lift and stair to provide direct lines of sight along the eastern walkway to increase passive surveillance
    - investigate opportunities to reinstate landscaping as a vegetated buffer at the eastern station entrance.

Measures to mitigate visual impacts during construction would be included in a CEMP for the Proposal and would include measures such as minimising light spill during night work and screening of compounds. Vegetation offsetting would be completed in accordance with *Vegetation Offset Guide* (Transport for NSW, 2019b) and included in the CEMP. The location and species of any vegetation offsetting would be decided prior to construction. Refer to Section 6.7 for Biodiversity Assessment and discussion regarding offsetting requirements.

An Urban Design Plan and Public Domain Plan would be prepared during detailed design for the operational phase of the Proposal. This would include details of the proposed materials and finishes to ensure the Proposal matches the existing urban design where possible.

6.3. Noise and vibration

A Noise and Vibration Impact Assessment has been completed by EMM to assess the construction and operational noise and vibration impacts of the Proposal (refer Technical Paper 2). The Noise and Vibration Impact Assessment has been prepared in consideration of the relevant guidelines (as listed in section 1.3 of Technical Paper 2) and included:

- establishing the existing background noise levels in the vicinity of Thornleigh Station
- establish construction noise management levels and vibration limits which would apply to the Proposal
- predict the construction noise and vibration levels at nearby residential and other sensitive assessment locations due to the Proposal and related construction road traffic
- recommend mitigation measures where necessary to reduce and manage noise and vibration impacts from the Proposal

As operational noise levels are expected to remain mostly unchanged and the specific mechanical systems to be installed for the Proposal are not yet finalised, no quantitative modelling of operational noise impacts was undertaken.

6.3.1. Existing environment

Noise sensitive receivers

Thornleigh Station is surrounded by predominately residential development, with a pocket of commercial development east of the station.

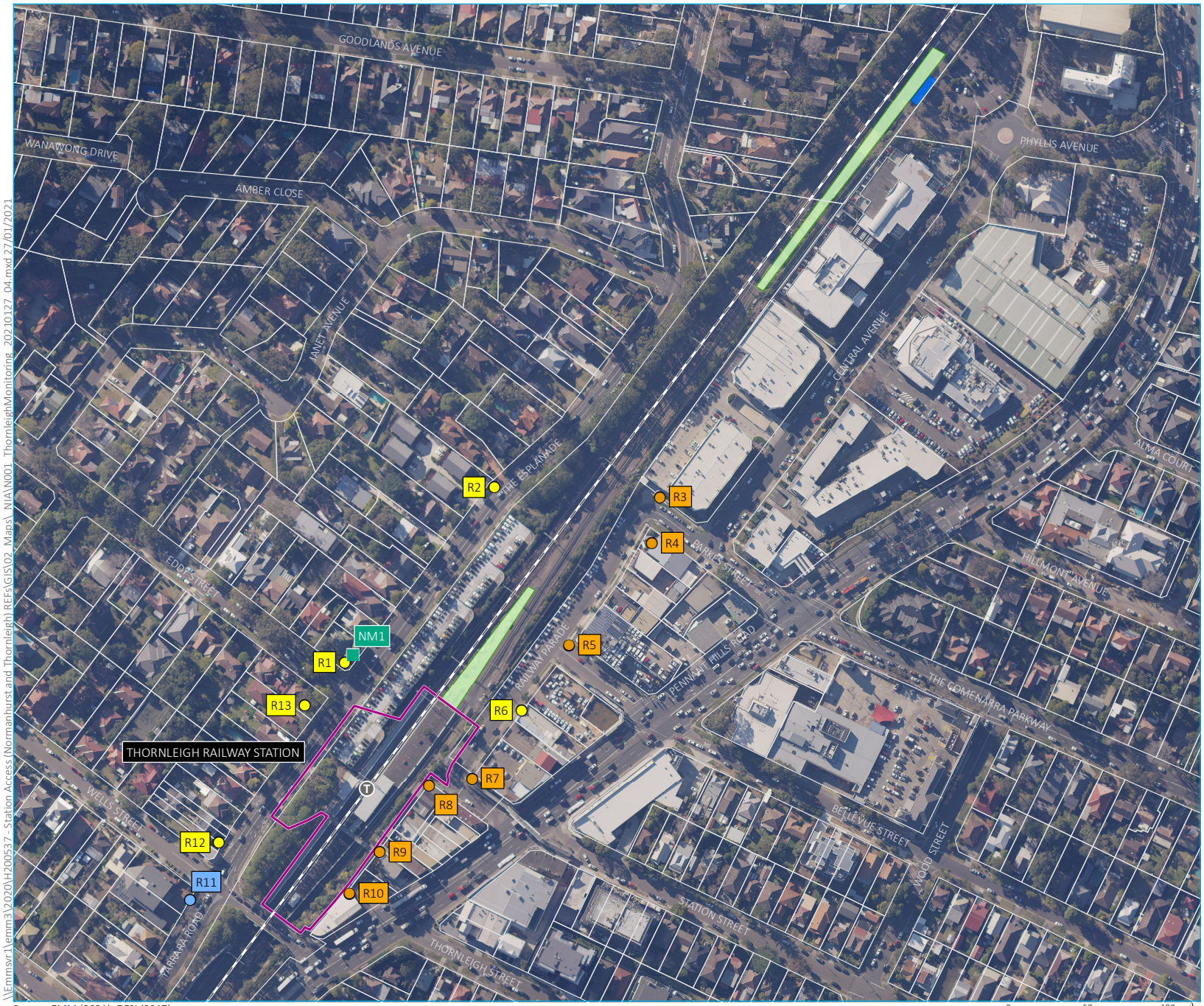
Access to Thornleigh Station is via the existing station access located on The Esplanade and the walkway between Wells Street and Railway Parade. The existing ambient noise environment is dominated by road traffic on The Esplanade and Pennant Hills Road.

The Noise and Vibration Impact Assessment considers thirteen noise sensitive locations, which were selected to represent the range and extent of noise impacts from the site. The noise sensitive locations are summarised in Table 6.6 and shown in Figure 19.

Table 6.6 Noise assessment locations

ID	Classification	Address	Distance to site (m)	Representative catchment area
R1	Residential	80 The Esplanade, Thornleigh	55	Residences to west (North of Eddy Street)
R2	Residential	64-66 The Esplanade, Thornleigh	195	Residences to north (West of rail line)
R3	Commercial	1-3 Central Avenue, Thornleigh	210	Commercial to north east
R4	Commercial	16 Railway Parade, Thornleigh	190	Commercial to north east
R5	Commercial	252-256 Pennant Hills Road, Thornleigh	105	Commercial to north east
R61	Residential	262-266 Pennant Hills Road, Thornleigh	55	Residences to east
R7	Commercial	270-272 Pennant Hills Road, Thornleigh	17	Commercial to east
R8	Commercial	4 Station Street, Thornleigh	Immediately adjacent	Commercial to east
R9	Commercial	290 Pennant Hills Road, Thornleigh	Immediately adjacent	Commercial to south east
R10	Residential	292 Pennant Hills Road, Thornleigh	Immediately adjacent	Commercial to south east
R11	Place of worship	2 Yarrara Road, Pennant Hills	80	Church to south west
R12	Residential	100 The Esplanade, Thornleigh	70	Residences to south west
R13	Residential	82 The Esplanade, Thornleigh	30	Residences to west (South of Eddy Street)

Notes: 1. This building is currently under construction and is nearing completion



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Source: EMM (2021); DFSI (2017)

Noise assessment locations

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 19

EMM
creating opportunities

Background noise levels

To establish the existing ambient noise environment of the area, an unattended noise survey and operator-attended measurements were conducted at monitoring locations as guided by the procedures described in Australian Standard AS 1055-2018 - *Acoustics - Description and Measurement of Environmental Noise*.

Noise monitoring was conducted at one location (80 The Esplanade, Thornleigh), considered to be representative of the range of noise levels likely to be experienced by residents in the vicinity of the site. The logger location was selected after inspection of the site and its surrounds, giving due consideration to other noise sources which may influence the readings (e.g. domestic air-conditioners), the proximity of assessment locations to the site, security issues for the noise monitoring device and gaining permission for access from the residents or landowners.

The noise logger was programmed to record statistical noise level indices continuously in 15-minute intervals, including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. Calibration of all instrumentation was checked prior to and following monitoring. All equipment carried appropriate and current National Association of Testing Authorities (NATA) (or manufacturer) calibration certificates.

Existing background and ambient noise levels are summarised in Table 6.7.

Table 6.7 Summary of Existing Background and Ambient Noise

Monitoring location[4]	Date	Period[1]	Rating background level (RBL)[2], dBA	Measured $L_{Aeq, period}$ noise level[3], dBA
NM1	11/11/2020 -	Day	51	62
80 The Esplanade,	21/11/2020	Evening	47	62
Thornleigh		Night	36	57

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am, Sunday to Friday and 10 pm to 8 am Saturday and public holidays.
2. The RBL is an NPfI term and is used to represent the background noise level. In accordance with the NPfI, minimum thresholds were adopted given measured values were lower.
3. The energy averaged noise level over the measurement period and representative of general ambient noise.
4. The noise logger was located in the rear yard of the property, which is the most exposed location to the proposed construction works.

Construction 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. The ICNG recommends standard hours of construction as:

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

Noise management levels (NMLs) have been determined for receivers as per the procedures in the ICNG. The ICNG prescribes set noise management levels for non-residential receivers such as commercial, schools and places of worship. Noise management levels for residential receivers are calculated based on the rating background level (RBL) + 10 dB(A) (for day time periods) or the RBL + 5 dB(A) (for evening and night time periods).

In addition, a 'highly noise affected' level of 75 dB(A) for residential receivers represents the point above which the ICNG indicates there may be strong community reaction to noise. Where work exceeds the noise management levels, all reasonable and feasible measures (such as equipment selection and location, construction scheduling and respite periods) should be implemented to reduce noise levels as far as practicable.

The Proposal's construction noise management levels (NMLs) for recommended standard and out of hour periods are presented in Table 6.8 for all assessment locations. It is acknowledged that construction works would generally be during daytime hours only, with the exception of works undertaken during rail shutdowns, which would be undertaken in accordance with the approved Out of Hours Works (OOHW) Procedure as part of the Construction Noise and Vibration Management Plan (CNVMP).

Table 6.8 Construction Noise Management Levels

Assessment location	Period	Adopted RBL	NML $L_{Aeq,15min}$, dB
Residential	Day (standard ICNG hours)	51	61
	Evening (out of hours)	47	52
	Night (out of hours)	36	41
Commercial	When in use	-	70
Place of worship	When in use	-	45 (internal) 55 (external)

Sleep disturbance noise goals have also been established for residential receivers in accordance with the Noise Policy for Industry (EPA 2017) (NPfI). As recommended in the NPfI, a detailed maximum noise level assessment should be undertaken where the noise levels exceed:

- $L_{Aeq,15\ minute}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater)
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

Construction vibration criteria

Human comfort

The EPA's *Assessing Vibration: a technical guideline* (Department of Environment and Conservation, 2006) provides guideline values for continuous, transient and intermittent events that are based on a vibration dose value (VDV) rather than a continuous vibration level. The VDV is dependent upon the level and duration of the short-term vibration event, as well as the number of events occurring during the day time or night time period.

The maximum criteria level is 0.4 $m/s^{1.75}$ for residences during the day time and 0.26 $m/s^{1.75}$ during the night time. For offices, educational facilities and places of worship (when in use) the maximum criteria is 0.8 $m/s^{1.75}$. For critical working areas (such as precision laboratories) the maximum criteria is 0.2 $m/s^{1.75}$.

Effects on building contents

People can perceive floor vibration at levels well below those likely to cause damage to building contents or affect the operation of typical equipment. For most receivers, the controlling vibration criterion would be the human comfort criterion, and it is therefore not normally required to set separate criteria in relation to the effect of construction vibration on most building contents.

Where appropriate, objectives for the satisfactory operation of critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives.

Structural damage vibration

Structural damage vibration limits are based on Australian Standard *AS 2187: Part 2-2006 Explosives - Storage and Use - Part 2: Use of Explosives* and British Standard *BS 7385 Part 2-1993 Evaluation and measurement for vibration in buildings Part 2*. These standards provide frequency-dependent vibration limits related to cosmetic damage, noting that cosmetic damage is very minor in nature, is readily repairable and does not affect the structural integrity of the building.

The recommended vibration limits for minimal risk of cosmetic damage to residential and industrial buildings is shown in Table 6.9. This has been adopted to assess the Proposal's potential to cause cosmetic damage associated with construction activities of residential and commercial buildings, heritage structures, infrastructure and transmission lines.

