Transport for NSW

NSW GOVERNMENT

Technical Paper 1

Design, Place and Movement

Parramatta Light Rail Stage 2
Environmental Impact Statement



Welcome to Country

Welcome to galumban nura/gurad (sacred Country). This Country is where nattaigalo (fresh or sweet water) creeks flow into the tidal garigalo (saltwater) Country. Where these two diverse environments meet, the fertile wetlands and swamps of biddigalo (bitter or sour water) are created. This place is home to ancient, mangrove cathedrals, nestled in the safety of Dahl'wah (the casuarina) and the stories of our women.

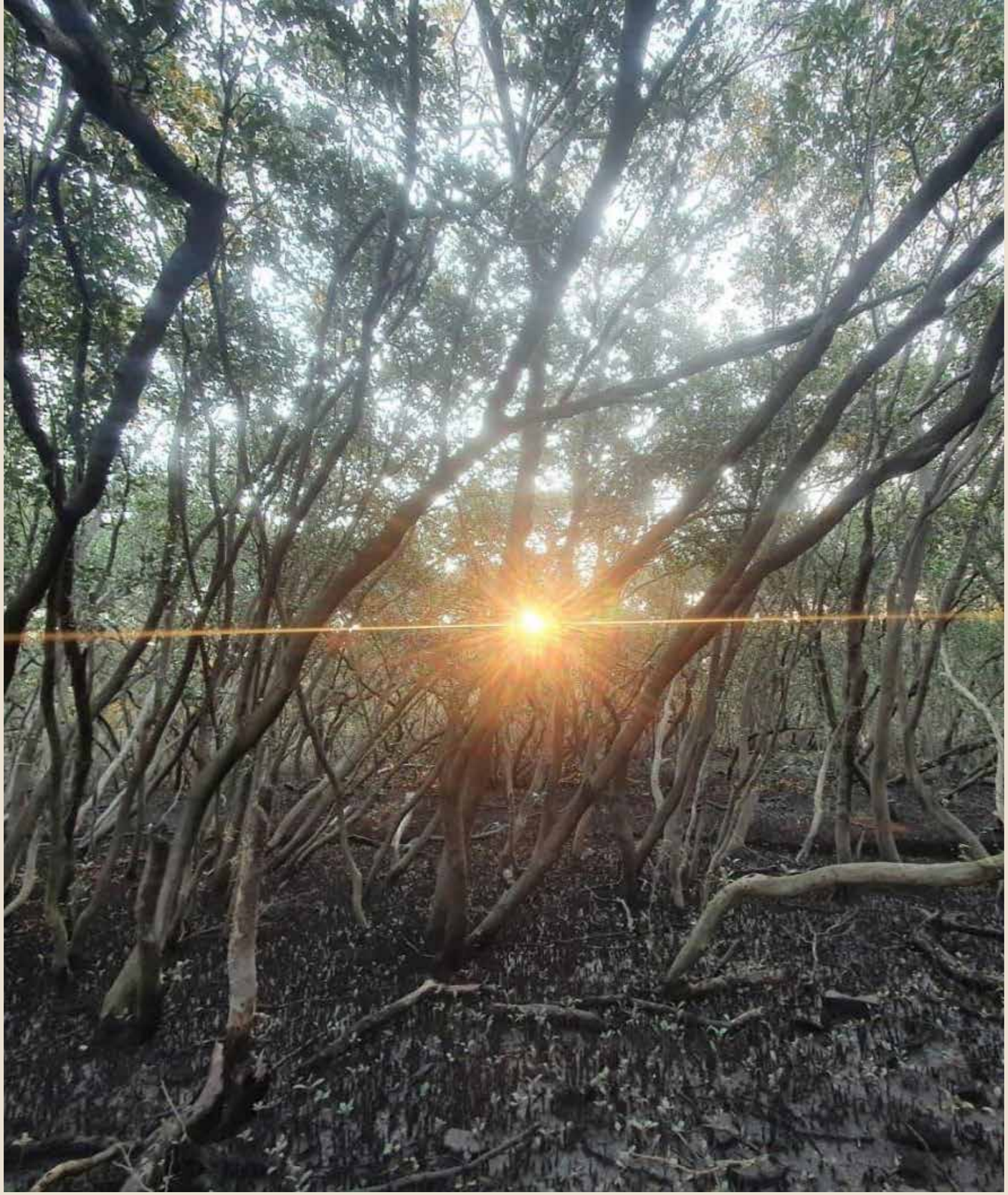
For thousands of generations, this Country has been carefully protected in a reciprocal relationship with local Aboriginal peoples. In the spirit of connectedness that the Parramatta Light Rail embodies, we inclusively acknowledge all of the eora (local custodians) of this area including the D'harawal, Dharug, Eora, Gai-maragal, Gundungurra and Guri-Ngai peoples. We pay our respects to the Ancestors and Elders, past, present and emerging, and honour their unique Ancestral connections to Country, story and knowledge.

Country here has provided for these local communities in great abundance for countless generations. It will be through honouring the enduring spirit of Country as a provider, healer and vital connection to culture that we can create a future whereby many diverse communities can continue to prosper connected to, and united by, Country.

Ngeeyinee bulima nandiritah
(May you always see the beauty of this earth)

Shannon Foster

D'harawal eora Knowledge Keeper and
ORALA Registered Sydney Traditional Owner



Sun setting within the biddigalo (bitterwater) mangroves of the Parramatta River (credit: Bangawarra).

Indigenous cultural & intellectual property rights

Australia is a signatory to the United Nations Declaration on the Rights of Indigenous People. This Declaration has impacts on the sharing of Aboriginal and Torres Strait Islander peoples' cultural knowledges.

We assert the rights of Aboriginal and Torres Strait Islander peoples to sovereignty over their own cultural knowledges, which is also known as 'Indigenous Cultural and Intellectual Property' (ICIP). The ICIP of all Aboriginal and Torres Strait Islander peoples, including the ICIP of the stories found across this document, remains with the Aboriginal and/or Torres Strait Islander peoples they belong to.

Articles 12 & 13 of the UN Declaration on the Rights of Indigenous Peoples include, but are not limited to:

- The right to protect traditional knowledge and sacred cultural material
- The right to ensure traditional laws and customary obligations are respected
- The right to control the recording of (including writing about) customs and expressions, and language which may be essential to cultural identity, knowledge, skill, and teaching Indigenous culture
- The right to prevent insulting, offensive and misleading uses of knowledges, art and all forms of culture.

ICIP in this document has not been, and can not ever be, vested or assigned, meaning that what you will read in this document is protected, and does not belong to Transport NSW, any Council, or any consultant, designer, artist or reader. To ensure that future uses of this cultural information supports Aboriginal and Torres Strait Islander ways of being and knowing, if you wish to include ANY aspect of ICIP from this document for other documents, websites, reports, plans or publications, you must first gain specific approval for that use from the people who shared the knowledge, and once that approval is given, you must always acknowledge where the information belongs or who shared it.

Articles 12 & 13 of the UN Declaration also include:

- The right to privacy in relation to cultural, religious and spiritual activities

"Privacy means controlling access and being able to undertake activities such as our ceremonies without interference. As [Aboriginal and/or Torres Strait Islander] people we can decide who to share our religions and spirituality with"

- The right to revitalise, use, develop and pass on to future generations Indigenous ways of being and knowing.

This includes: our histories and our oral traditions; our languages and ways of communicating; our ways of thinking about the world; our names for communities, people and places (AHRC Community Guide to the UN Declaration).

This Design Place and Movement Report positions the UN Declaration as fundamental to respectful engagement with Country, and immutable for respectful engagement with Aboriginal and Torres Strait Islander peoples.

This Design Place and Movement Report upholds these stated rights for all of the peoples of this Country: Dharug/Darug, D'harawal/Dharawal, Gai-maragal, Gundungurra/Gundangarra and Guri-Ngai. Each of these groups have the right to express their stories, culture, language and knowledges, and no one group of people may erase that right for any other group.

Across this document you will encounter stories that share knowledges of Country associated with the designated projects areas. They include a selection of the D'harawal stories of these places and are openly shared by one of the authors of this document, D'harawal Knowledge Keeper and ORALRA (Office of the Registrar. Aboriginal Land Rights Act 1983) registered Traditional Owner Shannon Foster, whose family include D'harawal, Dharug, and Gundungurra peoples. Shannon's Ancestors have kept these knowledges alive across millennia through oral traditions and storytelling. The stories shared are just the starting point. There are other stories, and each story has many layers that have not been unpacked in this document. Learning these will require personal effort and commitment.

There are also very likely to be Ancestral stories of this Country from other local peoples, including Dharug/Darug, Gai-maragal, Gundungurra/Gundangarra and Guri-Ngai peoples as well as those with cultural responsibilities and access here on this Country. Understanding their stories will require personal effort and time to respectfully and appropriately connect with any of these knowledges. As we engage with local Aboriginal stories, it is imperative that we all follow the nuanced cultural and intellectual protocols that govern the sharing of cultural information.

As D'harawal eora Elder Aunty Frances (Fran) Bodkin explains:

"...[our] culture is not based on the ownership of tangible things like land and dwellings and possessions, but it does have a very strong sense of ownership of information. That information, particularly in story form, was not traded, but could be given, and given freely, but its ownership was respected..."



Sharing knowledge with future generations and learning from Country (credit: Bangawarra).

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APPENDIX A – LANDSCAPE AND VISUAL IMPACT ASSESSMENT

APPENDIX B – ARBORICULTURAL REPORT

List of acronyms and definitions

Acronym / Term	Meaning
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHD	Australian Height Datum
ANZCTC	Australia-New Zealand Counter-Terrorism Committee
AS4970	Australian Standard 4970-2009 Protection of trees on development sites
BCA	Building Code of Australia
CBD	Central business district
CPTED	Crime Prevention Through Environmental Design
Definition Design	Design prepared for the EIS
DRP	Design Review Panel
DSAPT	Disability Standards for Accessible Public Transport
DPE	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
GANSW	Government Architect NSW
GPOP	Greater Parramatta to Olympic Peninsula
GSC	Greater Sydney Commission
HAT	Highest Astronomical Tide
IS	Infrastructure Sustainability
ISC	Infrastructure Sustainability Council
ISO	International Organization for Standardization
LAHD	Land and Housing Development
LCZ	Landscape character zone

Acronym / Term	Meaning
LRV	Light rail vehicle
NCC	National Construction Code
Scoping Design	Preliminary design for the project developed prior to the Definition Design
OHW	Overhead wires
ORALRA	Office of the Registrar Aboriginal Land Rights Act 1983
RAS	Royal Agricultural Society of NSW
SEARs	Secretary's Environmental Assessment Requirements
SDG	Sustainable Development Goals
SMW	Sydney Metro West
SOP	Sydney Olympic Park
SOPA	Sydney Olympic Park Authority
SPR	Strategic Planning and Review Department
The project	The Parramatta Light Rail Stage 2 Project
UHI	Urban heat island
UN	United Nations
Unforgetting	Unforgetting knowledges of Country are spatial and experiential ways of actively asserting the Ancestral and time immemorial knowledges of Country. Unforgetting is more than a process of remembering: where a feature of an individual or community's memory can be recalled, forgotten and later re-remembered. It is the process of revival and repetition, etching story and connection into physical reality and identity.
WSUD	Water sensitive urban design
WHO	World Health Organisation

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Chapter 1.0

1.0 Introduction

1.1 Overview

1.1.1 Parramatta Light Rail

The NSW Government's Greater Sydney Region Plan A Metropolis of Three Cities *(Greater Sydney Commission, 2018)* outlines a vision for a three-city metropolis. The Central River City covers the four local government areas of the City of Parramatta, Blacktown City, Cumberland City and The Hills Shire. A Metropolis of Three Cities highlights Greater Parramatta as the focal point for the Central River City, with employment growth and public transport being of key importance.

The Greater Parramatta and the Olympic Peninsula area (GPOP), which extends from Westmead and Parramatta in the west to Sydney Olympic Park to the east, is fast emerging as the heart of Sydney's Central River City and is set to grow and change significantly over the next 20 years. Forecasts predict that GPOP will accommodate almost 170,000 new residents by 2041. Employment opportunities will also grow, with an additional 100,000 jobs predicted by 2041 (SGS, 2017).

Parramatta Light Rail will deliver an integrated light rail service that supports the population and employment growth expected throughout GPOP. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

Parramatta Light Rail will be delivered in stages to keep pace with development:

- Stage 1 will connect Westmead to Carlingford via the Parramatta central business district (CBD) and Camellia. The construction and operation of Parramatta Light Rail Stage 1 was approved by the NSW Minister for Planning in May 2018. Major construction is underway, with the track installation complete and light rail stop construction in progress. Stage 1 is expected to start operating in 2024. Further information on Stage 1 is available at Parramatta Light Rail.
- Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Figure 1 provides an overview of the Parramatta Light Rail network showing both stages.

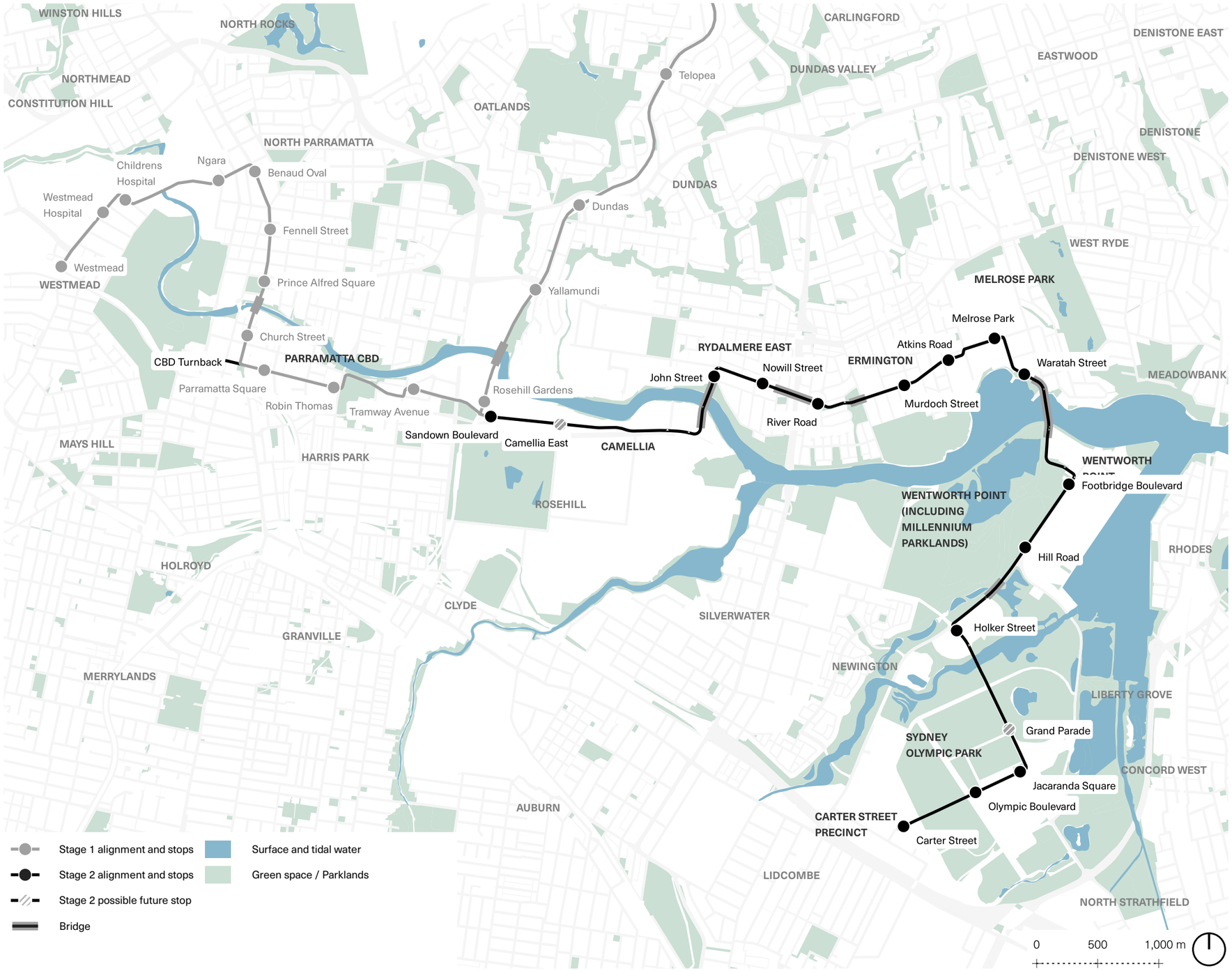


Figure 1: Parramatta Light Rail Stage 1 and Stage 2 alignments.

1.1.2 Project overview

The project comprises two main elements:

- construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
- operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.

Further information on the location of the project, and a description of the project site for the purposes of this document, is provided in the environmental impact statement (EIS).

Key features

The key features of the project, which are shown in Figure 2 include:

Light rail line and bridges

- a new 10 kilometre long dual light rail track, with 14 stops, between the Parramatta Light Rail Stage 1 line in Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
- two bridges over the Parramatta River between Camellia and Rydalmere, and between Melrose Park and Wentworth Point
- a bridge over Silverwater Road between Rydalmere and Ermington
- other bridge works in Ken Newman Park and Sydney Olympic Park.

Active and public transport integration

The project would also deliver:

- about 8.5 kilometres of new active transport links between Camellia and the Carter Street precinct, which would connect with the existing cycling and pedestrian network
- interchanges with other forms of public transport, including trains, ferries, buses and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Rydalmere and Sydney Olympic Park
- a light rail and pedestrian zone (no through vehicle access) within Sydney Olympic Park along Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard
- bus access over the proposed bridge between Melrose Park and Wentworth Point.

Other works

Works proposed to support the project's operation:

- turnback facilities, including along part of Macquarie Street in the Parramatta CBD
- adjustments to the Parramatta Light Rail stabling and maintenance facility at Camellia
- five new traction power substations to convert electricity to a form suitable for use by light rail vehicles
- new and improved open spaces and recreation facilities at Ken Newman Park, the Atkins Road stop and Archer Park.

Further information on the project's features is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

Operation

The project would operate between the Parramatta CBD and the Carter Street precinct, using a section of the Parramatta Light Rail Stage 1 alignment and the alignment constructed as part of the project.

Between the Parramatta CBD and Camellia, the project would operate along about three kilometres of the Parramatta Light Rail Stage 1 alignment. Parramatta Light Rail Stage 2 services would terminate at the Stage 1 Parramatta Square stop to allow customers direct and convenient access to Parramatta's CBD, and interchange with Stage 1 light rail services, trains, buses and Sydney Metro West.

From Camellia, the project would operate along the light rail infrastructure proposed as part of Stage 2, terminating at the proposed Carter Street stop.

The project would operate as a turn-up-and-go light rail service from 5am to 1am, seven days a week, in line with Parramatta Light Rail Stage 1. The project would have travel times of around 31 minutes from the Carter Street stop in Lidcombe to the proposed Sandown Boulevard stop in Camellia, and a further seven minutes to the Parramatta Square stop in the Parramatta CBD.

Further information on the project's operation is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

Timing

It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and the first passenger services are proposed to start from 2030/2031.

An indicative construction methodology is provided in the EIS (see Chapter 7 (Project description – construction)).

Approval requirements

The project is State significant infrastructure and is subject to approval by the NSW Minister for Planning under Part 5, Division 5.2 of the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act).

The project is also determined to be a controlled action under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) and requires approval from the Australian Minister for the Environment and Water.

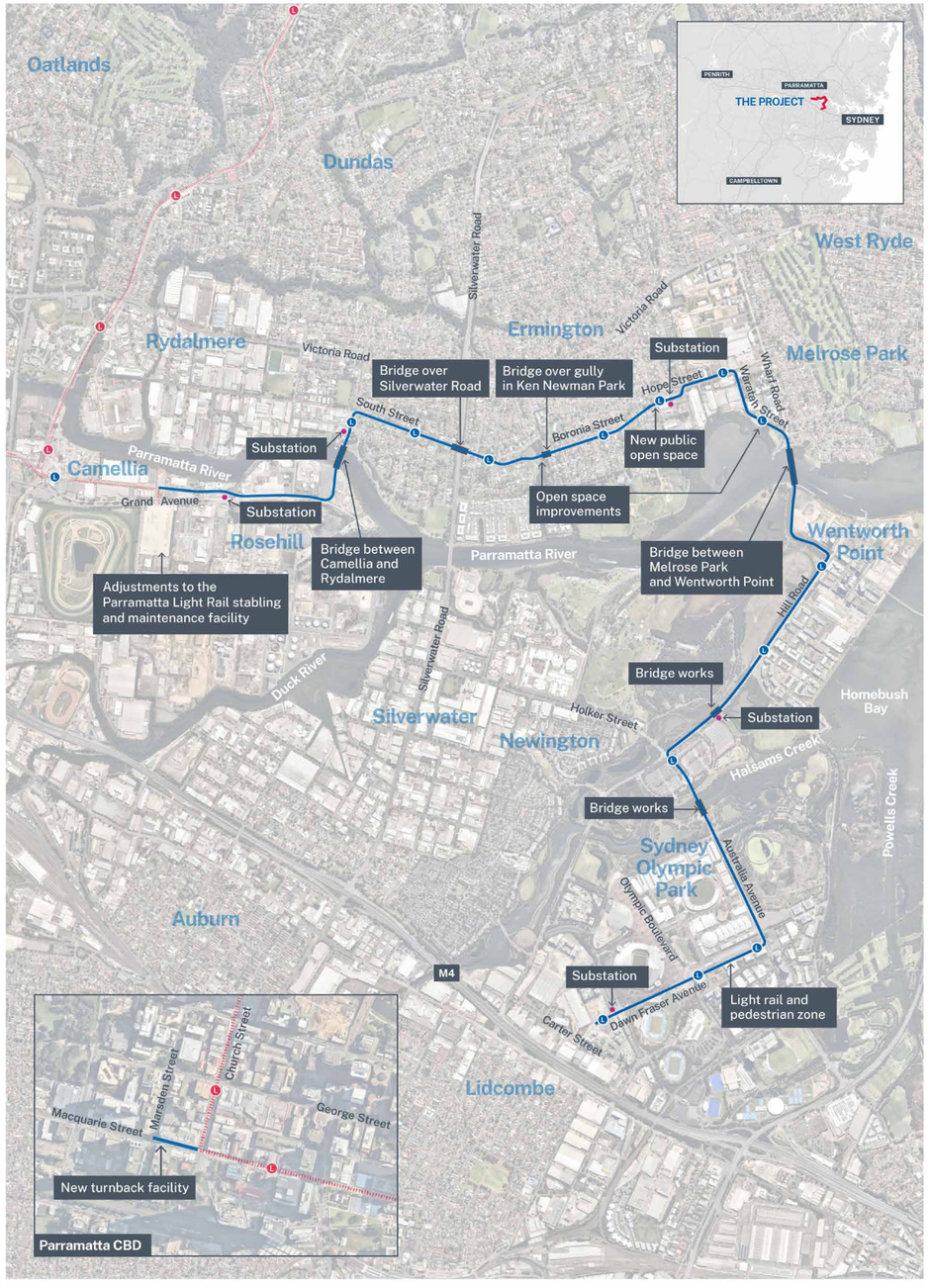


Figure 1.2 The project

Figure 2: Parramatta Light Rail Stage 2 alignment and key features.

1.1.3 Purpose of this report

This report has been prepared by ASPECT Studios, with Bangawarra, on behalf of Transport for NSW to support the project's EIS.

The EIS has been prepared to support an application for approval of the project in accordance with Division 5.2 of the EP&A Act. It addresses the environmental assessment requirements of the Secretary of the Department of Planning, Industry and Environment (the SEARs).

This report has been prepared as part of the EIS to describe the design, place and movement requirements for the project and how these would be met. The report:

- addresses the relevant SEARs listed in Table 1
- describes how the project is designed with and connects to Country and how the project values, respects, and is guided by Aboriginal people
- describes the design, place and movement framework for the project
- describes how the project has met the design, place and movement requirements
- describes how the protection of existing public open space has been prioritised and, where impacts to open space are unavoidable, how the project would seek to improve access to functionality/usability and the quality of open space.

1.1.4 Response to SEARs

The Planning Secretary's Environmental Assessment Requirements (SEARs) dictate that key issue impacts be assessed objectively and thoroughly to provide confidence that the proposal will be constructed and operated within acceptable levels of impact or with appropriate offsets.

Key issues are nominated by the Department of Planning and Environment in the SEARs. This report responds primarily to Key Issue 2 - design, place and movement.

The Desired Performance Outcomes for Key Issue 2 are that:

- the proposal is well-designed and enhances the environment where it is located, including improved accessibility and connectivity for communities and public spaces
- the proposal helps to support the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people
- the proposal contributes to greener places through the enhancement and provision of green infrastructure.

The specific assessment requirements of Key Issue 2 are listed within Table 2, together with a summary of the project's response and a cross reference to where further information regarding the project's response can be found.

An additional relevant assessment requirement of Key Issue 1 - Transport and traffic is also presented in Table 1.

Table 1: Response to SEARs Key Issue 1

Requirement	Summary Response	Report Section
2. Operational transport impacts, including:		
(e) the accessibility of each stop and the general vicinity of walking and cycling catchments	The project's stop locations would ensure that most of the existing and planned future high density mixed use, commercial and residential development in GPOP falls within a 400 metre, or 5 minute walking, catchment. Further details on stop accessibility is provided in Section 4.7. The stops, stop crossings and associated elements would be developed to comply with the Disability Standards for Accessible Public Transport (DSAPT), Australian Standard AS1428: Design for access and mobility, Building Code of Australia (BCA), and National Construction Code (NCC), Part H2. Further detail is provided in Section 14.3.	Chapter 4 Chapter 14

Table 2: Response to SEARs Key Issue 2

Requirement	Summary Response	Report Section
1. A design led process that is informed, collaborative and iterative, which:		
(a) utilises good design processes (such as Design Excellence and Design Review);	The project is committed to design excellence and has undertaken key measures to achieve this. An urban design-led approach has been adopted to achieve better placemaking, customer, and land use outcomes. This is reflected in the structure of the project team and urban design-led development of the Definition Design. Design review has been under the guidance of the Transport for NSW Design Review Panel (DRP). The purpose of the DRP is to provide independent high-level expert design review and advice to the project in accordance with industry best practice and to assist in achieving quality architectural, urban design and people-focused outcomes. All phases of the project have been presented to the DRP and a project-specific DRP would be established during the design development phase to continue providing design excellence advice through the stages of design development. Feedback from the DRPs would be incorporated into the project during design development. Consultation and design workshops with key stakeholders, such as the City of Parramatta Council and Sydney Olympic Park Authority, has also allowed for continuous design review throughout the development of the Definition Design and would continue during the design development phase.	Section 2.1.2 Section 2.3 Section 2.4 Section 2.5
(b) provides connectivity – active and public transport (at and to stops);	The project alignment has been designed to maximise integration of stops with their urban environments and with other modes of transport. Key connections between light rail and other modes would include interchange with trains, ferries, buses, Parramatta Light Rail Stage 1 and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Camellia, Rydalmere and Sydney Olympic Park. Additional active transport infrastructure along the project alignment would create effective interchanges, encourage stop access via walking and cycling, and effectively integrate with and complement existing active transport infrastructure. Bridges between Camellia and Rydalmere and between Melrose Park and Wentworth Point would provide new active transport crossing points of the Parramatta River, expanding commuter and recreational cycling opportunities. Upgrades to the existing pedestrian bridge over Silverwater Road would also provide improved cycling connections across this significant existing barrier.	Section 3.5.2 Section 4.8 Section 4.10 Chapters 5-12 Chapter 13
(c) retains and enhances existing and new views and vistas;	*Appendix A (Landscape and Visual Impact Assessment)* assesses the impact of constructing and operating the project on key viewpoints, including views and vistas. The outcomes of this assessment have been considered for each precinct and design place and movement outcomes have been developed to retain and minimise impacts upon these key viewpoints. Some key outcomes include increased tree and understory planting, and high quality urban fixtures and finishes.	Chapters 5-12 Appendix A

Requirement	Summary Response	Report Section
(d) is designed with and connected to Country;	There are several relevant NSW Government policies that commit to authentic engagement, collaboration, and co-design with local Aboriginal communities and knowledge holders. These include Transport for NSW's Aboriginal Culture and Heritage Framework and the Government Architect NSW's Connecting with Country Framework. Transport for NSW is committed to embedding Country-led collaboration and design into the ongoing development of the project, embracing an Aboriginal co-design approach to deliver positive community and place-making benefits. This process has commenced, with the engagement of Aboriginal design consultancy Bangawarra, who are embedded within the urban design team to best facilitate a Country-led co-design process for the project. Owned and operated by D'harawal eora Knowledge Keeper and registered Traditional Owner of the Sydney Basin, Shannon Foster, Bangawarra has ensured that the project is connected to local, site-specific knowledges of Country, both ancient and contemporary. Collaborating with on-Country consultants like Bangawarra also ensures that all the people of the kinship system in Sydney are included and not erased from the knowledges of Country and replaced with stories that belong to other parts of Country.	Section 2.3 Section 3.3.2 Section 5.2 Section 6.2 Section 7.2 Section 8.2 Section 9.2 Section 10.2 Section 11.2 Section 12.2
(e) is designed with integration of cultural heritage, heritage interpretation and public art;	The Definition Design has been developed to minimise potential impacts to Aboriginal and non-Aboriginal heritage sites. The alignment generally minimises heritage impacts by following the centre of the street. Nevertheless, there are some impacts associated with delivering the light rail infrastructure, providing accessible stop precincts, and avoiding utilities that cannot be relocated. Key heritage interfaces occur at Bulla Cream Dairy (Willowmere), with significant elements including Willowmere California-style bungalow and landscape plantings, and at the Abattoir Heritage precinct at Sydney Olympic Park. Heritage integration and interpretation opportunities in these locations are illustrated in the Design Place and Movement Report in Section 9.3.1 and Section 11.3.3. Other areas of heritage potential referred to in *Technical Paper 4 (Aboriginal Cultural Heritage Assessment Report)*, *Technical Paper 5 (Statement of Heritage Impact –Built Heritage)* and *Technical Paper 6 (Historical Archaeological Assessment)* would be considered in design development. Aboriginal design consultancy Bangawarra have been embedded in the urban design team to lead the integration of Aboriginal heritage interpretation and potential future public art opportunities. This work is ongoing and would inform design development and procurement phases of the project.	Section 2.3 Section 9.3.1 Section 11.3.3
(f) utilises design experts and multidisciplinary teams;	The project team brings together expertise in the delivery of transport infrastructure within existing urban environments, and includes urban designers, landscape architects, architects, First Nations consultants, transport planners, practitioners from several engineering disciplines, and environmental and engagement specialists.	Section 2.4
(g) demonstrates how design integrity will be maintained in subsequent stages of the assessment process; and	Design development for the project would continue through the development of the project's urban design requirements (UDR), as well as through future procurement and delivery phases of the project. The UDR would be developed during design development in consultation with stakeholders, the Operator, special technical advisors, and the rail regulator as the project develops under the advice of the project-specific Design Review Panel. The UDR would provide clear requirements and specifications to support the procurement and delivery of the project, including input into the Scope and Performance Requirements (SPR), third party agreements, and design and delivery approach. The project-specific Design Review Panel would also continue to provide design advice in subsequent stages of the project to ensure design integrity is maintained. The project would continue to work closely with stakeholders during design development. Design review would be undertaken with stakeholders throughout design development and procurement stages of the project.	Section 2.4 Section 2.5 Section 2.6 Chapter 15
(h) involves the community, user groups and other stakeholders.	The development of the Definition Design has been informed by consultation with and key contributions by several project stakeholders. These include City of Parramatta Council, City of Ryde Council, Sydney Olympic Park Authority, NSW Department of Planning and Environment, utility providers (Sydney Water, Ausgrid, Jemena), landowners of current and future planned significant developments along the alignment, and various divisions within Transport for NSW. Transport for NSW has also undertaken a range of engagement activities to gather feedback on the project which has helped shape and refine the project design. Further detail on these refinements is included in the EIS (see Chapter 9 (Community and stakeholder engagement). Consultation with stakeholders would continue during design development, with more information on consultation provided in the EIS.	Section 2.5

Requirement	Summary Response	Report Section
2. Identify place principles that reflect the design objectives in Better Placed, including a focus on:		
(a) fit – contextually, culturally, local and of its place;	Strategic development and design of the project's places is guided by several planning and design policies and frameworks, including the Government Architect NSW's (GANSW) Better Placed suite of documents, which promotes design excellence through place outcomes and design-led and integrative processes. The project has developed a design, place and movement vision plus supporting principles, which together translate the design objectives provided by Better Placed into project-specific design guidance. This process has been undertaken in collaboration with Transport for NSW's Design Review Panel and key project stakeholders. A detailed table of responses to Better Placed design objectives has been prepared in Section 3.2.2.	Section 3.2.2
(b) performance – sustainable, adaptable and durable;		
(c) community – inclusive, welcoming, connected, accessible and diverse;		
(d) people – safe, comfortable and liveable and healthy (such as crime prevention through environmental design);		
(e) working – functional, efficient and fit for purpose;		
(f) value – creating and adding value		
(g) look and feel – engaging, inviting and attractive.		
3. Include and illustrate place designs, outcomes and actions that protect and facilitate improvements to the built environment and place, including in relation to:		
(a) built form (including key project elements and amenity impacts on the surrounding environment);	The project would integrate light rail stop and alignment infrastructure with existing built environments. A key objective of this integration would be to reduce the impacts of the project on existing built form while also aligning with planned future development proposals.	Chapters 5-12 Chapter 13
(b) public space (including public open space, and how that space has been maximised and protected, access to and the quality of the space);	The protection of existing public open space has been prioritised in the development of the Definition Design. Where impacts to open space are unavoidable, the project would seek to improve access to and quality of open space. The project would provide new public transport and active transport connections between existing and new open spaces. The project would also provide new public open space, refer to Figure 85, Figure 98, and Figure 108.	Chapters 5-12 Chapter 13
(c) residual land (where it is known that this will be returned as public open space and the reallocation of space);	At numerous locations along the alignment there is potential for some of the project's residual land to be repurposed as new or expanded open space and public recreation facilities for the community. Transport for NSW would prepare a residual land management plan to guide how residual land would be used.	Chapters 5-12 Chapter 13
(d) stops as places;	Light rail stops would provide a focal point for opportunities to enhance and contribute to existing places, as well as catalyse the creation and transformation of new places. The location of project stops and design of stop precincts would seek to maximise their placemaking potential, prioritising walking and cycling, and integrating these precincts with their wider context.	Chapters 5-12 Chapter 13
(e) views and vistas (including an assessment of visual impact, and visual representations of the proposal from key locations to illustrate the proposal where visual impacts that are deemed greater than medium).	*Appendix A (Landscape and Visual Impact Assessment)* assesses the impact of constructing and operating the project on key viewpoints, including views and vistas. This assessment also provides visual representations of the proposal from key locations. The outcomes of this assessment have been considered for each precinct and design place and movement outcomes have been developed to protect and minimise impacts upon these key viewpoints. Some key outcomes include increased tree and understory planting, and high quality urban fixtures and finishes.	Chapters 5-12 Chapter 13 Appendix A
This should also address maintenance of infrastructure, place, landscaping and residual land.	Maintenance of the project would be facilitated at all areas of the alignment safely and securely. The design and use of cost effective durable materials and assets would be considered at the early stages of the design process, including the selection of materials and assets that are easily maintained and replaced.	Section 14.2.12
4. Identify movement (accessibility and connectivity) principles, outcomes and actions that facilitate improvements to movement, including in relation to:		
(a) how the proposal considers the relationship between movement and place;	By improving access in the GPOP area, providing an attractive public transport mode and creating and improving public spaces along its alignment, the project would deliver a range of place benefits. It would improve the amenity of communities along the alignment through the provision of better public spaces and high-quality streetscapes. High-quality walking and cycling facilities and street improvements around stops and along the alignment would make the area more attractive for residents, visitors and workers. In considering the relationship between movement and place, the project would seek to balance placemaking and transport outcomes in the Definition Design, including consideration of the light rail alignment, location stops, and integration with other transport modes, as well as technical design requirements such as the determination of light rail and road travel speeds.	Section 4.2 Section 4.6 Section 4.7 Section 4.8 Section 4.9 Section 4.10 Chapters 5-12 Chapter 13

Requirement	Summary Response	Report Section
(b) how the proposal contributes to more walking, cycling and public transport use (along the alignment and to and from stop(s)), including journey time comparisons for public and active transport for general traffic journey time improvements made, and the matters set out in the Healthy Urban Development Checklist TC1 and TC2 (NSW Health, 2009) (pages 76-78);	The project would encourage more walking and cycling trips in the GPOP area by providing over 8.5 kilometres of high-quality active transport infrastructure and supporting higher density land use. As a result, the total number of daily walking and cycling trips in the project area would be expected to increase significantly (almost doubling). The project would provide residents and workers in the study area with more efficient and reliable journeys, including to and from the key job centres of Parramatta and Sydney Olympic Park, as seen by the anticipated improvement in travel times described within this report. The project has considered the Health Urban Development Checklist TC1 and TC2, with Section 3.2.6 noting how the project has been guided by this tool.	Section 3.2.6 Section 4.10
(c) how any walking, cycling or public transport provided by the proposal integrates with wider active and public transport networks.	The proposed walking and cycling infrastructure along the alignment would connect to the existing network of routes in the Parramatta and Ryde Local Government Areas and would provide some of the proposed routes in the Parramatta Ways Walking Strategy and the Parramatta Bike Plan. These connections would link existing populations to schools, shopping areas, homes, workplaces, and open space and recreation facilities. While the proposed cycling infrastructure would provide for practical, safe transport connections, it would also represent an attractive addition to the large foreshore and parkland recreational network in Sydney Olympic Park and the Parramatta River valley. The project has been designed to maximise integration with other modes of transport, including interchange with trains, ferries, buses, Parramatta Light Rail Stage 1 and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Camellia, Rydalmere, and Sydney Olympic Park.	Section 4.8 Section 4.10
The EIS must demonstrate changes to:		
(a) access to public space;	The location of light rail stops and the integration of a continuous walking and cycling route along the alignment would significantly improve access to existing public spaces. A number of light rail stops would provide convenient access to existing public spaces. This would includes the John Street stop adjacent to Eric Primrose Reserve, the River Road stop near Ken Newman Park, the Waratah Street stop adjacent to Archer Park, and the Footbridge Boulevard stop near the Millennium Parklands. Access to public space would also be improved via the provision of new public space, such as at the Atkins Road stop, or with the improvement of existing but poorly used open spaces, such as Ken Newman Park and Archer Park.	Section 4.2 Chapters 5-12
(b) access to community facilities or areas providing services to the community, such as local centres;	The light rail alignment would pass through and alongside existing local centres and significant areas of new development, creating opportunities for alignment integration, establishment of new civic centres, urban renewal, and placemaking. Urban renewal sites at Camellia, Melrose Park, Wentworth Point, Sydney Olympic Park and the Carter Street Precinct would deliver a variety of community facilities and services. The project would significantly improve access to these amenities via light rail as well as walking and cycling. Existing low density residential development in Ermington and Rydalmere would also be likely to experience uplift pressure in the future as a result of the project. This would bring with it increased provision of community facilities and services and improve access for existing and future communities.	Section 4.2 Section 4.3 Section 4.7
(c) active transport and other forms of public transport, including local walking and cycling routes maintained or made more direct, safe and comfortable;	The project would include about 8.5 kilometres of new active transport links for both pedestrians and cyclists constructed along or close to the light rail alignment, including two new crossings of the Parramatta River. The proposed walking and cycling infrastructure along the alignment would significantly improve local walking and cycling journeys, providing local routes that are more direct, safe, and comfortable. Planting would be provided along much of the new active transport links to provide shade and improve the amenity for users of these facilities. The project would also ensure light rail integrates with other modes of public transport. This would include interchange with trains, ferries, buses, Parramatta Light Rail Stage 1 and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Camellia, Rydalmere and Sydney Olympic Park.	Section 4.8 Section 4.10

Requirement	Summary Response	Report Section
5. Identify green infrastructure design principles that are reflective of the principles in Greener Places and the Sydney Green Grid.		
	The project would embed sustainability outcomes along the alignment by encouraging the design and construction of assets that maximise land use while providing economic, social, and environmental benefits. It would also present an opportunity to integrate the natural environment with the built environment of the city. The project's green infrastructure objective is underpinned by a series of design principles that would guide the project through design development. A Green Infrastructure Strategy would also be developed to inform the future design stages of the project.	Section 4.11 Section 14.4
6. Include and illustrate green infrastructure designs, actions and outcomes for the proposal including in relation to:		
(a) green infrastructure, including enhancement of open space that supports recreation, biodiversity and waterway health;	The project design has been developed to improve and provide new open spaces, which support recreation, biodiversity and waterway health. The project alignment would pass through several open spaces, including Eric Primrose Reserve, Ken Newman Park, and Archer Park. The project would deliver enhancements to Ken Newman Park and Archer Park that support recreation, biodiversity, and waterway health, and expand the area of open space at Eric Primrose Reserve. The project would also create a new open space at the Atkins Road stop. Indicative concept designs have been developed in consultation with stakeholders and are included within this report. In addition, mitigation measures in EIS Chapters 16 (Biodiversity) and 17 (Water) would further protect and enhance biodiversity and waterway health.	Section 7.3.2 Section 8.3.2 Section 9.3.1 Section 9.3.3
(b) how the proposal will achieve a net increase in tree numbers and canopy within proximity of the impacted area. (This relates to the number of trees to be cleared by the proposal (a tree is defined by Australian Standard 4970) that will not be covered by a biodiversity offset strategy).	The project alignment would pass through a variety of urban environments of differing levels of vegetation and tree canopy coverage (assessed in *Appendix A (Landscape and Visual Impact Assessment)*). Construction of the light rail infrastructure would necessitate the removal of areas of vegetation cover and existing trees. Where the loss of trees is unavoidable, trees removed as a result of the project would be replaced by offset tree planting in areas along or close to the alignment, including open spaces and adjacent streets. This planting would occur in accordance with a Tree Offset Strategy, similar to that developed and implemented for Parramatta Light Rail Stage 1, and comprise selection of tree species suitable for site context and the reduction of the urban heat island effect. As part of the project's commitment to delivering high quality, comfortable, and amenable public domain and customer environments, a significant number of new street trees would be planted along its alignment, providing a valuable addition to the existing urban tree canopy. The offset tree planting would result in increased tree canopy coverage along the alignment.	Chapters 5-12
7. Identify how the proposal has been designed with and connected with Country, and reflects the findings of the Aboriginal Cultural Heritage Assessment Report (ACHAR).		
	Led by Bangawarra, the project has embedded a Country first co-design methodology. The project has been designed to connect with local peoples and their living knowledges of story and Country. Exceeding the ACHAR, the project embraces the stories of Country from the people of Country, to celebrate the continued custodianship of local Aboriginal peoples and return tangible indicators of this continuing culture to the urban realm. Three unifying cultural values have been developed for the project. Working through these cultural values, the project embraces shared local languages that are common to all of the Sydney nations, ensuring that all who belong to Country are recognised and celebrated here in this development.	Section 2.2 Section 3.4.3 Section 3.5 Section 5.2 Section 6.2 Section 7.2 Section 8.2 Section 9.2 Section 10.2 Section 11.2 Section 12.2 Chapter 13 Chapter 14

Requirement	Summary Response	Report Section
8. Outline the urban design response on the visual amenity and landscape impacts of construction across the alignment and for each precinct on:		
(a) views and vistas;	The project design has been developed to respond to impacts to views and vistas along the alignment (assessed in *Appendix A (Landscape and Visual Impact Assessment)*) and within each precinct. Mitigation measures typically include: • design development of the alignment and stop locations to remove or reduce visual impacts • urban design and landscape design responses that mitigate impacts to views and vistas Visual amenity mitigation measures are described throughout Chapters 5 to 12.	Chapters 5-12 (precinct outcomes)
(b) streetscapes, key sites and buildings (including existing landscape works, green space and tree canopy);	The project design has been developed to include design outcomes for streetscapes and key sites (including residual land) that mitigate visual amenity and landscape character impacts. The urban design response for streetscapes along the alignment typically includes prioritising place outcomes that result in landscape design, green space, and tree canopy benefits of the project. Examples of this would include maximising street tree planting to provide visual amenity improvements and increased tree canopy coverage (Assessed in *Appendix B (Arboricultural Report)*). The urban design response for key sites (including residual land) has been developed in consultation with stakeholders to mitigate visual amenity and landscape character impacts while delivering open space and recreation benefits of the project.	Chapters 5-12 (precinct outcomes)
(c) heritage items including Aboriginal places, environmental heritage and areas of heritage sensitivity	Aboriginal and non-Aboriginal heritage items and areas of sensitivity have been considered in the development of the project design, including visual amenity and landscape character impacts. The impacts of the project on Aboriginal and non-Aboriginal heritage haves been assessed in *Technical Paper 4 (Aboriginal Cultural Heritage Assessment Report), Technical Paper 5 (Statement of Heritage Impact – Built Heritage)* and *Technical Paper 6 (Historical Archaeological Assessment)*. Where appropriate, these items and areas of sensitivity have been incorporated into the project's urban design response, such as at the locally heritage listed property Bulla Cream Dairy (Willowmere) in Melrose Park, where new public open space has been provided incorporating the building to be retained. The project is also is committed to embedding Country-led collaboration and design into the ongoing development of the project, embracing an Aboriginal co-design approach to deliver positive community and place-making benefits.	Chapters 5-12 (precinct outcomes)
(d) the local community.	The project design has been developed to respond to and mitigate visual amenity and landscape character impacts on the local community. This includes an urban design response that sensitively incorporates light rail into the existing built and natural environment, while maximising place and movement benefits for the local community (assessed in *Appendix A (Landscape and Visual Impact Assessment)*). Visual amenity and landscape character impacts on the local community are generally mitigated with high quality urban design responses such as improvements to the streetscapes and open spaces through which the project passes. Visual amenity and landscape character outcomes would include improvements to the provision and quality of walking and cycling facilities; an increase to the urban tree canopy; improvements to recreation and amenity in existing open spaces; and the creation of new open spaces in areas of residual land.	Chapters 5-12 (precinct outcomes)
Visual representations of the proposal must be provided from key receiver locations to illustrate the proposal and its visual impacts and how the proposal has responded to the visual impact through urban design and landscaping.	Visual representations are included in *Appendix A (Landscape and Visual Impact Assessment)*.	Appendix A

1.2 Place and movement

1.2.1 Understanding place

The Government Architect NSW's *Aligning Movement and Place* defines places as 'the spaces where we get together, relax, celebrate and contemplate, as well as work, participate in civic life, learn and exchange'. Places are understood by different people in different ways and at different scales, comprising the interwoven tangible and intangible factors of meaning, physical form, and activity (refer Figure 3).

The delivery of Parramatta Light Rail Stage 2 presents the opportunity to enhance and contribute to existing places, as well as catalyse the creation and transformation of new places. As the neighbourhoods, precincts, and broader areas along the project alignment continue to evolve, there would be opportunities to change the way our places and transport network are designed, planned, and delivered to provide the maximum benefit for most people.

The project's approach to placemaking within each precinct is highly contextual, taking into consideration the various conditions of the different areas of the alignment. Placemaking for the project also acknowledges that light rail stops would become focal points of the areas in which they are located and the communities they serve.

1.2.2 Understanding movement

In extending our thinking about movement beyond mobility to also include access, we can promote the right mode of transport for each trip purpose and plan places that both serve their local areas and minimise the need to travel long distances.

Aligning Movement and Place identifies that 'movement enables people to connect with one another and pursue leisure and recreational activities. It is also about efficiently delivering goods and services to drive economic growth'.

Movement refers to how transport networks not only integrate with land use and public space but how they also serve users' needs to support an overall vision for places. Movement can occur to and from, through, and within places (refer Figure 4).

For Parramatta Light Rail Stage 2, the balance between movement and place is critical to ensure places along the alignment and at stop precincts contribute to place creation.

The efficient movement and interchange of people to and from stops, as pedestrians, cyclists, customers on other public transport modes, point-to-point or via private vehicle, is also an important movement consideration for the project.

1.2.3 Place and movement outcomes

Compared to buses, light rail has comparatively greater land use and placemaking potential and provides greater capacity to move passengers. Light rail also provides a more flexible solution than heavy rail or metro systems, which are highly complex, require significant investment, and have lengthy lead times to deliver and commission.

The benefits of light rail extend beyond macro transport and urban planning and development considerations. On the ground, light rail projects provide opportunities to significantly improve the liveability of the precincts through which they pass.

Recent research by Transport for NSW suggests that the 'structural' elements of a city—housing type, employment opportunities, locations of points of interest—are the primary variables that influence walking and cycling rates. Light rail is uniquely positioned to influence these variables and deliver co-benefits aligned with Transport for NSW's objectives for improving walking and cycling in Greater Sydney.

Additional co-benefits of light rail projects typically include the delivery of walking and cycling facilities, urban street tree canopy, and bridges that improve regional connectivity and connect communities. These co-benefits provide ample opportunity for Parramatta Light Rail Stage 2 to deliver benefits beyond its movement scope.

By improving access in the GPOP area, providing an attractive public transport mode, and improving public spaces along its alignment, the project would deliver a range of place benefits. It would improve amenities for communities along the alignment through the provision of better public spaces and high-quality streetscapes. It would also make the area more attractive for residents, visitors, and workers by the provision of high-quality walking and cycling facilities and street improvements around stops and along the alignment.

The project would create new places that are shaped and defined by the benefits of light rail and its associated infrastructure. This would include the project's two crossings of the Parramatta River, between Camellia and Rydalmere and between Melrose Park and Wentworth Point, and the delivery of integrated foreshore parklands well serviced by public and active transport. The project would also create new, and improve existing, open spaces throughout Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point, and Sydney Olympic Park.

The project would contribute to the embellishment of established places—such as Rydalmere and Ermington—catalysing their transition into dense, walkable, and liveable neighbourhoods. In some cases, the project's placemaking benefits would go hand-in-hand with the transformation that some precincts are already experiencing, such as Camellia, Melrose Park, Wentworth Point, and Sydney Olympic Park.

In considering the relationship between movement and place, the project would seek to balance placemaking and transport outcomes in its design development, including consideration of the light rail alignment, location of stops, and integration with other transport modes, as well as technical design requirements such as determination of light rail and road travel speeds.

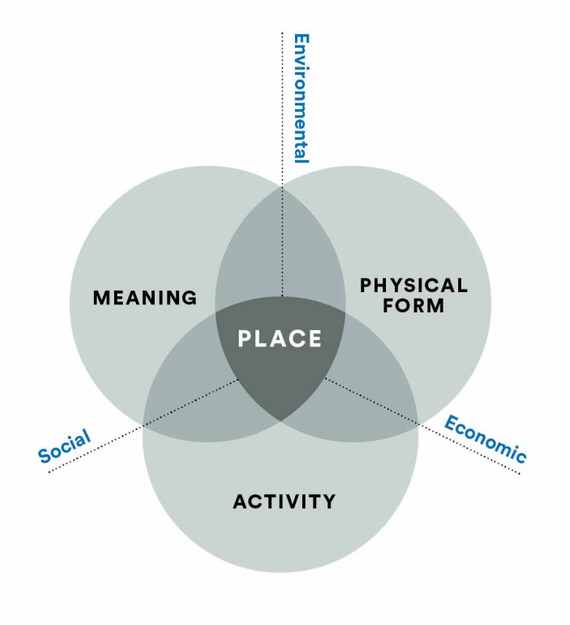


Figure 3: Factors of place (source: Government Architect NSW).

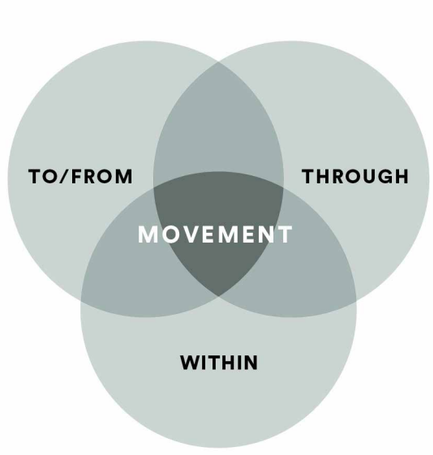


Figure 4: Factors of movement (source: Government Architect NSW).

1.3 The project

1.3.1 Route overview

Parramatta Light Rail Stage 2 services would operate for about 13 kilometres, running between the Parramatta Light Rail Stage 1 stop Parramatta Square in the Parramatta CBD to the Carter Street Precinct south-west of Sydney Olympic Park.

This would comprise about 3 kilometres of light rail route being delivered by Stage 1, in addition to about 10 kilometres of new route being delivered by the project between Camellia and the Carter Street Precinct.

The project would run through Camellia along the Sandown corridor and Grand Avenue, before crossing to the north of the Parramatta River via a new bridge and running along South Street in Rydalmere, Boronia Street in Ermington, and Hope Street and Waratah Street in Melrose Park.

The alignment would then return to the south side of the river via a new bridge, connecting to Wentworth Point along Hill Road, and Sydney Olympic Park via Australia Avenue and Dawn Fraser Avenue, before terminating in Uhrig Road within the Carter Street Precinct.

The project's precincts are described within the following section, and illustrated in Figure 5.

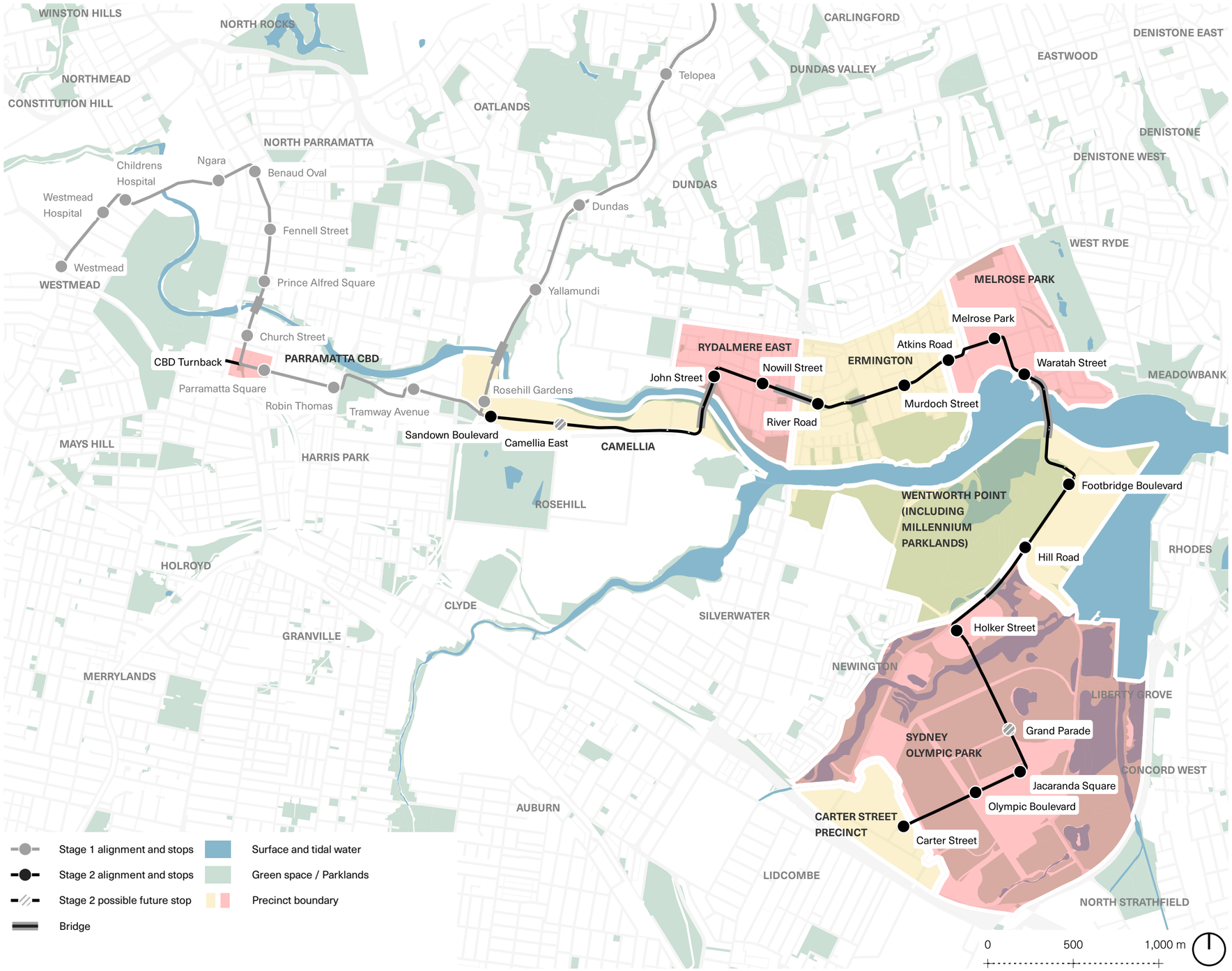


Figure 5: Stops and precincts along the alignment.

1.3.2 Design overview

Parramatta CBD

Parramatta Light Rail Stage 2 services would run along the Parramatta Light Rail Stage 1 alignment between Parramatta CBD and Camellia, terminating at the Parramatta Light Rail Stage 1 Parramatta Square stop. This terminus would allow Parramatta Light Rail Stage 2 customers direct and convenient access to Parramatta's city centre and other transport services.

Parramatta Light Rail Stage 1 is currently being delivered along Church Street and Macquarie Street through the heart of the Parramatta CBD. This is an important consideration for the location of the CBD terminus, so as to minimise impacts to Parramatta Light Rail Stage 1.

The terminus at Parramatta Square would require the construction of an additional length of track zone on Macquarie Street, west of Church Street, to facilitate turnback movements for light rail vehicles.

Camellia

The Camellia precinct will undergo significant transformation in the future. The NSW Government's strategic planning for Camellia and Rosehill will deliver a new living and business community in conjunction with retaining urban services and industrial uses. Parramatta Light Rail Stage 2 would integrate sustainable transport at the heart of this evolving precinct, fostering and supporting street life in the future town centre.

The project would deliver light rail track and an active transport link through Camellia via the Sandown Line and along the northern side of Grand Avenue. The project would then cross the Parramatta River via a new bridge.

The new bridge between Camellia and Rydalmere would provide a new, regionally significant crossing of the Parramatta River, connecting future and existing communities with light rail and active transport facilities.

Rydalmere East

The neighbourhood of Rydalmere comprises large industrial and service sector employment lands in the west and predominantly low-rise, detached residential housing in the east. A significant proportion of housing in the area is owned and managed by Land and Housing Corporation (LAHC).

The project alignment would run from the new bridge between Camellia and Rydalmere, through Eric Primrose Reserve and then along the precinct's primary east-west movement corridor of South Street, before crossing Silverwater Road via a new bridge.

The project would likely catalyse future uplift and renewal of this neighbourhood, presenting an opportunity to provide streets and public spaces that are safe, cool, and comfortable, and which support the transport and social needs of existing and future communities.

Ermington

Ermington primarily consists of low-rise, detached residential housing. Similar to Rydalmere, a significant proportion of housing in the area is owned and managed by LAHC.

The alignment would run from the new bridge over Silverwater Road through Ken Newman Park, and then along Boronia Street, the precinct's main east-west street.

As is the case in Rydalmere, uplift pressures are anticipated to catalyse future renewal of this neighbourhood over time.

Melrose Park

The existing industrial precinct of Melrose Park is currently undergoing significant renewal, with the delivery of a new town centre and surrounding high-density residential precinct. The project would provide an opportunity to fully integrate the light rail and its stop precincts with adjoining future development.

Seamlessly integrating the light rail with the town centre's street would create a corridor of continuous public domain, connecting thriving places, activating cross streets, and catalysing town centre development. Uplift pressures would also be anticipated to result in the redevelopment of the adjacent low-rise detached residential housing over time.

Light rail and active transport routes would run through the Melrose Park precinct along Hope Street and Waratah Street before crossing the Parramatta River via a new bridge.

Wentworth Point

While much of Wentworth Point is located on land initially reclaimed for industrial uses, ongoing development continues the evolution of the peninsula's character from industrial lands to high-density, predominantly residential development.

The project would provide an opportunity to transform the peninsula's primary access corridor, Hill Road, into a multimodal boulevard that mitigates impacts on the boundary of the Parklands.

Future development at the northern end of the peninsula, particularly at the Sanctuary Wentworth Point site, continues to change Parramatta River's foreshore landscape. The project would consider this development as an opportunity to integrate light rail and build on its placemaking potential.

The project would run along the eastern boundary of the Millennium Parklands, adjacent the western edge of Hill Road. Walking and cycling routes would run along the alignment, providing connections across Hill Road and into the existing path network of the Millennium Parklands.

Sydney Olympic Park

Sydney Olympic Park has continued to evolve since the 2000 Olympic Games to meet its changing demands, with its Olympic heritage reflected in the broad avenues that shape the precinct. The town centre will continue to undergo significant change in line with a new masterplan, becoming a major centre within the GPOP area.

The tree-lined boulevards of Australia Avenue and Dawn Fraser Avenue will play an increasingly pivotal role in active and public transport connectivity to and through the precinct. The project alignment would run along these boulevards, integrating with existing and future town centre uses.

Carter Street Precinct

On Uhrig Road, the project alignment would terminate at the proposed future town centre of the Carter Street Precinct in an integrated and amenable terminus.

1.4 Report structure

1.4.1 Report structure

The project is discussed and illustrated throughout the Design, Place and Movement Report in the following chapters:

- **Chapter 1 Introduction** - introduces the purpose and scope of the report; summarises the project's response to the SEARs; and provides an overview of the project
- **Chapter 2 Design Process** - describes the project process to date, including: design development; connecting with Country; design review; and consultation
- **Chapter 3 Design Place and Movement Framework** - summarises the project's geographic and policy context and describes its vision and principles
- **Chapter 4 Project Overview** - provides a high-level overview of the project and discusses various land use, development, and transport interfaces along the alignment
- **Chapter 5 Parramatta CBD** - describes and illustrates the Definition Design for the Parramatta CBD terminus
- **Chapter 6 Camellia** - describes and illustrates the Definition Design for the Camellia precinct
- **Chapter 7 Rydalmere East** - describes and illustrates the Definition Design for the Rydalmere East precinct
- **Chapter 8 Ermington** - describes and illustrates the Definition Design for the Ermington precinct
- **Chapter 9 Melrose Park** - describes and illustrates the Definition Design for the Melrose Park precinct
- **Chapter 10 Wentworth Point** - describes and illustrates the Definition Design for the Wentworth Point precinct
- **Chapter 11 Sydney Olympic Park** - describes and illustrates the Definition Design for the Sydney Olympic Park precinct
- **Chapter 12 Carter Street Precinct** - describes and illustrates the Definition Design for the Carter Street Precinct
- **Chapter 13 Bridges** - describes and illustrates the Definition Design for the project's bridges
- **Chapter 14 Design Elements** - provides high-level design objectives for the project's full suite of design elements that would comprise the project scope
- **Chapter 15 Actions and Next Steps** - summarises the project's response to impacts via a suite of mitigation measures
- **Chapter 16 References**

The project's Landscape Character and Visual Impact Assessment (RPS, 2022) can be found in *Appendix A*, while the project's Arboricultural Report (GHD, 2022) can be found in *Appendix B*.

Chapter 2.0

2.0 Design Process

2.1 The journey so far

2.1.1 Design development

Corridor development

In February 2017, the NSW Government announced that Parramatta Light Rail would be delivered in stages, with Stage 1 connecting Westmead to Carlingford via Parramatta, and Stage 2 connecting the Parramatta CBD to Strathfield via Sydney Olympic Park.

Nineteen possible corridor options were developed and evaluated between Camellia and Strathfield via Sydney Olympic Park. The performance of corridor options was evaluated using multi-criteria analysis against the project objectives and project-specific criteria. Options considered to result in unacceptable community and environmental impacts and/or significant engineering challenges and costs were excluded.

A key development during evaluation of the route corridor options was the NSW Government's announcement of the preferred route for Sydney Metro West between Greater Parramatta and the Sydney CBD, including stations at Parramatta, Sydney Olympic Park, Burwood, and North Strathfield.

In October 2017, the NSW Government announced a corridor for Parramatta Light Rail Stage 2 (refer Figure 6) based on a series of corridor option analyses and design development. Two options for connecting to the Parramatta Light Rail Stage 1 network at either Camellia or Rydalmere were identified. The corridor provided 10-12 stops and connected the Parramatta CBD and Sydney Olympic Park via Ermington, Melrose Park, and Wentworth Point.

Scoping Design (2018)

Following the NSW Government announcement, the corridor was refined through a multidisciplinary design process. The process commenced with a series of stakeholder visioning workshops, which enabled all key stakeholders to share their aspirations for the GPOP area and the Parramatta Light Rail Stage 2 project. This resulted in the development of a series of urban design principles to guide the early design process and enabled the design team to commence work with a shared vision for the project.

The multidisciplinary design team collaboratively developed a Scoping Design, in line with the urban design principles, through a process that included:

- interrogation of the 2017 corridor
- consideration of planning strategies and policies
- detailed site analysis, including site inspections and desktop review of site opportunities and constraints
- review of proposed development master plans along the alignment
- consideration of bridge design and construction methods
- consideration of site constraints, such as environment, heritage, existing utilities, and potential property impacts
- consideration of views and vistas and potential impacts
- development of design solutions to maximise accessibility to the stops via walking and cycling by integrating the project with the precincts through which it passes
- presentation to the Transport for NSW Design Review Panel.

Definition Design (2022)

The project is based on a Definition Design which further refined the alignment identified in the Scoping Design. The Definition Design stage of the project commenced with a stakeholder visioning workshop, which enabled all key stakeholders to confirm their aspirations for the project and share feedback from the Scoping Design phase. Design development then focused on resolving key stakeholder concerns in conjunction with an exploration of value engineering opportunities.

The multidisciplinary design team developed the Definition Design through a process that included:

- interrogation of the Scoping Design alignment
- detailed review and improvement of the Scoping Design placemaking, customer, and land use outcomes
- collaboration with stakeholders on design concepts for precincts under development
- incorporation of feedback from the Transport for NSW Design Review Panel
- confirmation of constraints around existing utilities, property impacts and bridge construction methods
- the exploration of design solutions that maximise cost savings without compromising the value of the project outcome.

