

NORTHWEST RAIL LINK RAPID TRANSIT RAIL FACILITY DESIGN AND LANDSCAPE PLAN

ARCHITECTURE PUBLIC DOMAIN + LANDSCAPE DESIGN REPORT
ISSUE H_09/10/15



Prepared for Northwest Rapid Transit
9 October 2015

NRT Document Number: NWRLOTS-NRT-RTF-AR-RPT-600019

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Front cover image: Artist's impression of RTRF

Image by Ai3D - updated by Hassell

Contact

Ross de la Motte, Principal

rdelamotte@hassellstudio.com

Geoff Crowe, Senior Associate

gcrowe@hassellstudio.com

HASSELL

Level 2, Pier 8/9

23 Hickson Road

Sydney NSW

Australia 2000

T +61 9101 2000

F +61 9101 2100

hassellstudio.com

@HASSELL_Studio

HASSELL Limited

ABN 24007711435 /ACN 007711435

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H	_ 09 October 2015	_ Stage 1	_ A Lucas	_ Julieanne Boustead	_ Geoff Crowe	_ Issue for Planning



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TALLAWONG ROAD





FUTURE ROAD

3
TOTAL

01

Overview

- A Primary Entry
- B Secondary Entry
- C Landscape buffer
- 1 Security + Fire Control Room
- 2 Administration +OCC
- 3 Distribution + Traction Substation
- 4 Rolling Stock Maintenance
- 5 Train Wash
- 6 Rail Stores
- 7 Wheel Lathe
- 8 Detention Basin
- 9 Infrastructure Workshop
- 11 Dangerous Goods
- 12 Bulk Supply
- 13 Rainwater Storage
- 14 Graffiti Cleaning
- 15 Bicycle Parking
- 16 Future Expansion
- 17 Train Monitoring
- 18 Biological Cleaning Pit



“to create a flagship centre of operations which reflects the line wide pride and signature branding”

Executive Summary

The Rapid Transit Rail Facility (RTRF) at Tallawong Road is the centre of operations for the North West Rail Link (NWRL) network. It provides an operations headquarter, stabling and depot facilities for the network within an efficient landscaped environment.

The NWRL Project is described in Chapter 02, where project context, history, line wide settings and background is established

The intention is to create an exemplar centre of operations capturing the following requirements:

- Stabling of trains
- Maintenance and cleaning of trains
- Support of infrastructure maintenance
- Housing the Operations Control Centre and Depot Control Centre
- Housing the network administration, training and meeting accommodation
- Future proofing to ensure capacity is provided for any increased patronage.

The layout and location of the buildings within the RTRF site have been optimised to provide good connectivity and efficient operations. The main buildings are located either side of the main access spine road which forms the public face of the facility.

The landscape design of the facility acknowledges the importance of creating well vegetated boundaries to contain the internal operations of the site and provide visual mitigation from external vantage points. Internally shaded public domain spaces are provided together with staff and visitor facilities. Permeable surfaces make up the majority of the site with open grassland where operational requirements allow.

The RTRF buildings are simple robust functional built forms, which are underpinned by a consistent system wide design language, robust palette of materials and kit of parts approach. Accommodation areas to different buildings are designed and detailed using the common design language, with remaining functional areas throughout the facility expressed differently.

The RTRF buildings have been designed with the objective of creating pleasant and contemporary workspace environments. This includes integrating sustainability features such as the introduction of daylighting to a variety of workspaces throughout the site and minimising energy use via natural ventilation, mixed mode air-conditioning or efficient air conditioning. The roof of the Rolling Stock Maintenance and Store is designed to accommodate photovoltaic panels. This is currently being developed further as part of the line wide photovoltaic power generation proposed strategy.

Flexibility will be provided in the RTRF buildings to accommodate future expansion of workshop, Operation Control Centre and maintenance while ensuring no impact to rail operations and customers.

Purpose

The purpose of this document is to support the NWRL planning process for the RTRF and to provide an overall description of the facilities to be established, their context and the design drivers for the proposals.

This document outlines proposals as presented by NRT as part of their Design Stage 1 reporting and forms part of a suite of Stage 1 reports which covers the full extents of the NWRL project.

This report establishes the following:

- Sets out the project context and vision
- Describes the local context
- Describes the urban design, landscaping and architectural design approach
- Describes and details the proposed buildings within the RTRF site
- Outlines the key relevant issues arising including any options investigated

Scope

The proposed RTRF facilities include:

- Stabling of the train fleet
- Rolling stock maintenance and stores
- Light and heavy engineering maintenance facilities
- Administration building for managing administration, operations and maintenance of the NWRL and the Operations Control Centre (OCC)
- Office and training facilities
- Infrastructure maintenance facilities
- Automated under floor wheel profiling
- Automated train wash
- Biological fatality and graffiti cleaning wash facilities
- Automatic wheel monitoring
- Bulk power supply substation
- Traction and distribution substation

This design report includes Stage 1 Architecture and Landscape Architecture drawings of the proposed RTRF precinct, site layout and facilities to be established on Day One.

Compliance with Planning Conditions

This table outlines extract from Schedule A SSI 5931

Schedule A, SSI-5931 Summary of requirements Rapid Transit Rail Facility		
Clause	Requirement	Relevant document/ information
C23	The Proponent shall, prior to the commencement of permanent built works and/or landscaping, unless otherwise agreed by the Director General, prepare and implement and Design and Landscape Plan for the corresponding permanent built works and/or landscaping. The Plan shall be submitted to the Director General for approval and be made publicly available.	
C23	In preparing the Plan, the Proponent shall consult with the Department (Land Release), RMS, relevant Councils and the community.	NWRLOTS-NRT-RTF-AR-RPT-600019 Chapter 06 Page 56
C23	Plan shall be prepared by appropriately qualified persons	NWRLOTS-NRT-RTF-AR-RPT-600019 Chapter 01 Page 67
C23	The Plan detail the design initiatives to integrate rail infrastructure and facilities into their existing and proposed settings, and landscaping measures to minimise, mitigate and/or offset the impacts of the SSI (including acoustic barriers and embankments/cuttings) on property and other land uses (such as open space), visual amenity and local vistas and heritage values. The Plan shall include, but not necessarily be limited to:	
C23 (a)	identification of design objectives and standards based on local environmental and heritage values, Strategic and statutory planning, future land release form and function, sustainable design and maintenance, transport and land Use integration, passenger and community safety and security, community amenity and privacy, and relevant design Standards and guidelines;	NWRLOTS-NRT-RTF-AR-RPT-600019, Chapter 02 Page 18 - 22 Chapter 03 Page 27,32 Chapter 04 Page 36,37 Chapter 05 Page 47
C23 (b)	details to provide, mitigate and/or augment landscaped areas and elements, with landscaping works to enhance ecological values, including riparian areas and fauna corridors, the provision of water sensitive urban design initiatives and measures to mitigate impacts to heritage landscapes;	NWRLOTS-NRT-RTF-AR-RPT-600019, Chapter 04 Page 36 - 43

Schedule A, SSI-5931 Summary of requirements Rapid Transit Rail Facility		
Clause	Requirement	Relevant document/ information
C23 (c)	design details of the built elements of the SSI, including retaining walls, embankments, noise barriers, and substations, and the measures to minimise the impact of these elements, particularly with respect to the impacts on adjoining residences, educational facilities, open space areas and heritage items and landscapes;	NWRLOTS-NRT-RTF-AR-RPT-600019, Chapter 04 Page 36 - 43 Chapter 05 Page 46 - 53 NWRLOTS-NRT-RTF-AR-RPT-606050_700 RTRF ARCHITECTURE AND PUBLIC DOMAIN
C23 (d)	implementation, management and monitoring strategies to ensure the establishment and ongoing maintenance of built elements and landscaped areas, including performance standards; and	NWRLOTS-NRT-RTF-AR-RPT-600019 Chapter 05 Page 48- 50
C23 (e)	Consideration of relevant standards	NWRLOTS-NRT-RTF-AR-RPT-600019 Chapter 06 Page 58 - 61
C23	The Plan shall be endorsed by an independent Design Review Panel. The Design Review Panel shall consist of appropriately skilled professionals in the fields of architecture, landscape design, transport integration and heritage.	NWRLOTS-NRT-RTF-AR-RPT-600019 Chapter 06 Page 56

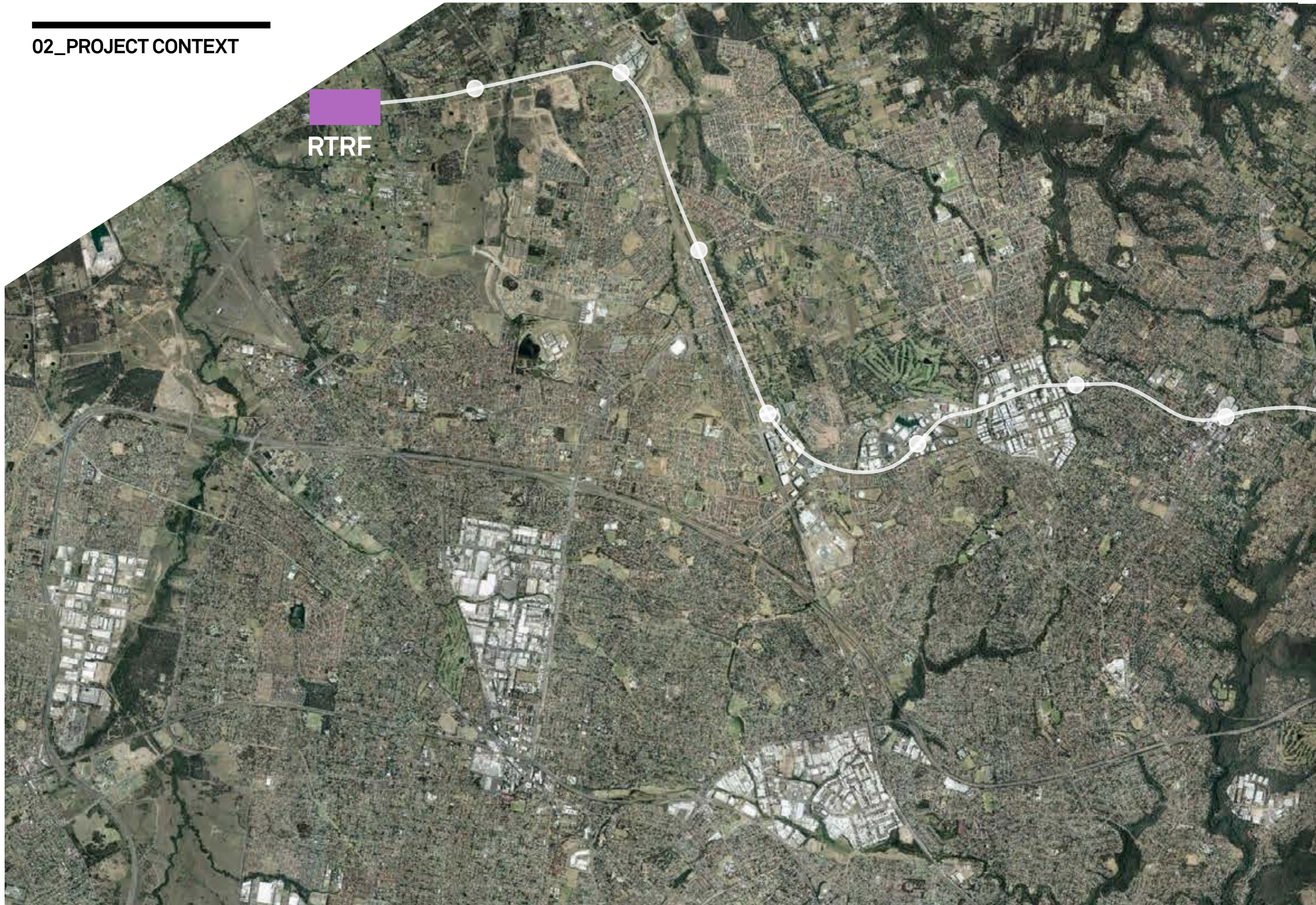
Abbreviations

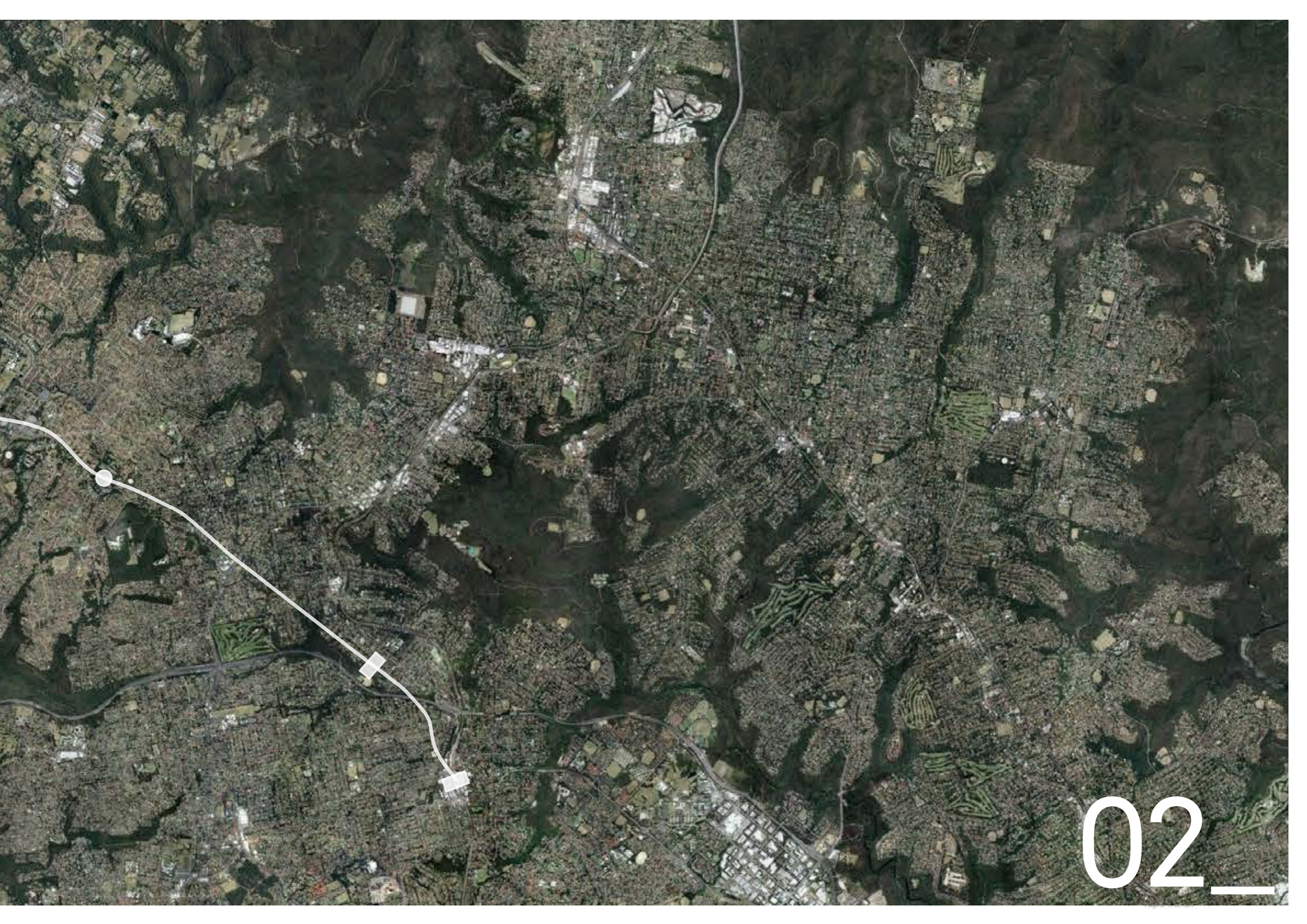
The table opposite outlines common abbreviations as they appear within this report.

DCC	Depot Control Centre
DDA	Disability Discrimination Acts
MIP	Mobility Impaired Passengers
NRT	Northwest Rapid Transit
NWRL	North West Rail Link
OCC	Operations Control Centre
RTRF	Rapid Transit Rail Facility
O&M	Operations and Maintenance
TfNSW	Transport for New South Wales
UTO	Unattended Train Operation
SPR	Scope and Performance Requirements (NWRL project specific)

02_PROJECT CONTEXT

RTRF





02_

Project Context

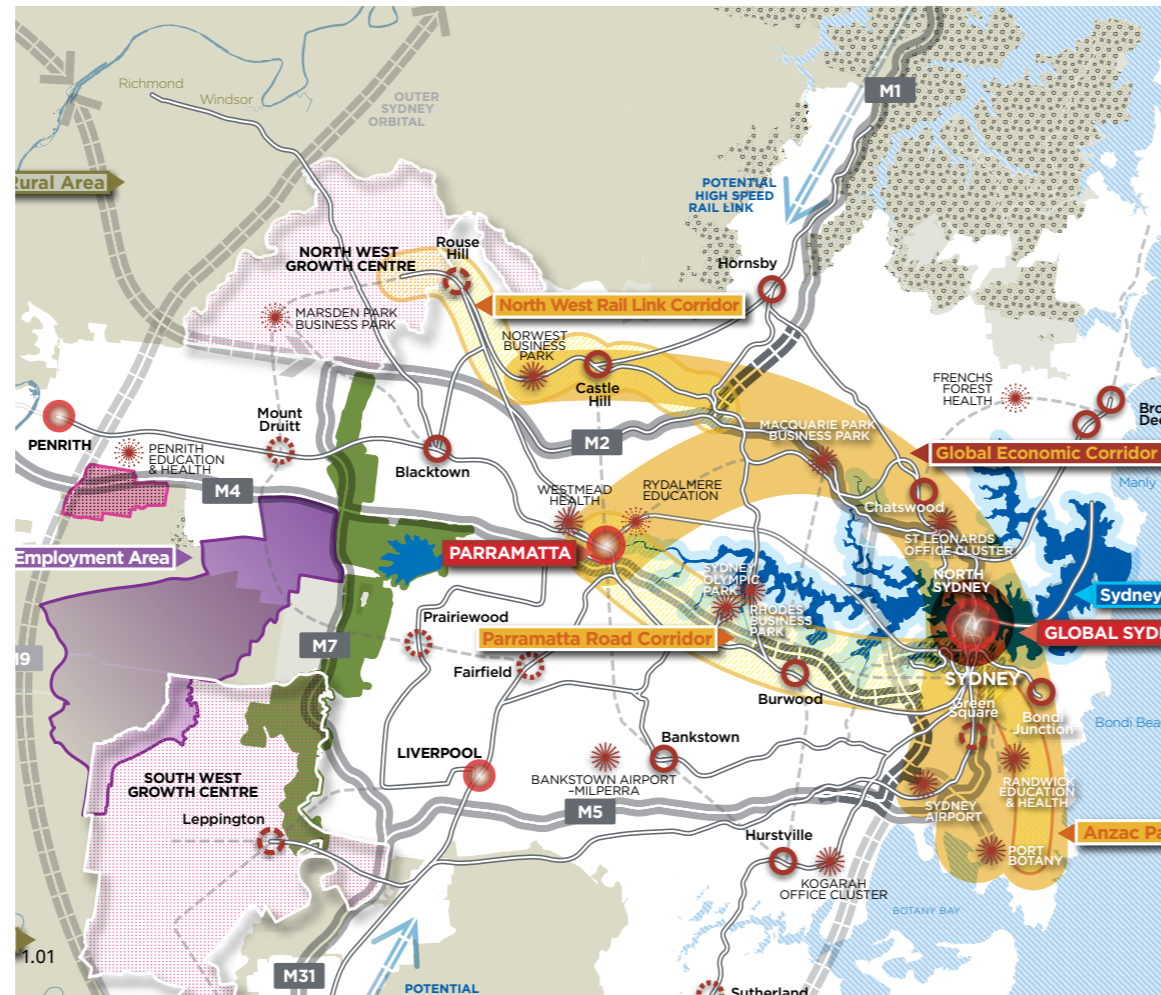
The North West Rail Link (NWRL) is a priority transport infrastructure project for the NSW Government. The NWRL will include eight new stations and services as part of a 23 kilometre link, running from Epping to Cudgong in north west Sydney, connecting with the Epping to Chatswood Rail Link (ECRL) and Sydney’s wider rail network.