Table 6.9 Transient vibration guide values for minimal risk of cosmetic damage (BS 7385)

Type of building	Peak particle velocity: 4-15 Hz	Peak particle velocity: 15 Hz and above
Reinforced or framed structures industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Un-reinforced or framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

6.3.2. Potential impacts

a) Construction phase

Noise

The predicted construction noise levels are summarised in Table 6.10 for each assessment location. A 3D computer noise model was used to predict the $L_{Aeq(15minute)}$ noise levels for each assessment location. This represents the energy-average noise level over a 15-minute period and assumes all plant operating concurrently. In practice, the noise levels would vary because plant would move around the worksites and would not all be operating concurrently. This means that noise levels are likely to be lower than the worst-case noise levels presented for notable periods of time during the work.

Based on the construction noise impact assessment, construction noise levels are predicted to exceed the NMLs by up to 10 dB at residential receivers and 14 dB at commercial assessment locations during standard construction hours (refer Table 6.10). It is noted that the highly noise affected NML of 75 dB would not be exceeded at any location.

Table 6.10 Predicted construction noise levels

Assessment location	Classification	Time period	Noise affected NML, dB	Highly noise affected NML, dB	Predicted construction noise level, dB $L_{Aeq,15min}$	Relative to NML
R1	Residential	Standard	61	75	66	+5
R2	Residential	Standard	61	75	50	-11
R3	Commercial	When in use	70	n/a	52	-18

Assessment location	Classification	Time period	Noise affected NML, dB	Highly noise affected NML, dB	Predicted construction noise level, dB $L_{Aeq,15min}$	Relative to NML
R4	Commercial	When in use	70	n/a	53	-17
R5	Commercial	When in use	70	n/a	58	-12
R6	Residential	Standard	61	75	62	+1
R7	Commercial	When in use	70	n/a	71	+1
R8	Commercial	When in use	70	n/a	82	+12
R9	Commercial	When in use	70	n/a	84	+14
R10	Commercial	When in use	70	n/a	83	+13
R11	Place of worship	When in use	55	75	61	+6
R12	Residential	Standard	61	75	66	+5
R13	Residential	Standard	61	75	71	+10

Note: Standard hours (7am to 6pm Monday to Friday, 8am to 1pm Saturday and no work on Sunday or public holidays).

While the majority of the work required for the proposal would be undertaken during NSW EPA's recommended standard construction hours, certain work may need to occur outside of recommended standard hours including night work and or work during routine rail shutdowns.

Construction noise levels from the proposal are predicted to exceed the ICNG NMLs at a number of residential and commercial assessment locations. Subject to approval, construction is expected to commence in mid-2021 and take up to two years to complete. The construction methodology would be further developed during the detailed design of the Proposal by the nominated Contractor in consultation with TfNSW.

Sleep disturbance

Noise levels from the Proposal during the night period with the potential to cause sleep disturbance at nearby residents have been assessed in accordance with the criteria in section 6.3.2 and derived from the NPfI (EPA 2017). Noise modelling results are provided in Table 6.11 in comparison to the maximum noise screening criteria.

Table 6.11 Predicted maximum noise even levels

Residential assessment location	Predicted LAeq,15 minute noise level, dB	Predicted LAmax noise level, dB	Maximum noise screening criteria, dB	
na	Noise-enhancing	Noise-enhancing	LAeq,15 minute	LAmax
R1	66	76	41	52
R2	50	61	41	52
R6	62	75	41	52

Residential assessment location	Predicted LAeq,15 minute noise level, dB	Predicted LAmax noise level, dB	Maximum noise screening criteria, dB	
na	Noise-enhancing	Noise-enhancing	LAeq,15 minute	LAmax
R12	66	75	41	52
R13	71	82	41	52

Results of noise modelling demonstrate that maximum noise level events are predicted to exceed the relevant maximum noise level event screening criteria at all representative residential assessment locations under noise-enhancing meteorological conditions.

The predicted L_{Amax} noise levels represent a conservative upper level of noise likely to be experienced if night-time construction works occur at the nearest locations to residences. Existing L_{Amax} noise levels measured in the vicinity of Thornleigh station are in the range of 70-80 dB. Given that the existing ambient and predicted L_{Amax} noise levels are of a similar level, it is unlikely that construction works cause any significant additional sleep disturbance impacts at nearby residences.

Cumulative noise impacts

Cumulative noise impacts warrant assessment where more than one work scenario operates at the same time and in the same location such that the same receiver is impacted by noise from more than one work scenario. Generally, the proposed work is scheduled in consecutive phases which are dependent on rail shutdowns and therefore cumulative noise impacts are not anticipated as the assessment is controlled by noise impacts from the individual phases (as assessed).

Where construction work associated with other projects occurs at the same time as the Proposal, this has the potential to result in marginally higher noise levels at the nearby receivers. However, noisy work from each project would typically not occur at the same time, and may affect different facades of a building, minimising the cumulative impacts.

Construction traffic noise

The construction road traffic volumes anticipated are less than 2% of the existing road traffic volumes on both The Esplanade and Pennant Hills Road. As such, any increases in road traffic noise on The Esplanade or Pennant Hills Road due to construction traffic are considered to have a negligible impact and have not been assessed further.

Construction vibration

Structural damage

For the proposed work, vibration emissions are intermittent and therefore higher vibration levels occurring over shorter periods is consistent with standards.

The nearest residential façades are located approximately 30 metres or more from the proposed construction work. It is unlikely that significant vibration generating activities would occur within 23 metres of residential facades. Given the most vibration intensive item of plant to be utilised close to residences would be a small to medium sized excavator, the risk of vibration impacts is low.

The nearest commercial façades are located immediately adjacent to the proposed construction work. Given the possibility for vibration generating equipment to be operated within proximity to the nearest commercial façades, the guide values presented in Table 6.12 should be implemented. Equipment specification and construction methodology should be carefully chosen to minimise potential vibration impacts on these buildings.

A house, listed as locally significant under Schedule 5 of the Hornsby LEP, is located directly adjacent to Thornleigh Station across The Esplanade. There would be no vibration impacts on this item, as minor excavation works would be wholly contained within the rail corridor of Thornleigh Station. Additionally, construction works or heavy vehicle usage would not result in vibration impacts which could impact the façade of this heritage item.

Table 6.12 Recommended safe working distances for vibration intensive plant

Plant item[1]	Rating/description	Safe working distance	
		Cosmetic damage (BS 7385)	Human response (BS 6472)
Vibratory Roller	<50 kN (typically 1–2 tonnes)	5 m	15 to 20 m
	<100 kN (typically 2–4 tonnes)	6 m	20 m
	<200 kN (typically 4–6 tonnes)	12 m	40 m
	<300 kN (typically 7–13 tonnes)	15 m	100 m
	>300 kN (typically 13–18 tonnes)	20 m	100 m
	>300 kN (>18 tonnes)	25 m	100 m
Small hydraulic hammer	(300 kg - 5 to 12 tonne excavator)	2 m	7 m
Medium hydraulic hammer	(900 kg - 12 to 18 tonne excavator)	7 m	23 m
Large hydraulic hammer	(1,600 kg - 18 to 34 tonne excavator)	22 m	73 m
Jackhammer	Hand held	1 m (nominal)	Avoid contact with structure

Human comfort

To ensure human comfort, the safe working distances in Table 6.12 would apply to residential receivers. For the Proposal, vibration emissions would be intermittent and therefore higher vibration levels occurring over time would be acceptable. Considering the known distances between construction activity and receptors, it is unlikely that the Proposal would cause vibration impacts.

b) Operation phase

Once the Proposal has been completed, noise generated from the operation of Thornleigh Station is expected to remain the same as that currently experienced by the nearest assessment locations. The proposal is not expected to generate any additional noise and as such, operational noise impacts stemming from the proposal are considered unlikely and have not been assessed further.

At this stage of the design, specific lift systems have not been selected, which means it is too early to assess compliance with the applicable noise criteria. However, given that the noise source of these new elements has relatively low noise emissions, it is anticipated that additional noise sources could be mitigated if required during the detailed design phase of the Proposal through the selection of appropriate equipment.

Road traffic volumes associated with the operation of the proposal are not expected to change from current volumes. As such, road traffic noise impacts as a result of the proposal are considered unlikely.

6.3.3. Mitigation measures

Considering the predicted NMLS would be exceeded during construction at multiple residential and commercial assessment locations in addition to possible exceedances of the vibration criteria, additional mitigation measures (AMM) may be required under Transport for NSW's Construction Noise and Vibration Strategy (CNVS). This may include proposal notification and verification and proposal respite offer and/or consideration of alternative construction techniques.

Regardless, as noted in section 6.2.2, works should be completed during standard hours only where possible. Additionally, residents would be notified prior to work commencing and informed of the duration and noise level of the work and any proposed respite periods.

For work occurring outside of standard hours, such as night work or work during rail shutdowns, AMM that may be required under the CNVS procedures include proposal notification, verification, specific notification, respite period and/or duration reduction. However, as mentioned previously, the nature, timing and extent of the proposed out of hours work is not known at this stage and a review of the applicable additional mitigation measures should be undertaken once the extent of the proposed out of hours work is determined.

The CNVS mitigation requirements for construction vibration are outlined in Table 6.13.

Table 6.13 Required CNVS mitigation

Assessment location	Predicted level above VML		Mitigation required		
	Human disturbance	Building damage	Standard hours	OOHW Period 1	OOHW Period 2
R1	No	No	Nil	Nil	Nil
R2	No	No	Nil	Nil	Nil
R3	No	No	Nil	Nil	Nil
R4	No	No	Nil	Nil	Nil
R5	No	No	Nil	Nil	Nil
R6	No	No	Nil	Nil	Nil
R72	Yes	Yes	PN, V, RO, AC	PN, V, SN, RO, RP, DR, AC	PN, V, SN, RO, AA, RP, DR, AC
R82	Yes	Yes	PN, V, RO, AC	PN, V, SN, RO, RP, DR, AC	PN, V, SN, RO, AA, RP, DR, AC
R9	Yes	Yes	PN, V, RO, AC	PN, V, SN, RO, RP, DR, AC	PN, V, SN, RO, AA, RP, DR, AC
R102	Yes	Yes	PN, V, RO, AC	PN, V, SN, RO, RP, DR, AC	PN, V, SN, RO, AA, RP, DR, AC
R11	No	No	Nil	Nil	Nil
R12	No	No	Nil	Nil	Nil
R13	No	No	Nil	Nil	Nil

Note: 1. The following abbreviations are used: Project Notification (PN), Verification of monitoring (V), Duration Reduction (DR), Respite Period (RP), Specific Notification (SN), Alternative Accommodation (AA), Project specific respite offer (RO), Alternative construction methodology (AC).

2. As these locations are classified as commercial locations, the human disturbance mitigation measures only apply when the location is in use. The building damage mitigation measures (verification of monitoring and alternative construction methodology) are applicable regardless of whether the location is in use.

The nature, timing and extent of the proposed out of hours works is not known at this stage and a review of the applicable AMM should be undertaken once the extent of the proposed out of hours works is determined.

A number of standard mitigation measures would be adopted by the proposal and are detailed in Section 7.1. In addition to those identified in Section 7.1, additional mitigation measures have been identified through the Noise and Vibration Impact Assessment.

Noise impacts will be mitigated via the following work practice methods:

- avoiding the use of public address systems or other methods of site communication that may unnecessarily impact upon nearby residents
- where possible, avoid the use of equipment that generates impulsive noise
- minimise the movement of materials and plant and unnecessary metal-on-metal contact
- use two-way radio rather than horns for signalling between plant and work groups
- set site up to avoid the need for trucks to reverse
- minimise truck movements

Additional measures for plant and equipment include:

- where possible, choose quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks

Work scheduling measures include:

- where possible, schedule activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events
- where possible, scheduling noisy activities to coincide with high levels of neighbourhood noise so that noise from the activities is partially masked and not as intrusive
- where possible, scheduling noisy activities to be separate from other noise generating activities to reduce the overall noise generated
- where possible, planning deliveries and access to the site to occur quietly and efficiently and organising parking only within designated areas located away from the sensitive receivers
- optimise the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours

Community consultation includes:

- periodic notification (such as monthly letterbox drop) detailing upcoming construction activities delivered to sensitive receivers at least seven days prior to commencement of works
- register of most affected noise and vibration sensitive receivers (NVSRs) including address, category (residential, commercial, etc), contact name and phone number

6.4. Aboriginal heritage

An assessment was undertaken for the Proposal in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales guidelines recommended to be followed by the DPIE. The assessment involved desktop review of information and observations from site inspection. The following database searches were completed:

- Aboriginal Heritage Information Management System (AHIMS)
- National Native Title Tribunal (NNTT) Register of Native Title Applications Registration Decisions and Determinations and Register of Indigenous Land Use Agreements (ILUAs).

6.4.1. Existing environment

Thornleigh Station is located within Lot 5 DP 1205944. A search of the AHIMS database and NNTT Register was carried out for this Lot on 25 November 2020.