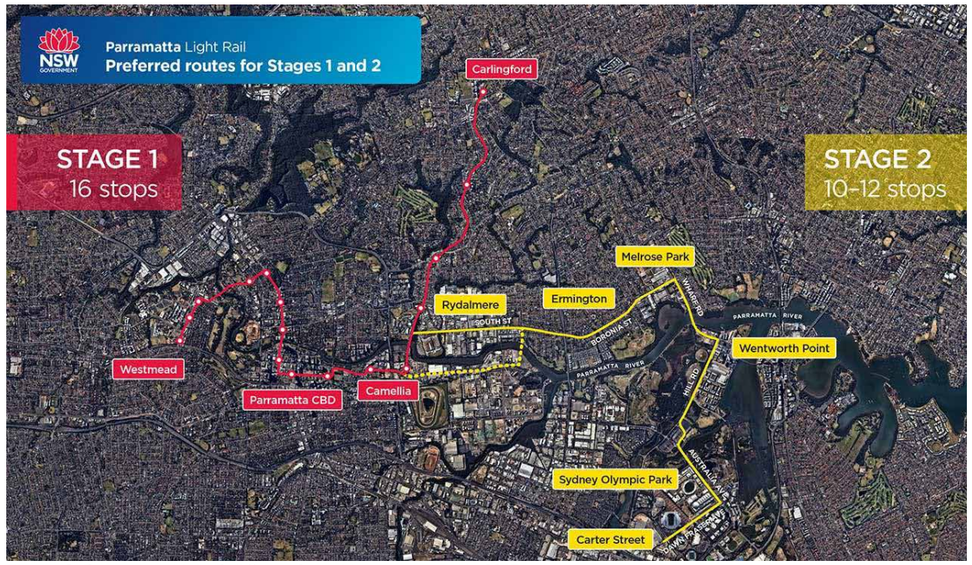


Figure 6: Parramatta Light Rail Stage 2 corridor announced in 2017 (source: NSW Government).

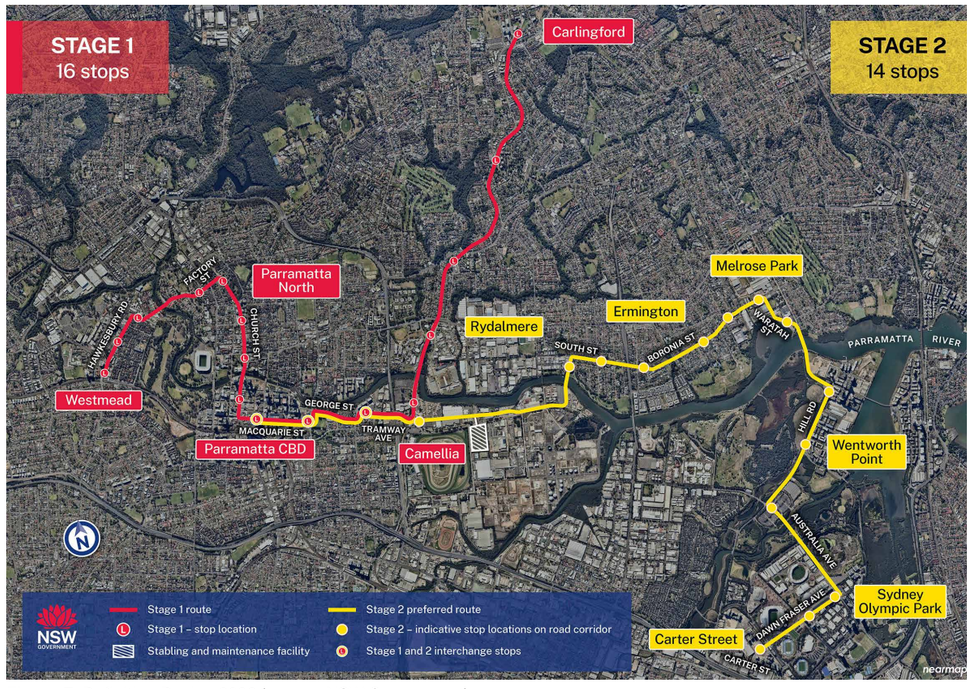


Figure 7: Definition Design 2022 (source: NSW Government).

2.1.2 Project team

This Design Place and Movement report has been prepared and facilitated by an expert and multi disciplinary team of urban designers, landscape architects, architects, engineers and First Nations consultants to realise the Parramatta Light Rail Stage 2 vision.

In putting together the project team, particular attention was paid to the benefits of an urban-design-led process in collaboration with engineering, especially as a means to better drive outcomes for placemaking, customers, and land-use.

The project team brings together expertise in the delivery of transport infrastructure within existing urban environments and includes urban designers, transport planners, practitioners from several engineering disciplines, and environmental and engagement specialists. Technical input to the development the concept design has focused on resolution of key technical challenges and inputs necessary to further inform constructability, operations, safety, and broader transport network objectives.

2.1.3 Feedback and improvements

Further to the composition of the project team, opportunities for improvement in relation to the Definition Design development have been integrated into the design process. These include consideration of:

- design outcomes that prioritise the placemaking potential of the project
- collaboration with key project stakeholders to maximise co-benefits of the project
- the opportunities and constraints of environmental and heritage considerations from the very beginning of the process of design development
- embedding the process of designing with Country throughout design development
- opportunities for the integration of heritage interpretation and public art in design development
- design development in line with future development proposals for adjacent sites
- development of urban design requirements with the advice from the Parramatta Light Rail Stage 1 Design Review Panel.

Further opportunities for reflection and learning came as a part of feedback sessions held with the Parramatta Light Rail Stage 1 Design Review Panel and key stakeholders, including City of Parramatta Council, Sydney Olympic Park Authority.

2.1.4 Landscape character and visual impact

A Landscape Character and Visual Impact Assessment has been undertaken by RPS (refer *Appendix A*). This utilises the *Guideline for Landscape Character and Visual Impact Assessment Environmental Impact Assessment Practice Note EIA-N04* (Transport for NSW - Centre for Urban Design, 2020) as its assessment framework to support the Design, Place and Movement Report.

A desktop study of the study area was undertaken to:

- determine potential landscape character zones along the project alignment
- map potential viewing envelopes of the project
- determine critical or significant views and vistas for visual amenity assessment.

Site inspections of the project were then undertaken from 21 to 23 September 2021 and from 20 to 22 February 2022 to validate the desktop evaluation.

Landscape character

For each landscape character zone, the specific characteristics identified were described before impacts were then evaluated. A combination of sensitivity to change and magnitude of change provide a rating of the landscape character impact, as per the assessment matrix shown in Table 3.

Visual amenity

For the visual impacts from key selected viewpoints, the current existing visual situation is described, referring to elements within various parts of the view. The views are represented by photography taken at set parameters to correspond to the perception of the normal human eye.

Each of the selected viewpoints are then rated to their sensitivity to change. Sensitivity of a viewpoint is related to the direction of view and the composition of the view and may cross more than one landscape character zone.

While it may be also important to assess length of exposure to a particular viewpoint as a factor of sensitivity, it is important to recognise whether a view is particular to an identifiable location (such as a vista across the corridor from a resident's living room) or representative of a situation that exists across a broader length (such as the experience of a motorist along a length of corridor of a consistent treatment) (Transport for NSW - Centre for Urban Design, 2020).

The potential magnitude for change is then assessed from each viewpoint location. Magnitude refers to 'the form—scale, size, character—of the project and its proximity to the viewer' (Transport for NSW - Centre for Urban Design, 2020). The magnitude of change from a viewpoint is described as both a daytime and nighttime setting as well as due to construction and operational phase changes.

Rankings for sensitivity and magnitude of change are then combined for each viewpoint to generate the visual amenity impact, as per the assessment matrix shown in Table 4.

Mitigation measures

In order to manage and mitigate potential landscape character and visual impact, the urban design developed strategies for those landscape character zones and viewpoints which have a moderate or higher impact rating during construction and/or operation of the project.

Additionally, general strategies are provided in *Appendix A (Landscape and Visual Impact Assessment)* to manage and mitigate potential landscape character and visual impacts during either construction or operation of the project.

Table 3: Impact rating matrix for landscape character

	MAGNITUDE OF CHANGE			
SENSITIVITY TO CHANGE	High magnitude of landscape character change	Moderate magnitude of landscape character change	Low magnitude of landscape character change	Negligible magnitude of landscape character change
High Sensitivity	High landscape character impact	High-moderate landscape character impact	Moderate landscape character impact	Negligible landscape character impact
Moderate sensitivity	High-moderate landscape character impact	Moderate landscape character impact	Moderate-low landscape character impact	Negligible landscape character impact
Low sensitivity	Moderate landscape character impact	Moderate-low landscape character impact	Low landscape character impact	Negligible landscape character impact
Negligible sensitivity	Negligible landscape character impact	Negligible landscape character impact	Negligible landscape character impact	Negligible landscape character impact

Table 4: Impact rating matrix for visual amenity

	MAGNITUDE OF CHANGE				
SENSITIVITY	High magnitude of change from a viewpoint	Moderate magnitude of change from a viewpoint	Low magnitude of from a viewpoint	Negligible magnitude of from a viewpoint	Nil magnitude of change from a viewpoint
High Sensitivity	High visual amenity impact	High-moderate visual amenity impact	Moderate visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact
Moderate sensitivity	High-moderate visual amenity impact	Moderate visual amenity impact	Moderate-low visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact
Low sensitivity	Moderate visual amenity impact	Moderate-low visual amenity impact	Low landscape character impact	Negligible visual amenity impact	Nil visual amenity impact
Negligible sensitivity	Negligible visual amenity impact	Negligible visual amenity impact	Negligible visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact

2.2 Designing with Country

2.2.1 The project's commitment

Transport for NSW is committed to embedding Country-led collaboration and design into the ongoing development of the project, embracing an Aboriginal co-design approach to deliver positive community and place-making benefits.

There are a number of NSW Government policies committed to authentic engagement, collaboration, and co-design with local Aboriginal communities and knowledge holders. These include Transport for NSW's *Aboriginal Culture and Heritage Framework* and the Government Architect NSW's *Connecting with Country Framework*.

The designing with Country process that the project would carry out during the next stages of design would occur in line with Transport for NSW's Aboriginal co-design principles, summarised below:

- early and ongoing engagement – Aboriginal co-design should occur as early as possible in the life-cycle of the project
- connection with people and Country – there should be allocated time to walk on Country with Aboriginal knowledge holders and hear stories that belong to the place
- embedding – co-design should be a normal part of project development in the same manner as engineering design, surveying, community engagement and environmental planning
- partnership – effective co-design should require that roles, responsibilities, and mutually beneficial outcomes are clearly defined and established at the outset.
- Aboriginal empowerment – Aboriginal co-design should require the empowerment and inclusion of Aboriginal people to participate in the work of the project and there should be consideration of how the finished project or service would meet the needs of both the Aboriginal and non-Aboriginal community
- two-way sharing and capacity building – Aboriginal co-design should require the two-way sharing of knowledge, capacity, and capability between Aboriginal people and Transport for NSW staff.

The project would traverse many complex, diverse, and sacred areas of cultural significance, providing opportunities to connect with, care for, and read Country. The project's alignment offers a contemporary Songline to uncover and remember some of the ancient ecologies of this place. Connecting with and supporting existing ecological networks, the project can allow all people the opportunity to experience the diversity of this Country.

2.2.2 Walking on Country

The project team including ASPECT Studios, Arup and personnel from Transport NSW's senior management, environment, and urban design teams undertook a walk on Country and cultural induction led by Bangawarra in the Badu Mangroves of Sydney Olympic Park.

The session was led by Shannon Foster, a D'harawal eora Knowledge Keeper and ORALRA (Office of the Registrar Aboriginal Land Rights Act 1983) Registered Traditional Owner of the area now known as the Sydney Basin. Shannon is also a founding partner of Bangawarra, an Aboriginal design consultancy and member of the ASPECT Studios-led urban design team.

2.2.3 Cultural values

The project traverses through many complex, diverse, and sacred areas of cultural significance, providing opportunities to connect with, care for, and read Country.

The alignment offers a contemporary Songline, uncovering, remembering, and celebrating some of the ancient knowledges of this place. Connecting with and supporting existing ecological networks, the project can provide all people the opportunity to experience the diversity of this Country.

Through three unifying cultural values, Bangawarra would lead the project team to ensure that the nuanced and site-specific knowledges of Country are embraced and integrated into this significant piece of public infrastructure in unique and spatially generative ways.

The three cultural values for connecting with Country are described below.

Ngalawallah / A Gathering Space

The word "Ngalawallah" translates to ''come and sit next to me''. This word has been chosen to reflect how the project would bring people and communities together through Country.

It has been chosen as it is a shared word from many of the local Sydney languages, including the D'harawal eora language of Sydney; the common Sydney language, which is sometimes referred to as Darug/Dharug, Gadigal and "The Sydney Language" as well as other local languages.

Tucoerah / Diverse, blending ecologies and water systems

''Tucoerah'' is a common language word describing places where two waters and many different ecologies meet. It has been chosen to celebrate the unique environments the project traverses through. It is shared in many of the local languages including the D'harawal eora language of Sydney.

Wingara / Reading Country

"Wingara" variously means to ''hear', ''think'', ''understand'' and ''foresee''. This word has been chosen to represent the ways in which people can connect to and understand Country through the project.

It is also a shared language word across many of the Sydney languages including D'harawal eora language of Sydney; the common Sydney language, which is sometimes referred to as Darug/Dharug, Gadigal and "The Sydney Language" as well as other local languages.

2.2.4 Next steps

Throughout this report, Bangawarra has provided designing with Country commentary for each of the project's precincts. These opportunities would continue to be developed alongside other project work. Bangawarra would produce a 'Connecting with Country Urban Design Requirements' document to support the project's design development.

Further engagement and site visits with Bangawarra and relevant stakeholders would also be undertaken to continue the project's commitment to Transport for NSW's co-design principles.

The findings of *Technical Paper 4 (Preliminary Aboriginal Cultural Heritage Assessment Report)* would also be incorporated in design development.

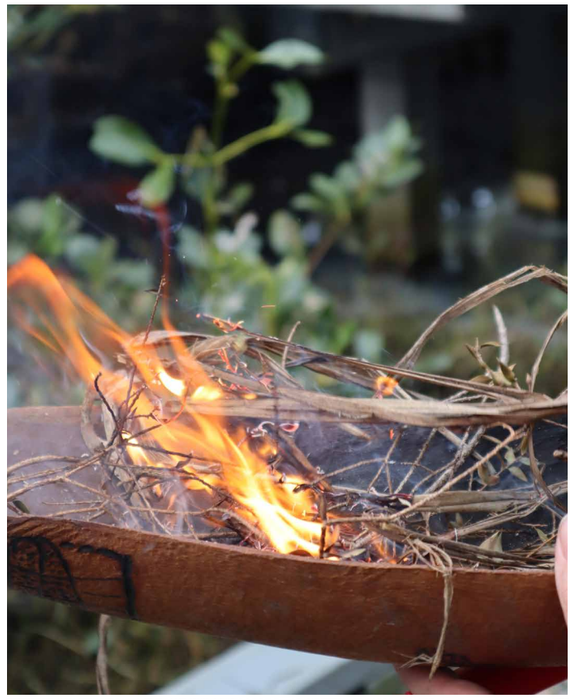




Figure 8: Cultural induction by Bangawarra. Badu Mangroves, Sydney Olympic Park (credit: Bangawarra, Transport for NSW).

2.3 Design Review Panel

2.3.1 Overview and purpose

The design development has been under the guidance of the Transport for NSW Design Review Panel (DRP). The purpose of this DRP is to provide independent high-level expert design review and advice in accordance with industry best practice.

The DRP provides recommendations for improvements and endorsement of quality design outcomes from early project planning stages through to detailed design. The objective of the panel's advice is to assist the project team in achieving a well-designed project that meets the needs of customers and communities and delivers high quality place outcomes.

The Transport for NSW Design Review Panel is chaired by the Director of Design Excellence from the office of the Government Architect NSW. Independent panel members include a range of suitably qualified, experienced independent professionals in each of the following fields:

- architecture
- urban design and placemaking
- landscape design
- Aboriginal or non-Aboriginal cultural heritage.

2.3.2 Process

The Transport for NSW Design Review Panel has provided advice at sessions held throughout the development of the design. All of the DRP's advice was recorded and responded to as part of the design development process.

Both the Scoping Design and Definition Design phases of the project were presented to the DRP at the following presentations:

1. DRP Presentation No. 1 – May 2018: Project introduction
2. DRP Presentation No. 2 – June 2018: Scoping Design
3. DRP Presentation No. 3 – May 2019: Definition Design (corridor, alignment and stops)
4. DRP Presentation No. 4 – May 2019: Definition Design (bridges and structures)
5. DRP Presentation No. 5 – February 2022: Definition Design update
6. DRP Presentation No.6 – April 2022: Definition Design update (bridges)

During the course of and subsequent to each of the DRP sessions, advice was provided on design issues and opportunities, which was incorporated into subsequent stages of design development. These included:

- development of the project vision and design principles
- development of the project alignment and bridge design options
- integration of the project alignment within existing precincts and planned future developments
- integration of light rail stops with streets and open spaces
- street design, including the provision of walking and cycling facilities and traffic circulation requirements.

The project would be presented to a project-specific DRP in future stages of design development (see section 2.5.3), including as part of the procurement process. The DRP would also have an ongoing role as the project progresses through construction phases.

Feedback from the DRP would be captured in a formal register that tracks the status of the panel's advice and provides evidence to the panel members as to how their advice has been integrated and addressed, or not addressed and the reasons for this.

2.4 Stakeholder and community consultation

2.4.1 Overview of stakeholders

The development of the Definition Design has been informed in part by consultation with and key contributions by several project stakeholders. These include:

- City of Parramatta Council
- City of Ryde Council
- Sydney Olympic Park Authority
- NSW Department of Planning and Environment
- utility providers (Sydney Water, Ausgrid, Jemena)
- significant landowners of current and future planned developments along the alignment
- various divisions within Transport for NSW.

In addition, the project has engaged with the community to understand their questions and concerns and to help shape the project design and future engagement. This engagement has driven some design refinements that have mitigated some potentially significant impacts.

Consultation with stakeholders would continue throughout design development, with more information on consultation provided in the EIS.

2.4.2 Overview of community consultation

The project has engaged with the community to understand their questions and concerns and to help shape the project design and future engagement. Further information on engagement undertaken to date is included in the EIS in Chapter 8 (Community and stakeholder engagement).

Key environmental and community issues have been considered throughout the design development process. Where practicable, impacts have been avoided or appropriate mitigation measures developed in response to this input. This has resulted in a number of design changes that have mitigated some of the potentially significant impacts. Examples of design refinements that have been adopted for the project are included in the EIS in Chapter 8 (Community and stakeholder engagement).

2.4.3 Design review

Design review was undertaken with key project stakeholders throughout the development of the Scoping Design and Definition Design. This included general Definition Design consultation and collaboration with City of Parramatta Council, Sydney Olympic Park Authority, asset owners, and developers of planned future precincts along the project alignment.

More detailed discussions and design review was also undertaken with utility and asset owners in relation to their specific design requirements, as well as with significant landowners of current and future planned developments along the project alignment to ensure design alignment and integration.

Further information can be found in Chapter 8 (Community and stakeholder engagement) of the EIS.

2.5 Future development of the design

2.5.1 Overview of design development

The Definition Design presented in this report summarises the design work done to date for the purposes of the EIS.

Future design development for the project would continue through the development of the project's urban design requirements, as well as through future procurement and delivery phases of the project.

Transport for NSW has prepared an *Urban Design Requirements Report* for Parramatta Light Rail Stage 1, which is publicly available online (https://s3.ap-southeast-2.amazonaws.com/data-new.parramattalightrail.nsw.gov.au/s3fs-public/2020-07/Urban-design-requirements-report.pdf).

The project proposes a similar process for guiding future design development.

This report—the Design, Place and Movement Report—forms the basis for the future development of the project's urban design requirements. This report would be developed in further detail to include:

- alignment plans to illustrate at a high-level the proposed design for the full length of the alignment
- stop design plans to illustrate in detail the proposed design for stops and adjacent environments
- detailed urban design requirements for the design elements included in Chapter 14.

2.5.2 Urban design requirements

The project's urban design requirements would be developed throughout design development in consultation with stakeholders, the Operator, and the rail regulator, and with the advice and recommendations of the Design Review Panel. Future design development would be carried out by design experts and a multidisciplinary team.

The urban design requirements would provide clear requirements and specifications to support planning for the procurement and delivery of Parramatta Light Rail Stage 2, including input into the Scope and Performance Requirements (SPR), third party agreements, and design and delivery approach.

The following are the intended steps in the requirements development process:

1. Operational Assessment and Hazard Identification: physical conditions and land use along the light rail alignment assessed to understand how light rail could operate efficiently and identify potential conflict between light rail and the public domain
2. Detail Design: public domain technical requirements developed further with a light rail operator in consultation with stakeholders and Transport for NSW
3. Accreditation and Implementation: public domain requirements assessed by the rail regulator and implemented.

Design development would also seek to further mitigate the impacts of the project, including retaining and enhancing existing views and vistas and providing for new views and vistas.

2.5.3 Design excellence

Design excellence is "the highest standard of architectural, urban and landscape design" (Government Architect NSW, 2017). Independent expert design review is a recognised best practice process for elevating design quality.

The development of the project Definition Design occurred under the guidance of the Transport for NSW Design Review Panel, chaired by the Director of Design Excellence from the office of the NSW Government Architect (refer to section 2.3.1 for further detail). This panel provides independent, high level expert design review and advice to Transport for NSW projects from early planning stages through to detail design and delivery phases (where a project specific panel is not established), with the aim of achieving well-designed projects that meet the needs of customers and communities and deliver high-quality place outcomes.

During the design development phase, the project would establish a Design Review Panel, specific to the Parramatta Light Rail Stage 2 project, to continue providing design excellence advice through the stages of design development. The project-specific Design Review Panel would be chaired by the NSW Government Architect (or its nominee) and would be comprised of:

- Members from the State Design Review Panel
- Members from the Transport for NSW Design Review Panel (to provide continuity).

Members would be highly qualified, experienced and independent professionals, with a variety of skills across design in the built environment, representing the fields of:

- Architecture
- Urban design
- Landscape architecture
- Aboriginal and non-Aboriginal cultural heritage
- Sustainability.

One member may have experience in multiple fields.

An appropriately qualified and experienced project team representative would also attend Panel meetings and provide information to assist the Panel in making well-informed decisions and recommendations.

The chair may extend an invite to relevant councils, technical experts, key stakeholders, and NSW government agencies to observe Design Review Panel meetings and to provide advice on local issues, context, and city outcomes.

Advice provided by the Design Review Panel would be taken into consideration and addressed during further design development, with the design amended accordingly where feasible.

2.5.4 Future consultation with stakeholders

During design development the project would continue to work closely with stakeholders. Design review would be undertaken with stakeholders throughout design development and procurement stages of the project. This would include design consultation and collaboration with relevant councils.

More detailed discussions and design review would also be undertaken with utility and asset owners in relation to specific design requirements related to these assets, as well as with significant landowners of current and future planned developments along the project alignment to ensure design alignment and integration.

3.0 Design Place and Movement Framework

3.1 Built and natural context

This section provides a high-level summary of the built and natural context for each of the project's precincts. The project's built context is illustrated in Figure 9. Its natural context is illustrated in Figure 10.

Refer to Chapters 5-12 for detailed descriptions of the design, place and movement outcomes for each precinct.

3.1.1 Parramatta CBD Terminus

Macquarie Street is located in the heart of the Parramatta CBD. It is one of the city centre's primary east-west streets and forms an important part of the Parramatta Light Rail Stage 1 alignment, delivering light rail services to and through the city.

The street is generally fronted by large scale commercial built form on both sides, interspersed with schools, public spaces, and other points of interest along its length.

The pedestrianisation of Church Street—known as 'Eat Street' and delivered as part of the Parramatta Light Rail Stage 1 project—between Macquarie Street and the Parramatta River brings a significant new public space to the city centre.

Sydney Metro West is currently under construction on the north eastern corner of Macquarie Street and Church Street.

3.1.2 Camellia

Camellia sits on the southern shore of the Parramatta River about 2 kilometres east of the Parramatta CBD, a strategically important riverside precinct at the heart of the Central River City. The industrial lands of Camellia comprise large scale heavy industrial operations on large lots, with heavy vehicle access to the precinct provided via Grand Avenue. No residential properties are present (as at Census 2016).

The precinct is immediately adjoined by the Rosehill Gardens Racecourse to the south. James Ruse Drive to the west provides a significant barrier between Camellia and the residential areas of Harris Park and Parramatta, while Parramatta River and Duck River provide barriers to the north, south, and east.

While the suburb is constrained by a range of challenges such as flooding, contamination, risk of hazard to pedestrians, limited transport access, and odour and noise impacts, the NSW Government's strategic planning for Camellia-Rosehill assigns the precinct with an important strategic role as an industry and employment hub within the Greater Parramatta and the Olympic Peninsula (GPOP) Economic Corridor.

The precinct would undergo significant transformation in the future, balancing the need for urban development and retention of employment lands, which are critical to the city's function.

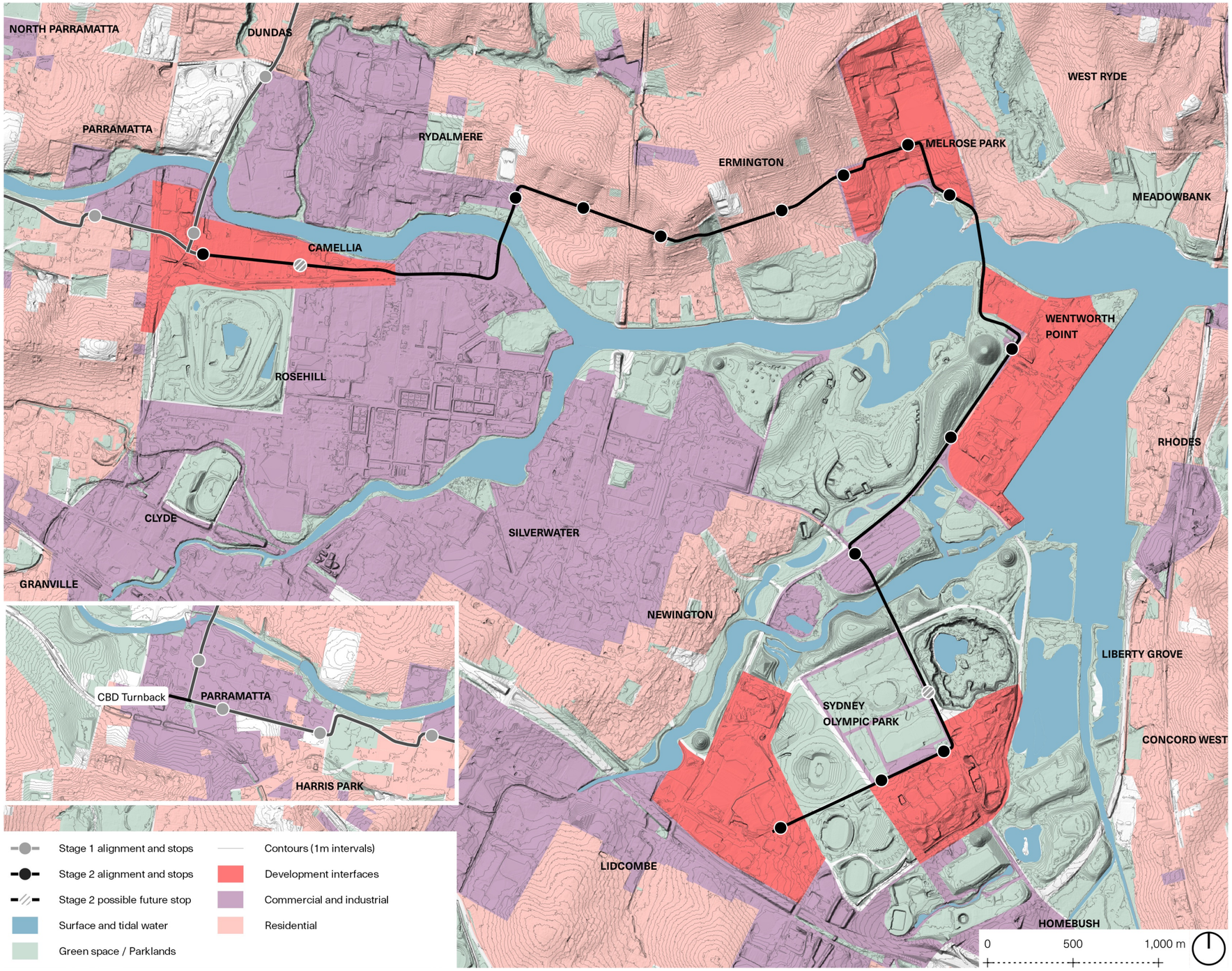


Figure 9: Built and natural context.

3.1.3 Rydalmere East

The eastern portion of the suburb of Rydalmere consists predominantly of low-rise, detached residential housing stock, typically post-war brick bungalows, as well as some more recent dual occupancies, townhouse developments, and apartments.

The western portion of the neighbourhood consists of a mixture of small- and medium-sized light industrial and commercial development, earmarked as an important industrial employment precinct by the Greater Sydney Commission.

Tree-lined streets throughout the precinct provide local traffic access. Significant Sydney Water utilities run along South Street creating large, turfed setbacks to properties on the northern side of the street. A series of ridgelines descend from Victoria Road to the Parramatta River, resulting in a sloping John Street and an undulating topography traversed by South Street east-west.

3.1.4 Ermington

The predominantly residential suburb of Ermington comprises low-rise, detached residential housing stock, typically post-war brick bungalows, as well as some more recent dual occupancies, townhouse developments, and apartments. The recently completed Royal Shores apartment and townhouse development is located on the Parramatta River in the south of the precinct. This development introduces significantly higher density to the Ermington suburb.

A series of north-south ridge lines descend from Victoria Road to the Parramatta River, resulting in steep topography in the west of the precinct.

Ken Newman Park is a neighbourhood park with a small playground and series of walking trails, located in the centre of the Ermington suburb about 400 metres north of the Parramatta River. It is bounded by a variety of streets and residential properties. The steep nature of the park reduces its amenity and recreation potential, with much of the northern section of the park poorly used. The park includes a utilities easement in its western portion, allowing for Sydney Water drinking water trunk mains to traverse the open space east-west between Hilder Road and Boronia Street.

These significant trunk mains run along the north side of Boronia Street, creating large, turfed setbacks to properties on the northern side of the road.

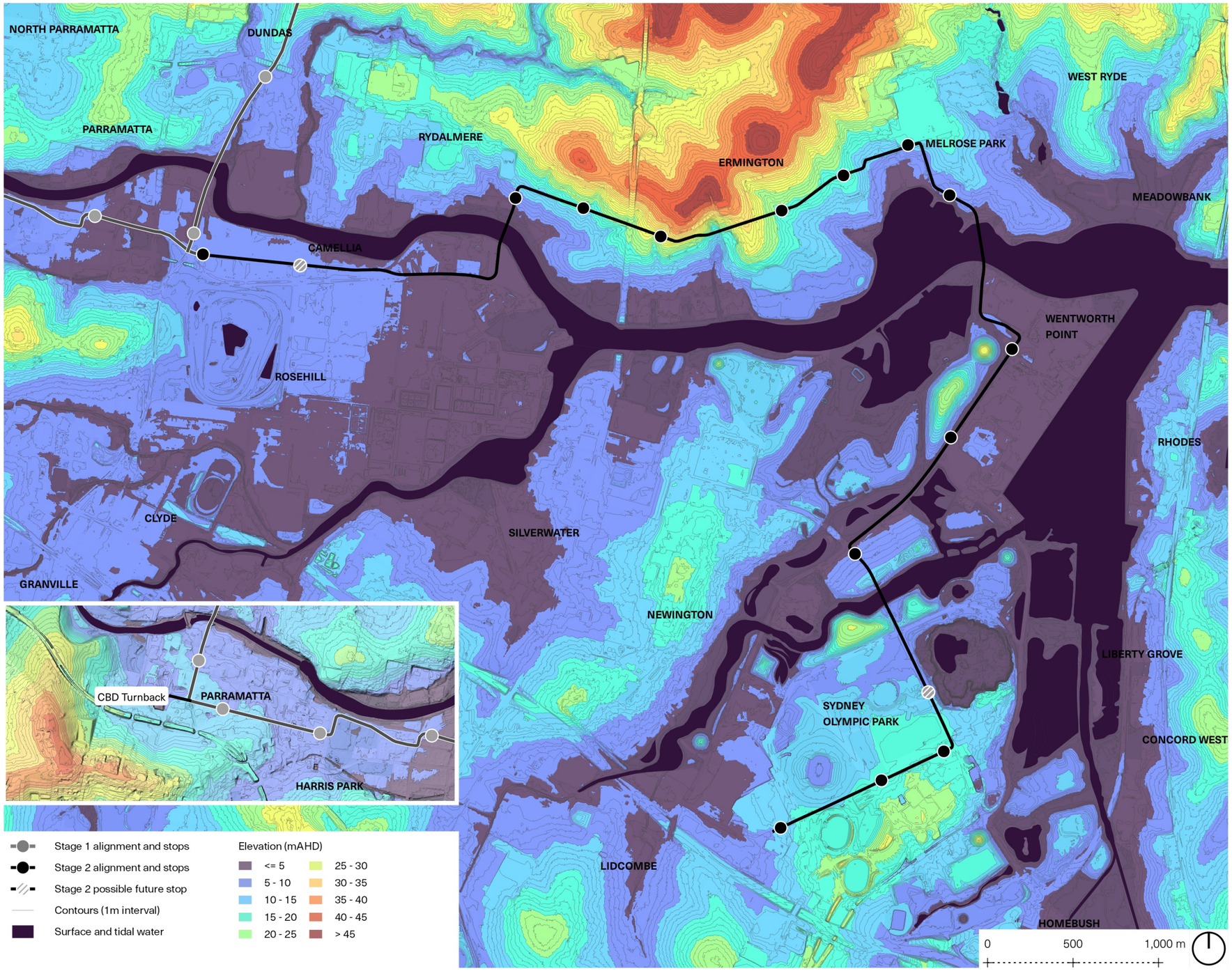


Figure 10: Topographic analysis.

3.1.5 Melrose Park

The suburb of Melrose Park comprises a variety of building stock and development proposals at different stages of redevelopment. The industrial lands north of Hope Street—known as Melrose Park North—are undergoing redevelopment, with the early phases of residential development already delivered adjacent to Victoria Road. Industrial lands south of Hope Street—known as Melrose Park South—comprise low rise light industrial land uses that are currently the subject of redevelopment proposals. Detached residential housing runs north-south to the east of Wharf Road, as well as to the west of the suburb in neighbouring Ermington.

The foreshore is lined with mangroves and contains recreational open space associated with the Parramatta Valley Cycleway and the Ermington Boat Ramp.

Both the northern and southern precincts of Melrose Park are forecast to undergo significant redevelopment and renewal, with plans for a new town centre and surrounding high density residential, which will deliver about 11,000 new dwellings and about 6000 jobs.

3.1.6 Wentworth Point

While much of Wentworth Point is located on land initially reclaimed for industrial uses, ongoing development continues the evolution of the peninsula's character from industrial lands to high density, predominantly residential development.

The precinct incorporates the regionally significant Millennium Parklands, Newington Nature Reserve, and Parramatta River foreshore. Future development at the northern end of the peninsula will continue to change the Parramatta River's foreshore landscape.

Hill Road currently provides the primary access to Wentworth Point and is a motor vehicle-dominated environment with poor pedestrian and cycle amenity, disconnecting the peninsula's development from adjacent parklands.

3.1.7 Sydney Olympic Park

The broad avenues of Sydney Olympic Park reflect its built heritage and Olympic legacy. NSW Government planning identifies Sydney Olympic Park as a successful lifestyle super precinct with the potential to attract anchor tenants specialising in sports, health and physical education (Greater Sydney Commission, 2018).

The region has been identified to support over 10,000 dwellings (23,000 residents), 34,000 workers and 5000 students in future years.

The tree-lined boulevards of Dawn Fraser Avenue and Australia Avenue will play an increasingly pivotal role in active and public transport connectivity to and through the precinct.

3.1.8 Carter Street Precinct

The Carter Street Precinct is an urban renewal area adjacent to Sydney Olympic Park, north of the M4 Motorway.

Rezoned in November 2015, the precinct is transitioning from an industrial area to an area with high density residential and mixed uses. The rezoning enables the delivery of about 5500 dwellings, a new village centre, a site for a new primary school, and new public open spaces.

3.2 Planning and policy context

3.2.1 Strategic planning context

Parramatta Light Rail Stage 2 would deliver new light rail and active transport facilities along and across the Parramatta River, creating new regionally and locally significant places and connections at the heart of Greater Sydney.

Several planning strategies and policies provide context for the Parramatta Light Rail Stage 2 project and have guided its strategic development. These are described below.

Greater Sydney Region Plan

Greater Sydney Commission, 2018

The *Greater Sydney Region Plan, A Metropolis of Three Cities*, is built on a vision of three cities—the Eastern Harbour City, Central River City (centred around Parramatta), and Western Parkland City—where most residents live within 30 minutes of their jobs, education and health facilities, services, and great places. The Metropolis of Three Cities is illustrated in Figure 11.

Parramatta Light Rail Stage 2 provides a critical component of the Central River City, in particular the Greater Parramatta and Olympic Peninsula (GPOP) corridor. GPOP is positioned as integral to the vision of A Metropolis of Three Cities and the Central River City, assisting in rebalancing opportunities across the Greater Sydney Region. The Central River City vision is illustrated in Figure 12.

GPOP is envisaged to become Central River City's connected and unifying heart. Both Parramatta Light Rail and Sydney Metro West will be catalysts for realising this vision.

Key objectives of the Plan relevant to the project include:

- Objective 15: The Eastern, GPOP and Western Economic Corridors are better connected and more competitive
- Objective 19: Greater Parramatta is stronger and better connected

Central City District Plan

Greater Sydney Commission, 2018

Greater Sydney's three cities reach across five districts: Western City District, Central City District, Eastern City District, North District and South District. The Central City District is the central and major component of the Central River City (refer Figure 12)

The Central City District Plan reiterates the importance of Parramatta Light Rail Stage 2 to the Central River City and GPOP corridor. In particular, the Plan notes that over the next 20 years, Sydney Olympic Park "will develop into a lifestyle precinct, offering the potential to attract anchor tenants specialising in sports, health and physical education."

To support this, a holistic and integrated transport solution is required for the area, including walking and cycling infrastructure, Parramatta Light Rail Stage 2, Sydney Metro West, all integrated with land use planning to significantly increase accessibility and contribute to achieving job targets.

Key priorities and actions of the Plan relevant to the project include:

- Priority C6: Creating and renewing great places and local centres, and respecting the District's heritage
- Priority C7: Growing a stronger and more competitive Greater Parramatta
- Priority C8: Delivering a more connected and competitive GPOP Economic Corridor
- Action 29: Prioritise public transport investment to deliver the 30-minute city objective for strategic centres along the GPOP Economic Corridor
- Action 30: Prioritise transport investments that enhance access to the GPOP Economic Corridor and between centres within the GPOP Economic Corridor

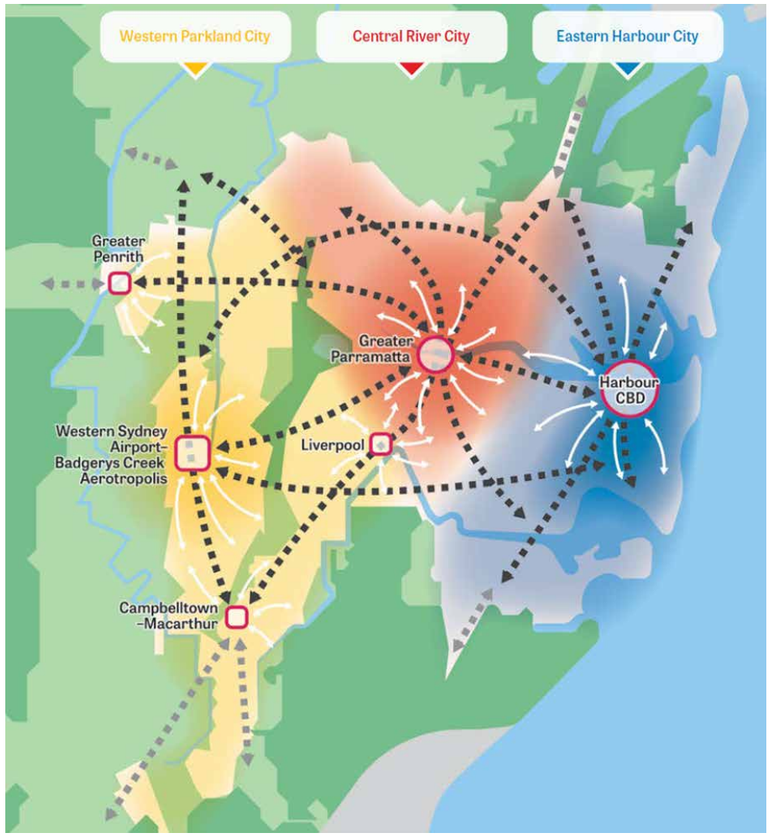


Figure 11: Greater Sydney Region Plan (source: NSW Government).

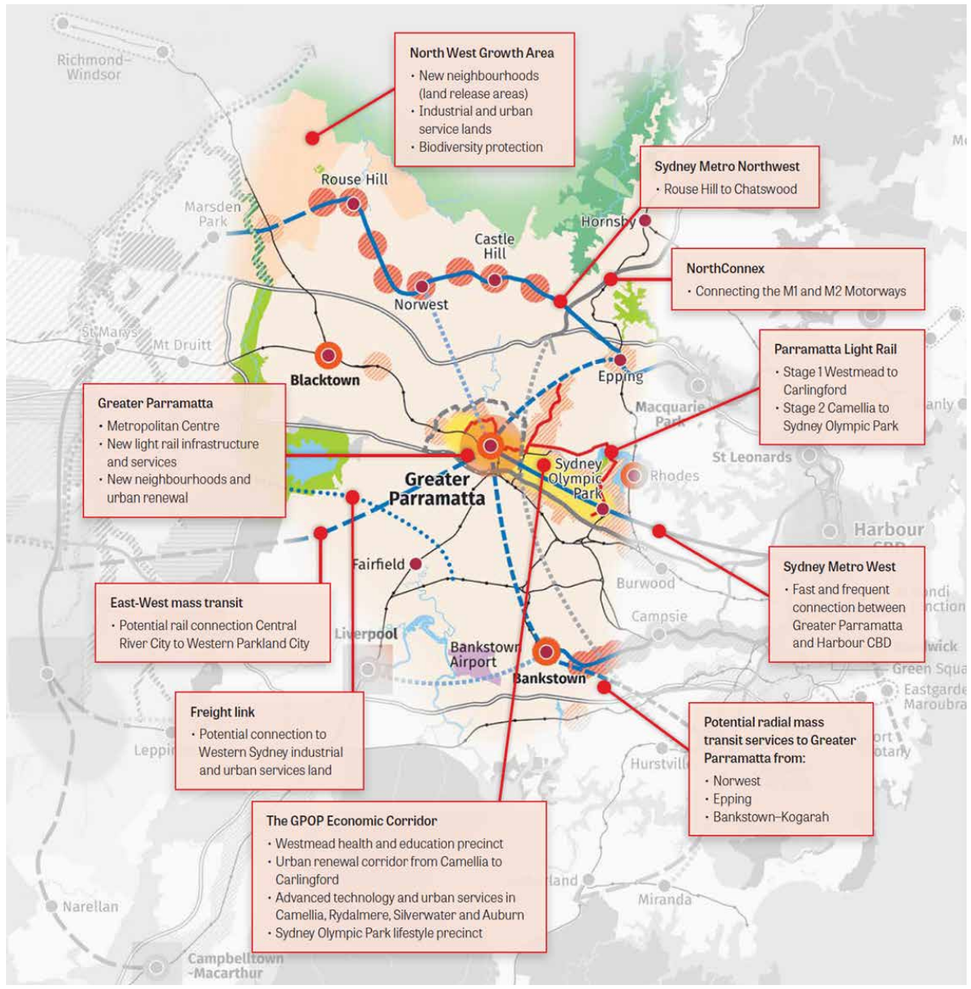


Figure 12: Central River City vision (source: NSW Government).

Greater Parramatta and the Olympic Peninsula Vision

Greater Sydney Commission, 2016

The Greater Parramatta and the Olympic Peninsula (GPOP) corridor is a 4,000-hectare area in the heart of Greater Sydney. It spans 13 kilometres east–west from Strathfield to Westmead, and seven kilometres north–south from Carlingford to Lidcombe and Granville. It is the geographic and demographic centre of Greater Sydney. The extent of the GPOP corridor is illustrated in Figure 13.

The Greater Parramatta and the Olympic Peninsula Vision (Greater Sydney Commission, 2016) notes that Parramatta Light Rail will form the spine of GPOP. Stage 2 of the light rail will play a critical role in connecting the eastern portion of the GPOP corridor between Parramatta and Sydney Olympic Park, in conjunction with Sydney Metro West.

Within their Recommendations Report: *Place-based Infrastructure Compact Pilot for Greater Parramatta and the Olympic Peninsula (2020)*, the Greater Sydney Commission note that 'given the commitment to Sydney Metro West, a new north-south regional public and active transport link across the Parramatta River to Sydney Olympic Park would enable more intense urban renewal in the precinct irrespective of the modes supported by the link'.

The Parramatta Light Rail Stage 2 project has been developed with the intent of aligning with, and contributing to the achievement of, this vision laid out within this strategic planning framework.

Key directions of the Vision relevant to the project include:

- Direction 7: Design Parramatta as our central '30-minute city', with good connectivity within GPOP and beyond to the north, south, east and west
- Direction 12: Shape attractive and effective built environments and public spaces that reflect a focus on great urban design and environmental excellence.

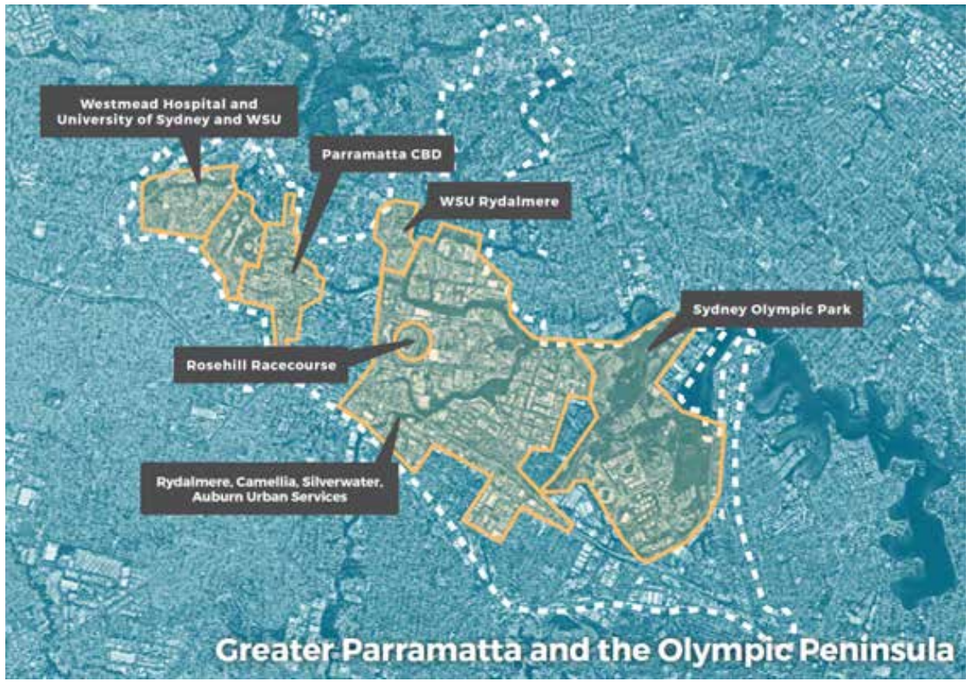


Figure 13: Greater Parramatta and the Olympic Peninsula location map (source: NSW Government).

3.2.2 Government Architect NSW



Better Placed

Government Architect NSW, 2017

Better Placed is an integrated policy that raises the standard for new developments within NSW by enhancing all aspects of the urban environment, nurturing a stronger design culture.

The purpose of this document is to achieve better design outcomes through:

- advocating for the importance of good design for better spaces and outcomes
- supporting industry and government to deliver good design for people
- enabling effective design processes to be established and supported in the planning framework

Better Placed achieves this through providing clear consistent rigorous objectives to achieve good design, identifying key concepts, good processes and objectives, and raising awareness of what the NSW Government means by good design in the urban realm.

Better Placed identifies seven objectives to define the key considerations in the design of the built environment. These are:

- Objective 1: Better fit.
- Objective 2: Better performance.
- Objective 3: Better for community.
- Objective 4: Better for people.
- Objective 5: Better working.
- Objective 6: Better value.
- Objective 7: Better look and feel.

The project supports all seven of these as outlined in Table 5.

Table 5: Response to Better Placed policy document.

Parramatta Light Rail Objectives	Parramatta Light Rail Stage 2 Design Objectives	Alignment with Better Placed Objectives
01 / City Shaping Support the vision for Parramatta as a 21st century city – attracting new investment and economic development. Catalyse and shape new growth – activating underutilised lands and providing the transport capacity needed to support sustainable population and employment growth in the area.	• Support the vision for Parramatta as a twenty-first century city—attracting new investment and economic development. • Catalyse and shape new growth—activating underutilised lands and providing the transport capacity needed to support sustainable population and employment growth in the area. • Support economic productivity and development by connecting current and future residential, employment, education, health and sporting precincts in GPOP with Parramatta. • Support sustainable employment and population growth through land use uplift by providing improved public transport capacity for regions north of Parramatta River through Rydalmere, Ermington, and Melrose Park. • Facilitate social and urban regeneration and growth around government owned land. • Facilitate new and improved recreation and transport opportunities by facilitating active transport links along the whole of the project. This would be facilitated through two river connections.	Objective 1: Better fit Contextual, local and of its place Objective 2: Better performance Sustainable, adaptable and durable Objective 6: Better value Creating and adding value
02 / Connectivity Connect people and places – supporting the diverse mix of customer journeys that link employment, cultural, educational, health and sporting precincts with existing and new communities.	• Provide new, reliable, and integrated public transport services that connect residential areas within GPOP with key destinations and major precincts such as Sydney Olympic Park, Western Sydney University and Parramatta CBD. • Support modal choice and reduce car dependence with safe, comfortable, and convenient light rail and active transport. • Provide intuitive connections and wayfinding throughout the project, in particular to and through stop precincts. • Investigate opportunities for interpreting Country within the design of the project's bridges and structures. • Design streets, public spaces and stop environments to enhance public safety and support crime prevention through environmental design.	Objective 2: Better performance Sustainable, adaptable and durable Objective 3: Better for community Inclusive, connected and diverse Objective 4: Better for people Safe, comfortable and liveable
03 / Place Contribute to the development of local hubs – supporting the creation of attractive and memorable public spaces that are better utilised by communities.	• Activate underutilised areas and support improved public domain outcomes within key precincts and public spaces both north and south of Parramatta river (i.e. Camellia Town Centre, Ken Newman Park, Sydney Olympic Park, planned Melrose Park developments and existing and future developments at Wentworth Point and Carter Street precincts) • Foster connection with Country working with local Aboriginal communities and knowledge holders • Create vibrant neighbourhood centres where people want to live, work and recreate.	Objective 1: Better fit Contextual, local and of its place Objective 4: Better for people Safe, comfortable and liveable Objective 7: Better look and feel Engaging, inviting and attractive
04 / Choice Provide attractive transport choices for customers – turn-up-and-go, safe, reliable, all-day light rail service that is integrated with roads, buses, trains and active transport.	• Provide an integrated public transport network with seamless interchange to alternate modes. • Facilitate broader public transport integration improvements including bus network re-design and the creation of new active transport links. • Create walkable neighbourhoods by providing active and sustainable transport choices along the alignment, in particular to and through stop precincts. • Develop places to rest and recuperate amongst vegetated corridors to help increase accessibility to active and public transport options and connections to Country. • Locate light rail stops to maximise active transport catchments and access to destinations.	Objective 3: Better for community Inclusive, connected and diverse Objective 4: Better for people Safe, comfortable and liveable
05 / Value Ensure the light rail delivers value-for-money transport, community and public domain outcomes. The Value objective has been adopted in recognition of the significant engineering, utility and structural scope of Parramatta Light Rail Stage 2.	• Investigate opportunities for light rail to catalyse local economic and social benefits. • Facilitate broader public transport integration improvements including bus network re-design and the creation of new active transport links. • Create walkable neighbourhoods by providing active and sustainable transport choices along the alignment, in particular to and through stop precincts. • Locate light rail stops to maximise active transport catchments and access to destinations. • Catalyse the future changes in precincts along the corridor.	Objective 2: Better performance Sustainable, adaptable and durable Objective 5: Better working Functional, efficient and fit for purpose



Greener Places

Government Architect NSW, 2020

Greener Places is a framework produced to increase the size and quality of green infrastructure across NSW in the pursuit of creating a healthier, liveable and more sustainable urban environment.

This policy promotes the creation of a networked urban ecosystem of green space that encompasses parks and open spaces, this includes trees, streets, squares, parks, and waterways to help create a healthier, more liveable, and resilient place to live.

Greener places advocates for integrated design solutions across all scales of the built environment by:

- supporting and maintaining Aboriginal culture and heritage
- improving access to community facilities
- increasing quantity and quality of parkland
- improving walking and cycling connections.

Project response

The project achieves the Greener Places objectives by providing access to new open space, improvements to existing open space, additional tree canopy, and continuous active transport links project wide.



Designing with Country

Government Architect NSW, 2020

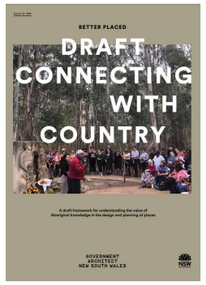
Designing with Country, through consultation with recognised Aboriginal knowledge holders, built environment experts, and local community, sets the framework by which new design can better develop a stronger presence for Aboriginal culture in the NSW planning system.

Rather than placing people at the centre of design, Designing with Country promotes a more equitable design process in which design considers natural systems that encompass people, flora, fauna, resources—an Aboriginal worldview— thereby making significant contributions to a more sustainable world.

Project response

The project is undertaking consultation and co-design with First Nations consultants and the local community to achieve the outcomes of Designing with Country.

The co-design would result in an integrated designing with Country approach resulting in embedded Aboriginal interpretation throughout the project.



Draft Connecting with Country

Government Architect NSW, 2020

The Draft Connecting with Country document commits to establishing a framework by which the development and delivery of projects within NSW proceed with a better understanding of Country, generating positive community and place-making benefits.

The draft framework commits the NSW Government to improving the health and wellbeing of Country. It does so with three long-term strategic goals, which are to:

- reduce the impacts of natural events such as fire, drought, and flooding through sustainable land and water use practices
- value and respect Aboriginal cultural knowledge with Aboriginal people co-leading design and development of all NSW infrastructure projects
- ensure Country is cared for appropriately and that sensitive sites are protected by Aboriginal people having access to their homelands to continue their cultural practices.

Project response

The project incorporates Aboriginal culture and heritage through co-design and engagement with local Aboriginal community members.



Aligning Movement and Place

Government Architect NSW, 2019

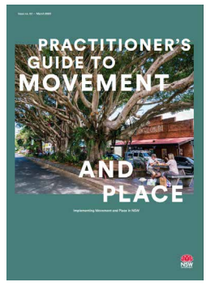
The Aligning Movement and Place document is a framework for planning, designing, and managing transport networks to maximise benefits for the people and places they serve. In order to better understand places in relation to movement of infrastructure, the Aligning Movement and Place document provides an introduction to the following components:

- a Practitioner's Guide with concepts, a core method and references, and a toolkit of technical resources for use in NSW and governance.
- a board to provide support, guidance, resolve disagreements and provide endorsement.

Project response

The project aligns with the framework by providing:

- **a range of travel options including public and active transport**
- **access to amenities and facilities along the alignment and parkland**
- **access to existing and new park**
- **access to the blue grid via the Paramatta River and within parkland**
- **low risk safe environments**
- **design that is responsive to local character and context.**



Practitioners Guide to Movement and Place

Government Architect NSW, 2020

Movement and Place is a cross-government framework for planning and managing roads ans streets across NSW.

Movement and Place considers the whole of the street, from property line to property line, including the footpaths. It takes into account the needs of all users in this space, including:

- pedestrians
- cyclists
- delivery drivers
- private vehicles
- public transport

Movement and Place also considers how people spend their time in the street , whether commuting, enjoying street life, partaking in outdoor dining, waiting for a bus, or simply watching the world go by.

Project response

The project considers the street at each of the above levels of detail. It provides safe access through the proposed pedestrian and road network and to all adjacent existing and future neighbourhoods, with consideration of their public domain uses.



Sydney Green Grid

Government Architect NSW, 2017

The Sydney Green Grid underpins the Greener Places and Draft Green infrastructure policy. It identifies a network of high quality green spaces that connects town centres, public transport hubs and major residential areas.

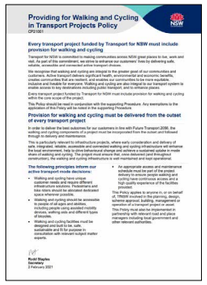
By mapping hydrological, recreational and ecological fragments of Sydney, this document proposes a cohesive green infrastructure network for greater Sydney.

The Sydney Green Grid prioritises the establishment of high quality, interconnected green infrastructure that supports high quality public spaces that in turn can support recreation, biodiversity, and hydrological health.

Project response

The project aligns with the aspirations of the Sydney Green Grid, maximising opportunities for delivering hydrological, recreational and ecological elements of the Grid.

3.2.3 Transport for NSW



Providing for Walking and Cycling in Transport Projects

Transport for NSW, 2021

This policy requires that every transport project funded by Transport for NSW must include provision for walking and cycling.

Principles include:

- walking and cycling have unique customer needs and require different infrastructure solutions. Pedestrians and cyclists should be allocated dedicated space wherever possible
- walking and cycling should be accessible to people of all ages, abilities. This includes people using assisted mobility devices, walking aids and different types of bicycles.

The policy applies to anyone working for, or on behalf of, Transport for NSW and involved in the planning, design, scheme approval, building management or operation of a transport project or asset. It must be implemented in partnership with relevant road and place managers, including local government and other relevant authorities.

Project response

The project would deliver continuous 8.5km of walking and cycling facilities along the length of the alignment, resulting in greater pedestrian permeability throughout the project.



Road User Space Allocation

Transport for NSW, 2021

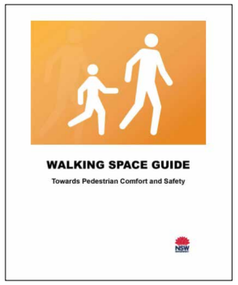
This policy requires that Transport for NSW allocates physical or temporal road user space safely and equitably in order to support the movement of people, goods and place objectives.

The order of road user space considerations is:

1. walking (including equitable access for people of all abilities)
2. cycling (including larger legal micro-mobility devices)
3. public transport
4. freight and deliveries
5. point-to-point transport ahead of general traffic
6. on street parking for private motorised vehicles.

Project response

The Definition Design has been developed by allocating road user space in line with the hierarchy set out above.



Walking Space Guide

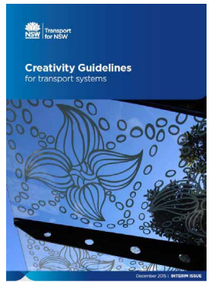
Transport for NSW, 2020

The Walking Space Guide provides a set of tools and standards to assist those responsible for designing walking spaces on streets. Its purpose is ensure enough clearance is provided to achieve comfortable environments that encourage walking.

The guide contains a consistent set of standards and processes to be applied in the design, planning, and implementation of walking space, according to intensity of use.

Project response

The project would deliver walking infrastructure that adheres to the requirements of the guide throughout the length of the alignment.



Creativity Guidelines for Transport Systems

Transport for NSW, 2015

As part of a growing desire for exceptional design outcomes within the public domain, Transport for NSW has developed the Creativity Guidelines for Transport as a means of delivering creative and out-of-the-ordinary design solutions for transport systems.

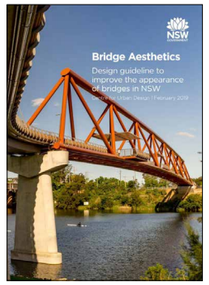
The document provides inspiration for design teams and stakeholders so that they are better placed to enhance user experience of public transport

Some examples of creative solutions associated with infrastructure include:

- public art within transport infrastructure
- bespoke fixtures such as seating, shelters, fencing
- integration of heritage elements
- sculptural design expression throughout their projects
- multimedia expressions/ interpretations
- creative writing integrated into architectural or landscape vessels.

Project response

The project would deliver creative and site-responsive design solutions along the alignment in consultation and co-design with local stakeholders and community members.



Bridge Aesthetics

Transport for NSW, 2019

The Bridge Aesthetics document is intent on providing transport agencies with unequivocal aesthetic outcomes desired by Transport for NSW.

The document provides a set of principles with regards to the design of pedestrian and vehicular bridges. Some of these include:

- achieving the desired design outcome of transport infrastructure in urban, rural, and bushland settings
- recognising the contribution that bridges make to local context and setting, history and heritage, and cultural environments
- the need for the involvement of professional urban designers at all levels of the design.

Project response

The Bridge Aesthetics guidelines have been considered in the preparation of the project's bridge design principles. This has involved undertaking multidisciplinary co-design workshops with stakeholders.



Cycleway Design Toolbox Designing for cycling and micromobility

Transport for NSW, 2020

The Cycleway Design Toolbox provides guidance for practitioners on cycling design for micromobility in the context of New South Wales and Greater Sydney.

The toolbox provides a range of design tools, and a comprehensive suite of best practice examples across a range of typical on-and-off road environments that can be tailored to suit specific environments across New South Wales.

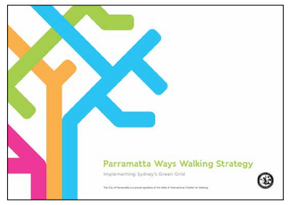
Project response

The project adheres to the Cycleway Design Toolbox by applying the six internationally recognised principles throughout the cycle routes across the alignment. These are:

- **safe**
- **connected**
- **direct**
- **attractive**
- **comfortable.**

In doing so, the project would create new and improved cycling facilities that integrate with the broader Parramatta Bike Plan and Sydney Olympic Park cycling network.

3.2.4 City of Parramatta Council



Parramatta Ways Walking Strategy

City of Parramatta, 2017

The Parramatta Ways Walking Strategy is a plan to improve walkability throughout the LGA. It does so by setting targets for both integrated transport and new open space opportunities.

The strategy prioritises pedestrians along network routes and intersections and an increase in comfort levels. This is achieved through:

- identifying and completing priority missing pedestrian network connections
- increasing recreational walking participation
- increasing walk to school rates
- increasing walk to work/public transport trips
- increasing foot traffic to local centres
- increasing tree canopy cover along the network
- increasing perceptions of safety associated with walking
- ensuring all residents live within a 5 minute walk of the Parramatta Ways network.

Project response

Whilst the project would provide additional paths of circulation throughout the LGA, it would also provide a number of new pedestrian paths and improve existing pedestrian paths outlined in the document .



Parramatta Bike Plan

City of Parramatta, 2017

The Parramatta Bike Plan seeks to better integrate cycle networks throughout Parramatta, creating a more active, liveable, productive, and sustainable future.

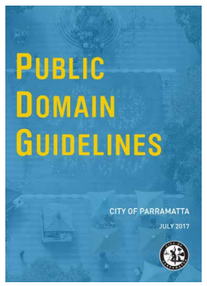
A vision for the next 20 years has been developed for the Parramatta cycling network with the following considerations:

- a cycling audit
- current and future population and job forecasts
- latest in cycling infrastructure thinking
- community consultation.

Project response

The project would improve existing cycling infrastructure impacted by the alignment. A variety of cycle infrastructure, including separated cycleways and shared paths would be provided along the alignment, some of which do not exist but are proposed within the Plan. Connections to the existing Bike Plan network have been considered throughout the project.

The projects also facilitates additional cycling connection currently not documented in the Parramatta Bike Plan.



Public Domain Guidelines City of Parramatta

City of Parramatta, 2017

The City of Parramatta Public Domain Guidelines provide design strategies and technical guidance for streets and public spaces within the City of Parramatta.

The guidelines ensure consistency in the delivery of these spaces through the prescription of:

- materiality
- design and construction standards
- maintenance and management procedure.

Project response

Selections of materials, fixtures, and finishes would be consistent with these guidelines, in consultation with City of Parramatta Council.

3.2.5 Sydney Olympic Park Authority



Sydney Olympic Park Master Plan 2030 (2018 Review)

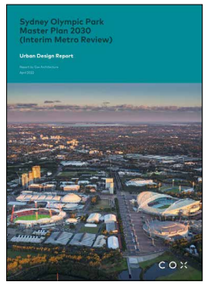
Sydney Olympic Park Authority, 2018

Sydney Olympic Park Master Plan 2030 (2018 Review) will guide Sydney Olympic Park's evolution from the site of Australia's largest events to a thriving economic town centre and growing residential community. It will do so through the integration of best practice examples of sustainable and urban development.

Project response

The project considers the SOPA Master Plan and any proposed future developments adjacent to the light rail. Adjustments have been made through the design process to include any proposed developments, with connections provided where necessary. Examples include:

- **URBNSURF**
- **the Sydney Olympic Park Metro station**
- **numerous multi unit residential and commercial developments under approval.**



Sydney Olympic Park Master Plan 2030 Interim Metro Review

Sydney Olympic Park Authority, 2021

The Sydney Olympic Park Master Plan 2030 Interim Metro Review sets the vision for the revitalisation of Sydney Olympic Park with a vibrant new town centre, educational facilities, shopping and retail, increased residential and open space, a new metro station, and new community and cultural facilities.

The purpose of the master plan is to:

- provide a comprehensive approach to the long-term development of Sydney Olympic Park
- ensure Sydney Olympic Park continues to evolve into an active, vibrant centre within Sydney
- protect Sydney Olympic Park's role as the premier destination for cultural, entertainment, recreation and sporting events
- protect and enhance the public domain and parklands
- provide detailed planning/design principles
- provide controls and encourage developments within Sydney Olympic Park to better engage with context, character and culture.

Project response

The project would respond to the SOPA Master Plan 2030 through the integration of public domain works with the document's intended outcomes for the city.