The Draft Metropolitan Plan for Sydney describes the strategic significance of the North West Rail Link Corridor in connecting the North West Growth Centre to the city. [Figure 1.01]

The NSW Transport Plan describes the role the Northwest Rail Link will play in building a long term mass transit network for Sydney that will cross under The Harbour and through the CBD towards the South West. [Figure 1.02]

The organisation serving the public transport needs of North Western Sydney NRT will have a corporate headquarters, a home base at The Rapid Transit Rail Facility (RTRF). It will play a key role in the operation and maintenance of the Northwest Rail Link.

The Line Wide Diagram opposite describes the location of the RTRF at the North Western end of the line adjacent to Schofields Road. [Figure 1.03]



- GLOBAL SYDNEY
- PARRAMATTA
- Regional City
- Specialised Precincts
- Specialised Precincts – Potential
- Major Centre
- Major Centre – Planned
- Major Centre – Potential
- 9 City Shapers
- Metropolitan Urban Area
- Growth Centres
- Potential Urban Area Expansion
- Western Sydney Parklands
- Metropolitan Rural Area
- Metropolitan Rural Area –National Parks
- Western Sydney Employment Area
- Corridors
- Global Economic Corridor

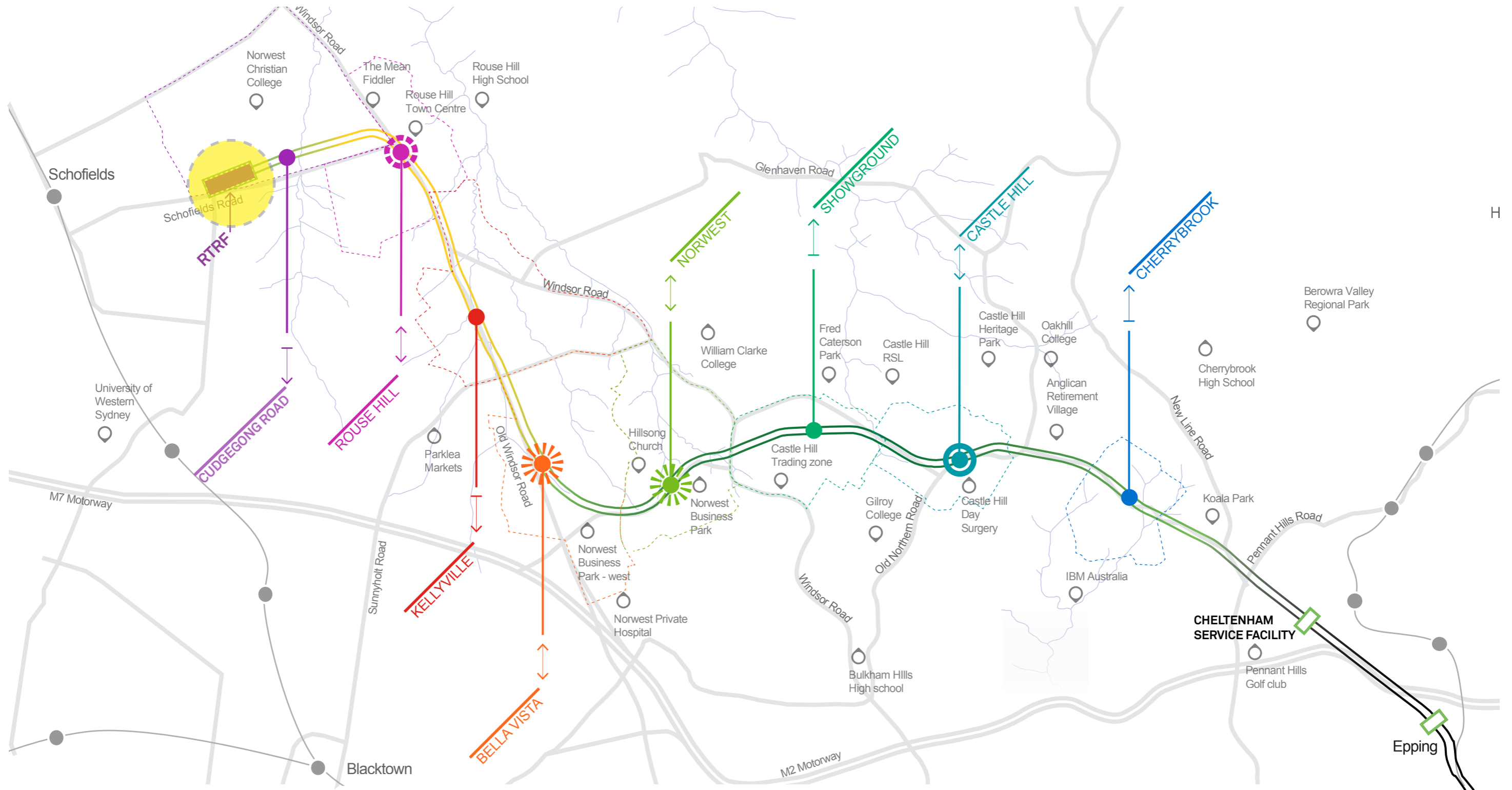
- InterCity (double deck) and regional diesel
- Mass Transit Network (single-deck)
- Suburban Network (double deck)

1.01 Vision for Sydney in 2031. Source: Draft Metropolitan Strategy For Sydney to 2031 (March 2013) NSW Government
 1.02 Sydney's Rail Future: How our rail network will look . Source NSW Long Term Transport Masterplan (Dec 2012)



02 Project Context

Line Diagram



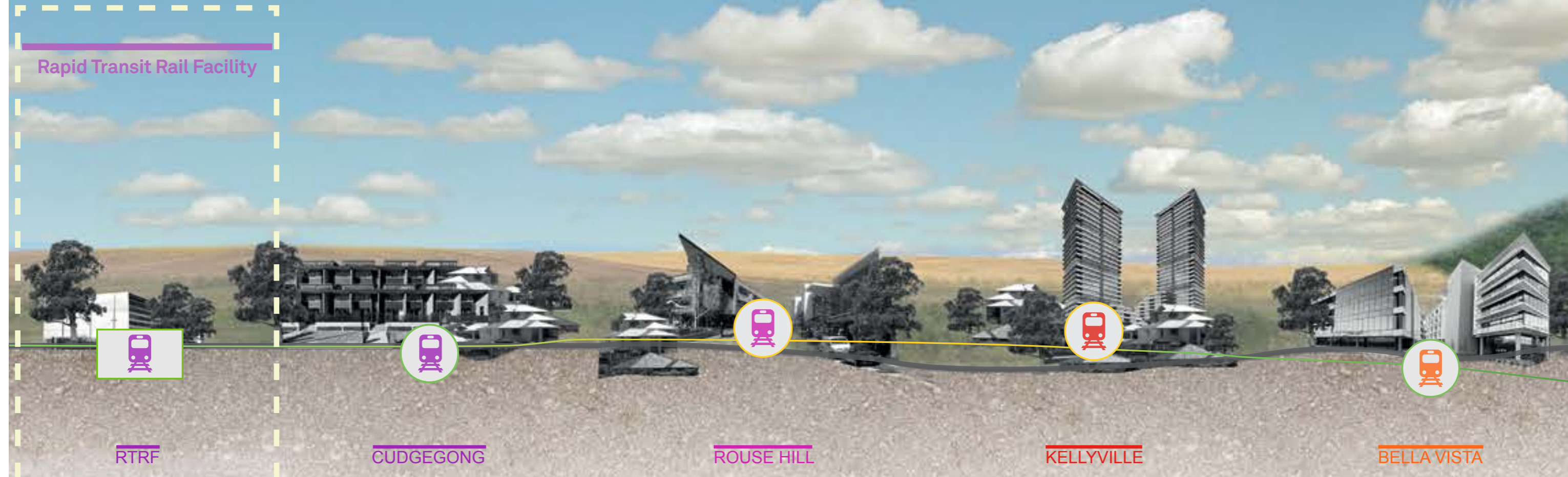
Legend

- Mined tunnel
- Embankment/cutting
- Cut and cover tunnel
- Viaduct
- Service Facility
- Major Centre
- Major Centre - Planned
- Specialised Precinct
- Transit Origin
- Transit Destination

1.03 Line Wide Diagram

02 Project Context

Line Diagram



“a flagship centre of operations which reflects the line wide pride and signature branding screened by a restored habitat”

‘A new town centre high street terminated by an open station’

‘A busy interchange square for a growing town centre’

‘Towers on the plains... alongside Windsor Road’

‘A key landmark in a civic plaza’

	RTRF	CUDGEGONG	ROUSE HILL	KELLYVILLE	BELLA VISTA
Typology	Open cut		Elevated	Elevated	Open cut
Centre type	Future neighbourhood		Major centre	Major neighbourhood	Specialised centre
Catchment	Predominantly residential		Employment and residential	Residential	Employment and residential
Depth below concourse	7.675m				7.100m south entry 8.400m north entry
Height above concourse			11.700m	13.700m	
Patronage forecast for the AM peak	5100/250 6800/350		2600/600 3500/825	3800/250 5100/350	2100/1100 2900/1475

02 Project Context
Line Diagram

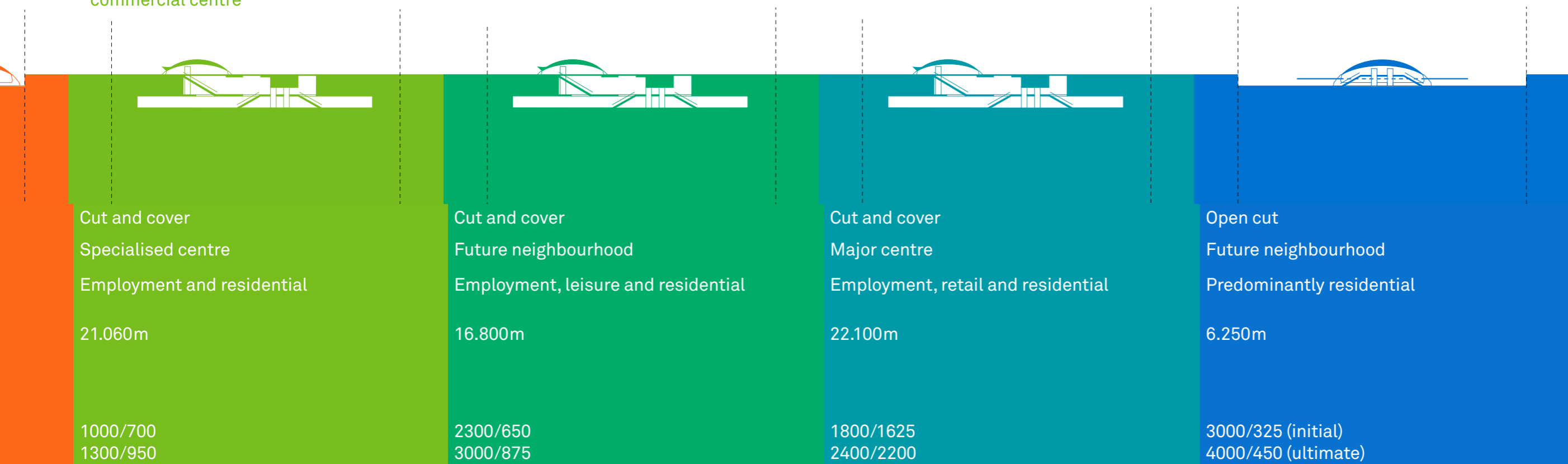


'An interchange plaza at the major crossroad of an invigorated commercial centre'

'A new civic gateway to a significant cultural event space'

'A legacy park in a major civic centre'

'A village high street in a blue gum forest'



Reference Documents

The following is a list of the key reference documents that have informed the background to this report.

A Plan For Growing Sydney

NSW Government December 2014

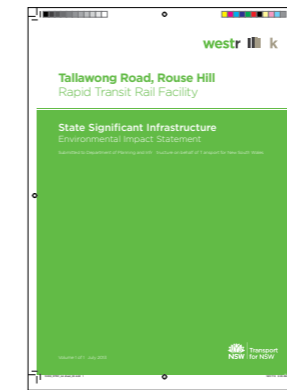


NSW Long Term Transport Master Plan

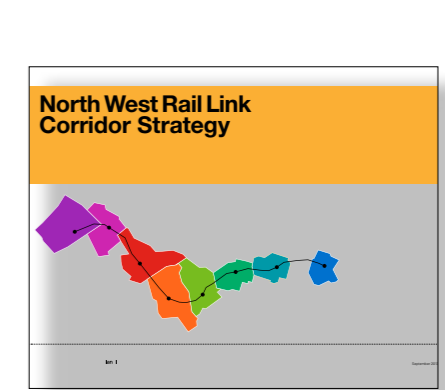
NSW Government December 2012



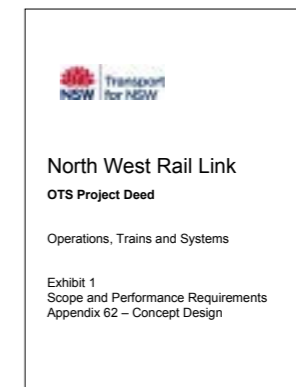
North West Rail Link Tallawong Road, Rouse Hill Rapid Transit Rail Facility Environmental Impact Statement



North West Rail Link Corridor Strategy



North West Rail Link Scope and Performance Requirements
Appendix 62 Concept Design



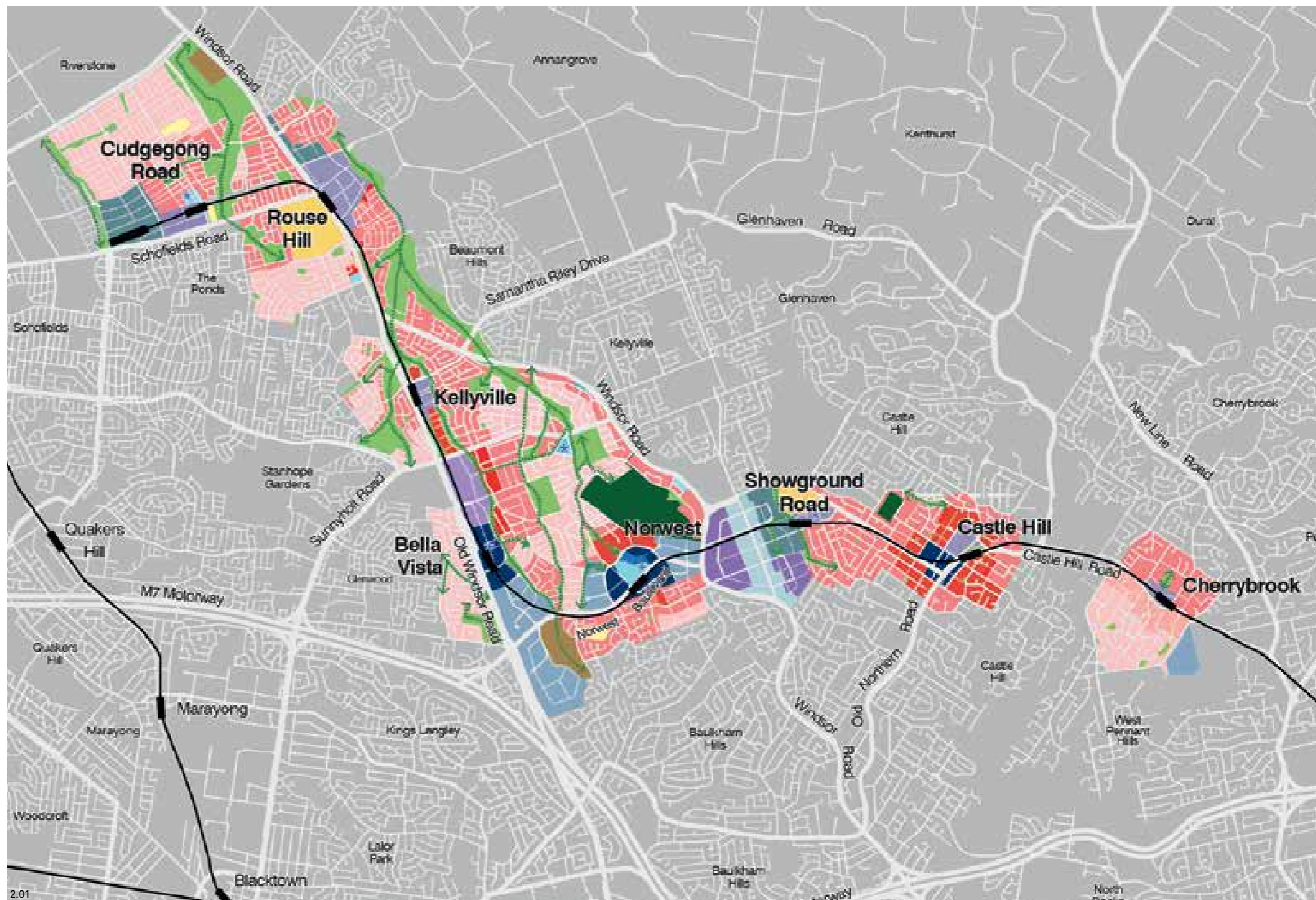
“greater connectivity, strengthening existing links and providing new links between the station and surrounding uses”

North West Rail Link Corridor Strategy

A Corridor Strategy which includes Structure Plans for each station and its surrounds, was prepared September 2013 to guide development along the corridor over the next 20-25 years.

Since then draft indicative precinct layouts have been prepared for some areas which refine the layout of each precinct. Chapter 03 provides more detail on layouts which relate to this precinct.

Figure 2.01 opposite is taken from the North West Rail Link Corridor Strategy and describes the proposed framework to guide future planning. It is founded on principles of providing greater connectivity, strengthening existing links and providing new links between the station and surrounding uses.



2.01 North West Rail Link
Corridor Strategy
Page 13 Corridor Structure Plan



02 Project Context

System Wide Design Aspirations/ Principles

Project Vision

The ambition of the RTRF is to create a flagship centre of operations which reflects the line wide pride and signature branding.

NRT has defined seven core design principles to drive the development of the design during Stages 1, 2 and 3 and to inform the evaluation of options. These high level considerations come from and complement the main Customer Service Drivers defined by TfNSW.

The TfNSW's customer satisfaction service drivers are listed below.

- Timeliness
- Information
- Ticketing
- Convenience
- Accessibility
- Cleanliness
- Comfort
- Personal Safety and Security
- Customer Service¹

⁰¹ Taken from TfNSW Operations, Trains and Systems Volume 1 Overview

1_Integrated, efficient, safe, enjoyable experience

- Maximise customer safety and feeling of safety
- Maximise journey efficiency
- Create a memorable experience
- Consider the complete experience door to door
- Make the journey simple and intuitive
- Ensure the journey is accessible to all
- Focus on the detail that people touch

2_Beautiful places and buildings

- Define and enhance the unique qualities of each station location
- Reinforce local networks and connections
- Respond to the local environment, micro climate and topography
- Focus on design excellence, quality and coherence



02 Project Context

System Wide Design Aspirations/ Principles

3_ A natural systems approach

- _ Reduce energy use, maximise passive performance
- _ Optimise renewables
- _ Optimise water catchment and re-use
- _ Consider whole of life requirements
- _ Regenerate local habitats
- _ Minimise waste

4_ Embedded social infrastructure

- _ A key community use future proofed at each station
- _ Use of integrated art to reinforce community identity
- _ Accommodate future activity/ development specific to local needs

5_ Safeguarding future growth

- _ Build in flexibility
- _ Built to last
- _ Visionary
- _ Demanding of current technology

6_ Economic of Resource

- _ Minimal use of structure and materiality
- _ Modular
- _ Energy efficient
- _ Cost effective

7_ Reinforcing a strong Sydney Metro brand

- _ A family of distinctive and identifiable elements
- _ A coherent design language that reinforces the transport brand
- _ Use of a kit of parts strategy
- _ A language that ties into existing stations



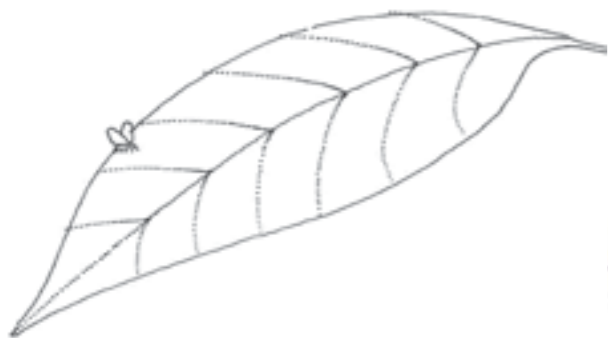
Beautiful places and buildings

Beautiful, signature places and buildings will be the legacy of the NWRL. The project will deliver a world class, customer-focussed rail line that is equivalent to the contemporary benchmarks of international urban rail networks such as Copenhagen Metro, and locally, the Epping to Chatswood Rail Link.