The AHIMS database search was conducted for Lot 5 DP 1205944 and a 50 metre buffer. The results of the AHIMS search did not identify any known Aboriginal sites or places in or near Thornleigh Station of the immediate rail corridor.

There are no determined native title or land claims over Thornleigh Station. In addition, no ILUAs exist over Thornleigh Station.

The laydown areas are located within the railway corridor extending north from Thornleigh Station. Although no ground disturbance is proposed for the laydown areas, searches of the relevant databases was completed to identify Aboriginal sites which may occur in or near the proposed laydown area. The results of the AHIMS search did not identify any known Aboriginal sites or places in or near Lot 5 DP 1205944.

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 Aboriginal objects. None of these features are present immediately surrounding the station 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 across the Proposal area suggests that the presence of culturally sensitive buried items is unlikely within the boundaries of the Proposal.

The extensive landscape modification that has occurred across the Proposal site suggests that intact evidence of Aboriginal land use is unlikely to occur within the boundaries of the Proposal site. Similarly, the high level of disturbance would suggest that the archaeological potential of the area is low. Accordingly, it was not considered necessary to undertake specific Aboriginal consultation.

6.4.2. Potential impacts

a) Construction phase

The construction phase of the Proposal would require earthworks for the construction of multiple elements, including:

- piling and excavation for lift shaft foundations and support structures
- stair demolition and new stair construction
- demolition and reconstruction of sections of the existing footbridge stairs
- platform work including lowering of the floor of the waiting areas on Platforms 1/2, and Platform 3 and provision of a Family Accessible Toilet and unisex Ambulant Toilet on Platform 1/2

- regrading and tie-in work in relation to existing roads and pathways, in order to achieve the compliant grades for DSAPT compliance
- other minor civil work, including drainage/stormwater work, and trenching activities for underground service adjustments and relocations.

Ground disturbance would be wholly contained within land previously disturbed through the historic establishment of Thornleigh Station.

As noted above, no known Aboriginal heritage items or sites exist within the proposed disturbance area. Considering the landscape of Thornleigh Station is highly modified, there is low archaeological potential within and surrounding Thornleigh Station. It is unlikely that unknown Aboriginal sites exist in or near Thornleigh Station. As such, the Proposal is unlikely to affect Aboriginal heritage during construction.

The laydown areas would be used for the storage of construction equipment and as a parking facility for the construction workforce. This land can be considered highly modified due to its location in the railway corridor. Considering no ground disturbance is proposed for the laydown area, the use of this land is unlikely to impact unknown Aboriginal sites.

The extensive landscape modification that has occurred across the Proposal site suggests that intact evidence of Aboriginal land use is unlikely to occur within the boundaries of the Proposal site. Similarly, the high level of disturbance would suggest that the archaeological potential of the area is low. Accordingly, it was not considered necessary to undertake specific Aboriginal consultation.

As no known Aboriginal heritage items are located in the vicinity of the Proposal site and no high-risk landscape features are considered to be within the Proposal site, the potential for unknown items to be present is considered to be low.

The construction phase of the Proposal is unlikely to affect Aboriginal heritage.

b) Operation phase

There would be no impact to Aboriginal heritage from the operation of the Proposal.

6.4.3. Mitigation measures

Considering the construction and operation of the Proposal is unlikely to impact Aboriginal sites, no specific mitigation measures have been proposed as part of this REF.

If unforeseen unidentified Aboriginal objects are uncovered during construction, the procedures contained in the Transport for NSW *Unexpected Heritage Finds Guideline* (Transport for NSW, 2019c) would be followed, and work within the vicinity of the find would cease immediately. The Contractor would immediately notify the Transport for NSW Proposal Manager and Transport for NSW Environment and Planning Manager so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, the Heritage NSW and the Local Aboriginal Land Council.

If human remains are found, work would cease, the site secured and the NSW Police and Heritage NSW 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.

6.5. Non-Aboriginal heritage

This section provides a summary of the desktop non-Aboriginal heritage assessment completed for the Proposal. To support this assessment, statutory and non-statutory databases were searched to form an understanding of the existing environment and to identify items of non-Aboriginal heritage significance which may exist in or near Thornleigh Station and therefore potentially be impacted by the Proposal. The following databases were searched on 25 November 2020:

- Hornsby LEP
- National Heritage List (NHL) under the EPBC Act
- Commonwealth Heritage List (CHL) under the EPBC Act
- State Heritage Register (SHR) under the NSW Heritage Act *1977*
- Heritage and Conservation Register under Section 170 (Section 170 Register) of the NSW *Heritage Act 1977*
- State Heritage Inventory (SHI)
- Register of the National Estate (RNE)
- National Trust of Australia (NT).

6.5.1. Existing environment

The desktop search did not identify any heritage items listed on the World, Commonwealth or National Heritage Lists or the Register of the National Estate within proximity of the Proposal.

To form an understanding of the existing environment in a non-Aboriginal heritage context, the results of the databases are summarised in Table 6.14.

Thornleigh Station is not listed on RailCorp's Section 170 Register or any of the other databases searched for this assessment.

Table 6.14 Summary of non-Aboriginal heritage database results

Database	Results	Distance to the Proposal
Hornsby LEP	Five items listed on Schedule 5 of the Hornsby LEP are located in vicinity of Thornleigh Station: • *House* (Heritage Item 689) • *House* (Heritage Item 690) • *House* (Heritage Item 723) • *House* (Heritage Item 725) • *House* (Heritage Item 718) The location of these items is shown on Figure 17.	Heritage items 689, 690 and 723 are located within the visual catchment of Thornleigh Station. The distances between these heritage items and Thornleigh Station are listed below: • Heritage Item 689 – 150 m south-west • Heritage Item 690 – 170 m south-west • Heritage Item 723 – 70 m north-west
NHL	No items listed	Not applicable
CHL	No items listed	Not applicable
SHR	No items listed	Not applicable
Section 170 Register	No items listed	Not applicable
SHI	No items listed	Not applicable
RNE	No items listed	Not applicable

Database	Results	Distance to the Proposal
NT	No items listed	Not applicable

6.5.2. Potential impacts

a) Construction phase

As shown on Figure 20, Heritage Item 723 *'House'* listed as locally significant under Schedule 5 of the Hornsby LEP. It is located directly opposite Thornleigh Station across The Esplanade. There would be no impact to this item, as construction activities would be wholly contained within the rail corridor of Thornleigh Station. Additionally, construction of the Proposal or heavy vehicle usage would not result in vibrational impacts which could impact the façade or structural integrity of this heritage item.

There would be minor and temporary changes to the visual catchment of these heritage items. This would comprise elements such as construction equipment, signage and rail infrastructure. This would be consistent with the existing visual catchment of these heritage items which contains rail infrastructure.

Considering the landscape of Thornleigh Station is highly modified, there is low potential for unknown non-Aboriginal heritage items to exist within or surrounding Thornleigh Station.

b) Operation phase

There would be no impact to non-Aboriginal heritage from operation of the Proposal. Minor yet permanent changes would occur to the visual catchment of the relevant heritage items, however the new elements within the visual catchment would be consistent with existing rail infrastructure.

6.5.3. Mitigation measures

The following mitigation measures are recommended to be implemented to minimise potential non-Aboriginal heritage impacts during the construction of the Proposal.

- All construction staff would undergo an induction in the recognition of non-Aboriginal cultural heritage material.
- If previously unidentified non-Aboriginal heritage objects are uncovered during construction, in accordance with Transport for NSW's Unexpected Heritage Finds Guideline (Transport for NSW, 2019d), work would cease in the vicinity of the find and the Transport for NSW Proposal Manager and Transport for NSW Environment and Planning Manager would be notified immediately to assist in co-ordinating next steps which are likely to involve consultation with an archaeologist, and Heritage NSW.

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

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Source: EMM (2021); DPE (2020); Nearmap (2020); DFSI (2017)

Non-Aboriginal heritage items in proximity to Thornleigh Station

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 20

EMM
creating opportunities

6.6. Socio-economic impacts

6.6.1. Existing environment

Overview

The Proposal is located in the suburb of Thornleigh in the Hornsby LGA. Thornleigh is located between the suburbs of Pennant Hills and Normanhurst. It is approximately 18 kilometres north-west of the Sydney CBD.

Thornleigh Station is zoned SP2 Rail Infrastructure Facility, with the majority of the surrounding land zoned R2 Low Density Residential (refer Figure 10). Local businesses on Pennant Hills Road are zoned B2 Local Centre and B6 Enterprise Corridor. A small area of land is zoned R4 High Density Residential just east of Pennant Hills Road.

Thornleigh Station is surrounded by predominately low-density residential housing. Local businesses surround the existing access to Thornleigh Station on Pennant Hills Road. The business precinct extends north on Pennant Hills Road and includes larger businesses like Bunnings Warehouse, a McDonalds and the McDonalds headquarters, Kennards Self Storage, an Ibis Hotel and Caltex Petrol Station amongst others.

Undisturbed bushland is located south-east of Thornleigh Station across Pennant Hills Road. The southern-most extent of Berowra Valley National Park is located 800 metres north-west of Thornleigh Station.

Demographics

In total, 19,437 people live across the suburbs of Normanhurst, Thornleigh and Westleigh with a median age of 39.5 (ABS 2015). In total, 1,368 people travel to work via public transport services. This includes 1306 people on train services and 62 people on bus services. In 2013, a total of 2120 people travelled to or from Thornleigh Station on a typical weekday (Bureau of Transport Statistics 2014).

Out of the total population of Normanhurst, Thornleigh and Westleigh, there are 415 persons over the age of 85 (ABS 2015), which is approximately 2% of the total population. There are 580 persons between the ages of 0-4 years, making up 6.9% of the total population. This provides an indication of the potential use of wheelchairs, walking frames or pram use within the suburb.

In total, 313 persons received the disability support pension. Additionally, 317 persons have a profound or severe disability. This provides an indication of the amount of people living with a disability in the area.

In addition to meeting requirements of the DSAPT, the Proposal would succeed in providing appropriate facilities to support the use of train services by the elderly and disabled population as well as parents with prams.

Community Plan

Hornsby Council's primary strategic planning document is the *Hornsby Shire Community Strategic Plan 2018-2028* (the plan). It notes four key themes to meet the community's vision of Hornsby Shire LGA: liveable, sustainable, productive and collaborative.

The Proposal fulfils multiple key community outcomes of the plan under the themes of 'liveable' and 'productive'. The plan identifies a need to establish infrastructure that meets the needs of a liveable and productive community, with main indicators being the implementation of adequate aged care and disability services and facilities and public transport which is adequate for needs.

Hornsby Local Strategic Planning Statement

The Hornsby LSPS sets up the 30-year vision for land use in the Hornsby area and outlines how this change would be managed. The key priorities emphasised in the Hornsby LSPS relevant to the Proposal include:

- P3 - responding to climate change with an active strategy to reduce carbon emissions and manage energy, waste and water efficiently
- P5 - revitalising the Hornsby Town Centre
- P8 - supporting sustainable economic growth based on the Shire's built and natural assets, infrastructure and locational advantages
- P10 - promoting the '30-minute City' by improving the walkability, connectivity and accessibility of our centres and neighbourhoods.

6.6.2. Potential impacts

a) Construction phase

During the construction phase, the local amenity of the surrounding residential housing may be impacted by construction noise and alternate access options to the station platforms. However, these impacts are likely to be temporary as detailed in Section 6.2. As detailed in Section 6.3, the visual impact of surrounding residential housing would vary depending on the viewpoint location.

Local businesses on Pennant Hills Road and Railway Parade may be impacted by localised traffic impacts from the use of heavy vehicles. As noted in section 6.4.2, heavy vehicles including a crane for the delivery and installation of the lift and other elements such as glazing panels and safety screens and concrete agitator trucks would be required during the construction phase. Whether a crane is needed would be determined during detailed design of the Proposal, including the type of crane and most suitable access point to Thornleigh Station. The proposed construction access to Thornleigh Station from Pennant Hills Road is through the car park of the Giant Bike Store. Although the majority of the parking spaces would be maintained through the construction phase, this may temporarily impact access to Giant Bike Store. Transport for NSW would consult with Giant Bike Store prior to any access changes to minimise impacts to the business.

Construction related light vehicles would park in the proposed laydown area, which would reduce impacts to roadside parking. However, some overflow may occur, in particular during rail shutdowns conducted predominantly on weekends. Further discussion on traffic and parking impacts are provided in Section 6.1.

Pedestrian access to local businesses, Thornleigh Station or surrounding residential housing would not be significantly impacted by the Proposal and access would be maintained during construction.

The Proposal may result in minor and localised positive socio-economic impacts to local businesses due to spending by the construction workforce.

With the exception of scheduled rail shutdowns, access to the station would be maintained at all times during construction, including pedestrian access to both sides of the station. Temporary pedestrian diversions would be placed around the construction areas.