Sydney Olympic Park Vision and Strategy 2050 Summary

Sydney Olympic Park Authority, 2022

The Sydney Olympic Park Vision and Strategy 2050 Summary serves as a road map which will inform the decision making for the next three decades of development within Sydney Olympic Park.

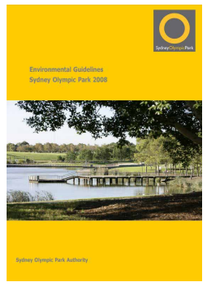
The Vision summary has been co-created with hundreds of stakeholders, residents, workers and Government representatives drawing on rich insights gathered through the engagement process

The summary and subsequent master plan due to be delivered in 2023 will guide the Sydney Olympic Park Authority and its partners to deliver the 2050 vision of a place that is a home, workplace and playground for thousands of Sydneysiders.

Project response

The project would contribute to the objectives of The Sydney Olympic Park Vision and Strategy 2050 Summary by:

- **recognising the importance of caring for Country**
- **improving transport connectivity to and from Sydney Olympic Park**
- **supporting job growth in the area by improving access to the suburb**
- **providing improved access to parkland and exercise facilities.**



Environmental Guidelines Sydney Olympic Park

Sydney Olympic Park Authority, 2008

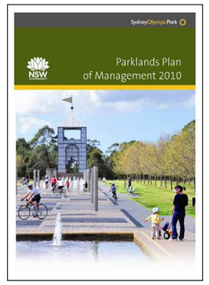
As an amendment to the Environmental Guidelines for the Summer Olympic Games (1993), the Environmental Guidelines for Sydney Olympic Park (2008) sets a series of best practice benchmarks against which to measure developments in comparable circumstances.

The guidelines do not prescribe a series of rigidly specifying actions that must be adhered to. Instead, they highlight key environmental issues and challenges facing Sydney Olympic Park. The guidelines state various commitments that are to be met as part of efforts to enhance the sustainability of Sydney Olympic Park.

Project response

The project would meet the objectives of the Sydney Olympic Park Environmental guidelines through appropriate use of sustainable materials and design methodology throughout the Sydney Olympic Park precinct.

The project is also committed to minimising its footprint by being considerate of the ecologically sensitive environments it engages with.



Parklands Plan of Management 2010

Sydney Olympic Park Authority, 2010

The Parklands Plan of Management is the second Plan of Management created for Sydney Olympic Park, and was developed to guide the management and development of the parkland in 1974 the aspiration that one day they will form a urban parkland of international significance.

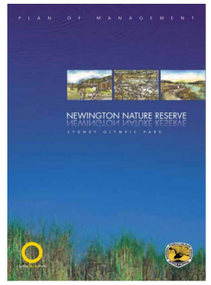
The plan of management presents the broad parameters and sets out the statutory framework under which the parklands has been formulated, and provides objectives for any future works affecting the parklands, and policies for all land categories within the document.

These categories include:

- sport and recreation
- nature reserve
- wetland and waterways
- leisure and play
- conservation.

Project response

Minimal impact to the parklands within Sydney Olympic Park has been achieved with the project's proposed alignment being located within or directly abutting existing road corridors.



Plan of Management for Newington Nature Reserve

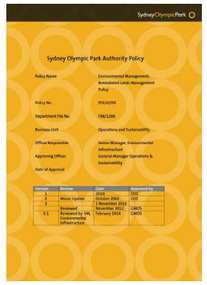
Sydney Olympic Park Authority, 2003

This legally binding document was created pursuant to the *National Parks and Wildlife Act 1974* and the *Sydney Olympic Park Authority Act 2001*. The document outlines how the lands are to be managed in the years ahead, with any conduct not in accordance with the plan prohibited.

The Parklands Plan of Management for Newington Nature Reserve is the means by which to realise the conceptual plan for the parklands. It contains a general scheme of operations for the whole parkland and as well as local schemes of operation for each of the seventeen constituent precincts, while satisfying the statutory and operational requirements.

Project response

The project is committed to minimal impact to the Newington Nature Reserve. Accordingly, transport infrastructure would be located on its periphery.



Environmental Management: Remediated Lands Management Policy

Sydney Olympic Park Authority, 2014

The Remediated Lands Management Policy describes how the Sydney Olympic Park Authority (SOPA)intends to manage remediated landfill sites and their associated infrastructure with a series of policies on use, management, and monitoring, including:

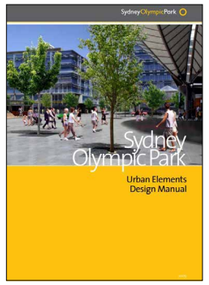
- landfill design
- legislation
- risk
- community needs
- corporate requirements.

The implementation of this policy ensures the appropriate management of any existing and new waste containment systems and allows for the continuous monitoring and reporting of their effectiveness.

This policy is to be referenced by persons planning works or development on remediated landfills.

Project response

Should the project impact upon existing landfill or remediation management measures in place, the works would be completed in accordance with the policies in this document.



Sydney Olympic Park Urban Elements Design Manual

Sydney Olympic Park Authority, 2009

The Sydney Olympic Park Urban Elements Design Manual sets out the quality and performance standards for the public domain within Sydney Olympic Park. The goal of this document is to integrate new urban public domain works seamlessly with the existing public realm dedicated to serving major sporting and leisure venues.

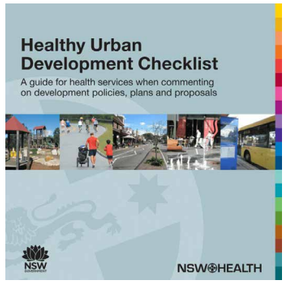
SOPA's vision for the public domain is a consistent high quality, multi-functional, equitable and sustainable urban space which balances the needs of workers, residents, visitors, and students while continuing to be a world class regional park and premiere for major entertainment and sporting events.

This document would be read in conjunction with other SOPA policies to ensure a cohesive and considered public domain treatment.

Project response

The project would follow the technical guidance of the Urban Design Elements Manual within the Sydney Olympic Park lands in conjunction with stakeholder workshops and approvals.

3.2.6 NSW Health



Healthy Urban Development Checklist

NSW Health, 2009

The Healthy Urban Development Checklist develops guidelines to ensure that NSW Health plays a key role in the realisation of healthy sustainable communities in NSW by critically examining urban development policies, plans and proposals.

As a tool for reviewing and commencing development plans, the checklist provides input and advice at the earliest phases of urban planning to provide better health outcomes. This is achieved through:

- providing a standardised tool to guide and inform feedback and advice to, for instance, local government and developers on urban development policies and plans in NSW
- evaluating the health aspects of urban developments
- supporting engagement between urban planners and developers and health professionals
- informing others (planners, developers, policy makers) about the range of factors that need to be considered in healthy urban developments.

Table 6: TC1 Improve Public Transport Services

Code	Question	Response	Evidence
TC1.1	Does the policy, plan or development proposal identify the provision of public transport as a priority?	YES	The project encourages alternative transport by providing new cycling and walking connections in the form of 8.5km of new active transport infrastructure, however specific schemes are out of scope. Refer Chapters 5 to 12 for further information.
TC1.2	Does the policy, plan or development proposal make provision for public transport routes/services to link the proposed development to the wider area?	YES	The project would integrate with existing and proposed future development along its alignment. Refer Chapters 5 to 12 for further information.
TC1.3	Does the policy, plan or development proposal identify public transport routes that address the needs of different groups in the population (e.g. travel to education, shopping, recreation and employment areas)?	YES	The project's alignment would provide active and public transport routes to existing and proposed future development, including education, shopping, recreation and employment areas. Refer Chapters 5 to 12 for further information.
TC1.4	Does the policy, plan or development proposal encourage alternative transport system development such as car share programs, electric taxis, walking/cycling "bus" programs and/or community bike hire schemes?	YES	While the project does not directly provide alternative transport systems, the new and improved active transport links expand opportunities for commuter and recreational walking and cycling. The project encourages alternative transport by providing new cycling and walking connections in the form of 8.5km of new active transport infrastructure, however specific schemes are out of scope.
TC1.5	URBAN FORM Are public transport stops located in comfortable walking distance (approximately 400-500 metres for bus stops and 800 metres for train stations) of housing, employment, and other local destinations? (NOTE: The quality of urban design can influence and extend the distances that people are willing to walk between destinations. Similarly, poor design can discourage people from walking even relatively short distances.)	YES	The project proposes light rail stops in locations that relate to housing, employment, and other local destinations. Refer Chapter 4 (Project Overview) for further information.
TC1.6	Are public transport systems and nodes designed to be universally accessible?	YES	Stops would be designed as fully accessible environments. A flush interface would be provided between platform and light rail vehicle to ensure accessible boarding/alighting. Refer Chapter 14 (Design Elements).
TC1.7	Are public transport nodes safe and easy to approach on foot and bicycle (are they clearly signed and well-lit with direct routes and safe and convenient crossing points)?	YES	The project adopts Transport for NSW's Road Space User Allocation Policy and Walking Space Guide, ensuring light rail stop environments that would prioritise people walking and cycling. Refer Chapter 14 (Design Elements).
TC1.8	Do public transport nodes include places to park and/or rent bicycles? Can bicycles be taken onto trains and/or buses?	YES	Bicycle parking would be integrated into the detailed design of all stop precincts.
TC1.9	Do public transport nodes include amenities such as: shelter, seating, proper lighting, transport user information, wayfinding guidance, washrooms, refreshments, bicycle parking, power outlets and internet service, as well as information about the surrounding area and transport options (including walking or cycling) for the onward journey?	YES	Light rail stops would provide shelter, seating, lighting, transport user information, wayfinding guidance, and bicycle parking. Refer Chapter 14 (Design Elements).
TC1.10	Is the policy, plan or proposal located near an existing transport node and, if so, does this require upgrading to ensure that it can meet the needs of the future population?	YES	The project would have key connections between light rail and other modes including interchange with trains, ferries, buses, Parramatta Light Rail Stage 1 and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Camellia, Rydalmere and Sydney Olympic Park. The alignment of the project has been selected to service planned urban developments and land use change in the GPOP. Refer to Chapter 4 (Project Overview).

Table 7: TC2 Reduce car dependency and encourage active transport

Code	Question	Response	Evidence
TC2.1	Is a stated goal of the policy, plan, or proposal to reduce car dependency and car use and encourage more active forms of transport?	YES	Refer Section 3.4 - Vision and Principles.
TC2.2	Does the policy, plan or proposal propose measures to encourage walking and cycling such as vehicle speed limits, restrictions on vehicle access, parking requirements, etc.?	YES	The project would encourage walking and cycling by providing 8.5km of new active transport infrastructure and links to existing infrastructure. Proposed vehicle speed limits have considered safe walking and cycling. Refer Chapter 4 (Project Overview).
TC2.3	Does the policy, plan or proposal encourage carpooling or car sharing, including through designated parking spaces for car share programs?	N/A	This item is not applicable to the project scope.
TC2.4	Does the policy, plan or proposal include incentives to encourage bicycle use such as 'park and bike' measures, shared bicycle schemes etc.?	YES	The project encourages a combination of cycling and public transport use by providing bicycle storage at light rail stops. Refer to Chapter 14 (Design Elements).
TC2.5	Does the policy, plan or proposal encourage the reduction of car parking spaces in urban areas (particularly where there is good public transport available) including the re-allocation of car parking spaces for bicycle parking and cycling routes?	YES	Car parking would be reduced in sections of the alignment due to space constraints in delivering light rail to existing streets and urban environments. Refer Chapters 5 to 12 for typical cross sections illustrating the re-allocation of car parking spaces for bicycle facilities.
TC2.6	URBAN FORM Does the plan, policy or proposal provide a well-connected street pattern? (NOTE: This includes blocks that are relatively short, a road and pedestrian network that provides numerous alternative routes, mid-block pedestrian access links, and the avoidance of cul-de-sacs especially those without any pedestrian and bicycle through access.)	YES	The project would integrate with the existing street pattern of the neighbourhoods through which it would pass. Pedestrian and bicycle crossings would be maximised wherever possible and cul-de-sacs avoided.
TC2.7	Are there particular features that present potential safety hazards, such as busy roadways separating schools from residential areas, level crossings of rail lines etc.?	YES	While these features are present, safety hazards are addressed by the Definition Design. The project would also improve connectivity across busy roads such as Silverwater Road, by providing improved walking and cycling infrastructure as well as public transport. Refer Chapters 5 to 12 for further information.
TC2.8	Are there areas with both high pedestrian and bicycle activity, and high vehicle traffic that could benefit from additional safety measures?	YES	Stops would provide areas where high pedestrian and bicycle activity is anticipated, as would existing and future town centres through which the project would pass. Safety hazards are addressed by the Definition Design. Refer Chapters 5 to 12 for further information.
TC2.9	Do trees border streets where walking and cycling is desired (as a means for improving amenity and helping to reduce traffic speeds)?	YES	The project would maximise the delivery of street trees where space and utility constraints allow. Refer Chapters 5 to 12 for further information.
TC2.10	Are walking and cycling entrances to buildings prioritised and safe (avoiding conflict with cars)?	YES	Walking and cycling facilities delivered as part of the project would integrate with existing networks and adjacent connections, including the provision of safe entries to buildings. Refer Chapters 5 to 12 for further information.
TC2.11	Are walking and cycling routes through parking areas clearly marked and safe (avoiding conflict with cars)? Is bicycle parking prioritised?	YES	While pedestrian and cycling routes may be near or through parking areas, safety hazards would be addressed by the Definition Design. Refer Chapters 5 to 12.
TC2.12	Where traffic 'squeeze points' are introduced (to slow traffic speeds and provide safer pedestrian crossings) are there provisions for cyclists to pass through unobstructed?	YES	Refer Chapters 5 to 12 for descriptions and illustrations of cycling provisions.
TC2.13	Are pedestrian areas (such as public plazas, squares, pathways, trails, shopping areas, etc.) designed to be universally accessible?	YES	All public domain areas delivered in line with Australian Standards. Refer Chapter 14 (Design Elements).

3.2.7 Other government policies

Australia's Strategy for Protecting Crowded Places from Terrorism

Australia-New Zealand Counter-Terrorism Committee (ANZCT), 2017

This policy provides the guidelines by which new projects should consider methods to minimise any potential threats.

The policy defines crowded places as locations that are easily targeted due to their frequent, predictable, and popular use. These include, but are not limited to, stadiums, transport infrastructure, and retail and civic centres.

Project response

The project is committed to meeting the ANZCTC's objectives within this document by:

- **developing sustainable and strong partnerships at all levels of government and the private sector**
- **enabling better information sharing by participating in forums that provide owners and operators with emerging information**
- **implementing effective security and seeking appropriate guidance where necessary**
- **building a strong security culture via strong communication strategies**
- **regularly training staff**
- **evaluating and testing policies and procedures.**

Crime Prevention and the Assessment of Development Applications

Department of Urban Affairs and Planning, 2001

This document provides guidelines on enabling effective design to reduce crime opportunities.

Crime Prevention Through Environmental Design (CPTED) seeks to influence design by:

- increasing perception of risk to criminals
- increasing the effort required to commit crime
- reducing the potential rewards of criminal activity.

The guidelines in this document detail the need for a crime risk assessment when considering a development and basic design principles that can minimise crime risk.

Project response

The project considers the CPTED guidelines throughout the alignment to minimise any illicit behaviour through appropriate design methods and management systems. This would include safe driving environments.

Refer to section 14.10.2 for more detail.

National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds

Department of Environment and Energy, 2020

This document outlines the process to be followed where there is potential for artificial lighting to affect wildlife and provides practical information required to mitigate these effects, regardless of scale.

This document provides technical guidance for the management of the impacts of effects artificial light on listed threatened migratory species, endemic species, and species protected under state or territory legislation for which artificial light has been demonstrated to affect behaviour, curability, or reproduction.

Project response

Opportunities to minimise light pollution to ecologically sensitive areas, particularly the Parramatta River, Newington Nature Reserve and the Millennium Parklands, would be investigated and implemented where reasonable and feasible, with regard to the Guidelines.

AS 4282-1997 Australian Standard -Control of obtrusive effects of outdoor lighting

Standards Australia, 1997

AS 4282-1997 was developed by the Standard Australia Committee to provide guidance on the obtrusive effects of light spill beyond a project boundary, and provides a common basis for assessment of the likely effects outdoor lighting has on neighbouring residents.

Although the standard provides guidance on the limit of allowable light spill, it is not the only policy document that needs to be considered.

The standard provides limiting values for lighting technical parameters which consider the following:

- The level of lighting existing in the area.
- The times that the proposed lighting is to operate.
- The type of lighting technology available to light the activity.
- The use of readily available and easily understood technical data on the lighting
- Installations which can easily be verified at the design and assessment stages.

Project response

Lighting would be provided along the entirety of the alignment in accordance with AS 4282-1997 and other guiding documents to minimise the effects of light spill through appropriate design, and luminaire selection.

Creating Walkable Neighbourhoods

NSW Healthy Planning Expert Working Group, 2018

Walkability is fundamental to creating valuable leisure filled neighbourhoods. Urban planning that results in a dependence on private motor vehicle has significant environmental, health, and social costs, meaning walkability is essential feature of healthy and liveable built environment.

The document lists three characteristics of successfully planned walkable neighbourhoods. These are:

- the distance between destinations is short
- the transport system is an integrated network of choice between public and active transport options
- the use of the private car is for infrequent trips that cannot be accommodated using public and active modes.

Project response

The project would deliver an improvement on existing pedestrian spaces throughout the project, providing continuous dedicated pedestrian infrastructure along the alignment consistent with the Creating Walkable Neighbourhoods guide.

The project would prioritise:

- **walking and active travel options such as cycling and public transport.**
- **provide access to pedestrian infrastructure in neighbourhoods of planned future high density growth**
- **improve on existing pedestrian infrastructure where the project would impact this**
- **provide improved access to existing pedestrian and active transport facilities where the alignment engages withe these**
- **create comfortable walking environments by maximising the provision of generous landscape amenity.**

3.3 Sustainability

3.3.1 Overview

Public transport is an essential service and an environmentally attractive transport option that supports the living standards and economic competitiveness of Sydney and its citizens.

Light rail is an inherently sustainable form of transport that can significantly reduce traffic congestion, noise, air pollution, and greenhouse gas emissions by encouraging mode shift away from private vehicle use. Parramatta Light Rail Stage 2 provides an opportunity to bring significant sustainability benefits to an area of Sydney that has so far been shaped by the car-dependent motorway urbanism prevalent in mid-twentieth century urban planning.

Six key sustainability goals were developed during Parramatta Light Rail Stage 1. These were based on international and national benchmarking of sustainability on light rail projects; a review of relevant government policies, plans and strategies; and the outcomes of an internal Transport for NSW sustainability workshop during the Definition Design phase for Stage 1.

These goals remain relevant and apply to Parramatta Light Rail Stage 2. They include:

- Reinforce the Inherent Sustainability Benefits of the Parramatta Light Rail
- Benchmark Against Recognised Rating Tools
- Maximise Energy Efficiency, Renewables and Greenhouse Gas Reduction
- Advocate for Sustainable Communities
- Utilise an Environmental Management System
- Report on our Progress.

3.3.2 Sustainable development goals

At the heart of the 2030 Agenda for Sustainable Development are seventeen sustainable development goals (SDGs), an urgent call for action by all countries—developed and developing—in a global partnership.

They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth—all while tackling climate change and working to preserve our oceans and forests.

As part of the ISC IS rating process, Parramatta Light Rail Stage 2 has adopted the SDG approach to complete its materiality assessment in line with Australian Government and NSW Government policy and direction.

A workshop was held with the Parramatta Light Rail project team and representatives from the City of Parramatta Council, during which six UN SDGs were identified as being material to the Definition Design. Seven SDGs were identified as being material to the project. These are listed below.

SDGs ranked as having '**high**' materiality included:

- Good health and well-being (SDG 3): Ensure healthy lives and promote well-being for all at all ages.
- Affordable and clean energy (SDG 7): Ensure access to affordable, reliable, sustainable and modern energy for all.
- Decent work and economic growth (SDG 8): Promote inclusive and sustainable economic growth, employment and decent work for all.
- Peace, Justice and Strong Institutions (SDG 16): Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

SDGs ranked as having '**very high**' materiality included:

- Sustainable cities and communities (SDG 11): Make cities inclusive, safe, resilient and sustainable.
- Responsible consumption and production (SDG 12): Ensure sustainable consumption and production practices.
- Climate action (SDG 13): Taking urgent action to combat climate change and its impacts.



Figure 14: Sustainable Development Goals for the project.

3.3.3 Project contribution to key UN SDGs

The Project's contribution towards achieving the identified key UN SDGs and their alignment with the Project's sustainability goals are outlined in Table 8.

Table 8: Contribution made by the project to key UN SDGs

Priority SDG	Alignment of Project sustainability goals with UN SDGs	How the Project would positively contribute to the achievement of the UN SDGs
SDGs ranked as having '**high**' materiality		
SDG 3 **Good health and well-being** Ensure healthy lives and promote well-being for all at all ages.	**Project sustainability goal 1:** Reinforce the inherent sustainability benefits of the Parramatta Light Rail **Project sustainability goal 4:** Advocate for Sustainable Communities	The Project would provide a range of community health, well being and safety benefits through: • Improving travel reliability and encouraging physical activity in the form of walking and cycling through the active transport link • Improving access for the community to health services and facilities.
SDG 7 **Affordable and clean energy** Ensure access to affordable, reliable, sustainable and modern energy for all.	**Project sustainability goal 3:** Maximise energy efficiency, renewables and greenhouse gas reduction	The Project would positively contribute towards increased energy efficiency and the increased use of renewable energy by: • Investigating new and emerging technologies in energy efficiency and carbon reduction. • Identifying renewable energy targets for the Project for both construction and operation phases.
SDG 8 **Decent work and economic growth** Promote inclusive and sustainable economic growth, employment and decent work for all.	**Project sustainability goal 1:** Reinforce the inherent sustainability benefits of the Parramatta Light Rail **Project sustainability goal 4:** Advocate for Sustainable Communities	The Project would positively contribute to sustainable economic growth and provision of decent work opportunities by: • Providing productive employment and training opportunities for a diverse and inclusive workforce. • Promoting business development and growth of SMEs. • Supporting transport access to education and training. • Implementing measures to eradicate modern slavery in the supply chain. • Promoting safe and secure working environments for all workers. • Unlocking potential for further employment growth in the Greater Parramatta and the Olympic Peninsula (GPOP) areas serviced by the Project alignment, leading to enhanced productivity and economic growth.
SDG 16 **Peace, Justice and Strong Institutions** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.	**Project sustainability goal 2:** Drive sustainability through recognised rating tools **Project sustainability goal 5:** Utilise an Environmental Management System **Project sustainability goal 6:** Report on our Progress	The Project is positively contributing to building more peaceful, inclusive societies and effective, accountable institutions by: • Having accountable and transparent Project governance systems and processes including using a rating tool to benchmark sustainability performance and reporting performance against sustainability objectives and targets. • Ensuring decision-making is responsive, inclusive, participatory and representative. • Adoption of an environmental management system which meets the requirements of ISO14001 would ensure the Project minimises any adverse effect on the environment, ensures compliance with applicable laws, and regulations and enables continual improvement.
SDGs ranked as having '**very high**' materiality		
SDG 11 **Sustainable cities and communities** Make cities inclusive, safe, resilient and sustainable.	**Project sustainability goal 1:** Reinforce the inherent sustainability benefits of the Parramatta Light Rail **Project sustainability goal 4:** Advocate for Sustainable Communities	The Project would positively contribute to the provision of access to basic services, energy, housing and transportation for all by: • Providing access for the community to a safe, affordable, accessible and sustainable transport system and improving road safety. • Increasing accessibility and trip diversity through expanded network and connection to key destinations such as Sydney Olympic Park. • Improving localised air quality and reducing noise pollution through modal shift from cars to light rail.
SDG 12 **Responsible consumption and production** Ensure sustainable consumption and production practices.	**Project sustainability goal 3:** Maximise energy efficiency, renewables and greenhouse gas reduction **Project sustainability goal 4:** Advocate for Sustainable Communities	The Project would positively contribute to "doing more and better with less" through the: • Sustainable management and efficient use of natural resources. • Environmentally sound management of chemicals and all wastes throughout their life cycle. • Reduce waste generation through prevention, reduction, recycling and reuse. • Adoption of sustainable and ethical procurement practices.
SDG 13 **Climate action** Taking urgent action to combat climate change and its impacts.	**Project sustainability goal 3:** Maximise energy efficiency, renewables and greenhouse gas reduction	The Project would positively contribute to climate resilience by: • Integrating climate change risk identification, mitigation, adaptation and impact reduction in to the planning and design of the Project. • Identifying opportunities to contribute to wider climate resilience through the Project.

3.3.4 Sustainability objectives

By building on the opportunities for improvement from Parramatta Light Rail Stage 1 and aligning with version 2.1 of the Infrastructure Sustainability Council (ISC) Infrastructure Sustainability (IS) Rating Tool, several key sustainability objectives and initiatives have been identified to guide the design, construction and operation of the project.

The key sustainability objectives for the project have been developed across the following themes:

1. Governance
2. Innovation
3. Sustainable procurement
4. Resilience
5. Energy and carbon
6. Green infrastructure
7. Resource efficiency
8. Water
9. Urban design and landscape planning
10. Stakeholder engagement
11. Heritage
12. Workforce sustainability
13. Good health and well-being

The Definition Design articulates the project's commitment to achieving these objectives through the incorporation of a number of key sustainable design components, illustrated throughout the following pages.

Theme 1

Governance

Project objective:

Demonstrate leadership in sustainability by integrating sustainability objectives into decision making and actions.

Potential initiatives + future opportunities:

- Achieve a rating using the ISC IS rating tool.
- Adopt an Environmental Management System that meets with the requirements of IS014001.
- Share opportunities for improvement about sustainability with industry peers.
- Assess tenders based on criteria that include environmental and social impacts/risks, quality, durability and whole-of-life costs.
- Capture environmental, social and economic risks in the project's risk register.
- Report publicly on the sustainability performance against targets and sustainability indicators.

Theme 2

Innovation

Project objective:

Implement innovative technologies, designs and processes to enhance sustainability performance and legacy.

Potential initiatives + future opportunities:

- Reward innovative approaches to the design, construction and operation of the project.
- Hold innovation forums.
- Specify output-based rather than prescriptive contractual requirements to encourage innovative solutions.
- Foster a culture of innovation.

Theme 3

Sustainable procurement

Project objective:

Influence contractors, subcontractors and material suppliers to minimise adverse environmental, social and economic impacts of purchased goods and services across the project life cycle.

Potential initiatives + future opportunities:

- Develop a sustainable procurement approach (or policy) for construction, operation and maintenance phases.
- Incorporate sustainability criteria into project contracts and tender evaluation criteria.
- Develop a mitigation plan for all high social, ethical and environmental risks associated with delivery and operation.
- Require supply chain and product certifications for key materials such as timber and steel to ensure they are sourced from legal and well-managed sources with independent third-party certification.
- Procure from suppliers and contractors with a demonstrated record of responsible sourcing of materials.
- Ensure suppliers and contractors have fair work policies and report inclusion data in sustainability reporting.
- Ensure suppliers and contractors undertake due diligence of their supply chain to ensure environmental and human rights standards are not contravened.
- Require contractors and suppliers to develop and implement sustainable procurement policies and strategies based on ISO 20400: Sustainable Procurement.
- Align procurement and reporting requirements for contractors and suppliers with the ***Federal Modern Slavery Act 2018*** and *NSW Modern Slavery Act 2018*.

Theme 4

Resilience

Project objective:

Plan and design infrastructure and operations to cope, adapt and improve in response to chronic stresses and acute shocks.

Potential initiatives + future opportunities:

- Use data, hazard mapping and other tools to manage and quantify increasing catastrophe risks to allow more accurate prediction of shocks to the project.
- Design for forecast climatic conditions including potential, extreme weather events and increases in annual average temperatures.
- Incorporate climate change risks into the overall project risk register and risk management processes.
- Integrate processes to actively identify and manage climate change impacts into the planning, delivery and service operations of the project, including emergency management plans and water drainage networks.
- Action to minimise climate related risks on the project and for surrounding communities.
- Identify opportunities to contribute to wider climate resilience through the project.
- Provide an increase in street trees, resulting in a net microclimate benefit and reduction in urban heat island effect (UHI).
- Provide green tracks and additional planting to increase the heat resilience of streetscapes and minimise the UHI.

Theme 5

Energy and carbon

Project objective:

Reduce energy use and greenhouse gas emissions through design and during construction and operation.

Potential initiatives + future opportunities:

- Prioritise energy efficiency across operations through internal carbon accounting and target setting.
- Identify design measures and specifications that can contribute to reduction of energy consumption and carbon across the life of the project.
- Investigate new and emerging technologies in energy efficiency and carbon reduction.
- Identify renewable energy targets for the project for both construction and operation phases.
- Investigate suitable power agreements to ensure the project is net zero for operational energy emissions.
- Investigate partnership opportunities (with the likes of Sydney Olympic Park Authority) to develop renewable energy offtake agreements.

Theme 6

Green infrastructure

Project objective:

Provide economic, ecological, and social benefits though the incorporation of high-performing green spaces in the project design.

Potential initiatives + future opportunities:

- Incorporate water sensitive urban design (WSUD) principles in the design of the project.
- Lower surface and air temperatures by planting trees and other vegetation.
- Use light-coloured surfaces to reflect light and heat.
- Investigate the use of permeable surfaces to manage stormwater run-off.
- Design the alignment to include effective multifunctional land use and connectivity to support urban communities and biodiversity.
- Prioritise green design approach and the associated benefits to bring it into a more influential position in the planning and design process.
- Educate the project team as to the benefits of green infrastructure beyond aesthetics and environmental outcomes.
- Support preparation of a green infrastructure strategy for the corridor, integrated with the Sydney green grid network.

Theme 7

Resource efficiency

Project objective:

Reduce materials consumption and minimise waste generation and disposal throughout the project lifecycle.

Potential initiatives + future opportunities:

- Use materials with low embodied energy to reduce lifecycle impacts.
- Investigate new technologies in concrete and other high impact materials.
- Explore alternate materials including green concrete, recycled glass and other recycled/low embodied carbon material options.
- Design to reduce waste and ensure that unavoidable waste is utilised to fullest degree.
- Apply modular design for easy disassembly and disposal.
- Develop targets for waste minimisation in the design and construction of the project.
- Identify product innovations and specifications that can contribute to reducing waste and avoiding virgin materials.
- Prioritise the use of local suppliers.
- Source materials from quality and environmental certified suppliers.

Theme 8

Water

Project objective:

Minimise use of potable water and maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater.

Potential initiatives + future opportunities:

- Incorporate water metering devices which allow real-time consumption monitoring during construction and operation where feasible.
- Use non-potable water or alternative methods for dust suppression.
- Implement rainwater harvesting and reuse systems at construction sites.
- Establish targets for non-potable water use.
- Use landscape species which do not require significant quantities of water once established.
- Seek to use recycled water for both passive and active irrigation.

Theme 9

Urban design and landscape planning

Project objective:

Protect and create biodiversity and habitat connectivity whilst ensuring appropriate land use development and enhancement of land.

Potential initiatives + future opportunities:

- Develop a tree offset strategy to offset the loss of trees and achieve a net increase in tree canopy
- Maximise the use of stormwater in the landscape.
- Maximise the retention of existing vegetation and incorporate endemic tree species where practicable.
- Consider biodiversity through the Tree Offset Strategy and Urban Design Guidelines throughout the project, particularly where adjoining sensitive ecological areas within Sydney Olympic Park
- Identify with, protect, and where appropriate enhance the environment and landscape of the area surrounding the site.
- Support the restoration of underperforming sites, particularly contaminated land for beneficial and safe reuse.
- Design to minimise impact on greenfield sites, reuse derelict land and be a catalyst for urban regeneration.
- Minimise impact of bridges throughout its expected life on aquatic ecosystems.

Theme 10

Stakeholder engagement

Project objective:

Advocate best practice approaches to community participation in corridor-wide decision making.

Potential initiatives + future opportunities:

- Engage with stakeholders to align sustainable development approaches and minimise environmental impacts.
- Provide the community with opportunities to participate in the project's planning and delivery.
- Create opportunities for local business involvement during the construction and operation of the project.
- Share information with the community in a timely manner.

Theme 11

Heritage

Project objective:

Protect and promote cultural and natural heritage through appropriate design, planning, and management controls.

Potential initiatives + future opportunities:

- Continue the project's commitment to Aboriginal co-design to ensure the protection and promotion of Aboriginal heritage values and connecting with Country opportunities.
- Protect and enhance items of heritage significance where identified, to ensure benefits to the wider community through integration and education.
- Develop partnerships with relevant stakeholders to utilise heritage places and features to promote local heritage values.
- Investigate opportunities for enhancing heritage as part of the project legacy.
- Integration and interpretation of Aboriginal heritage through the Designing With Country process.

Theme 12

Workforce sustainability

Project objective:

Utilise the project lifecycle to use and grow local and regional skills, capability and diversity.

Potential initiatives + future opportunities:

- Develop and implement a project-specific social procurement and workforce development strategy which defines approaches to achieve nominated workforce development targets and outcomes, and supports job creation and skill development opportunities for the project.
- Develop a workforce diversity culture to encourage industry to develop an inclusive workforce that addresses issues such as employment inclusiveness, diversity, capability development and safety.
- Prioritise local suppliers to support local employment.
- Offer apprenticeship opportunities which initiate skills development programs.
- Promote business and workforce development by providing access to employment and business opportunities.

Theme 13

Good health and well-being

Project objective:

Positively contribute to health and wellbeing through alignment with outcomes sought by the community for their future.

Potential initiatives + future opportunities:

- Require suppliers to have adequate health and wellbeing policies in place and that staff have access to health services.
- Ensure the project health and wellbeing initiatives are being implemented and align to the World Health Organisation (WHO) guidance (or similar equivalent guidance).
- Align human resources policies with principles of human rights and follow WHO guidelines.
- Provide healthy transport alternatives through continuous active transport links and additional electronic public transport service, resulting in a reduction in vehicular traffic and associated pollutants.
- Provide connections via public and active transport encouraging pedestrian permeability between suburbs.

3.4 Project vision

3.4.1 Parramatta Light Rail vision

A program-wide vision has been adopted for all stages of Parramatta Light Rail to ensure it delivers on its city-shaping, placemaking, productivity, and transport potential benefits.

The vision for the whole Parramatta Light Rail is:

to deliver integrated light rail services that support the NSW Government's vision for the Greater Parramatta to the Olympic Peninsula priority growth area.

A key consideration for defining this vision has been balancing the specific scope of the Parramatta Light Rail, having light rail services at the core and integrated with other transport services, and supporting the significant land use outcomes envisaged for the Greater Parramatta to the Olympic Peninsula priority growth area.

Five project objectives that apply specifically to the project have been identified across four category areas of city shaping, connectivity, place and choice. These categories form the basis of the project principles presented in Section 3.5.

3.4.2 Connecting with Country vision

A Connecting with Country vision has been developed by Bangawarra. The vision is:

Along the waterways of the Parramatta River, vast systems of nattai (fresh), biddi (bitter) and gari (salt) water seep and blend. These ancient waterways connect forest to coast, sustaining fertile wetlands and a complex range of diverse ecologies. Local peoples have followed seasonal indicators and sacred ceremonial knowledges here for millennia; travelling the Songlines of this unique and precious place while managing and protecting Country.

As a contemporary Songline, the project would travel along these same ancient journeys, connecting people and Country while celebrating and protecting the unique ecologies, landscapes and Ancestral stories of each precinct.

The project would embrace the cultural nuances of this Country and her people, ensuring that all aspects of the complex kinship system of Sydney is acknowledged here. Local peoples include the D'harawal, Dharug, Gai-maragal, Gundungurra and Guri-Ngai peoples as well as others who hold Ancestral and ceremonial responsibilities to this diverse Country here.

3.4.3 Design place and movement vision

A design place and movement vision has been developed specifically for the project in response to analysis and stakeholder consultation.

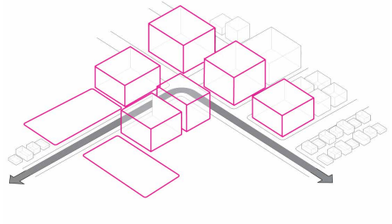
The vision for the project is that:

the project would deliver comfortable, attractive, convenient, and safe places, maximising transport choice and public amenity for the communities through which it passes.

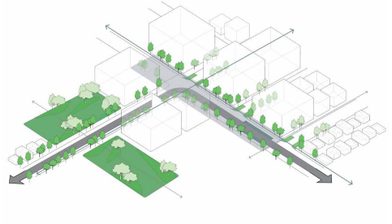
Fostering environmental and social resilience, and celebrating local character, the project would underpin the future liveability of the Greater Parramatta and Olympic Park precinct.

Project principles below have been developed to support the delivery of this vision. These are presented in Section 3.5.

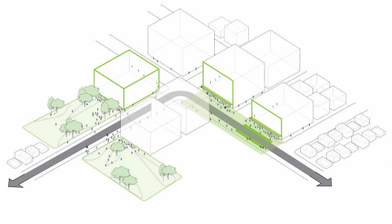
Principles



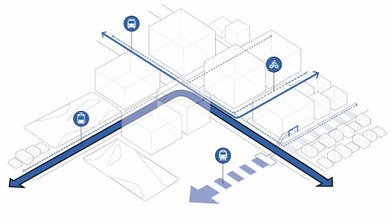
01 / City shaping



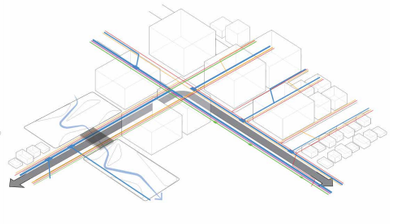
02 / Connectivity



03 / Place



04 / Choice



05 / Value



Figure 15: Pedestrianised George Street on CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

3.5 Project principles

3.5.1 City shaping

Parramatta Light Rail Stage 2 would deliver new light rail and active transport facilities along and across the Parramatta River, creating new regionally and locally significant connections for the Central River City.

The Parramatta River lies at the heart of a number of broader State and Local Government policies and objectives. The project's engagement with the river corridor, in particular its bridges across the Parramatta River, would provide a unique opportunity to improve accessibility across and along the river landscape, its parklands, and nearby neighbourhoods.

The project would make two key contributions to the Central River City: providing convenient public and active transport connections and creating successful places integrated within their communities and landscapes.

The Parramatta River corridor would also sit at the heart of Local Government strategic recreation and environmental planning. The project therefore provides Transport for NSW with an opportunity to catalyse the implementation of these strategies in collaboration with Local Government.

Designing with Country

Country is always here. Country is the city, and the city is Country. We do not have to be in natural surroundings to be connected to, and protected by, Country.

It can be standard practice for non-Indigenous people to forget that Country still exists all around us despite the concrete, steel, glass, and asphalt of urban development. Birds, insects, lizards, marsupials, and mammals find refuge in urban landscaping, while ancient languages and stories are held within the memories of local Aboriginal peoples here. Steel, glass, and concrete, and every other part of the built environment are themselves a part of, and are built from, Country.

The project is a reminder that we are all always 'on Country' and influenced through the Ancestral Stories of Country. The project is the interlocutor, protecting and shaping a resilient and sustainable future guided by the ancient care and custodianship of local peoples, Elders and Ancestors. The alignment is a contemporary Songline connecting dense urban environments and incredibly diverse, cultural communities with Country.

Figure 16 provides an example of the city shaping potential of light rail.

Objectives

- Support the vision for Parramatta as a twenty-first century city—attracting new investment and economic development.
- Catalyse and shape new growth—activating underutilised lands and providing the transport capacity needed to support sustainable population and employment growth in the area.
- Support economic productivity and development by connecting current and future residential, employment, education, health and sporting precincts in GPOP with Parramatta.
- Support sustainable employment and population growth through land use uplift by providing improved public transport capacity for regions north of Parramatta River through Rydalmere, Ermington, and Melrose Park.
- Facilitate social and urban regeneration and growth around government owned land.
- Facilitate new and improved recreational and transport opportunities by facilitating active transport links along the whole of the project. This would be facilitated through two river connections.
- Celebrate Country and local Aboriginal knowledges as the unifying identity of all precincts and cities along the light rail.
- Recognise the many unique and important stories across the precincts to create cities that are deeply embedded within (hi)stories and the continuity of the world's oldest surviving, living cultural knowledge system.
- Protect and strengthen all elements of Country including the ecologies, local languages, knowledges, stories, and communities.

Urban design requirements

- Undertake a holistic approach to the design of light rail in the street
- Integrate light rail with existing and catalyse future land uses
- Integrate the light rail corridor and its stop precincts with regionally significant open space and recreation facilities
- Consider the surrounding environment of the tracks and not just the impacted areas within the project boundary.
- Consider the desired outcomes and visions included in local plans for each precinct.
- Integrate new active transport connections with existing statutory guidelines on existing and proposed pedestrian and cycling infrastructure.
- Strengthen urban ecologies, smaller and significant parks and reserves.
- Protect ecologically endangered/threatened species and ecosystems that interface with the light rail.
- Prioritise all aspects of accessibility to ensure inclusive and usable spaces for all (including physical, sensorial, neurodivergent, age and cultural accessibility).

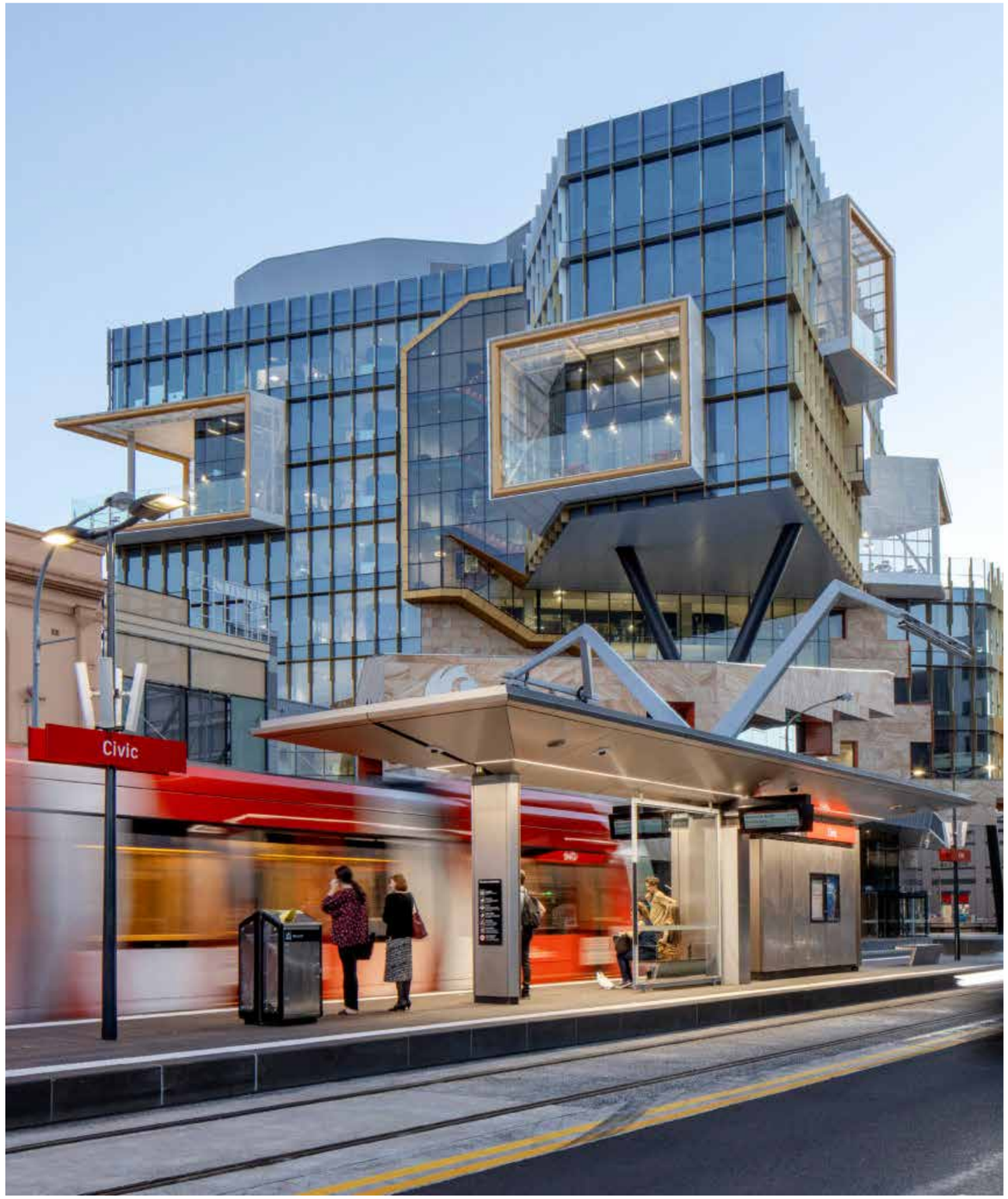


Figure 16: City shaping example - Newcastle light rail, Newcastle, Australia (credit: Simon Wood).

3.5.2 Connectivity

Light rail provides an opportunity to deliver convenient, reliable, and safe public transport options. When coupled with Transport for NSW's commitment to delivering continuous walking and cycling facilities in their projects, Parramatta Light Rail Stage 2 would bring unparalleled benefits to the Greater Parramatta and Olympic Peninsula area.

The project would deliver on the guiding principles of Future Transport 2056. Customers' experiences and their end-to-end journeys would be convenient and enjoyable, seamlessly integrating travel in the rhythms of daily life. Every light rail customer would enjoy safe travel across a high-performing, integrated, and efficient network.

The liveability, amenity, and economic success of GPOP's communities and places would be enhanced by light rail and active transport. Light rail would play a fundamental role in the economic growth of GPOP. A local light rail network integrated with regional connections would enable everyone to get the most out of life, wherever they live and whatever their age, ability, or personal circumstances.

Designing with Country

Country allows us to witness and experience the connections between all things, whether living or non-living. We recognise that this place has always been a complex interconnected system that holds the knowledges and Songlines of local Aboriginal peoples.

Urbanisation has disrupted ecological interconnectivity, and cut off Aboriginal Songlines. The light rail provides an opportunity to reconnect isolated places into a network of public domain spaces. As we establish this new contemporary Songline, the project would also facilitate ecological, cultural, and community connectivity and revitalise many of the layers of healthy Country. Prioritising the revitalisation of several significant existing open spaces along the travel route, the project would create connected blue, green, and brown infrastructures that support diverse community and ecological uses alongside this new travel route.

Figure 17 provides an example of the potential connectivity benefits of light rail.

Objectives

- Provide new, reliable, and integrated public transport services that connect residential areas within GPOP with key destinations and major precincts such as Sydney Olympic Park, Western Sydney University and Parramatta CBD.
- Support modal choice and reduce car dependence with safe, comfortable, and convenient light rail and active transport.
- Provide intuitive connections and inclusive wayfinding throughout the project, in particular to and through stop precincts.
- Investigate opportunities for interpreting Country within the design of the project's bridges and structures.
- Provide interconnected ecological, cultural, and community networks through revitalised open spaces and associated blue, green, and brown infrastructure.

Urban design requirements

- Integrate designing with Country opportunities into the process of bridge design to improve its amenity for pedestrians and cyclists through the use of interpretation.
- Provide robust landscaping strategies that rebuild connected networks of green, blue and brown (soil) infrastructure that contribute to healthy ecologies and Country.
- Ensure cultural and visual connectivity to and between significant points of High (elevated or escarpment) and Low (valley or river) Country.
- Design streets to provide safe thoroughfare for light rail users, pedestrians, cyclists, and motorists, while maximising neighbourhood amenity and providing local access for walking, cycling, and driving.
- Increase permeability by creating more accessible links across the alignment.
- Provide connectivity to open space, essential services and community facilities, and safe and equitable connectivity and address pedestrian desire lines for all customers.
- Design safe, accessible, and amenable stops and associated public domain areas, maximising choice for customers and addressing desire lines with intuitive connections.
- Provide safe, dedicated walking and cycling paths. Connecting to the existing and planned network with suitably sized, well-designed comfortable infrastructure that encourages more people to walk and cycle.
- Provide accessible footpaths that meet the minimum provisions of Transport for NSW's Walking Space Guide.
- Design streets to minimise adverse impacts to existing street trees and proposed tree planting, and maximise opportunities for water sensitive urban design initiatives such as raingardens and permeable paving.
- Provide traffic-calming and intersection treatments that prioritise walking and cycling for local trips and maximise access to light rail stops.
- Provide intersection designs and thresholds treatments at side streets to provide priority for people walking and cycling along Boronia Street.
- Provide more canopy coverage to the public domain, catalysing additional pedestrian use through comfortable and safe environments.
- Provide improved wayfinding along the whole of the project both at the pedestrian and vehicular scale, improving user experience whether it be along active transport links, or light rail interchanges both existing and proposed.

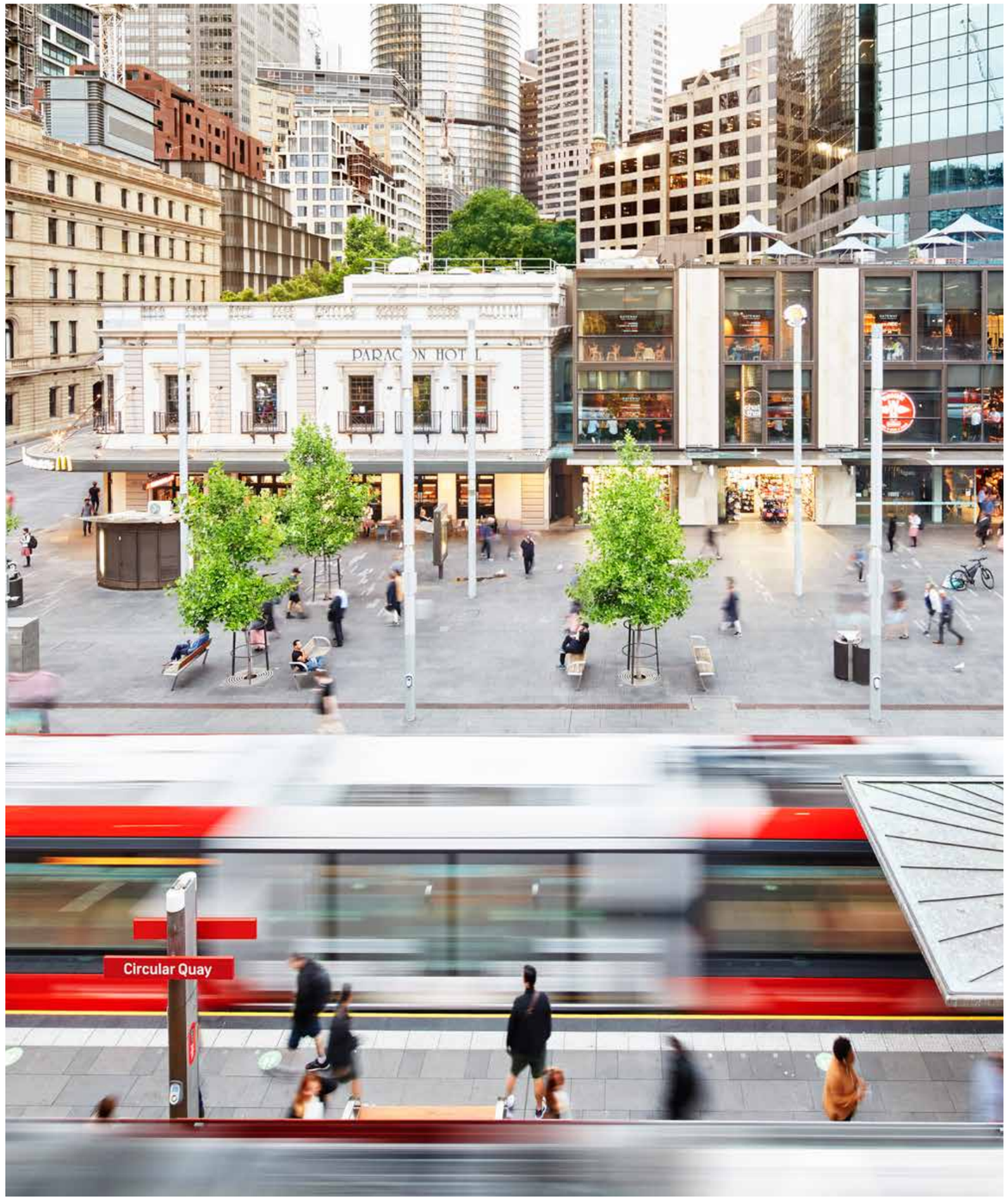


Figure 17: Connectivity example - CBD and South East Light Rail in Circular Quay, Sydney (credit: ASPECT Studios).

3.5.3 Place

Light rail is uniquely positioned to catalyse the change in Sydney's urban fabric required to deliver better, more vibrant, and healthier places.

The Government Architect NSW's *Better Placed* seeks to capture our collective aspiration and expectations for the places where we work, live, and play. It creates a clear approach to ensuring good design delivers the architecture, public places, and environments we want to inhabit now and those we make for the future. It articulates the means and methods to value and improve our built environment and public domain, so that we can be proud of our cities, towns, and public places.

Public and active transport delivered as part of the project would generate greater land use and placemaking potential than other surface-based modes of transport. With light rail at their core, the precincts through which the project passes would evolve to adopt sustainable modes of transport that foster better places and healthier communities. The project would integrate green infrastructure that embeds sustainability outcomes throughout the project and delivers economic, social, and environmental benefits. The streets, plazas, parks and open spaces along the project alignment would provide an opportunity to integrate green infrastructure into the delivery of the project.

Designing with Country

"The opposite of dispossession is not possession … It is unforgetting. It is mattering."
— Angie Morrill, Eve Tuck, in *Before Dispossession, or Surviving It*

Designing with Country methodologies recognise that all places, no matter their size, scale or perceived value, have always been Country. Each place already holds unique stories, ecologies, and communities that are shaped by a continuum of both Ancestral knowledges of Country and contemporary communities.

Unforgetting Country requires a series of spatial and experiential processes that actively assert the Ancestral knowledges of place. Unforgetting is more than a process of remembering (where a feature of an individual or community's memory can be recalled, forgotten, and later re-remembered). It is the process of revival and repetition, etching story and connection into physical reality and identity.

From an 'Unforgetting Country' perspective, the project does not offer places to be made, but rather places to be revived, repeated, etched, and connected. By privileging local Aboriginal knowledges of Country, the project would bring to the fore local languages and stories, ensuring that the precincts across the project are distinctly local, ecologically contextual and built upon millennia old Aboriginal knowledges of deep connections with Country.

Figure 18 provides an example of the placemaking potential of light rail.

Objectives

- Activate and support improved public domain outcomes within key precincts and public spaces both north and south of the Parramatta River.
- Create vibrant neighbourhood centres where people want to live, work, and recreate.
- Foster connections with Country, working with local Aboriginal communities and Knowledge Keepers/Holders and Elders.
- Recognise and celebrate Country as the primary uniting element across all precincts, activating the public domain through contextually relevant stories, communities, and ecologies.
- Unforget Country to ensure Aboriginal knowledges (plural) are revived, repeated, etched and connected across the project.

Urban design requirements

- Integrate only local Aboriginal (Dharug, Dharawal eora, Gaimariagal, Guringai, Gundungurra) stories, art styles and symbologies into design and public art decision making, to ensure Country (and local Aboriginal knowledges) are not tokenized and abstracted.
- Where languages are intended to be integrated into the public domain and place naming, local shared languages (meaning words that are found in a number of local languages) would be used to ensure the entire kinship system is recognised and celebrated, and that all local Aboriginal people can see their own language expressed.
- Integrate light rail with key local places and open space. Increase place amenity and recreation. Include continuous walking and cycling connections along and across the light rail corridor; recreation facilities such as seating, shelters, and picnic areas; and green and blue infrastructure such as tree and understorey planting, raingardens, and bioswales.
- Maximise tree canopy cover.
- Respond to new and existing centres and support social infrastructure.
- Deliver comfortable, safe and resilient streets that capture the placemaking potential of light rail stop precincts and balance the tension between movement and place.
- Minimise impacts on existing ecologies and sensitive landscapes through excessive excavation and filling.
- Minimise encroachment into adjoining properties wherever possible.
- Increase canopy coverage, and use of environmentally sustainable materials at the stop precincts.
- Using heritage interpretation, tell the story of local Aboriginal communities not only within the stops precinct but in all possible and proper locations in the alignment.

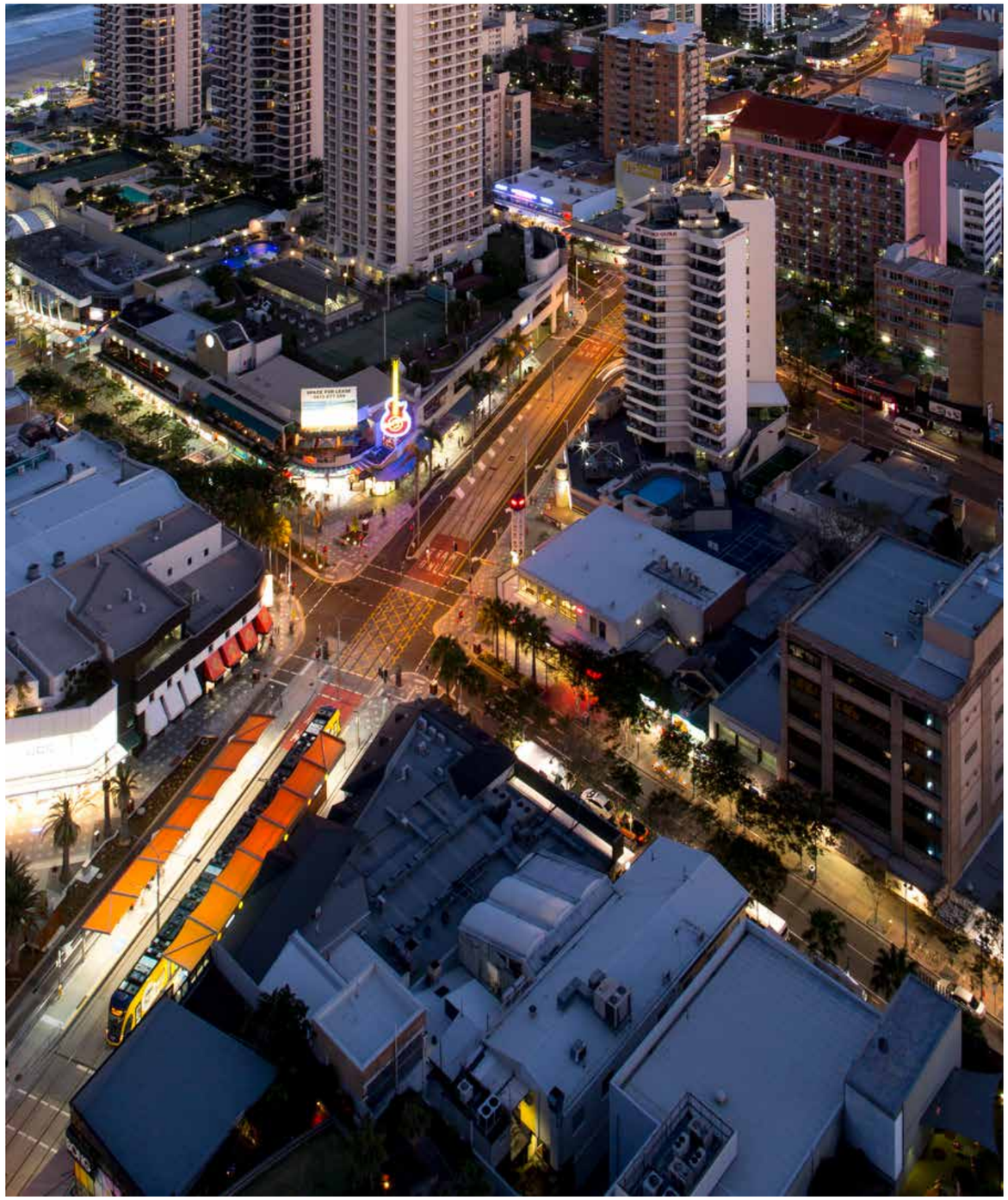


Figure 18: Place example - Gold Coast Light Rail on Surfers Paradise Boulevard, Surfers Paradise (credit: Architectus).

3.5.4 Choice

An integrated transport network with light rail at its heart would provide those living, working, and visiting GPOP with greater modal choice and travel flexibility.

Planning for a dynamic transport network that improves customer choices and options is key to the sustainability and resilience of GPOP. Ensuring light rail is supported by a comprehensive network of walking and cycling infrastructure would ensure that travel choices can best suit travel need, allowing walking and cycling to replace private motor vehicles for local trips, not just to and from light rail stops, but also local destinations and places of interest.

Ensuring this integrated transport network is safe and accessible would mean more choice for people with mobility constraints and would make travel easier for everyone, whatever their age, ability, or personal circumstances. All precincts would be designed to create spaces of choice that help the whole community to choose to use light rail.

Designing with Country

The project would begin to create genuine community connections to people and places. By prioritising tactile/ sensorial experience, accessibility, landscaped places, and active transport alongside the delivery of light rail, the project can help encourage people to choose the light rail.

Encouraging people to build strong connections to Country, would help everyone in the community to better know their Country and feel connected to it. If people can experience this kind of connection on the light rail, community sentiment would be more positive towards this mode of public transport, helping to ensure it is utilised as widely as possible.

Figure 19 provides an example of how the light rail would allow users to choose their preferred method of transportation.

Objectives

- Create walkable neighbourhoods and active transport connections that prioritise accessibility by creating generous and diverse spaces of rest and pause that are activated by Country, public art and incidental education.
- Create places to rest and recuperate amongst vegetated corridors to increase accessibility to active and public transport options and connections to Country, supporting a more diverse uptake of the light rail and ancillary services.
- Share a range of relevant local Aboriginal knowledges at stops, on approach to the stops, within the carriages of the light rail, and online, so that people can choose from a range of ways to connect and know Country.
- Provide an integrated public transport network with seamless interchange to alternate modes.
- Facilitate broader public transport integration improvements including bus network re-design and the creation of new active transport links.
- Create walkable neighbourhoods by providing active and sustainable transport choices along the alignment, in particular to and through stop precincts.
- Develop places to rest and recuperate amongst vegetated corridors to help increase accessibility to active and public transport options and connections to Country.
- Locate light rail stops to maximise active transport catchments and access to destinations.

Urban design requirements

- Provide safe and convenient interchange experiences between multiple modes of transport, including Sydney Metro West and heavy rail at Sydney Olympic Park and Parramatta; ferry services at Rydalmere and Wentworth Point; and bus routes along the alignment.
- Provide continuous, safe, and comfortable walking and cycling facilities that connect people to key destinations and promote walking and cycle for local trips.
- Deliver greater choice for Transport for NSW customers, including through human-centred design approaches in infrastructure delivery and operations.
- Ensure all stops and surrounding environments are safe and accessible to a wide spectrum of needs including physical, sensorial, age, neurodivergent, and cultural.
- Share relevant local Aboriginal knowledges at stops, on approach to the stops, within the carriages of the light rail, and online.



Figure 19: Choice example - CBD and South East Light Rail on Alison Road, Randwick (credit: ASPECT Studios).

3.5.5 Value

The project presents a significant opportunity for unlocking customer value in the transport network. Light rail would play a central role in delivering on the NSW Government's 30-minute city aspirations for GPOP.

Maximising the co-benefits of light rail would ensure that the project is able to deliver value to the existing and planned future communities of the region.

Our communities also value a transport network that is integrated, accessible, safe, and efficient. Public and active transport delivered as part of the project would better connect communities and enhance customer experience through place-led transport planning and design.

Light rail can be planned, designed, delivered, and managed to support safety and enhance the places through which it passes. Such an approach would make positive contributions to the environmental, social, and economic value of those places.

In addition, by moving people via efficient modes of transport—like walking, cycling, and light rail—transport network assets can contribute to enhanced place qualities, for example, by reallocating road space.

Designing with Country

Through designing with Country, the light rail can draw people in, create spaces to rest and explore, and encourage them to wander more broadly through the precincts.

Adding value to neighbourhoods through cultural, economic, and public domain diversity, the light rail would be a catalysing element that revitalises ecologies and urban areas through culturally responsive languages, knowledges and stories of Country.

Figure 20 provides an example of the potential public space benefits delivered by light rail.

Objectives

- Investigate opportunities for light rail to catalyse local economic and social benefits.
- Facilitate broader public transport integration improvements including bus network re-design and the creation of new active transport links.
- Create walkable neighbourhoods by providing active and sustainable transport choices along the alignment, in particular to and through stop precincts.
- Locate light rail stops to maximise active transport catchments and access to destinations.
- Catalyse the future changes in precincts along the corridor.
- Draw people into the precincts associated with the light rail and encourage them to explore and wander more broadly through the urban and ecological diverse areas of Country serviced by light rail.
- Build spatial and operational connections to existing communities, community and cultural groups and economic nodes.

Urban design requirements

- Ensure the light rail alignment maximises public and active transport benefits across multiple modes.
- Carefully consider engineering requirements to minimise impacts on adjoining property, existing utilities and infrastructure.
- Minimise property impacts wherever possible without compromising the achievement of the Project Vision and Project Principles.
- Fully consider all the details between the public domain and private boundary to achieve high quality finishes along the corridor.
- Integrate wayfinding and other spatial solutions that guide people to significant cultural, economic, and ecological places beyond site boundaries.
- Leverage pedestrian priority intersections as places that prompt exploration beyond the site.
- Support significant existing precincts, such Sydney Olympic Park, to deliver diverse and multi-modal experiences.