- _ Place: Product: Brand
- _ Place: Genius loci

Each station, station precinct and operations facilities will encapsulate the spirit of place, the ‘genius loci’ of its locale through careful selection of materials.

Each station locale has a distinctive character, purpose and pattern of land use and occupation. The design response for the stations and precincts is to address these unique place-defining characteristics and activate the public life of the local community.



2.02 Signature element

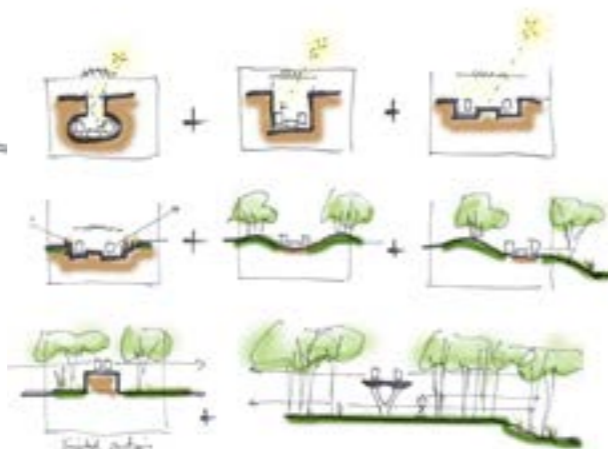
A Natural Systems Approach

A natural systems approach is taken to guide the project .

Urban Ecology

The principles of urban ecology are a key aspect of the approach for this project. This means the protection of habitat, the use of endemic species, diversity of use, form and function, the minimisation of waste, the recycling of resources, use of local materials and the minimisation of energy use.

These principles guide the projects commitment to a broad suite of initiatives including ground water recharge, infiltration, insulation of buildings, installation of green roofs, water harvesting, collection, treatment and reuse, composting and recycling programs, re-forestation, urban wetlands and bioswales – as these are the essential tools of an urban ecology.

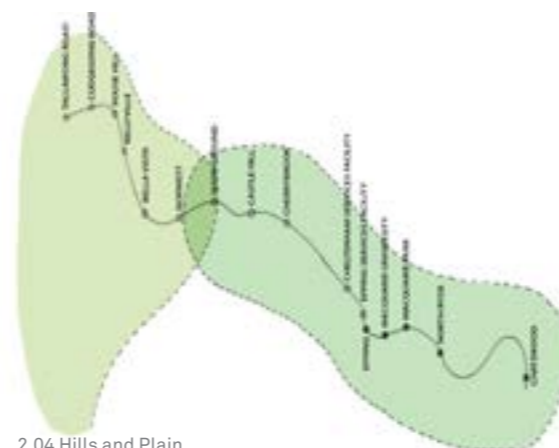


2.03 Character Experience

The Hills and Plain

The NWRL passes through two distinct landscape settings and a memorable sequence of landscape character types; predominantly the steeply undulating, cool, forested and enclosed ridges and valleys of the Hills District, and the more expansive, warm, dry and undulating plains and shallow creek lines of the Cumberland Plain.

The RTRF is within the “plains” character area, the acknowledgment of which directs species selection when creating a vegetated setting for the facility



2.04 Hills and Plain

Re-vegetating North West Sydney

Over time the pre-European landscape of the Sydney Basin has been given over to the needs of a growing metropolis. From early agricultural holdings, to small villages and then rapid post war expansion of urban development with extensive roads and subdivisions. Little of the original habitat and vegetation of North West Sydney remains.

The scale and location of the NWRL presents an opportunity to contribute to a grand landscape legacy – the revegetation of North West Sydney. At all stations, precincts and throughout the corridor, the Blue Gum High Forest, Turpentine and Ironbark Woodlands, and Cumberland Plain Woodlands relevant in each locale will be reinstated using signature trees to provide a canopy above the stations, which will protect, shelter and define public space.

Vegetation Types

- Blue Gum High Forest
- Turpentine-Ironbark Forest
- River-flat Forests
- Cumberland Plain Woodlands
- Eastern Suburbs Banksia Scrub
- Estuarine and Freshwater Wetlands
- Castleragh Woodlands
- Sandstone Heath, Woodlands and Forests

2.05 Character Vegetation



The RTRF boundaries require a vegetated treatment to contain, shield and encapsulate the facility activities.

This vegetation will reflect immediate site character and will reinstate plant communities which are local to the area.



System wide kit of parts

Significant quality benefits, recognisable line identity, economies of time and cost and reduced risk can be achieved by adopting a system wide kit of parts approach in the design, documentation and procurement of common elements.

This will apply to the RTRF where appropriate as to other operations and maintenance buildings along the line.

NRT's architectural response is underpinned by the use of a common design language achieved through consistent form, details, materials, equipment and finishes.

It is the intention to reflect this within the design of the RTRF precinct as consolidation of line wide identity and the NWRL signature brand.

System wide quality

The vision for Northwest Rapid Transit (NRT) is to standardise and modularise a line wide suite of architectural, engineering and public domain components.

Common interchangeable components offer potential repurposing, improved replacement and recyclability of materials, maximum flexibility, and are scalable: readily extendable or reducible.

Consistent design improves quality control and building tolerances, reduces on site construction time and material waste in manufacture.

Key outcomes and benefits

- _ Quality
- _ Consistency
- _ Speed
- _ Value
- _ Identity
- _ Maintainability

Sustainability

NRT will adopt a highly sustainable approach, increasing the product life cycle, and minimising energy, material usage and waste.

Strategies for the RTRF include:

- _ Orientation and form of buildings allow plenty of natural daylight, promote natural ventilation, maximise thermal comfort and reduce demand on artificial sources
- _ Photovoltaic cells mounted on the maintenance building roof will generate 10% of annual low voltage electrical energy demand, while lighting initiatives will minimise light spill to surrounding areas.

Services integration

Fully integrated design for 'plug in' installation of services (power/data, hydraulic, M&E) offers reduced on-site construction time, standardised fittings, inbuilt future capacity and potential for zoned and auditable energy use.

Services modules will be adaptable for current and future technologies, expandable to meet demand, reducing the potential for unsightly retrofitted elements.

Materials and finishes

The drivers for determining the materials and finishes include: demountability, sustainable replenishment of materials, recycled content, VOC content, and selection of materials that provide the best value for money during construction and long term maintenance requirements.

Heritage

Places of Aboriginal and European cultural heritage value along the NWRL route and at each of the station precincts and RTRF site will be conserved, celebrated and communicated as a way of connecting the new stations and precincts with the history and identity of the area.

The project provides the perfect opportunity to celebrate the history and identity of Sydney's north western suburbs – from Aboriginal occupation and use, to farmland and market gardens, and twentieth and twenty-first century suburban expansion. Conservation of adjacent European heritage items.



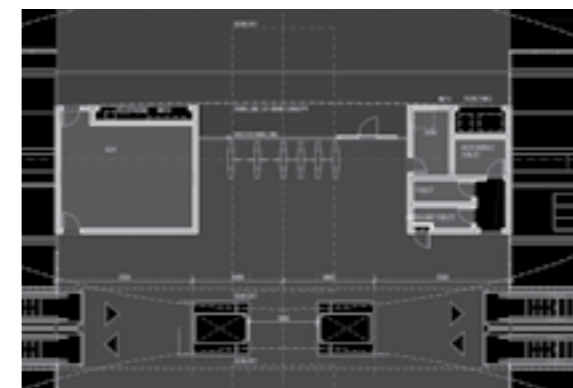
2.06 Cross Rail London - Grimshaw



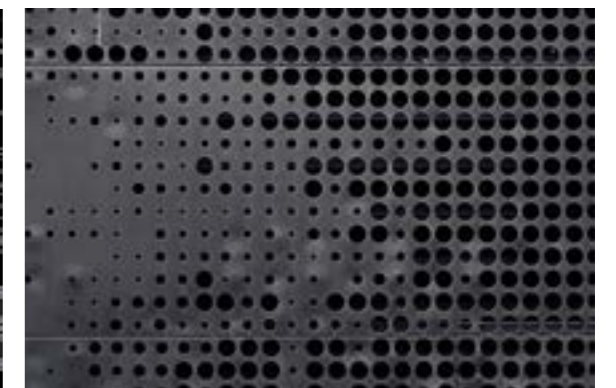
2.07 M4 Line Barcelona



2.08 Novartis Headquarters Basel



2.09 Cudgegong Road Station Concourse Sketch



2.10 Standard Perforated Metal Sheet - Locker Group



Design Themes

NRT's design response to these strategic drivers and aspirations is manifest in seven key design themes within an overarching philosophy to create "living infrastructure".

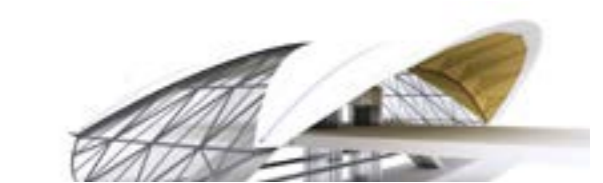
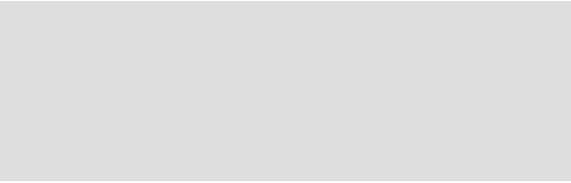
1_Gradation; from landscape to station

[rough to smooth, formal to informal, movement/ stationary, circulation/ waiting, natural bush re-vegetation to civic planting character]



2_External resilience, internal warmth

[hard shell, soft warm welcoming inside, heroic scale/ human dimension]



3_Accent colour and texture

[for intuitive wayfinding, a subdued and calm background/ line or station specific, colour where people touch, colour planting species to highlight civic entries]



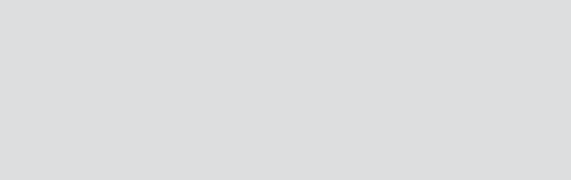
4_Calming simplicity, ordered hierarchy

[a simple canvas for activity, not prescriptive, able to accommodate future change, modular and simple, uncluttered civic spaces with clear views and movement]



5_Poetic expression of structure

[a celebration of the manner in which things are put together, the craft of construction and expression of structure and materiality, fractal light motif]



6_Expressive sustainability

[low energy, long life, loose fit, celebrate rainwater collection, integrated bulletin and energy display]



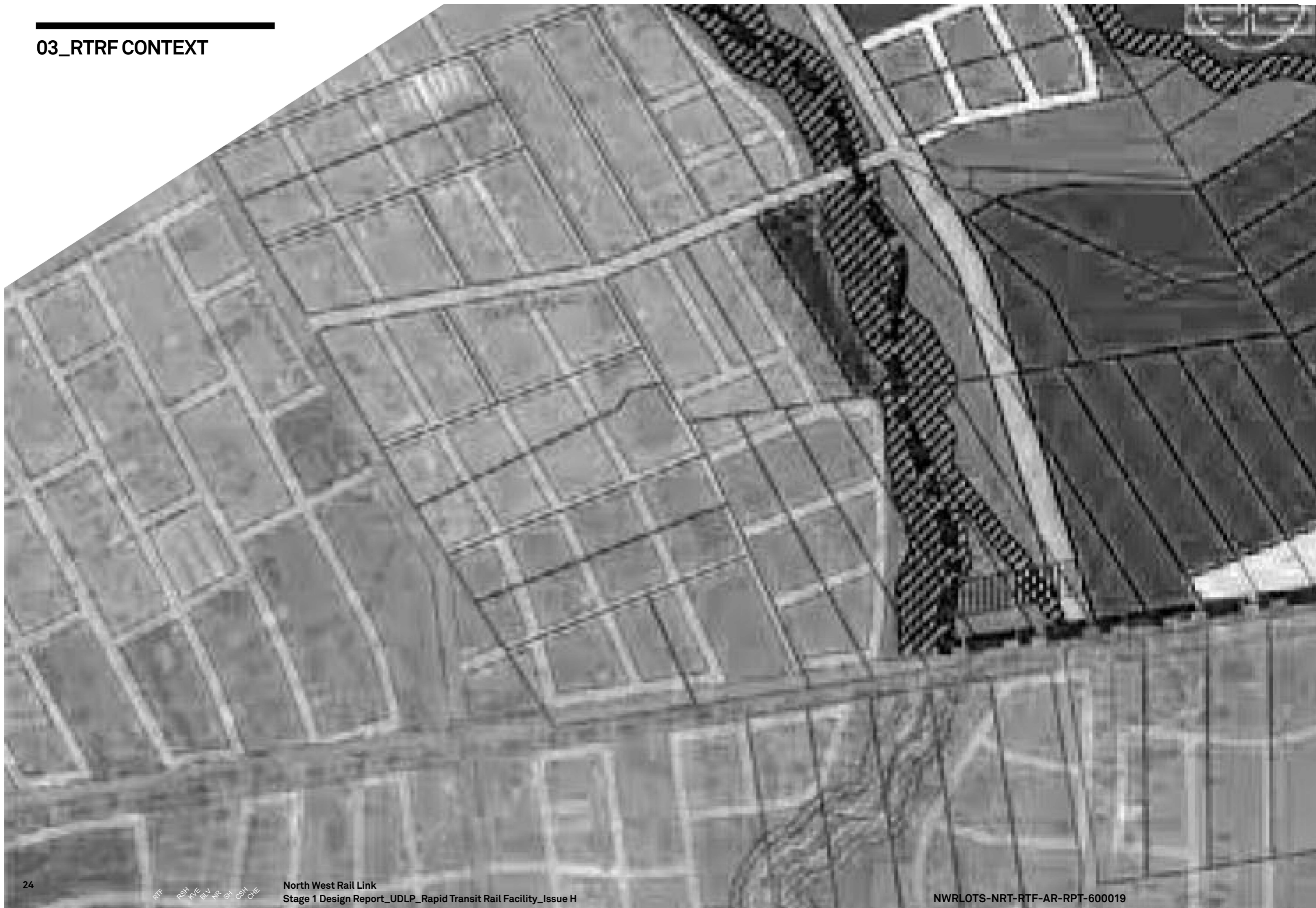
7_Integral art, place and community

[embedded in architectural detail, human touch, fine detail, precast panels, skylights, lighting, soffit, social use]





03_RTRF CONTEXT





Site

Figure 3.01 opposite describes the RTRF site boundary and existing land uses. It includes the following;

1. Proposed entry from Tallawong Road
2. Proposed extension of Hambledon Road
3. Existing Vegetation considered for retention where earth works allow
4. Future Cudgegong Rd Station Precinct
5. Existing riparian corridor



3.01 Aerial_Source Hassell

➤ *‘Create a flagship centre of operations which reflects line wide pride and signature branding’*

Key design drivers

The key design drivers for the RTRF are listed below

- _ Acknowledge immediate neighbouring land uses, current and future
- _ Respond to the requirements to screen and shield the site from current and future residences and local views
- _ Relate directly to and blend with the immediate landscape character and vegetated surroundings
- _ Support an efficient and functional rail facility
- _ Provide workplace amenity with access to outdoor spaces
- _ To establish a positive site presence
- _ An architectural response underpinned by the use of a common design language achieved through consistent form, details, materials, equipment and finishes.

3.01 Visual representation Tallawong Road

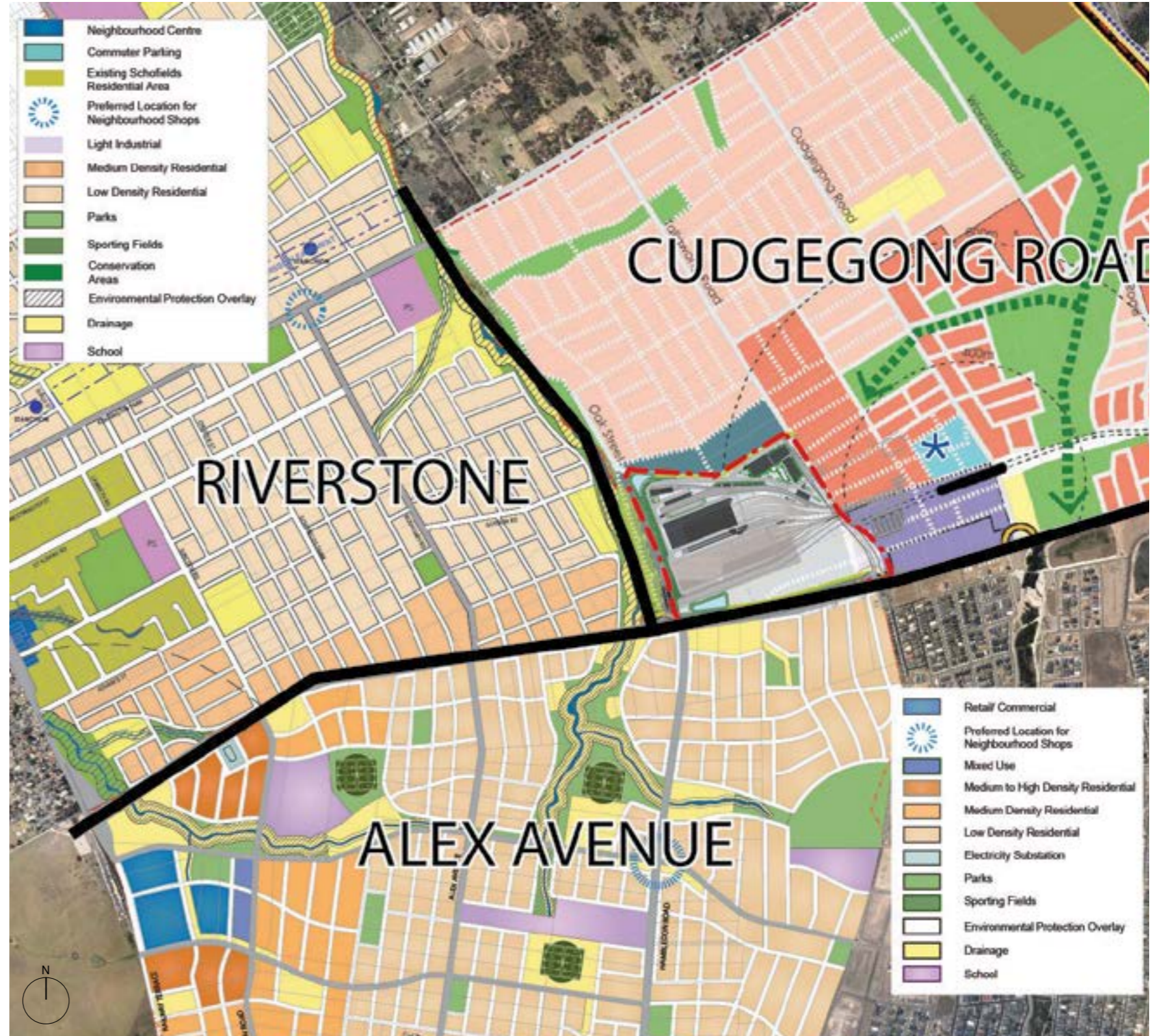


Surrounding Development

The RTRF is located in the south west corner of the Cudgegong Road development site and will be surrounded by:

- _ Medium density residential zoning to the east
- Low density residential zoning to the north
- A proposed new road and the First Ponds Creek riparian corridor to the west, which borders the recently proposed low density residential zonings of the new Riverstone development precinct
- The recently upgraded Schofields Road and the low density residential zonings of the new Alex Avenue precinct to the south.