Vehicle access to the commuter car park would be maintained during construction, however there would be temporary disruptions and unavailability of some parking spaces surrounding the accessible parking spaces in the commuter car park. Access to the rest of the parking spaces in the existing commuter car park will be maintained throughout the work. The amount and location of disrupted parking spaces would be confirmed during detailed design of the Proposal.

The Proposed activity would largely be contained within the rail corridor however the Proposal includes some work within the road reserve of The Esplanade on Hornsby Shire Council land to replace the bus stop. Improvement works proposed at the northern station entrance including footpath and landscaping upgrades is also located on land maintained by Council.

The Transport for NSW *Social Procurement and Workforce Strategy* outlines specific targets for a socially sustainable inclusive workforce. These requirements would be incorporated into contracts for the construction phase and would have positive impacts on the economic, social, and environmental well-being of the LGA. Opportunities for local businesses, local employment opportunities, community welfare programs and community cultural activities would be investigated.

b) Operation phase

Overall, the Proposal would result in positive socio-economic impacts to the surrounding community through:

- improved accessibility of Thornleigh Station for the community including new levelled ground at both station entrances, accessible parking and lifts
- improved customer amenity of Thornleigh Station through new levelled ground providing accessibility to the toilet and platforms and also weather protection on the platforms
- improved safety facilities on the platforms through new tactile floor on the edge of the platform
- improved safety facilities from the installation of CCTV
- improved safety of the Wells Street walkway by widening the walkway, entrance to the walkway and entrance to the station
- improved transport interchange facilities through the upgrading of accessible car parking spaced in the multi-storey car park on The Esplanade and on Railway Parade and levelling out and replacement of the bus shelter on The Esplanade.

The Proposal may promote a modal shift in transport and would enable increased use of the station by members of the community with a disability, limited mobility, parents/carers with prams, and customers with luggage.

Existing parking spaces on Railway Parade would be converted to accessible parking spaces and a widened entry to the walkway, therefore potentially impacting the local businesses in the immediate vicinity by reducing short term parking in proximity to the businesses.

6.6.3. Mitigation measures

Mitigation measures to address socio-economic impacts are provided in Section 7.2.

Any impacts to pedestrian, traffic or roadside parking would be managed by ensuring access to existing facilities is maintained where possible, although there may be temporary changes to access routes.

Transport for NSW has completed early community consultation to inform the surrounding community on the Proposal and receive feedback on how this may impact the community. Transport for NSW would continue to consult with the community and other stakeholders (including businesses) through all stages of the Proposal in consideration of the Proposal's Community Liaison Management Plan, including the notification of any temporary changes to access routes. Community consultation completed to date for the Proposal has been detailed in Section 5.

Transport for NSW will liaise with Hornsby Shire Council regarding opportunities to relocate short-term parking further to the north along Railway Parade.

Consultation would be undertaken Hornsby Shire Council to determine ongoing ownership and maintenance responsibilities of Proposal elements located on Council owned road reserve.

6.7. Biodiversity

A Biodiversity Impact Assessment Report was prepared for the Proposal (Technical Paper 1). This included a site inspection by two qualified ecologists on 18 November 2020, along with a review of relevant databases and other ecological resources including:

- Protected Matters Search Tool, managed by DAWE, for matters protected by the EPBC Act (a copy of the search results is provided in the Biodiversity Impact Assessment Report)
- BioNet Atlas of NSW Wildlife, managed by the Biodiversity Conservation Division (BCD) of DPIE, for threatened species and communities listed under the BC Act and EPBC Act
- Regional vegetation mapping
- NSW Vegetation Information System (VIS), managed by BCD, to review plant community types (PCTs) that may occur
- NSW Weedwise website to identify priority weeds for the Greater Sydney Local Land Services (LLS) region
- Aerial imagery and other relevant spatial information such as soil mapping.

6.7.1. Existing environment

Vegetation

The Proposal is located on the Hornsby Plateau, a sandstone plateau to the north of Sydney Harbour. The key vegetation type indigenous to this area is Blue Gum High Forest, which is a tall open forest or wet sclerophyll forest associated with high rainfall areas on Wianamatta Shale soils and which was historically characterised by very large Sydney Blue Gum (*Eucalyptus saligna)* and Blackbutt (*E. pilularis*). Since European settlement, the land was cleared for farms and orchards, followed by the development of the northern railway and subsequent urban settlement.

Local government area mapping indicates that native vegetation within the study area is limited to a stand of Blackbutt Gully Forest remnant trees, located within the rail corridor between the two proposed laydown areas. Blackbutt Gully Forest is classified as Plant Community Type 1841- Coastal enriched sandstone moist forest under the NSW Plant Community Type classification. Blackbutt Gully Forest is a vegetation community that is related to Blue Gum High Forest. It is characterised by a canopy of Blackbutt, Smooth-barked Apple (*Angophora costata*) and Turpentine (*Syncarpia glomulifera*) but can also have less frequent occurrences of Red Bloodwood (*Corymbia gummifera)*, Sydney Peppermint (*Eucalyptus piperita*), Red Mahogany (*E. resinifera*) and Sydney Blue Gum.

The findings of the site investigation were generally consistent with the local government area vegetation mapping in that there were no remnant woodland or forest patches remaining in the study area. Extant vegetation is restricted to stands of remnant trees and planted vegetation containing a mix of native and non-native species, with the following key vegetated areas observed as follows:

- a patch of trees on The Esplanade side of the station dominated by planted Brush Box (*Lophostemon confertus*) over planted understorey (Figure 21), and a few regenerating Blackbutt (*Eucalyptus pilularis*) trees at the Wells Street intersection. Brush Box occurs north from the Hunter Valley and is not indigenous to the Sydney region, whilst Blackbutt is indigenous to the study area;

- native and exotic shrub plantings alongside the Brush Box plantings, adjacent to the rail corridor fenceline on The Esplanade side of the station (Figure 22) dominated by:
    - Flaxleaf Broom (*Genista linifolia*), which is a priority weed for Greater Sydney LLS region;
    - *Westringia* species, which is a commonly cultivated group and was likely to have been planted as part of the station landscaping. Many *Westringia* species that naturally occur within the Sydney region grow on sandy or skeletal soils either in mallee, shrublands or on exposed cliff habitats and not the wet sclerophyll forest types that would have originally occurred in the study area; and
    - Tick Bush (*Kunzea ambigua*), which occurs within the Sydney region but is naturally associated with heath or dry sclerophyll forest vegetation and not the wet sclerophyll forest types that would have originally occurred in the study area. This species was likely to have been planted as part of the station landscaping;
- a stand of remnant trees on the Railway Parade side of the station behind a commercial carpark. This stand contains two mature Sydney Blue Gum trees (*Eucalyptus saligna*) and two White Cedar trees (*Melia azedarach*). Both species are indigenous to the study area. The trees are identified as Tree ID 1 and 2 (Sydney Blue Gum) and Tree ID 3 and 4 (White Cedar) within the arboricultural assessment (Witten 2020) and would be referred to these tree numbers hereafter;
- mixed exotic and native plantings on the embankment within the rail corridor and adjacent to the pedestrian walkway on the Railway Parade side of the station. Frequently recorded species at this location include:
    - Brush Box (native but not indigenous to Sydney region)
    - Sydney Golden Wattle (*Acacia longifolia*) (native but commonly planted and not associated with the wet sclerophyll forest types that would have originally occurred in the study area)
    - Broad-leaved Paperbark (*Melaleuca quinquenervia*) (native but associated with coastal swamps and around lake margins, and not with the wet sclerophyll forest types that would have originally occurred in the study area)
    - Cootamundra Wattle (*Acacia baileyana*) (not indigenous to the Sydney region)
    - Queensland Silver Wattle (*Acacia podalyriifolia*) (not indigenous to the Sydney region)
    - Camphor Laurel (*Cinnamomum camphora*) (invasive exotic species)
    - Flaxleaf Broom (priority weed for Greater Sydney LLS)
    - Large-leaved Privet (*Ligustrum lucidum*) (invasive exotic species)
    - Lantana (*Lantana camara*) (priority weed for Greater Sydney LLS)
- four Sydney Blue Gum saplings located within the above patch of mixed native and exotic plantings, with diameters at breast height (DBH) estimated to be between two centimetres to 15 centimetres
- large occurrences of Large-leaved Privet along the railway corridor fence line near the carpark on Railway Parade. This is an invasive exotic species
- two Lemon-scented Gum trees (*Corymbia citriodora*) and one Turpentine (*Syncarpia glomulifera*) located at the proposed site office. Lemon-scented Gum naturally occurs in Queensland and is not indigenous to the Sydney region, whilst Turpentine is indigenous to the study area.

Vegetation within the remaining study area comprises woody invasive weeds and exotic ground cover species. The proposed laydown areas are located entirely within cleared exotic grassland.

The stand of remnant trees behind a commercial carpark (Trees 1, 2,3 and 4), as well as the four saplings of Sydney Blue Gum trees on the embankment near the Railway Parade station access belong to Blue Gum High Forest, which is a critically endangered ecological community (CEEC) listed under the BC Act and EPBC Act. Under the BC Act listing, the CEEC can comprise remnant trees without a native understorey, whilst the EPBC Act listing for Blue Gum High Forest excludes such stands from the CEEC. These trees comprise the local occurrence of Blue Gum High Forest within the study area in accordance with the BC Act listing. These trees and areas are shown on Figure 24.

Figure 21 Brush Box plantings along The Esplanade

Figure 22 Planted shrubs along the rail corridor fence line, The Esplanade

Figure 23 Sydney Blue Gum sapling at the edge of Platform 1 at the Railway Parade access

Figure 24 Sydney Blue Gum High Forest vegetation behind Domino's Carpark

Source: EMM (2021); DFSI (2017); GA (2011); Hornsby Shire Council (2019)

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GDA 1994 MGA Zone 56

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KEY

- Sydney Blue Gum sapling
- Subject tree
- Rail line
- Vegetation trimming

Vegetation community

- Blue Gum Shale Forest - Remnant Trees (BC Act)
- Brush Box - planted stand
- Cadastral boundary

Indicative site work areas

- Material laydown
- Construction footprint

Vegetation mapping of the Proposal area

Transport for New South Wales
Thornleigh Station access upgrades
Review of environmental factors
Figure 25

EMM
creating opportunities

Priority Weeds

Of the 29 weed species recorded, three are priority weeds for the Greater Sydney LLS region. These are:

- African Olive (*Olea europaea subsp. Cuspidate*)
- Flaxleaf Broom (*Genista linifolia*)
- Lantana (*Lantana camara*)

Refer to Appendix B of the Biodiversity Impact Assessment Report for a full list of weed species recorded during the field investigation.

Threatened ecological communities

A discussion of locally listed Threatened Ecological Communities that are potentially reflective of the vegetation identified in the vicinity of the project is provided below:

- Blue Gum High Forest of the Sydney Basin Bioregion (EPBC Act)
    - For vegetation to conform to EPBC Act listing as *Blue Gum High Forest of the Sydney Basin Bioregion*, characteristic native species from all structural layers must be present and the patch size must be greater than one hectare. The listing advice specifically states that single isolated trees or stands of trees without a native understorey do not form part of the listed community (TSSC 2005).
    - The stand of trees represented by Tree IDs 1, 2, 3, 4 and the four Sydney Blue Gum saplings do not meet the condition thresholds to be included as part of the CEEC Blue Gum High Forest of the Sydney Basin Bioregion. Although the trees would have once been part of the CEEC, it is considered to fall outside of the definition of the CEEC due to its highly modified state and degraded condition, and lack of native midstorey and ground components.
- Blue Gum High Forest in the Sydney Basin Bioregion (BC Act)
    - The remnant Blue Gum High Forest occurring in the study area (as represented by Tree IDs 1, 2, 3 and 4 and the four individual saplings) conforms to the BC Act listing for the critically endangered ecological community (CEEC) *Blue Gum High Forest in the Sydney Basin Bioregion* (NSW Scientific Committee 2011).

Threatened species habitat

The forest vegetation within the study area is modified from its original state by historical clearing and urban development. The study area features an actively managed rail corridor and a well-frequented train station.

None of the trees inspected within the study area within proximity of the subject site are hollow-bearing or contained active nests. No burrows, denning sites, or water features (including wet drains and soaks, or shallow pools) were observed within the study area. There were no observed flying-fox camps, signs of owl whitewash or other evidence of fauna usage of the study area. There was no timber debris, log piles or rail sleeper piles that would function as ground habitat or refugia for rare or cryptic species. Some ground fauna groups, such as common reptile species or urban pest species, may be encountered in the understorey within the study area but threatened ground mammals are unlikely to occur.

The habitat values of the study area for fauna are generally limited to foraging habitat represented by blossom-producing trees and shrubs, including planted vegetation within a landscaped matrix and street trees. It is expected that blossom- and canopy- foraging species would use the study area for foraging resources as part of a larger foraging range and/ or as part of movements within vegetation along the rail corridor.