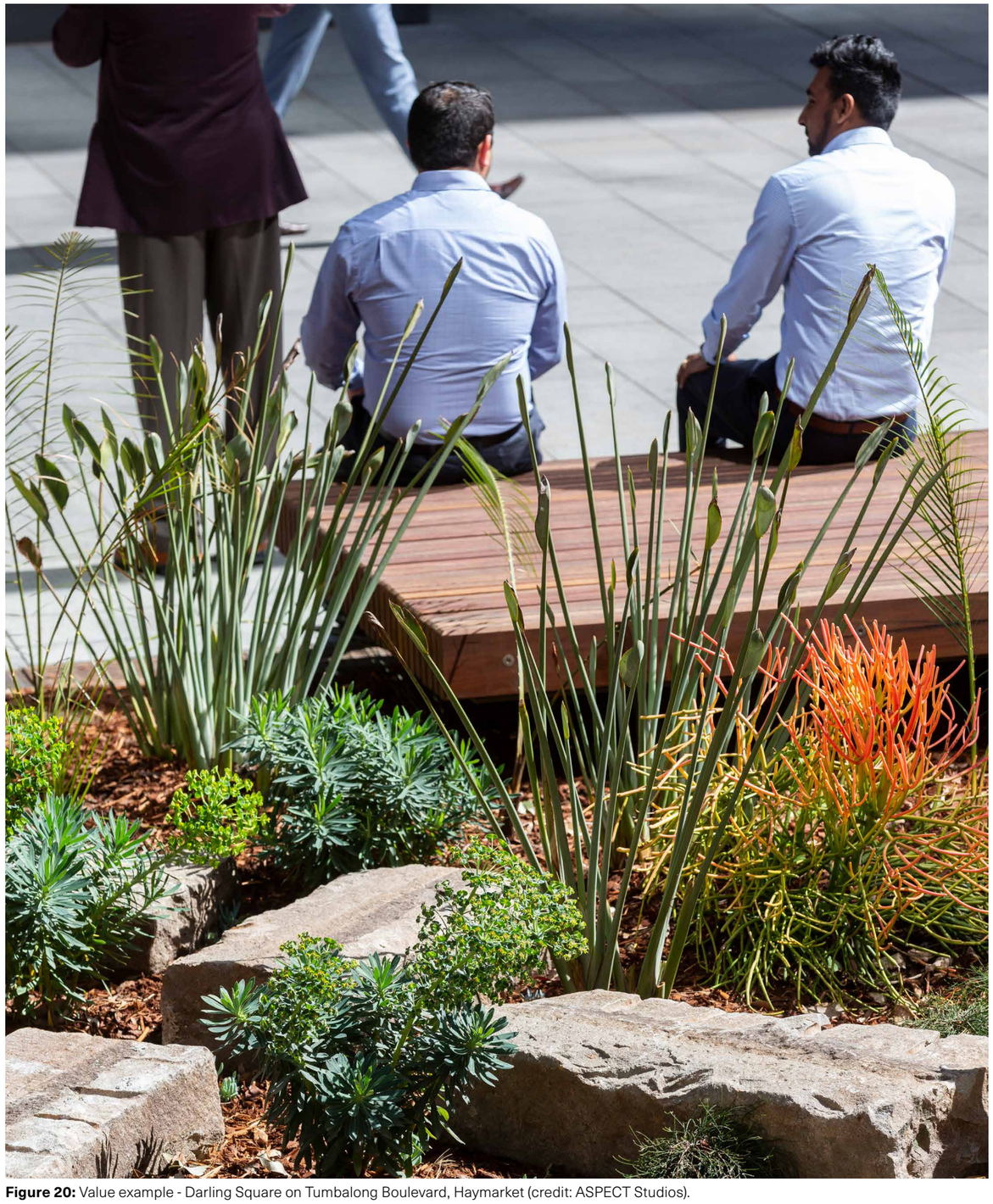


Figure 20: Value example - Darling Square on Tumbalong Boulevard, Haymarket (credit: ASPECT Studios).

4.0 Project Overview

4.1 Route alignment

4.1.1 Project summary

The project would operate for about 13 kilometres, running between the Parramatta Light Rail Stage 1 Parramatta Square stop in the Parramatta CBD and the Carter Street Precinct south-west of Sydney Olympic Park.

This would comprise about 3 kilometres of light rail route being delivered by Parramatta Light Rail Stage 1 between Parramatta CBD and Camellia, in addition to about 10 kilometres of new route constructed between Camellia and the Carter Street Precinct south of Sydney Olympic Park. About 8.5 kilometres of active transport facilities would also be constructed along the alignment between Camellia and the Carter Street Precinct.

4.1.2 Alignment overview

The project would run along the Parramatta Light Rail Stage 1 alignment between the Parramatta CBD and Camellia.

The project would then run through Camellia along the Sandown Line and Grand Avenue, before crossing to the north of the Parramatta River via a new bridge and running along South Street in Rydalmere, Boronia Street in Ermington, and Hope Street and Waratah Street in Melrose Park.

The project would then return to the south side of the Parramatta River via a new bridge, connecting to Wentworth Point along Hill Road, and Sydney Olympic Park via Australia Avenue and Dawn Fraser Avenue, before terminating in Uhrig Road within the Carter Street Precinct.

4.1.3 Chapter overview

This chapter focuses on the extent of the project between Camellia and the Carter Street Precinct, and includes a summary of stop locations, development interfaces, environmental considerations, and transport outcomes including walking and cycling.

The project's light rail alignment and stops between Camellia and the Carter Street Precinct are illustrated in Figure 21.

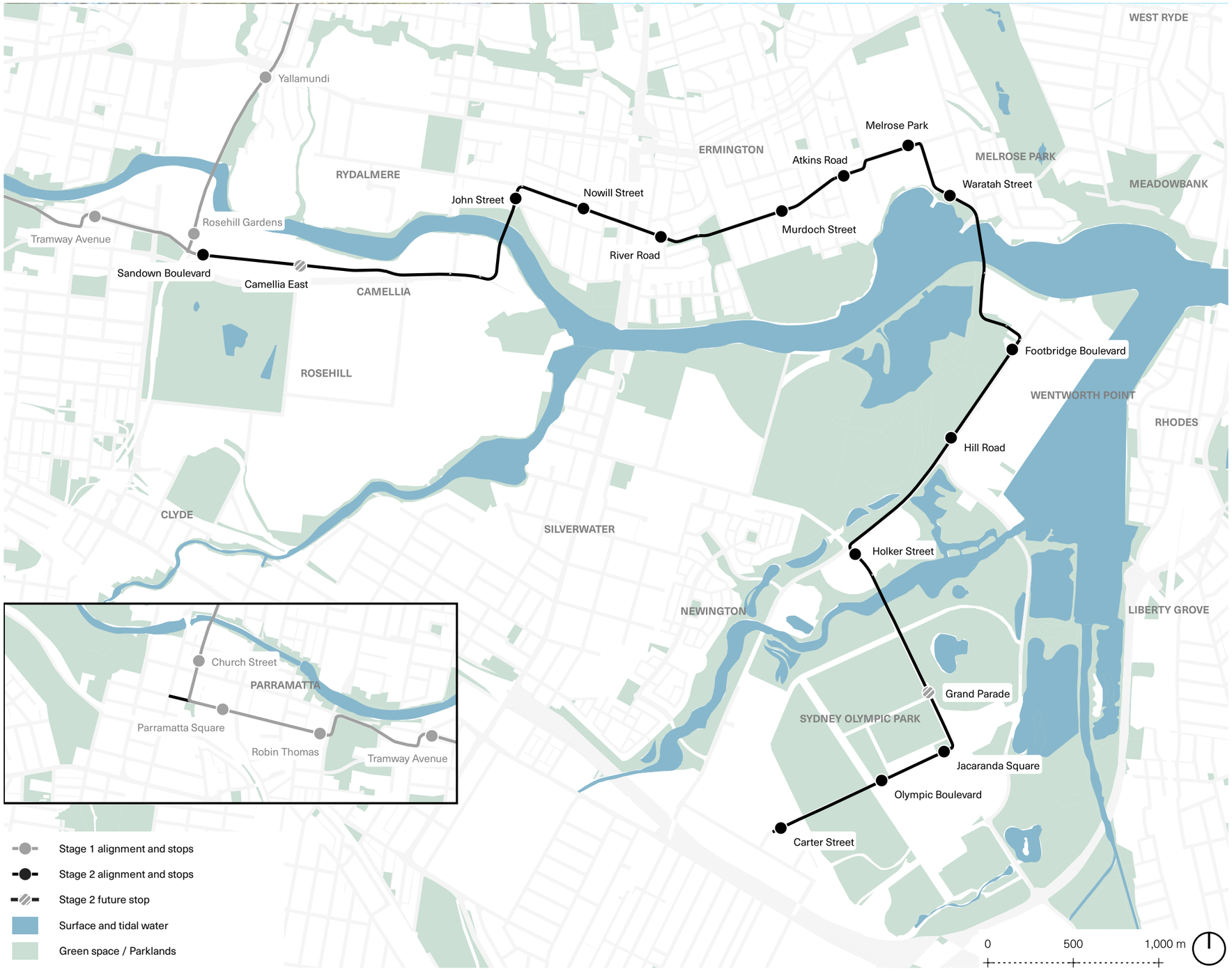


Figure 21: Route alignment.

4.2 Stop locations

4.2.1 Development of stop locations

Initial project planning considered eleven light rail stops at spacings illustrated for the corridor announced in 2017.

At the commencement of the Scoping Design phase of the project, a review of selected contemporary Australian light rail projects was used to benchmark stop spacing provision. Stop spacing was also considered against existing and planned future high-density development along the alignment. The Scoping Design investigated and proposed a number of additional stops at Nowill Street, Trumble Avenue, Wharf Road, and Olympic Boulevard.

Development of the Definition Design continued to refine stop locations and propose adjustments to stop locations at Murdoch Street, Waratah Street, and Footbridge Boulevard. Potential future stops were also identified at Camellia East and Grand Parade.

The development of stop locations is illustrated in Figure 22 below.



Figure 22: Development of stop locations.

4.2.2 Overview of proposed stops

Sandown Boulevard

The Sandown Boulevard stop would be positioned at the western end of the Sandown Line, as close as feasible to the Parramatta Light Rail Stage 1 Rosehill Gardens stop to provide interchange for light rail customers now and in the future town centre.

Camellia East (potential future)

The Camellia East stop would potentially be delivered in the future in conjunction with the development of the town centre. It would serve residents in the eastern portion of the town centre as well as provide access to potential education and open space facilities.

John Street

The John Street stop would be located west of the existing John Street roadway, north of Eric Primrose Reserve, to allow for the vertical alignment requirements of the stop and platforms and accessible tie-ins with John Street and Antoine Street. The stop would provide catchment for residential and commercial development in Rydalmere, interchange with Rydalmere Ferry Wharf, and access to Eric Primrose Reserve on the river foreshore.

Nowill Street

The Nowill Street stop would be located on South Street between Nowill Street and Primrose Avenue. The stop would be positioned centrally in the street corridor and provide catchment for the eastern portion of Rydalmere.

River Road

The River Road stop would be located in an existing utilities easement between River Road and Hilder Road, Ermington. The stop would be positioned to provide light rail catchment for the portion of Ermington that lies on the eastern side of the divisive Silverwater Road corridor.

Murdoch Street

The Murdoch Street stop would be located on Boronia Street between Murdoch Street and Boyle Street. The stop would be positioned centrally in the street corridor and serve a suburban catchment in Ermington with significant urban uplift potential.

Atkins Road

The Atkins Road stop would be located to the south of the existing locally heritage listed Willowmere property, between Atkins Road and Hughes Road. The project would create a new open space to serve the western portion of the Melrose Park town centre, as well as the anticipated future uplift of the surrounding neighbourhood.

Melrose Park

The Melrose Park stop would be positioned to maximise integration with the proposed future town centre, including access to stop platforms from both ends and providing an opportunity to integrate light rail access as part of the town centre's retail circuit.

Waratah Street

The Waratah Street stop would provide catchment for the southern Melrose Park precinct and could accommodate any future uplift and renewal of low density residential development to the east. Its low-lying position would also provide an ideal location for pedestrians and cyclists using the Parramatta Valley Cycleway to access Parramatta Light Rail Stage 2 services.

Footbridge Boulevard

The proposed Footbridge Boulevard stop would provide for the large existing catchment within the northern portion of the Wentworth Point peninsula. The stop would also provide convenient connections to commercial and community facilities on Footbridge Boulevard, connections to Sydney Olympic Park ferry wharf, and interchange with bus services that operate along Footbridge Boulevard to and from Rhodes via the Bennelong Bridge.

Hill Road Stop

The Hill Road stop would be located to maximise light rail catchment for the southern portion of Wentworth Point. The stop would be positioned adjacent the Woo-la-ra parklands, providing access for visitors to the parklands as well as the Piazza retail precinct in the south of Wentworth Point.

Holker Street

The proposed Holker Street stop would create a place of arrival for several of the recreation facilities in the northern portion of the Sydney Olympic Park precinct. This would include the URBNSURF wave park, the southern section of Millennium Parklands, Wentworth Common, and the Brickpit Ring Walk. The stop would provide a walkable connection to the nearby Newington residential area via Holker Street and the Louise Sauvage Pathway.

Grand Parade (potential future)

The Grand Parade stop would potentially be delivered in the future in conjunction with the ongoing evolution of the Sydney Olympic Park Showgrounds precinct. The stop would provide convenient access to the Showgrounds precinct, as well as recreation facilities and open space areas in the adjacent parklands.

Jacaranda Square

The Jacaranda Square stop would be located at the north-eastern end of Dawn Fraser Avenue, adjacent Jacaranda Square, providing a pedestrian plaza in which stop platforms would be integrated. This stop would create a new place and point of arrival for the northern portion of SOP's evolving Central precinct, as well as for the Parkview precinct north of Australia Avenue.

Olympic Boulevard

The Olympic Boulevard stop would be located at Dawn Fraser Avenue's intersection with Olympic Boulevard, providing a pedestrian plaza integrating stop platforms. This stop would create a new transport place fronting the forecourt of the existing heavy rail station. The stop would contribute to the activation of the southern portion of the Central precinct and provide access to Sydney Olympic Park's Stadia precinct.

Carter Street

The Carter Street stop's position in the heart of the Carter Street Precinct would provide light rail services to the significant catchment of this growing town centre. The stop would provide a public place of arrival and departure within the town centre and become a focal point for the centre's public life, contributing to a vibrant, walkable main street.

4.3 Contributing to place identity

The project would deliver a range of place benefits by improving access in GPOP, providing an attractive public transport mode, and improving public spaces along its alignment.

The project would improve the amenity of communities along the corridor through the provision of better public spaces and high-quality streetscapes. In particular, high-quality walking and cycling facilities and street improvements around stops and along the corridor would make the area more attractive for residents, workers, and visitors.

The project would create new places, shaped and defined by the place benefits of light rail and its associated infrastructure. This would include the project's two crossings of the Parramatta River—between Camellia and Rydalmere and between Melrose Park and Wentworth Point—and the delivery of integrated foreshore parklands that are well-serviced by public and active transport.

The project would also contribute to the embellishment of established places, such as Rydalmere and Ermington, catalysing their transition into dense, walkable, and liveable neighbourhoods. In some cases, the project's placemaking benefits would go hand-in-hand with the transition that some precincts are already experiencing, such as Camellia, Melrose Park, and Sydney Olympic Park.

While the project would improve places along its entire alignment, there are particular locations where these place benefits would be the most pronounced, including:

- the new bridge between Camellia and Rydalmere, including the adjacent Eric Primrose Reserve
- Ken Newman Park in Ermington
- Atkins Road open space in Melrose Park
- the new bridge between Melrose Park and Wentworth Point, including the adjacent Archer Park and Wentworth Point foreshore
- Dawn Fraser Avenue in Sydney Olympic Park.

These places are illustrated in Figure 23.

The project's public art, designing with Country, and heritage interpretation outcomes would also contribute to place identity along the alignment. Strategies for these would be particularly relevant for the above-mentioned places, as well as at light rail stops, the full suite of bridges, and other light rail infrastructure such as substations.

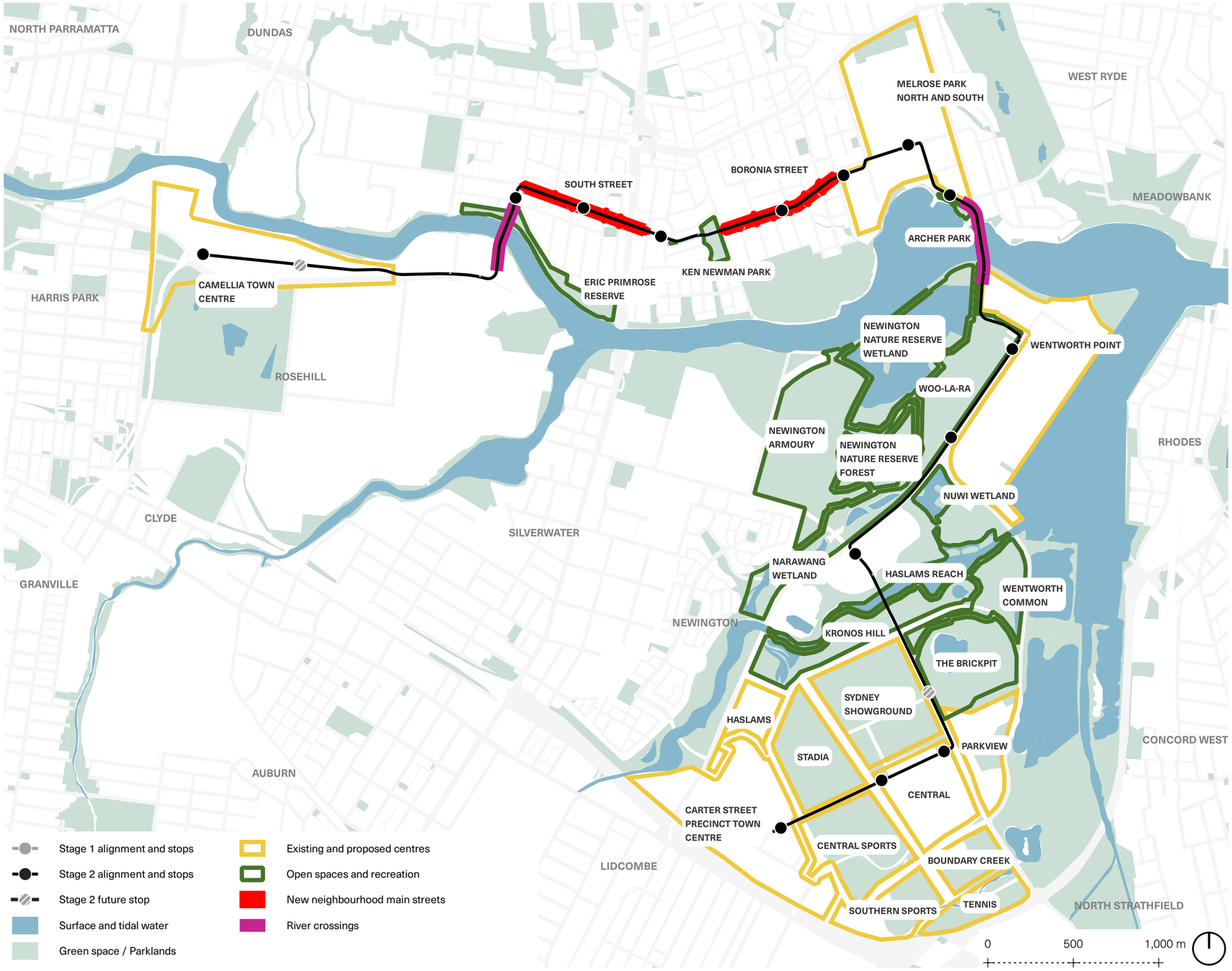


Figure 23: Contributing to place identity.

4.4 Stop accessibility

The project's stop locations would ensure that most of the existing and planned future high density mixed use, commercial and residential development in GPOP falls within a 400 metre, or 5 minute walking, catchment.

In Camellia, preliminary planning provided within the Rosehill-Camellia Place Strategy indicates a town centre layout with a grid of north-south streets connecting the foreshore with Grand Avenue. This network of streets ensures all of the future town centre would fall within a 400 metre catchment of a stop.

Within Rydalmere, Rydalmere Public School is located in close proximity to the proposed location of the John Street stop. In Ermington, Rydalmere East Public School is located close to the proposed location of the Murdoch Street stop. Future urban renewal in both of these neighbourhoods would provide an opportunity to remove barriers to stop access, for example via the provision of mid-block through-site links, to unlock additional light rail catchment inhibited by the existing suburban block structure.

The Melrose Park precinct is currently characterised by large industrial and commercial blocks with limited permeability. However, masterplanned residential redevelopment will produce a dense grid of new streets and connections that would provide excellent access to light rail stops at Atkins Road, Hope Street, and Waratah Street.

The location of stops in Wentworth Point attempts to balance coverage of the high density residential catchment with other design considerations such as the siting of new crossings on Hill Road. The majority of the existing and future residential population in the area would be within 400 metres of a stop, although walk-in distances of up to 800 metres would be experienced in parts of the peninsula. The stop at Footbridge Boulevard would also provide for the new high school on Burroway Road.

The location of the two stops on Dawn Fraser Avenue in Sydney Olympic Park—at Jacaranda Square and Olympic Boulevard—would accommodate special event running, but would also allow very good coverage of the existing and future residential and commercial catchment, including the Parkview precinct.

In Carter Street, a significant portion of residential development would be within a 400 metre, or 5 minute walking, catchment of the terminus stop.

Stop accessibility is illustrated in relation to adjacent land uses in Figure 24.

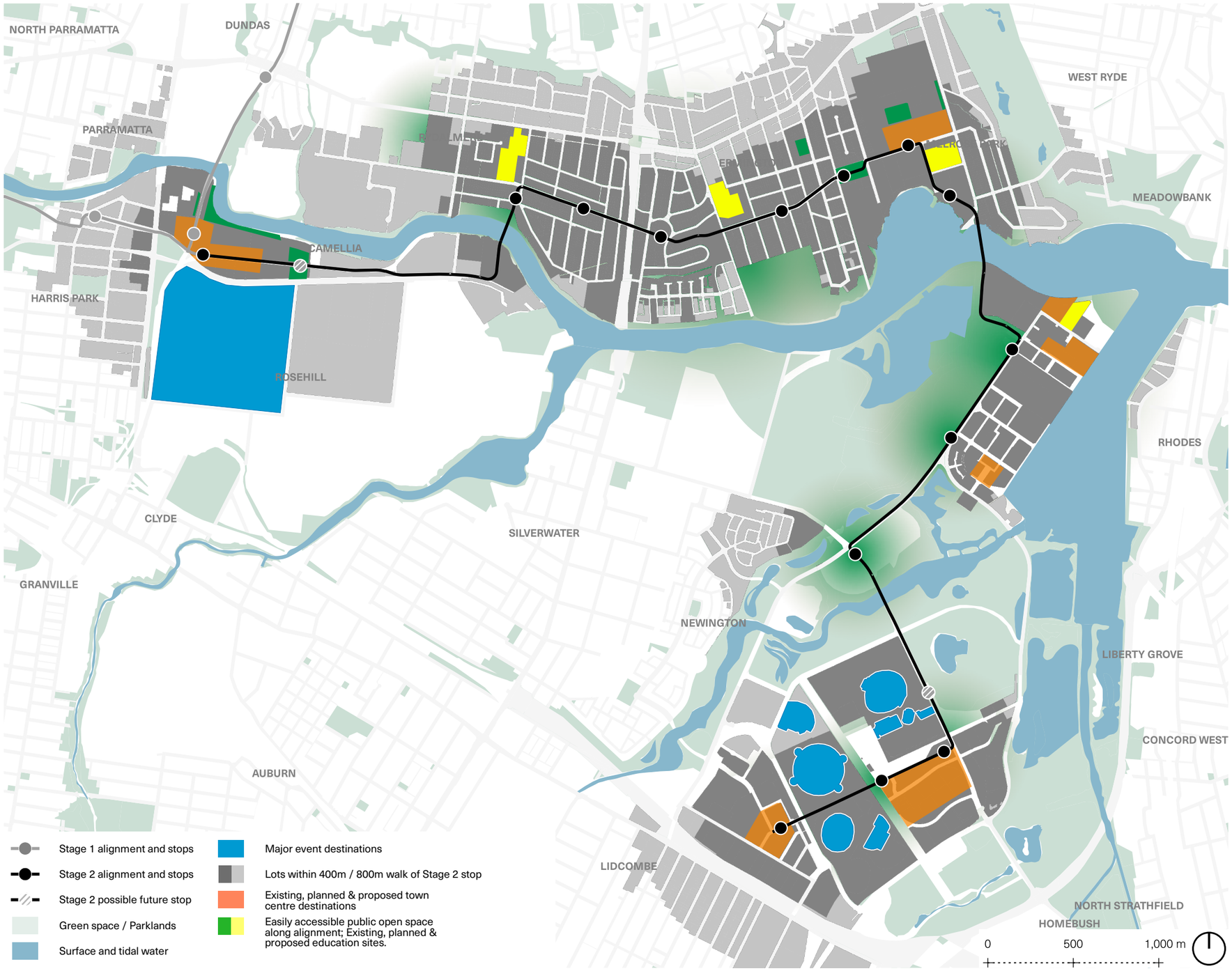


Figure 24: Stop accessibility.

4.5 Development interfaces

The project would pass through and alongside significant areas of new development, creating opportunities for alignment integration, establishment of new civic centres, urban renewal, and placemaking outcomes.

Proposed and planned future development has the potential to create about 47,500 dwellings and 64,865 jobs in high density urban renewal precincts, both in GPOP and in neighbouring suburbs across the river. A majority of these developments would fall within a 400 metre catchment of the project's proposed light rail stops.

Urban renewal sites at Camellia, Melrose Park, Wentworth Point, Sydney Olympic Park and the Carter Street Precinct will dramatically increase the population of this region (refer Figure 23). Existing low density residential development in Ermington and Rydalmere would also likely experience uplift pressure in the future.

The project's development interfaces are illustrated in Figure 25, together with indicative 400/800 metre walking catchments.

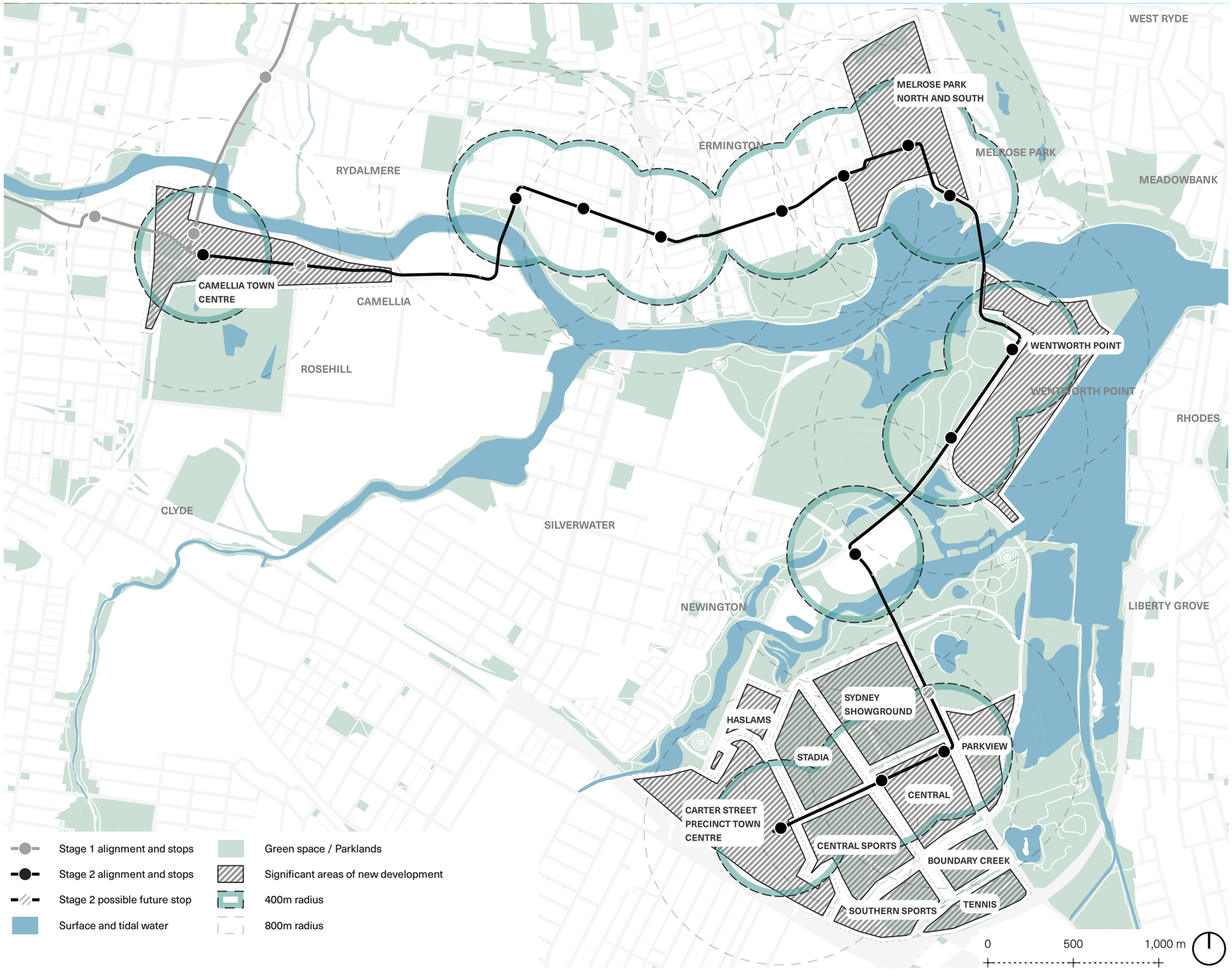


Figure 25: Development interfaces.

4.6 Ecology

The project would cross diverse environments with unique environmental conditions. Minimising environmental impacts has been a key focus of the design. Key environmental issues for consideration along the alignment are discussed below and illustrated in Figure 26, with further detail provided in *Technical Paper 9 (Biodiversity Development Assessment Report)*.

Operational impacts

In addition to transport and access changes associated with the project, noise and vibration would need careful assessment and mitigation may include the use of resilient or noise-attenuating trackforms near sensitive receivers and the management of noise associated with passenger announcements at stops and other potential sources.

Parramatta River foreshore

Both river crossings would result in the loss of some mangroves and foreshore vegetation. The bridge at Wentworth Point adjoins sensitive habitat on both sides of the river: Ermington Bay to the north, and Newington Nature Reserve (a National Park) to the south. The project would have some direct impacts on this habitat during construction, however there is also a risk of indirect impacts associated with construction, as well as from overshadowing, noise, and the lighting of the corridor and walking and cycling paths.

Hill Road and Sydney Olympic Park

Over the last two and half decades, Olympic Peninsula has been the focus of intensive conservation, remediation, habitat creation, and environmental monitoring. Respecting the environmental legacy of the Sydney Olympics is a core design focus for the project.

The alignment on Hill Road has been designed to minimise potential impacts on Newington Nature Reserve and the Narawang Wetland, as well as utilities adjacent to the parkland. The shared path within Woo-la-ra would also require reinstatement where it would be impacted by the construction of the light rail corridor and stop platforms.

The project would likely have an impact on habitat for the Green and Golden Bell Frog (*Litoria aurea*) key population at Homebush, particularly in the vicinity of Hill Road and Australia Avenue at Sydney Olympic Park.

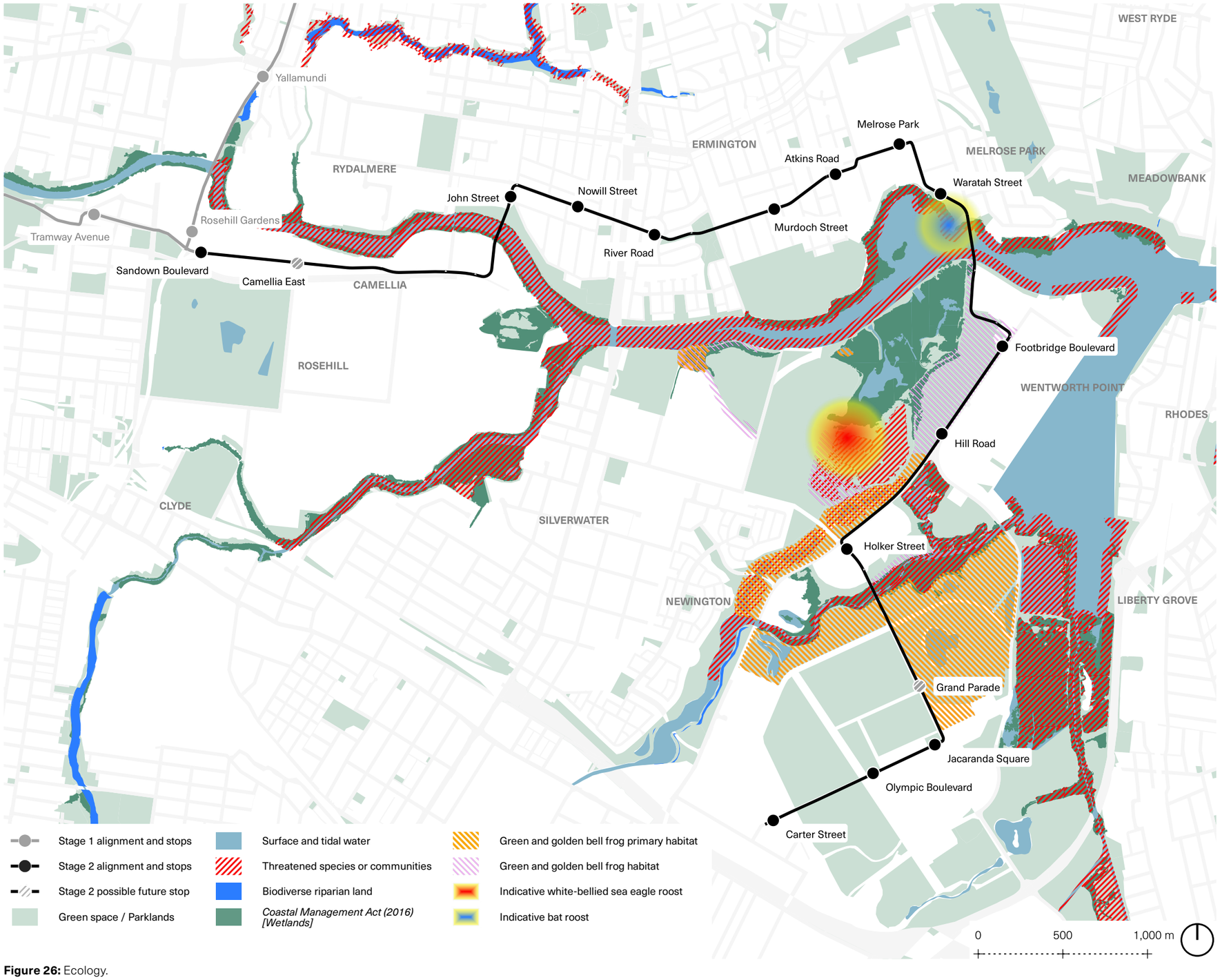


Figure 26: Ecology.

4.7 Remediated lands

Camellia

The project would be located on or adjacent to areas of industrial use within Camellia. Detailed site assessments on many properties in the area have confirmed the presence of contamination in soils and groundwater, with the main contaminants of concern being hexavalent chromium, petroleum hydrocarbons, chlorinated hydrocarbons, and asbestos.

Management of soil and groundwater contamination within the project site would be a key focus during detailed design.

Sydney Olympic Park

The alignment would be on or adjacent to areas of former landfill that are currently managed by extensive leachate contamination systems, including the Woo-la-ra landfill, Haslams Reach North Landfill, and Kronos Hill landfill. Management of soil and groundwater contamination, and protection of existing leachate systems throughout Sydney Olympic Park, would be a key focus of detailed design.

EPA notified and reported contaminated sites are illustrated in Figure 27.

Further information can be found in Chapter 18 (Soils and contamination) of the environmental impact statement.

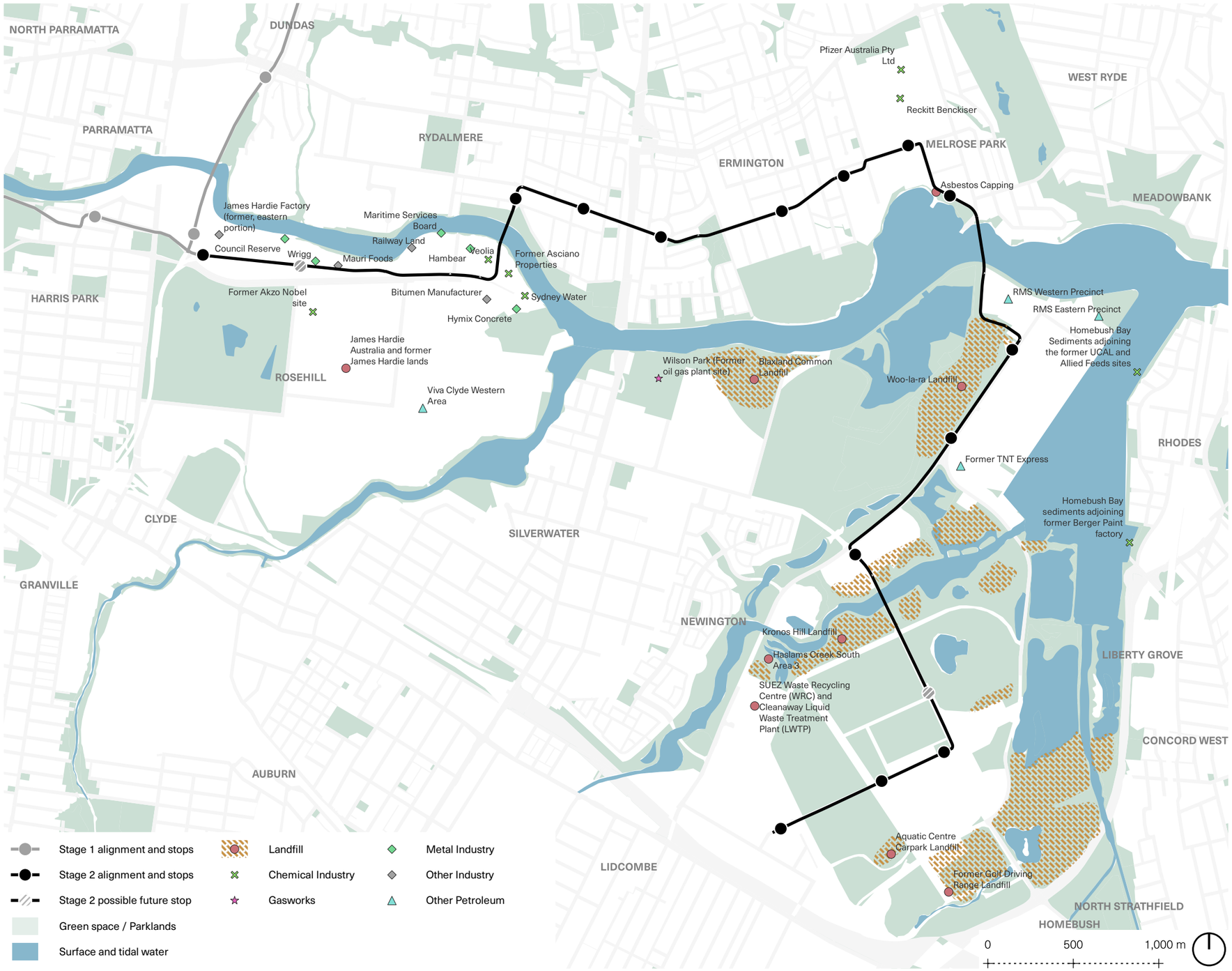


Figure 27: Existing remediated lands.

4.8 Integrated transport

The project has been designed to maximise integration with other modes of transport. Key considerations between light rail and other modes are discussed below and illustrated in Figure 28.

- Light rail - the project would integrate with Parramatta Light Rail Stage 1 services, running along the Stage 1 alignment between Camellia and Parramatta before terminating in the Parramatta CBD. A light rail interchange would also been designed at Camellia to promote integration between Stage 1 and Stage 2 services.
- Metro - the project would provide a high frequency feeder service to Sydney Metro West at Parramatta CBD and Sydney Olympic Park. The Parramatta Square stop would provide interchange to Sydney Metro West at Parramatta CBD, while the Olympic Boulevard stop would provide for interchange in the Sydney Olympic Park Central precinct. Design of the public domain within the stop precincts and surrounding areas would be aimed at maximising convenience and legibility between stop platforms and Metro station entries.
- Rail - interchange between the project and heavy rail would be provided at Sydney Olympic Park via the Jacaranda Square stop and at Parramatta CBD via established infrastructure for Parramatta Light Rail Stage 1. Interchange with bus services using the Bennelong Bridge at Wentworth Point would also provide a connection to heavy rail at Rhodes.
- Bus - the new bridge between Melrose Park and Wentworth Point provides the opportunity to create new routes or amend existing bus routes to provide improved connectivity between key locations and improved accessibility for key growth areas (including Camellia, Melrose Park, and Wentworth Point). Other bus network changes may be facilitated by the project and implemented by others.
- Ferry - Parramatta Light Rail Stage 2 stops would be well-integrated to create effective interchanges at Rydalmere and Sydney Olympic Park ferry wharves, minimising walking distances and providing clear visibility between the two modes.
- Active transport - additional active transport infrastructure along the alignment would encourage stop access via walking and cycling and effectively integrate with and complement existing active transport infrastructure. New bridges between Camellia and Rydalmere, and between Melrose Park and Wentworth Point, would provide new walking and cycling crossing points of Parramatta River, opening up both commuter and recreational cycling opportunities.
- Road - the function and capacity of key state and regional roads would be maintained through grade separation. Where possible, the integration of the project on local roads would minimise impacts and seek to maintain existing road network capacity.

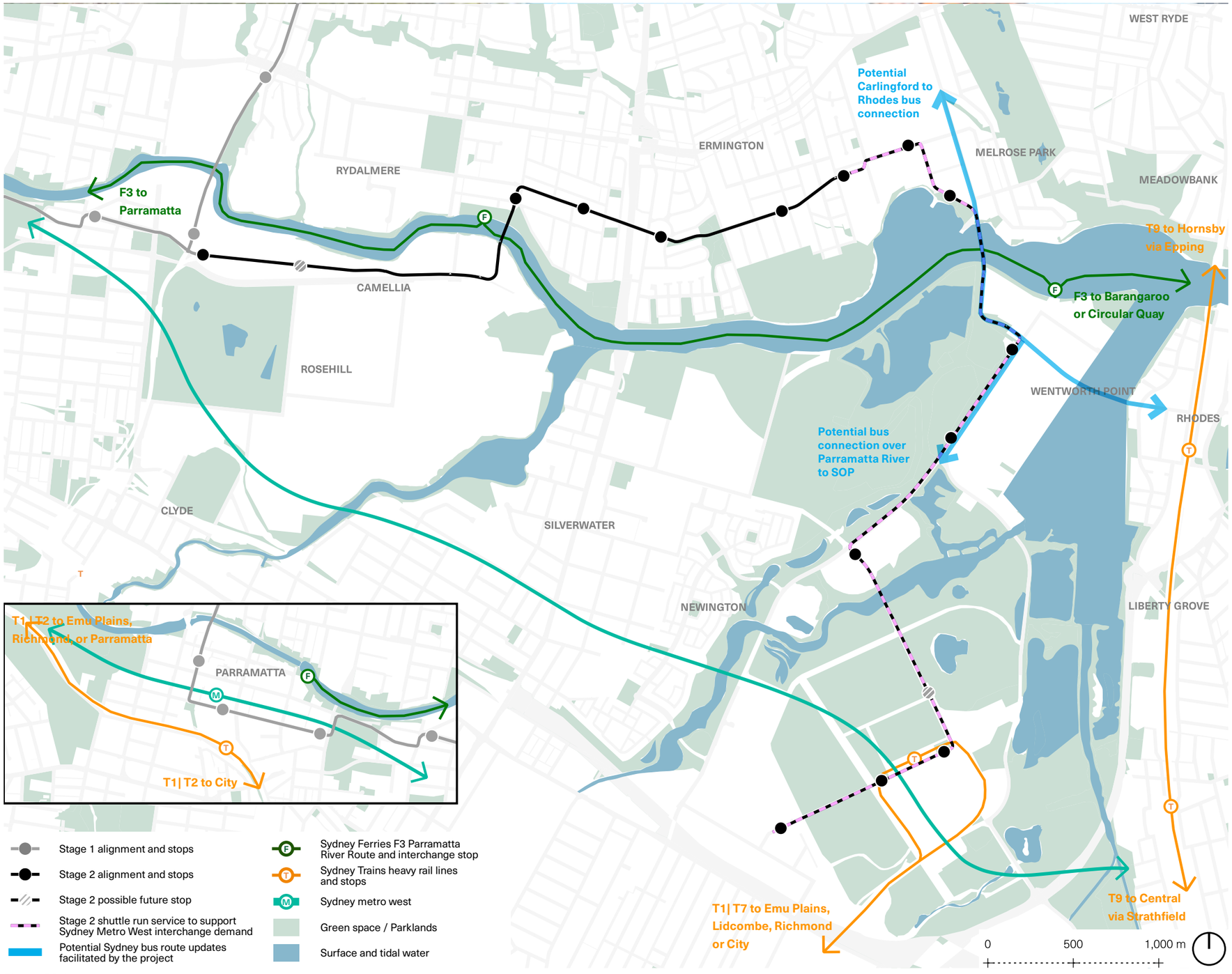


Figure 28: Integrated transport.

Further information can be found in Chapter 9 (Transport and traffic) of the environmental impact statement.

4.9 Travel speeds

Speed limits are a key influence on the character and feel of streets and places, as well as the function and performance of the transport network. The transformative character of light rail, in conjunction with major urban renewal along the corridor, necessitates careful consideration of vehicle travel speeds on existing and proposed streets, as well as through open spaces and over bridges.

Assumed speed limits on the alignment have been developed with regard to existing and desired future street character, transport and journey time objectives, engineering requirements, and safety considerations. Where light rail operates in the street environment, it would observe signposted speed limits.

Urban growth and change along the project alignment would dramatically transform the function and character of existing streets, as well as creating new high streets in town centres. Hope Street in Melrose Park would transition from a street of predominantly industrial uses to one lined by retail and residential frontages. Given the significant pedestrian activity on this street, including access paths to proposed light rail stops, a posted speed limit of 40km/hr has been assumed in these environments.

On South Street, Boronia Street, and Australia Avenue—where the light rail operates in the centre of the street—a posted speed of 50km/hr is assumed for all vehicles.

Where a fully separated corridor is planned—such as within the Sandown corridor, on Hill Road, and parts of Grand Avenue—there may be potential for light rail speed limits to be independent of adjacent streets. Generally, a light rail speed of 60km/hr has been assumed in these locations.

New bridges over the Parramatta River between Camellia and Rydalmere, and Melrose Park and Wentworth Point, are assumed to have a speed limit of 70km/hr for buses and light rail vehicles.

While light rail vehicles are permitted to operate at the posted road speed limit, speeds in practice would be limited by engineering, safety, and operational requirements. Operating speed on corners would be constrained to manage vehicle stability and lateral acceleration, and to maintain passenger comfort. Typically, light rail vehicles would operate at a speed of 15km/hr through minimum radius horizontal curves.

As project design and precinct planning is developed further, these assumed speed limits would be further evaluated by road and rail authorities.

Travel speeds would be reduced where the project interfaces with open spaces, such as Ken Newman Park and Atkins Road open space, with considerations for the increased pedestrian traffic in these areas.

Indicative travel speeds are shown in Figure 29. Further information can be found in Chapter 9 (Transport and traffic) of the environmental impact statement.

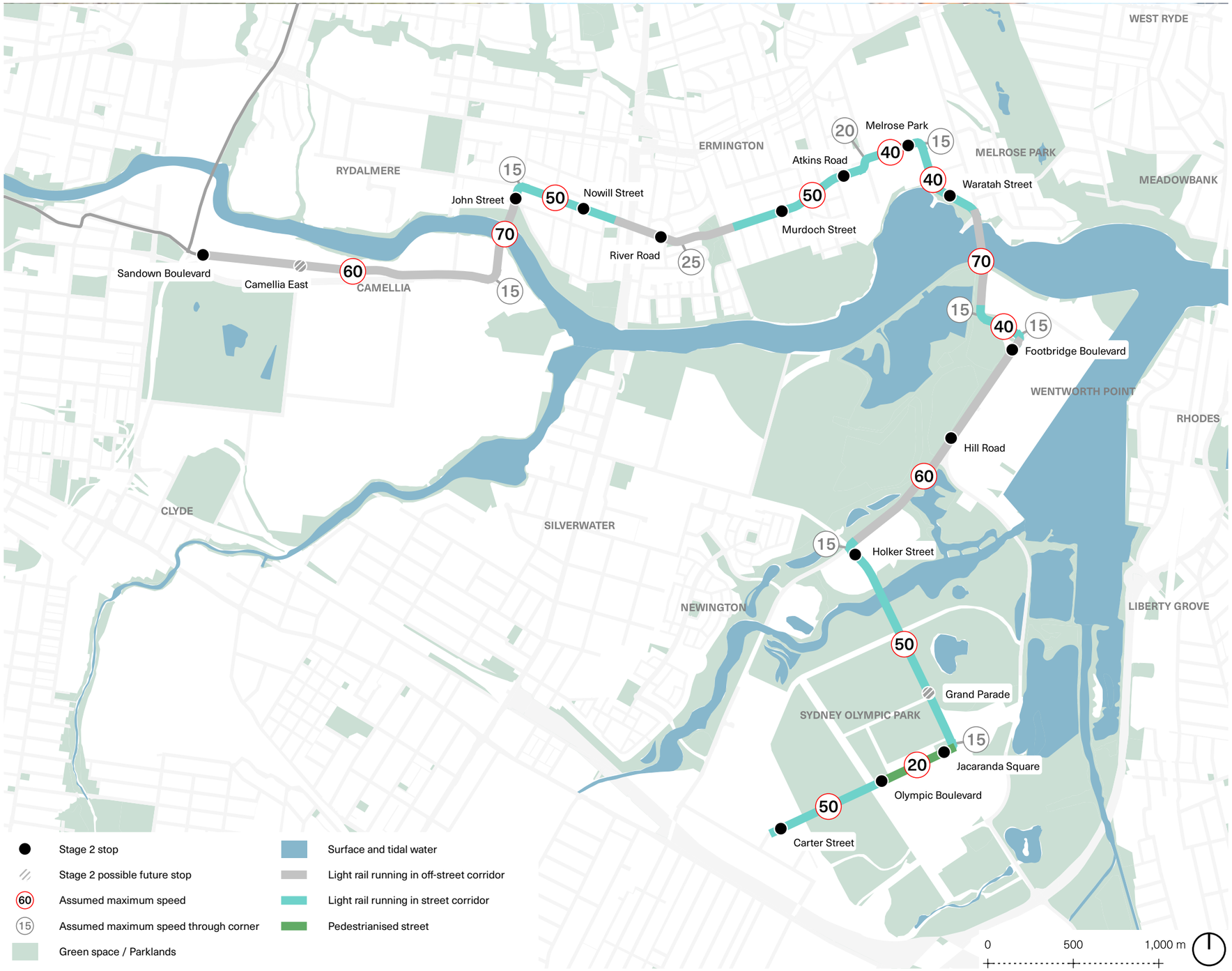


Figure 29: Light rail travel speeds.

4.10 Walking and cycling

4.10.1 Overview

Walking and cycling are integral to the greater good of communities and customers, and critical to achieving the transport and urban renewal objectives of the project.

Active transport delivers significant health, environmental, and economic benefits; creates communities that are resilient; and enables communities to be more equitable, inclusive, and liveable for everyone. Walking and cycling are also integral to the transport system to replace local car-based trips, enable access to key destinations including public transport, and to enhance places.

New walking and cycling links along and across the project's alignment would expand cycling catchments, encourage transport mode shift, and help enable dense, walkable areas of urban renewal.

Walking and cycling in transport projects

In line with Transport for NSW policy, the project is committed to incorporating safe, integrated, accessible, and connected walking and cycling infrastructure.

This is guided by the following principles drawn from Transport for NSW's *Providing for Walking and Cycling in Transport Projects Policy*:

- Walking and cycling have unique customer needs and require different infrastructure solutions. Pedestrians and bike riders should be allocated dedicated space wherever possible.
- Walking and cycling should be accessible to people of all ages and abilities, including people using assisted mobility devices, walking aids and different types of bicycles.
- Walking and cycling facilities must be designed and built to be safe, sustainable and fit for purpose in consultation with relevant subject matter experts.
- An appropriate access and maintenance schedule must be part of the project delivery to ensure people walking and cycling have continuous access and a high quality experience of the facilities provided.

Road user space allocation

The project predominantly runs down existing streets. In doing so, guidance is taken from Transport for NSW's *Road User Space Allocation Policy* for the design and allocation of street space, in line with the following principles:

- Realise a balance between place and the movement of people and goods by first establishing a network vision and primary road functions based on strategies and plans.
- When allocating road user space based on the network vision and road functions, consider all road users in order of: walking (including equitable access for people of all abilities); cycling (including larger legal micro-mobility devices); public transport; freight and deliveries; and point to point transport ahead of general traffic and on-street parking for private motorised vehicles.
- Facilitate the movement of goods and servicing of property in a manner that responds to the local movement and place context.
- Aim for the reduction of the mode share of private motor vehicle trips within built up areas.
- Where it is not practicable to allocate physical space in line with these principles, dynamically allocate road user space.
- Implement measures over time to achieve the strategic intent and outcomes identified as part of strategies or plans.
- Track how these road space allocation principles are being implemented against the strategic intent and outcomes identified as part of strategies or plans.
- Adhere to these principles ahead of any guidance that seeks to protect or maintain private vehicle level of service.

4.10.2 Walking and cycling journeys

The project would encourage more walking and cycling trips in the GPOP corridor by providing high-quality active transport infrastructure and supporting higher density land use. As a result, the total number of daily walking and cycling trips in the project area would be expected to increase significantly (almost doubling).

Walking and cycling journey times would also improve significantly, as shown in Table 9 below. The current journey times calculated 'Without Stage 2' in the table below are based on analysis of publicly available walking and cycling route generation websites. The times 'With Stage 2' reflect average travel speeds along walking and cycling routes that often comprise a combination of existing and proposed active transport infrastructure.

Table 9: Changes to walking and cycling journey times

		Walking and cycling journey times		
	Mode	Without Stage 2	With Stage 2	Improvement
Melrose Park to Parramatta CBD	Walking	90 minutes	90 minutes	Negligible
	Cycling	26 minutes	**24 minutes**	**≈ 2 minutes**
Melrose Park to Sydney Olympic Park	Walking	83 minutes	**55 minutes**	**≈ 28 minutes**
	Cycling	24 minutes	**13 minutes**	**≈ 11 minutes**
Wentworth Point to Parramatta CBD	Walking	110 minutes	110 minutes	Negligible
	Cycling	29 minutes	**26 minutes**	**≈ 3 minutes**
Wentworth Point to Sydney Olympic Park	Walking	37 minutes	37 minutes	Negligible
	Cycling	8 minutes	8 minutes	Negligible



Figure 30: Shared path through parkland, Mayfield, Newcastle (credit: City of Newcastle).



Figure 31: Separated cycleway on Bourke Street, Surry Hills (credit: Government Architect NSW).

4.10.3 Walking and cycling facilities

The project would build on more than a decade of investment in local cycle infrastructure by the City of Parramatta Council, Transport for NSW, and Sydney Olympic Park Authority. Importantly, the infrastructure would be designed to best practice standards that offer full and safe separation of users wherever possible, sufficient to encourage ordinary people to consider walking or cycling for everyday trips.

Two new crossings of the Parramatta River, at Camellia and Wentworth Point, would fundamentally improve walking and cycling conditions in the project area. The bridges would:

- allow direct access from areas north of the river to Sydney Olympic Park, the Millennium Parklands, and Newington Armory
- allow direct access to playing fields and regional parklands on both sides of the river for existing and future communities
- connect new and expanding primary schools at Melrose Park, Wentworth Point and Rydalmere, as well as providing new connections to Western Sydney University via Rydalmere
- connect dense areas of urban renewal north of the river to facilities and transport modes at Wentworth Point, Rhodes and Sydney Olympic Park
- provide a new, accessible connection between Camellia and Rydalmere, linking areas of significant urban renewal potential
- form key components of future regional cycle connections, including north-south connections between Auburn and Ryde via Sydney Olympic Park, or between the planned Duck River Corridor and Rydalmere via Camellia.

The project would deliver 8.5km of new walking and cycling facilities in the form of separated cycle ways, shared paths, and pedestrian paths. These would be located along the alignment and would connect to the existing and proposed network of routes in the Parramatta and Ryde Local Government Areas. These connections would link existing populations to schools, shopping areas, homes, and open space and recreation facilities.

While the proposed cycling infrastructure would provide for practical, safe transport connections, it would also represent an attractive addition to the large foreshore and parkland recreational network in Sydney Olympic Park and the Parramatta River valley.

Design development would consider more detailed road and public domain design that includes the investigation of maximising widths of walking and cycling facilities to cater to future population needs.

The project is illustrated in the context of existing and proposed walking and cycling facilities in Figure 32.

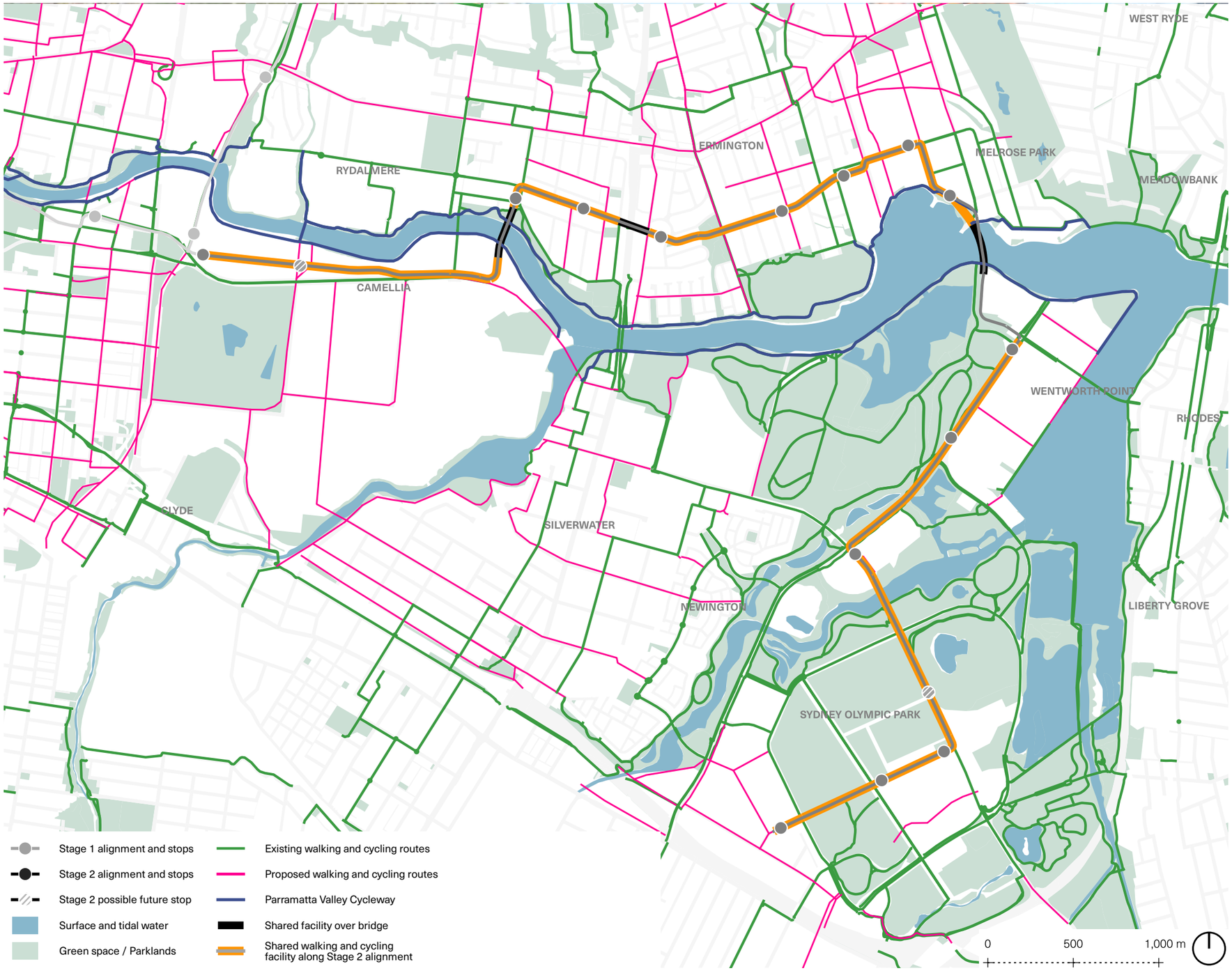


Figure 32: Walking and cycling facilities.

Walking and cycling on streets

Uni-directional kerbside cycle lanes are intuitive for all road users and thus are generally preferred where space allows, such as on Australia Avenue in Sydney Olympic Park.

Elsewhere, however, constraints imposed by the need to avoid property, environmental, and utility impacts prevent the achievement of uni-directional cycle lanes. In these locations alternate facilities would be provided, such as a two-way cycle path generally placed adjacent to, but separated from, the footpath. Where space constraints prevent separated walking and cycling facilities, a shared path would be adopted. Raised threshold treatments would be used at low volume side streets to maintain priority and ensure safety.

Walking and cycling within open spaces

Generous shared paths would be provided through open spaces—such as Ken Newman Park, Eric Primrose Reserve, and Archer Park—or where existing shared paths would be impacted within the parklands along Hill Road.

Existing shared paths would be retained where not impacted by the project, including areas of the Louise Savage Path and over the existing Holker Street busway bridge.

4.10.4 Walking and cycling on bridges

The Parramatta River bridges and their connecting foreshore paths would become increasingly attractive in their own right. The 'loops' created by these new river crossings (refer Figure 33) would generate strong recreational usage by cyclists, family groups and walkers, as well as by commuters on new regionally significant routes. Similar waterfront loop walks in Sydney are shown in Figure 34 for reference.

4.10.5 Implementation strategy

Implementation of walking and cycling facilities for the project would be undertaken in line with the following implementation principles:

- prioritise continuous access and permeability along and across the light rail corridor
- provide low cost, best value and safe infrastructure solutions
- replace existing facilities where impacted
- avoid additional property impacts wherever possible.

The above principles would result in a combination of new facilities and reinstatement of existing facilities where impacted by the project.

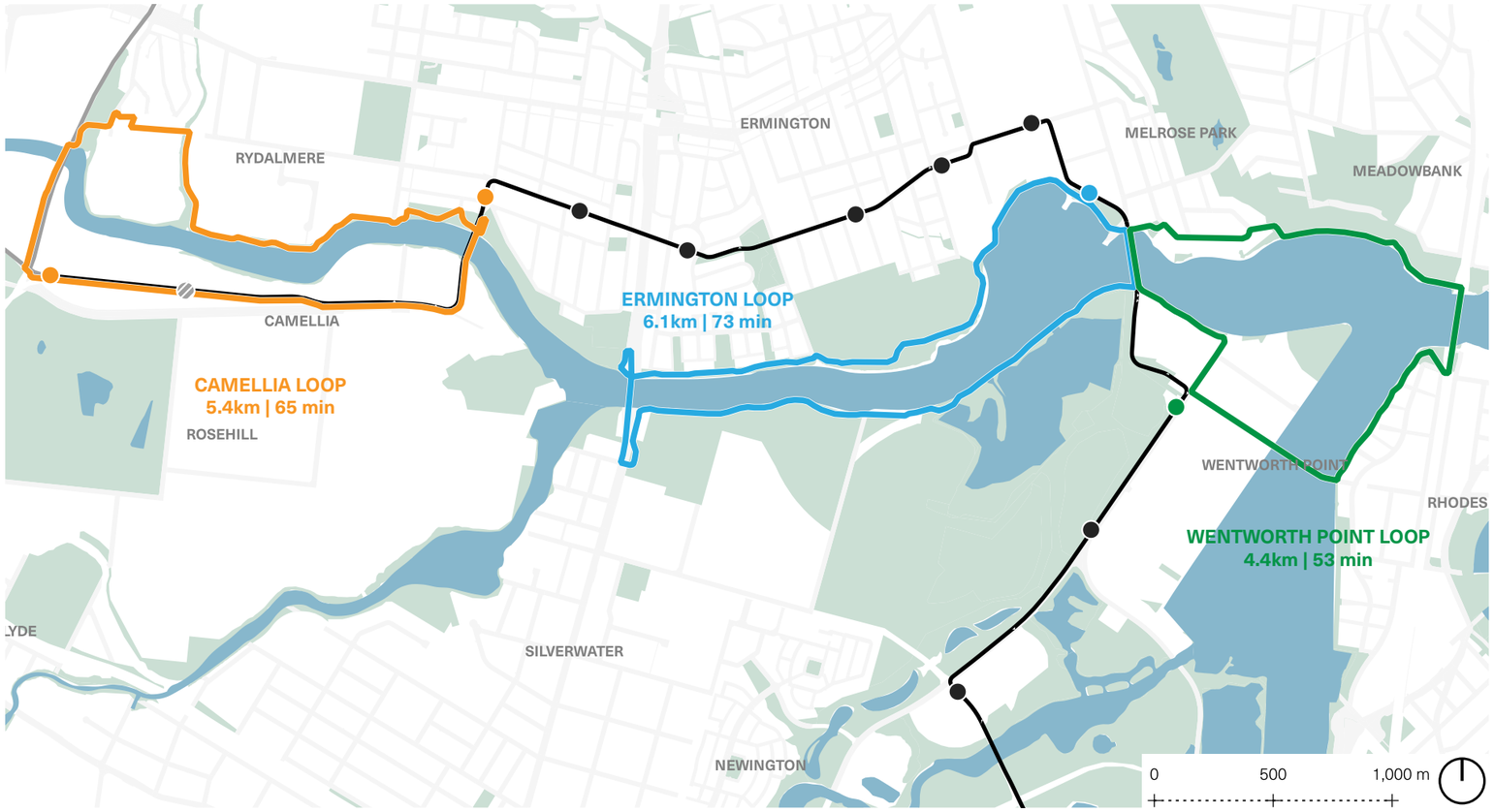


Figure 33: Walking and cycling recreation loops created by new Parramatta River crossings.