Figure 4.01 opposite is taken from page 45 of the RTRF Environmental Impact Assessment produced by JBA in July 2013.



4.01 Combined Plan_Source EIS

Cudgegong Rd Structure Plan

Figure 4.02 opposite is taken from the Cudgegong Rd Structure Plan and will guide future development within the area.

- The area is proposed to become predominantly residential
- Higher residential densities are proposed within 800 metres of the station. This comprises a mixture of medium density development of 3-6 storey apartment buildings and 2-3 storey townhouses
- An employment zone is proposed in the area surrounding the NWRL stabling yard and along Schofields Road with the ability to expand north of the stabling yards to accommodate potential future expansion
- The Structure Plan proposes additional low rise housing to replace rural residential uses in other parts of the area, particularly within Riverstone East
- In the event that the expansion of the NWRL stabling yard is not required, the land north of the stabling yard could revert to a different use, such as low rise residential developments
- A finer street network is proposed throughout the local centre to increase connectivity and permeability
- Open space linkages are reinforced along First and Second Ponds Creek. These links will become significant recreational links for residents and also provide significant habitat for wildlife¹



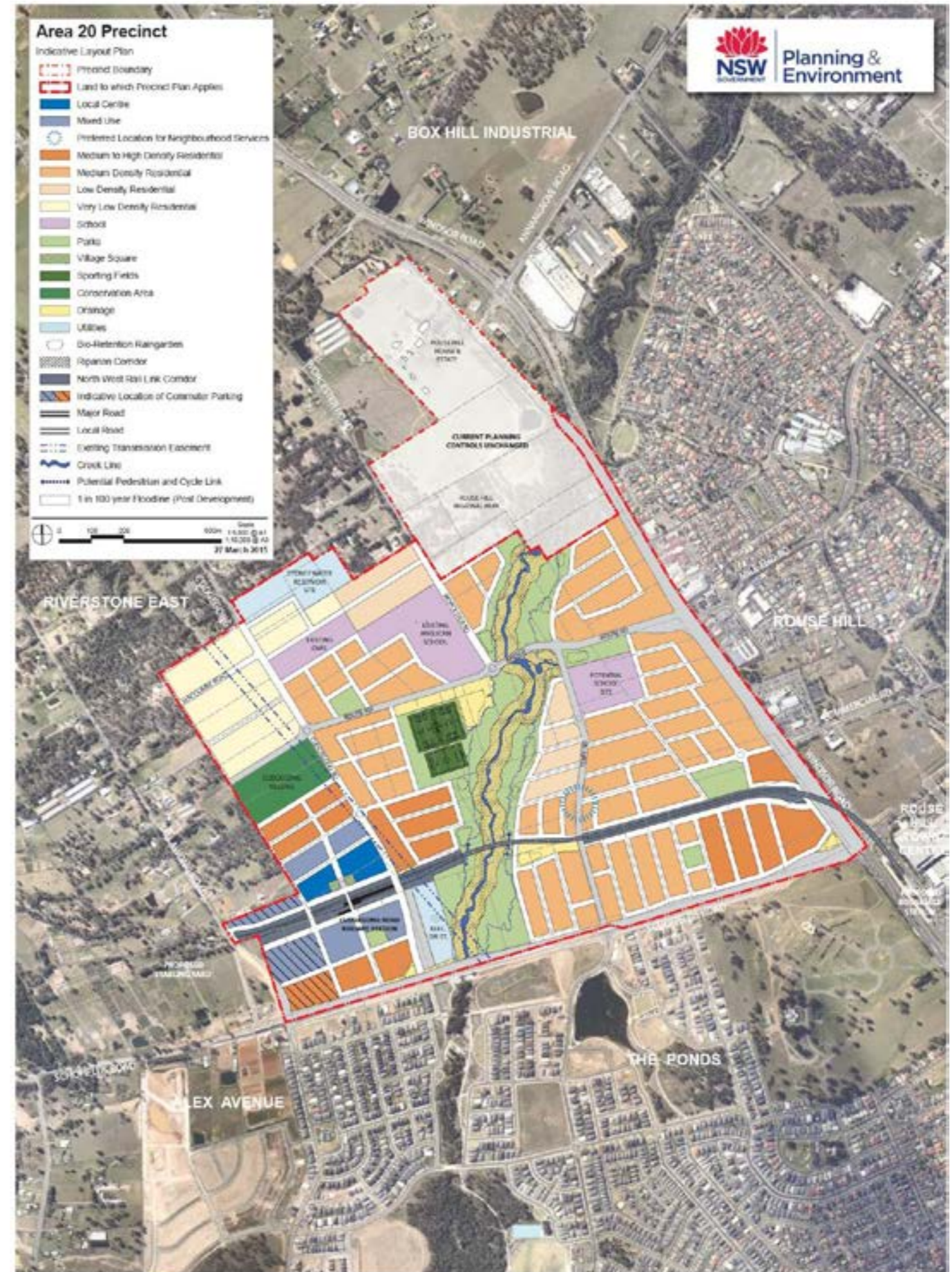
4.02 Cudgegong Road Structure Plan

Cudgegong Road (Area 20) Precinct Plan

Figure 4.03 outlines a draft indicative layout prepared by NSW Government to refine and represent acknowledged developments to the structure plan, some of which are:

- Residential dwelling yield increase
- Increased provision of open space.
- Updated boundaries to Second Ponds Creek riparian corridor.
- Some revisions to the precinct road network to reflect the finalised rail design and the associated traffic studies.

“The proposed amendments to the Area 20 Precinct Plan will allow for development of a local centre that supports a vibrant residential community” Cudgegong Road Station Precinct (Area 20) Finalisation Report



4.03 Cudgegong Road (Area 20) Precinct Indicative Layout Plan March 2015

03 RTRF Context

Cudgegong Rd Structure Plan

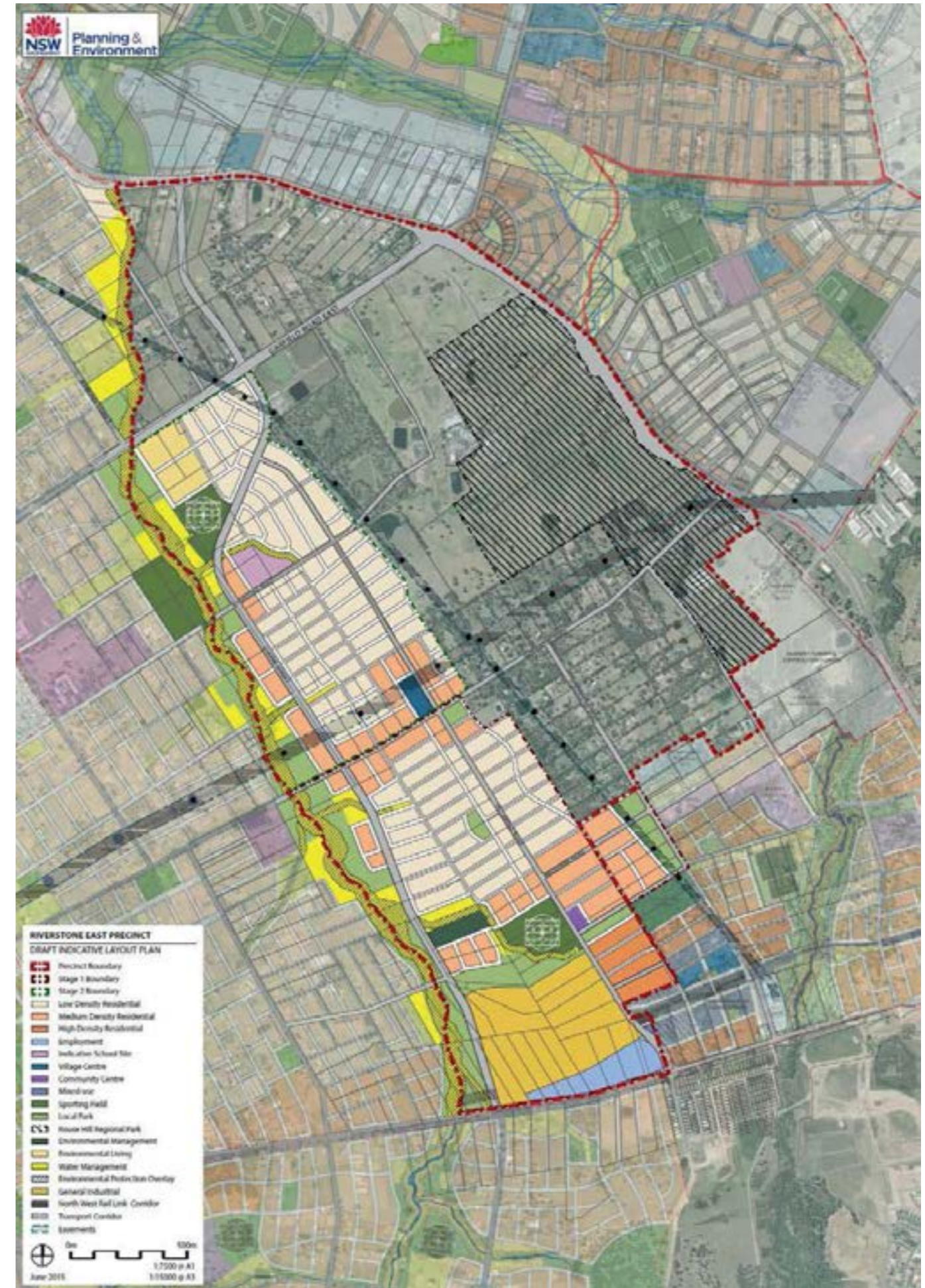
Riverstone East Precinct Plan

Figure 4.04 outlines a indicative layout prepared by NSW Government for inclusion with the draft Development Control Plan currently under consideration (at time of writing) for this precinct.

An extract from the draft DCP vision describes the proposals as follows.

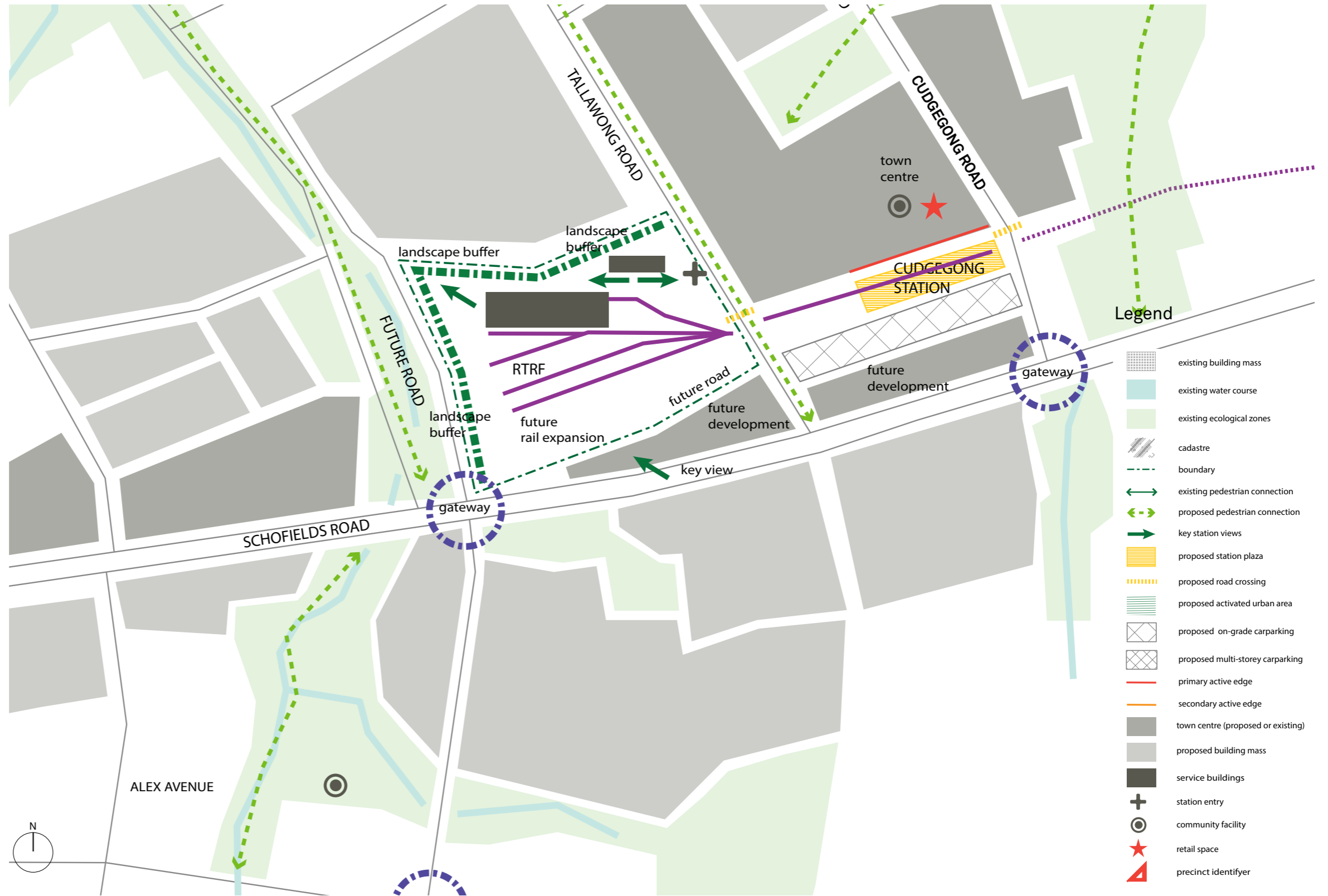
- “a mix of housing types that allows greater choice for different household types.
- predominantly accommodated with low density housing.
- medium density housing is located around the village centre, schools and open spaces.
- medium and high density housing is located in proximity to Cudgegong Road station on the North West Rail Link in the adjacent Area 20 Precinct, to optimise convenient living near retail, community facilities, schools, recreational facilities and public transport.”
- Direct road connections to the nearby Riverstone and Schofields Railway Stations and the North West Rail Link ensure regional public transport accessibility.
- Consideration has also been made for a transport corridor that could potentially link the North West Rail Link to the west. A safe and permeable street network will promote accessibility, connectivity and social interaction.”

4.04 Riverstone East Precinct Indicative Layout Plan June 2015



Key Principles

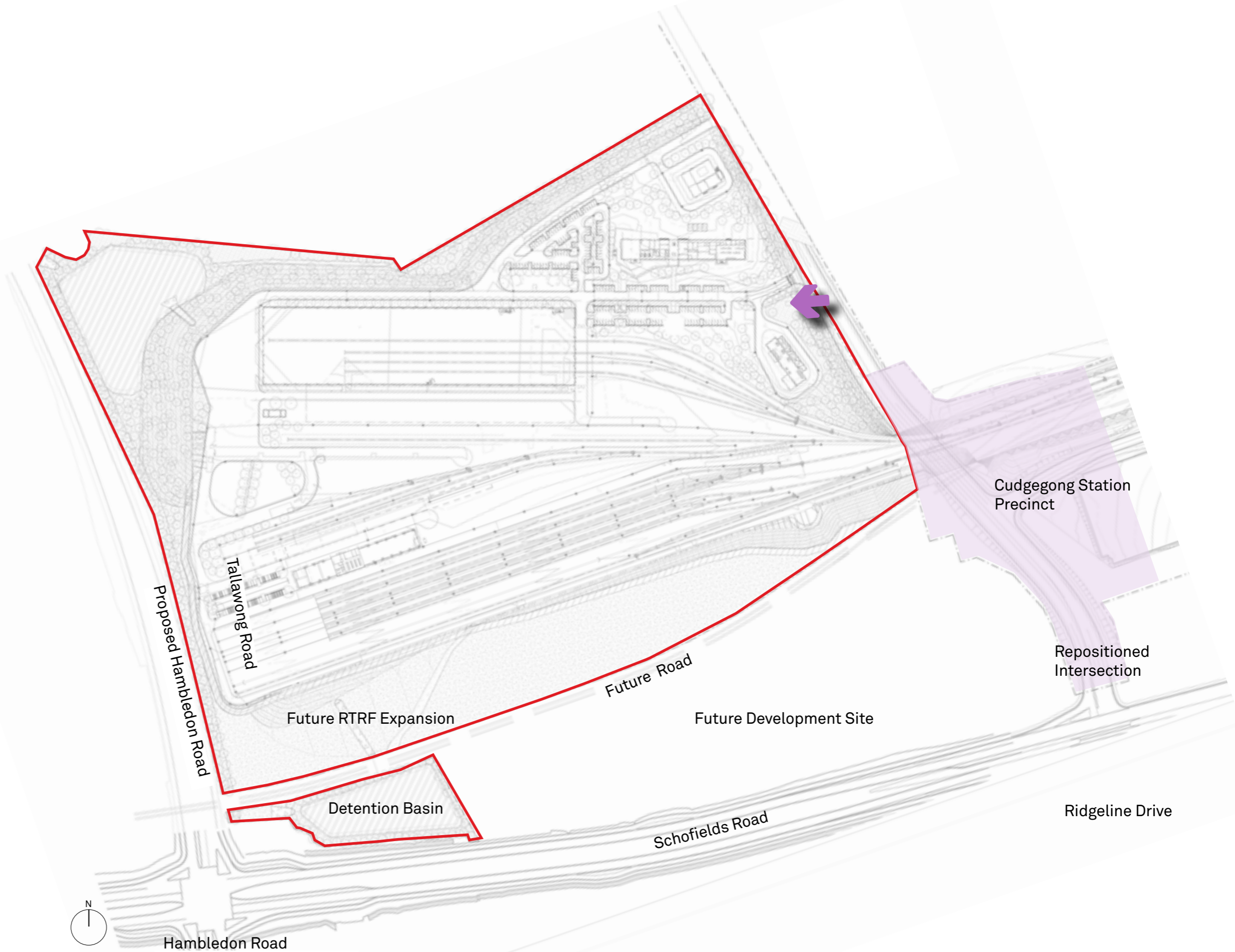
1. Create an integrated facility that responds to the existing and future surrounding landscape
2. Ensure landscape buffers are provided on the north, west and eastern boundaries
3. Create an easily identifiable entry off Tallawong Road
4. Provide a working environment that employees appreciate and feel safe
5. Ensure the facility is effortlessly connected to Cudgegong Station
6. Maximise all view opportunities within the site boundary
7. Provide a facility that sets a new benchmark in sustainability



5.01 Precinct Principles Plan

Site Boundary

Figure 5.02 opposite describes the site boundary in relation to Schofields Road and The Cudgegong Station Precinct.



5.02 Site Plan

**04_RTRF Public Domain
and Landscape Design**





04_

Site Opportunities

1. Landscape buffer.

- Vegetated buffer encapsulates the site to protect, contain and shield the facility from immediate neighbouring areas.
- Opportunity to retain existing trees where site levels allow.
- Opportunity for the facility to be immersed within a vegetated setting.

2. Riparian/ environmental corridor.

- An existing riparian corridor relates to the western boundary of the facility.
- Opportunity to supplement corridor and relate buffer planting to this north south connection.

3. External key views.

- Requirement to introduce buffer planting to the site boundary to provide screening elements which respond to external key views.

4. Internal key views.

- Opportunity to promote internal views across the site from the entry area and administration building. This is for improved passive surveillance of site and circulation spaces, plus for operational supervision of track areas.

5. Local district views.

- Opportunity for views out of the site, towards the north west site boundary across the retention basin and vegetated boundary.