The vegetation within the study area does not support characteristic koala feed tree species from Schedule 2 of the Koala SEPP. One secondary food tree species, Red Mahogany (*Eucalyptus resinifera*), listed for the Central Coast Koala Management Area (DECC 2008) was recorded within the study area at The Esplanade station access among established Brush Box plantings; there are three mature Red Mahogany trees in this area. There are nine records of Koala (*Phascolarctos cinereus)* in the search area between 2017 and 2020, with the most recent being recorded within Ku-ring-gai Chase National Park. However, the study area is unlikely to provide potential koala habitat due to isolation from more contiguous areas of vegetation.

Threatened species

No threatened species were observed within the study area during the field investigation.

The threatened species atlas database and protected matters search report indicates that there are 50 threatened flora species and 49 threatened fauna species that have been recorded in the search area within the last 20 years or are predicted to occur. The threatened fauna species records are represented by four frog species, 22 bird species, two invertebrate species, 19 mammal species and two reptile species.

In addition, four migratory species have also been recorded, or are predicted to occur.

Protected marine species (including pelagic mammals, reptiles, birds and fish), wading birds and shorebirds are excluded from the assessment as there is no suitable habitats for these species within the study area.

Threatened flora

The majority of the threatened flora species known or predicted to occur in the search area are not associated with Blue Gum High Forest habitat but rather shale/sandstone transition habitats, heath woodlands, sandstone ridgetop habitats or moist habitats such as rainforests, swamp woodlands, riparian or gully habitats. No threatened flora species were observed within the study area during field investigation and no threatened flora species are considered likely to occur within the subject site.

Considering the above, no further assessment of threatened flora is required.

Threatened fauna

Of the threatened fauna species known or predicted to occur in the search area, the species that are likely to utilise the habitats within the study area are highly mobile species that could forage over the study area as part of a larger foraging range. A likelihood of occurrence assessment has been prepared, which indicates that the threatened Powerful Owl (*Ninox strenua*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Eastern Coastal Free-tailed Bat (*Micronomus norfolkensis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) are known from the search area and there may be resident populations nearby. These species are likely to flyover, forage or rest in the canopy from time to time but are unlikely to be residing (roosting, nesting, breeding) in the vegetation in the study area.

There are no Grey-headed Flying-fox camps within the study area and considering their range, no further assessment is required for this species. However, considering the high number of records for Powerful Owl, Gang-gang Cockatoo and microbats within the search area, five-part tests have been completed on a conservative basis to assess the potential impacts of the proposal on suitable foraging habitat for the following species:

- Powerful Owl
- Gang-gang Cockatoo
- Large Bent-winged Bat

- Little Bent-winged Bat (*Miniopterus australis*)
- Eastern Coastal Free-tailed Bat
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*), and
- Eastern False Pipistrelle.

Nectarivorous birds like Little Lorikeet (*Glossopsitta pusilla*) and Swift Parrot (*Lathamus discolor*) have been recorded in the search area but are likely to utilise the site on a transient basis rather than rely on the habitats in the study area on a more permanent basis.

There is no breeding or foraging habitat for frog species, lakes and large waterbodies for White-bellied Sea-eagle (*Haliaeetus leucogaster*) or abundant Allocasuarina trees for Glossy Black-Cockatoo (*Calyptorhynchus lathami*).

Considering the above, no further assessment of remaining threatened fauna is required.

Migratory species

There are four migratory species that have been recorded in the search area or are predicted to occur:

- Fork-tailed Swift (*Apus pacificus*) – occurs in inland plains, coastal foothills and cliffs, and beaches;
- Satin Flycatcher (*Myiagra cyanoleuca*) – occurs in heavily vegetated sheltered gully forest;
- Yellow Wagtail (*Motacilla flava*) – utilises wetland habitats and marshlands; and
- Rufous Fantail (*Rhipidura rufifrons*) – occurs in tall wet sclerophyll forests with a dense shrubby understorey.

These species are unlikely to occur within the study area as there is a lack of suitable foraging, nesting and roosting habitat for these species.

Considering the above, no further assessment of migratory species is required.

6.7.2. Potential impacts

a) Construction phase

Direct impacts

Vegetation removal

Vegetation removal that would be required as part of the proposal would be limited to works on the Railway Parade side of the station access and be restricted to the plantings on the embankment within the rail corridor. This would include removal of the following trees, which are not part of Blue Gum High Forest CEEC:

- Large-leaved Privet (one tree)
- Camphor Laurel (four trees)
- Illawarra Flame Tree (*Brachychiton acerifolius*) (one tree), and
- Broad-leaved Paperbark (one tree).

Large-leaved Privet and Camphor Laurel are invasive exotic woody weeds and their removal does not represent a constraint to the proposal. Illawarra Flame Tree and Broad-leaved Paperbark are both native plant species that are known to occur in the Sydney region. However, Illawarra Flame Tree is a subtropical rainforest specialist that is often cultivated in gardens and is not associated with the wet sclerophyll forest types that would have occurred in the study area. Likewise, Broad-leaved Paperbark is a swamp forest species and is also not associated with the wet sclerophyll forest types that would have originally occurred in the study area. It is likely that Illawarra Flame Tree and Broad-leaved Paperbark were established as part of the station landscaping. Their removal does not represent a constraint to the proposal.

The occurrence of Sydney Blue Gum trees (Trees 1, 2, 3, 4 and four saplings) would be avoided and retained in situ.

The understorey component of this area of vegetation is dominated by Flaxleaf Broome, which is a priority weed and a Weed of National Significance.

Vegetation trimming

Vegetation trimming works would primarily affect exotic and planted native vegetation. Trimming works on along the Railway Parade side of the station would affect Camphor Laurel, planted wattles and Large-leaved Privet along the rail corridor fence line.

Trimming works along The Esplanade side of the station access would largely affect Brush Box (which is a species that is native to northern NSW but is a commonly planted landscape tree species within the Sydney area), and up to two Red Mahogany trees, with an estimated removal of approximately 119m² or 0.012 hectares of canopy.

Impacts on critically endangered Blue Gum High Forest

An assessment of significance has been prepared in accordance with Section 7.3 of the BC Act (refer to the Biodiversity Impact Assessment Report). The assessments conclude that the proposal is unlikely to have a significant impact on the persistence of the local occurrence of Blue Gum High Forest.

Blue Gum High Forest has a highly restricted distribution and has suffered a severe reduction in extent from its original extent. It is severely fragmented and persists as small, often highly degraded or modified patches within an urban matrix. It continues to be affected by urban land use, particularly weed invasion, the effects of which are amplified in small, fragmented patches.

Notwithstanding this, the proposal would avoid all occurrences of Blue Gum High Forest remnant and regenerating trees, which would be retained and would contribute to the continued persistence of the community. Trimming works are also unlikely to adversely affect the persistence of the community within the study area, particularly as trimming would avoid Blue Gum High Forest trees and chiefly affect exotic trees or non-indigenous native species.

The implementation of mitigation measures and environmental safeguards as outlined in Section 7.2 would mitigate impacts on the integrity of the local occurrence of the community. The tree protection measures outlined would ensure that impacts on Blue Gum High Forest can be avoided.

On the basis that the measures identified within Section 7.2, the assessments conclude that the proposal is unlikely to have a significant impact on the persistence of the local occurrence of Blue Gum High Forest.

There are no areas of Blue Gum High Forest listed under the EPBC Act within the subject site.

Impacts on threatened species

An assessment of significance has been prepared in accordance with Section 7.3 of the BC Act for the following threatened species:

- Powerful Owl
- Gang-gang Cockatoo
- Large Bent-winged Bat
- Little Bent-winged Bat
- Eastern Coastal Free-tailed Bat
- Yellow-bellied Sheathtail-bat
- Greater Broad-nosed Bat, and
- Eastern False Pipistrelle.

The assessments indicate that the proposal is unlikely to have a significant impact on the above species as the proposal:

- is unlikely to interfere with critical life cycle stages such as breeding
- would not reduce a substantial area of foraging habitat, provided that the mitigation measures and environmental safeguards as outlined in the Biodiversity Assessment Report are implemented
- such foraging habitat is not considered to be critical to the long-term persistence of the species in the locality, and
- is unlikely to fragment or isolate foraging habitat.

None of the species listed above are listed under the EPBC Act.

Indirect impacts

The field investigation identified 29 weed species within the Proposal area, with three of these classified as priority weeds. Soil disturbance associated with the proposed construction work is likely to encourage the establishment of these weeds within the Proposal area. Mitigation measures outlined in Section 6.7.3 are to be implemented to prevent and control their spread.

b) Operation phase

No operational impacts to biodiversity are anticipated from the Proposal.

6.7.3. Mitigation measures

The specific safeguards below are prescribed to address the potential impacts of the proposal on biodiversity values:

- CEMP is to include a map and details about the Blue Gum High Forest, noting that it has an extremely high level of conservation significance, with the vegetation listed as Critically Endangered. The CEMP should also note that whilst removal of specified landscape trees and tree branches is part of the project, that great care must be taken not to exceed the project's impacts without assessment and approval.
- Minimise the area of native vegetation to be cleared as far as is practicable through the detailed design process, particularly in areas of CEEC.
- Should additional vegetation removal be required above that assessed in this report, then assessment and approval must be sought before these works occur.

- Delineating work areas by survey with a high visibility barrier such as bunting, flagging tape or the like to prevent accidental clearing or disturbance of retained vegetation.
- Implement the tree protection measures as outlined in the arboricultural impact assessment and tree protection measures (Witten 2020) to protect trees that would be retained. The tree protection measures include provisions for:
    - Tree protection fencing
    - Site inspections by a qualified arborist at key project stages, and
    - Specific measures to protect trees at the Railway Parade station access (Trees 1, 2, 3 and 4).
- Undertake site survey, including trunk diameter and canopy spread, to confirm precise tree locations and tree impacts during detailed design phase.
- Implement protection measures for four Sydney Blue Gum saplings to be retained near the Railway Parade station access to protect these saplings during construction and post construction works.
- The measures are to include identification of the saplings on ground using high visibility flagging tape to clearly mark the locations of the trees to be avoided, and setback of the construction footprint a minimum of 2 metre from these saplings.
- Undertake tree replacement in accordance with the Transport for NSW *Vegetation Offset Guide* (DMS-SD-087).

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

6.8. Contamination, geology and soils

6.8.1. Existing environment

Landform, geology and soils

The natural topography of the Proposal area is characterised as low hills and is underlain by Wianamatta Group Shale within the Hornsby Plateau (eSPADE 2020). The topography of the area gently slopes north-east.

The Proposal area is located within the Glenorie Soil Landscape (eSPADE 2020). The Glenorie Soil Landscape is an erosional soil landscape found on rolling hills of the Wianamatta Group Shale. The Glenorie Soil Landscape is typical of shallow to moderately deep soils around 100 centimetres thick. Typical soil types include red and brown chromosols (red and brown podzolic soils) and yellow chromosols (yellow podzolic soils).

Acid sulfate soils

As mapped on the eSPADE mapping tool by DPIE, there is no risk for acid sulfate soils (ASS) in or near Thornleigh Station. Additionally, no land in or near the Proposal area is mapped to contain ASS under the Hornsby LEP.

Contamination

Thornleigh Station may contain traces of contaminants in the soil due to the historical use of the land as a railway corridor. Contamination may have resulted from the introduction of fill materials or oil spills.

Given the age of the building at Thornleigh Station, there is also potential for asbestos materials and lead paint to be encountered in the platform building.

The NSW Environmental Protection Authority (EPA) maintains a register of notices made under the NSW *Protection of the Environment Operations Act 1997* (PoEO Act) for activities which may result in pollution if not addressed. There are multiple current notices issued by the NSW Environmental Protection Authority (EPA) for activities within the suburb of Thornleigh at six different premises. None of these premises are located within a one kilometre radius.

6.8.2. Potential impacts

a) Construction phase

The Proposal would require minor excavation work for several elements of the Proposal. Soil disturbance associated with minor excavation works could result in the following impacts:

- erosion of exposed soil and stockpiled material
- increase in sediment loads entering waterways or stormwater systems
- dust generation from excavation or vehicle movements of exposed soil.

The Lane Cove River is located approximately one kilometre south-east of Thornleigh Station in bushland. The Lane Cover River extends further south to the Parramatta River. Three shallow drainage lines extend off Lane Cover River towards Thornleigh Station, including Scout Creek, Camp Creek and Terra Ulong Creek. Tedbury Creek, a shallow tributary of Berowra Creek, is located 1.2 kilometres north-west of Thornleigh Station.

It is unlikely that sediment run-off would impact waterways near Thornleigh Station, as the topography gently slopes north-east, downhill from these nearby waterways. The land surrounding Thornleigh Station is heavily built which would prevent the travel of sediment run-off towards surrounding waterways.