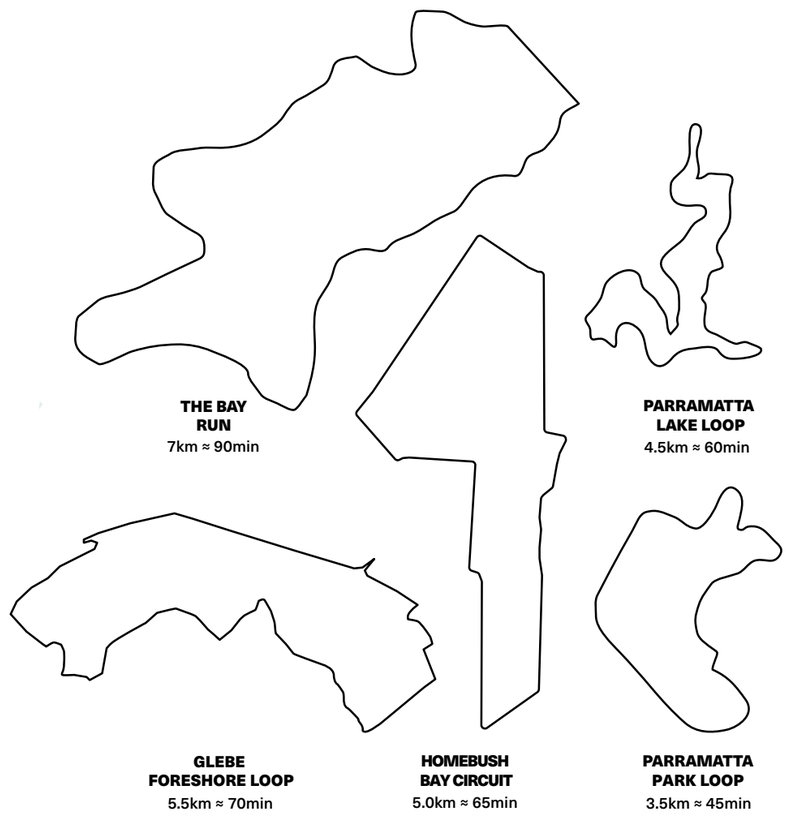


Figure 34: Comparable walking and cycling recreation loops in metropolitan Sydney.

4.11 Green infrastructure

4.11.1 Overview

Green infrastructure would embed sustainability outcomes throughout the project by encouraging the design and construction of assets that maximise land use while providing economic, social, and environmental benefits. It would also present an opportunity to integrate the natural environment within the built environment of the city.

The need for green infrastructure to be incorporated into the project is embedded within a range of NSW Government policies and the Infrastructure Sustainability Council (ISC) version 2.1 Sustainability Rating tool, which would be applied to the project. A Green Infrastructure Strategy would be developed to inform the future design stages of the project.

Benefits of green infrastructure are illustrated in Figure 35, while examples are included in Figure 36, Figure 37, and Figure 38.

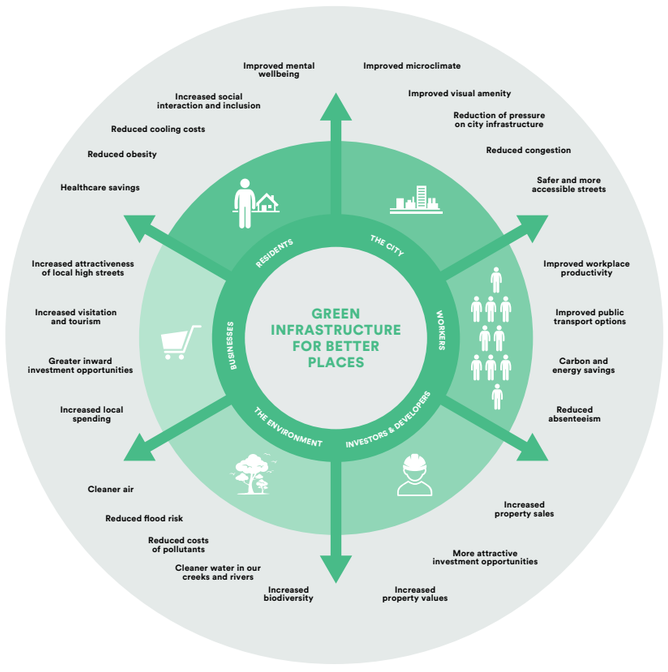


Figure 35: Benefits of Green Infrastructure (source: Greener Places, GANSW).



The elements of Green Infrastructure.
Individual components of Green Infrastructure or assets range from residential gardens to local parks and housing estates, streetscapes and highway verges, services and communications corridors, waterways and regional recreation areas. The components can be existing assets or designed to become part of the Green Infrastructure network.



1 Green roofs and walls including roof gardens and living walls.



2 Private and semi private residential gardens including shared spaces around apartment buildings, backyards, balconies, roof gardens and community gardens.



3 Squares and plazas including both public and private courtyards and forecourts.



4 Public residential and other tree lined streets, including road verges.



5 Parks and gardens including regional parks, well-designed urban parks, open space reserves and formal gardens.



6 Greenways including river and creek corridors, cycleways and routes along major transport (road, rail and light rail) corridors.



7 Sports and recreational facilities including ovals, school and other institutional playing fields, and other major parks and golf course.



8 Natural green space including national parks and nature reserves, waterways, wetlands and coastal margins.



9 Agricultural and other productive land and farms including vineyards, market gardens, orchards.

Figure 36: Examples of green infrastructure (source: Greener Places, GANSW).



Figure 37: Green tracks on Parramatta Light Rail Stage 1 (credit: Transport for NSW)

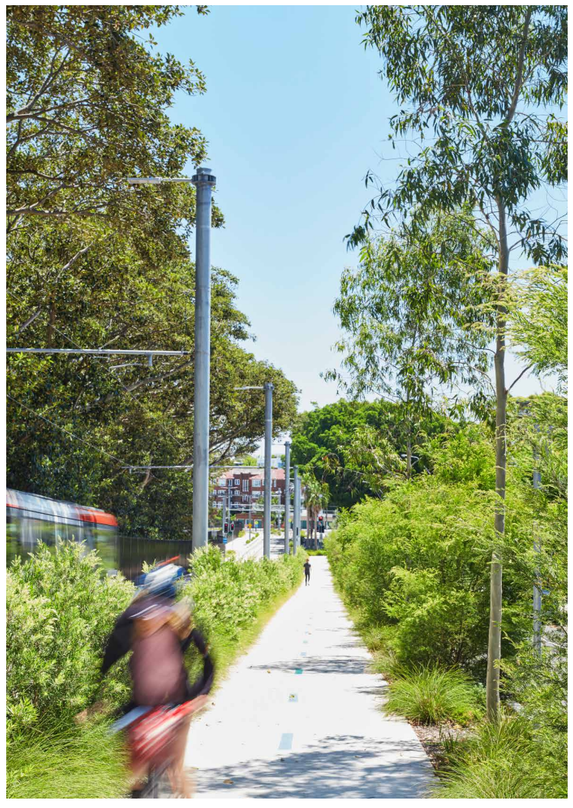


Figure 38: Planting along light rail infrastructure (credit: ASPECT Studios).

4.12 Precincts

The project comprises a total of eight precincts. These are listed below and illustrated in Figure 39.

- Parramatta CBD
- Camellia
- Rydalmere East
- Ermington
- Melrose Park
- Wentworth Point (including Millennium Parklands)
- Sydney Olympic Park
- Carter Street Precinct

Design, place and movement outcomes for each precinct are presented in Chapters 5-12.

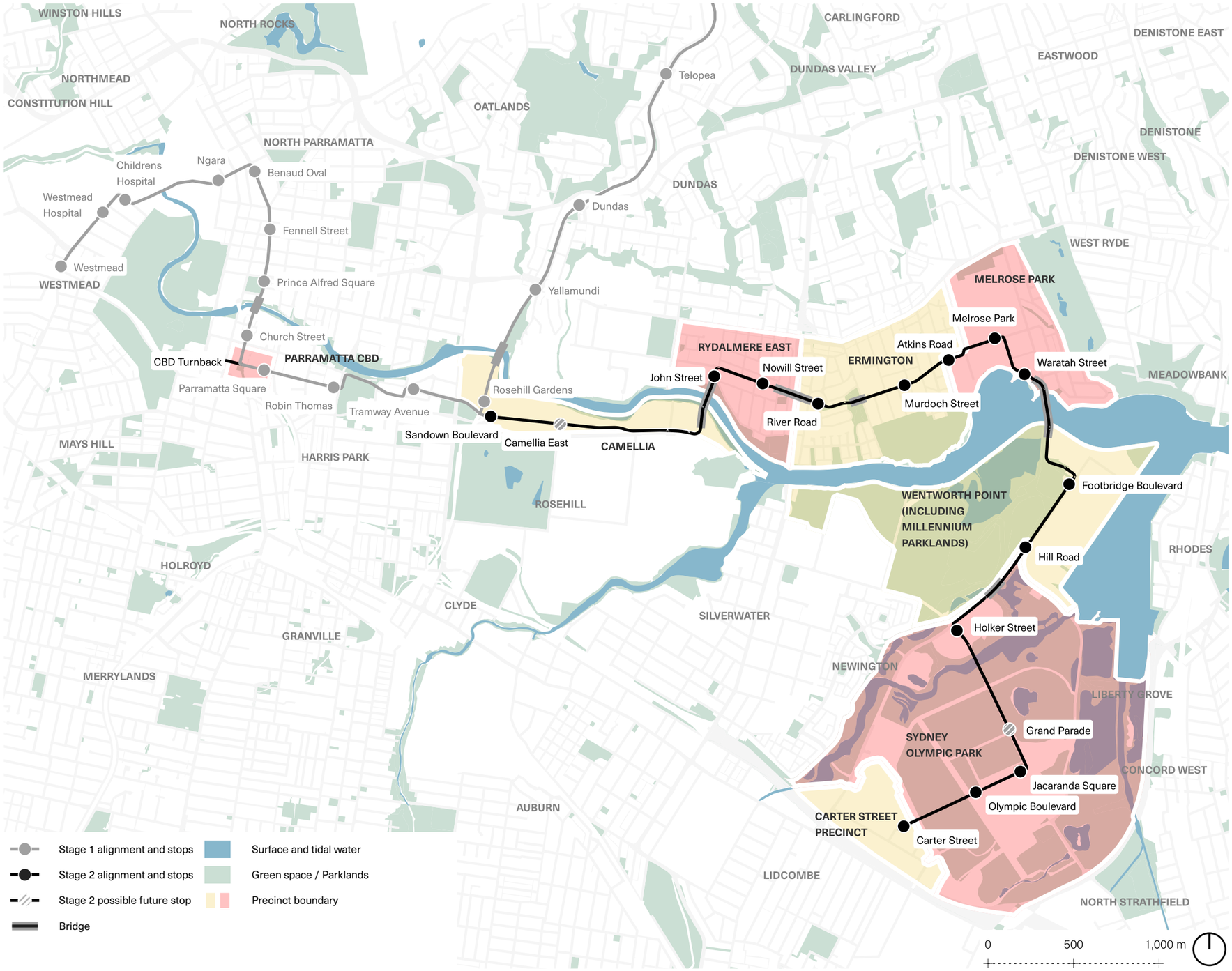


Figure 39: Precincts.

5.0 Parramatta CBD

5.1 Overview

5.1.1 Alignment summary

The project's operations between the Parramatta CBD and Camellia would utilise the Parramatta Light Rail Stage 1 alignment and stops.

A terminus would be required within the Parramatta CBD to enable services to terminate in Parramatta, before returning east to Camellia, then along the Stage 2 corridor to its termination in the Carter Street Precinct. Services would terminate at the Parramatta Light Rail Stage 1 Parramatta Square stop.

The project's CBD terminus would be facilitated by the construction of a light rail turnback facility in Macquarie Street between Church Street and Marsden Street. The turnback design would be integrated within an upgrade to the street that aligns with future development and place character.

The alignment is shown in the context of its built and natural environment within Figure 40.

The design, place, and movement outcomes of Macquarie Street are discussed and illustrated in this chapter.

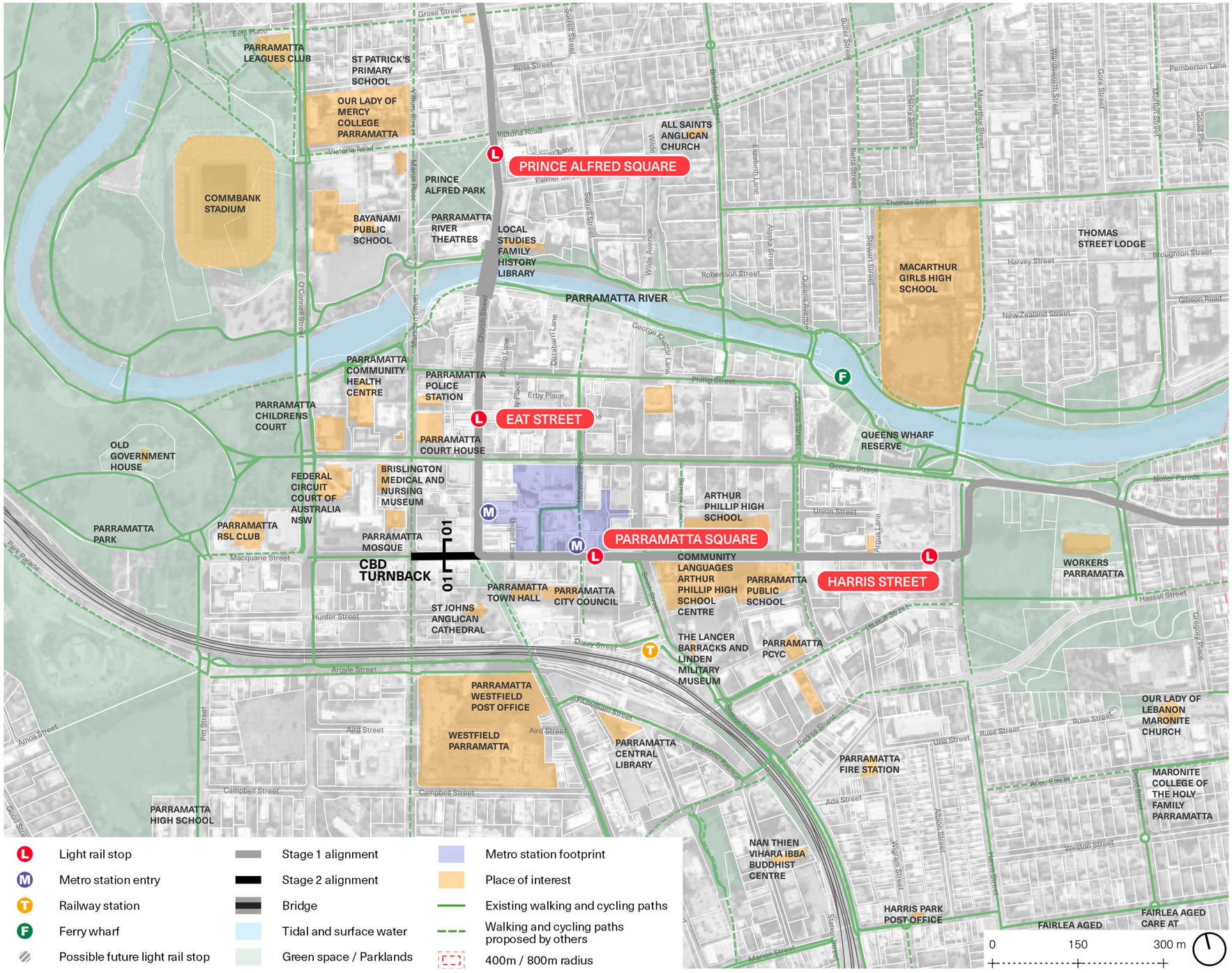


Figure 40: Overview map - Parramatta CBD.

5.2 Designing with Country

***Ngalawallah* / A gathering space**

The project should provide a welcoming and calm resting point within the public domain. With increasing physical accessibility along Macquarie Street towards Parramatta Park, the precinct should integrate diverse street furniture alongside urban landscaping to enable people and ecologies to gather and rest safely.

Enabling and supporting this cultural practice within a dense, urban environment would ensure all people are welcome and included in this incredibly diverse area. This would also ensure that Country and the custodianship of local Aboriginal peoples continues to be respected across the city and light rail.

***Tucoerah* / Diverse blending of ecologies and water systems**

Located on what should be a natural brackish floodplain of biddigalo (D'harawal eora: sourwater) ecologies, the area has been vastly modified through the introduction of the Charles Street Weir in 1855 which transformed Country into nattaigalo (D'harawal eora: freshwater).

Sitting in close proximity to this artefact of colonisation, the site exists within a complex, resilient and changed urban ecology, providing opportunities to share interconnected stories of colonisation and cultural and ecological resilience.

The Parramatta CBD Terminus should be a place that activates the public domain through tactile spatial memories of Tucoerah Country, adding to the urban tree canopy and encouraging people to wander and explore the many diverse stories of this place.

***Wingara* / Reading Country**

As a cultural value, Wingara describes how we read Country; not as an artefact in the pages of history, but a living, breathing entity.

To read Country we must stop, listen, think, observe, feel, and experience. There are many opportunities to enable this reading of Country spatially across the project but, as a start, each precinct should be designed to reflect a nuanced and specific character of each place.

The Parramatta CBD terminus should represent parra, the short finned eel. Variously spelt parra and burra, the eel is a significant cultural animal across this part of Country. Capable of moving through land and both salt and freshwater networks, parra is an incredibly resilient animal that informs seasonal changes and ceremonial responsibilities for many local Aboriginal peoples. Parra should be reflected in the public domain, wayfinding and materiality for the Parramatta CBD terminus to draw in connections to the river and other vast water systems of this area.



Figure 41: Parra/Burra (short finned eels) traveling through flood plains (Credit: ABC News).



Figure 43: Flowering wattles provide urban habitat and are seasonally associated with Parra/Burra (Credit: Bangawarra).

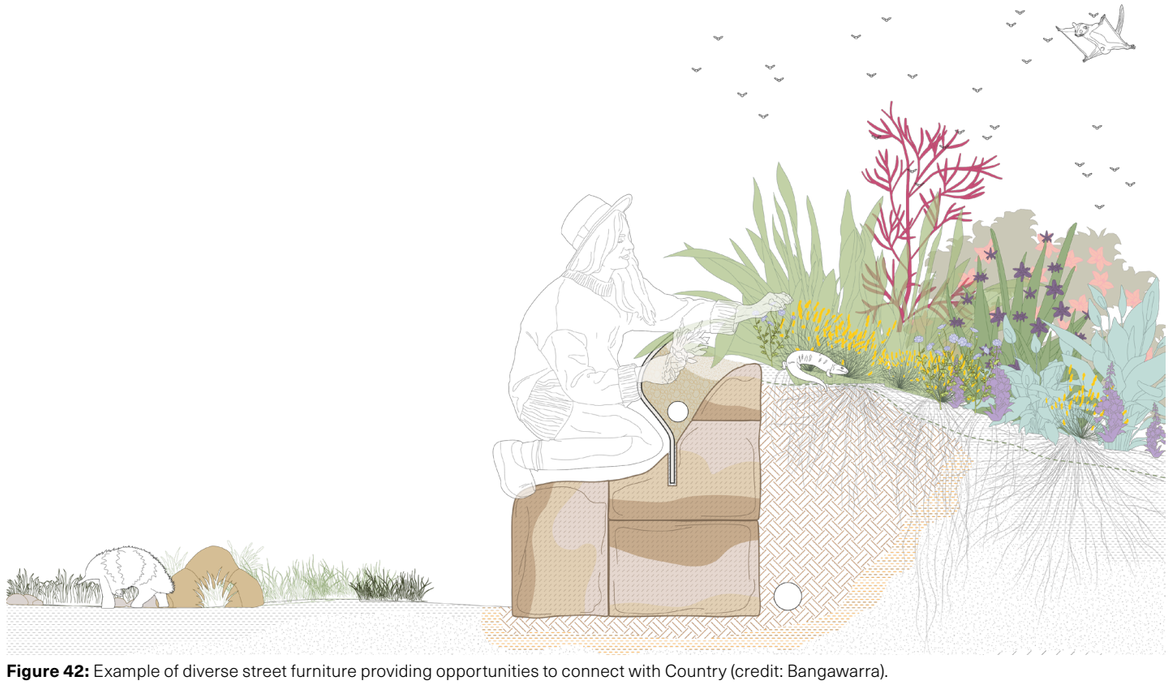


Figure 42: Example of diverse street furniture providing opportunities to connect with Country (credit: Bangawarra).

5.3 Vision and principles

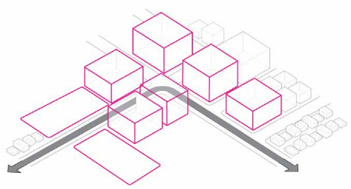
5.3.1 Vision

Leveraging Stage 1, the project should provide a place to stop and observe Country - how she is today, how she was, and how she will be.

Terminating within the heart of the rapidly developing CBD, the project would sensitively integrate into the surrounding streets and minimise impacts on Parramatta Light Rail Stage 1. All the while encouraging people to explore and wander the resilience of this urban Country and ecology.

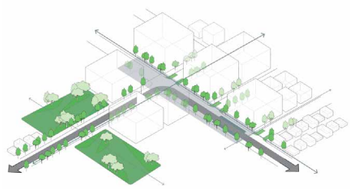
5.3.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. These are presented here under each of the project's design principles.



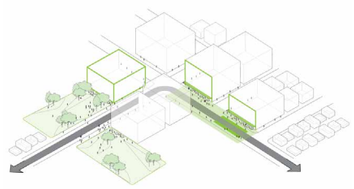
City shaping

- Deliver Stage 2 light rail services to the heart of the city centre.
- Consider the evolving nature of the city centre in the context of planned and potential future redevelopment, particularly in relation to the delivery of Sydney Metro West and its impacts on the future of the city centre.
- Consider the impact to the surrounding Parramatta CBD environment beyond the project boundary.
- Reflect and celebrate the enduring spirit of parra/burra (the eel).
- Consider and connect to the deep time history of Country - past, present and future - and reflect these complex and intersecting stories across the public domain.
- Celebrate the diverse stories, histories, ecologies and resilience of this distinct area of Country.



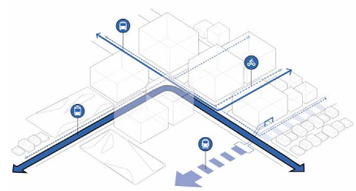
Connectivity

- Integrate Stage 2 light rail infrastructure with Parramatta Light Rail Stage 1 while minimising impacts on its future operations.
- Maximise the ability of Stage 2 services to provide convenient interchange with Sydney Metro West.
- Provide terminus and turnback infrastructure without impeding existing and potential future walking, cycling, and local traffic circulation and connections.
- Strengthen connections to the CBD, urban ecologies, public/ cultural infrastructure and Country beyond the project boundary.
- Provide opportunities to connect to and explore Country by connecting with Parramatta Light Rail Stage 1.



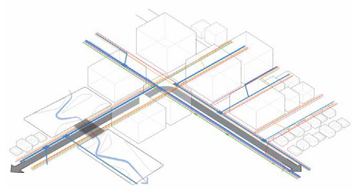
Place

- Maximise place and public domain benefits of delivering light rail terminus infrastructure to the CBD.
- Incorporate terminus infrastructure (e.g. in-track charging infrastructure, control cabinet, etc.) in a location that minimises impacts on the existing street environment, pedestrian circulation, and existing businesses.
- Adopt infrastructure design, materials, and finishes to align with those delivered for Parramatta Light Rail Stage 1 to maximise consistency between the two projects.
- Embrace the unique character of this urban Country and adopt strategies to reflect this uniqueness within design, materiality and finishes, whilst still ensuring consistency with Parramatta Light Rail Stage 1.



Choice

- Terminate Stage 2 services in a location that allows for interchange with other significant transport services in the Parramatta CBD, such as heavy rail at Parramatta Station, or Sydney Metro West.



Value

- Terminate Stage 2 services at a location that best captures value of a city centre terminus and maximises integration with the transport network, in line with projected light rail patronage.
- Adopt a suite of elements, materials, and finishes that are consistent with Parramatta Light Rail Stage 1 to maximise potential efficiencies of scale and optimise maintenance.

5.4 Design place and movement outcomes

5.4.1 Macquarie Street turnback

Overview

Following an options assessment process, the Parramatta Light Rail Stage 1 stop at Parramatta Square was selected as the preferred terminus location. This location was chosen to minimise potential impacts on delivery and operations of Parramatta Light Rail Stage 1, seamlessly integrating with the existing public domain while still providing access to the city centre and interchange with Parramatta Station and the future Sydney Metro West station.

Terminating Parramatta Light Rail Stage 2 services at the Parramatta Square stop would require the construction of a turnback in Macquarie Street. A turnback at this location is not a light rail stop. Passengers would alight from the Light Rail Vehicle (LRV) at the Parramatta Square stop and the empty vehicle would be driven to the turnback. The turnback could be used to charge the LRV's on-board batteries. One or two vehicles could be parked at the turnback intermittently, before leaving to commence the Parramatta Light Rail Stage 2 route by picking up passengers from the Parramatta Square stop.

Built form

Construction of the turnback would include two pocket tracks between Church Street and Marsden Street, connected to both the eastbound and westbound Parramatta Light Rail Stage 1 mainline tracks. A double cross-over within the limits of the track zone would provide operational flexibility and access between both mainline tracks and both pocket tracks.

The turnback would also require the construction of a buffer stop at its western end to provide safety and protection for pedestrians and motor vehicles walking along Marsden Street. The buffer stop would comprise elements such as a low height concrete block or wall, a planted garden bed, or a combination of these.

Public space

To integrate the turnback pocket tracks into the street, car parking within Macquarie Street between Church Street and Marsden Street would be removed, and the east bound traffic lane retained, potentially as a shared zone.

High quality public domain treatments—such as stone paving to the track zone to match the Parramatta Light Rail Stage 1 track zone on Church Street—would create a high quality pedestrian environment and contribute to public space within the city centre.

Residual land

This is no residual within this section of the project.

Stops as places

There are no stops proposed within this section of the project. The nearby Parramatta Square stop would serve as the terminus for Stage 2 services.

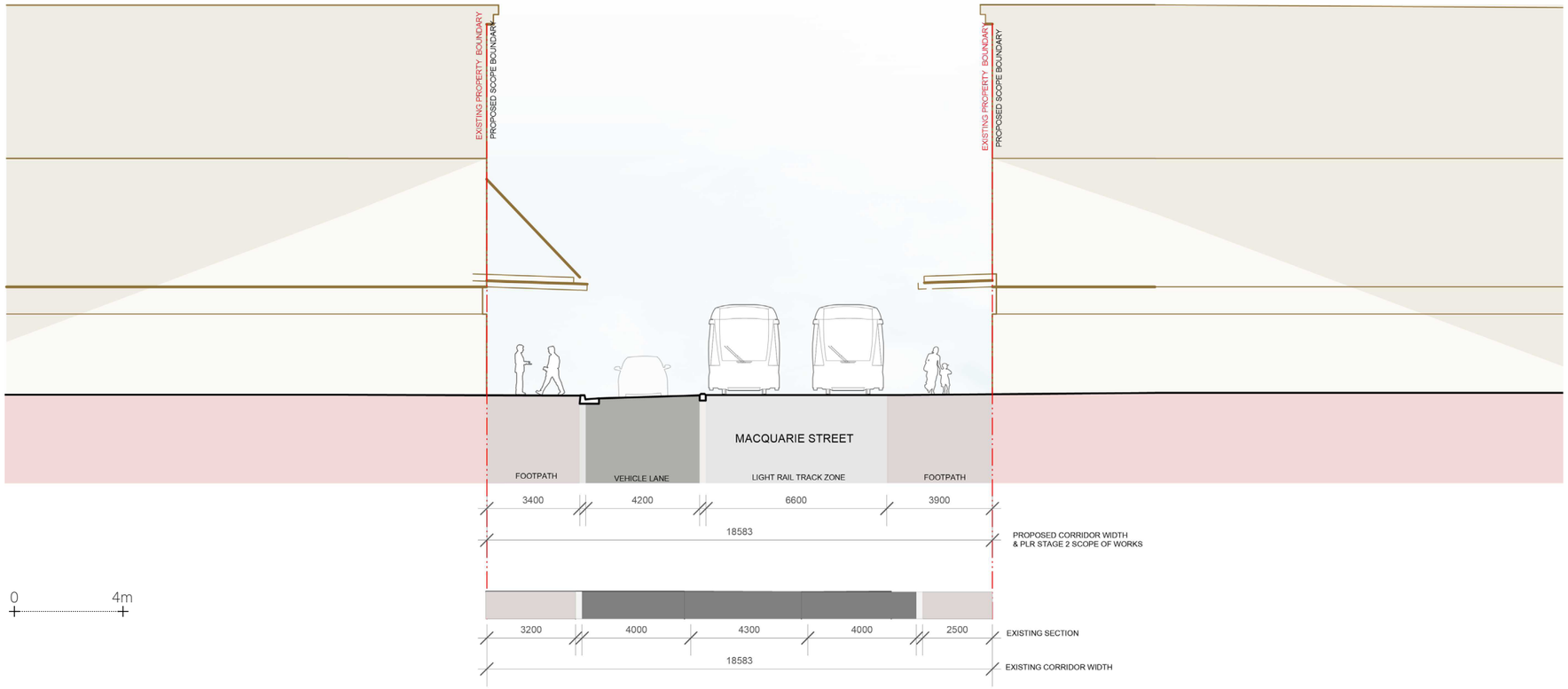


Figure 44: Cross section 01 - Macquarie Street turnback (indicative only - subject to design development).

Transport integration

The turnback in Macquarie Street would facilitate Stage 2 services into the Parramatta CBD, providing for interchange between the Parramatta Square stop, heavy rail, and Sydney Metro West within the city centre. The turnback could be used to charge the LRV's on-board batteries and charging infrastructure would be provided to facilitate this.

Visual amenity

Construction of the turnback would result in a negligible magnitude of change in the character of Macquarie Street.

The project would integrate with the visual amenity already established by Parramatta Light Rail Stage 1 in this area of the CBD. Similar materials, finishes, and design details would be adopted to ensure continuity in public domain palettes between the existing built environment, Parramatta Light Rail Stage 1 works, and Parramatta Light Rail Stage 2 works.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment).*



Figure 45: Sketch - Macquarie Street turnback (indicative only - subject to design development).

6.0 Camellia

6.1 Overview

6.1.1 Alignment Summary

The project would enter the Camellia precinct via the Parramatta Light Rail Stage 1 spur line to the stabling and maintenance depot, connecting to the Stage 1 main line with a triangular track arrangement at the western end of the existing Sandown Line. The project would provide a stop at this location for interchange with the Parramatta Light Rail Stage 1 Rosehill Gardens stop. The project would also allow for the future construction of a second stop in Camellia to serve the eastern portion of the future town centre.

The alignment would then extend east of the stabling and maintenance depot turnout along the Sandown Line, before running along the northern side of Grand Avenue, past Thackeray Street and then turning north through anexisting industrial property at 37A Grand Avenue.

The alignment would then cross the Parramatta River via a new bridge between Camellia and Rydalmere, providing a regionally significant new crossing of the Parramatta River and connecting future and existing communities with light rail and walking and cycling routes.

The project within the Camellia precinct is shown in the context of its built and natural environment within Figure 46.

The project would comprise the following key places within the Camellia precinct:

- Sandown Line
- Grand Avenue

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

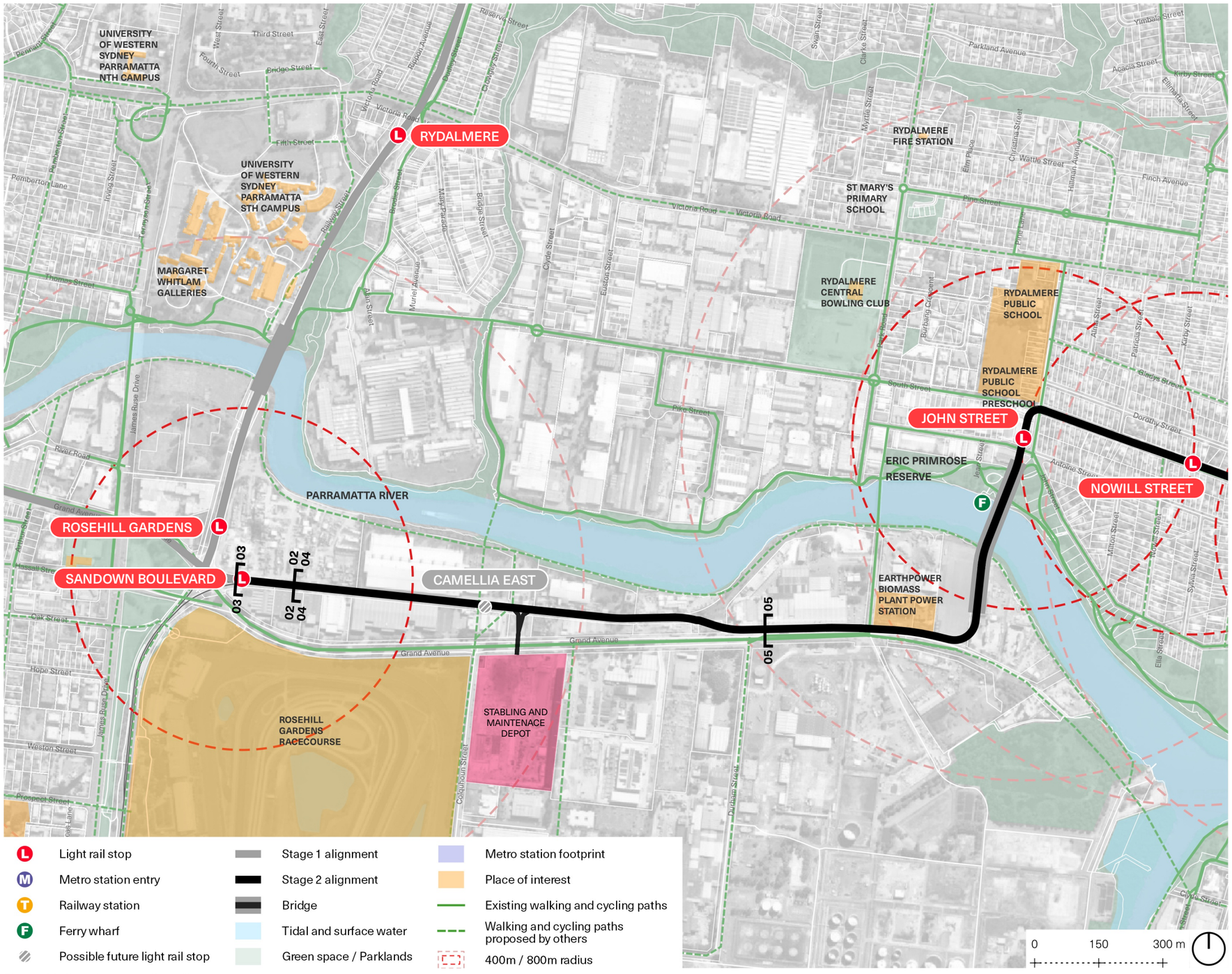


Figure 46: Overview map - Camellia.

6.1.2 Draft Camellia-Rosehill Place Strategy

The Draft Camellia-Rosehill Place Strategy, exhibited for public comment from 17 December 2021 to 4 March 2022, indicates new investment and infrastructure in the precinct (refer Figure 47, Figure 48, and Figure 49).

The Place Strategy will enable up to 14,500 jobs and 10,000 homes for around 24,000 people, supported by the project in conjunction with a network of new open space and social infrastructure. The project's design would accommodate existing industrial and commercial land uses, while allowing for future land use change, including the progressive realisation of the Place Strategy.

Light rail infrastructure serving the future town centre would be constructed as part of project, which would include new track within the existing Sandown Line east of the stabling and maintenance depot. The use of embedded concrete track at existing ground level would allow for the future conversion of the corridor to a main street, with light rail continuing to operate in a dedicated central median.

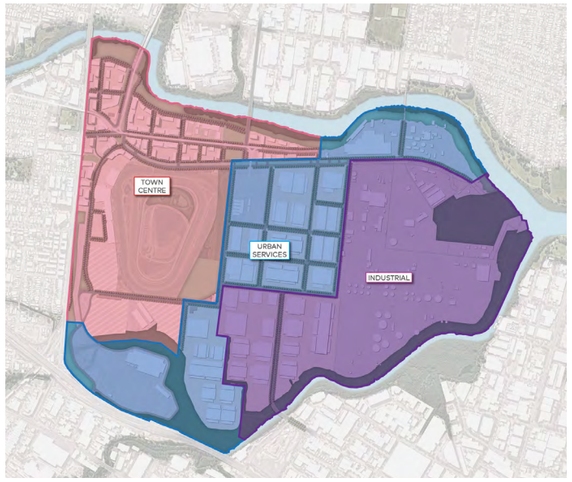


Figure 47: Overview of sub precincts; town centre [red], urban services [blue] and industrial [purple] (source: Department of Planning and Environment).

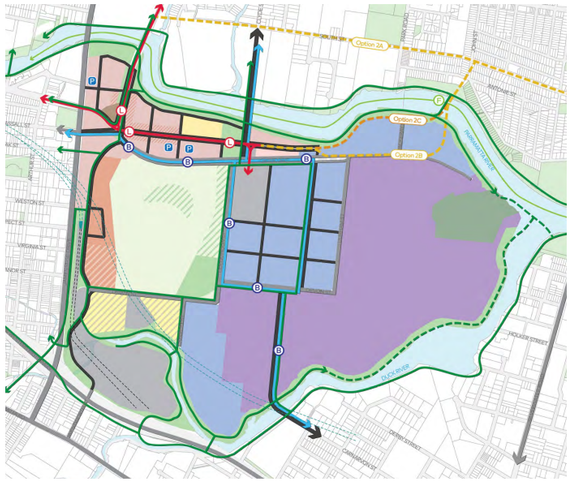


Figure 48: Integrated transport and land use master plan (source: Department of Planning and Environment).

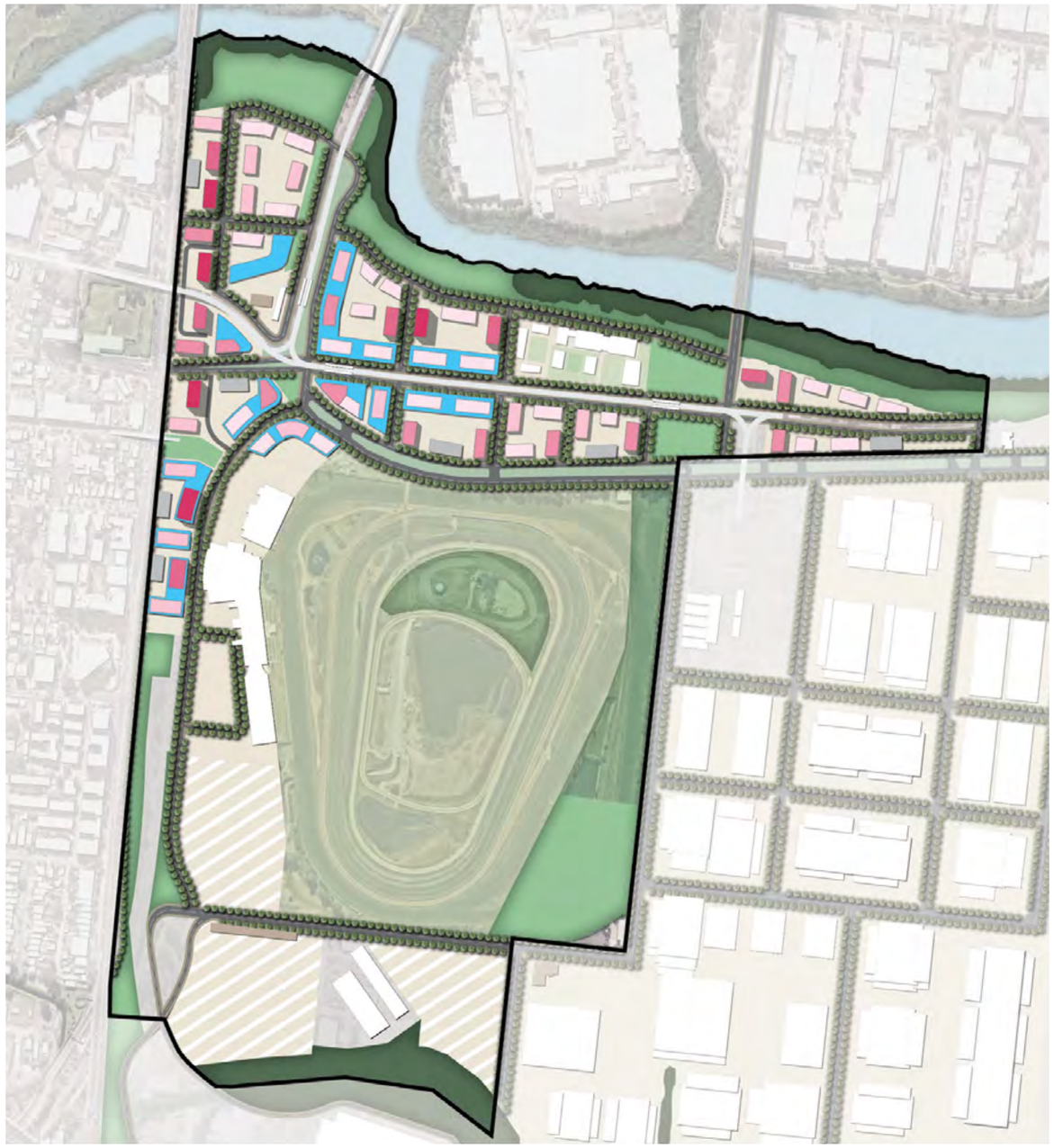


Figure 49: Master plan of the active town centre sub precinct (source: Department of Planning and Environment).

6.2 Designing with Country

Ngalawallah / A Gathering Space

Supported by rich ecological diversity, this Country has always provided the necessary resources to sustain an incredibly diverse kinship system. Along the shores of the Parramatta River, vast groups of local Aboriginal people have gathered and thrived for thousands of generations. Though greatly disturbed through urban development, this Country still holds this complex knowledge system, forever protecting local peoples stories, observations and science.

The Camellia precinct offers the opportunity for ''unforgetting'' the knowledges and stories that have been silenced and, sometimes, erased from our lives. Unforgetting Country, the precinct would be activated through local stories of ecology, water and sky. Supporting remaining urban ecologies while always echoing the enduring songs and knowledge of those lost.

Tucoerah / Diverse blending of ecologies and water systems

Nestled along the banks of the Parramatta River, Camellia is Low Country. The precinct is part of a large ancient estuarine floodplain where nattaigalo (D'harawal eora: freshwater) runs from the mountains and rises from aquifers, travelling through local streams to mix with the unceasing tidal inundation of garigalo (D'harawal eora: saltwater). As these saline and fresh waters mix, they create biddigalo (D'harawal eora: sour or bitterwater) wetlands where mud, sediment, and water are replenished and enriched with nutrients, fostering some of the most fertile habitats in the world.

Today the Camellia precinct is an urban floodplain of significantly altered ecologies. Concrete, steel, and asphalt now lay on top of these fertile soils and seawalls restrain tidal water flows concealing these ecologically and culturally rich environments. Through public domain design and public art the rich ecological and cultural diversity that should exist across this place would be brought to the fore for the Camellia precinct.

Wingara / Reading Country

To read Country across the Camellia precinct we recognise the importance of Currujin (D'harawal eora word that is also common across all Sydney languages: Kurrajong/ Brachychiton), an important cultural resource for many local Aboriginal peoples. With a vibrant canopy full of red flowers during the season of Parra'dowee (D'harawal eora: eel creator spirit), Currujin is a ceremonial indicator, guiding people through the landscape and along Songlines. At other times of the year the bark, seeds, roots, and wood also provide essential resources.

Currujin should be the unifying element across the Camellia precinct, celebrating how local Aboriginal people have always moved through and sustainably cared for Country, guided by sacred seasonal and ceremonial indicators. Currujin's presence should not only be celebrated through landscaping strategies, but can inform every element of the design and place strategies.





Figure 50: Currujin in full bloom during the season of Parra'dowee (credit: True Green Nursery, Bangawarra).

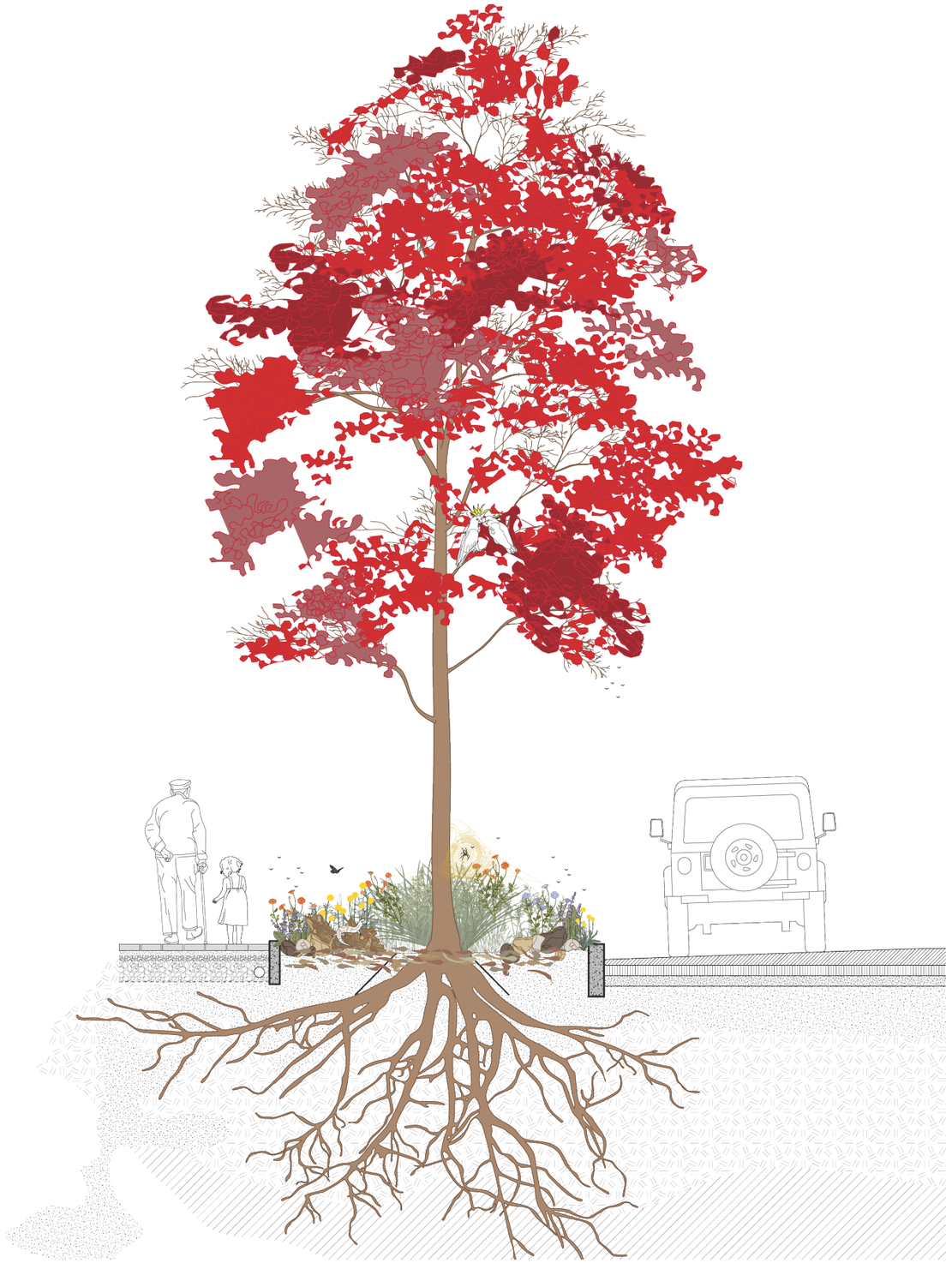


Figure 51: Ceremonial indicator planting within verge (credit: Bangawarra).

6.3 Vision and principles

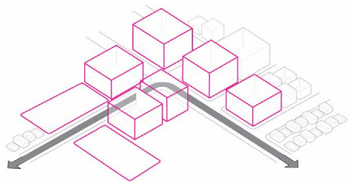
6.3.1 Vision

To support Country, to heal and sustain the future of the Camellia town centre, the vision for the precinct is to achieve an interconnected light rail and active transport network that crosses the Parramatta River.

Integrating existing industrial land uses and supporting the development of new vibrant street life, the light rail is the future premier street for the Camellia town centre and would encourage all people to actively and responsively connect with Country.

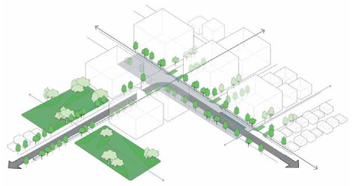
6.3.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. They are presented here under each of the project's design principles.



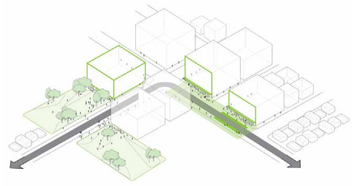
City shaping

- Reflect and celebrate the enduring spirit of Kurrajong (the flame tree).
- Underpin sustainable transport and connectivity in the precinct by delivering light rail through the heart of this evolving precinct.
- Align with the Draft Camellia-Rosehill Place Strategy and integrate light rail within the potential future main street of the Camellia town centre.
- Future-proof the creation of a legible high street through the precinct, prioritising pedestrian amenity and safety, with stop locations that align with planned future uses.
- Future-proof the delivery of a second stop in the eastern portion of the potential future Camellia town centre to facilitate and promote urban renewal.
- Investigate the opportunity for wire free running through the area of the potential future Camellia town centre.
- Protect and heal Country by providing ecologically activated public and active transport through robust and safe vegetated landscape corridors.
- Add-to and provide design leadership towards the future town centre's cultural identity by holistically integrating locally relevant and site-specific knowledges of Country.



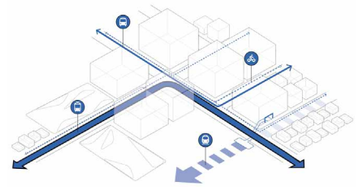
Connectivity

- Provide direct, safe, well lit, and legible connections and crossings within Camellia, responsive to the Draft Camellia-Rosehill Place Strategy and any future planning proposals.
- Maximise ease of interchange between Parramatta Light Rail Stage 1 and Stage 2 services within the western portion of the precinct.
- Ensure connections between Stage 1 and Stage 2 services are safe, legible, and intuitive, in order to maximise the convenience of light rail, for both existing conditions and the potential future town centre environment.
- Incorporate continuous walking and cycling facilities, complimented with convenient crossings and continuous street tree planting, to maximise regionally active transport connections through the precinct.
- Maintain and accommodate heavy vehicle movements to industrial properties in the road and urban design, prioritising the safe interaction between light rail and heavy vehicle movements.
- Support the future town centre to develop an ecological and pedestrian priority street network with fine grained connections to Country.



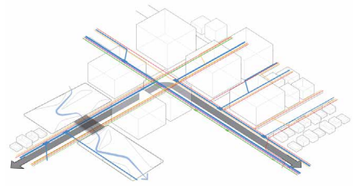
Place

- Maximise new tree plantings aligned with the potential future layout and character of the town centre's main street. New tree plantings would deliver shady and amenable environments for ecology, pedestrians and cyclists on the Sandown Line shared path and Grand Avenue.
- Minimise filling and excessive earthworks along the environmentally sensitive landscapes and existing ecologies.
- Maximise any opportunities for additional or new open space, with particular consideration for how these spaces would relate to the potential future town centre.
- Catalyse new functions of space such as up-zoning of land and the necessary open space provisions to support that.
- Provide more canopy coverage and environmentally sensitive planted areas throughout Camellia to mitigate the UHI.
- Recognise and embrace local and Aboriginal heritage by protecting heritage items and landscapes and preparing an interpretation strategy for their consideration within the project.
- Recognise and embrace Country, including the continuing connections held by local Aboriginal peoples, by prioritising ecology, supportive and accessible active transport and storytelling throughout the public domain and other built environment interfaces.



Choice

- Increase walking and cycling permeability to and from the Parramatta CBD and surrounding neighbourhoods to maximise transport mode choice for local journeys.
- Improve walking and cycling opportunities between Camellia and Rydalmere East via the new Camellia bridge.



Value

- Ensure the project provides for the ongoing use of industrial land in Camellia, which NSW Government strategic planning intends to retain.
- Minimise interaction with and impacts to critical utilities and services within the precinct.
- Ensure tree planting gives due consideration to the location of underground utilities, the requirements of utility providers, and requirements for contaminated sites.

6.4 Design place and movement outcomes

6.4.1 Sandown Line

Overview

The project would connect with Parramatta Light Rail Stage 1 at the western end of the existing Sandown Line, providing interchange between the Parramatta Light Rail Stage 1 Rosehill Gardens stop and the project's Sandown Boulevard stop.

The light rail alignment is dictated by the Parramatta Light Rail Stage 1 spur line to the stabling and maintenance depot, connecting to the Stage 1 main line with a triangular track arrangement. A new shared path would be provided along the southern side of the track alignment for the full length of the Sandown Line.

Built form

Two stop canopies would be constructed for the Sandown Boulevard stop, one on each platform, providing amenity and wayfinding for customers. The architectural design of the canopies would minimise visual impact to the existing visual setting, while also providing a positive placemaking contribution to the future town centre. Stop infrastructure and elements on platforms would be integrated to as much as possible to minimise clutter.

Power supply would be provided via a traction power substation located within the residual land.

Public space

A new shared path and vegetated landscape corridor would be delivered adjacent the light rail track zone along the Sandown Line. This would provide a new regionally significant east-west walking and cycling route and contribute to the urban tree canopy within the precinct.

Residual land

Residual land within the Sandown railway corridor not required for the permanent light rail corridor would be utilised to provide the shared path and tree planting.

Additional tree planting would be incorporated in available areas of residual land to provide shade and amenity for path users and screen adjacent industrial development for customers aboard light rail vehicles.

Stops as places

The Sandown Boulevard stop would be positioned as close as feasible to the Parramatta Light Rail Stage 1 Rosehill Gardens stop, at a distance of about 110 metres, to provide interchange for light rail customers now and in the future town centre. This stop is described in the context of the 'Future Sandown Boulevard' below.

The project would also allow for the future delivery of the Camellia East stop to serve the eastern portion of the future town centre.

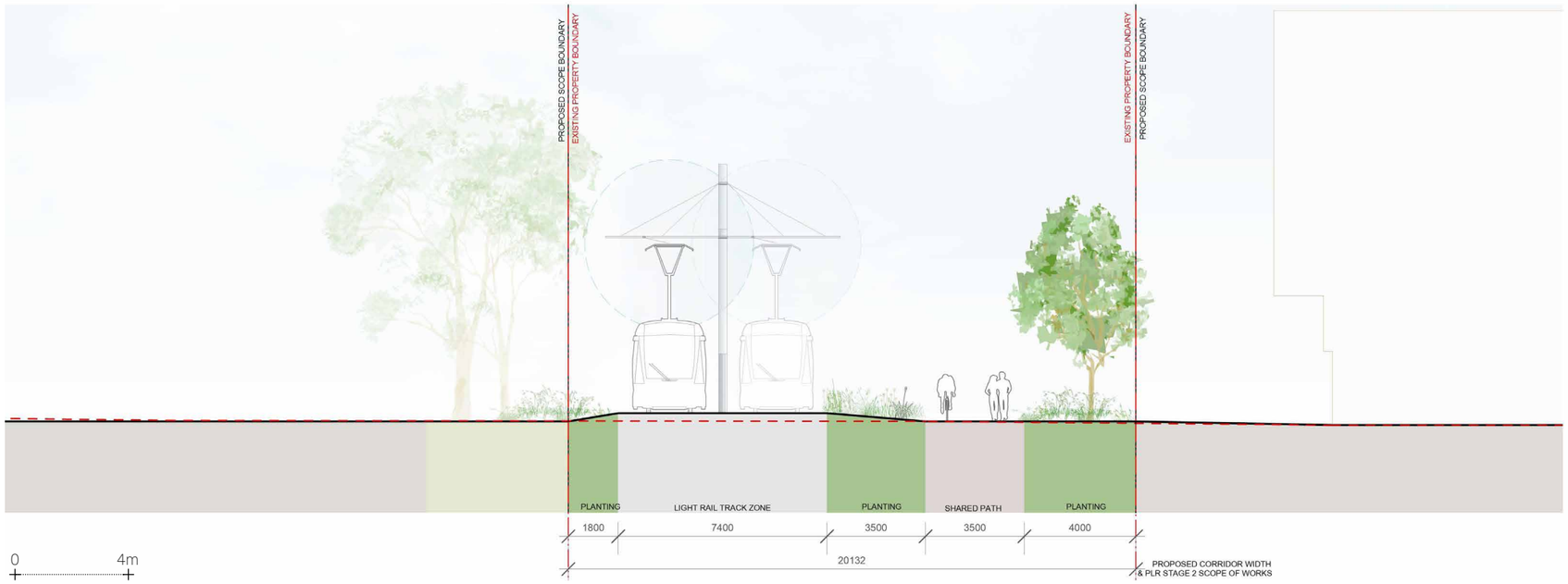


Figure 52: Cross section 02 - Sandown railway corridor (indicative only, subject to design development).

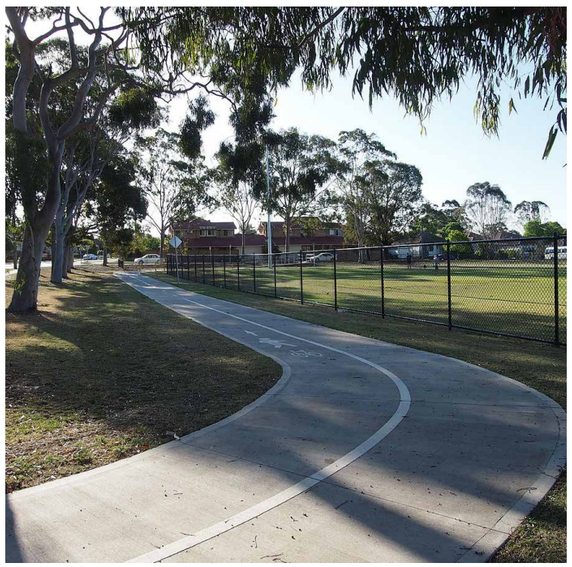


Figure 53: Shared path amongst mature tree planting (credit: City of Canterbury Bankstown).

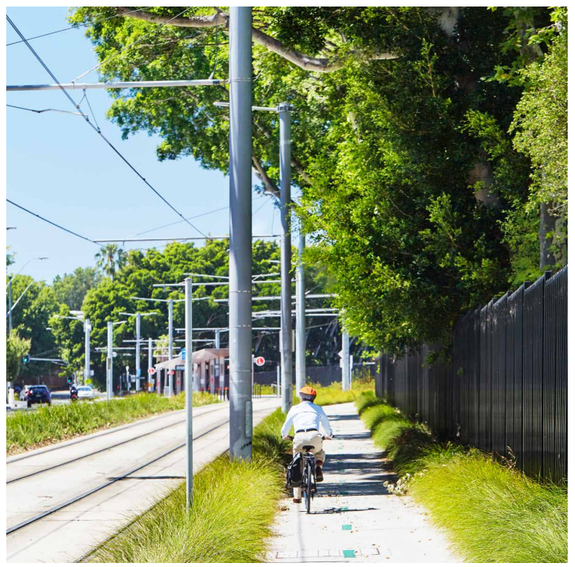


Figure 54: Light rail interface with shared path, Randwick, Australia (credit: ASPECT Studios).

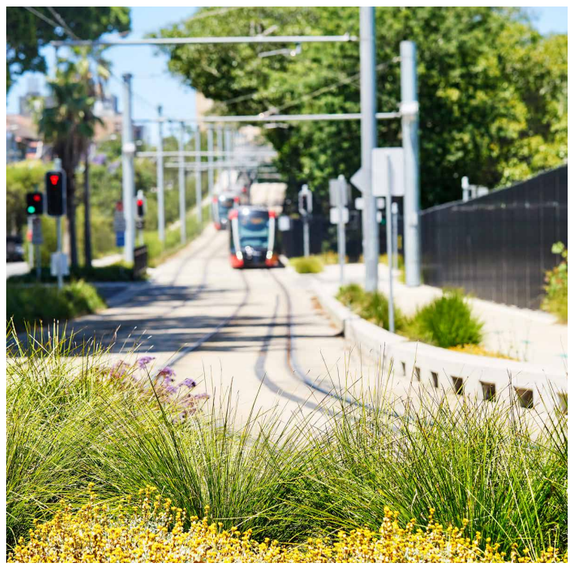


Figure 55: Light rail track with robust planting to edge, Randwick, Australia (credit: ASPECT Studios).

Transport integration

The shared path within the railway corridor would connect in the east to Grand Avenue and the new bridge over the Parramatta River, and in the west to the James Ruse Drive bridge. This would create a new regionally significant active transport connection through the precinct.

Future Sandown Boulevard

The light rail alignment through the future Camellia town centre would run along the precinct's premier street, Sandown Boulevard. Seamless integration of the light rail infrastructure and accompanying public domain with the broader street would ensure street life and activity occurs along the length of Sandown Boulevard. Pedestrian plazas would be established at stop precincts to prioritise accessibility and amenity for light rail customers.

The light rail alignment would sit centrally within the Sandown Boulevard road reserve, with a single vehicular travel lane in each direction on either side. A median would be provided between the light rail corridor and adjoining vehicular travel lanes to provide for safe pedestrian crossing along the full length of Sandown Boulevard and maintain precinct permeability. The median would incorporate areas of paving for pedestrian crossing movements, interspersed with biofiltration planting beds.

A verge would provide for car parking, street trees, and understorey planting. Street trees would provide continuous canopy cover along the length of Sandown Boulevard, improving amenity and supporting street activity essential for the town centre, as well as providing comfort for both light rail customers and the general public.

Signalised intersections at a number of points along Sandown Boulevard allow local traffic to cross the light rail corridor, while the remaining local streets provide left in / left out traffic access to and from Sandown Boulevard.

The town centre master plan will deliver a regional cycling facility along Grand Avenue. Local cycling access will be along Sandown Boulevard in mixed volume controlled traffic and a slow speed environment. Bicycle parking would be integrated within stop precincts.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of the Sandown Line.

The visual amenity of the Sandown Line would be improved through the landscape design, including canopy trees and understorey planting.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.

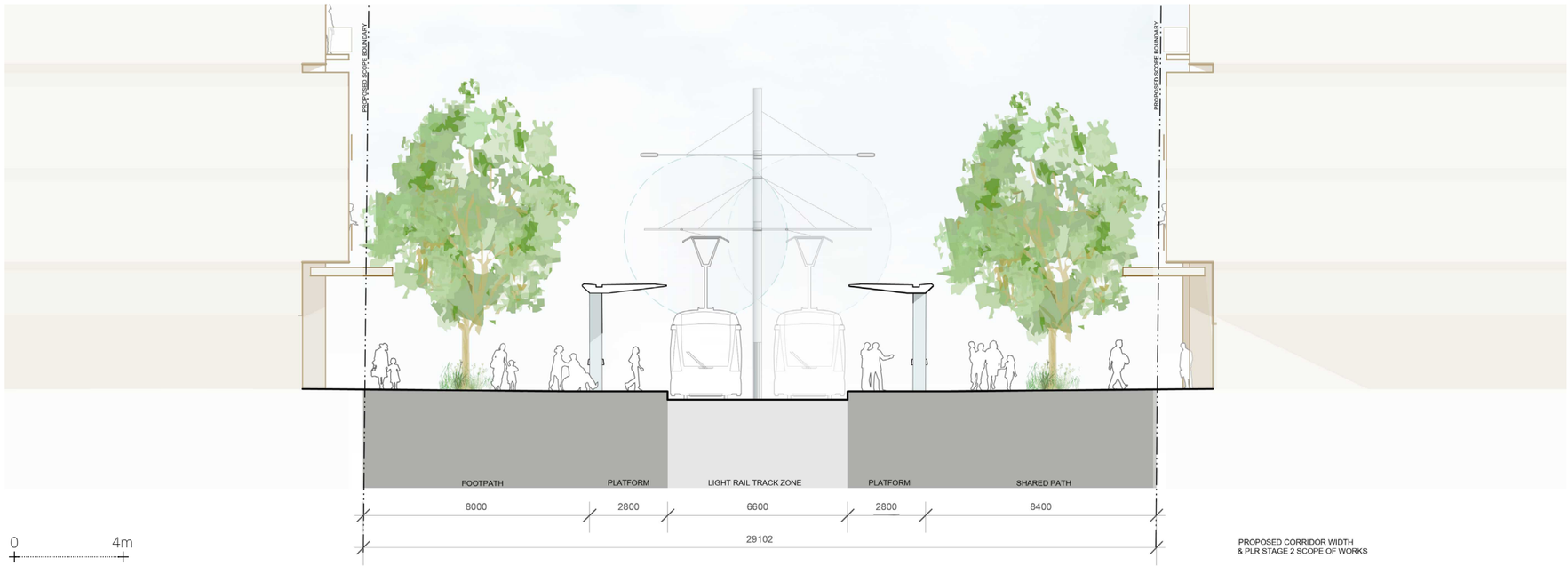


Figure 56: Cross section 03 - Sandown Boulevard stop integrated with potential Camellia town centre (indicative only - subject to design development).



Figure 57: Cross section 04 - Sandown Boulevard integrated with potential Camellia town centre (indicative only - subject to design development).

6.4.2 Grand Avenue

Overview

The light rail alignment would proceed along the northern edge of Grand Avenue with upgrades to the road layout to maintain road function and access to industrial properties on either side of the street. The alignment would be dictated by offset requirements to Sydney Water trunk mains in Grand Avenue.

The upgrades would include a new shared path, tree planting and landscape verge to provide pedestrian and cycle access to the Camellia Bridge.

At the eastern end of Grand Avenue the rail corridor would run along with separated pedestrian and cycle pathways, turn north, and become a bridge over the Parramatta River.

Three Sydney Water trunk mains run along Grand Avenue, two of which then run north-south along Thackeray Street and over the Parramatta River via the existing Sydney Water pipe bridge. No relocations are proposed to these assets.

Built form

Built form within this section of the project would be limited to the construction of the new bridge between Camellia and Rydalmere. This would include an abutment and bridge spans on the southern shore of the Parramatta River. Refer to Chapter 13 for more information on bridges.

Public space

A new shared path and street tree and understorey planting would be delivered adjacent the light rail track zone along the northern side of Grand Avenue. This would provide regionally significant east-west walking and cycling connections and contribute to the urban tree canopy.

Residual land

There may be an area of residual land to the east of Grand Avenue, where some of the land required to construct the project is surplus to the project's operational requirements. The final area of residual land would be subject to ongoing design development. A residual land management plan would be prepared which outlines the approach to managing residual land, including the future use of the land.

Stops as places

There are no stops proposed within this section of the project.

Transport integration

The shared path provided along the northern side of Grand Avenue would provide regionally significant connections between the new bridge over the Parramatta River and the Parramatta CBD via the Sandown railway corridor and bridge over James Ruse Drive.