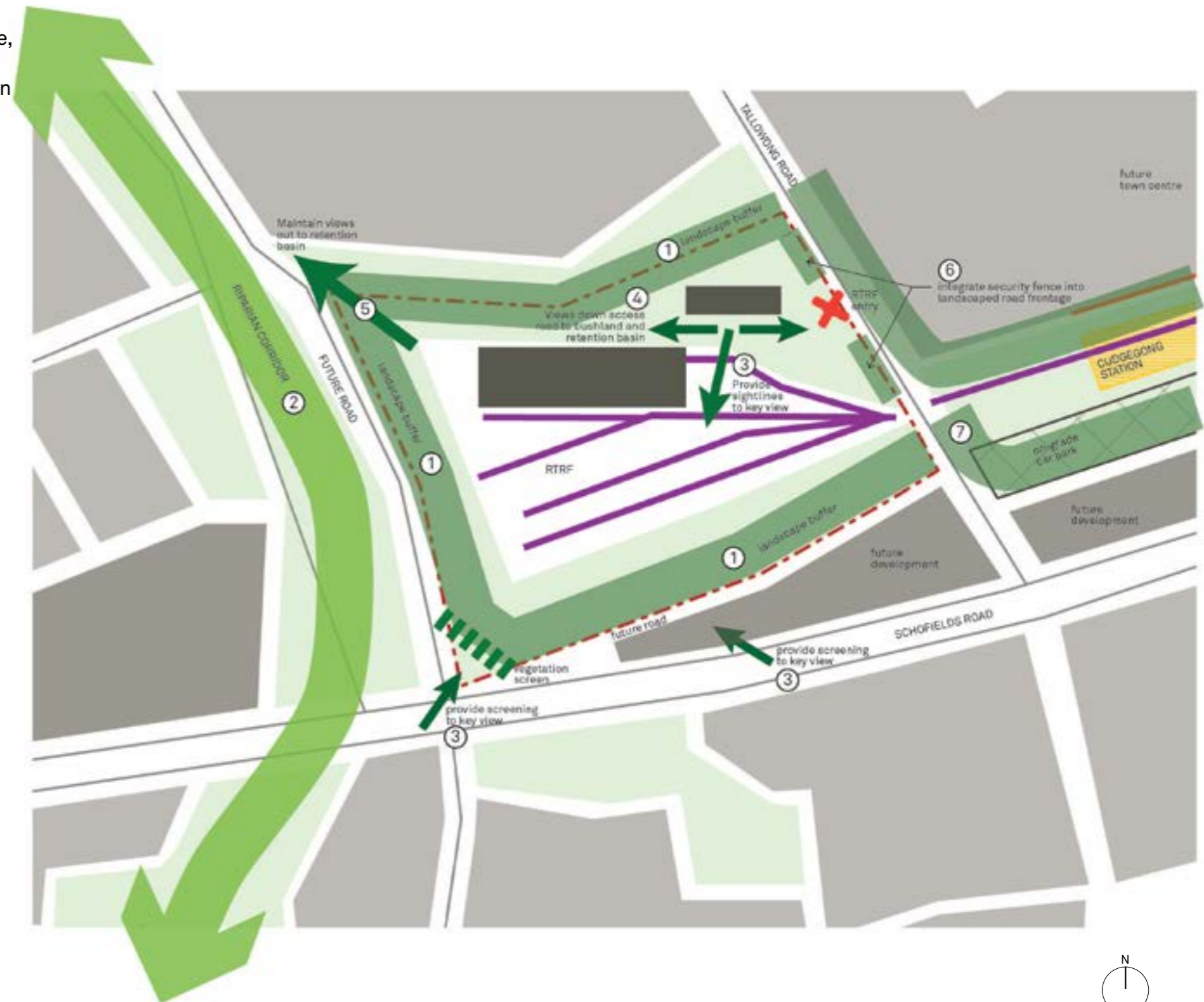
6. Approach to site.

- Opportunity to integrate security fence with streetscape design of Tallowong Road for a coordinated and clean arrival experience to the facility.

7. Relationship with corridor.

- Opportunity to acknowledge vegetated line wide corridor connections and the immediate relationship with the planted areas of the neighbouring Cudgong precinct.

6.01 Precinct Opportunities Diagram



Landscape Design Principles

The landscape design principles are:

1. Access and Circulation

- provide safe and direct pedestrian movement around the RTRF
- Ensure a coordinated suite of directional signage

2. Image and Character

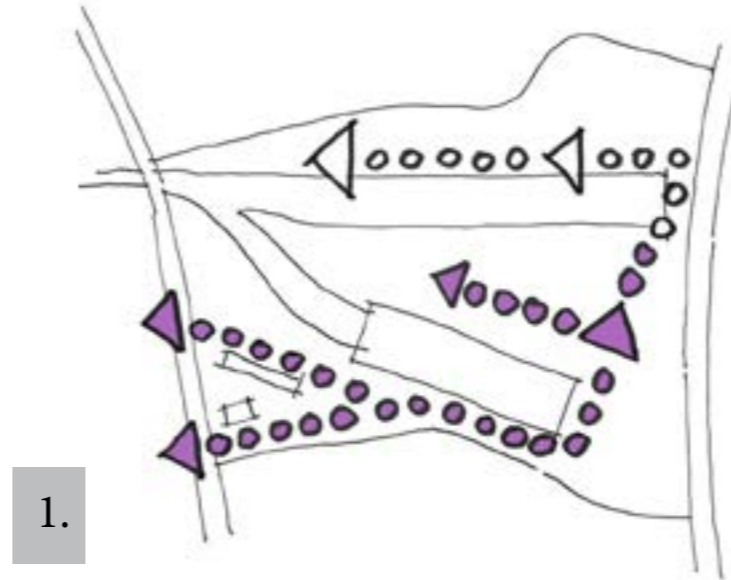
- Position trees and vegetation to allow views and vistas to detention basins from within the site
- Locate and select appropriate high canopy, clear stemmed trees to help with passive surveillance and CCTV positioning
- Create a strong sense of arrival at key destinations within the site
- Create well vegetated boundaries to screen the facility from the surroundings, while allowing the site to blend into immediate environs

3. Facilities and Uses

- To ensure shading to external recreation areas, pathways and car parks to address amenity requirements for site users
- Provide spaces that are multifunctional and take advantage of sunlight

4. Environment

- Ensure permeable surface treatments are used throughout with a vegetated ground cover and abundant tree planting where site function and internal operations allow
- Carefully manage all drainage swales to direct surface storm water to the two detention basins with the intention of developing organically shaped detention basins in future design stages
- Improve water management in basins before stormwater flows off site



6.02



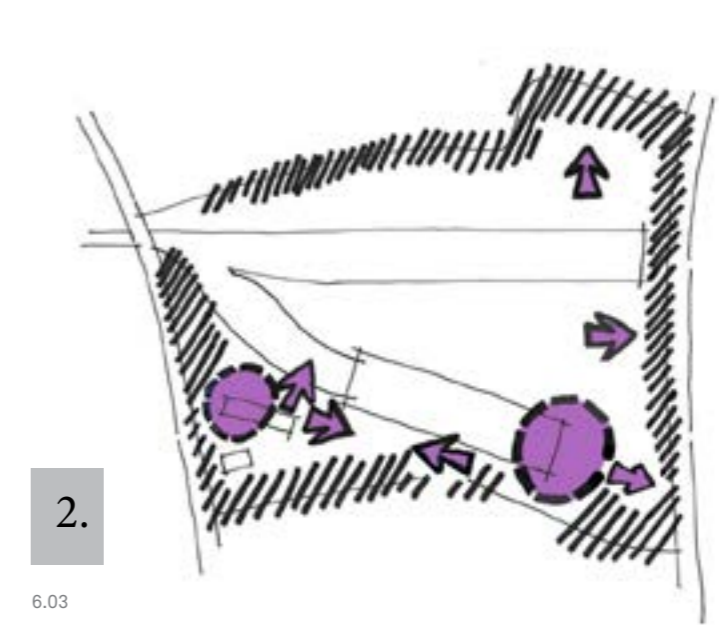
6.03

6.02 Access and Circulation

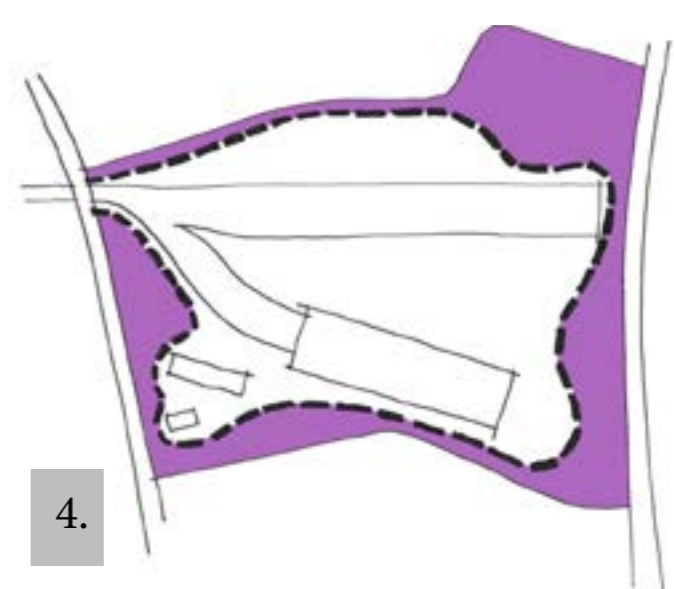
6.03 Image and Character

6.04 Facilities and Uses

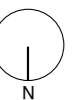
6.05 Environment



6.04



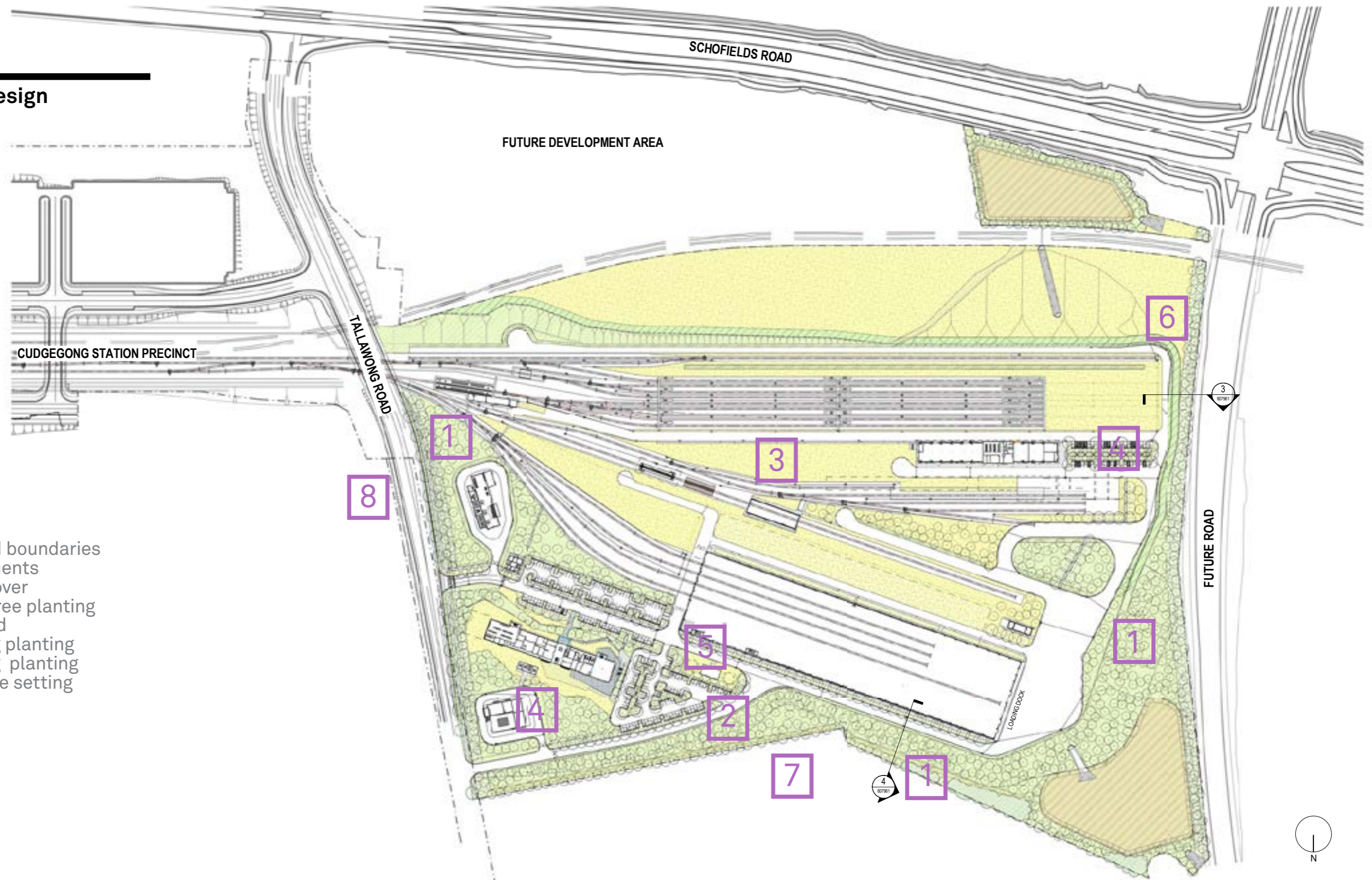
6.05



Landscape Design

KEY PLAN

- 1 Vegetated boundaries
- 2 Embankments
- 3 Ground cover
- 4 Carpark tree planting
- 5 Spine road
- 6 Screening planting
- 7 Screening planting
- 8 Landscape setting



6.06 Landscape Site Plan

04 RTRF Public Domain and Landscape Design

1. Vegetated Boundaries

West, east and north boundaries of the site are to be well vegetated with the provision of a generous landscape buffer. This will incorporate as many existing mature trees as possible. To the south a planted embankment will establish a screening to north of the future expansion area.

2. Embankments

To the north and west, batters will allow site levels to meet existing and are generally at a 1 in 4 grade to reduce the requirement for geo-textile erosion control. A 1 in 3 batter can be introduced where existing trees need to be retained.

3. Ground Cover

Generally a dry grassland surface is proposed across the open spaces. This ensures open views are available across the site which has safety and supervision benefits. Trees planted at a small size are scattered where they do not impose upon the functions of the site. Water tolerant grasses are planted along swales and around retention basins.

4. Tree planting at car parks

Larger sized trees are to be planted at the entry, arrival road and within the administration building car park, and in the workshop car park. These locations will benefit most from instant impact of larger trees both for shade and shelter, as well as be visually more significant.

5. Circulation - Spine Road

A spine road creates a public face to the facility and provides users with a calm and well landscaped wide central link. Road layouts are designed around access and servicing needs.

Controlled entry is from Tallawong Road.

Footpaths are provided to the entry, administration building, plus alongside the maintenance and workshop buildings. Elsewhere pedestrians share the roadway space.

Internally across the facility, the site layout responds directly to functional and safety requirements necessitated by operations to move, house, clean and maintain the trains.

The administration building car parking will be used by both visitors and staff, plus immediately. Car parking is also available further into the site at the workshop

6. Significant Views from south/ west

Views from the south west are screened with planting. The impact of the retaining edge is treated with a planted terrace gabion wall detail. This is with particular consideration for the impact on views from existing surrounding properties.

7. Significant Views from north/ west

Views from the north and west are screened with planting. This is with particular consideration for the impact on views from Rouse Hill House and existing surrounding properties with views across the facility from this direction.

8. Viewed within a Landscape Setting

Views of the facility are offered from Tallawong Road where the extents of the site will be seen within a landscape vegetation settings.

While there is considered to be minimum impact upon existing community amenity and privacy, the creation of this facility within a planted setting provides a backdrop and boundary definition for the site.



6.07



6.08

6.07 Blacktown Showground immersion in vegetated setting

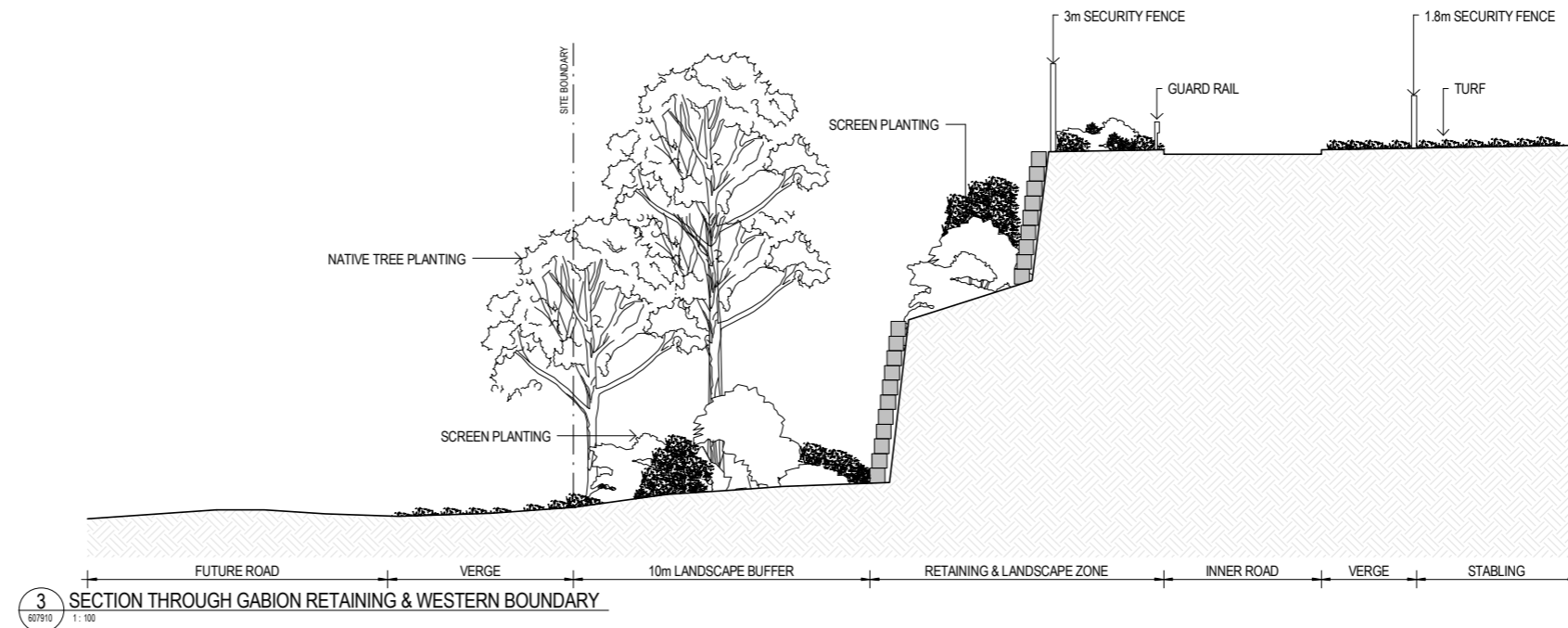
6.08 Blacktown showground raingardens

Site Sections

Example of retaining wall at western boundary

The change in level to the south west of the site is managed using a stepped gabion retaining wall.

Stepping the gabion wall allows the overall change in level to be split in two, creating an intermediate space for a planted terrace. This will visually break up the overall height and massing of the wall, as well as encouraging the wall to blend into the buffer planting.