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

The Proposal has the potential to disturb asbestos containing material and other hazardous substances (such as lead paint) from modifications to the existing platform building. There is also potential for construction activities to result in the contamination of soil through accidental spills of dangerous goods.

b) Operation phase

There would be no operational risk to geology and soil, or operational risk of contamination as a result of the Proposal.

6.8.3. Mitigation measures

Mitigation measures would be implemented to ensure sediment loads or contaminants do not enter waterways or stormwater drainage system. An Erosion and Sediment Control Plan would be prepared for the construction phase of the Proposal in consideration of the *'Blue Book' Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). Additionally, mitigation measures would be implemented to prevent the contamination of the surrounding environment from the spillage of hazardous materials.

Erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the works are complete and areas are stabilised.

As there is potential for onsite contamination given historic activities associated with the railway land use, prior to construction commencing, a contamination investigation would be undertaken by a suitably qualified professional to confirm the composition and nature of excavated material.

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.

Refer to Section 7.2 for a full list of mitigation measures relevant to contamination, geology and soils.

6.9. Hydrology and water quality

6.9.1. Existing environment

Surface water

The Proposal area is within the Glenhaven Hydrogeological Landscape (GHL). It is located within the Berowra Catchment of the broader Sydney Metro Catchment.

The Lane Cove River is located approximately one kilometre south-east of Thornleigh Station in bushland. The Lane Cover River extends further south to the Parramatta River. Three shallow drainage lines extend off Lane Cover River towards Thornleigh Station, including Scout Creek, Camp Creek and Terra Ulong Creek. Tedbury Creek, a shallow tributary of Berowra Creek, is located 1.2 kilometres north-west of Thornleigh Station.

The suburb of Thornleigh is not mapped as flood prone land under the Hornsby LEP.

Groundwater

There is a localised groundwater system within the GHL. Groundwater flow occurs along structures in fractured bedrock and connected pores within sandstone units. The groundwater system is characterised by short flow lengths, intermediate to deep groundwater table depth (over 10 metres), moderate to high recharge rate and freshwater quality (eSPADE 2020).

Based on searches of the WaterNSW publicly available data completed in November 2020, there are no groundwater bores in proximity to the Proposal area.

Water quality

Water quality within the GHL is generally fresh. It is characterised by low salinity and low electricity conductivity (EC) (eSPADE 2020). The nearest waterway with available water quality data is Waitara Creek, which is approximately two kilometres north-east of Thornleigh Station. Like Tedbury Creek which is located in proximity to Thornleigh Station, Waitara Creek is a tributary of Berowra Creek. The results of water quality monitoring for the Waitara Creek are summarised below (Hornsby Shire Council website accessed November 2020):

- elevated pH and EC
- low dissolved oxygen
- low turbidity and total suspended solids (TSS)
- elevated nutrient and bacteria levels.

6.9.2. Potential impacts

a) Construction phase

There is potential for sediment loads or pollutants to enter waterways or the stormwater system from the proposed construction work if not appropriately managed.

Mitigation measures would be implemented as part of the Erosion and Sediment Control Plan prepared for the construction phase of the Proposal to prevent sediment run-off or contaminants entering the surrounding environment (refer section 7.2).

WaterNSW requires that any impacts from an activity located within a drinking water catchment result in a neutral or beneficial (NorBE) impact to water quality within that drinking water catchment. The Proposal is not located within a drinking water catchment and therefore an assessment under the NorBE Tool is not required to be completed for the Proposal.

While groundwater levels were not determined as part of this assessment, areas of excavation may need to be locally dewatered as a result of groundwater seepage or rainfall runoff (such as within the vicinity of the excavations for the western lift). Incorrect dewatering may pose risks to nearby waterways where run-off travels from the site to these areas.

It is proposed that a depth of less than 2 metres below ground surface would need to be excavated for installation of the lifts. Based on the information available, the station and proposed work areas are unlikely to be at risk of inundation during a flooding event.

b) Operation phase

Reconfiguration of the existing access ramp and stairs on the western side of the station and regrading of other footpaths within the station precinct may result in a minor alteration to the surface water flow regime where these areas result in a minor increase in overall hardstand area.

Alterations to the surface water flows would likely be within the capacity of the stormwater network and as such, impacts would be minor.

The proposed lift shafts would require drainage connections for the lift shaft rainwater to the nearest existing stormwater drainage line. The detailed design would take stormwater management around new and existing structures into consideration and the stormwater system for the Proposal would be designed to meet the requirements of AR & R guidelines and the AS3500 National Plumbing and Drainage Code.

6.9.3. Mitigation measures

A site-specific Erosion and Sediment Control Plan would be prepared and implemented for the Proposal to manage risks to water quality.

Other mitigation measures that would be required for construction and detailed in a CEMP include regular vehicle and equipment maintenance, sediment fencing, along with spill kits and spill response procedures.

Surface water runoff from paved areas would be directed to existing the stormwater management system around the station.

If groundwater is encountered during excavations, groundwater would be managed in accordance with the requirements of the Waste Classification Guidelines (EPA, 2014) and Transport for NSW Water Discharge and Reuse Guideline (Transport for NSW, 2019e).

Operational risks associated with localised flooding from an increase to impervious areas from new/widened footpath and new vehicle bay would be addressed during detailed design of the Proposal.

Refer to Section 7.2 for a full list of mitigation measures relevant to hydrology and water quality.

6.10. Air quality

6.10.1. Existing environment

Regional air quality

DPIE manages a network of air quality monitoring stations across NSW. The nearest station to the Proposal is in Macquarie Park, which is therefore the most representative of air quality at the Proposal area.

Between January 2019 to December 2019, the daily site air quality index for the Macquarie Park monitoring station was 'very good' to 'fair' for 330 days within this period. For 18 days, multiple pollutants exceeded the parameters noted in the National Environment Protection (Ambient Air Quality) Measure.

Air pollutant sources

Based on the existing land uses surrounding the Proposal, the existing air quality is considered characteristic of an urban environment. Typical sources of pollutants include emissions from motor vehicles and trains.

For the period 2018-2019, six air polluting sources located in the Hornsby LGA were registered on the DoEE National Pollutant Inventory website.

Sensitive receivers

Sensitive receivers near the Proposal include:

- local residential housing in close proximity to Thornleigh Station
- local businesses on Pennant Hills Road
- train passengers using Thornleigh Station.

6.10.2. Potential impacts

a) Construction phase

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

Anticipated sources of dust and dust-generating activities include:

- excavation for the foundations and footings of the lift shaft pits, stairs and canopies
- other trenching or excavation for footpath and road works
- upgrade of surrounding interchange facilities, including demolition works
- stockpiling activities
- loading and transfer of material from trucks
- other general construction activities.

Any dust generated from the Proposal is unlikely to impact nearby sensitive receivers as Proposal elements would not require extensive excavation, and therefore minimal dust generation is expected. Additionally, dust suppression techniques would be implemented to prevent impact to nearby residential housing or local businesses (refer to Section 7.2).

There would be minimal construction traffic associated with the Proposal and construction traffic would include a heavy vehicle for the delivery of the lifts and concrete and light vehicles associated with the construction workforce. Considering this, emission levels during the construction phase of the Proposal would be minimal and short term.

b) Operation phase

The proposal would not change the land use of Thornleigh Station, as it would continue to operate as a train station. The proposal does not include the provision of additional train services through Thornleigh Station. Therefore, there would be no impacts to the existing air quality during operation on the Proposal.

Additionally, the Proposal would improve the accessibility of Thornleigh Station. This may result in an overall increase in the use of public transport, and potentially decrease the use of motor vehicles for some members of the local community. Overall, this has the potential to improve air quality.

6.10.3. Mitigation measures

Air quality management and monitoring for the Proposal would be undertaken in accordance with the Transport for NSW *Air Quality Management Guideline* (Transport for NSW, 2019f).

Refer to section 7.2 for a full list mitigation measures relevant to air quality.

6.11. Waste and resources

This section outlines the waste streams likely to be generated from the Proposal.

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

The handling, storage, transport and disposal of asbestos and hazardous waste (including any lead waste) would be in accordance with the requirements of relevant EPA and Safe Work NSW guidelines. Waste management targets in consideration of the Infrastructure Sustainability Rating Scheme – Version 1.2 (ISCA, 2018) would be developed for the Proposal and would include reuse and recycling.

6.11.1. Potential impacts

c) Construction phase

The types of waste likely to be produced from the construction phase of the Proposal are summarised in Table 6.15.

Table 6.15 Waste types

Waste classification	Waste types
General solid waste – non-putrescible	• earthworks spoil from minor excavation work required for lift installation, pavement upgrade works and replacement of the bus shelter on The Esplanade • building and demolition waste from the pavement upgrade works, bus shelter upgrade on The Esplanade and extension of the station building (this would mostly include concrete) • concrete and asphalt waste from the pavement upgrade works, signage installation, toilet upgrades, bus shelter upgrade on The Esplanade and extension of the station building • garden waste from any vegetation clearing • glass, plastic, paper and cardboard generated by construction workers
General solid waste – putrescible	• food waste generated by construction workers
Hazardous waste	• fuel for the use of machinery and light and heavy vehicles

Waste would be managed in accordance with the requirements of the POEO Act, WARR Act, Protection of the Environment Operations (Waste) Regulation 2014*, Waste Classification Guidelines* (EPA 2014) and the *Waste avoidance and resource recovery strategy* 2014-21 (EPA 2014).

A waste management plan (WMP) would be prepared for the construction phase of the Proposal. Management measures would be incorporated into the WMP to ensure waste is appropriately reused, recycled or disposed of. The primary aims of waste management during the Proposal would be the prevention and avoidance of waste generation, recycling and the use of renewable and recycled materials. The WMP would outline the waste streams likely to be generated from the Proposal and outline the disposal method of waste which cannot be reused or recycled at an appropriately licensed waste facility.

All efforts would be made by the construction workforce to ensure the Proposal area is kept clean and waste does not litter the surrounding environment.

d) Operation phase

No additional waste would be generated during the operation phase of the Proposal.

6.11.2. Mitigation measures

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.

Refer to section 7.2 for a full list of mitigation measures relevant to waste generation and management.

6.12. Hazard and risk

6.12.1. Potential impacts

a) Construction phase

There are several potential hazard and risks that could occur during construction of the Proposal relevant to workplace health and safety (WHS), the environment, bushfires and traffic delays.

Risks to WHS could result from construction work occurring within the rail corridor. This could include conflict of equipment or vehicles with overhead transmission lines or unknown buried services, in addition to the risk of collision with other vehicles.

Environment risks are associated with the transport, storage and use of dangerous goods during the construction phase, which could pollute the surrounding environment in the event of a spill. Waste generated from the Proposal could also pollute the environment if not managed appropriately.

Train stations on the Northern Line are characterised by intact native vegetation along the rail corridor. There is a potential for a spark to be ignited from the following activities, which could generate a larger bushfire:

- incorrect storage of flammable chemicals or exposure to an ignition source
- electrical fault from the incorrect use or poor maintenance of equipment.

Although street closures are unlikely, the Proposal may result in temporary impacts to traffic and parking on The Esplanade, Pennant Hills Road and Railway Parade. This could impact accessibility to local businesses and emergency services to the surrounding community.

b) Operation phase

Operation of the Proposal would not introduce any new hazards to the existing environment of Thornleigh Station, as the land use would not be changed. It would eliminate hazards for community members who require disability access by improving accessibility to Thornleigh Station and would improve overall safety.

6.12.2. Mitigation measures

Refer to section 7.2 for a full list of mitigation measures relevant to hazard and risk.

6.13. Sustainability

The design of the Proposal would be based on the principles of sustainability, including aiming for an excellent rating as a program under the Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability (IS) Rating Tool Version 2.0 and the Transport for NSW Environmental Management System (EMS). These guidelines require a number of mandatory and discretionary initiatives to be applied. Refer to Section 3.1.4 for more information regarding the application of these guidelines.

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

6.14. Climate change

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

Climate change could lead to an increase in the intensity of rainfall events, whereby the rainfall expected to occur in a 100-year average recurrence interval flood event would occur more frequently. Such changes in weather in the region are unlikely to impact on the operation of the Proposal with respect to issues such as increased flooding (for more information on flooding refer to Section 6.9).

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

The detailed design would consider the impacts of climate change on the Proposal through:

- selection of materials for durability in extreme conditions and that minimise heat retention
- incorporate fire resistant/retarding materials wherever practicable
- incorporate engineering and design features to ensure structures are constructed to minimise direct impacts from severe storms and strong winds.

The Proposal is not considered to be at risk for inundation or flooding during excavation. Therefore, a hydrological assessment to consider potential flooding is not deemed necessary.