Figure 58: Cross section 05 - Grand Avenue (indicative only - subject to design development).

Visual amenity

The project would result with a low magnitude of change to the visual amenity of Grand Avenue.

The visual amenity of Grand Avenue would be improved with the introduction median trees, layered planting, and paving finishes consistent with the local area. The light rail alignment along the northern side of the road reserve would allow for a continuous row of street trees and layered planting, providing visual screening to the light rail.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 59: Light rail track separated from road with buffer planting, Randwick, Australia (credit: ASPECT Studios).



Figure 60: Shared path with buffer planting adjacent light rail track, Randwick, Australia (credit: ASPECT Studios).

Chapter 7.0

7.0 Rydalmere East

7.1 Overview

7.1.1 Alignment summary

The alignment would cross the Parramatta River via a new bridge between Camellia and Rydalmere. The bridge and light rail alignment would land within Eric Primrose Reserve on the northern foreshore of the Parramatta River. The bridge abutment and light rail corridor would traverse the parkland and existing car park in a north-south direction.

The alignment would then run north along the western side of John Street before running east-west along South Street, creating a multimodal spine through the centre of the Rydalmere suburb.

The alignment would cross the significant barrier of Silverwater Road via a new bridge located on the alignment of South Street.

The alignment is shown in the context of its built and natural environment within Figure 61.

The project would comprise the following key places within the Rydalmere East precinct:

- John Street
- Nowill Street
- River Road.

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

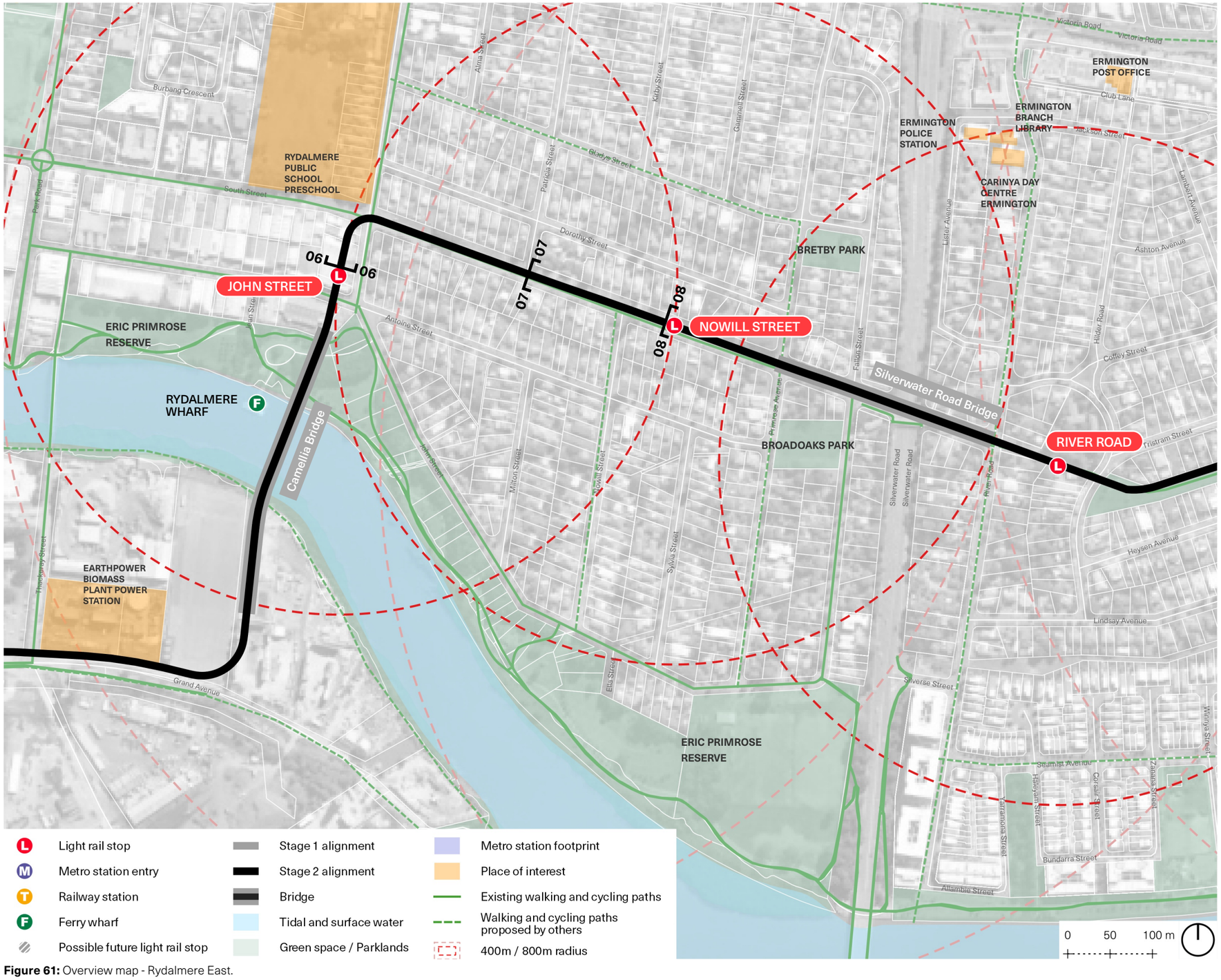


Figure 61: Overview map - Rydalmere East.

7.2 Designing with Country

Ngalawallah / A Gathering Space

Through the introduction of a new bridge over the Parramatta River, the Rydalmere East precinct is a significant piece of community infrastructure connecting communities north and south. As we work and design with Country for this precinct we must realise that, before colonisation, the river was never a barrier to connectivity. Instead this resource was an essential source of cultural, kinship and familial connections and a vital travel route.

Bridging the shorelines between Camellia and Rydalmere East, the precinct offers to return the river to the public, creating unique opportunities to tactically connect with Country, especially across Eric Primrose Park. Integrating local knowledges of bitterwater ecologies, human and ecological Songlines, ceremonies and tools of transport, the precinct can become a place where all people can learn from Country and enact culture. Prioritising living cultural practice the precinct should celebrate its role as ceremonial Country, and add to cultural and economic opportunities for local Aboriginal peoples.

Tucoerah / Diverse blending of ecologies and water systems

North of the Parramatta River steep ridges and rocky outcrops of sandstone define Country. As the light rail corridor travels north across the river it sits along the footholds of the first minor ridge in this vast interconnected system. Moving between Low Country floodplains and High Country sandstone coastal forests, these two interconnected but distinct areas are sacred to understanding and protecting Country.

The Rydalmere East precinct is the transition point between Low and High Country. Engaging with both significant ecological Songlines running through the river and rising topographical changes, the precinct offers a culturally rich context to embed and celebrate Country.

Wingara / Reading Country

Language is an important aspect of Country, and it reveals many diverse and complex aspects of culture and lore. Language also plays a vital role in how local Aboriginal peoples can see themselves, and their cultures, reflected in space.

For local Aboriginal peoples, Country is always named after what it is known for. Names are also not given to vast areas but are defined by very discrete moments, allowing people to easily read and respond to the landscape sustainably.

Along the shoreline of Rydalmere, Country is known as Wulumay (Common Sydney Language: snapper), a place where you can fish for snapper. The snapper is a sacred animal for local peoples, and parts of this Country have been named for its cultural importance.

Often misattributed as the name of a people, Wulumay is instead used as the name for specific locations where snapper can be readily found. Sometimes people residing in that place are referred to by that word, but this has been misunderstood by colonial recordkeepers as a fixed name (a subtle but crucial difference).

People living on Wulumay Country have been called Wulumadagal, meaning “the men of snapper Country” since colonisation. This omits all of the - galyun (women). Referring only to the men of a community is a reflection of the patriarchal society of the British and the imposition of their gender bias to local cultural language and knowledges.

To celebrate Wulumay Country across Rydalmere East, we remember the life-sustaining resources this Country provides and make a commitment to honouring local culture and stories.

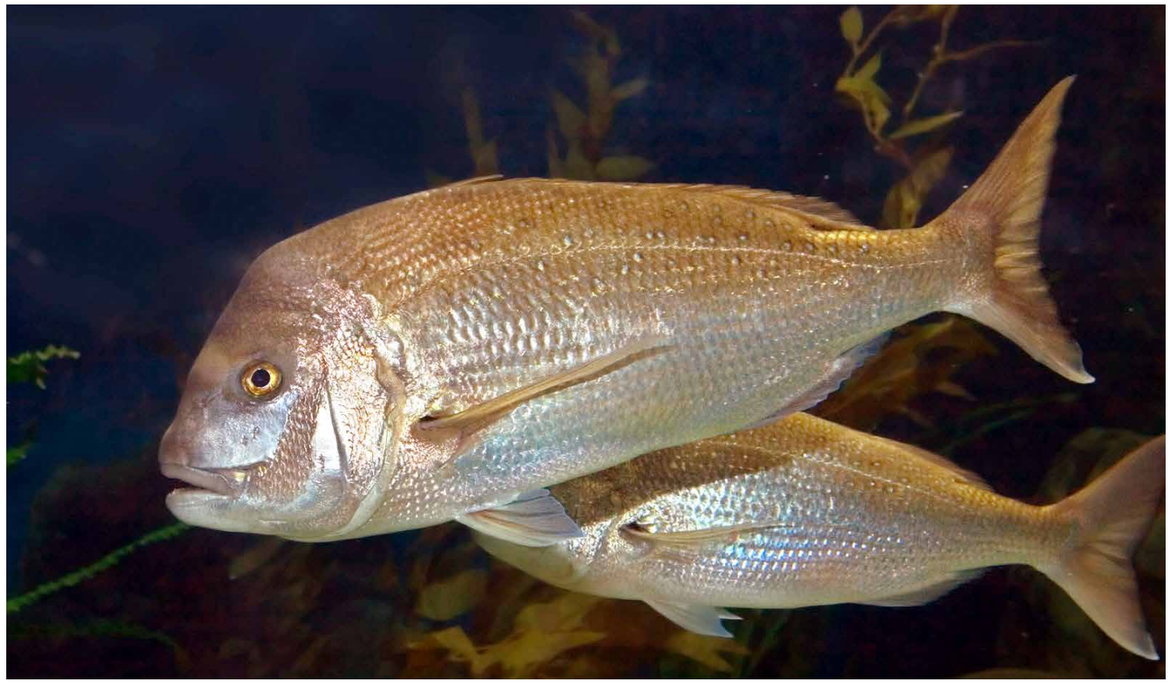


Figure 62: Colours and forms of Wulumay, the snapper (Credit: Wikimedia Commons).



Figure 63: Exposed sandstone ridge with Port Jackson fig sapling (Credit: Bangawarra).

7.3 Vision and principles

7.2.1 Vision

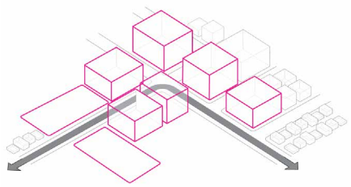
Crossing the shorelines of the Parramatta River, the Rydalmere East precinct is a new waterfront interchange connected to the culturally and ecologically rich stories of Country.

On the doorstep to the advanced technology and urban services sector employment lands at Rydalmere, the precinct would feature safe, amenable, and multimodal neighbourhood streets.

Together with rejuvenated neighbourhood open spaces, the precinct would invest in all peoples abilities to connect with Country by supporting the transport and social needs of existing and future communities of people and ecology.

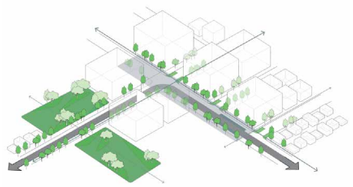
7.2.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. These are presented here under each of the project's design principles.



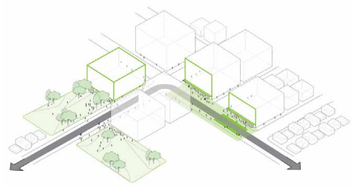
City shaping

- Reflect and celebrate the enduring spirit of Wulumay (the snapper).
- Design the new bridge over the Parramatta River to integrate with sensitive foreshore areas, maximise local connectivity, and provide new connections between areas of Sydney currently disconnected by the river corridor.
- Create a permeable, green, and accessible corridor on South Street, minimising potential negative impacts on local residents.
- Provide safe thoroughfare for light rail users, pedestrians, cyclists, and motorists, while maximising neighbourhood amenity and accessibility and minimising adverse impacts on street tree planting.
- Integrate as much as possible green and blue infrastructure, including street trees, planting, and permeable pavements, to maximise street amenity, minimise visual impact, and deliver a variety of social and environmental benefits for the project.
- Carefully consider property impacts against other urban design considerations to maximise the amenity of the future light rail infrastructure for everyone. Support sensitive public ceremonial/gathering places connected to the waterfront at Eric Primrose Reserve.



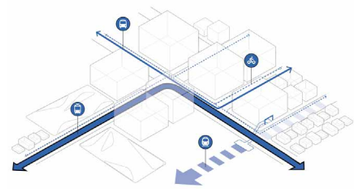
Connectivity

- Provide best practice active transport facilities on the bridge in addition to light rail services.
- Increase pedestrian permeability throughout neighbouring suburbs through new pedestrian links and integration with the Parramatta Valley Cycleway.
- Integrate east-west and north-south walking and cycling connections into the design of the light rail alignment and stop environments to maximise active transport convenience, choice, and connectivity.
- Maximise north-south permeability across South Street.
- Maximise access to stops from the surrounding neighbourhoods through the considered design of the public realm and road and pedestrian networks.
- Return travel between shorelines north and south of the Parramatta River to the public domain.
- Maximise visual connections from the alignment to adjacent areas of High and Low Country, and the mangrove tree tops lining the river.



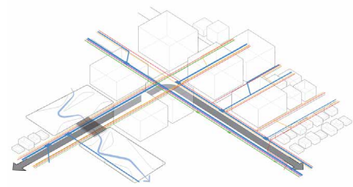
Place

- Use street trees to maximise street amenity, minimise visual impact, and deliver a variety of social and environmental co-benefits for the project.
- Maximised new street tree plantings, with due consideration given to the location of underground utilities and the requirements of utility providers.
- Maximise the retention of any existing significant trees and maximise the delivery of large street trees that increase canopy cover, including provision of adequate tree pit soil volumes to ensure optimal tree growth.
- Recognise and embrace local and Aboriginal heritage by protecting heritage items and landscapes and preparing an interpretation strategy for their consideration within the project.
- Celebrate the Songlines and journeying of significant river ecologies including snapper, mullet, and eels.
- Maximise and support opportunities for public social and ceremonial gathering spaces within the public domain to leverage the cultural context of High Country.
- Support sensitive public ceremonial/gathering places connected to the waterfront at Eric Primrose Reserve.
- Provide high quality habitat additions to support ecology and community connections to Country.



Choice

- Provide direct, intuitive, accessible and shaded connections between light rail and the Rydalmere Ferry Wharf, maximising the role the project plays in local transport opportunities and choice.
- Maximise transport mode choice for local journeys with direct, convenient and intuitive connections to the existing and planned future walking and cycling network, including the Parramatta Valley Cycleway.
- Prioritise people on foot and bicycle, and balance movement and place outcomes with best practice design of streets, footpaths, and cycleways.
- Develop places to rest and recuperate amongst vegetated corridors, increasing accessibility to active and public transport options and connections to Country.



Value

- Minimise impacts to existing large mature trees; if removal is warranted, relocate or replace trees with similar sized canopies.
- When designing the location of light rail infrastructure within South Street, take into account offset requirements from Sydney Water trunk mains, as well as the need for other critical utility infrastructure to remain insitu.
- Where existing overhead services are undergrounded, design verges to consider appropriate locations and arrangements for overhead light and wire poles, and associated utility boxes to avoid pathway disturbance.
- Support all existing landscapes, especially mature trees, by planting complete ecologies and associative lower and middle storey landscaping.

7.4 Design place and movement outcomes

7.4.1 Eric Primrose Reserve and John Street

Overview

Eric Primrose Reserve sits on the northern shore of the Parramatta River. The project alignment would enter the reserve via a new bridge over the Parramatta River between Camellia and Rydalmere.

North of the bridge landing, the alignment would run to the west of John Street to the John Street stop at the intersection of John Street and South Street. The stop, shown in Figure 64, would provide an opportunity to serve the industrial employment lands to the west, while catalysing future renewal of low density housing stock in Rydalmere.

Built form

Built form within this stretch of the project would include the construction of a new bridge between Camellia and Rydalmere. This would include an abutment and bridge spans on the northern shore of the Parramatta River within Eric Primrose Reserve. Refer to Chapter 13 for more information on bridges.

Stairs and ramps, constructed to the south of the John Street stop, would facilitate east-west walking and cycling connections where the track zone is at a higher level than the existing levels of John Street and Antione Street.

Power supply would be provided via a traction power substation located within the land adjoining the new car park access driveway.

Public space

The John Street stop would provide new public space connections between South Street and the Parramatta River foreshore via the provision of continuous walking and cycling facilities throughout the stop environment. These facilities would connect with existing footpaths and provide access south to the Parramatta Valley Cycleway.

Residual land

At the John Street stop, residual land would be retained as needed for public space, providing space within the stop environment for accessibility and passive surveillance requirements. There may be an area of residual land to west of John Street, where some of the land required to construct the project is surplus to the project's operational requirements. The final area of residual land would be subject to ongoing design development. A residual land management plan would be prepared which outlines the approach to managing residual land, including the future use of the land.

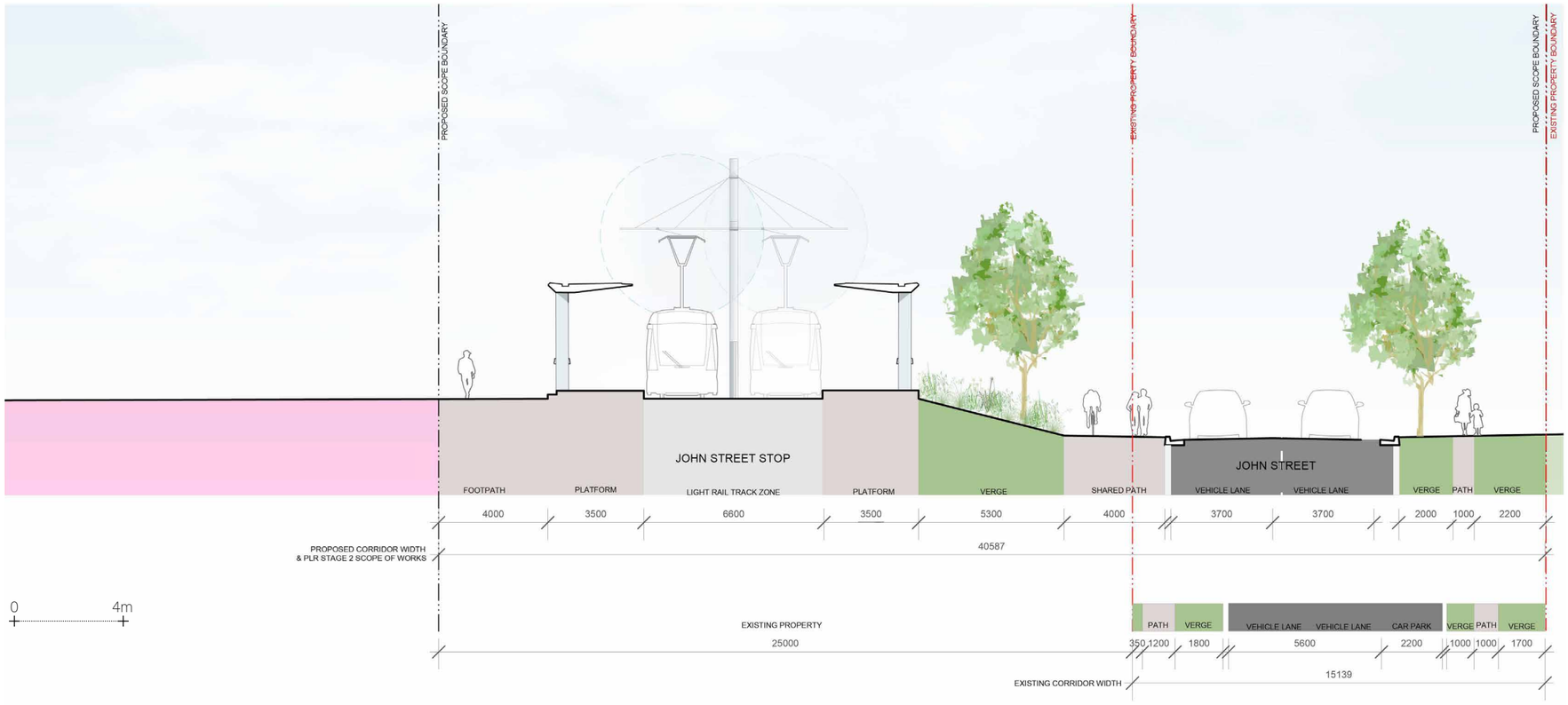


Figure 64: Cross section 06 - John Street stop (indicative only - subject to design development).

Stops as places

The John Street stop would be located west of the existing John Street roadway to allow for the vertical alignment requirements of the stop and platforms and accessible tie-ins with John Street and Antoine Street. Antoine Street would be closed where the project alignment traverses it, which would allow for the regrading of the stop precinct and optimal connectivity between the public domain and the ferry wharf and river foreshore.

A new signalised intersection would allow for the project to safely transition from the stop precinct to the South Street roadway.

Transport integration

The John Street stop would allow for interchange with Rydalmere Wharf via accessible and intuitive connections.

New walking and cycling connections would be provided between the new bridge over the Parramatta River, existing pathways within Eric Primrose Reserve, and new routes proposed as part of the project along South Street.

Walking and cycling facilities would be provided through the John Street stop precinct via a separated, bi-directional bicycle path in John Street. Bicycle parking would be integrated within the stop precinct, while pedestrian access would be provided via footpaths along both sides of the stop platforms.

Visual amenity

The project would result in a moderate magnitude of change to visual amenity in Eric Primrose Reserve and John Street. The majority of visual impact would be as a result of the new bridge between Camellia and Rydalmere.

Impacts to the visual amenity of Eric Primrose Reserve would be mitigated with improvements to the landscape design of the parklands. The visual amenity of the John Street stop would be improved through the landscape design, including street trees, understorey planting, and high quality stop and public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 65: Row of street trees screening light rail from adjacent residential buildings, Paris, France (credit: Gordon Stewart).

7.4.2 South Street

Overview

The project alignment would run along the centre of South Street east-west through the Rydalmere suburb, with a single lane of traffic on each side of light rail track zone.

Significant Sydney Water trunk mains run along South Street on the northern boundary of the road reserve within a wide existing verge. The project alignment along the street would be governed by offset requirements to the trunk mains. The detailed design of the northern verge, including location of kerbs, paths and tree planting, would occur in close coordination with Sydney Water and be subject to design requirements relating to the ongoing integrity of these assets.

Built form

South Street traverses a series of minor ridge lines that descends from Victoria Road to the Parramatta River and form an undulating landscape. Constraints on the vertical gradient of the light rail track zone would necessitate the construction of low-height retaining walls in the vicinity of the Nowill Street stop.

Two stop canopies would be constructed for the Nowill Street stop, one on each of the stop's platforms, providing amenity and wayfinding for customers. The architectural design of the canopies would integrate with the existing suite of canopies of Parramatta Light Rail Stage 1.

Public space

The project alignment on South Street would aim to catalyse the creation of a multi-modal street appropriate to the future development of a dense, urban neighbourhood, while retaining the existing heavy vehicle access requirement of the industrial lands of Rydalmere.

North-south walking and cycling access across the project alignment to the Parramatta River foreshore, playing fields, and parklands is important to local amenity and would be facilitated with a number of signalised crossings along South Street.

Residual land

There would be no residual land associated with the section of the project.

Stops as places

The Nowill Street stop would be located on South Street between Nowill Street and Primrose Avenue. The stop would adopt a side platform arrangement—one platform on either side of centrally located tracks—to maximise pedestrian accessibility and provide access to both ends of both platforms from adjacent footpaths and shared paths.

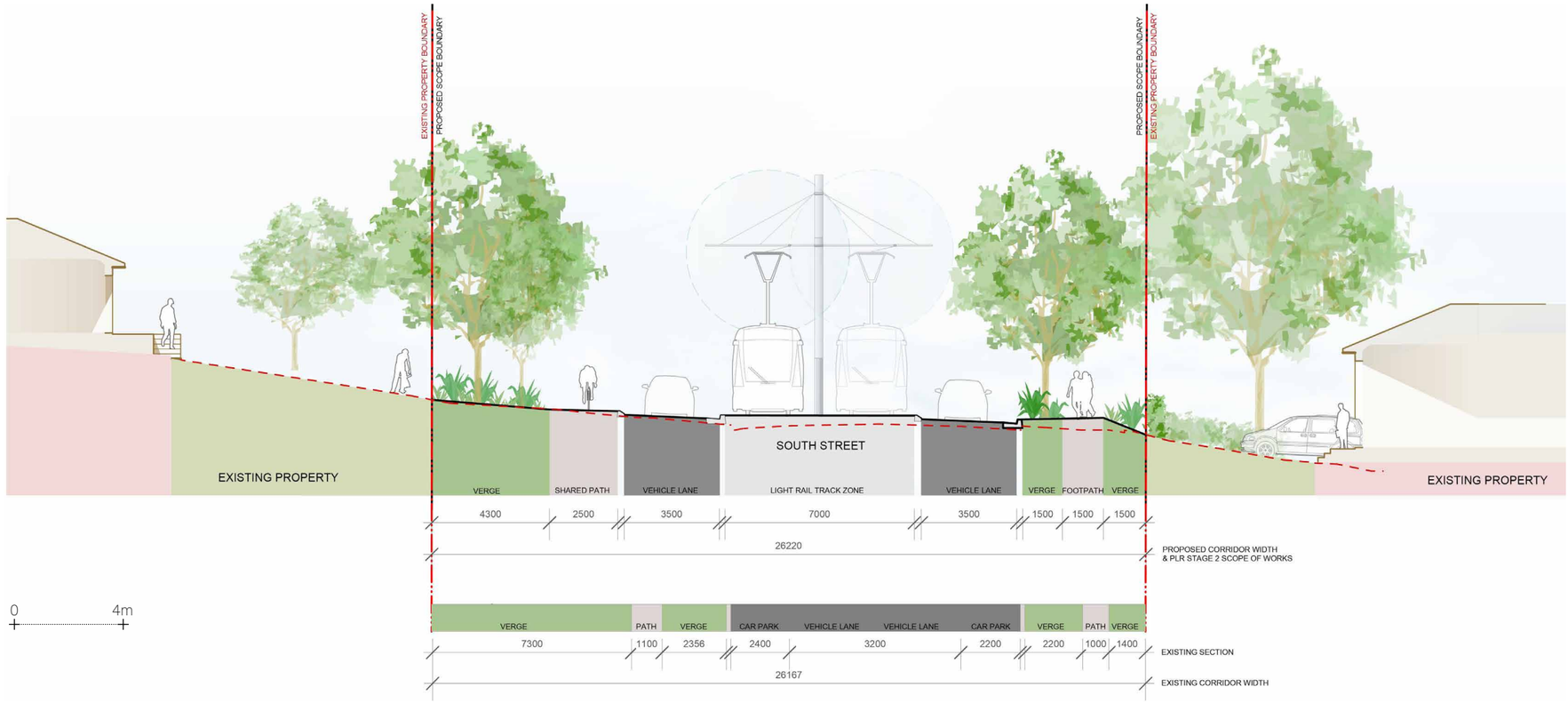


Figure 66: Cross section 07 - South Street (indicative only - subject to design development).



Figure 67: Light rail track to centre of road corridor, Kensington, Australia (credit: ASPECT Studios).



Figure 68: Light rail corridor with planted verge adjacent pedestrian path, Surry Hills, Australia (credit: ASPECT Studios).

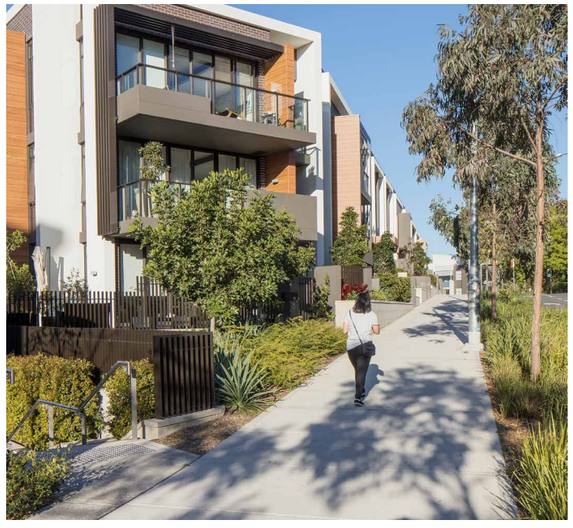


Figure 69: Dedicated pedestrian paths with street tree planting, Harold Park, Australia (credit: ASPECT Studios).

Both sides of the street would be provided with public domain fixtures that improve the amenity of the stop precinct, including benches, bins, and bike parking. Street trees would be planted wherever underground utilities allow. The stop arrangement and associated design outcomes are illustrated in Figure 70. Exemplar precedent imagery is provided in Figure 71, Figure 72, and Figure 73

Transport integration

Walking and cycling would be integrated into the design of South Street with a shared path on the northern side that forms part of a regional east-west active transport route through the Rydalmere suburb. Vehicle thresholds at side streets would provide priority for people walking and cycling along South Street.

The shared path would provide customers with convenient walking and cycling access to and from the Nowill Street stop and provide people walking and cycling within the neighbourhood with local access. This access would be supported by a footpath on the southern side of the street.

Bicycle parking would be integrated within the verge design of the Nowill Street stop environment.

Visual amenity

The project would result in a moderate magnitude of change to the visual amenity of South Street.

The project would include changes in the width of South Street roadway, to accommodate the alignment and stop platforms, resulting in a change in street character. The visual amenity of the road corridor and alignment would be improved through street tree and understorey planting within verges, and high quality stop and public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.

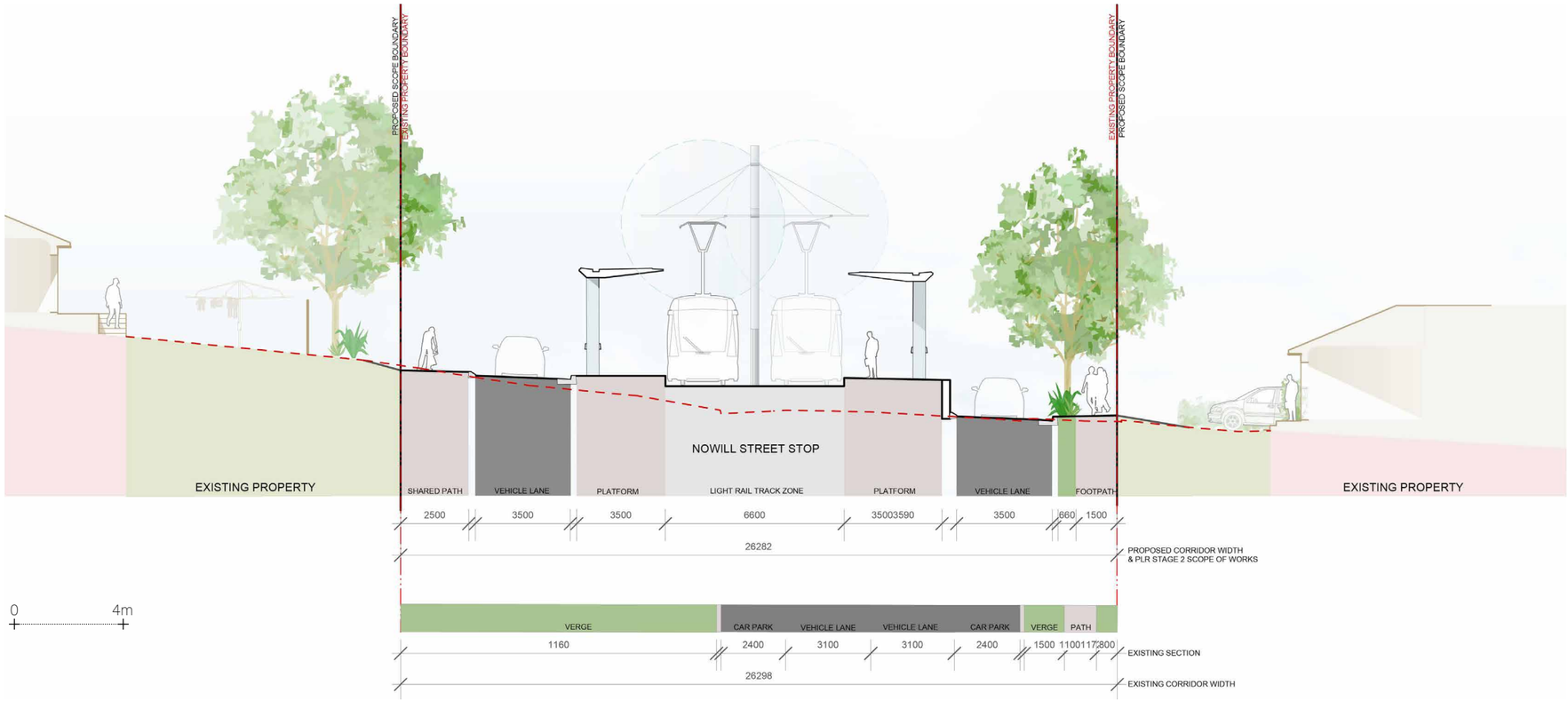


Figure 70: Cross section 08 - Nowill Street stop (indicative only - subject to design development).



Figure 71: Stop platform and alignment to centre of road corridor, Kensington, Australia (credit: ASPECT Studios).

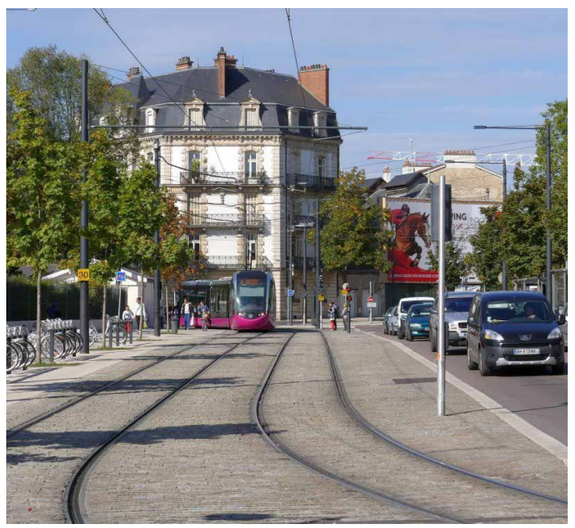


Figure 72: Light rail corridor adjacent to single lane streets, Dijon, France (credit: Gordon Stewart).



Figure 73: New street trees and pedestrian infrastructure, Harold Park, Australia (credit: ASPECT Studios).

8.0 Ermington

8.1 Overview

8.1.1 Alignment summary

The project alignment would cross Silverwater Road via a new bridge. The bridge would also incorporate a footpath and cycleway to provide walking and cycling connections between Ermington and Rydalmere.

The bridge would land in Ermington within South Street, between Silverwater Road and River Road. The alignment and adjacent shared path would then continue through the existing utilities easement between River Road and Hilder Road.

From Hilder Road, the alignment would run through the neighbourhood park Ken Newman Park, through the utilities easement, and then across the large sloping open space in the east of the park, providing an opportunity for the project to contribute to the park's placemaking potential. A shared path would be provided adjacent to the project alignment through Ken Newman Park.

The alignment and shared path would then run along Boronia Street towards Melrose Park, transforming this street into a new multimodal neighbourhood spine.

The project within the Ermington precinct is shown in the context of its built and natural environment within Figure 74.

The project would comprise the following key places within the Ermington precinct:

- River Road
- Ken Newman Park
- Murdoch Street.

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

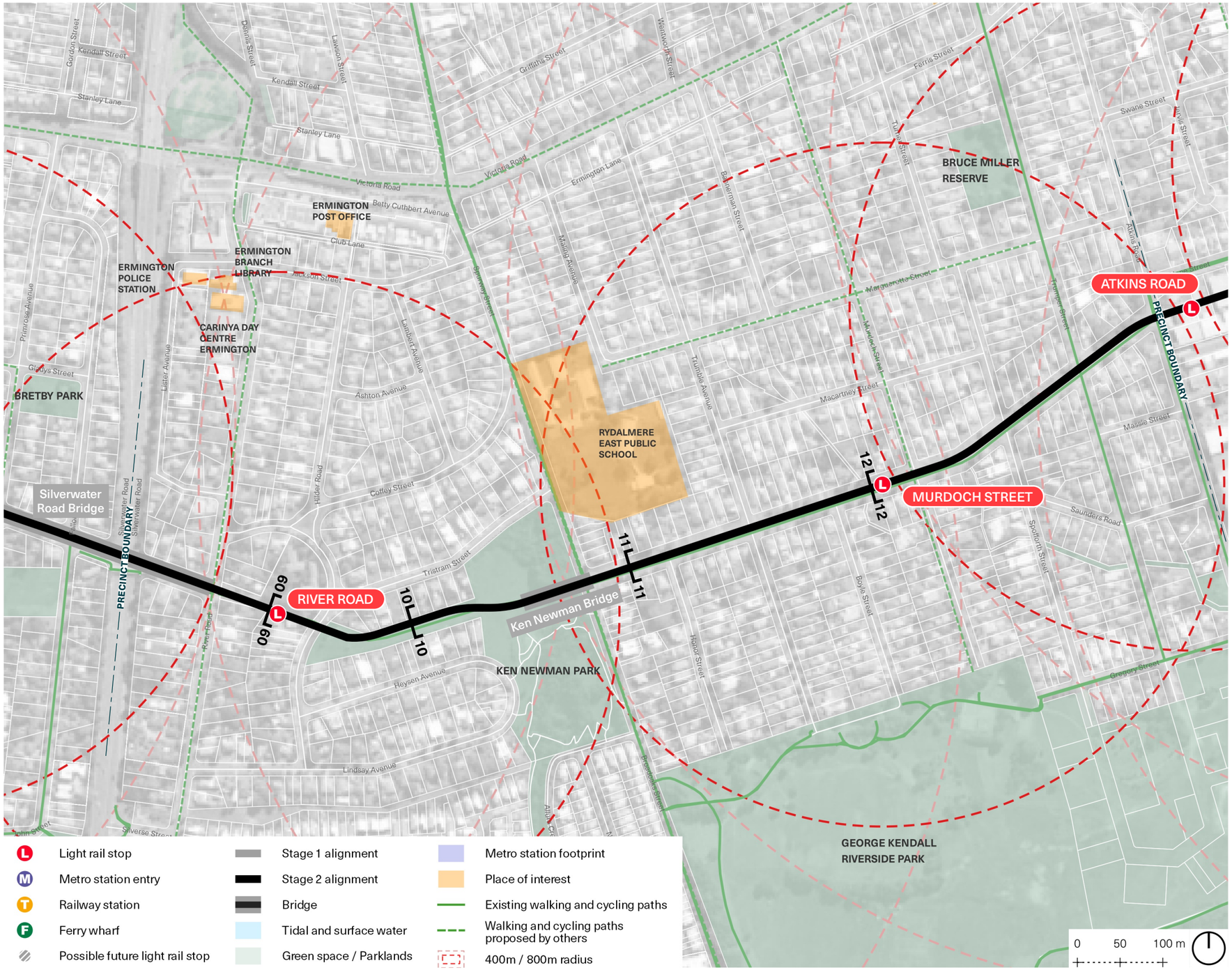


Figure 74: Overview map - Ermington.

8.2 Designing with Country

Ngalawallah / A Gathering Space

Protected from uninitiated onlookers, this High Country provides vital spatial resources to protect and pass on the most sacred and important knowledges. Across the extensive network of ridges north of the Parramatta River, senior Elders and Kordji (healers) from the entire kinship system are known to have used this Country to enact their most important ceremonies. Ascending the slopes while large lore meetings are being held south of the river on Low Country, Elders would light significant fires to signify that important cultural practice is being enacted, reminding all peoples below of their responsibilities to Country.

Respecting and celebrating this connection to High Country, the Ermington precinct is an important place to care for Country and ceremony. Protecting visual connections to northern High Country and creating places to gather would strengthen connections to significant surrounding parklands and the stories and culture embedded within. Through Country, the Ermington precinct would ensure that communities are safe and connected today, and into the future.

Tucoerah / Diverse blending of ecologies and water systems

Defined by sandstone slopes, ridges, rocky outcrops and shallow soils, this Country is nurtured by flowing streams of freshwater and pristine underground aquifers.

Elevated above saline and bitter water estuaries, Country and ecology transform into freshwater sandstone and shale forests. Supplementing the fertile mangrove environments below, the Ermington precinct continues to nurture transient coastal ecologies, while providing habitat and sustenance for many more diverse forest species.

Communities of open turpentine forest gums, eucalyptus, angophoras and corymbias define the landscape of this Country. When supported by robust and complete ecologies of associated shrubs and ground covers, these parts of Country supply the richest and most effective medicines and food.

Designing for these complete ecologies across the Ermighton precinct would ensure that the project helps to protect and sustain Country in the same ways that Country has always sustained and cared for local Aboriginal peoples.

Wingara / Reading Country

Elevated above the floodplain the Ermington precinct is Nattai Guard (D'harawal eora: freshwater Country). On this Country women have always protected freshwater lore and raised future generations amongst Dahl'wah (D'harawal eora: casuarina) groves.

As we listen to the wind rustling through leaves of the remnant ecological communities across Ermington, we remember and hear the old women: those who have always cared for this place. As freshwater streams flow down the escarpment to meet the saline ecologies below, we celebrate the healing freshwater and are reminded that we are connected to and accountable to all aspects of Country, both living and non-living, human and other-than-human species.

By celebrating and protecting freshwater across the Ermington precinct we can create vital connections to Country for local communities. By protecting and strengthening connections to Ken Newman Park, and the associated Allura Crescent bioswale (or creek) and George Kendall Riverside Park, we help people to read Country and experience freshwater through all layers of this diverse, built and natural environment.



Figure 75: Dahl'wah (D'harawal eora: casuarina) groves have always protected streams and women's freshwater lore (Credit: Bangawarra).

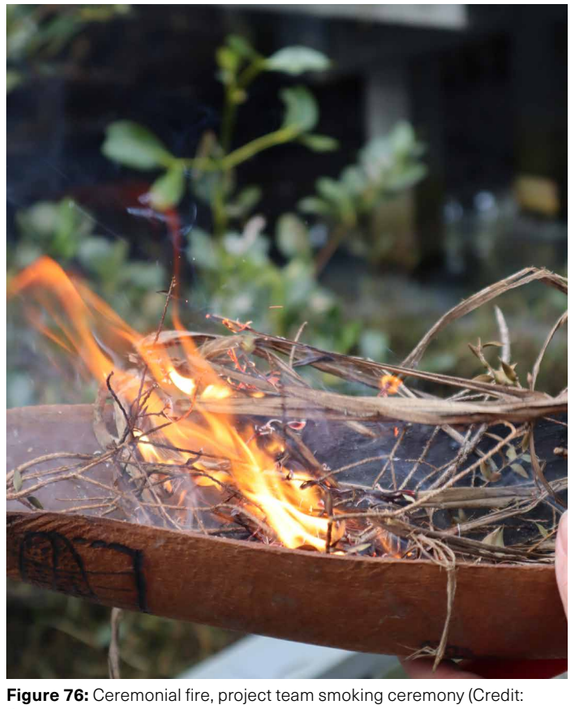


Figure 76: Ceremonial fire, project team smoking ceremony (Credit: Bangawarra).

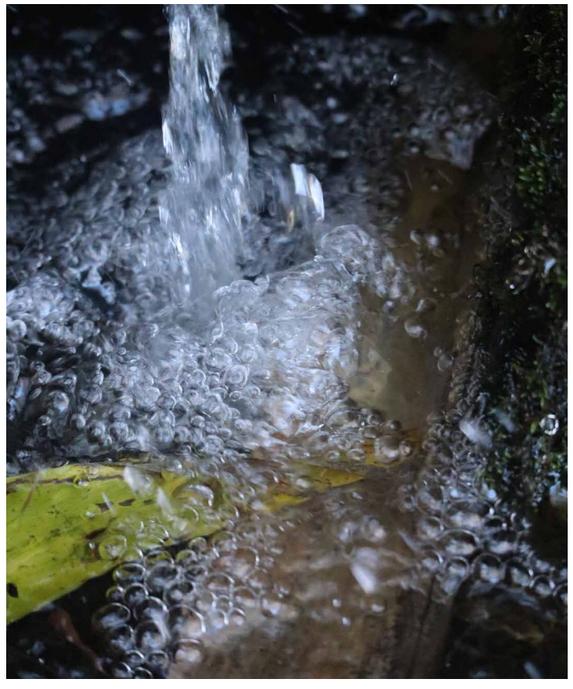


Figure 77: Bubbling freshwater waterfall (Credit: Bangawarra).

8.3 Vision and objectives

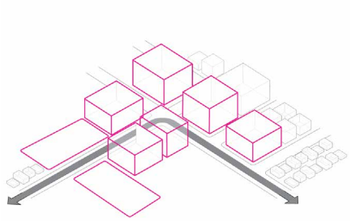
8.3.1 Vision

Located along the footholds of High Country, the Ermington precinct creates new safe, amenable and multimodal neighbourhood streets.

By protecting this sacred part of Country, the project would support the transport and social needs of existing and future communities alongside rejuvenated neighbourhood open spaces that are activated through the unique character of this Country.

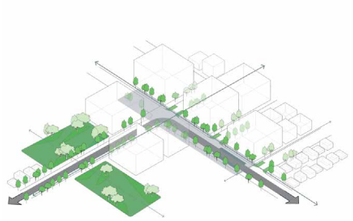
8.3.2 Objectives

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. They are presented here under each of the project's design principles.



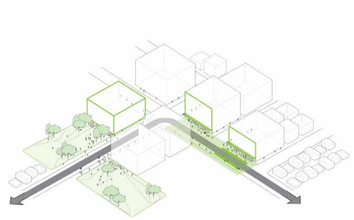
City shaping

- Reflect and celebrate the enduring spirit of Nattai Guard (freshwater Country).
- Maximise visual and physical permeability along and across the project alignment for walking, cycling and local traffic. Prioritise permeability, as much as possible, to integrate the project with the wider Ermington neighbourhood and its current or potential future movement patterns.
- Consider local movements within the neighbourhood, including access to local destinations such as parklands and schools, in the design of the project.
- Integrate as much as possible green and blue infrastructure, including street trees, planting, and permeable pavements, to maximise street amenity, minimise visual impact, and deliver a variety of social and environmental benefits for the project.
- Carefully consider property impacts against other urban design considerations to maximise the amenity of the future light rail infrastructure for everyone.



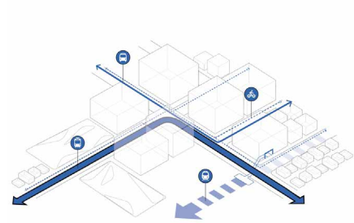
Connectivity

- Integrate new walking and cycling paths on the bridge over Silverwater Road with surrounding areas maximising local connectivity.
- Integrate a low-impact bridge structure into Ken Newman Park to provide east-west connectivity across the gully while providing an underpass for north-south connections within the park to maintain ecological, soil, fungi and human connections north-south through the park.
- Integrate east-west and north-south walking and cycling connections into the design of the light rail alignment and stop environments to maximise active transport convenience, choice, and connectivity.
- Integrate light rail infrastructure through best practice design of streets and open spaces, to maximise north-south connectivity across the alignment, prioritise people on foot and bike, and balance movement and place outcomes.
- Consider alternate routes that minimise local access issues to existing properties where necessary.
- Maximise visual and physical permeability across the corridor for people and cars to better integrate the project within the neighbourhood.
- Consider local destinations, such as parklands and schools, in the design of the alignment.



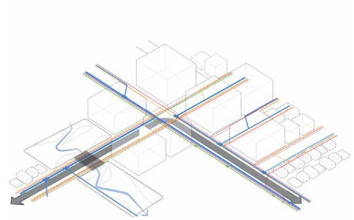
Place

- In collaboration with the local community and stakeholders, integrate Country-led design initiatives into the design of Ermington's key places, including Ken Newman Park, and stop precincts at River Road and Murdoch Street.
- Provide improvements to Ken Newman Park that increase its amenity and recreation offer, including continuous north-south and east-west walking and cycling connections along and across the project alignment; recreation facilities such as seating, shelters, and picnic areas; and green and blue infrastructure such as tree and understorey planting, raingardens, and bioswales.
- Explore designing with Country opportunities through multidisciplinary co-design-led consultations to deliver an integrated and considered design response.
- Celebrate the precincts connections to High and Low Country.



Choice

- Create a new public space and movement spine through the Ermington neighbourhood by providing comfortable walking and cycling facilities supported by street trees and understorey planting on Boronia Street.



Value

- Make improvements to Ken Newman Park that increase its amenity and recreation offer, and integrate light rail in a way that does not compromise its value as a neighbourhood public space.
- Minimise impacts to adjacent properties, streets, and open spaces through the design of the project alignment and necessary infrastructure and, in further design development, consider and mitigate community impacts as far as practicable.
- Consider, where impacts to local traffic movements are unavoidable, alternate routes that minimise local access issues to existing properties.
- When designing the location of light rail infrastructure within South Street, take into account offset requirements from Sydney Water trunk mains, as well as the need for other critical utility infrastructure to remain insitu.
- Where existing overhead services are undergrounded, design verges to consider appropriate locations and arrangements for overhead light and wire poles, and associated utility boxes to avoid pathway disturbance.

8.4 Design place and movement outcomes

8.4.1 River Road stop

Overview

The River Road stop would be located in an existing utilities easement between River Road and Hilder Road, Ermington. The stop would be positioned to provide light rail catchment for the portion of Ermington that lies on the eastern side of the divisive Silverwater Road corridor. The project alignment through the stop precinct would be governed by offset requirements to adjacent Sydney Water trunk mains.

Built form

Two stop canopies would be constructed, one on each platform, providing amenity and wayfinding for customers. The scale of stop canopies would integrate with the scale of the surrounding predominantly low-rise residential built form, while their architectural design would minimise visual impacts. Stop infrastructure and elements on platforms would be integrated as much as possible to minimise clutter.

The alignment of the light rail corridor through the stop precinct would be at a level that is above that of existing ground, necessitating a retaining wall on the southern side of the stop, as shown in Figure 78. The wall would be designed with materials and finishes that minimise its visual impact.

Public space

The River Road stop would provide new public space connections between River Road and Hilder Road via the provision of continuous walking and cycling facilities through the stop environment. These facilities would connect with existing footpaths and the planned future cycling route on River Road to provide access south to the Parramatta River foreshore and Parramatta Valley Cycleway.

The River Road stop would also be the main stop for accessing the improved Ken Newman Park (refer Section 8.3.2).

Residual land

Residual land not required for the project would be retained as open space within the stop environment, providing opportunities for landscape design as well as ensuring accessibility and passive surveillance requirements are achieved.

Open space would also allow for the provision of walking and cycling facilities through the stop precinct and additional tree planting for tree canopy cover and shade.

Stops as places

The place created by the River Road stop environment would extend the public space corridor of Ken Newman Park, connecting these places and providing a continuous corridor of public space across this portion of the Ermington neighbourhood.

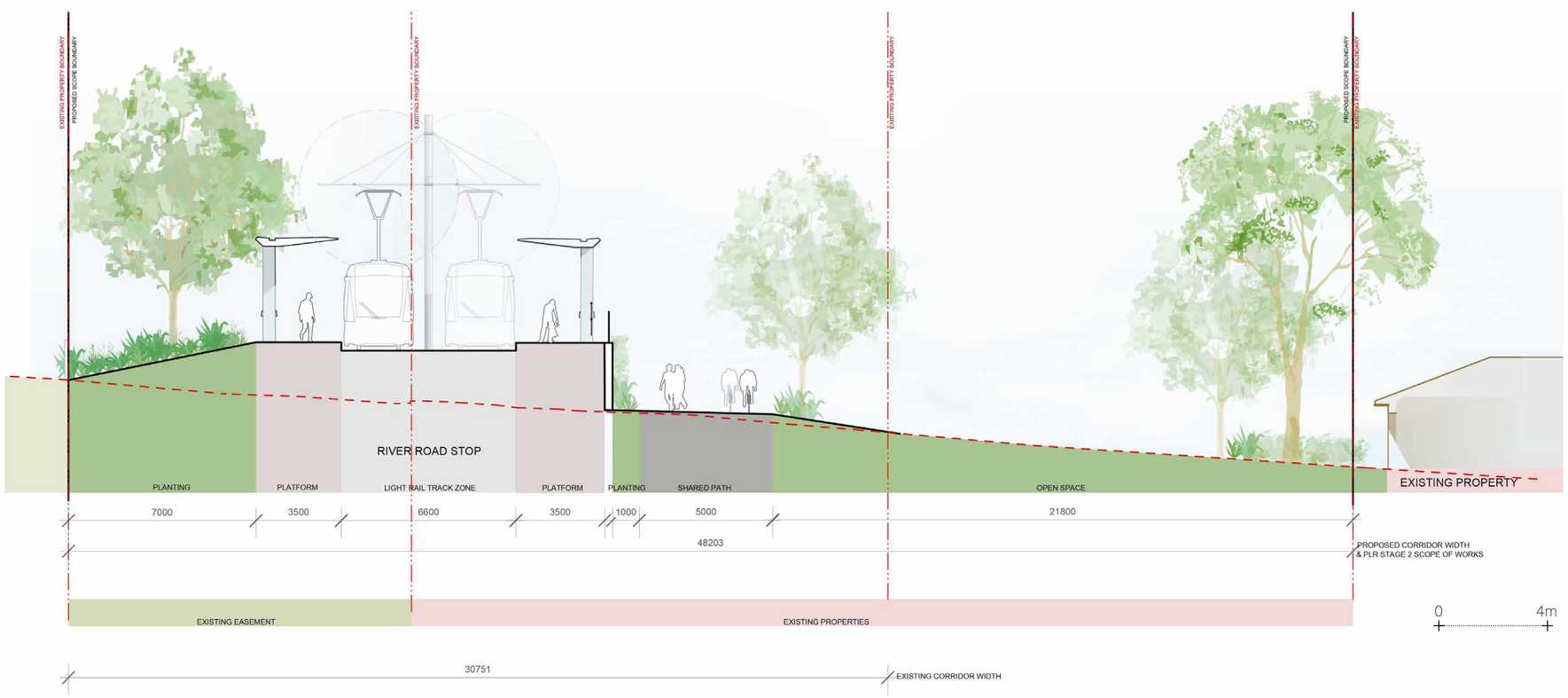


Figure 78: Cross section 09 - River Road Stop (indicative only - subject to design development).

Transport integration

Walking and cycling would be encouraged with the provision of a shared path to the southern side of the stop platforms. This would provide access to the platforms from their ends, as well as regional active transport connections through the stop precinct. Bicycle parking would be integrated into the design.

The River Road stop would also allow for connections to bus routes on Silverwater Road about 100m away (1-2 minutes) and Rydalmere Public School about 300m away (4 minutes).

Visual amenity

The project would result in a moderate magnitude of change at the River Road stop. The visual amenity of the stop environment would be improved through the landscape design, including street trees, understorey planting, and high quality stop and pavement fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 79: Light rail stop integrated with parkland setting, Randwick, Australia (credit: ASPECT Studios).

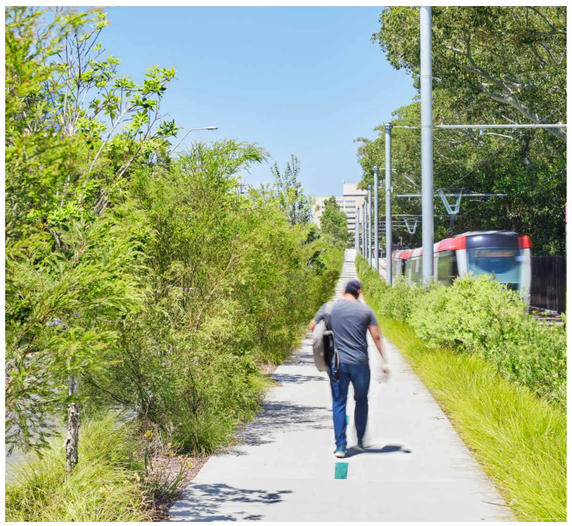


Figure 80: Shared path adjacent light rail, Randwick, Australia (credit: ASPECT Studios).

8.4.2 Ken Newman Park

Overview

The project alignment would run through Ken Newman Park via an existing Sydney Water trunk main easement between Hilder Road and Spurway Street. The alignment through the narrow easement in the western portion of the park would be optimised to mitigate as far as practicable ground borne vibration, airborne noise, and visual intrusion into adjacent properties, while maintaining offset requirements to the trunk mains.

In the eastern portion of the park the alignment would run through the centre of the existing turf slope before crossing a small gully to connect to the intersection of Spurway Street and Boronia Street.

Built form

The sloping nature of the narrow utilities easement would necessitate a retaining wall on the northern side of the light rail track zone. This wall is illustrated in Figure 81.

In the eastern portion of the park, the project alignment would traverse a small creek that runs north-south along the eastern edge of the park. This would require construction of a bridge, which is described in further detail in Chapter 13.

Public space

The light rail alignment through Ken Newman Park would provide an opportunity for the project to contribute to the placemaking potential of this neighbourhood park, located in the heart of a precinct that would likely undergo future uplift and renewal.

The park would be improved as part of the project with the provision of recreation amenities and facilities such as lookout and picnic areas and improved north-south and east-west walking and cycling connections. An indicative concept design is presented in Figure 85 on page 91.

The park has been identified as having moderate archaeological potential. This provides a source of inspiration for future design development , including incorporation of Country-led design opportunities. Potential impacts to archaeology would be managed and minimised throughout design development, which would respond to the results of heritage investigations.

Residual land

Residual land not required for the project would be retained as open space within Ken Newman Park and improved in line with the concept design presented in Figure 85 on page 91.

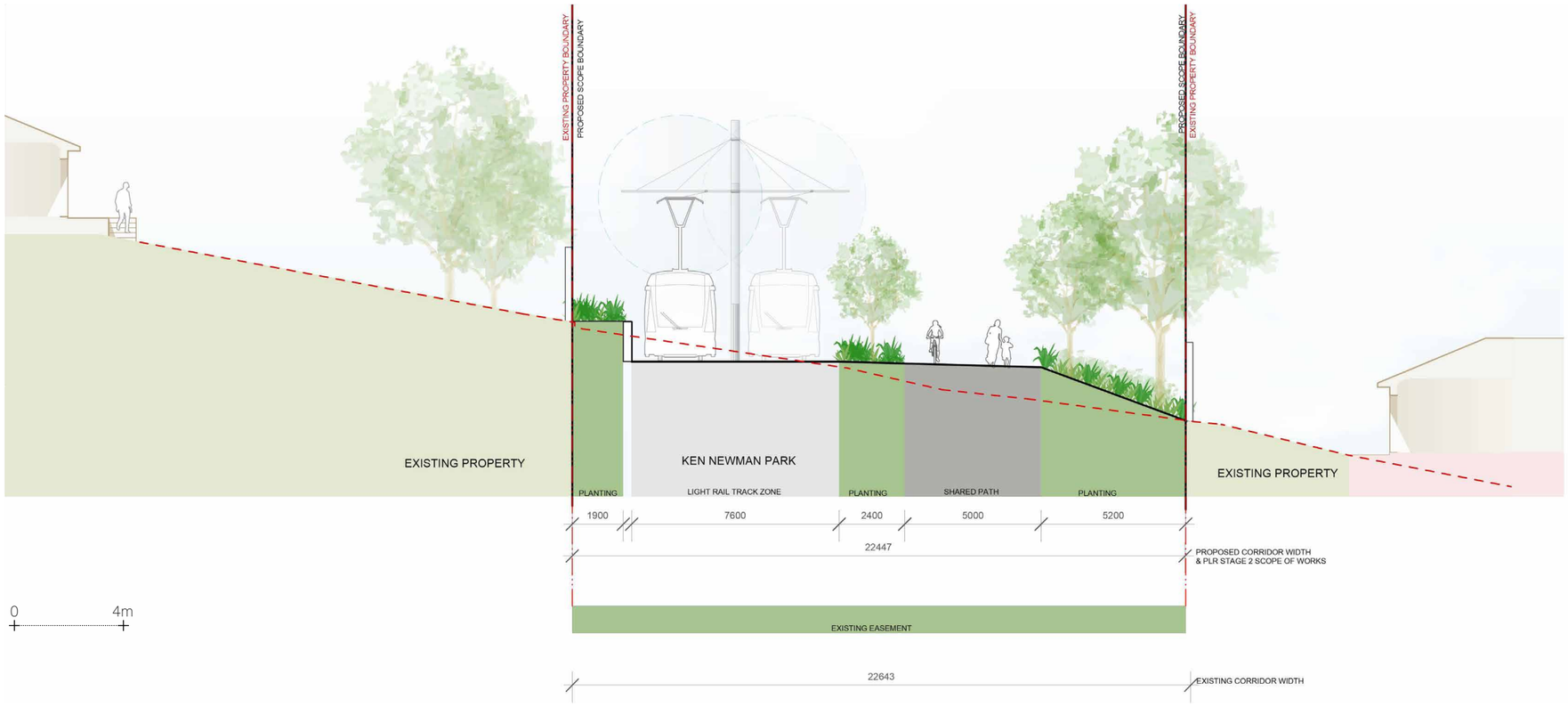


Figure 81: Cross section 10 - Ken Newman Park (indicative only - subject to design development).



Figure 82: Shared path through park, Prince Alfred Park, Sydney (credit: architectureau.com).



Figure 83: Shared path through park, Prince Alfred Park, Sydney (credit: architectureau.com).



Figure 84: Shared path adjacent light rail with buffer planting (credit: ASPECT Studios).

Stops as places

There are no light rail stops proposed within Ken Newman Park.

Transport integration

Walking and cycling through the park would be provided via an east-west shared path adjacent to the project alignment, providing a regional active transport route through the Ermington suburb that also significantly improves access to the park from nearby areas.

Embellishment of the park would also incorporate a variety of pathways that allow for local access to and within the park, including north-south walking connections and a crossing of the project alignment.

Visual amenity

The project would result in a high magnitude of change to visual amenity within Ken Newman Park.

The visual amenity of the park would be improved with the creation of new open spaces and recreation facilities, as well as new tree planting, understorey planting, and high quality public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 85: Ken Newman Park indicative concept plan.

Ken Newman Park indicative concept design

The light rail alignment through Ken Newman Park would provide the project with an opportunity to improve the amenity of the parkland, creating new recreation facilities that integrate and enhance existing facilities and characteristics of the site.

The concept plan would seek to utilise the topography of the site as its strength and would introduce:

- viewing platforms at the highest points of the park
- usable open turf areas for picnicking and casual recreation
- an informal creek trail along the existing drainage corridor.

Key considerations and objectives are discussed in relation to light rail, topography, and cultural interpretation

<u>Light rail</u>

- A safe light rail corridor through the park.
- Continuous active transport connection through the park, integrating with existing pathways where possible.
- Safe interfaces with existing and new parkland facilities.

<u>Topography and Open Space</u>

- Utilise bulk earthworks associated with the light rail project to create more usable areas of park.
- Celebrate the significant views afforded the northern portion of the park.
- Introduce a variety of parkland experiences via different responses to the site's topography, from tiered picnic spaces to trails along the drainage line.

<u>Culture and environment</u>

- Explore the Aboriginal significance of the site (to be undertaken with Bangawarra, not included in this concept design).
- Rehabilitate bushland areas associated with the existing drainage corridor.
- Revegetation of parkland with endemic and culturally significant planting.



Figure 86: Ken Newman Park indicative concept precedent images.

8.4.3 Boronia Street

Overview

The light rail alignment would run along the centre of Boronia Street, east-west through the Ermington suburb, with a single lane of traffic on each side of light rail track zone.

The light rail alignment along the street would be influenced by offset requirements to significant Sydney Water trunk mains on the northern boundary of the road reserve within a wide existing verge. The detailed design of the northern verge, including location of kerbs, paths and tree planting, would occur in close coordination with Sydney Water and be subject to design requirements relating to the ongoing integrity of these assets.

Built form

Boronia Street traverses a series of minor ridge lines that descend from Victoria Road to the river, which form an undulating landscape. The slope of the street between Spurway Street and Trumble Avenue is steeper than the maximum allowable gradient for the light rail, and therefore would necessitate the construction of retaining walls either side of the track zone to facilitate the alignments, climb up the steep section of street.

Two stop canopies would be constructed for the Murdoch Street stop, one on each platform, providing amenity and wayfinding for customers. The scale of stop canopies would be proportionate to the surrounding predominantly low-rise residential built form, while their architectural design would minimise visual impacts. Stop infrastructure and elements on platforms would be integrated as much as possible to minimise clutter.

Public space

Public space in the vicinity of Boronia Street includes the regionally significant George Kendall Reserve about 200 metres to the south. Bruce Miller Reserve is a smaller neighbourhood park located about 200 metres north of Boronia Street on Trumper Street.

Access to these public spaces is a priority for the project. The design of Boronia Street would seek to integrate light rail infrastructure and access requirements into a unified street design that maximises north-south permeability and ensures access to public space for walking, cycling, and local traffic is maintained.

Residual land

Residual land not required for the project occurs in two locations where property acquisition is unavoidable, however the final area of residual land would be subject to ongoing design development. A residual land management plan would be prepared which outlines the approach to managing residual land, including the future use of the land.