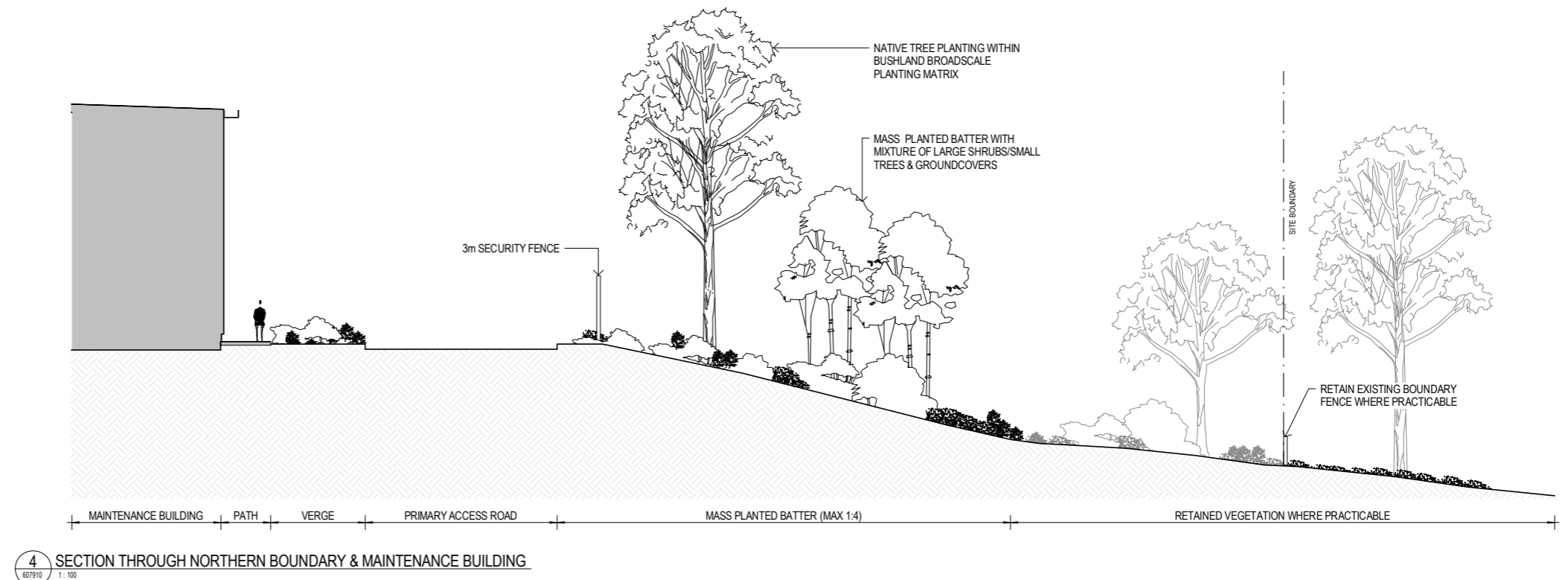


7.09 Site section 3: through retaining wall and western boundary

Example of buffer planting to boundaries

A mix of native species is to be used to promote canopy height diversity once mature.

Planted batters shown here at 1:4 grade, this is typical around the site. Existing mature trees will be incorporated where site levels allow, and batters will be increased to 1:3 if required to retain significant trees.



7.10 Site section 2: through maintenance building and northern boundary

Crime Prevention Through Environmental Design (CPTED)

The important principles of Crime Prevention Through Environmental Design (CPTED) are prioritised throughout the project.

These principles have been applied to the benefit of all those working or visiting the facility:

- Natural surveillance
- Natural access control
- Natural territorial reinforcement.

Natural surveillance

This is achieved by arranging physical elements, activities and customers in such a way as to maximise visibility, promote day and night time use, and foster social interaction. This approach includes:

- Arrangement of access roads that allow long views and free movement of pedestrian and bicycle traffic
- Location of the administration building where it can overlook the entrance gates, adjacent parking, footpaths, and have wider views across the tracks.
- Secure fences where required are see-through anti-climb fencing.

- All internal and external public places will be well lit including pathways, stairs, entrances/exits, parking areas, external amenity areas and service areas
- Landscaping will use clear stemmed trees and low level planting, which will allow uninterrupted eye level views across the public realm
- All public spaces illuminated at night.
- CCTV that will complement these natural surveillance measures.

Natural access control

There is clear differentiation between public space and non-public space by selectively placing entrances and exits, fencing, lighting and landscape to control flow and ensure natural access control occurs. Other control features include:

- The facility has a prominent entry with controlled access.
- Way finding and access is simple and intuitive with minimum need for signage
- Roofs are not easily accessible
- Placing of fencing to secure access to operations and service areas.

Natural Territorial reinforcement

A primary objective for the project is to create a sense of line wide ownership and pride and their associated public domain to ensure that natural territorial reinforcement occurs.

This aspect particularly relates to the RTRF which is the centre of operations and ownership and pride of the facility will be established. Materials used at the RTRF will reflect those used line wide to enhance and promote this aspect.

The building roofs, service buildings, fences, pavements, signs, lighting and landscape are designed as a cohesive suite of elements to express ownership and define public, semi-public and private space.

The buildings, external spaces and all landscape areas will be maintained in a clean and healthy condition at all times.

Substantial tree planting will be undertaken in adjacent streets and places to enhance amenity and ensure the public domain is attractive, safe and popular. Other territorial features include:

- Clearly designated area of public/ visitor and private/ employee domain
- Security system signage will be used at access points
- Employee and visitor amenity areas are located where passive surveillance
- Scheduling activities in common areas increases proper use, attracts more people and increases the perception that these areas are controlled.

Landscape Materials and Finishes Planting

Scope and Performance Requirements (SPR) Appendix 12 provides species lists to be used as a basis for plant selection. Plant species noted * where selected from SPR lists.

Plant mixes have been selected to be low maintenance. Irrigation is provided initially on a temporary basis to ensure that plants are established well during the early years of growth although it is expected that the trees will become independent of irrigation by the end of the first growing season.

The public domain planting areas will be maintained to ensure plants are healthy and in good physical condition at all times.

A number of vegetation characters are proposed across the facility. The vegetation proposed includes:

- screening planting
- bushland broad scale planting
- swale and bio-retention basins
- dry grassland with scattered trees
- entry road and car park trees
- turf
- massed plant beds

Screening mix includes

- Acacia falcata*
- Acacia implexa*
- Acacia longifolia
- Acacia parramattensis
- Allocasuarina littoralis
- Allocasuarina torulosa
- Backhousia myrtifolia*
- Banksia integrifolia
- Calistemon salignus*
- Callistemon citrinus 'Endeavour'*
- Callistemon pachyphyllus *
- Casuarina cunninghamiana*
- Dodonaea triquetra
- Elaeocarpus reticulatus
- Indigofera australis*
- Leucopogon juniperinus
- Leucopogon landeolatus
- Melaleuca decora*
- Melaleuca styphelioides*
- Pittosprum revolutum*
- Ziera smithii*

Bushland broadscale mix includes

- Acacia implexa *
- Acacia parramattensis
- Angophora bakeri
- Casuarina cunninghamiana
- Dodonaea viscosa
- Eucalyptus crebra
- Eucalyptus maculata
- Eucalyptus tereticornis
- Indigofera australis*
- Lomandra multiflora*

Bioswales and Retention Basins includes

- Carex appressa*
- Baumea articulata
- Dianella caerulea *
- Eleocharis sphacelata

- Ficinia nodosa*
- Juncus usitatus*
- Lepironia articulate
- Lomandra confertifolia
- Lomandra longifolia*
- Phragmites australis
- Shoenoplectus validus
- Typha orientalis

Dry Grassland mix includes

- Austrodanthonia fulva
- Austrodanthonia racemosa
- Austrostipa setaceae
- Chloris truncata
- Cynodon dactylon
- Dichelachne micrantha
- Echinopogon ovatus
- Imperata cylindrica
- Microlaena stipoides*
- Themeda australis*

Tree Species includes

- Corymbia maculata *
- Elaeocarpus reticulatus
- Eucalyptus amplifolia
- Eucalyptus crebra*
- Eucalyptus moluccana
- Eucalyptus tereticornis
- Melia azedarach
- Melaleuca decora



8.01



8.02



8.03



8.04

8.01 Broadscale planting

8.02 Massed plant beds with trees

8.03 Bioswale and rain garden car park edge

8.04 Car park trees

Landscape Materials and Finishes - Hardscape

SPR Appendix 12 provides material selections to be used across the project. Quality, longevity, vandal resistance and maintenance aspects are considered fully when making final selections. (See section 5.3) Materials are summarised as follows:

Pedestrian paving

Footpaths across the site will be insitu concrete with panels and jointing to suit local conditions and access points to buildings.

Paving units are proposed at building entry areas and outdoor gathering areas.

Furniture

Benches will be informally positioned near the administration building, the workshop and maintenance buildings where they are likely to be of most use for lunchtime and social gatherings.

Fences

A 2.4m high boundary security fence, with 0.6m concertina short barbed tape, forms a clear boundary around the perimeter of the site.

The location of the fence takes into account practical aspects, such as location of batters and vegetation where necessary in response to improved security and access control, rather than strictly following the exact property boundary.

Retention of the existing post and wire fence along the northern property boundary will remain to mark boundary lines. This style of fence can be used elsewhere if required for similar purposes.

1.8m high fences are arranged to prohibit access to rail tracks except at nominated controlled access points.

Retaining Walls

The gabion baskets will be filled with carefully selected stone, colour and texture to be appropriate to the immediate context to minimise visibility.

Lighting

Site lighting is required for safety, security and evening amenity. Lighting will respond to operational needs, with light being directed internally to minimise lighting overspill beyond the site boundaries. Vegetated buffers will assist with minimising impact of light outside the site.



8.05



8.06



8.07



8.05 Insitu concrete paths

8.06 Timber Bench

8.07 Security fence

8.08 Retaining gabion walls

05_RTRF Architecture
Design





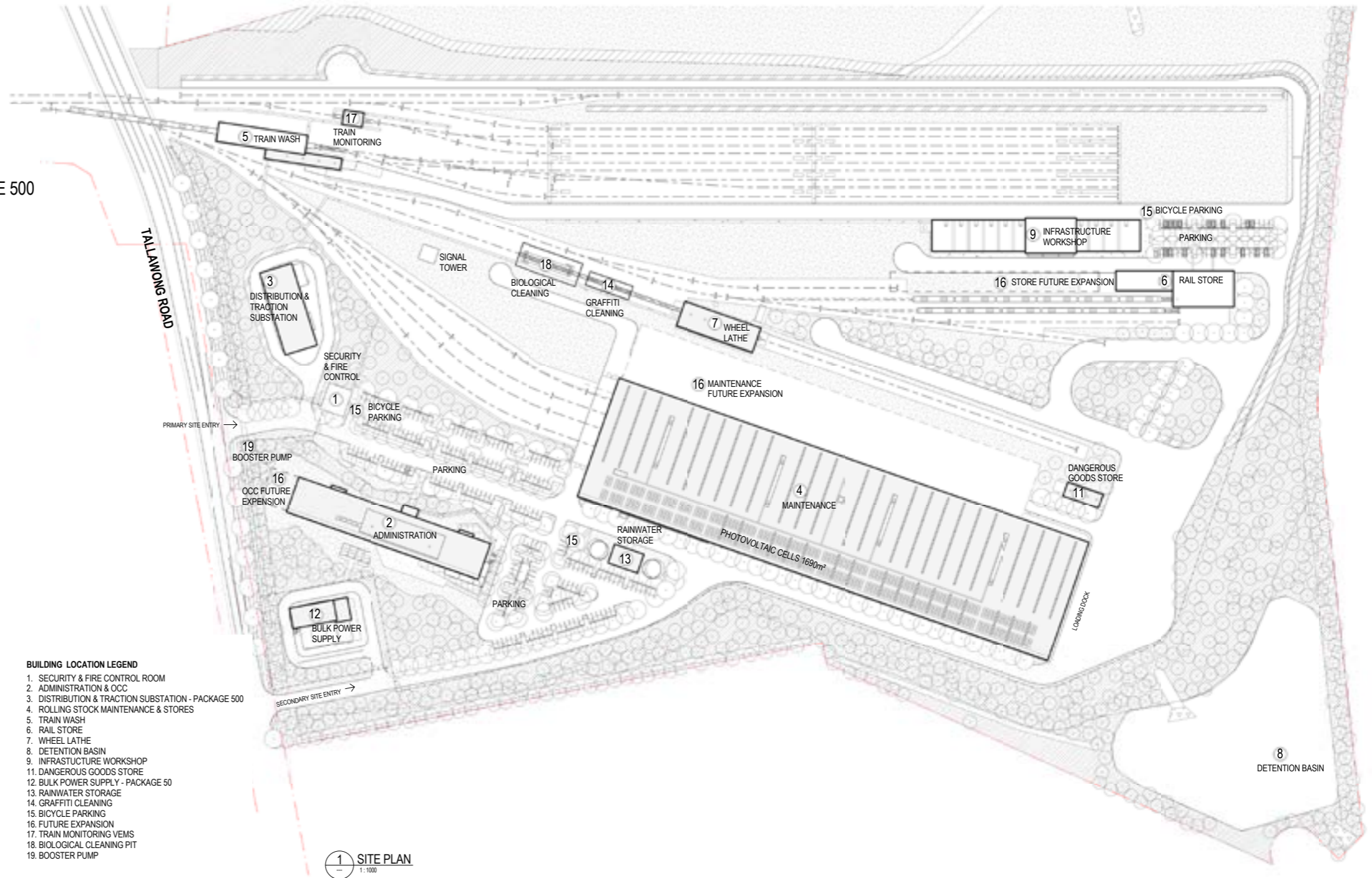
05_

Site Plan



BUILDING LOCATION LEGEND

1. SECURITY & FIRE CONTROL ROOM
2. ADMINISTRATION & OCC
3. DISTRIBUTION & TRACTION SUBSTATION - PACKAGE 500
4. ROLLING STOCK MAINTENANCE & STORES
5. TRAIN WASH
6. RAIL STORE
7. WHEEL LATHE
8. DETENTION BASIN
9. INFRASTRUCTURE WORKSHOP
11. DANGEROUS GOODS STORE
12. BULK POWER SUPPLY - PACKAGE 50
13. RAINWATER STORAGE
14. GRAFFITI CLEANING
15. BICYCLE PARKING
16. FUTURE EXPANSION
17. TRAIN MONITORING VEMS
18. BIOLOGICAL CLEANING PIT
19. BOOSTER PUMP



9.01 Site plan RTRF



RTRF Design Principles

- Simple robust functional built forms which are sensitive and responsive to the local surrounding context
- Consistency and clarity in architectural approach and materials palette to both occupied and plant/ equipment accommodation areas
- Flexible and able to accommodate future expansion
- Integrates sustainability features including daylighting, natural or mixed mode ventilation and photovoltaic panels where appropriate
- All buildings are ventilated as required by their function with either mechanical air conditioning, mixed mode or natural ventilation.

System-wide approach: kit of parts

NRT's architectural response is underpinned by the use of a common design language achieved through consistent form, details, materials, equipment and finishes.

It is the intention to reflect this within the design of the RTRF precinct as consolidation of line wide identity and the NWRL signature brand.

Building Typology

Function of buildings and their parts are expressed by different cladding systems and colour.

Mixed Mode Ventilation expressed

Articulated facade developed into a angled facade element with damped louvres for controlled natural ventilation into maintenance and workshop areas.

Sunshading on glazing

Sunshading is incorporated to reduce direct solar penetration.

Natural light / rooflights in plane

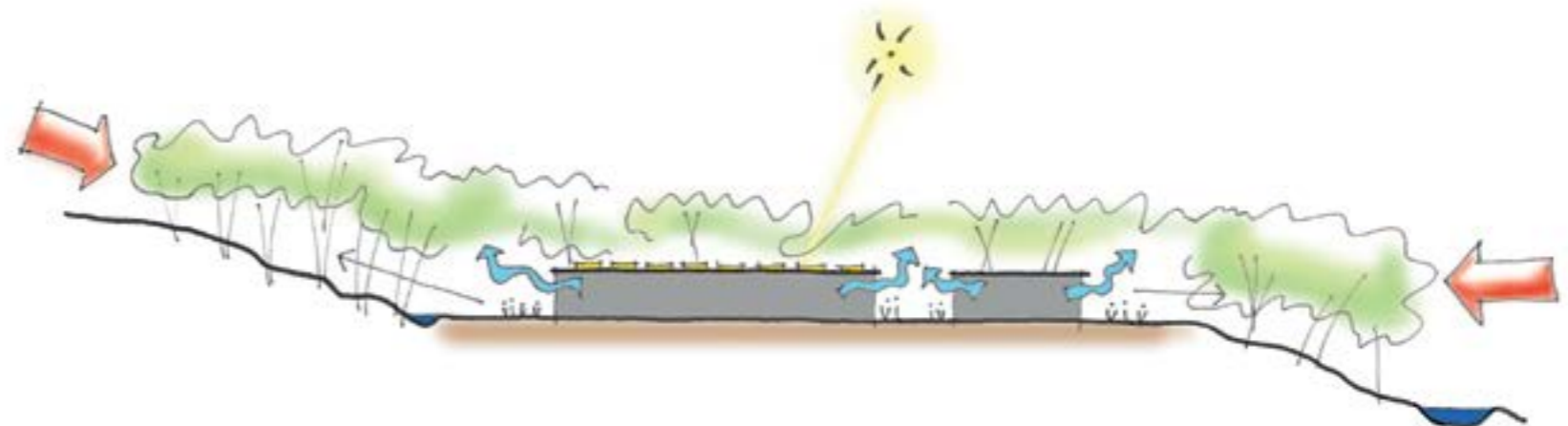
Buildings are orientated to optimise natural light penetration.

Common material palette & form

- high thermal performance insulated panels in horizontal or vertical format
- insitu concrete
- coloured blockwork
- metal sunshades
- translucent clerestory wall cladding
- steel structure

Green Star

The Administration building is being designed to meet Green Star Office and Interiors 4 stars.



9.02 RTRF design principles

Materials and Finishes

A material palette has been developed reflecting the kit of parts strategy. Materials and finishes have been selected on the basis of performance, aesthetics and durability in accordance with SPR requirements. Materials include:

- _ Modular metal faced insulated wall panelling
- _ Windows either double glazed or translucent sheeting
- _ Metal roof sheeting with insulation and acoustic treatment as required
- _ Translucent roofing and rooflights for work area daylighting
- _ Aluminium sunshading to glazing
- _ In-situ and precast concrete
- _ Painted steel

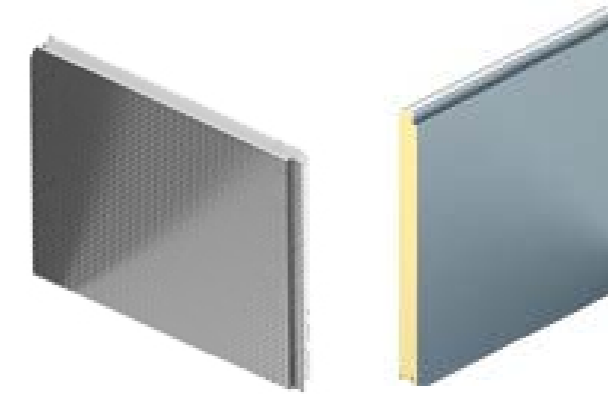
Benchmarks

Benchmarks referenced in the design of the RTRF include:

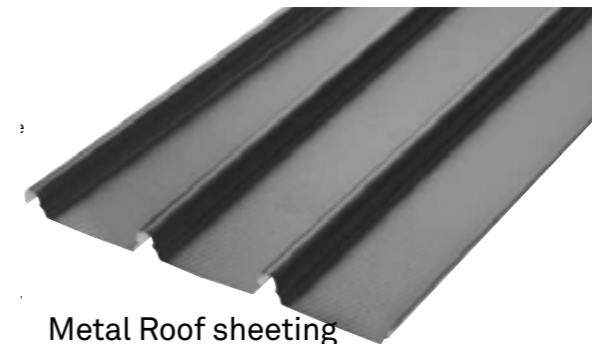
- _ Auburn Maintenance Centre for Reliance Rail.
- _ MTR Pat Heung Depot



10.01 Auburn Maintenance Centre - Reliance Rail
 10.02 Auburn Maintenance Centre - Reliance Rail
 10.03 Control Centre MTR Pat Heung Depot
 10.04 Control Centre NASA Mars mission
 10.05 Control Centre Madrid police headquarters



Insulated cladding panels



Metal Roof sheeting



Translucent roofing

Operation, Access and Maintenance

The NRT approach to maintainability and whole of life design and operation is founded on the following key drivers and strategies:

- Complete design and documentation to ensure the fine resolution of detail and fabrication.
- A kit of parts solution to maximise quality, durability, repetition and consistency in detailing, materials and equipment.
- Independent Design Review validation to ensure design quality and detail resolution
- Validation of detailing prior to construction
- Emphasis on pre-fabrication to ensure quality of finish, efficiency and economy
- Specification of high quality, robust and resilient materials, equipment, finishes and fittings selection to ensure long design life and low maintenance
- Secure supply chain and spares program to enable ready replacement where necessary with an equivalent and matching material, fitting or element.
- Reliability, Availability and Maintainability (RAM) analysis of key components.