6.15. Greenhouse gas emissions

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

The detailed design process would undertake a compliant carbon footprinting exercise in accordance with Transport for NSW's *Carbon Estimate and Reporting Tool Manual* (Transport for NSW, 2017) or other approved modelling tools. The carbon footprint would to be used to inform decision making in design and construction. Greenhouse gas emissions would also be assessed in accordance with ISCA IS Rating Tool V1.2. Due to the small scale of the Proposal and the short-term temporary nature of the individual construction work, it is considered that greenhouse gas emissions resulting from the construction of the Proposal would be minimal. Furthermore, greenhouse gas emissions generated during construction would be kept to a minimum through the implementation of the standard mitigation measures detailed in Section 7.2.

It is anticipated that, once operational, the Proposal may result in an increase in use of public transport and a relative decrease in use of private motor vehicles by commuters to travel to and from Thornleigh. A modal shift in transport usage may reduce the amount of fuel consumed by private motor vehicles with a corresponding relative reduction in associated greenhouse gas emissions in the local area.

6.16. Cumulative impacts

Cumulative impacts occur when two or more proposals 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 proposal was undertaken in isolation. Multiple proposals 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.

A search of the Department of Planning, Industry and Environment's (DPIE) Major Proposals Register, North Sydney Planning Panel Development and Planning Register, and Hornsby Shire Council's Development Application Register in December 2020 identified one major development application are listed near Thornleigh.

This includes an apartment complex nearing completion at 258 Pennant Hills Road and backing onto Railway Parade.

Transport for NSW currently has another project in the planning phase as part of the Transport Access Program at Normanhurst Station, which may create a cumulative impact.

The construction of both proposals would be managed by Transport for NSW to coordinate work and ensure the community is informed of all work. Required rail shutdown work would where possible occur simultaneously and be coordinated with any other construction activities in the area, to minimise cumulative construction impacts such as traffic and noise.

Traffic associated with the Proposal for Normanhurst Station (due for concurrent construction) is not anticipated to have a significant impact on the surrounding road network. Operational traffic and transport impacts would have a negligible impact on the performance of the surrounding road network.

Previous major proposals in the region such as NorthConnex tunnel and Sydney Metro Stage 1 Northwest have been recently completed and therefore potential cumulative impacts associated with these proposals are unlikely to occur.

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

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

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 the Transport for NSW 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 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
1.	A Construction Environmental Management Plan (CEMP) would be prepared by the Contractor in accordance with the relevant requirements of *Environmental Management Plan Guideline – Guideline for Infrastructure Proposals,* NSW Department of Planning, Industry and Environment, 2020) for approval by Transport for NSW, prior to the commencement of construction and following any revisions made throughout construction.
2.	A proposal 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.
3.	An Environmental Controls Map (ECM) would be developed by the Contractor in accordance with Transport for NSW's *Guide to Environmental Controls Map* (Transport for NSW, 2019g) for approval by Transport for NSW, prior to the commencement of construction and following any revisions made throughout construction.
4.	Prior to the commencement of construction, all contractors would be inducted on the key proposal environmental risks, procedures, mitigation measures and conditions of approval.
5.	Site inspections to monitor environmental compliance and performance would be undertaken during construction at appropriate intervals.
6.	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.
7.	Any modifications to the Proposal, if approved, would be subject to further assessment and approval by Transport for NSW. This assessment would need to demonstrate that any environmental impacts resulting from the modifications have been minimised.

No.	Mitigation measure
	Traffic and transport
8.	Prior to the commencement of construction, a Traffic Management Plan (TMP) would be prepared as part of the CEMP and would include at a minimum: • ensuring adequate road signage at construction work sites to inform motorists and pedestrians of the work site ahead to ensure that the risk of road accidents and disruption to surrounding land uses is minimised • maximising safety and accessibility for pedestrians and cyclists • ensuring adequate sight lines to allow for safe entry and exit from the site • ensuring access to railway stations, businesses, entertainment premises and residential properties (unless affected property owners have been consulted and appropriate alternative arrangements made) • managing impacts and changes to on and off-street parking and requirements for any temporary replacement provision • parking locations for construction workers away from stations and busy residential areas and details of how this would be monitored for compliance • routes to be used by heavy construction-related vehicles to minimise impacts on sensitive land uses and businesses • details for rail replacement bus stops if required, including appropriate signage to direct patrons, in consultation with the relevant bus 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 roads authorities would be undertaken during preparation of the TMP. The performance of all proposal traffic arrangements must be monitored during construction.
9.	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 work.
10.	Road Occupancy Licences for temporary road closures would be obtained, where required.
11.	Suitable vehicle and pedestrian paths would be maintained throughout the construction of the proposed upgrade to ensure safe and easy access throughout the station.
12.	Suitable pedestrian provisions would also be made to ensure that pedestrian connectivity between various transport modes and the bus stop is not impacted as a part of the work and that suitable and safe paths are provided.
13.	Qualified traffic controllers would be used during construction work to ensure safe and efficient movement of vehicle and pedestrian traffic on the external road as well as in and out of the construction site and fencing and barriers would be installed between construction site and outside construction zone to ensure safe and easy navigation of pedestrians and cyclists.
	Urban design, landscape and visual amenity

14.	An Urban and Landscape Design Plan (ULDP) would be prepared by the Contractor, in consultation with the relevant council, and submitted to Transport for NSW for endorsement by the Precincts and Urban Design team, prior to finalisation of the detailed design. The ULDP, at a minimum, would address the following:
	• the appropriateness of the proposed design with respect to the existing surrounding landscape, built form, behaviours and use-patterns (including consideration of Crime Prevention Through Environmental Design principles). This is to include but not be limited to:
	  ○ site analysis
	  ○ vision and objectives for the infrastructure
	• strategies that apply to ISCA approved guidelines in accordance with Urb-1 (ISCA V 1.2)

No.	Mitigation measure
	• connectivity with surrounding local and regional movement networks including street networks, other transport modes and active transport networks. Existing and proposed paths of travel for pedestrians and bicycles should be shown • integration with surrounding local and regional open space and or landscape networks. Existing and proposed open space infrastructure/landscape elements should be shown • integration with surrounding streetscape including street trees, entries, vehicle cross overs etc • integration with surrounding built form (existing or desired future) including building height, scale, bulk, massing and land-use • design detail that is sensitive to the amenity and character of heritage items located within or adjacent to the Proposal.
15.	A Public Domain Plan would be prepared by the Contractor, in consultation with the relevant council, and submitted to Transport for NSW for endorsement by the Precincts and Urban Design team, prior to finalisation of the detailed design. The PDP, at a minimum, would address the following: • materials, finishes, colour schemes and maintenance procedures including graffiti control for new walls, barriers and fences • location and design of pedestrian and bicycle pathways, street furniture including relocated bus and taxi facilities, bicycle storage (where relevant), telephones and lighting equipment • landscape treatments and street tree planting to integrate with surrounding streetscape • opportunities for public art created by local artists to be incorporated, where considered appropriate, into the Proposal • total water management principles to be integrated into the design where considered appropriate • design measures included to meet ISCA 1.2/2.0 • identification of design and landscaping aspects that would be open for stakeholder input, as required.
16.	All permanent lighting would be designed and installed in accordance with the requirements of standards relevant to *AS 1158 Road Lighting* and *AS 4282 Controlling the Obtrusive Effects of Outdoor Lighting.*
17.	The detailed design of the Proposal would comply with Crime Prevention Through Environmental Design principles.
18.	Worksite compounds would be screened with shade cloth (or similar material, where necessary) to minimise visual impacts from key viewing locations.
19.	Temporary hoardings, barriers, traffic management and signage would be removed when no longer required.
20.	During construction, graffiti would be removed in accordance with Transport for NSW's Standard Requirements.
21.	Tree protection: • develop supplementary tree planting if necessary • develop a construction methodology and processes for the installation of lift 1 to ensure both of the large mature eucalyptus trees in the Domino's property to the east of the walkway are retained • develop a construction methodology and processes for the installation of lift 3 to minimise the extent of pruning required to existing mature Brush Boxes • construction of the Proposal must be carried out in accordance with the Vegetation Management (Protection and Removal) Guideline (Transport for NSW, 2019a)

No.	Mitigation measure
22.	With regard to urban design, public domain and landscaping, reconsider the placement of the lift and stairs on the eastern walkway to achieve: • a direct line of sight along the walkway from the eastern entrance at Railway Parade to the Wells Street overbridge • investigate options to reduce the impact of the stir stringer of the existing footbridge where it extends into proposed lift waiting area • enlarge waiting areas at lift and stair to increase passive surveillance of the area • align the lift and stair to provide direct lines of sight along the eastern walkway to increase passive surveillance • investigate opportunities to reinstate landscaping as a vegetated buffer at the eastern station entrance.
	Noise and vibration
23.	Prior to commencement of work, a Construction Noise and Vibration Management Plan (CNVMP) would be prepared and implemented in accordance with the requirements of the *Interim Construction Noise Guideline* (Department of Environment and Climate Change, 2009), *Construction Noise and Vibration Strategy (Transport for NSW, 2019h)* and the Noise and Vibration Impact Assessment for the Proposal (EMM, 2020). The CNVMP would take into consideration measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable.
24.	The CNVMP would outline measures to reduce the noise impact from construction activities. Reasonable and feasible noise mitigation measures which would be considered, include: • regularly training workers and contractors (such as at the site induction and toolbox talks) on the importance of minimising noise emissions and how to use equipment in ways to minimise noise • avoiding any unnecessary noise when carrying out manual operations and when operating plant • ensuring spoil is placed and not dropped into awaiting trucks • avoiding/limiting simultaneous operation of noisy plant and equipment within discernible range of a sensitive receiver where practicable • switching off any equipment not in use for extended periods e.g. heavy vehicles engines would be switched off whilst being unloaded • avoiding deliveries at night/evenings wherever practicable • no idling of delivery trucks • keeping truck drivers informed of designated vehicle routes, parking locations and acceptable delivery hours for the site • minimising talking loudly; no swearing or unnecessary shouting, or loud stereos/radios onsite; no dropping of materials from height where practicable, no throwing of metal items and slamming of doors.

No.	Mitigation measure
25.	The CNVMP would include measures to reduce the construction noise and vibration impacts from mechanical activities. Reasonable and feasible noise mitigation options which would be considered, include: • maximising the offset distance between noisy plant and adjacent sensitive receivers and determining safe working distances • using the most suitable equipment necessary for the construction work at any one time • directing noise-emitting plant away from sensitive receivers • regularly inspecting and maintaining plant to avoid increased noise levels from rattling hatches, loose fittings etc. • using non-tonal reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms for all plant used regularly onsite (greater than one day), and for any out of hours work • use of quieter and less vibration emitting construction methods where feasible and reasonable.
26.	Work would generally be carried out during standard construction hours (i.e. 7.00am to 6.00pm Monday to Friday; 8.00am to 1.00pm Saturdays). Any work outside these hours may be undertaken if approved by Transport for NSW and the community is notified prior to this work commencing. An Out of Hours Work application form would need to be prepared by the Contractor and submitted to the Transport for NSW Environment and Planning Manager for any work outside normal hours.
27.	As per the *Construction Noise and Vibration Strategy* (Transport for NSW, 2018b), construction activities with special audible characteristics (high noise impact, intensive vibration, impulsive or tonal noise emissions) would be limited to standard hours, starting no earlier than 8am; and to continuous blocks not exceeding three hours each with a minimum respite from those activities and work of not less than one hour between each block, unless otherwise approved by Transport for NSW.
28.	Blasting, where required, would be limited to between 9am and 5pm Monday to Friday and 9am and 1pm Saturday. There would be no blasting on Sundays or public holidays.
29.	Work would be conducted behind temporary hoardings/screens wherever practicable. The installation of construction hoarding would take into consideration the location of residential receivers to ensure that 'line of sight' is broken, where feasible.
30.	Vibration (other than from blasting) resulting from construction and received at any structure outside of the proposal would be managed in accordance with: • for structural damage vibration –British Standard BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 and German Standard DIN 4150:Part 3 – 1999: Structural Vibration in Buildings: Effects on Structures • For human exposure to vibration the acceptable vibration - values set out in the *Environmental Noise Management Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006) which includes British Standard BS 6472-2:1992 *Guide to Evaluation of Human Exposure to Vibration in Buildings (1 Hz to 80 Hz).*
31.	Property conditions surveys would be completed prior to piling, excavation of bulk fill or any vibratory work including jack hammering and compaction for all buildings/structures/roads with a plan distance of 50 metres from the work and all heritage listed buildings and other sensitive structures within 150 metres of the work (unless otherwise determined following additional assessment they are not likely to be adversely affected).