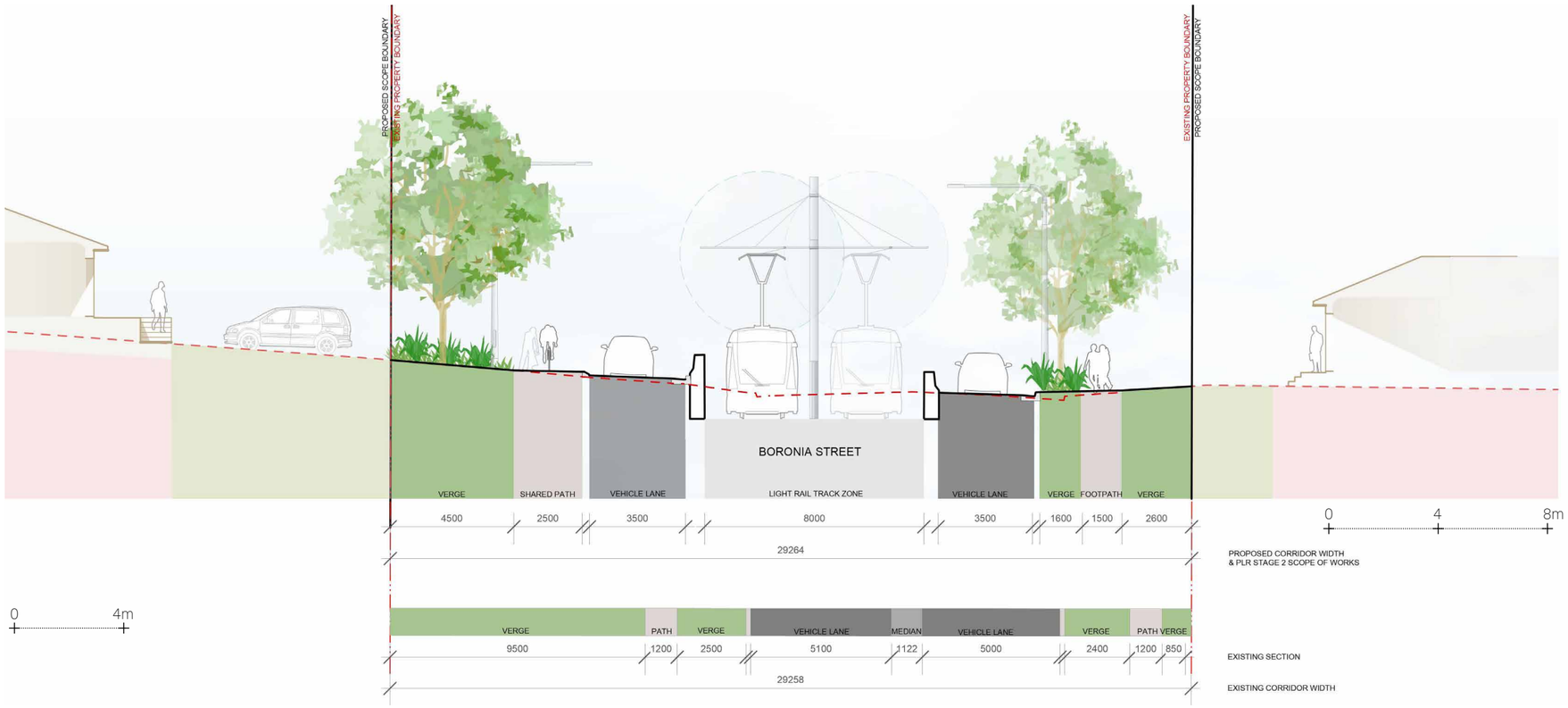


Figure 87: Cross section 11- Boronia Street between Spurway Street and Trumble Avenue (indicative only - subject to design development).



Figure 88: Separated pedestrian facilities integrated within a residential neighbourhood, Surry Hills, Australia (credit: Jason Packenham).



Figure 89: Significant vegetation within dedicated street setbacks, Constitution Avenue, Washington, USA (credit: John Gollings - Landzine).

Stops as places

The Murdoch Street stop would be located on Boronia Street between Murdoch Street and Boyle Street. The stop would adopt a side platform arrangement—one platform on either side of centrally located tracks—to maximise pedestrian accessibility and provide access to both ends of both platforms from adjacent footpaths and shared paths.

Both sides of the street would be provided with public domain fixtures that improve the amenity of the stop precinct, including benches, bins, and bike parking. Street trees would be planted wherever underground utilities allow. The stop arrangement and associated design outcomes are illustrated in Figure 90. Exemplar precedent imagery is provided in the below figures.

Transport integration

Walking and cycling would be integrated into the design of Boronia Street with a shared path on the northern side that forms part of a regional east-west active transport route through the Ermington suburb. Vehicle thresholds at side streets would provide priority for people walking and cycling along Boronia Street.

The shared path would also provide customers convenient walking and cycling access to and from the Murdoch Street stop and local access for people walking and cycling within the neighbourhood. This would be supported by a footpath on the southern side of the street.

Bicycle parking would be integrated with the verge design of the Murdoch Street stop environment.

Visual amenity

The project would result in a moderate magnitude of change in the visual amenity of Boronia Street.

The alignment would run centrally through Boronia Street, providing generous amounts of adjacent landscape space to a majority of the road corridor. The visual amenity of the project would be mitigated and improved through extensive street trees and layered planting within verges, public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.

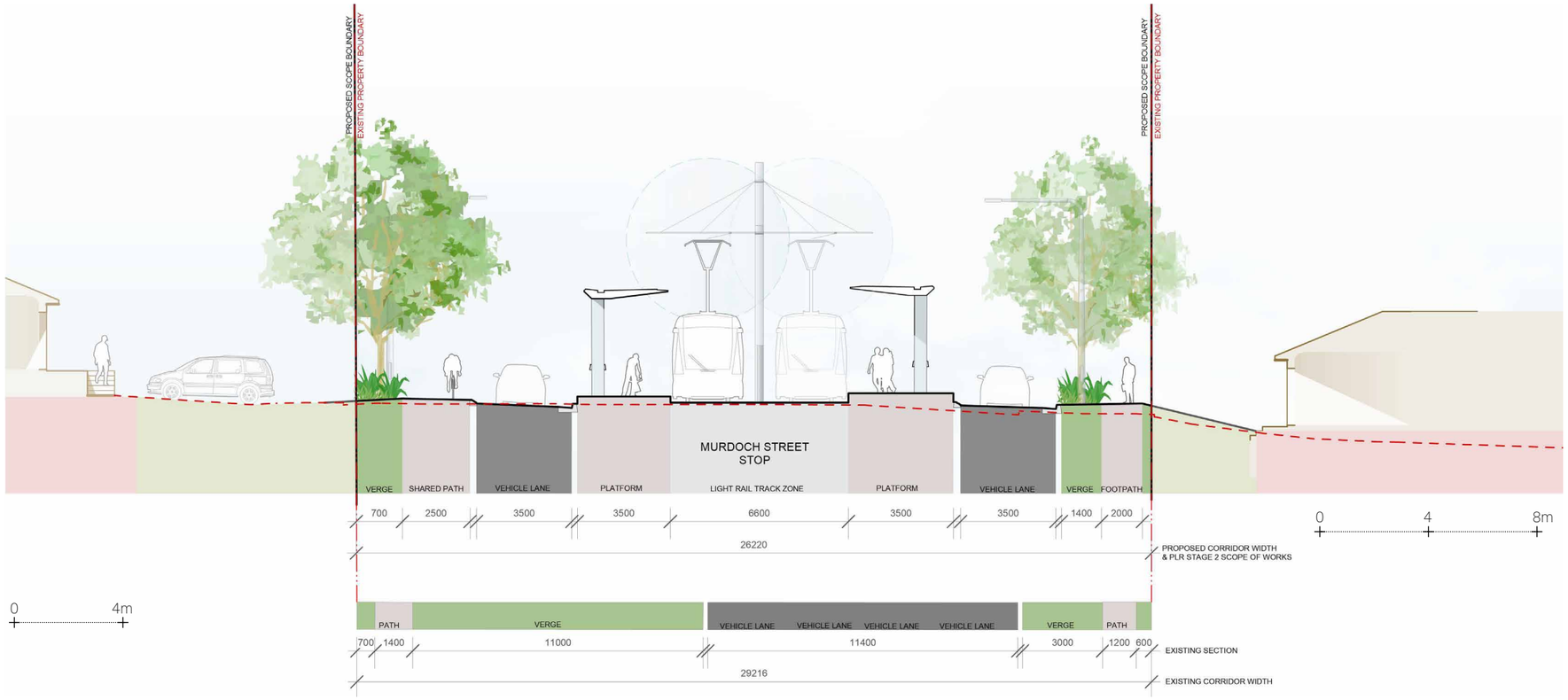


Figure 90: Cross section 12 - Murdoch Street stop on Boronia Street (indicative only - subject to design development).



Figure 91: Stop platforms within a residential setting, Dijon, France (credit: Gordon Stewart).

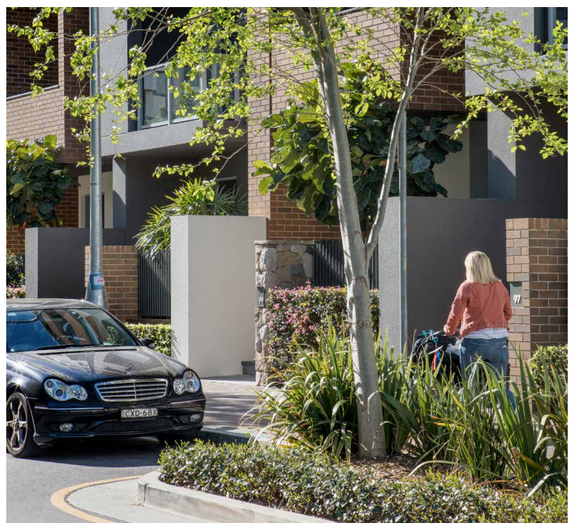


Figure 92: New street tree planting providing shade to active transport links, Harold Park, Australia (credit: ASPECT Studios).



Figure 93: Shared Path adjacent road corridor, Westlink M&, Australia (credit: Westlink M7).

Chapter 9.0

9.0 Melrose Park

9.1 Overview

9.1.1 Alignment summary

The project provides an opportunity to fully integrate the light rail corridor and its stop precincts with adjoining future development to ensure the urban design aspirations of both the project and adjoining planning proposals are achieved. Seamlessly integrating the light rail into the town centre's streets would create a corridor of continuous public domain, connecting thriving places, activating cross streets and catalysing town centre development that responds to the placemaking potential of light rail.

The Atkins Road stop would be located in the western portion of Melrose Park. The light rail alignment would run along the southern edge of the locally heritage listed property Bulla Cream Dairy (Willowmere), before turning onto the northern side of Hope Street.

Towards the east of Hope Street, the project alignment would meet the Melrose Park stop, which would be integrated with the future planned land uses of Melrose Park North. The alignment would then turn south and run along the centre of Waratah Street, with Waratah Street stop located at the southern edge of the precinct.

The alignment would then cross the Parramatta River via a new bridge between Melrose Park and Wentworth Point. This bridge is described in more detail in Chapter 13.

The project within the Melrose Park precinct is shown in the context of its built and natural environment within Figure 94.

The project would comprise the following key places within the Melrose Park precinct:

- Atkins Road
- Melrose Park
- Waratah Street.

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

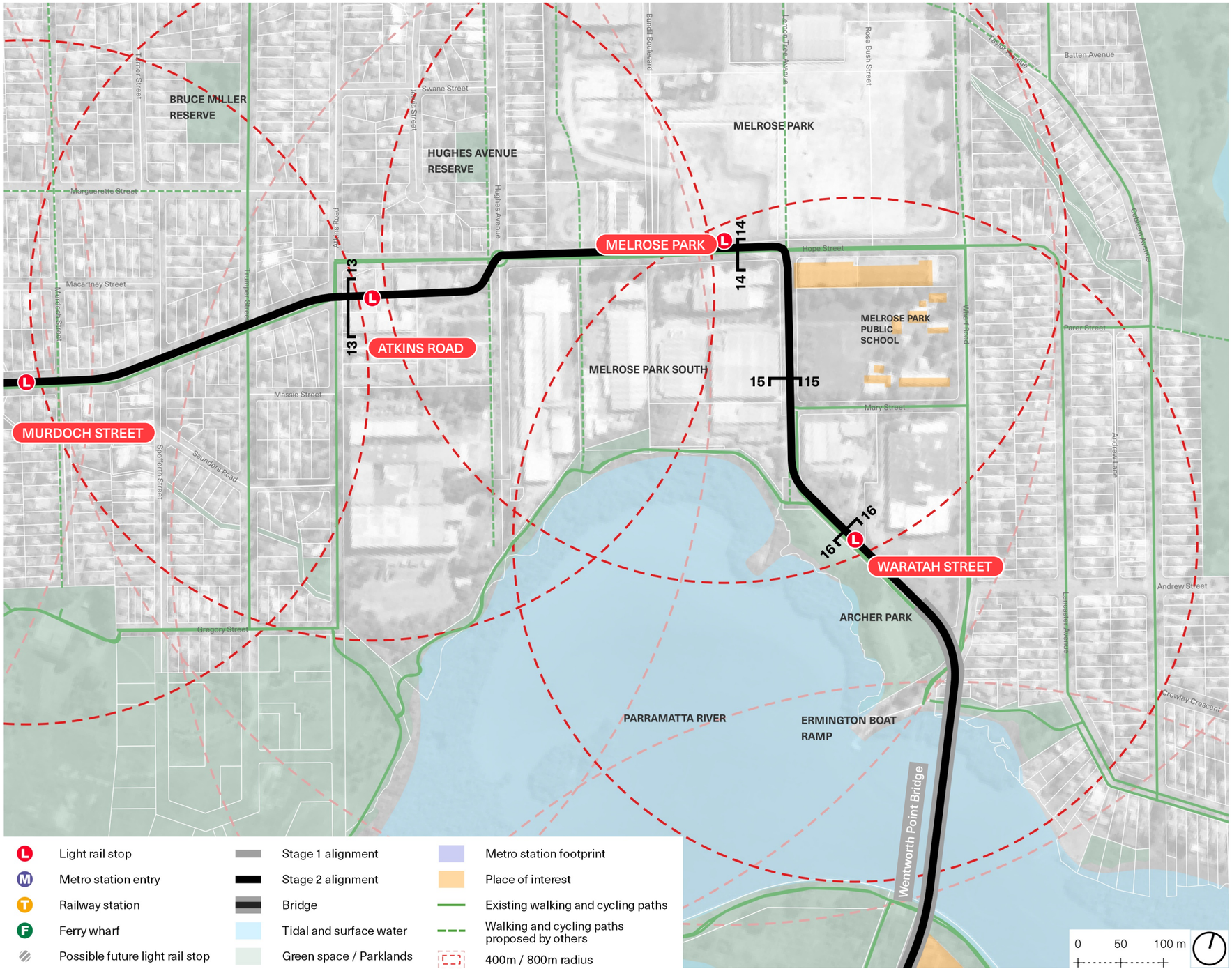


Figure 94: Overview map - Melrose Park.

9.2 Designing with Country

Ngalawallah / A Gathering Space

Travelling east back down into the floodplain, the Melrose Park precinct has the opportunity to protect cultural connections to Country and heritage by integrating, and returning to the public realm, the Bulla Cream Dairy (Willowmere) property. By prioritising Country within the restoration and reclamation of this artefact of colonial heritage, the precinct can create community-focused spaces where all people can come together and share in the diverse and complicated histories of Country.

With an elevated aspect overlooking the Parramatta River, the precinct can allow for community gathering that celebrates cultural practice and the site's connections to High and Low Country. Overlooking mangrove tree-topped ecologies to the south, the precinct may also be a catalyst to protect visual connections towards Top Ryde (which is a significant High Country ceremonial site for the Elders of the entire kinship system) to the north-east as the future of Melrose Park develops.

Tucoerah / Diverse blending of ecologies and water systems

The Melrose Park precinct is located on the interstitial plain between High Country ridges north and the saline waters south. As the freshwaters run off the major sandstone ridge from the sites north across Ryde, they meet the tidal flows of Parramatta River, again creating the rich and diverse Tucoerah environment. Connected to culturally and ecologically rich environments of High and Low Country, Melrose Park is another transition point that can allow the project to protect and care for the water systems of this Country.

The precinct can play a vital role in ensuring that when the two water systems meet there is a buffer between dense urban environments and the protected natural environments surrounding the site in the healthiest and cleanest manner possible. Alongside this care of Country, Melrose Park can facilitate natural, accessible and all age appropriate tactile spaces to play and learn from Country and blending water systems.

Wingara / Reading Country

The enduring spirit of this Country celebrates the white-bellied sea eagle who, even today, can be spotted flying through Sky Country along the mangrove lined shoreline of Melrose Park. Roosting and raising their future generations along the river in the wetlands of the Parramatta River, resident pairs of white-bellied sea eagles continue to thrive on this Country through the careful management and protection of Country as their habitat.

Celebrating and protecting the ecologies that sustain these important animals across the Melrose Park precinct, we support the continuation of their story on Country. Integrating sensitive design and engineering that protects the mangroves of Parramatta, the Melrose Park precinct can also create spatial connections to Sky Country through the travel route of the light rail and the public domain, so that all people can connect to these birds on the land as they sore through the sky.

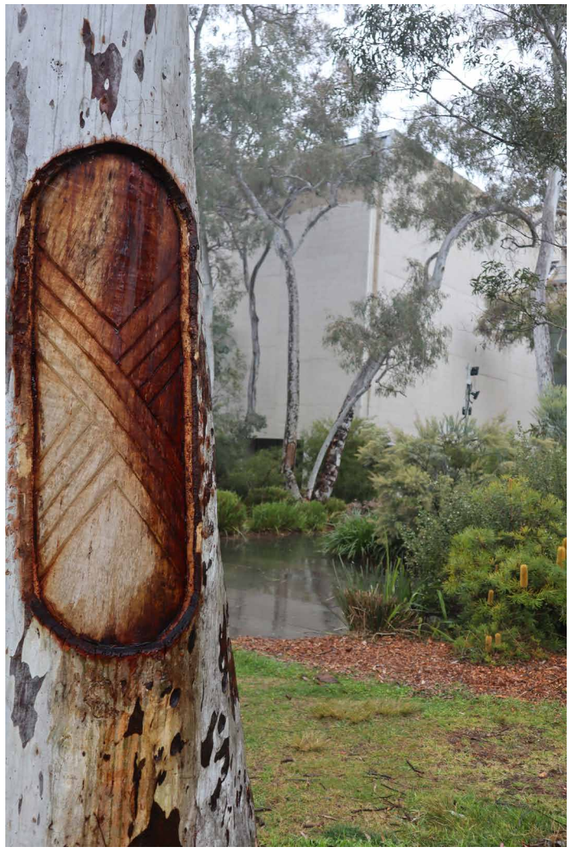


Figure 95: Shared heritage and history. Mulanggari yur-wang (alive and strong) at the National Gallery of Australia, by Aunty Dr Matilda House & Paul Girrawah House (credit: Bangawarra).



Figure 96: Street typologies designed to create complete ecologies with dwarf eucalyptus planting in verge providing shade and amenity to active transport links shared path (credit: Bangawarra).

9.3 Vision and principles

Vision

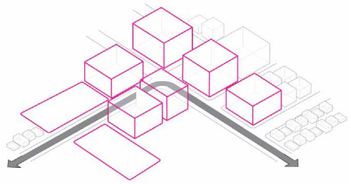
The Melrose Park precinct offers the opportunity to care for and heal all parts of Country and heritage.

As a catalysing element for the ongoing evolution of the planned Melrose Park town centre, the light rail provides a stop precinct that is integrated with future retail and community offerings.

New neighbourhood streets can provide an opportunity for the precinct's renewal to be oriented towards a new multimodal spine that celebrates journeys through Country.

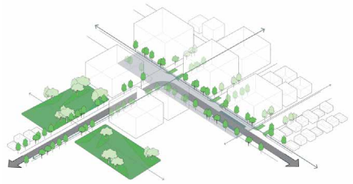
Objectives

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. These are presented here under each of the project's design principles.



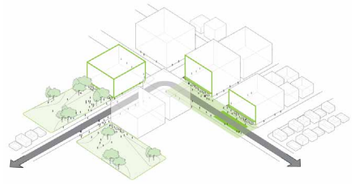
City shaping

- Reflect and celebrate the enduring spirit of the White-bellied Sea Eagle.
- Provide a light rail alignment and public domain design that encourages the future Melrose Park town centre to orient its land uses towards a comfortable, accessible, and shaded high street and stop precinct where pedestrian convenience and amenity is prioritised.
- Balance the existing function of the precinct with future redevelopment proposals to ensure the project's integration with existing and future conditions.
- Consider the desired outcomes and visions included in local plans for Melrose Park including the Melrose Park northern and southern structure plans.
- Celebrate all of the diverse and unique elements of Country, including shared heritage and significant ecologies to instil care of Country into existing and future communities.
- Leverage the opportunities of both Archer Park and Atkins Road stop (including the Willowmere property) to create a diverse, connected, and activated precinct.



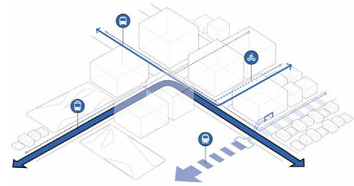
Connectivity

- Integrate north-south bicycle connectivity along Waratah Street and east-west along Hope Street with the design of the light rail corridor and surrounding streets and stop precincts, via separated off-road cycle facilities, to provide regionally significant active transport connectivity.
- Increase pedestrian permeability throughout neighbouring suburbs through new pedestrian and cycle links, and integration with the Parramatta Valley Cycleway.
- Maximise connectivity across the corridor, prioritise people on foot and bike, and balance movement and place outcomes with best practice design of streets and public domain.
- Celebrate and protect visual corridors south to Low Country, including the mangroves along Archer Park, the Parramatta River, and Wentworth Point.
- Protect existing connected mangroves buffering the northern shoreline of Parramatta River.



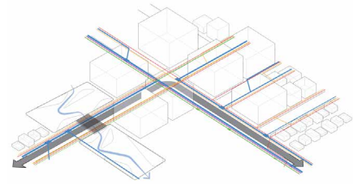
Place

- Minimise filling and excessive earthworks along the environmentally sensitive landscapes and existing ecologies within Melrose Park.
- Prioritise revegetation in known ecologically endangered habitats within Archer Park, and along the waterfront.
- Create sensitive connections with significant existing ecologies and create new green public spaces to increase community care of Country and support healthy ecologies.
- Recognise and embrace local and Aboriginal heritage by protecting heritage items and landscapes and preparing an interpretation strategy for their consideration within the project.
- Create a precinct of education, exploration and care that is embedded within the Ancestral knowledges of Country.
- Prioritise diverse landscaping and public domain responses to create many nodes of ecology.



Choice

- Prioritise walking and cycling for local journeys to and within the town centre.
- Maximise transport mode choice for local journeys with direct, convenient and intuitive connections to the existing and planned future walking and cycling network, including the Parramatta Valley Cycleway.
- Prioritise people on foot and bicycle, and balance movement and place outcomes with best practice design of streets, footpaths, and cycleways.



Value

- Design vehicular traffic circulation, including heavy vehicle routes, to contribute to the vibrancy of a high street and town centre, with carefully considered provision for parking and precinct circulation that does not dominate or detract from town centre amenity.
- Take account of offset requirements from Sydney Water trunk mains in the location of light rail infrastructure within Hope Street.
- Fully consider all the details between the public domain and private boundary to achieve high quality finishes along the corridor.

9.4 Design place and movement outcomes

9.4.1 Atkins Road stop

Overview

The Atkins Road stop would be located to the south west of the existing locally heritage listed Bulla Cream Dairy (Willowmere), between Atkins Road and Hughes Road. The project would seamlessly integrate a new stop precinct to serve the western portion of the Melrose Park town centre, as well as the anticipated future uplift of the surrounding neighbourhood.

The light rail alignment through the Atkins Road open space would be governed by the presence of Sydney Water trunk mains to the north of the Willowmere property in Hope Street. This would necessitate the alignment of the project to the south of the Willowmere property.

Built form

Two stop canopies would be constructed for the Atkins Road stop, one standard single-sided canopy for the side platform, and one double-sided canopy for the island platform.

These canopies would provide amenity and wayfinding for customers. The architectural design of the canopies would integrate with the existing suite of canopies on Parramatta Light Rail Stage 1.

Power supply would be provided via a traction power substation located to the south of the stop.

Public space

There is little existing public space in the proximity of the open space beyond the Parramatta River corridor, located about 300 metres to the south.

Atkins Road stop would provide a catalyst for the ground floor activation of adjoining redevelopment. In conjunction, the design of the stop precinct would maximise pedestrian amenity to support the street life required for retail, commercial, and civic uses. This would ensure that the stop precinct contributes to the quality of public space within Melrose Park.

Residual land

Residual land would be retained as needed for public space, providing space within the stop environment for accessibility and passive surveillance requirements, as well as embellishment as public open space for community use. This would involve the integration of the local heritage listing known Bulla Cream Daily (Willowmere) property. This is described and illustrated in further detail on the following page.

There may be an area of residual land to south of the open space, where some of the land required to construct the project is surplus to the project's operational requirements. The final area of residual land would be subject to ongoing design development. A residual land management plan would be prepared which outlines the approach to managing residual land, including the future use of the land.

Stops as places

The stop would be located adjacent to Bulla Cream Dairy (Willowmere), a California-style bungalow at 64 Hughes Avenue, Ermington. The house was constructed in 1924 and is of local historical significance for being built and resided in by the Swane family for a period over 40 years.

This heritage item would provide the stop with a significant placemaking opportunity. This is described and illustrated in further detail within the following pages.

Transport integration

A bi-directional cycleway north of the stop would provide cycling connectivity through the precinct. Bicycle parking would be integrated near the stop. Pedestrian access would be via footpaths on both sides of the corridor.

Visual amenity

The project would result in a moderate magnitude of change to the visual amenity of the Atkins Road stop environment.

The visual amenity of the stop environment would be improved with the creation of new public space, including flexible open spaces, and new recreation facilities. Tree planting, high quality public domain fixtures and finishes, layered planting and opportunities for interpretation would contribute to an overall improvement to visual amenity.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 97: Cross section 13 - Atkins Road stop (indicative only - subject to design development).



Figure 98: Concept plan - Atkins Road open space.

Preliminary concept design for the Atkins Road open space

An Assessment of Cultural Significance for the property Willowmere at 64 Hughes Avenue, Ermington NSW was prepared by the City of Parramatta Council to:

- assess the heritage status of the property
- make recommendations for the heritage inventory sheet
- provide guidance for the assessment of any future proposals for the site.

The property holds a California bungalow-style residence with garden trees and mature palms and the Bulla Cream Dairy factory building. The report incorporates documentary research, a study of the built fabric and landscape features, and an analysis of comparable sites to provide an understanding of its cultural significance.

The integration of the Bulla Cream Dairy (Willowmere) property with new public space associated with the Atkins Road stop would provide the project with a unique placemaking opportunity. Some residual land not required by the permanent light rail corridor would provide the ability to establish a vibrant stop precinct.

Key considerations and design objectives are discussed in relation to light rail, heritage interpretation, and public space.

<u>Light rail</u>

- Safe and accessible stop platforms
- Continuous active transport and pedestrian connections through open space
- Provision of a third track at Atkins Road stop to safely and efficiently facilitate turnback movements for shuttle and event services to Sydney Olympic Park
- Provision of traction power substation, including service vehicle access to the substation.

<u>Heritage</u>

- Retain, as far as practical, significant heritage elements within the Willowmere property, prioritising the retention of the main residence.
- Transplant significant trees that are not able to reasonably be retained insitu with the design and location of light rail infrastructure.
- Provide vehicle access to the retained Willowmere residence.
- Provide views and access to Willowmere House from the public realm.

<u>Public space</u>

- Minimise the footprint of light rail operations to maximise the amenity and community benefit of residual land to be embellished for community use and parklands.

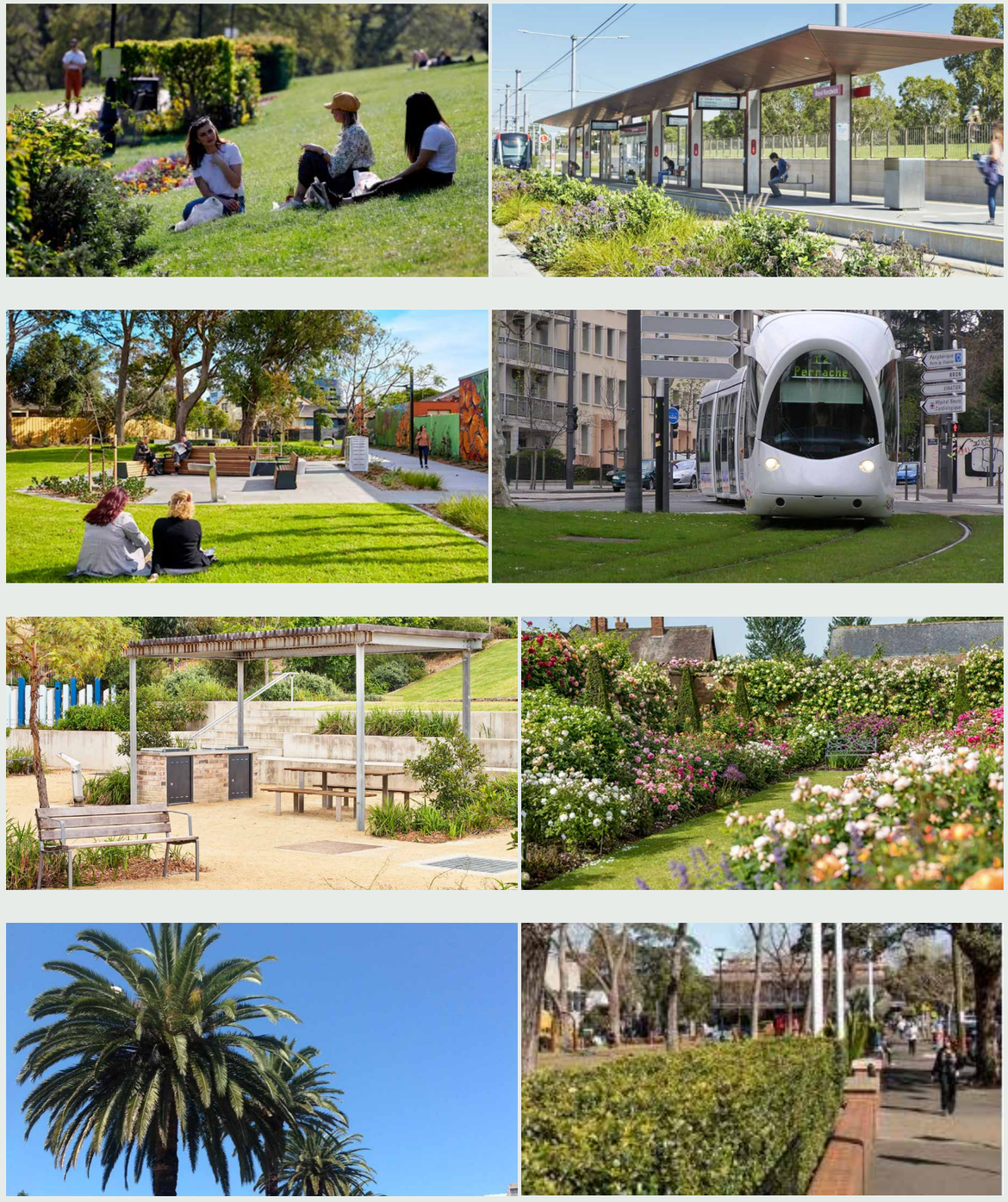


Figure 99: Atkins Road open space indicative concept precedent images.

9.4.2 Hope Street

Alignment

The alignment would run east-west through the centre of Melrose Park along Hope Street, about 300-400 metres north of the Parramatta River. The street follows the gently undulating landform of this section of the Parramatta River valley.

The project alignment would run along the northern side of the street, governed by the offset requirements of existing Sydney Water trunk mains.

Built form

The undulating nature of Hope Street is the result of its traversing the minor ridge lines that descend from Victoria Road to the Parramatta River. Constraints on the vertical gradient of the light rail track zone would necessitate the construction of a low-height retaining wall at the Melrose Park stop.

Two stop canopies would be constructed for the Melrose Park stop, one on each of the stop's platforms, providing amenity and wayfinding for customers. The architectural design of the canopies would integrate with the existing suite of canopies on Parramatta Light Rail Stage 1.

Public space

Seamlessly integrating light rail infrastructure into the town centre's street would create a corridor of continuous public domain, connecting lively places, activating cross streets, and catalysing town centre development that responds to the placemaking potential of light rail.

A north-south open space corridor would run along the alignment of existing overhead high voltage power lines. The design of Hope Street would provide a midblock crossing aligned with this open space corridor, allowing pedestrians and cyclists easy passage across the light rail and roadway.

A median between the light rail corridor and adjoining vehicular travel lanes would provide for the safe pedestrian crossing of Hope Street and maintain the precinct's permeability.

Street tree planting and landscape design within the street itself would maximise amenity and comfort for both light rail customers and the general public. This would ensure Hope Street provides a high quality contribution to the public space of Melrose Park's evolving town centre.

Residual land

Residual land not required for the project would be used for additional tree and understorey planting within Hope Street.

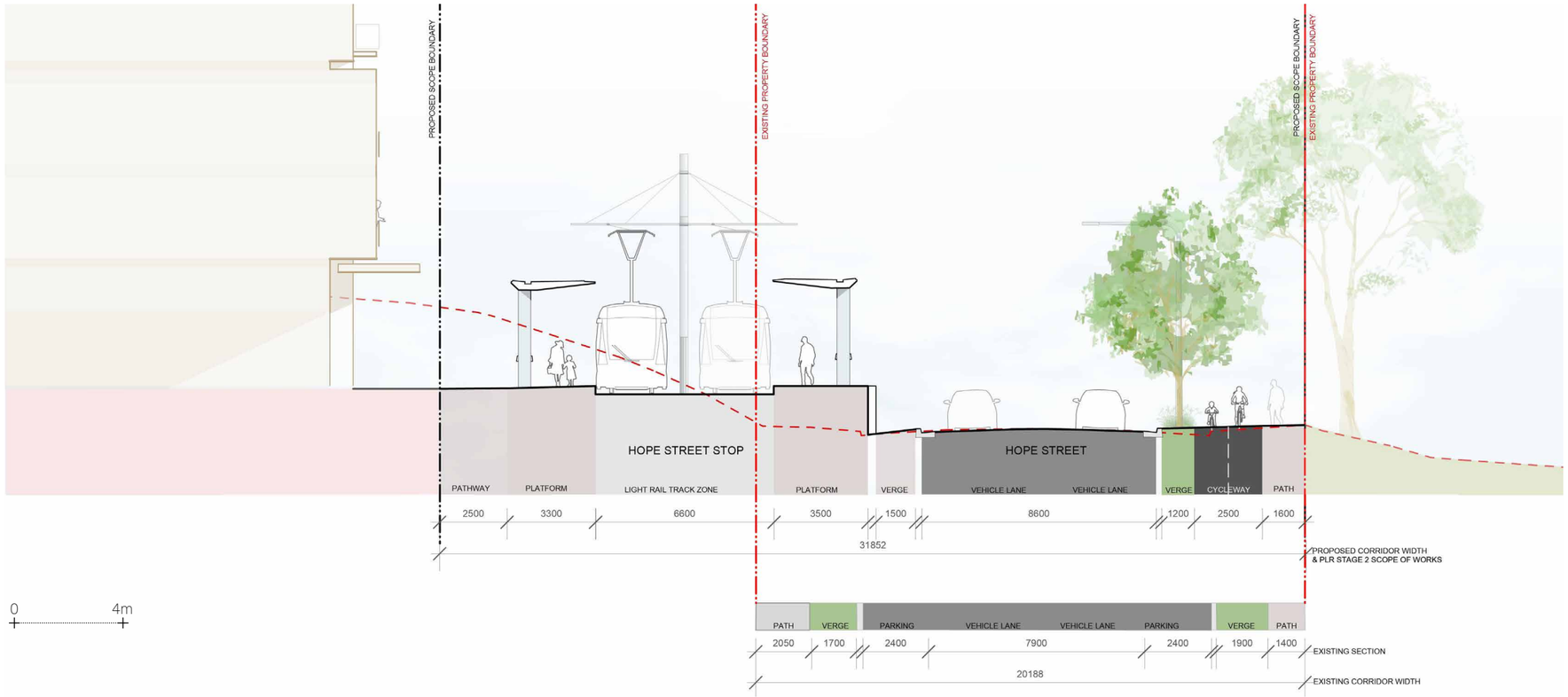


Figure 100: Cross section 14 - Melrose Park stop (indicative only - subject to design development).

Stops as places

The Melrose Park Stop would be positioned to maximise a seamless integration with the proposed future town centre, including access to stop platforms from both ends and providing an opportunity to integrate light rail access as part of the town centre's retail circuit.

Transport integration

Walking and cycling through the future Melrose Park town centre would be encouraged with the provision of separated walking and cycling facilities. Walking and cycling would be provided along Hope Street via footpaths on both sides of the street and a separated, bi-directional bicycle path on the southern side of the street.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of Hope Street.

The visual amenity of Hope Street would be improved with rows of street trees and layered planting within the public domain. High quality public domain fixtures and finishes consistent with the proposed Melrose Park development would also provide a positive contribution to the visual amenity of the street.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 101: Light rail corridor integrated into parkland setting, Murcia, Spain (credit: Gordon Stewart).

9.4.3 Waratah Street

Overview

Waratah Street runs north-south through Melrose Park South, between Hope Street and the Ermington Boat Ramp at the southern end of Wharf Road. The light rail alignment on Waratah Street has been designed to consider a staged modification of existing predominantly industrial land uses to a new residential precinct, maintaining existing vehicular access to adjoining properties.

Built form

A combination of existing street gradients and track vertical alignment constraints would necessitate a difference in levels between the track zone and Waratah Street roadway and the construction of a low-height retaining wall. This level difference would be minimised to ensure future redevelopment of the precinct is able to deliver an integrated and accessible outcome for the street.

Two stop canopies would be constructed for the Waratah Street stop, one on each of the stop's platforms, providing amenity and wayfinding for customers. The architectural design of the canopies would integrate with the existing suite of canopies on Parramatta Light Rail Stage 1.

Public space

The light rail alignment would interface with foreshore open space at Archer Park. This would provide the project with an opportunity to deliver park improvements. This is described and illustrated in the following pages.

Residual land

The project's alignment along Waratah Street adjacent Archer Park, as well as the construction of the new bridge between Melrose Park and Wentworth Point, would result in residual land not required for the permanent light rail corridor.

This would be returned to the community as parklands and embellished in consultation with the City of Parramatta Council. A preliminary concept design is provided within the following pages.

Stops as places

The Waratah Street Stop would provide catchment for the southern Melrose Park precinct and could accommodate future uplift and renewal of low density residential development to the east. Its low-lying position would also provide an ideal location for pedestrians and cyclists using the Parramatta Valley Cycleway to access Parramatta Light Rail Stage 2 services.

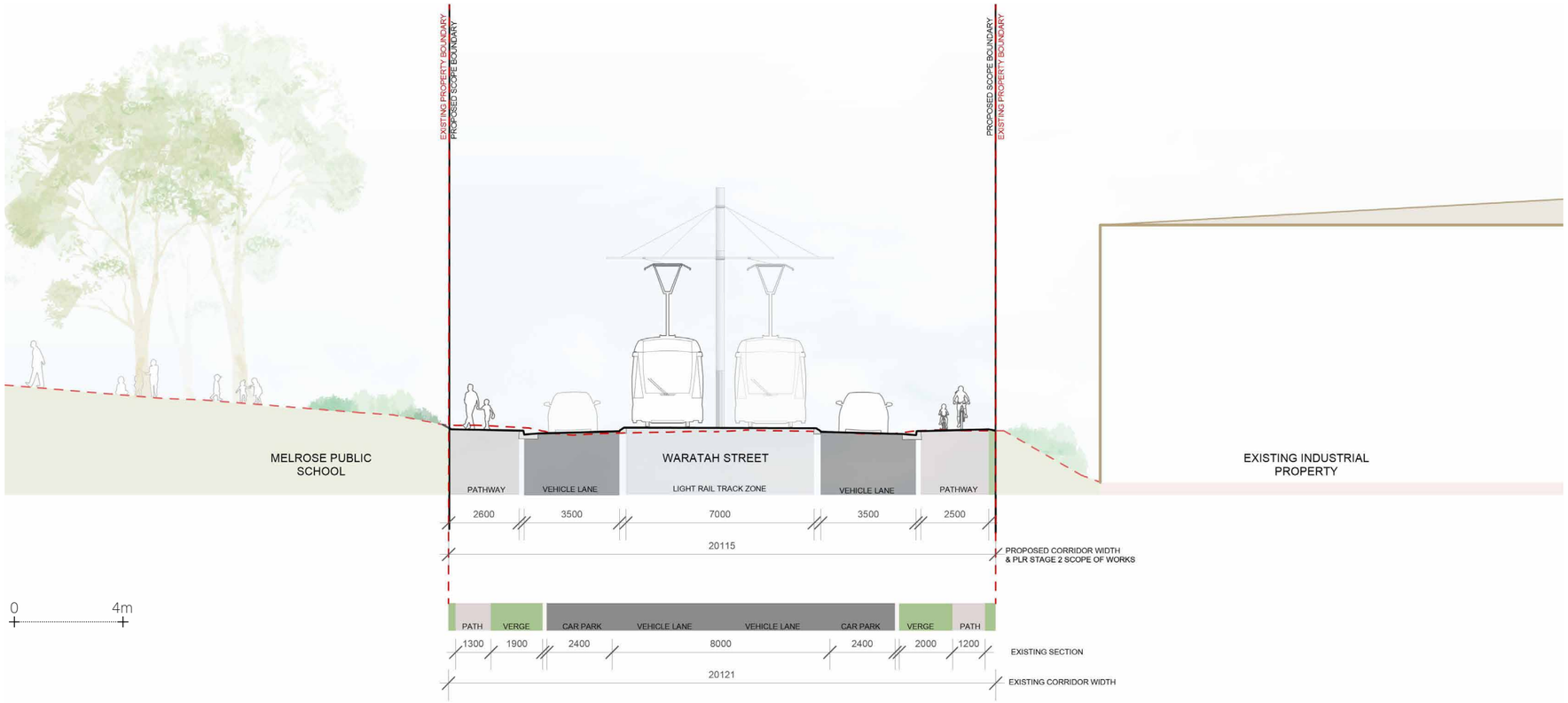


Figure 102: Cross section 15 - Waratah Street adjacent Melrose Park Public School (indicative only - subject to design development).

Transport integration

Walking and cycling would be provided for along Waratah Street between Hope Street and Mary Street with shared paths on both sides of the street. This would provide north-south active travel connections between Melrose Park town centre, Melrose Park Public School, and the Parramatta River and associated public spaces.

The project would allow for buses to travel along Waratah Street and over the new bridge between Melrose Park and Wentworth Point, providing for future local bus routes and special event services associated with Sydney Olympic Park. Bus access would be via a combination of Waratah Street road lanes, bus-only lanes, and shared running in the light rail track zone.

Driveway access from the existing private road to the south of Waratah St would be maintained, while a signalised intersection at Mary Street and Waratah Street would be provided to facilitate safe vehicular access through the precinct.



Figure 103: Light rail corridor with commercial buildings beyond (Credit: Context Landscape Architecture).



Figure 104: Light rail corridor through street centre,Murcia, Spain (Credit: Gordon Stewart).

Visual amenity

The project would result in a low magnitude of change to visual amenity of Waratah Street.

The visual amenity of Waratah Street would be improved with tree and understorey planting, particularly south of Mary Street where the alignment adjoins Archer Park.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.

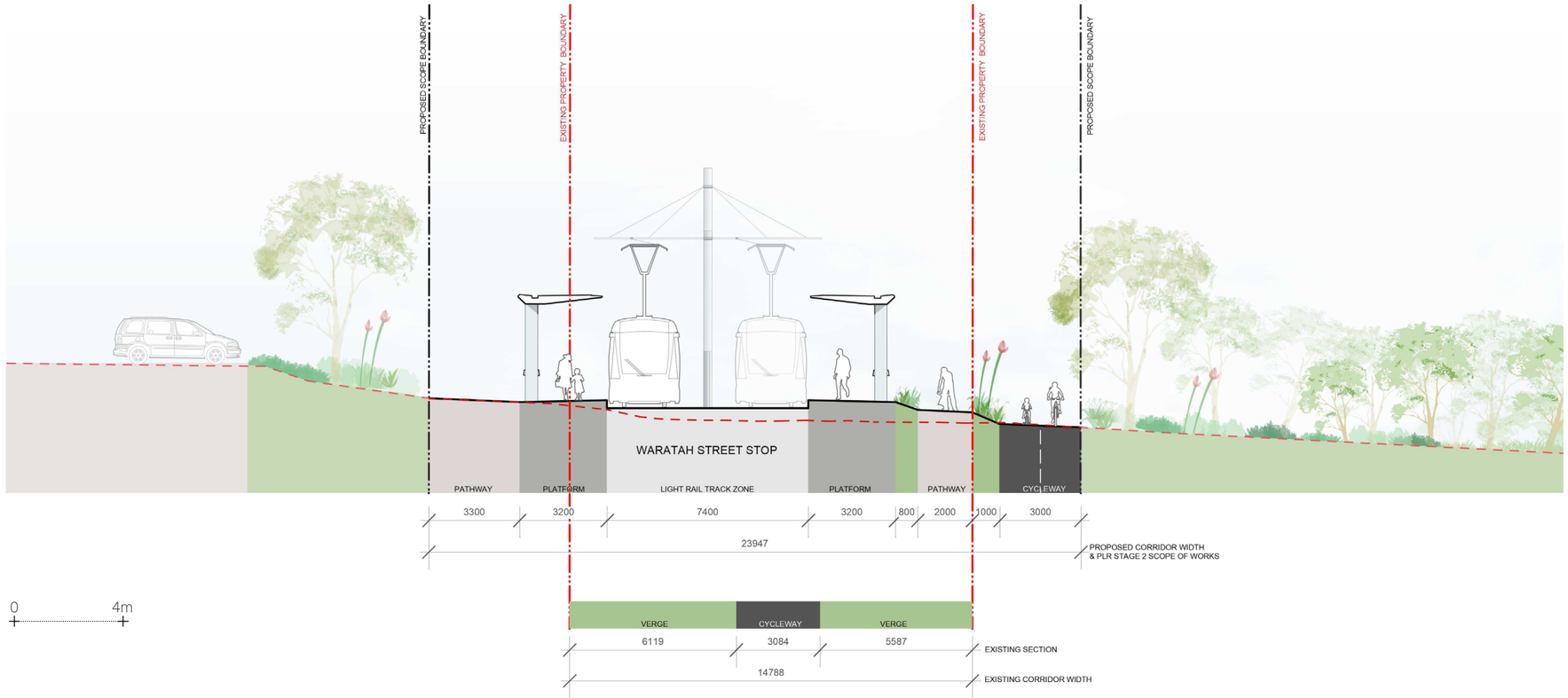


Figure 105: Cross section 16 - Waratah Street stop (indicative only - subject to design development).



Figure 106: Dedicated light rail corridor with avenue of street trees, Bordeaux, France (credit: Gordon Stewart).



Figure 107: Cycleway integrated with parkland, Newcastle, Australia (credit: City of Newcastle).

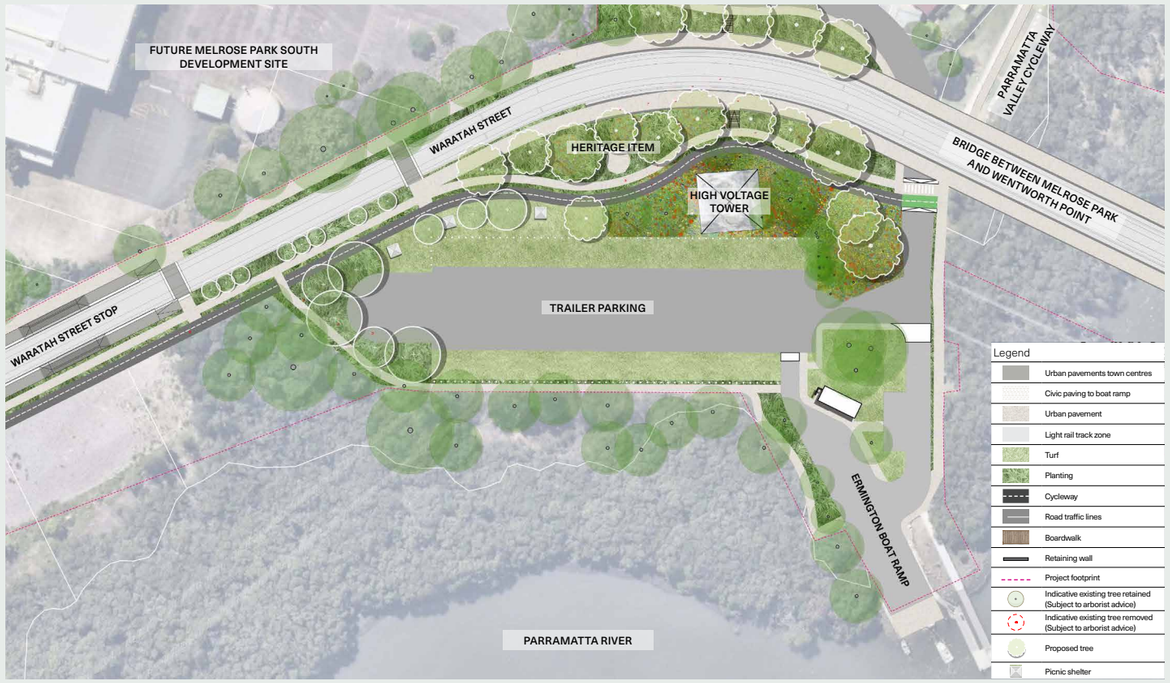


Figure 108: Archer Park indicative concept plan.

Preliminary concept design for Archer Park

Archer Park is a public open space on the northern foreshore of the Parramatta River. It sits adjacent to the Ermington Boat Ramp and currently provides boat and trailer parking associated with the boat ramp.

The light rail alignment along Waratah Street and the new bridge between Melrose Park and Wentworth Point would result in impacts to Archer Park and the area of foreshore adjoining the Ermington Boat Ramp.

The project's impacts to these spaces would provide an opportunity to embellish existing open space areas and improve the recreation amenity of the foreshore area.

Key considerations and objectives are explored in relation to light rail, waterfront engagement, and environmental rehabilitation.

Light rail

- Safe light rail corridor through Archer Park.
- Continuous active transport connection through stop precinct.
- Safe and accessible paths of travel from the stop to the waters edge.

Waterfront Engagement

- Provide pedestrians and cyclists with safe access to waters edge via the Parramatta Valley Cycleway.
- Additional facilities for recreation.

Ecological Rehabilitation and Engagement

- Revegetate Archer Park with endemic species conducive to the local biodiversity.
- Provide unique circulation opportunities through the mangroves on the river edge.



Figure 109: Archer Park indicative concept precedent images.

10.0 Wentworth Point

10.1 Precinct 6 - Wentworth Point

10.1.1 Alignment Summary

A new bridge between Melrose Park and Wentworth Point would land in the north-western corner of the privately owned development site at 14-16 Hill Road, providing a new crossing of the river for light rail, walking and cycling. Shared paths over the new bridge would connect to the foreshore path and Louise Sauvage Pathway. The project would the run along the western boundary of 14-16 Hill Road, before turning east towards Hill Road.

The light rail alignment would then run south along the eastern edge of the Millennium Parklands, interfacing with Hill Road along its length between Footbridge Boulevard and Holker Street. Walking and cycling would be provided via the foreshore park, the Louise Sauvage Pathway, and the various shared paths within Newington Nature Reserve and Woo-la-ra, with a connection provided that results in minimal impact to the existing vegetation within the parklands.

Light rail stops would be provided at Footbridge Boulevard and Stromboli Strait, providing public transport services to the catchment of existing and future development at Wentworth Point, as well as access to the adjacent parklands. Shared paths and the Louise Sauvage Pathway would connect to both stops, providing access from the stops into Woo-la-ra and the Millennium Parklands.

The project within the Wentworth Point precinct is shown in the context of its built and natural environment within Figure 110.

The project would comprise the following key places within the Wentworth Point precinct:

- Interface with 14-16 Hill Road
- Hill Road (north of Bennelong Parkway)
- Hill Road (south of Bennelong Parkway).

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

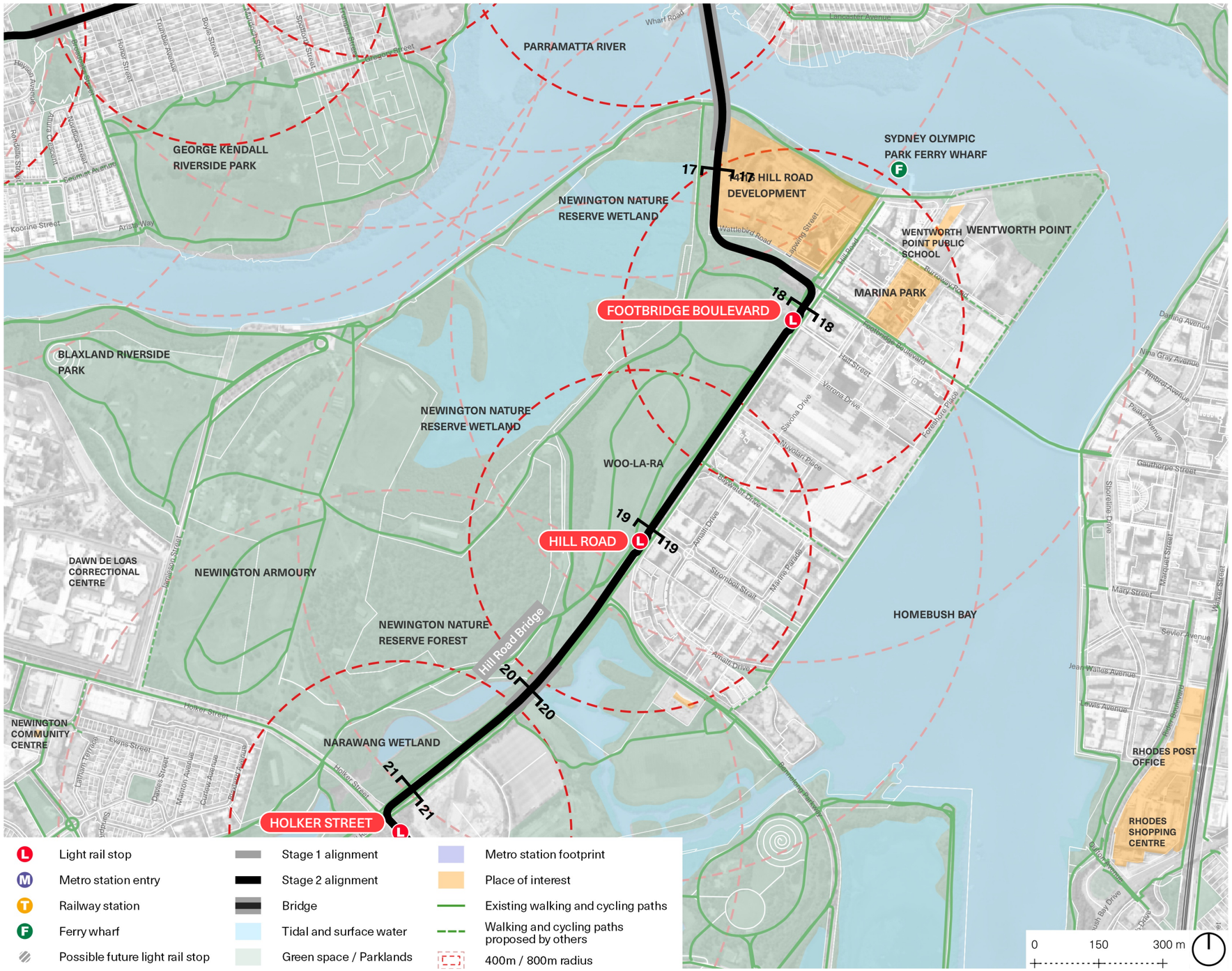


Figure 110: Overview map - Wentworth Point.

10.2 Designing with Country

Ngalawallah / A Gathering Space

Wentworth Point is one part of a vast ceremonial ground shared by many nations across the kinship system of Sydney and many more nations who hold lore, ceremonial and caretaking responsibilities here. For thousands of years people from all over Sydney and surrounding areas would travel to this area for lore ceremonies, following cyclical ecological and cultural indicators. These cultural ceremonies also hold significant connections to the protected lore ceremonies of Elders and Koradji (healers) upon High Country.

The project can honour this story and protect this significant ceremonial gathering site, as well as the cultural, spiritual, and visual connections to High Country. Prioritising Country and celebrating the headland, the precinct can create simple yet meaningful community connections that honour the cultural significance of Wentworth Point and surrounding Country.

Tucoerah / Diverse blending of ecologies and water systems

Defined by low-lying mudflats and wetlands, Wentworth Point is one of the most significant surviving Tucoerah environments along the light rail alignment. Home to crabs, amphibians, diverse schools of fish, many water and migratory birds, reptiles, mammals, and insects, this precinct is significant to the ecological resilience of Country in Sydney. This is a space where all young life is nurtured and supported as the foundation for a sustainable future with Country.

The primary goal of the project in this precinct would be to buffer and protect this ecology. Creating sensitive and responsive human and public domain interfaces with this wetland, the precinct would be designed as a hub of incidental education for users and the community, allowing them to learn of these ecologies and understand the importance of caring for Country.

Wingara / Reading Country

Before colonisation, Wentworth Point was an island known to local Aboriginal peoples as Arrowanlly. A vast island composed mostly of thick, nutrient rich mud replenished by regular tidal flows, Arrownally was a vital resource for ecology and people alike. At the head of the bay, the island helped to connect people living along Haslams Creek north to Parramatta River.

As a buffer to tidal inundations, the island allowed women in Wulban (D'harawal eora: bark canoes especially designed to carry fire) and Nuwi (D'harawal eora and the Common Sydney Language: bark canoes) to travel through the water and connect to the vital food and cultural resources supplied by the ecologically diverse river.

Eventually the island was given the name 'Mud Island' by the colonists and was 'reclaimed' through expansion of the industrial and maritime uses through the 1890s. Completely disturbing the water systems of Country, the expansion of the urban environment now isolates and diverts Haslams Creek, creating a set of disconnected retention ponds just south-east of the precinct.

Remembering Arrownally, the thick mud, and the women in their canoes can allow the project to re-read Country and assert the stories of this place, lost through colonisation and poorly considered urban development.

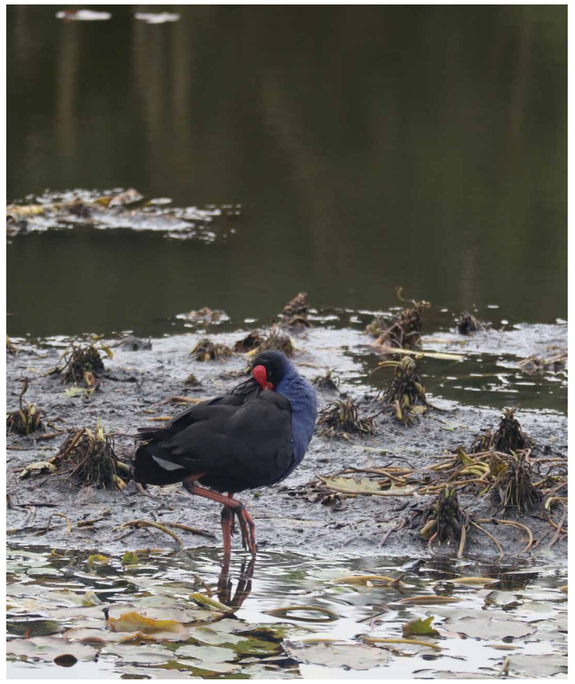


Figure 111: Swamp hen resting in swampy mudflats (Credit: Bangawarra).

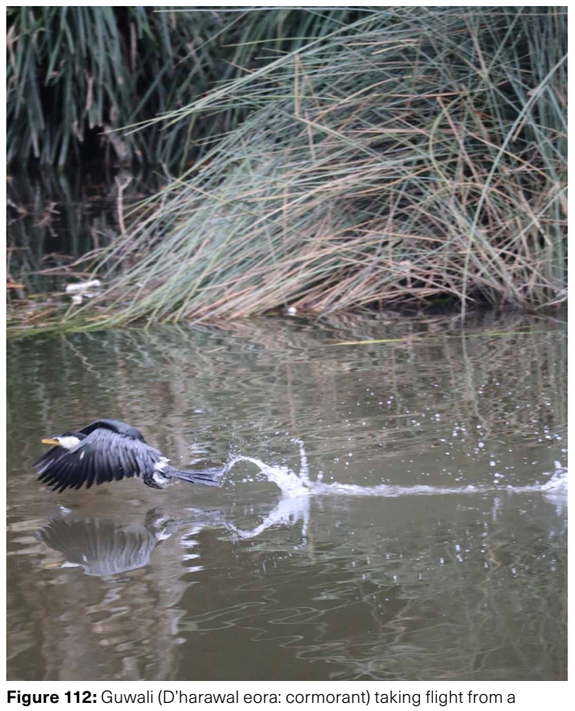


Figure 112: Guwali (D'harawal eora: cormorant) taking flight from a marsh lagoon (Credit: Bangawarra).

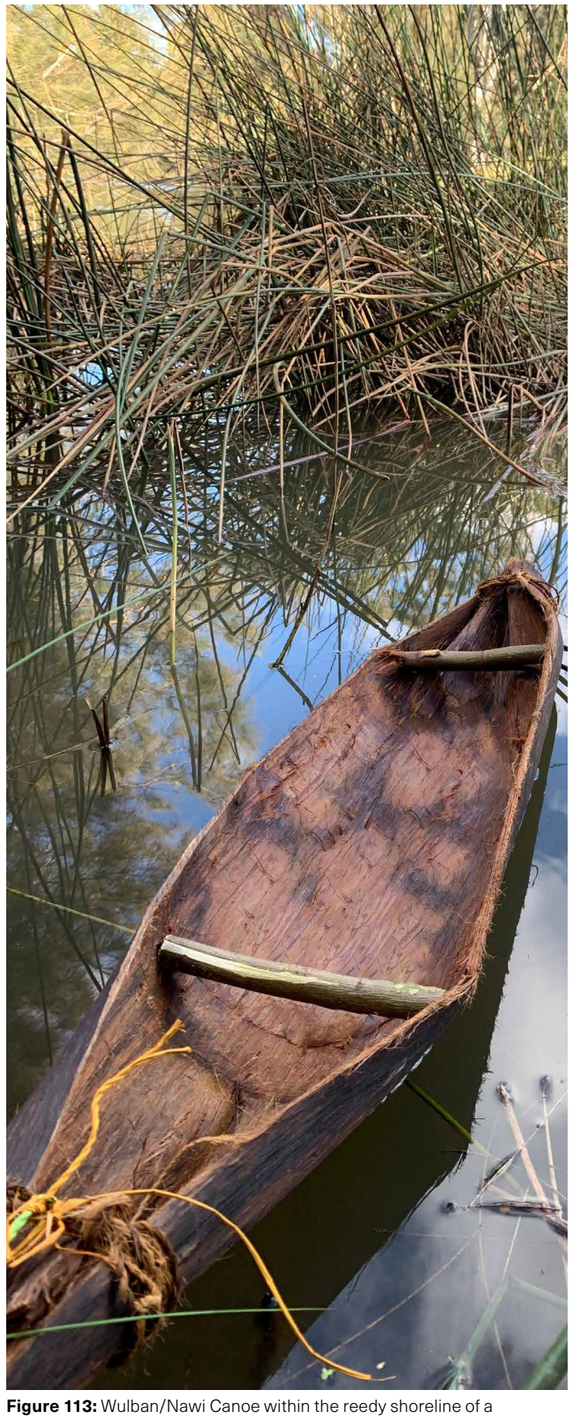


Figure 113: Wulban/Nawi Canoe within the reedy shoreline of a freshwater creek (Credit: Bangawarra).

10.3 Vision and principles

10.3.1 Vision

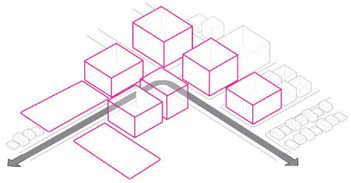
The project's vision for the Wentworth Point precinct is to celebrate the cultural significance of this site by protecting Country.

Creating a new green corridor, the project would act as a sensitive interface between the parklands and Hill Road, maximising street amenity and permeability for all users.

The light rail would integrate with and respond to the existing and future development of Wentworth Point, buffer urban developments and this sensitive ecological landscape, maximise the placemaking potential of the light rail, and minimise impacts on the parklands, while taking into consideration existing utilities and traffic along Hill Road.

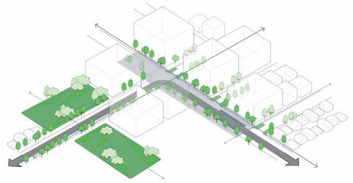
10.3.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. They are presented here under each of the project's design principles.



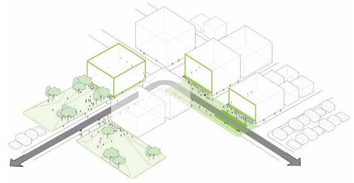
City shaping

- Reflect and celebrate the enduring spirit of the Arrownally (the island Wentworth Point was built upon).
- Consider the desired outcomes and visions included in local plans for Wentworth Point, including existing and proposed future developments along the Parramatta River foreshore.
- Provide a safe and intuitively permeable interface between Hill Road and the parklands, prioritising convenience, accessibility, and permeability for both customers and parkland visitors, and maximising connectivity between development and the green spaces of the Parklands.
- Consider the impact to the surrounding environment beyond the project boundary.
- Celebrate and protect this ecologically rich, ceremonially sacred and sensitive part of Country.
- Add to a supportive and ecologically diverse urban tree canopy (and associated understoreys) to protect, buffer and filter urban run-off and waste.



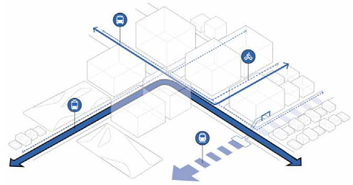
Connectivity

- Deliver stop precincts that are appropriate to their location, adjoining regionally significant parklands and the future town centre of the 14-16 Hill Road development, where pedestrian convenience and amenity is prioritised.
- Integrate pedestrian and cycle connections with the existing pedestrian network within the parklands.
- Support independent travel by youth to schools at Wentworth Point.
- Consider emergency, service, and maintenance vehicle access in areas where the project impacts the parklands. Impacts to access routes to parkland to be minimised and improved where possible with new safe and amenable crossing points on Hill Road.
- Return travel between shorelines north and south of the Parramatta River to the public domain whilst acknowledging that before colonisation, this resource was not a barrier, but instead a source of cultural, kinship, and familial connections and a vital travel route.
- Celebrate the Songlines and journeying of significant river ecologies including snapper, mullet, and eels.
- Support the future development of a recreational bridge-to-bridge walk between Wentworth Point and Rydalmere East.