Key maintainability features:

RTRF buildings cleaning and maintenance proposals have been developed in conjunction with operations to ensure safe, practical methods are incorporated into the station designs.

Materials and finishes have been selected and specified in order to minimise ongoing cleaning and maintenance costs. Anti-graffiti finishes are an Special Project Requirement and have been specified for all internal wall finishes. Unnecessary ledges, horizontal surfaces and recesses have been avoided to assist in the ease of cleaning.

Consideration has been given to the means of access to all building and services elements requiring cleaning or maintenance.

The buildings have been designed around the use of a standard 6m scissor lift for access to the majority of areas requiring cleaning or maintenance access. A maintenance equipment store with a battery charging point is provided to accommodate a scissor lift.

The principal electrical, communications and fire services routes are located in at ceiling level where access is provided via accessible ceiling panels. Access to the track and the areas above the tracks will require a power

outage. Access may be provided by ‘hi-rail’ vehicle or a mobile scaffold erected on the concrete track bed.

RAM analysis will be undertaken on all elements during detailed design Stage 2.

The discouragement of birds will be an integral part of detailed design. Where ledges are unavoidable they will be deterred by means of tensioned wires and bird spikes.

Strategy for dealing with graffiti and vandalism

SPR Appendix 12 clarifies the requirement for anti-vandal finishes and surfaces. In addition to the selection of appropriate materials to meet this requirement it is recognised that the principle means of minimising graffiti and vandalism is to consistently and vigorously apply CPTED principles: As outlined in Section 4.5 and summarised here.

- Natural surveillance
- Natural access control
- Territorial reinforcement.

These principles will drive responsible behaviours and will be augmented by the project’s commitment to quality and the clear and responsive supervision of the public domain by trained, people-friendly customer service staff.

In addition to these important CPTED initiatives the operator will:

- Ensure the cleanliness and appearance of all floors, walls and ceilings at all times
- Use anti-graffiti coatings or paint over strategy on vulnerable walls in public areas
- Install shatter proof glazing to vulnerable glazed screens, windows and barriers
- Provide vandal resistant materials, fittings and equipment

Landscape maintenance

External areas that are the responsibility of NRT are defined within the SPR Appendix 03 - Licenced Maintenance Areas.

NRT shall be responsible for maintaining the landscape softworks consistently to the standards outlined here so that the site is in an excellent condition of health and appearance

Where planting is used, plant species have been selected to be low maintenance. Irrigation is provided on a temporary basis, principally to ensure that plants are established well during the early years of growth although it is expected that the trees will become independent of irrigation by the end of the first growing season.

External lighting includes recessed wall lights at steps and street light poles to provide lighting to pedestrian areas and to support CCTV cameras. These may generally be accessed by scissor lift.

The following are general maintenance requirements for areas under the responsibility of NRT.

During the Landscape Maintenance Period the following horticultural practices shall be carried out to ensure that plants are maintained in a healthy vigorous condition.

Maintenance shall be continuous throughout the licensing period. Landscape maintenance operations to be monitored and reported on a monthly basis

The extent of work comprises:

Generally

- Watering: Generally ensure that all planting is receiving sufficient water to ensure vigorous growth and maintenance in a healthy condition
- Weed and pest control. Eradicate all grass, weeds and pests from within planted areas with approved weedicides and insecticides and remove from site and use measure to prevent reinfestation
- Equipment/ features maintenance. Monitor all features within the public domain for damage. Repair all elements as soon as notified to minimise further deterioration and prevent harm or access where security is compromised
- Monitor all plants and trees for pest and disease on a monthly basis
- Fertilising as appropriate to the species

- Replacement of plants; Treat or replace injured plants and replace unhealthy or stolen plants to ensure minimum planting densities are retained as specified in SPR Appendix 12
- Remulch as necessary throughout the Landscape Maintenance Period to maintain mulched areas to the specified depths
- Litter and debris. Ensure that the site is kept clean, free of all litter landscape construction waste, and general debris at all times.

Turf and Seeding

- Mowing of turf and grassed lawns to occur where grass in turfed areas reach greater than 500mm
- Topdressing of grass seeded areas as required to maintain healthy grass surface and coverage
- Turf areas to be replaced where dead or dying, and establishment practices undertaken for a minimum of 2 weeks

Shrub and Ground cover planting

- Pruning of vegetation for safety. With regard operations of rail line, safety of public domain and CPTED surveillance.

Trees

- Adjustment of tree ties, and timber edging and tree stakes.



11.01



11.02

11.01 Flush edge at parking edge Swale

11.02 Swale with trees

Sustainability Initiatives

A natural systems approach has been adopted to ensure project wide sustainability initiatives have been integrated within the design of the RTRF.

Energy

NRT has orientated buildings and their shapes to allow optimised levels of natural daylight to penetrate deep into the buildings. Buildings integrate translucent rooflights and translucent cladding to provide natural light to all work areas.

External lighting will be controlled via a programmable time clock with photoelectric sensors for override should there be sufficient daylight. Photo-luminescent types will be used for emergency lighting.

There is a line wide renewable sources strategy which outlines the extent of PV panels to be provided at the RTRF facility to satisfy line wide requirements.

Renewable energy generation will be via photovoltaic cell array mounted on the Main Maintenance Building roof. The array size has been calculated to provide the required 10 % of the RTRF's low voltage energy demand.

Internal lighting will be controlled by photoelectric sensors to ensure lights are only on when needed. Lighting levels will be reduced to no more than

400 lux. Sub metering and outputs linked to the BMS will be provided for monitoring and recording energy usage.

The balanced cut and fill methodology minimises transport of excavated material from the site thus reducing overall construction energy costs.

Insulation for all buildings has been designed to meet or exceed BCA Part J requirements. Glazing for air-conditioned spaces in the Administration, Maintenance and Infrastructure buildings has been designed with high U value, double glazed units.

Sun-shading has been incorporated to reduce direct solar penetration.

Waste minimisation during operations has been considered in the planning of administrative and operational parts of the facility. Recycling facilities and storage for the separation of different waste streams, oil, electrical, electronic and equipment waste has been provided

Water

The Train Wash Plant is designed to recycle 85% of wash water and will incorporate a water capture treatment and filtration system linked to recycled water storage tanks sized to accommodate a full wash/rinse cycle.

Monitoring systems

The RTRF will be monitored by the BMS to enable monitoring and control of connected systems to ensure they operate efficiently based on demand requirements. NRT will incorporate the following monitoring and control items:

- Motion sensors will be used to turn off artificial lighting when rooms not occupied
- CO2 monitoring and control in the Administration building to reduce mechanical ventilation when it is not required
- Mechanical services will be monitored and controlled so that night flushing of indoor areas with cool fresh air can take place and reduce mechanical ventilation
- Administration Foyer uses mixed mode ventilation with automatic glazed louvres when conditions are suitable
- Water metering with digital output linked to the BMS for both potable and non-potable water supplies will enable abnormal usages to be detected and rectified.
- Maintenance building ventilation is mixed mode being naturally ventilated the majority of the time. The building uses a programmable minimal spot heating and cooling system when required.

Materials and finishes

Materials have been selected which respond to the following sustainable principles.

- High quality, durable and easily maintained and replaced materials
- Life cycle assessment to understand whole of life environmental impacts for material selection
- Design for disassembly with bolted steel connections

Landscape

Landscape sustainability initiatives can be summarised as follows:

- Species indigenous to the Cumberland Woodland area have been selected to relate directly to and blend with the immediate landscape
- Irrigation requirement minimised to turf areas at the Administration building. Treated stormwater used for irrigation.
- Drought tolerant native plants selected to majority of landscaped areas to obviate requirements for irrigation
- Shaded outdoor spaces provided to improve workplace amenity;
- Heat island effect reduced and amenity improved by providing shaded pedestrian routes;
- Stormwater runoff controlled by vegetated drainage swales directed to vegetated detention basins;
- Asset protection zones (APZ) as defined by the Rural Fire Service have been considered in the placement of buildings and landscape while complying with the landscape strategy and planning requirements.

Signage and Wayfinding

Introduction

The RTRF is train repair and maintenance depot and the location of the Operations Control Centre and administrative centre for the NWRL. RTRF visitors will include delivery suppliers and staff for training. There will be no public visitors.

Signage design

The wayfinding requirement is mostly going to be limited to identification signs for the site, individual buildings, areas, rooms etc. The TfNSW wayfinding principles, devised for public use in transport environments, will be used as the basis for signage graphics.

Signing and wayfinding approach

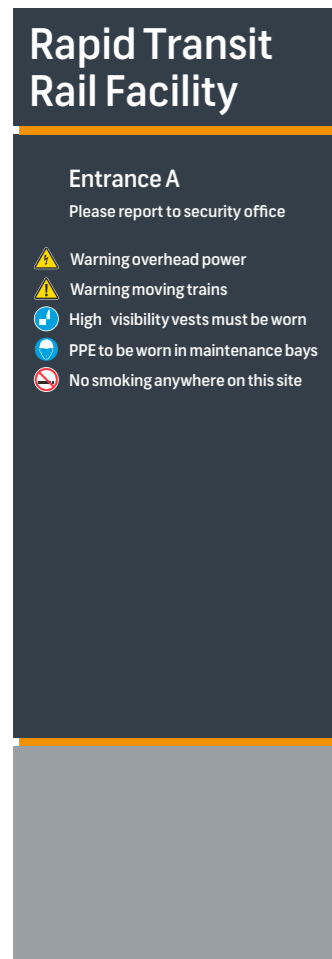
The signing and wayfinding used at the RTRF will help to ensure the efficient operation of the site and contribute toward safety for everyone working there.

Primarily the wayfinding strategy is for vehicular and pedestrian directional signage and building identification. The site needs to be easy to find and navigate for first time visitors.

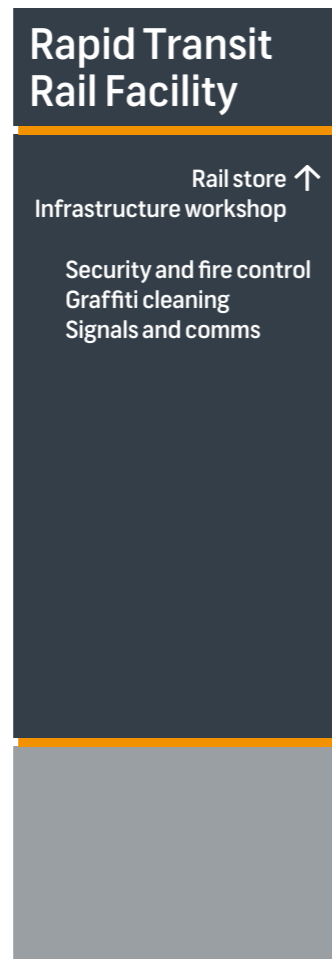
Sign types

The types of signs required for the RTRF include the following:

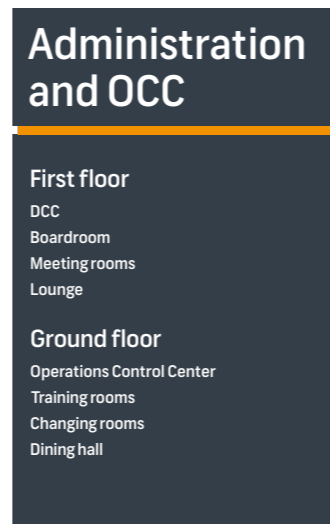
- Road/traffic directional signs
- Site (branded) name signs and entrance signs
- Site traffic signing (including car parks)
- Building identification signs
- Area, zone and building entrance identification signs
- Pedestrian (directional) site signing, using station precinct sign structures
- Building menu signs and internal direction signs
- Building internal door signs
- Safety signing (personal safety, hazards, security etc)
- Emergency signing (exits, escape routes, refuges etc)
- Fire signing (alarms, fire equipment, fire-service facilities)
- Operational signs



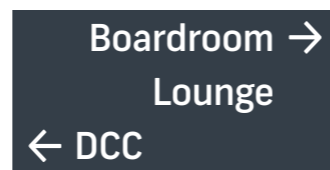
Entrance sign



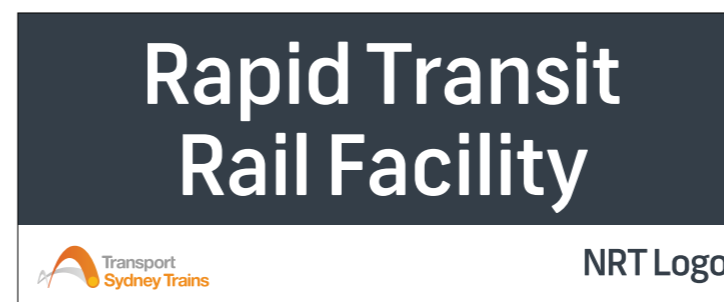
Pedestrian/precinct sign



Internal menu sign



Internal directional sign



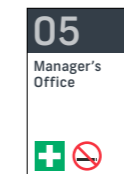
Site name sign



Building sign



Building sign



Door sign



Fire equipment sign



Emergency exit sign



Site safety sign



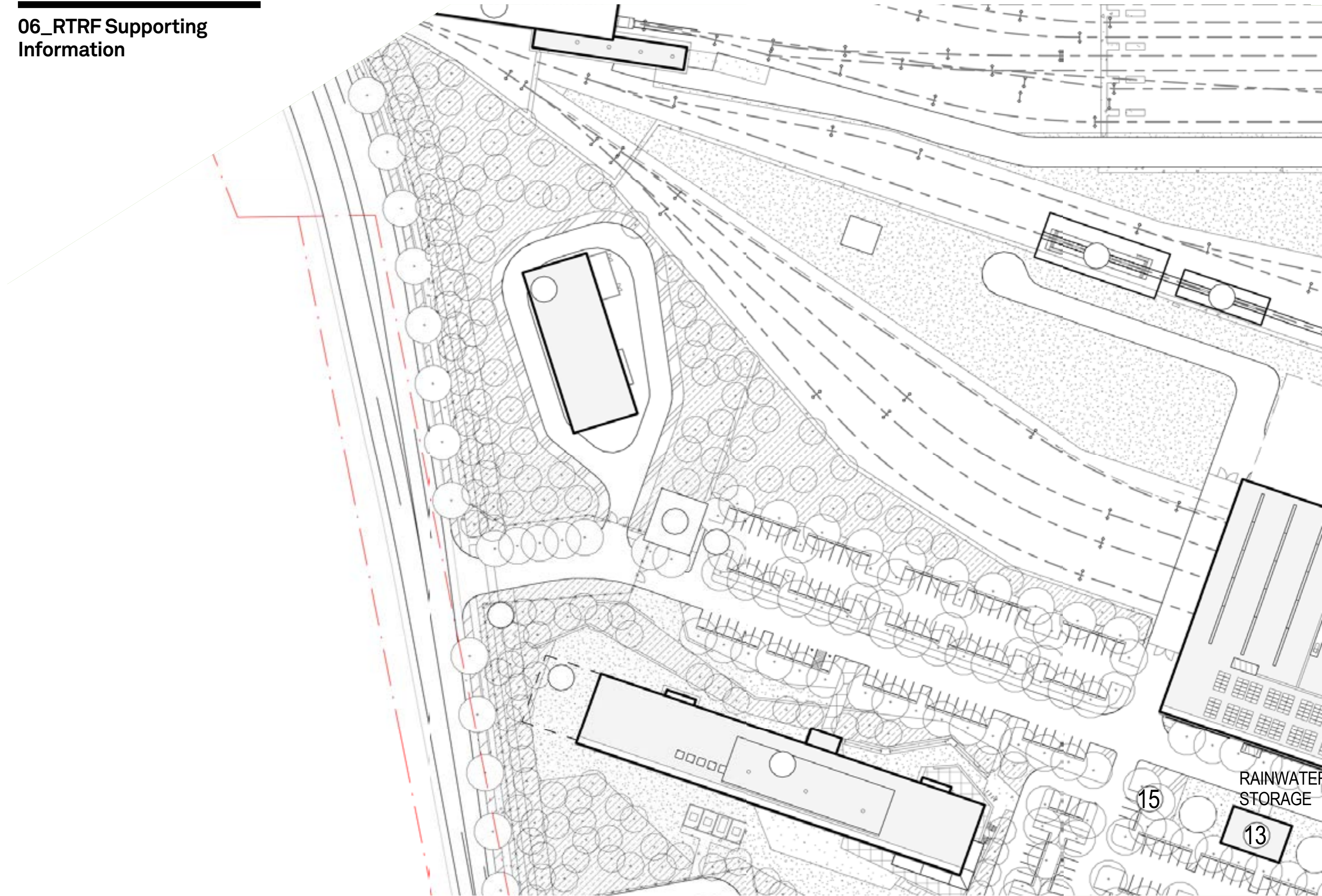
Traffic sign

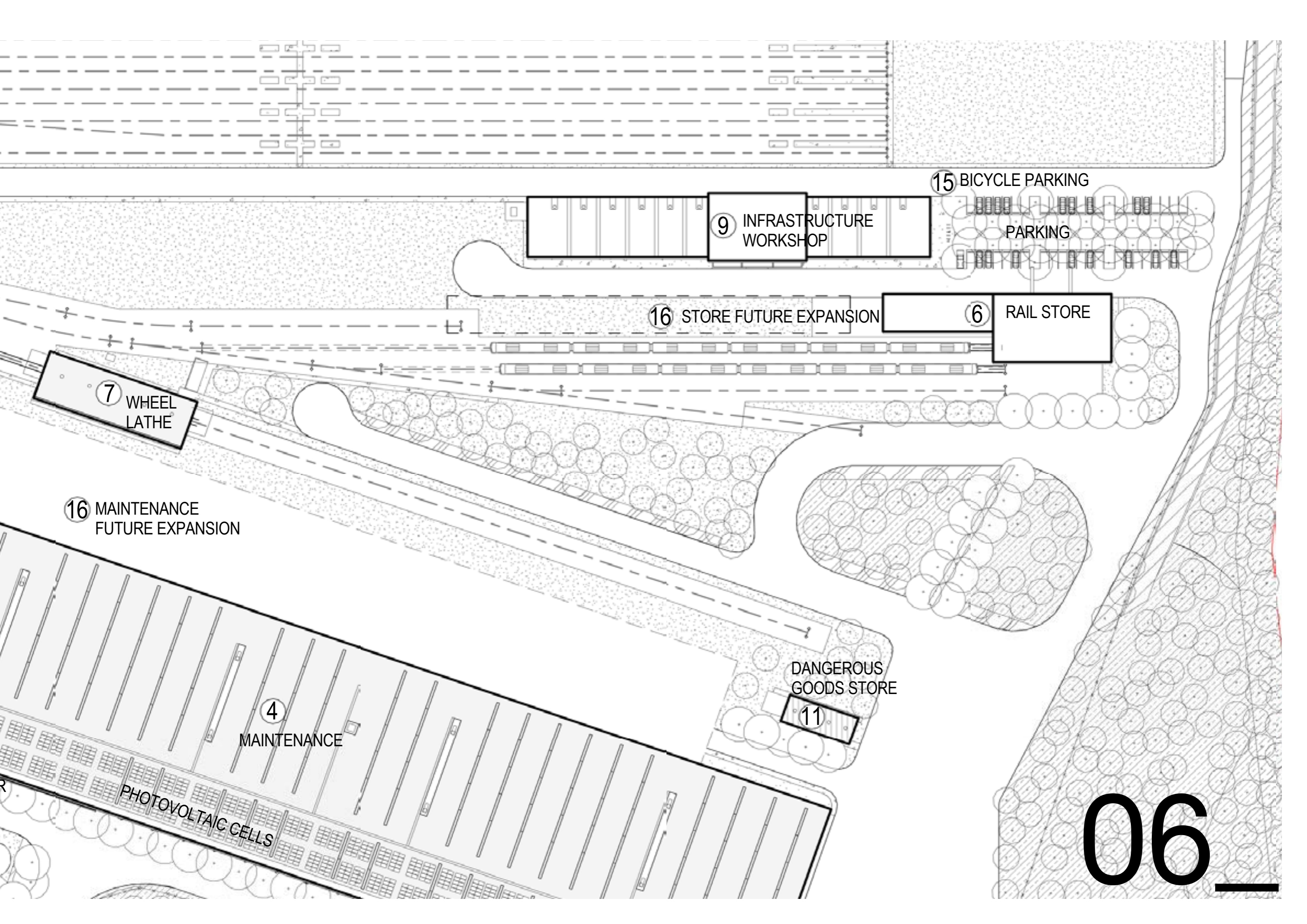


Traffic sign

12.01 Sign types for RTRF

06_RTRF Supporting Information





15 BICYCLE PARKING

9 INFRASTRUCTURE WORKSHOP

PARKING

16 STORE FUTURE EXPANSION

6 RAIL STORE

7 WHEEL LATHE

16 MAINTENANCE FUTURE EXPANSION

4 MAINTENANCE

DANGEROUS GOODS STORE

11

PHOTOVOLTAIC CELLS

06

Summary of consultation comments and responses

Summary of consultation Rapid Transit Rail Facility		
Organisation	Comment	Response
Blacktown Council	Draft Document issued for consultation date - No comments have been received from Blacktown Council	
RMS	Draft Document issued for consultation date - No comments have been received from RMS	
NSW Department of planning: Housing and Land Release	The plans should make reference to the gazetted Cudgegong Road Station (Area 20) Precinct Plan and ensure compatibility with surrounding land uses, particularly in terms of access, parallel road alignments, priority bus roads, etc	Area 20 plan included and referenced appropriately. Noted and added to revision F
	The plans should note the gazettal development yield of 4,400 dwellings in Area 20, not 2,500 as presently documented, with potential for the 4,400 yield to be exceeded.	Noted and added to revision F
	The plans should update references to the Draft Metropolitan Plan for Sydney to <i>A Plan for Growing Sydney</i> .	Noted and added to revision F
	No objection is made to the design, materials, landscaping, etc proposed in the RTRF and CUD documents.	Noted
Community	An information session was held on site on the 8 th August 2015. Session was attended by 17 people. All proposals received positive feedback. Focus of questions were directed at nature/ size / type/ orientation of the station buildings, plus clarification of construction programs. Attendees welcomed the opportunity to talk to the construction team and to have questions answered.	