No.	Mitigation measure
32.	Property condition surveys need not be undertaken if a risk assessment indicates that selected buildings/structures/roads would not be affected as determined by a qualified geotechnical and construction engineering expert with appropriate registration on the National professional Engineers Register prior to commencement of Designated Works. Selected potentially sensitive buildings and/or structures shall first be surveyed prior to the commencement of the Designated Works and again immediately upon completion of the Designated Works Note: surveys are subject to landowner agreement/consent
33.	Affected pre-schools and other identified sensitive receivers are to be consulted in relation to noise mitigation measures to identify any noise sensitive periods. As much as reasonably possible noise intensive construction work in the vicinity of affected educational buildings are to be minimised.
	Aboriginal heritage
34.	All construction staff would undergo an induction in the recognition of Aboriginal cultural heritage material. This training would include information such as the importance of Aboriginal cultural heritage material and places to the Aboriginal community, as well as the legal implications of removal, disturbance and damage to any Indigenous cultural heritage material and sites.
35.	If unforeseen Aboriginal objects are uncovered during construction, the procedures contained in Transport for NSW's *Unexpected Heritage Finds Guideline* would be followed, and work within the vicinity of the find would cease immediately. The Contractor would immediately notify the Transport for NSW Proposal Manager and Transport for NSW Environment and Planning Manager so they can assist in co-ordinating next steps which are likely to involve consultation with an Aboriginal heritage consultant, Heritage NSW and the Local Aboriginal Land Council. If human remains are found, work would cease, the site secured and the NSW Police and Heritage NSW notified. Where required, further archaeological investigations and an Aboriginal Heritage Impact Permit would be obtained prior to work recommencing at the location.
	Non-Aboriginal heritage
36.	A heritage induction would be provided to workers prior to construction, informing them of the location of known heritage items and guidelines to follow if unanticipated heritage items or deposits are located during construction.
37.	In the event that any unanticipated archaeological deposits are identified within the proposal site during construction, the procedures contained in Transport for NSW's *Unexpected Heritage Finds Guideline* would be followed, and work within the vicinity of the find would cease immediately. The Contractor would immediately notify the Transport for NSW Proposal Manager and the Transport for NSW Environment and Planning Manager so they can assist in co-ordinating the next steps which are likely to involve consultation with an archaeologist and Heritage NSW. Where required, further archaeological work and/or consents would be obtained for any unanticipated archaeological deposits prior to work recommencing at the location.
	Socio-economic
38.	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.
39.	Feedback through the submissions process would be encouraged to facilitate opportunities for the community and stakeholders to have input into the proposal, where practicable.

No.	Mitigation measure
40.	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 proposal, where practicable.
41.	Contact details for a 24-hour construction response line, Proposal Infoline and email address would be provided for ongoing stakeholder contact throughout the construction phase.
42.	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
43.	Construction of the Proposal must be undertaken in accordance with Transport for NSW's *Vegetation Management (Protection and Removal) Guideline* and Transport for NSW's *Fauna Management Guideline*.
44.	All workers would be provided with an environmental induction prior to commencing work onsite. This induction would include information on the protection measures to be implemented to protect vegetation, penalties for breaches and locations of areas of sensitivity.
45.	Disturbance of vegetation would be limited to the minimum amount necessary to construct the Proposal. Trees/vegetation nominated to be removed in the Biodiversity Assessment Report (EMM, 2020) would be clearly demarcated onsite prior to construction, to avoid unnecessary vegetation removal. Trees to be retained would be protected through temporary protection measures discussed below.
46.	Tree Protection Zones (TPZs) would be established around trees to be retained. Tree protection would be undertaken in line with *AS 4970-2009 Protection of Trees on Development Sites* and would include exclusion fencing of TPZs.
47.	In the event of any tree to be retained becoming damaged during construction, the Contractor would immediately notify the Transport for NSW Proposal Manager and Transport for NSW Environment and Planning Manager to coordinate the response which may include contacting an arborist to inspect and provide advice on remedial action, where possible.
48.	Should the detailed design or onsite work determine the need to remove or trim any additional trees, which have not been identified in the REF, the Contractor would be required to complete Transport for NSW's Tree Removal Application Form and submit it to Transport for NSW for approval.
49.	For new landscaping works, mulching and watering would be undertaken until plants are established.
50.	Weed control measures, consistent with Transport for NSW's *Weed Management and Disposal Guideline (2019J)*, would be developed and implemented as part of the CEMP to manage the potential dispersal and establishment of weeds during the construction phase of the proposal. This would include the management and disposal of weeds in accordance with the *Biosecurity Act 2015.*
51.	CEMP is to include a map and details about the Blue Gum High Forest, noting that it has an extremely high level of conservation significance, with the vegetation listed as Critically Endangered. The CEMP should also note that whilst removal of specified landscape trees and tree branches is part of the project, that great care must be taken not to exceed the project's impacts without assessment and approval.
52.	Should additional vegetation removal be sought above that assessed in this report, then assessment and approval must be sought before these works occur.
53.	Delineating work areas by survey with a high visibility barrier such as bunting, flagging tape or the like to prevent accidental clearing or disturbance of retained vegetation

No.	Mitigation measure
54.	Implement the tree protection measures as outlined in the arboricultural impact assessment and tree protection measures (Witten 2020) to protect trees that would be retained. The tree protection measures includes provisions for: • Tree protection fencing; • Site inspections by a qualified arborist at key project stages; and • Specific measures to protect trees at the Railway Parade station access (Trees 1, 2, 3 and 4).
55.	Undertake site survey, including trunk diameter and canopy spread, to confirm precise tree locations and tree impacts during detailed design phase.
56.	Implement protection measures for four Sydney Blue Gum saplings to be retained near the Railway Parade station access to protect these saplings during construction and post construction works
57.	The measures are to include identification of the saplings on ground using high visibility flagging tape to clearly mark the locations of the trees to be avoided, and setback of the construction footprint a minimum of 2 metres from these saplings.
58.	Undertake tree replacement in accordance with the Transport for NSW *Vegetation Offset Guide* (DMS-SD-087).
	Soils and water
59.	Prior to commencement of work, a site-specific Erosion and Sediment Control Plan would be prepared in accordance with the *'Blue Book' Managing Urban Stormwater: Soils and Construction* (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 work and maintained throughout construction.
60.	Erosion and sediment control measures would be established prior to any clearing, grubbing and site establishment activities and would be maintained and regularly inspected (particularly following rainfall events) to ensure their ongoing functionality. Erosion and sediment control measures would be maintained and left in place until the work is complete and areas are stabilised.
61.	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.
62.	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 Transport for NSW's *Chemical Storage and Spill Response Guidelines* (2019k).
63.	Adequate water quality and hazardous materials procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) would be implemented in accordance with relevant EPA guidelines and the Transport for NSW *Chemical Storage and Spill Response Guidelines* 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.
64.	In the event of a pollution incident, work would cease in the immediate vicinity and the Contractor would immediately notify the Transport for NSW Proposal Manager and Transport for NSW Environment and Planning Manager. The EPA would be notified by Transport for NSW if required, in accordance with Part 5.7 of the POEO Act.
65.	The existing drainage systems would remain operational throughout the construction phase.
66.	Should groundwater be encountered during excavation work, groundwater would be managed in accordance with the requirements of the *Waste Classification Guidelines* (EPA, 2014) and Transport for NSW's *Water Discharge and Reuse Guideline*.

No.	Mitigation measure
	Air quality
67.	Air quality management and monitoring for the Proposal would be undertaken in accordance with Transport for NSW's *Air Quality Management Guideline*.
68.	Methods for management of emissions would be incorporated into proposal inductions, training and pre-start/toolbox talks.
69.	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.
70.	Vehicle and machinery movements during construction would be restricted to designated areas and sealed/compacted surfaces where practicable.
71.	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.
	Waste and contamination
72.	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 work 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.
73.	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 WorkCover requirements.
74.	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.
75.	All spoil and waste must be classified in accordance with the *Waste Classification Guidelines Part 1: Classifying waste (*EPA, 2014) prior to disposal.
76.	Any concrete washout would be established and maintained in accordance with Transport for NSW's *Concrete Washout Guideline 2019l* with details included in the CEMP and location marked on the ECM.
	Sustainability, climate change and greenhouse gases
77.	Detailed design and construction of the Proposal is to be undertaken in accordance with the *ISCA Infrastructure Sustainability Rating Scheme (v1.2).*
78.	The detailed design process would undertake an AS 14064-2 (Greenhouse Gases - proposal level) compliant carbon footprinting exercise in accordance with Transport for NSW's *Carbon Estimate and Reporting Tool Manual* (Transport for NSW, 2017a) or other approved modelling tools. The carbon footprint would to be used to inform decision making in design and construction.

No.	Mitigation measure
	Cumulative impacts
79.	The potential cumulative impacts associated with the Proposal would be further considered as the design develops and as further information regarding the location and timing of potential developments is released. Environmental management measures would be developed in the CEMP and implemented as appropriate.

8. Conclusion

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

The Proposal would provide the following benefits:

- a station that is accessible to people with a disability, limited mobility and parents with prams
- buildings and facilities for all modes that meet the needs of a growing population
- modern interchanges that support an integrated network and allow seamless transfers between all modes for all customers
- improved safety of the existing platform stairs by installing new TGSI, new nosings and handrails.

The likely key impacts of the Proposal are as follows:

- temporary construction noise which exceed NMLs at a number of residential and commercial assessment locations
- vibration risks to commercial façades immediately adjacent to the station entrance on Railway Parade and Pennant Hills Road
- temporary impacts on local traffic flow associated with construction of the existing interchange zone at the bus stop on The Esplanade
- loss of five parking spaces on Railway Parade
- impacts to the visual environment from the introduction of new elements, such as the lifts and station access point upgrades
- temporary disruptions to station facilities and amenities during construction, including potential weekend closures of the Station
- temporary changes to vehicular, bus, bicycle and pedestrian access to, through and movements around the station
- potential temporary loss of time-restricted parking on nearby streets
- potential sediment mobilisation, dust generation and erosion risk during construction.
- removal and trimming of some vegetation around the station to facilitate the work
- impacts to the visual environment from the introduction of new elements, such as the lifts and upgrades to the station entrances.

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 significantly affect the environment or any threatened species, populations or communities. Accordingly, an EIS is not required, nor is the approval of the Minister for Planning.

The Proposal has also taken into account the principles of ESD and sustainability (refer to Section 3.3.3 and Section 6.13). These would be considered further during the detailed design, construction and operational phases of the Proposal. This would ensure the Proposal is delivered to maximum benefit to the community, is cost effective and minimises any adverse impacts on the environment.

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Appendix A Consideration of matters of National Environmental Significance

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

Matters of NES	Impacts
Any impact on a World Heritage property? No World heritage properties in the vicinity of the proposal.	Nil
Any impact on a National Heritage place? No National heritage properties in the vicinity of the proposal.	Nil
Any impact on a wetland of international importance? No wetlands of international importance are located within a ten-kilometre radius of the site.	Nil
Any impact on a listed threatened species or communities? No threatened species or communities will be impacted by the Proposal	Nil
Any impacts on listed migratory species? No listed migratory species are likely to utilise the habitat within the study area. Vegetation to be cleared as part of this Proposal is of poor quality for habitat for 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? The Proposal would not impact on a Commonwealth marine area.	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 does not relate to coal seam gas or mining.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The Proposal would not impact on Commonwealth land.	Nil

Appendix B Consideration of clause 228

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

Factor	Impacts
(a) Any environmental impact on a community? There would be some temporary impacts to the community during construction, particularly in relation to noise, traffic and access and visual amenity. Mitigation measures outlined in Table 7.1 would be implemented to manage and minimise adverse impacts.	Minor
(b) Any transformation of a locality? The Proposal would involve the introduction of new visible elements in the landscape (three new lifts, BAZ roofing, amendments to existing platforms, buildings and stairs. The appearance of the new elements would be consistent with the existing station elements and are considered to be common features in urban areas. The Proposal would necessitate the removal of some vegetation from outside the Station entrance, to allow access for the work. Minimal remnant vegetation remains around Thornleigh Station and the vegetation that was observed during the field study for the Biodiversity Assessment is of low quality. The Proposal would have a positive contribution to the locality by creating accessible entrances to the station and station platforms.	Minor
(c) Any environmental impact on the ecosystem of the locality? The Proposal would require some vegetation removal. However, given the Proposal's location within an urbanised environment and the low habitat value of the trees to be removed, impacts to biodiversity and ecosystems are expected to be negligible.	Minor
(d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? There would be some temporary impacts during construction particularly in relation to noise, traffic and access and visual amenity. Minor vegetation removal would be required for access to work locations at the station, and for accessibility work to be completed. However, the number of trees and understorey vegetation to be removed has been minimised as far as possible.	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? No European or Aboriginal Heritage items are likely to be harmed by the Proposal. The visual impacts from the Proposal are anticipated to be moderate. During operation the Proposal would have positive impacts to the community through providing a modern access point to the station with improved access, lighting and safety measures and by creating equitable access to the station.	Moderate
(f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The Proposal is unlikely to have any impact on the habitat of protected fauna.	Nil

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