Summary of consultation Rapid Transit Rail Facility		
Organisation	Comment	Response
Design Review Panel	<p>Extract from DRP meeting August 11th 2015 “Item: 5. Urban Design and Landscape Plan – Cudgegong Station and RTRF The DRP endorsed the Cudgegong Station and RTRF Urban Design and Landscape Plan with some comments to be addressed as outline below:</p> <p>5.1 DRP Feedback – Cudgegong Station The document has come together and reads well.</p> <p>Coordination in the fencing and the fence structure - for future Cudgegong Station – the 2.4m height of the palisade fence may need to change to be more up to date (NRT brief that the information in the report are freeze at Stage 1 design)</p> <p>5.2 Noted that further work is forthcoming for the Public Art Plan and that in time this will be incorporated into the design.</p> <p>5.3 DRP Feedback – RTRF document DRP endorses the RTRF on the condition that the following changes are updated Depot plans - Relationship to diagram with titles and text do not come together. It is difficult to understand how the vision will be realised.</p> <p>Update the images to be more current with the design development on the basis that this is representative of design at Stage 1.</p>	<p>Noted. Fencing Strategy to acknowledge.</p> <p>Confirmed.</p> <p>Noted and amended in revision F.</p> <p>Noted. NRT brief that the information in the report is “freeze” at Stage 1 design.</p>

06 Australian Standards

Standards and Guidelines

The table on the following pages outlines the referenced standards used a guidance for this project

Reference	Title of Standard or Guideline	Tick	Reference	Title of Standard or Guideline	Tick
AS 1049	Telecommunication Cables Insulation, Sheath & Jacket	✓	AS 1530.4	Method for Fire Tests on building materials, components and structures part 4 – fire-resistance test of elements of construction.	✓
AS/NZS 1055.1	Description and measurement of environmental noise	✓	AS 1562.1	Design and installation of sheet roof and wall cladding - Metal	✓
AS 1158	Lighting for Roads and Public Spaces	✓	AS 1580	Paints and related materials - Methods of test	✓
AS/NZS 1163	Cold-formed structural steel hollow sections	✓	AS 1580.408.4	Paints and related materials - Methods of test - Adhesion (crosscut)	✓
AS/NZS 1170 (set)	Structural Design Actions	✓	AS 1657	Fixed platforms, walkways, stairways and ladders - Design, construction and installation	✓
AS 1221	Fire hose reels	✓	AS/NZS 1664	Aluminium structures - Limit state design	✓
AS 1231	Aluminium and aluminium alloys - Anodic oxidation coatings	✓	AS/NZS 1664.2	Aluminium structures - Allowable stress design	✓
AS 1288	Glass in buildings - Selection and installation	✓	AS 1665	Welding of aluminium structures	✓
AS 1316	Masonry cement	✓	AS/NZS 1668.1	The use of ventilation and air conditioning in buildings - Fire and smoke control in multi-compartment buildings	✓
AS 1319	Safety signs for the occupational environment	✓	AS/NZS 1668.2	The use of ventilation and air conditioning in buildings - Mechanical ventilation in buildings	✓
AS 1365	Tolerances for flat-rolled steel products	✓	AS 1668.4	The use of ventilation and air-conditioning in buildings - Natural ventilation of buildings	✓
AS 1379	Specification and supply of concrete	✓	AS 1670.1	Fire detection, warning, control and intercom systems – System design, installation and commissioning – Fire	✓
AS/NZS 1385	Textile floor coverings - Metric units and commercial tolerances for measurement	✓	AS/NZS 1680	Interior lighting	✓
AS 1391	Metallic materials - Tensile testing at ambient temperature	✓	AS 1734	Aluminium and aluminium alloys - Flat sheet, coiled sheet and plate	✓
AS 1397	Continuous hot-dip metallic coated steel sheet and strip - Coatings of zinc and zinc alloyed with aluminium and magnesium	✓	AS 1735	Lifts, Escalators and Moving Walk	✓
AS 1428	Design for Access and Mobility	✓	AS 1735.1	Lifts, escalators and moving walks - General requirements	✓
AS 1428.1	Design for access and mobility - General requirements for access - New building work	✓	AS 1735.2	Lifts, escalators and moving walks. Passenger and goods lifts – Electric	✓
AS 1428.2	Design for access and mobility - Enhanced and additional requirements - Buildings and facilities	✓	AS 1735.12	Lifts, escalators and moving walks - Facilities for persons with disabilities	✓
AS 1428.4.1	Design for access and mobility - Means to assist the orientation of people with vision impairment - Tactile ground surface indicators	✓	AS 1743	Road signs - Specifications	✓
AS 1442	Carbon steels and carbon-manganese steels - Hot rolled bars and semi-finished products	✓	AS/NZS 1859	Reconstituted wood-based panels - Specifications	✓
AS 1444	Wrought alloy steels - Standard, hardenability (H) series and hardened and tempered to designated mechanical properties	✓	AS/NZS 1859.1	Reconstituted wood-based panels - Specifications - Particleboard	✓
AS 1449	Wrought alloy steels: Stainless and heat resisting steel plate, sheet and strip	✓	AS/NZS 1859.2	Reconstituted wood-based panels - Specifications - Dry-processed fibreboard	✓
AS 1478	Chemical admixtures for concrete, mortar and grout	✓	AS/NZS 1866	Aluminium and aluminium alloys - Extruded rod, bar, solid and hollow shapes	✓
AS 1530	Methods for fire tests on building materials, components and structures	✓	AS 1884	Floor coverings - Resilient sheet and tiles - Installation practices	✓



06 Australian Standards

Reference	Title of Standard or Guideline	Tick
AS/NZS 1891	Industrial Fall-arrest Systems	✓
AS/NZS 1891.1	Industrial fall-arrest systems and devices - Harnesses and ancillary equipment	✓
AS 1905	Components for the protection of openings in fire-resistant walls	✓
AS 2039.1.1	Methods for testing anodic oxidation coatings on aluminium and aluminium alloys - Thickness and related property tests - Local thickness of anodic oxidation coatings by micrographic examination of cross-sections	✓
AS 2047	Windows in buildings - Selection and installation	✓
AS/NZS 2107	Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors	✓
AS/NZS 2208	Safety glazing materials in buildings	✓
AS/NZS 2270	Plywood and blockboard for interior use	✓
AS/NZS 2271	Plywood and blockboard for exterior use	✓
AS/NZS 2272	Plywood - Marine	✓
AS/NZS 2293	Emergency escape lighting and exit signs for buildings	✓
AS/NZS 2311	Guide to the painting of buildings	✓
AS/NZS 2312	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings	✓
AS/NZS 2327	Composite structures – A new standard for composite steel concrete buildings	✓
AS 2342	Development, testing and implementation of information and safety symbols and symbolic signs	✓
AS 2358	Adhesives - For fixing ceramic tiles	✓
AS 2436	Guide to noise and vibration control on construction, demolition and maintenance sites	✓
AS 2441	Installation of fire hose reels	✓
AS 2444	Portable fire extinguishers and fire blankets – selection and location	✓
AS/NZS 2455.1	Textile floor coverings - Installation practice - General	✓
AS 2484.2	Fire – Glossary of terms – protection and fire fighting equipment	✓
AS/NZS 2588	Gypsum plasterboard	✓
AS 2633	Guide to the specification of colours	✓
AS/NZS 2699	Built-in components for masonry construction	✓

Reference	Title of Standard or Guideline	Tick
AS/NZS 2699.1, .2, .3	Built-in components for masonry construction	✓
AS 2700	Colour standards for general purposes	✓
AS 2700S	Colour Standards for general purposes - Swatches	✓
AS 2701	Methods of sampling and testing mortar for masonry constructions	✓
AS/NZS 2785	Suspended ceilings - Design and installation	✓
AS 2796.3	Timber - hardwood - sawn and milled products	✓
AS 2832	Cathodic protection of metals	✓
AS 2834	Computer Accommodation	✓
AS 2865	Confined spaces	✓
AS 2890	Parking facilities	✓
AS 2899.1	Public information symbol signs - General information signs	✓
AS/NZS 2904	Damp-proof courses and flashings	✓
AS/NZS 2908.2	Cellulose-cement products - Flat sheet	✓
AS/NZS 2924.1.	High pressure decorative laminates - Sheets made from thermosetting resins - Classification and specifications	✓
AS 2946	Suspended ceilings, recessed luminaires and air diffusers - Interface requirements for physical compatibility	✓
AS/NZS 3012	Construction and demolition sites	✓
AS 3553	Adhesives for floor and wall applications - Resilient vinyl, linoleum and rubber sheet and tiles - Interior and exterior use	✓
AS 3590	Screen-based Workstations	✓
AS 3600	Concrete Structures	✓
AS 3610	Formwork for Concrete	✓
AS 3661.2	Slip resistance of pedestrian surfaces - Guide to the reduction of slip hazards	✓
AS/NZS 3666	Air handling and water systems of buildings – Microbial control	✓
AS/NZS 3678	Structural steel - Hot-rolled plates, floor plates and slabs	✓
AS/NZS 3679	Structural steel - Hot-rolled bars and sections	✓
AS 3679.1	Structural steel - Hot-rolled bars and sections	✓
AS 3679.2	Structural steel - Welded I sections	✓
AS 3700	Masonry structures	✓

06 Australian Standards

Reference	Title of Standard or Guideline	Tick	Reference	Title of Standard or Guideline	Tick
AS 3706	Geotextiles - Methods of test	✓	AS 4292	Railway safety management	✓
AS/NZS 3715	Metal finishing - Thermoset powder coating for architectural applications of aluminium and aluminium alloys	✓	AS 4292.1	Railway safety Management - General Requirements	✓
AS 3730	Guide to the properties of paints for buildings	✓	AS 4292.4	Railway Safety Management - Part 4: Signalling and Telecommunications Systems and Equipment	✓
AS 3730.21	Guide to the properties of paints for buildings - Primer - Solvent-borne - For ferrous metallic surfaces	✓	AS 4312	Atmospheric corrosivity zones in Australia	✓
AS 3735	Concrete structures retaining liquids	✓	AS 4360	Risk management	✓
AS 3740	Waterproofing of domestic wet areas	✓	AS 4419	Soils for landscaping and garden use	✓
AS/NZS 3750	Guide to the properties of paints for buildings Paints for steel structures	✓	AS 4426	Thermal Insulation of Pipe work, Ductwork and Equipment	✓
AS/NZS 3750.6	Paints for steel structures - Full gloss polyurethane (two-pack)	✓	AS 4431	Guidelines for Safe Working on New Lift Installations in New Constructions	✓
AS 3771	Road lighting luminaires with integral control gear	✓	AS 4442	Office desks	✓
AS/NZS 3799	Liquid membrane-forming curing compounds for concrete	✓	AS 4443	Office panel systems - Workstations	✓
AS 3845	Road safety barrier systems	✓	AS/NZS 4455	Masonry units and segmental pavers	✓
AS 3894	Site testing of protective coatings	✓	AS 4456	Masonry units and segmental pavers and flags - Methods of test	✓
AS 3958	Ceramic Tiles and Tiling	✓	AS 4459	Methods of Sampling and Testing Ceramic Tiles	✓
AS 3958.1	Ceramic tiles - Guide to the installation of ceramic tiles	✓	AS/NZS 4536	Life cycle costing - An application guide	✓
AS 3995	Design of steel lattice towers and masts	✓	AS/NZS 4548	Guide to long-life coatings for concrete and masonry - Wall coatings - Latex extensible	✓
AS 3996	Access covers and grates	✓	AS/NZS 4586	Slip resistance classification of new pedestrian surface materials	✓
AS 4024.1	Safety of machinery	✓	AS 4600	Cold-formed steel structures	✓
AS 4100	Steel structures	✓	AS 4654	Waterproofing membrane systems for exterior use - Above ground level	✓
AS 4145.1	Locksets and hardware for doors and windows - Glossary of terms and rating system	✓	AS 4662	Ceramic tiles—Definitions, classification, characteristics and marking	✓
AS 4154	General Access Floors (Elevated Floors)	✓	AS/NZS 4663	Slip resistance measurement of existing pedestrian surfaces	✓
AS 4155.6	Test methods for general access floors - Test for floor resistance for electrostatic control	✓	AS/NZS 4666	Insulating glass units	✓
AS 4254	Ductwork for Air Handling Systems in Buildings	✓	AS/NZS 4667	Quality requirements for cut-to-size and processed glass	✓
AS 4254.1	Ductwork for air-handling systems in buildings – Flexible Duct	✓	AS 4673	Cold-formed stainless steel structures	✓
AS 4254.2	Ductwork for air-handling systems in buildings – Rigid Duct	✓	AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles	✓
AS 4282	Control of the obtrusive effects of outdoor lighting	✓	AS 4687	Temporary Fencing and Hoardings	✓
AS/NZS 4284	Testing of building facades	✓	AS/NZS 4707	Chain of custody for certified wood and forest products	✓
AS 4288	Soft underlays for textile floor coverings	✓	AS/NZS 4740	Natural Ventilators Classification and Performance	✓
			AS 4777	Grid connection of energy systems via inverters	✓
			AS 4785	Timber – Softwood – Sawn and milled products	✓

06 Australian Standards

Reference	Title of Standard or Guideline	Tick
AS 4785.3	Timber - softwood - sawn and milled products	✓
AS 4791	Hot-dip galvanized (zinc) coatings on ferrous open sections, applied by an in-line process	✓
AS/NZS 4792	Hot-dip galvanized (zinc) coatings on ferrous hollow sections, applied by a continuous or a specialized process	✓
AS 4806	CCTV	✓
AS/NZS 4859.1	Materials for the thermal insulation of buildings - General criteria and technical provisions	✓
AS/NZS 5033	Installation of photovoltaic (PV) arrays	✓
ISO 14520	Gaseous fire-extinguishing systems	✓
AS 60076	Power transformers	✓
AS 60076.1	Power Transformers - General	✓
AS/NZS 60076.3	Power Transformers - Insulation Levels, Dielectric Tests and external Clearances in Air	✓
AS 60076.4	Power Transformers - Guide to the lightning impulse and switching impulse testing - Power transformers and reactors	✓
AS/NZS 60076.5	Power Transformers - Ability to withstand short circuit	✓
AS/NZS 60076.10	Power Transformers - Determination of Sound Levels	✓
AS 60076.11	Power Transformers - Dry Type Transformers	✓
AS 60118.4	Hearing Aids - Magnetic Field Strength in Audio-frequency Induction Loops for Hearing Aid Purposes	✓
AS 60265.1	HV Switches - Switches for rated voltages above 1 kV and less than 52 kV	✓
AS 60265.2	HV Switches - Switches for rated voltages of 52 kV and above	✓
AS/NZS 60479	Effects of current on human beings and livestock	✓
AS 60529	Degrees of Protection Provided by Enclosures (IP Code)	✓
AS/NZS 60598	Luminaires - General requirements and tests	✓
AS 60849	Sound Systems for Emergency Purposes	✓
AS 60947	Low Voltage Switchgear and Controlgear	✓
AS/NZS 61000	Electromagnetic Compatibility (EMC)	✓

Reference	Title of Standard or Guideline	Tick
AS/NZS 61000.3.6	Electromagnetic compatibility (EMC) - Limits - Assessment of emission limits for distorting loads in MV and HV power systems	✓
AS 61000	Electromagnetic Compatibility (EMC)	✓
AS 61508	Functional safety of electrical/electronic/ programmable electronic safety-related systems.	✓
AS/NZS 61558	Safety of power transformers, power supplies, reactors and similar products	✓
AS 61935.1	Testing of Balanced Communication Cabling in Accordance with ISO/IEC 11801 - Installed Cabling	✓
AS 62040	Uninterruptible power systems (UPS)	✓
HB 39	Installation code for metal roof and wall cladding	✓
SAA HB 59	Ergonomics - The Human Factor	✓
HB 167	Security risk management	✓
HB 197	An introductory guide to the slip resistance of pedestrian surface materials	✓
HB 230	Rainwater Tank Design and Installation Handbook	✓
RMS TD 2008/08	Technical Direction 2008/08	✓
RTA	Road design guideline June 1999	✓
RTA Pub08.091	RMS Guide to Delineation	✓
RTA Pub 03.286	NSW Bicycle Guidelines	✓
TCA EN-ST-106/4.0	Vertical Transportation – Lifts Specification	✓
TM P99/4	RTA Bicycle Policy (Maintenance Work)	✓
TM P00/1	RTA Bicycle Policy Grates	✓

06 Competency

Competency

There is a requirement to provide evidence that this report is prepared by suitably qualified persons.

The following people have prepared this report.

Geoff Crowe
Qualification
_BA Arch (Hons), Sheffield University, United Kingdom
_DipArch, Sheffield University, United Kingdom
Geoff has over 20 years experience in transport projects in Australia and the United Kingdom with a particular focus on underground and surface rail stations.

Julianne Boustead
Qualification
_Bachelor of Planning and Design, Melbourne University
_Master of Landscape Architecture, Melbourne University
Julianne has over 25 years experience in the design and implementation of a wide range of complex landscape architectural projects.

Anne Lucas
Qualification
__BA (Hons) LArch, Heriot Watt University, Edinburgh
Anne has over 20 years experience and has acquired particular expertise in delivering public domain projects and collaboration within a multidisciplinary team environment.