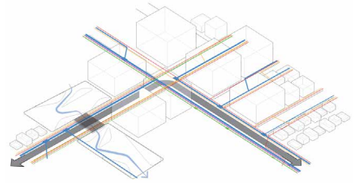
Place

- Optimise intersections on Hill Road for ecology, residents, and traffic.
- Minimise filling and excessive earthworks along the environmentally sensitive landscapes and existing ecologies of the parklands, particularly around the Newington Nature Reserve.
- Draw on the unique history of the parklands as inspiration for the design of the project's infrastructure, public domain, and stop environments.
- Recognise and embrace local and Aboriginal heritage by protecting heritage items and landscapes and preparing an interpretation strategy for their consideration within the project.
- Create a protected buffer between the sensitive ecological landscape to the west of Hill Road and urban development to the east.
- Leverage connecting with Country opportunities to create a built environment that educates the significance of these ecologies and the associated Ancestral stories of Country.
- Celebrate the Ancestral and continuing knowledges of Country.



Choice

- Design the light rail corridor and stop precincts to prioritise walking and cycling along the route, pedestrian access to the town centre, interchange with bus stops, and wayfinding to and from the Sydney Olympic Park ferry wharf.
- Improve walking and cycling opportunities between Melrose Park and Wentworth Point via the new Wentworth Point bridge.



Value

- Provide a comfortable, accessible, and shaded light rail corridor and street environment for all users.
- Minimise impacts to Woo-la-ra, Millennium Parklands, and Narawang Wetland along Hill Road's interface with the parklands.
- Minimise impacts to habitat, tree canopy, wetland, and climate change risks such as grass fires at Woo-la-ra.
- Explore permeable track form strategies (turf, planting, crushed stone and the like) that integrate the light rail with its parklands setting.

10.4 Design place and movement outcomes

10.4.1 Interface with 14-16 Hill Road

Overview

The new bridge between Melrose Park and Wentworth Point would land in the north-western corner of the privately owned development site at 14-16 Hill Road. The light rail alignment would run along the western boundary of the site, before entering the Millennium Parklands north of Sanctuary Hill and running east to Hill Road. Shared paths over the new bridge would connect to the foreshore path and Louise Sauvage Pathway.

Built form

The new bridge and light rail alignment would land on the southern shore of the Parramatta River at the same level as those proposed within the 14-16 Hill Road development. This would necessitate the construction of a retaining wall along the western side of the light rail track zone (refer Figure 114). For more information on the new bridge refer to Chapter 14.

Public space

The light rail alignment in this section of the project would seek to minimise its footprint and reduce impacts on the 14-16 Hill Road development and adjacent parklands. The new river crossing would significantly improve access to public space for communities on both sides of the river.

The section of the alignment immediately north of Sanctuary Hill would provide an opportunity to create a new interface between parklands and adjacent development and further contribute to the public space of the peninsula.

Residual land

Residual land not required for the project would be returned as open space, providing an opportunity for offset tree planting and potential open space improvements to this area of the parklands.

Stops as places

There are no stops proposed in the section of the project.

Transport integration

The light rail track zone over the new bridge and to its intersection with Hill Road would be designed to allow for buses to run between Melrose Park and the local street network of the 14-16 Hill Road development, providing a significant new transport connection across the Parramatta River. This would also include provision of special event buses servicing Sydney Olympic Park, as well as potential light rail shuttle services between the Atkins Road and Jacaranda Square stops.

The shared path connecting to the Louise Sauvage Pathway would connect Melrose Park to the regionally significant active transport routes through Sydney Olympic Park and to Sydney Metro West.

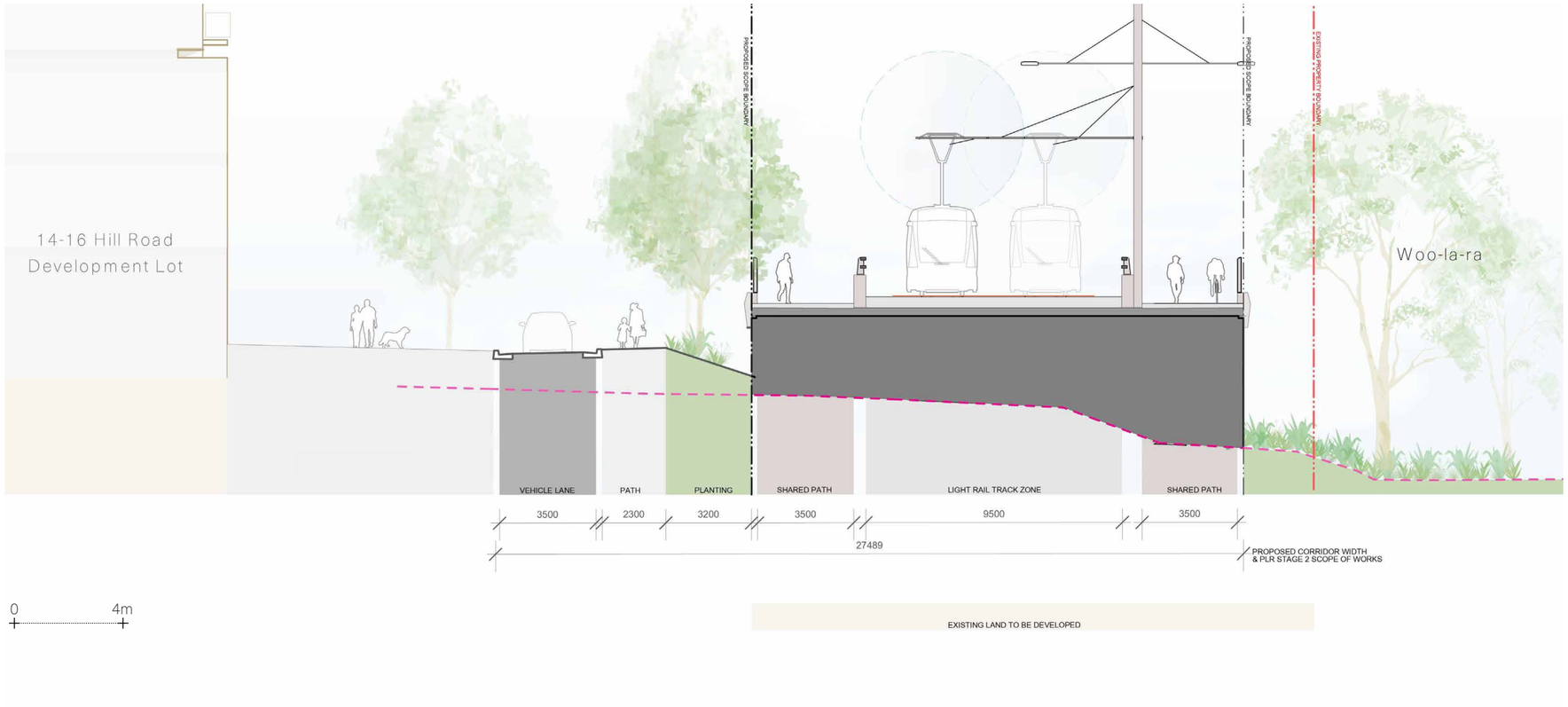


Figure 114: Cross section 17 - Bridge landing at 14-16 Hill Road (indicative only - subject to design development).

Visual amenity

The project would result in a low magnitude of change to the visual amenity of the area.

The majority of visual impact would result from the new bridge between Melrose Park and Wentworth Point. The alignment would run south, partially within the private property of 14-16 Hill Road, further reducing the visual prominence of the project. Visual amenity would be improved by extensive planting and revegetation works between the alignment and adjacent development, and areas of parkland.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 115: Light rail and shared path through parkland approaching a stop precinct, Reims, France (credit: Gordon Stewart).



Figure 116: Light rail integrated with commercial/residential city streets, Newcastle, Australia (credit: ASPECT Studios).

10.4.2 Hill Road (north of Bennelong Parkway)

Overview

The project would run along the western boundary of the Millennium Parklands, passing recreation areas at Sanctuary Hill and Woo-la-ra. The alignment would border the western edge of Hill Road, providing pedestrian crossing facilities along its length to improve access between Wentworth Point and the parklands. A continuous walking and cycling connection would be provided along the project corridor, connecting with the Louise Sauvage Pathway and intersections on Hill Road. Light rail stops are proposed at Hill Road's intersection with Footbridge Boulevard and Stromboli Strait.

Built form

Two stop canopies would be constructed at each of the Footbridge Boulevard and Hill Road stops, one on each platform, to provide amenity and wayfinding for customers. The design of these built elements would be in keeping with the suite of canopes across the project while remaining sympathetic to their parkland setting. The high quality of their architectural design would mitigate visual impacts and improve visual amenity when viewed from adjacent development.

Alignment levels in this area are subject to flood assessment.

Public space

The light rail alignment in this section of the project seeks to minimise its footprint and reduce impacts on the adjacent parklands. New light rail stops would significantly improve regional access to the parklands, while new intersections on Hill Road would improve local access from adjacent residential and commercial development.

Residual land

Residual land not required for the permanent light rail corridor would be returned as open space, providing an opportunity to mitigate impacts to the open space. This would include improved walking and cycling paths along Hill Road, offset tree planting, and improvements to access and connections into the parklands from a number of locations along Hill Road.

Stops as places

The proposed Footbridge Boulevard stop would provide for the large existing catchment within the northern portion of the Wentworth Point peninsula. The stop would also provide convenient connections to commercial and community facilities on Footbridge Boulevard, connections to Sydney Olympic Park ferry wharf, and interchange with bus services that operate along Footbridge Boulevard to and from Rhodes via the Bennelong Bridge.

Permeability across the light rail corridor would be maximised with dual stop access points, in addition to the signalised intersections at Footbridge Boulevard and Verona Drive,

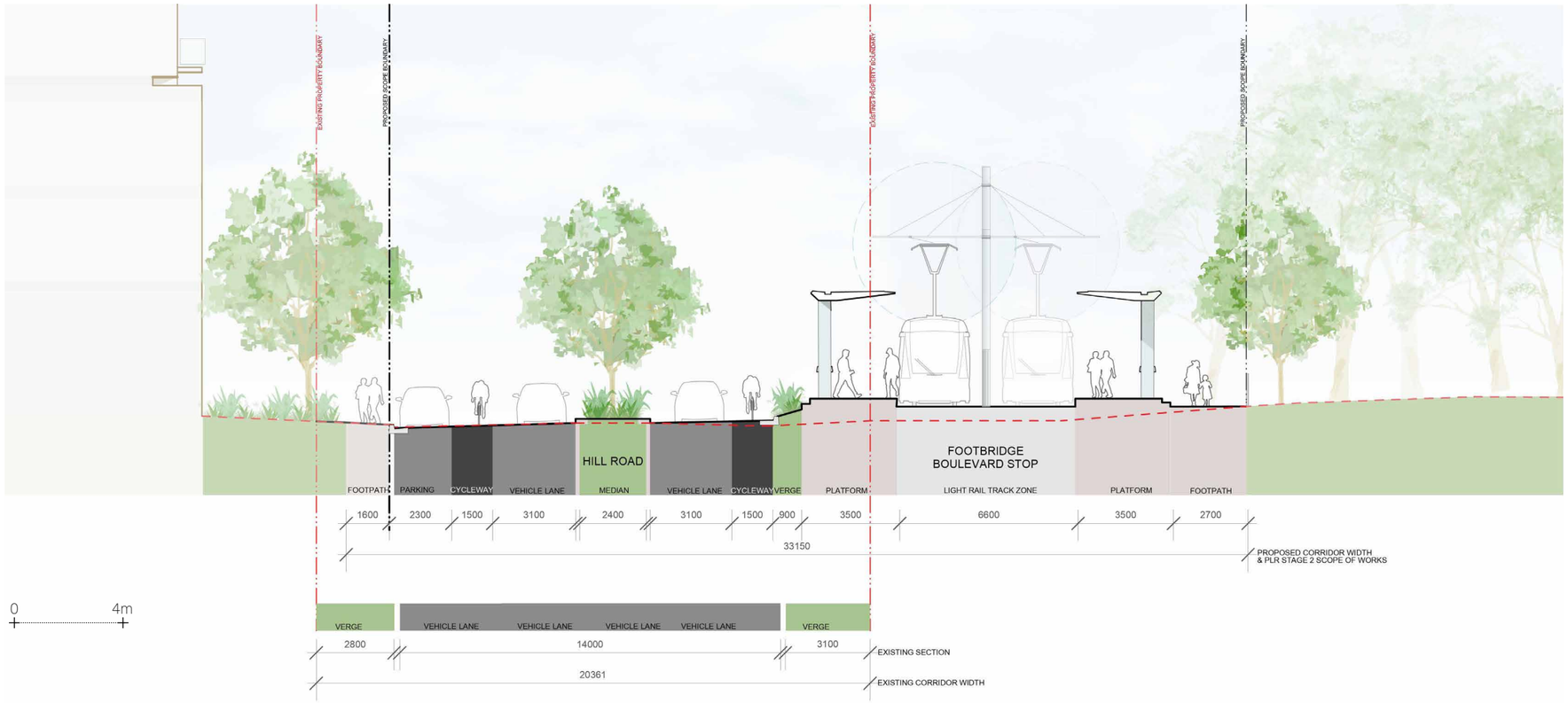


Figure 117: Cross section 18 - Footbridge Boulevard stop (indicative only - subject to design development).

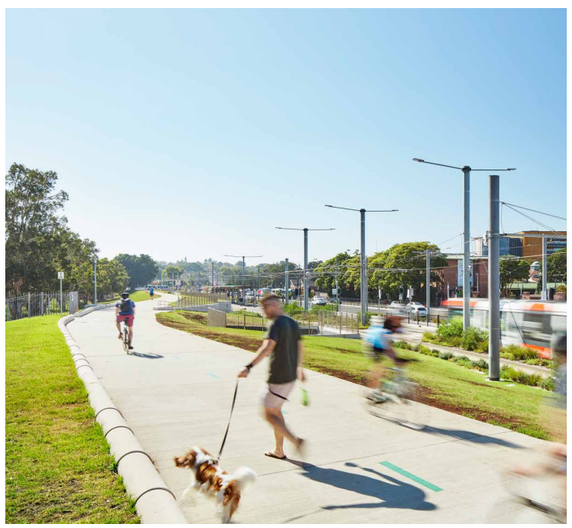


Figure 118: Shared path adjacent light rail on Alison Road, Randwick, Australia (credit: ASPECT Studios).

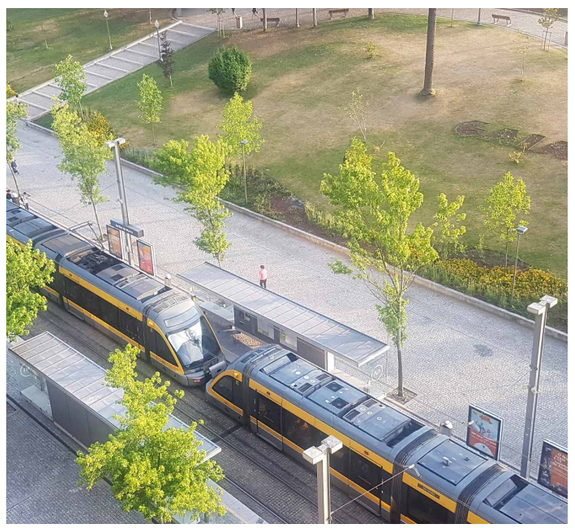


Figure 119: Light rail stop within a parkland setting, Porto, Portugal (credit: Jason Packenham).



Figure 120: Separated light rail running adjacent traffic lanes, Reims, France (credit: Gordon Stewart).

greatly improving pedestrian connectivity across Hill Road. The existing shared path along the western side of Hill Road would be reconstructed to the rear of the western stop platform.

The Hill Road stop would be located to maximise light rail catchment of the southern portion of Wentworth Point. The stop would also provide for visitors to the Woo-la-ra parklands and the Piazza retail precinct in the south of Wentworth Point.

Stop platforms and access pathways would be designed to maximise safe and legible access to stop platforms for customers, as well as permeability through the stop precinct for parkland visitors. Signalisation of the intersection at Hill Road and Stromboli Strait greatly improve pedestrian connectivity across the existing roadway.

A new parklands entry would be provided immediately west of the stop environment, with connections to the Louise Savage Pathway.

Transport integration

Light rail stops would be co-located with existing bus stops on Hill Road, with the public domain design in these locations allowing for interchange between modes. The Footbridge Boulevard stop would be located about 5-minutes walk from the Sydney Olympic Park ferry wharf at the northern end of Hill Road.

The project would deliver a continuous shared path along Hill Road, providing a regionally significant walking and cycling route through Wentworth Point between the new bridge over the Parramatta River and Sydney Olympic Park. The project would also improve walking and cycling connections across Hill Road and into the adjacent parklands.

The Footbridge Boulevard and Hill Road stops would provide access into the adjacent parklands via the shared paths in Woo-la-ra and the Loiuse Sauvage Pathway.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of Hill Road north of Bennelong Parkway.

The alignment would be screened from within the parkland, and is complementary to the desired future character of adjacent Wentworth Point. The visual amenity in this area would be improved by street trees, layered planting, and high quality public domain fixtures finishes, in line with the potential future Hill Road Masterplan.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 121: Cross section 19 - Hill Road stop (indicative only - subject to design development).



Figure 122: Sketch - View south along Hill Road to the Hill Road stop (indicative only - subject to design development).

10.4.4 Hill Road (south of Bennelong Parkway)

Overview

The project's alignment in the southern portion of Hill Road would run along an interface with the adjoining Narawang Wetland, a highly sensitive ecological landscape that would require careful consideration and a design response sympathetic to this sensitive habitat.

The light rail would run along the western edge of the Hill Road roadway, allowing light rail services to operate independent of a signalised intersection between Hill Road and Bennelong Parkway.

The Hokler Street intersection would provide vehicular access to the URBNSURF wave park currently under construction. A continuous walking and cycling connection would be provided along the project alignment, connecting with the Louise Sauvage Pathway, the shared paths within Woo-la-ra, and intersections on Hill Road.

Built form

A new bridge would be constructed immediately west of the existing Hill Road bridge over Haslams Creek.

Power supply would be provided via a traction power substation located within adjacent land, to the east of Hill Road.

The existing bridge would be retained and duplicated, with a new bridge structure provided for light rail vehicles on the western side of the existing bridge. The new bridge would be a single span, concrete structure, about 20 metres long and 12 metres wide. It would be of a similar height to the existing bridge.

The light rail running corridor would be skewed slightly from Hill Road over about 130 metres on either side of the bridge, and would operate in an off-road (separated) arrangement. Retaining structures on the western side would be required to manage the differences between the existing ground level and light rail alignment.

Minor works may be required on the existing bridge associated with the road readjustment works to comply with current standards.

Public space

The project would improve access to Narawang Wetland with a new signalised intersection at Hill Road and Bennelong Parkway, providing new walking and cycling connections across the street and into the parklands. The project's walking and cycling paths would also provide new connections into the wetland.

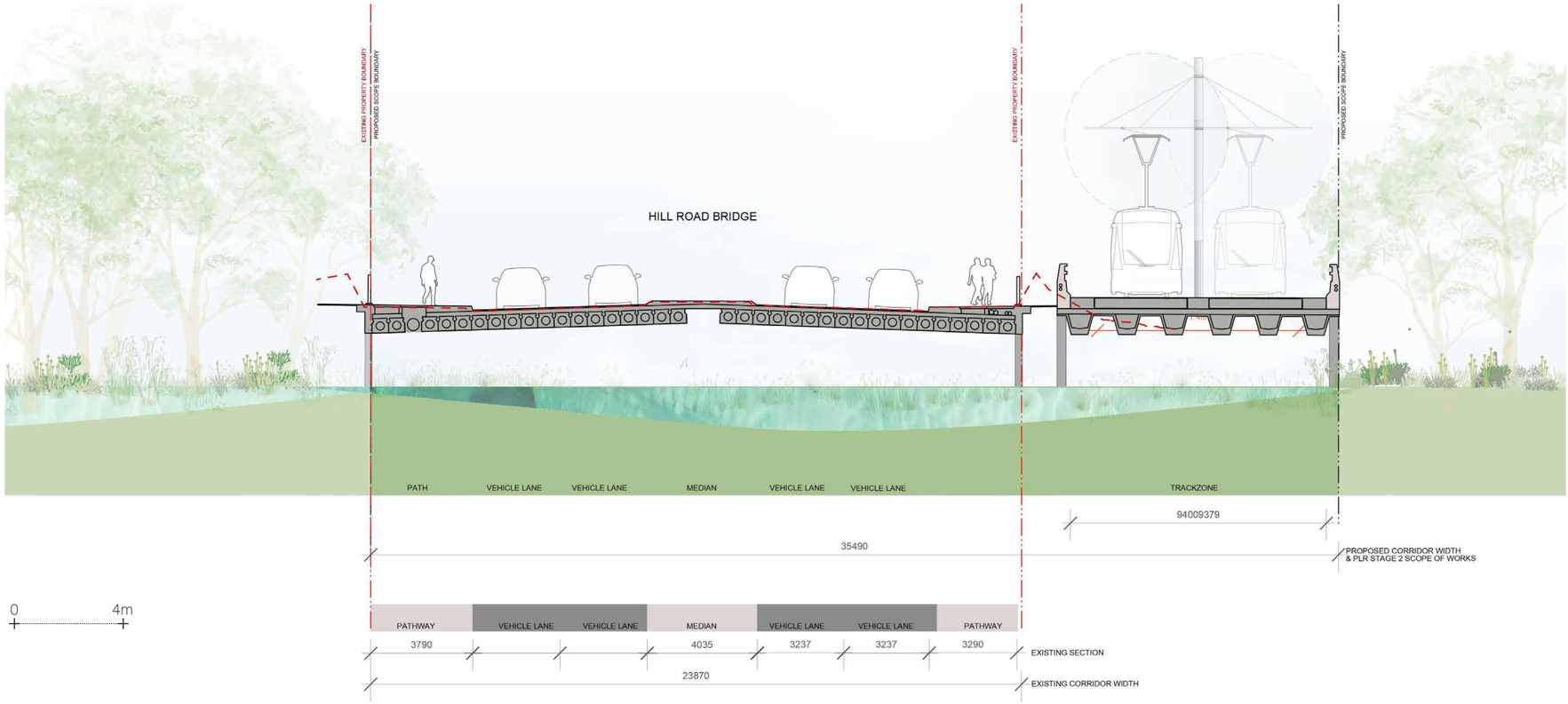


Figure 123: Cross section 20 - existing Hill Road bridge over Haslams Creek (indicative only - subject to design development).



Figure 124: Lightrail located on dedicated bridge, Porto, Portugal (credit: PlanodeMetro).



Figure 125: Shared path along light rail interfacing with wetlands, Randwick, Australia (credit: ASPECT Studios).



Figure 126: Shared path along light rail with connection to stop, Randwick, Australia (credit: ASPECT Studios).

Residual land

There is no residual land within this section of the project.

Stops as places

There are no light rail stops within this section of the project.

Transport integration

Recognising that Hill Road comprises the only vehicle route to and from the Wentworth Point peninsula, the project would seek to minimise impacts to existing traffic capacity, including for buses running along Hill Road. This would be achieved with the light rail's alignment along the western edge of the roadway, independent of traffic movement.

A shared path on the eastern side of Hill Road would provide for walking and cycling between Holker Street and the parklands' entry opposite Bennelong Parkway, with crossing of Hill Road providing by a new signalised intersection at Hill Road and Bennelong Parkway.

Visual amenity

The project would result in low magnitude of change to visual amenity of Hill Road south of Bennelong Parkway.

The alignment would run along the western side of the road reserve and would be screened from within the parkland. The visual amenity in this area would be improved by street trees, layered planting, and high quality public domain fixtures and paving finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 127: Cross section 21- Hill Road at intersection with Holker Street (indicative only - subject to design development).



Figure 128: Light rail corridor interface with major arterial road, Murcia, France (credit: Gordon Smith).



Figure 129: Separated light rail corridor integrated within parkland setting, Moore Park, Australia (credit: ASPECT Studios).

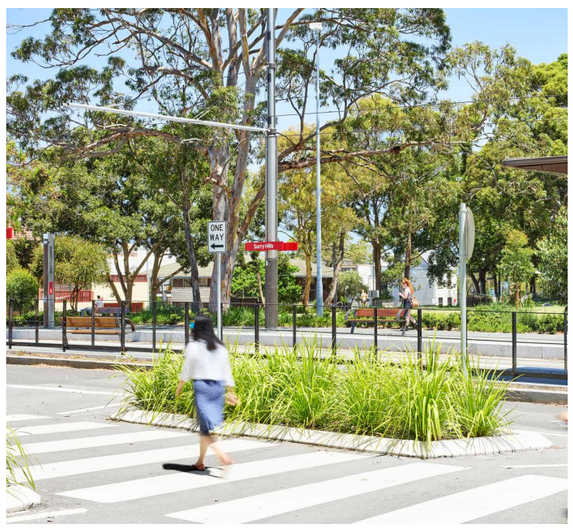


Figure 130: Light rail integrated with existing open space, Surry Hills, Australia (credit: ASPECT Studios).

11.0 Sydney Olympic Park

11.1 Overview

11.1.1 Alignment summary

Light rail would enter Holker Street via a signalised intersection at Hill Road. The Holker Street stop would be located on the south-eastern side of the intersection, with bus-only lanes to the back of its platforms and shared paths on both sides of the street.

The alignment would cross Haslams Creek via the existing Holker Street Busway bridge, which incorporates walking and cycling connections on both sides, before proceeding into the centre of Australia Avenue, with traffic lanes located both sides of the track zone. Walking and cycling on Australia Avenue would be provided for with separated, uni-directional cycle lanes and footpaths on both sides of the street. The project would allow for the future construction of a stop at Grand Parade to serve the Showgrounds as the precinct evolves in the future.

The alignment would then turn into Dawn Fraser Avenue at its intersection with Australia Avenue. The Jacaranda Square stop would be located adjacent this intersection, adjoining the south-eastern side of the existing Jacaranda Square public open space.

Light rail would then run centrally down Dawn Fraser Avenue in a pedestrianised street between Australia Avenue and Olympic Boulevard, adjoining the north-western edge of Sydney Olympic Park's Central precinct. A separated cycleway would be provided between Australia Avenue and Olympic Boulevard in line with SOPA's active transport strategy.

The Olympic Boulevard stop would be located at the southern extent of the Dawn Fraser Avenue pedestrianisation, in the vicinity of the planned future Sydney Metro West station to provide convenient and legible interchange.

The alignment would then run west along Dawn Fraser Avenue with a single lane of traffic and shared paths either side, past the southern edge of the Sydney Olympic Park Stadium precinct before entering the Carter Street Precinct.

The project within the Sydney Olympic Park precinct is shown in the context of its built and natural environment within Figure 131.

The project would comprise the following key places within the Sydney Olympic Park precinct:

- Holker Busway
- Australia Avenue
- Dawn Fraser Avenue

The design, place, and movement outcomes of these places are discussed and illustrated in this chapter.

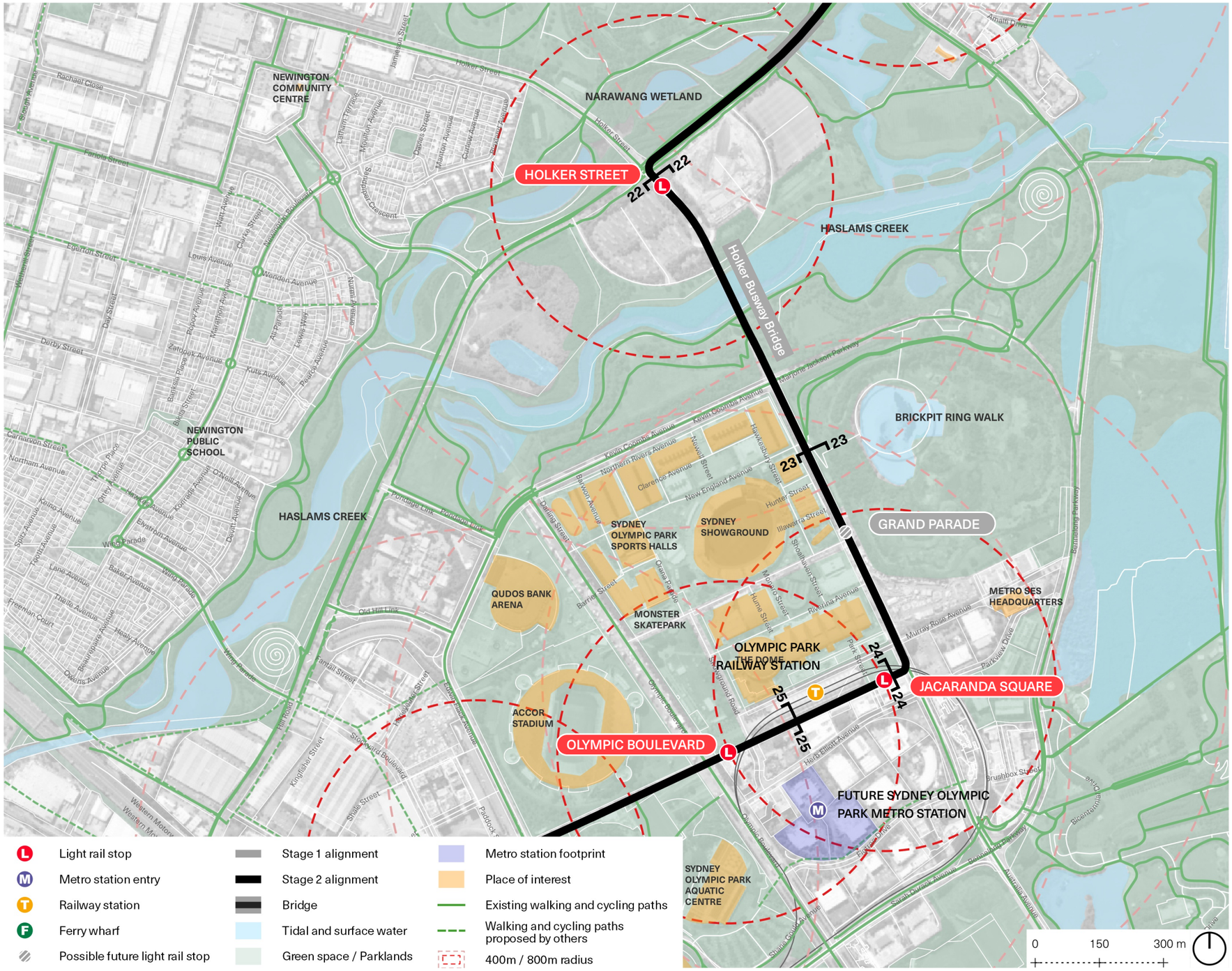


Figure 131: Overview map - Sydney Olympic Park.

11.2 Designing with Country

Ngalawallah / A Gathering Space

The areas around Sydney Olympic Park are ceremonial grounds - past, present and future. Whether it be for contemporary events like the Olympics, concerts, arts, culture or eco-tourism, the enduring spirit of this Country has always been rooted in the Ancestral ceremonies of local Aboriginal peoples. This place has always been where people have come together connecting through lore and cultural obligations to care for Country and community.

Spatially activated by the ancient stories and ceremonies of Country, the Sydney Olympic Park precinct can provide community spaces that add to a diversity of operations, helping to re-define this precinct as a diverse and multi-modal destination. Lured by the rich ecological wetlands and waterbirds, tourists can wander day-to-day through ecologically supported walking and cycling connections, while large events can be serviced through robust and efficient public transport networks.

***Tucoerah* / Diverse blending of ecologies and water systems**

The Sydney Olympic Park precinct sits 500 metres south-west from the largest remaining mangrove forest along the Parramatta River. This pocket of remnant ecology gives us the opportunity to physically, culturally, and spiritually experience Tucoerah: the blending of fresh and saltwater environments. Traversing through resolute groves of Dahl'wah (D'harawal eora: casuarina), still holding the stories of freshwater and our women, you enter into an intertidal floodplain. At the furthest extents where only very high and king tides reach, salt marsh grows. Moving deeper inwards, dwarfed mangroves line paths that eventually blend into grand mangrove cathedrals marking places where salt and saline linger longer on lower tides. Figure 132 illustrates this experiential and ecological transect through the mangroves at Sydney Olympic Park.

Formally, operationally and materially connecting to the mangroves, the Sydney Olympic Park precinct can celebrate and support the ongoing protection of these significant ecologies. Adding economic, educational and cultural opportunities to Sydney Olympic Park to support it in becoming a multi-modal precinct beyond large scale events.

***Wingara* / Reading Country**

At Sydney Olympic Park we celebrate the mangroves that make this place iconic. Providing opportunities to read Country - as she should be - these mangroves remain a vital resource to the continuing survival of local Aboriginal peoples.

Holding contemporary and Ancestral stories, the mangrove ecologies of Sydney Olympic Park protect plants that have grown here since before colonisation. With thick mud that holds and stores decades of colonial pollution, these ecologies also teach us of resilience and continuation.



Figure 133: Endangered saltmarsh blending into a Dahl'wah grove at Sydney Olympic Park (credit: Bangawarra).



Figure 134: New mangrove saplings with nutrient rich mud at Sydney Olympic Park (credit: Bangawarra).

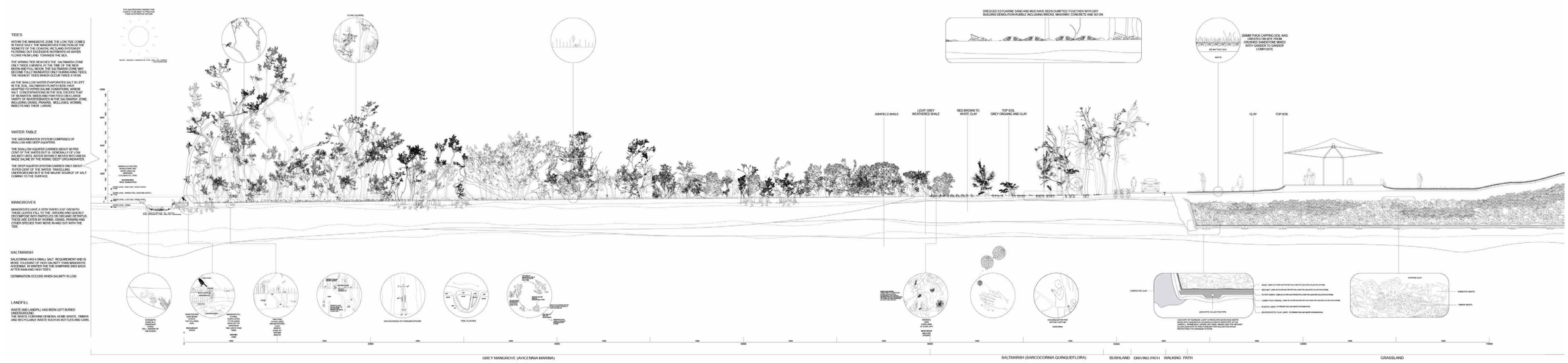


Figure 132: Blending ecologies, Mangrove transect through Sydney Olympic Park, drawn by Subjunctive Futures (UTS) master of architecture studio and Bangawarra (credit: Bangawarra and UTS).

11.3 Vision and principles

11.3.1 Vision

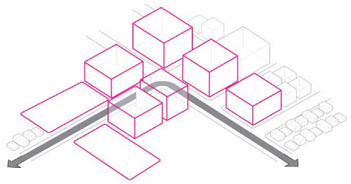
Celebrating the contemporary and Ancestral uses of Sydney Olympic Park as a ceremonial place for celebration and gathering, the project would provide a new regionally significant public transport and walking and cycling option.

Creating connections through the Sydney Olympic Park precinct would celebrate and build upon the grand, axial structure of the precinct's boulevards and reassert Country back into the heart of this urban precinct.

These connections would create new places, integrate with the existing dynamic town centre, while remaining respectful of the precinct's Olympic heritage.

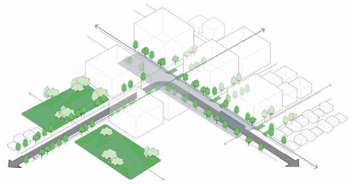
11.3.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. They are presented here under each of the project's design principles.



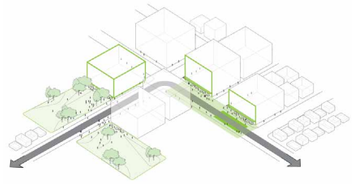
City shaping

- Reflect and celebrate the enduring spirit of the mangroves.
- Reflect and build upon the outstanding built legacy of the Sydney Olympic precinct with landscape, architecture, and system elements that integrate with existing streetscapes and built form.
- Consider the desired outcomes and visions of the Sydney Olympic Park Master Plan 2030 (Interim Metro Review) and ensure the project integrates with its future places.
- Integrate with existing streets and places as well as proposed redevelopment sites throughout the precinct.
- Consider the impact to the surrounding environment beyond the project boundary.
- Reflect, assert, and celebrate the entire kinship system of this Country including the D'harawal, Dharug, Eora, Gai-maragal, Gundungara and Guri-Ngai peoples through an inclusive space that welcomes all visitors to Country.
- Maximise the activation of Sydney Olympic Park, not only during large scale events, but for all scales and modes of use. Supporting the precinct to become a diverse and valuable town centre long into the future.



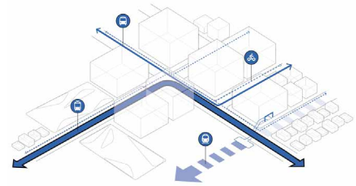
Connectivity

- Ensure people of all ages and abilities can easily and comfortably move around the precinct day-to-day and during events.
- Offer robustness, simplicity, and efficiency for events with light rail infrastructure and associated road and public domain design enabling special event operations.
- Integrate separated cycleways throughout the precinct within street corridors to serve the high density of the future neighbourhoods and town centre.
- Ensure clear and logical access and connections are provided to Sydney Metro West Station and surrounding destinations including the Stadium precinct and the Brickpit.
- Create opportunities for people to connect with the significant ecologies beyond the boundary of the project.
- Enhance social connection by providing a range of comfortable places to sit, stay or relax.
- Support people to connect with Country and the diverse ceremonial, historical and cultural significance of this place.
- Connect all people with site specific local Aboriginal knowledges.



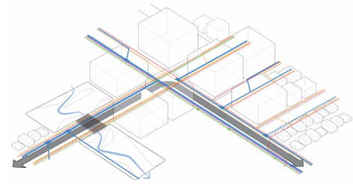
Place

- Design with attention to detail, street richness and necessary street trees for shading the precinct's ongoing transition to a town centre that is pivotal to GPOP.
- Ensure stop environments, streets, shared spaces, and pedestrianised areas contribute to the vibrancy of the precinct. Streets and places would provide thermal comfort and wind mitigation through canopy cover, awnings, and plantings.
- Provide distinct spaces for social gatherings and programming for celebrations and events.
- Design of the light rail track bed—including track bed materials, vertical alignment, crossovers, LRV storage requirements, and driver facilities—would ensure the track zone integrates into a highly amenable street environment in accordance with SOPA guidelines while enabling special event operations.
- Minimise impact on sensitive ecological areas and remediated lands through appropriate route planning and infrastructure design outcomes.
- Provide green infrastructure with a diversity of native species that creates viable, connected ecosystems of locally native species.
- Reflect, assert, and celebrate the local art styles and symbologies, to create a unique and culturally safe place reflective of local knowledges.



Choice

- Providing choice of transport systems and pedestrian circulation paths would be prioritised and considered within Sydney Olympic Park.
- Ensure Sydney Olympic Park Authority's access and inclusion guidelines are considered in the project.
- Revive and rejuvenate Sydney Olympic Park, supporting multi-modal and diverse activation ranging from large scale events through to less intense day-to-day usage.
- Provide places that allow for rest, reading, listening and experiencing country within the urban domain.



Value

- Protect, enhance, and integrate significant landscape features into highly amenable street environments—including the outer-most avenue of street trees along Dawn Fraser Avenue, Jacaranda Square, the significant fig tree located on the corner of Australia Avenue and Murray Rose Avenue, and the avenue of street trees along Australia Avenue. Prioritising locally endemic species with associated understory planting to support full and culturally responsive ecologies
- Fully consider all the details between the public domain and private boundary to achieve high quality finishes along the corridor.
- Minimise impacts on delivery of major events and support Sydney Olympic Park's role as a world class event precinct.
- Integrate appropriate safety and security measures and principles to support Sydney Olympic Park's role as a major event precinct.

11.4 Design place and movement outcomes

11.4.1 Holker Busway

Overview

Light rail would run along the Holker Busway between Hill Road and Kevin Coombs Avenue. A centre-running arrangement would be adopted north of Haslams Creek to allow for bus-only lanes to the rear of the Holker Street stop's platforms, maintaining existing special event bus services to and from Sydney Olympic Park.

The existing Holker Busway bridge over Haslams Creek would provide for shared light rail and bus running within the track zone. The alignment would then continue to the Busway's intersection with Kevin Coombs Avenue, where separated bus-only lanes would allow for bus movements through a signalised intersection.

Built form

Two stop canopies would be constructed for the Holker Street stop, one on each platforms, providing amenity and wayfinding for customers. The canopies would integrate with other public transport shelters and buildings in the area.

The existing Holker Busway bridge over Haslams Creek would be maintained, with a reallocation of shared path and travel lane widths to safely allow for walking, cycling, bus, and light rail movements over the bridge.

Public space

The light rail alignment along the Holker Busway and the location of the Holker Street stop would improve access to the Millennium Parklands to the west and the Brickpit Ring Walk to the east. The light rail stop would also provide convenient access to the proposed URBNSURF wave park currently under construction immediately north of the proposed stop location.

Residual land

There is no residual land within this section of the project.

Stops as places

The proposed Holker Street stop would create a place of arrival for several of the recreation facilities in the northern portion of the Sydney Olympic Park precinct. This would include the proposed URBNSURF wave park, the southern section of Millennium Parklands, Wentworth Common, and the Brickpit Ring Walk.

Transport integration

The Holker Street stop would provide a 500 metre (7 minute) walkable connection to the nearby Newington residential area via Holker Street and the Louise Sauvage Pathway.

Permeability of the stop precinct would encourage walking and cycling to and through the area. Pedestrian and cycle accessibility across Holker Street is proposed via its signalisation at Hill Road, as well as a non-signalised crossing at the southern end of the platform.

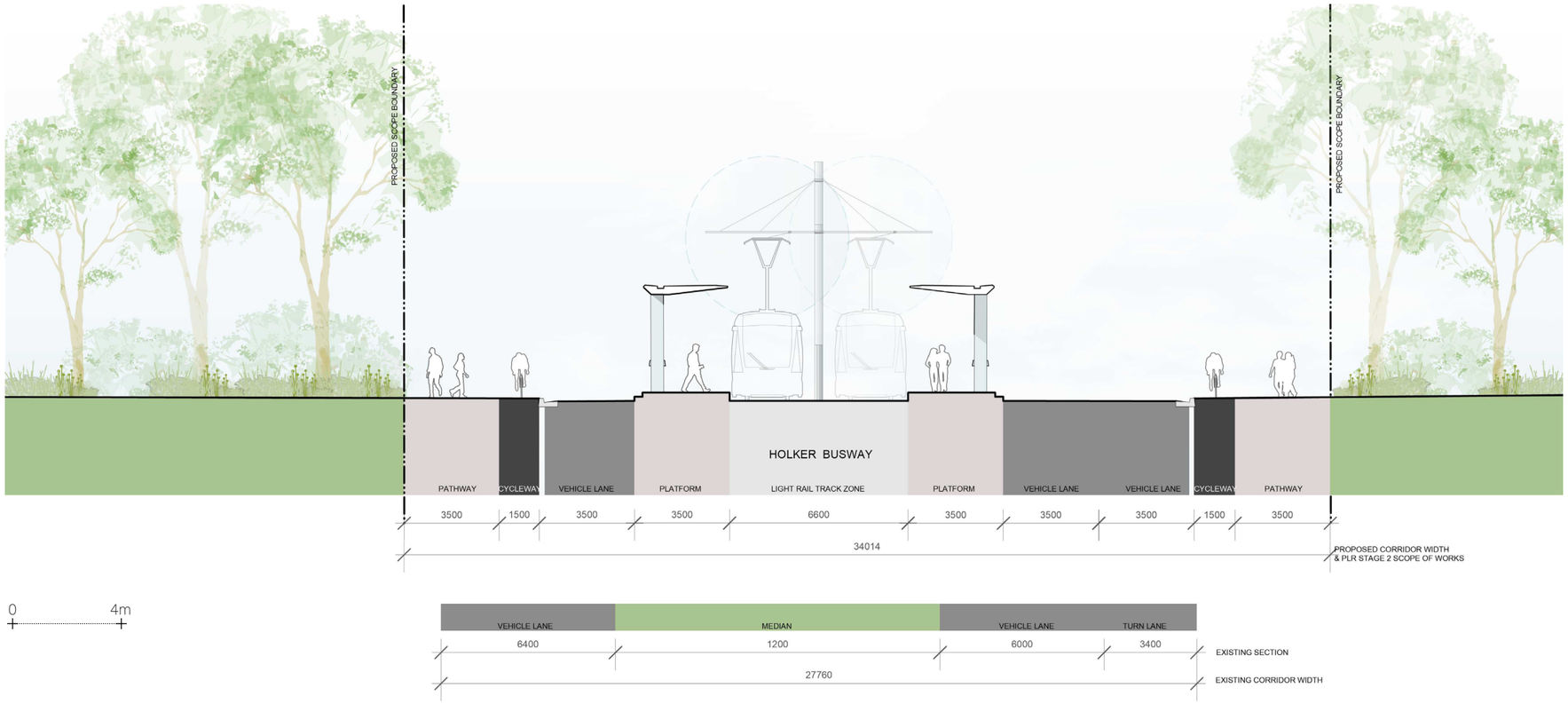


Figure 135: Cross section 22 - Holker Street stop (indicative only - subject to design development).

Shared paths are proposed on both sides of the Busway and over the existing bridge, improving walking and cycling facilities along a popular active transport route between Australia Avenue and Hill Road.

Bus-only lanes would run through the Holker Street stop precinct to provide bus priority access between Hill Road and the Holker Street bridge over Haslams Creek.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of the Holker Street Busway.

The visual amenity of the Holker Street stop would be improved through the landscape design including street trees, understorey planting, a high quality stop, and public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 136: Light rail stop precinct integrating bus-only lanes and interchange facilities, Kingsford, Australia (credit: ASPECT Studios).



Figure 137: Mature vegetation screening light rail stop and infrastructure from adjacent development, Dijon, France (credit: Gordon Stewart).

11.4.2 Australia Avenue

Overview

Light rail on Australia Avenue would aim to replicate the existing character of the street, with centrally-located light rail situated in the approximate position of the existing central median. The light rail would run in the centre of the road corridor, with traffic lanes either side to maintain the existing character of the street and provide for vehicle circulation through the precinct. Separated walking and cycling facilities would be provided both sides of the street. Significant existing Eucalyptus trees near Australia Avenue's intersection with Kevin Coombs Avenue would be retained.

Built form

There would generally be little new built form proposed in this section of the project, beyond the construction of the light rail track zone. New light rail infrastructure would integrated with the existing character of the street and be sympathetic to the scale and type of built form within the adjacent Showgrounds.

Public space

Australia Avenue forms the interface between Sydney Olympic Park's Showgrounds precinct and the parklands of Wentworth Common and the Brickpit Ring Walk. The project would maximise walking and cycling connections along and across the street, ensuring access to existing public space is improved. The landscape design of the street would also replicate the character of the adjoining parklands, with street trees and understorey planting in verges and medians ensuring the street contributes to the public space of the precinct.

Residual land

There is no residual land within this section of the project.

Stops as places

The project would allow for the future construction of a stop at Grand Parade to serve the Showgrounds as the precinct evolves in the future.

Transport integration

Walking and cycling would be integrated on both sides of Australia Avenue, via footpaths and separated, uni-directional bicycle paths, set behind existing trees to be retained supplemented with new street tree planting to create a comfortable walking and cycling environment.

Vehicle movements required for events at the adjacent Showgrounds would also be allowed for within the design.

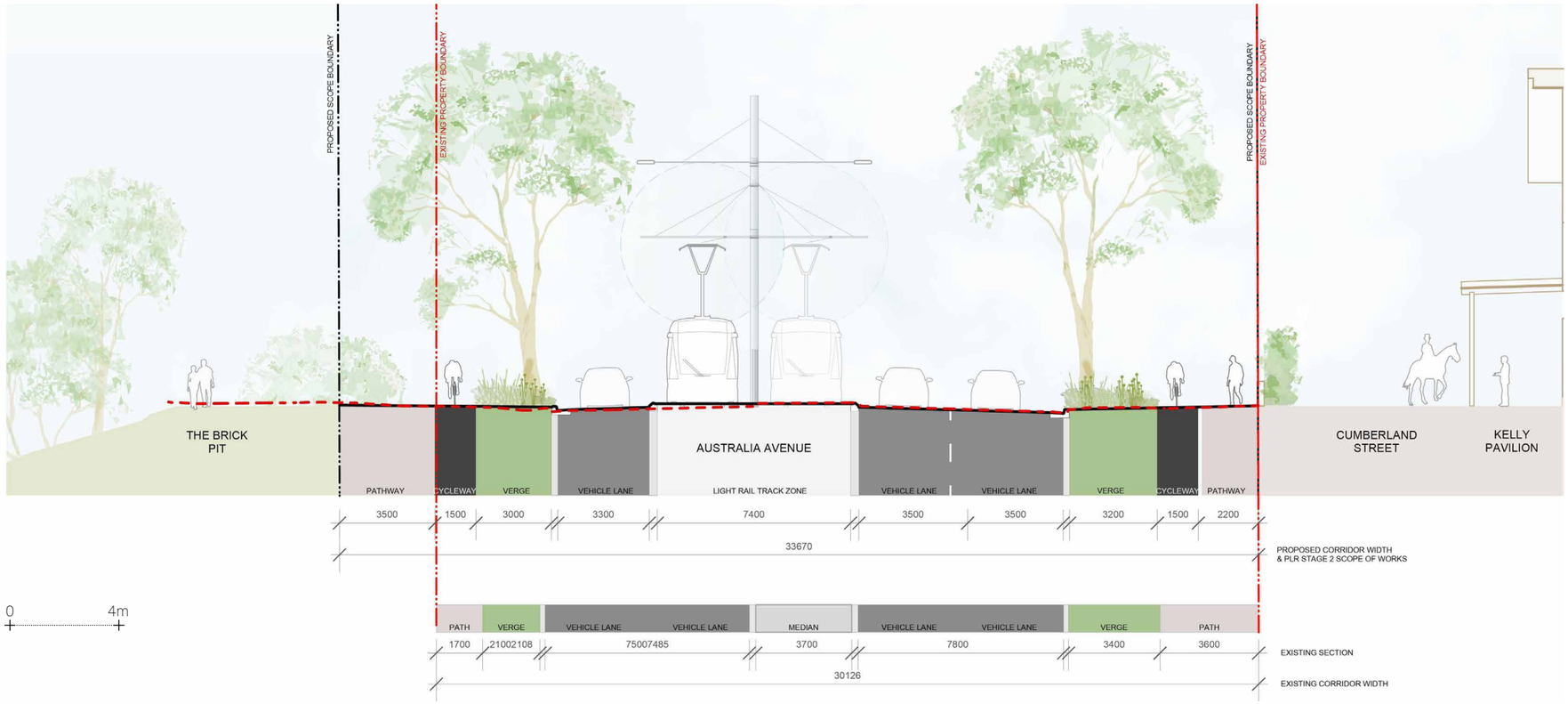


Figure 138: Cross section 23 - Australia Avenue (indicative only - subject to design development).

Visual amenity

The project would result in a low magnitude of change to the visual amenity of Australia Avenue.

The visual amenity of this area would be improved by large canopy street trees, layered planting, and high quality public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 139: Sketch - View west along Australia Avenue from Jacaranda Square (indicative only - subject to design development).

11.4.3 Dawn Fraser Avenue

Overview

The light rail alignment on Dawn Fraser Avenue would seamlessly integrate and enhance the character of the street in line with the future vision of Sydney Olympic Park's Central and Parkview precincts.

A pedestrianised zone would be created between Australia Avenue and Olympic Boulevard with the removal of vehicular through-traffic. The Jacaranda Square and Olympic Boulevard stops would be located at the eastern and western end of the pedestrianised zone respectively. South of Olympic Boulevard, light rail runs past the stadium precinct centrally within the street, with a single lane of traffic in each direction either side of the track zone.

Built form

Light rail stop platforms would be located at the northern and southern ends of the pedestrianised section of street between Australia Avenue and Olympic Boulevard. Stop canopies would be constructed at the Jacaranda Square and Olympic Boulevard stops to provide amenity and wayfinding for customers.

At the Jacaranda Square stop, two stop canopies would be constructed, sympathetic to the scale and location of the adjacent existing awnings and structures within Jacaranda Square, which would be retained.

Two stop canopies would be constructed at the Olympic Boulevard stop, one on each platform. These would be integrated within a plaza, with existing and newly planted trees mitigating potential visual impacts.

The track zone would adopt a 25 metres radius turn at the intersection of Dawn Fraser Avenue and Australia Avenue, to reduce impacts on Jacaranda Square and the existing significant Fig tree at Australia Avenue's intersection with Murray Rose Avenue.

Public space

The pedestrianisation of Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard would create a significant new public space and contribute to the placemaking potential of Sydney Olympic Park's Central precinct. This new place would prioritise pedestrian amenity and encourage increased activation of adjacent ground floor building uses.

The Jacaranda Square stop would improve access to the existing public space at Jacaranda Square, while the Olympic Boulevard stop would improve access to a variety of open space and recreation facilities, including Cathy Freeman Park and the Stadium precinct.

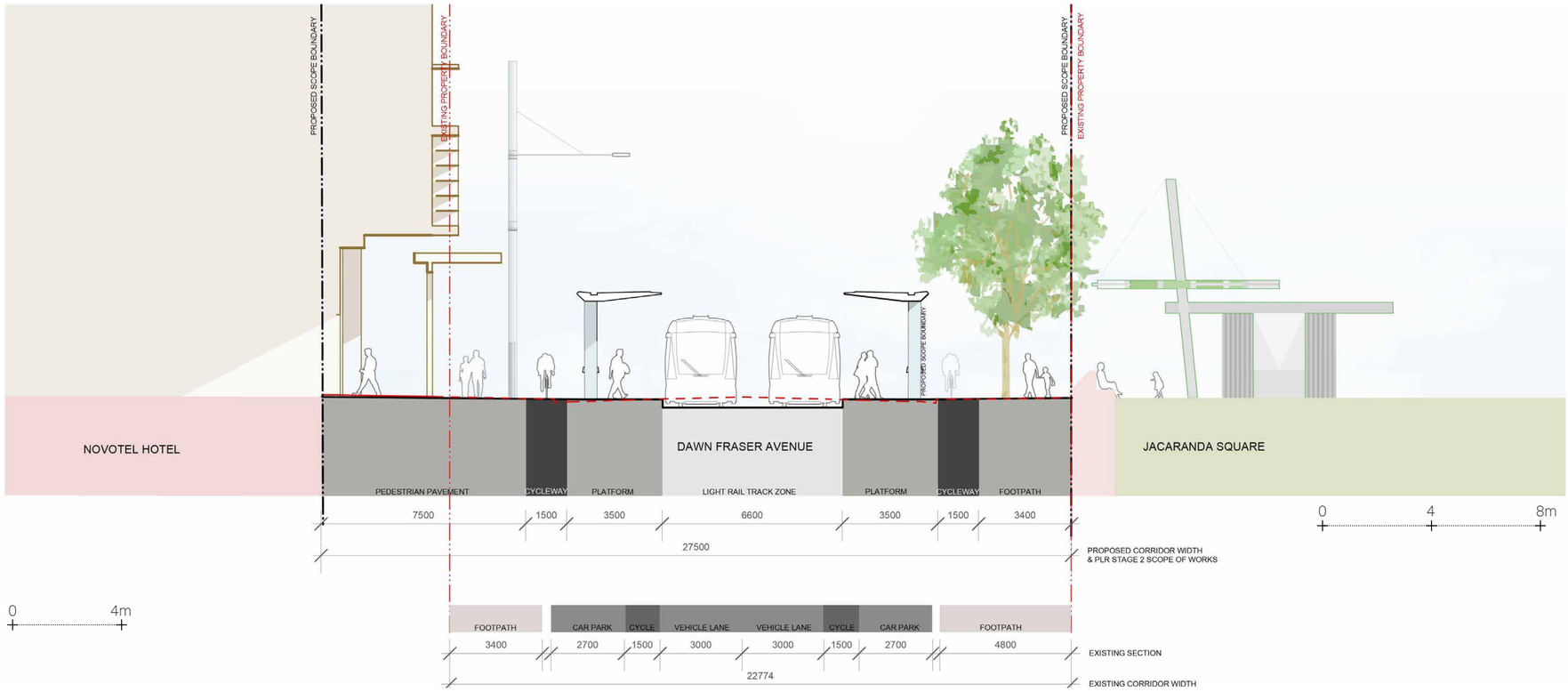


Figure 140: Cross section 24 - Jacaranda Square stop (indicative only - subject to design development).

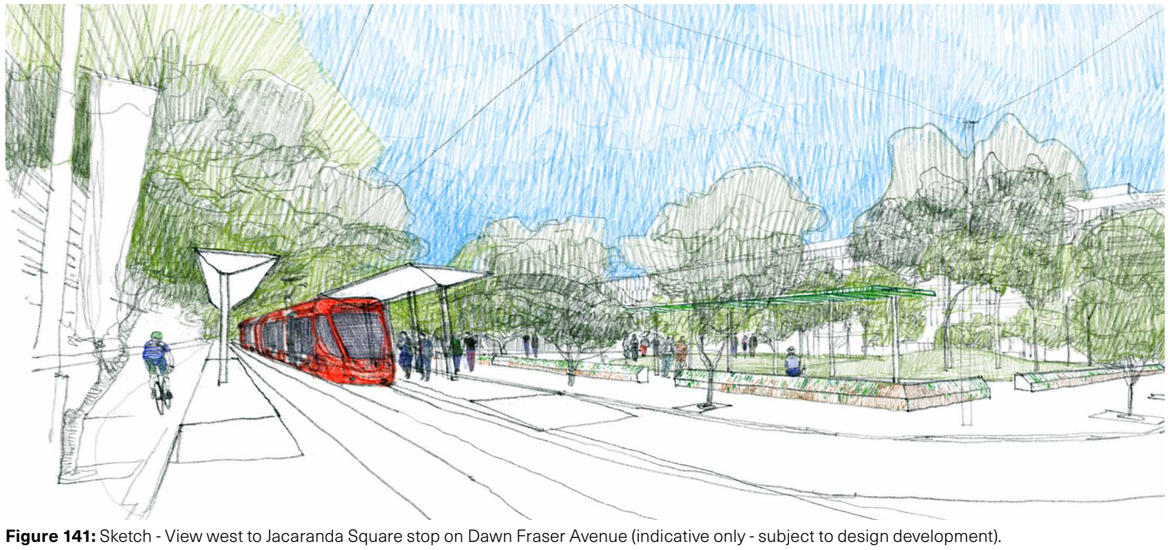


Figure 141: Sketch - View west to Jacaranda Square stop on Dawn Fraser Avenue (indicative only - subject to design development).



Figure 142: Public domain activation within a pedestrianised light rail street, Sydney, Australia (credit: ASPECT Studios).

Residual land

There is no residual land within this section of the project.

Stops as places

Dawn Fraser Avenue would be closed to vehicular traffic adjacent Jacaranda Square, seamlessly integrating a pedestrian plaza in which stop platforms would be integrated. This stop would create a new place and point of arrival for the northern portion of SOP's evolving Central precinct, as well as for the Parkview precinct north of Australia Avenue.

Dawn Fraser Avenue would also be closed to through vehicular traffic between Showground Road and Olympic Boulevard, providing a pedestrian plaza integrating stop platforms. This stop would create a new transport place fronting the forecourt of the existing heavy rail station. The stop would contribute to the activation of the southern portion of the Central precinct.

Transport integration

Light rail services would interchange with Sydney Metro West via the Olympic Boulevard stop, providing an interchange distance of about 200 metres via Showground Road. Showground Road would be closed to through vehicular traffic to maximise convenience and legibility of the interchange with Sydney Metro West. Murray Rose Avenue would be extended west to Olympic Boulevard to maintain vehicular thoroughfare.

During large events, light rail services would terminate at the Jacaranda Square stop. Scissor tracks would be located immediately south of the stop to provide for terminus light rail vehicle movements during event-mode running.

Bus access would realigned from Dawn Fraser Avenue to Herb Elliott Avenue, while allowance for bus setdown and termination on Park Road would be retained.

Cycling connections would be provided between Australia Avenue and Olympic Boulevard in line with SOPA's active transport strategy. South of Olympic Boulevard, shared paths would be provided both sides of the street to providing cycling connections through this area of the SOP precincts and to and from the Carter Street Precinct.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of Dawn Fraser Avenue.

The renewal of this area into a pedestrianised zone would deliver positive urban design outcome. The visual amenity of this area would be improved through street tree planting, high quality public domain fixtures and finishes.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.

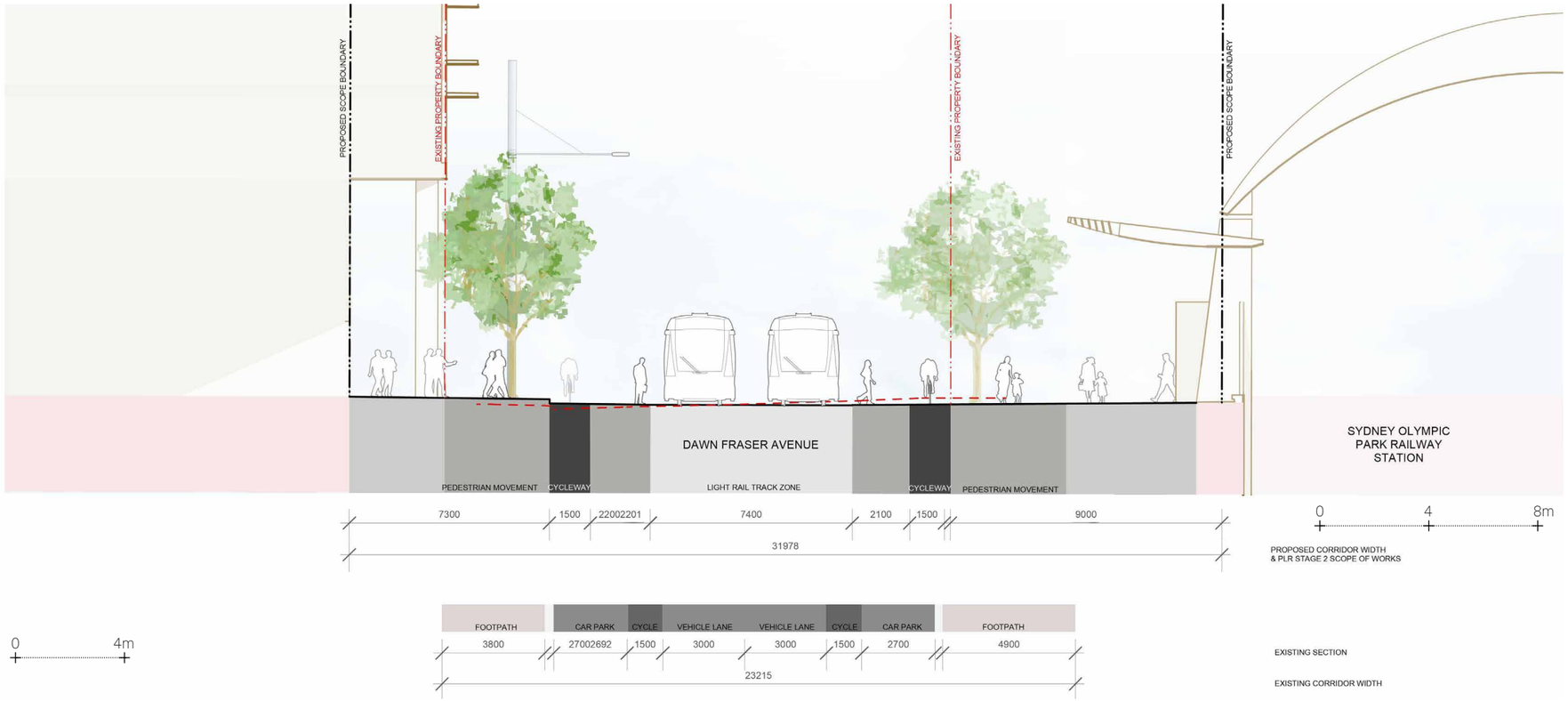


Figure 143: Cross section 25 - Dawn Fraser Avenue (indicative only - subject to design development).



Figure 144: Sketch - View east along Showground Road to Dawn Fraser Avenue and Olympic Boulevard stop (indicative only - subject to design development).

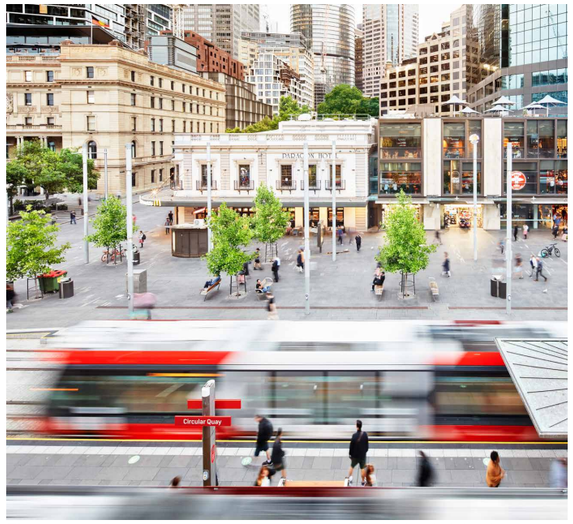


Figure 145: Public domain activation the pedestrianised civic plaza at light rail terminus, Circular Quay, Australia (credit: ASPECT Studios).

12.0 Carter Street Precinct

12.1 Overview

12.1.1 Alignment summary

The light rail alignment would enter the Carter Street Precinct from Dawn Fraser Avenue via its intersection with Edwin Flack Avenue. The corridor would then run down the centre of Uhrig Road at the current gradient of the existing street.

The Carter Street Terminus stop would be situated at the western termination of the project. The light rail corridor and stop platforms would be located centrally within both the existing and planned future road corridor to integrate with future development. Driver facilities and a substation would also be located in the vicinity of the terminus.

The project within the Carter Street Precinct is shown in the context of its built and natural environment within Figure 146.

The design, place, and movement outcomes of Uhrig Road are discussed and illustrated in this chapter.

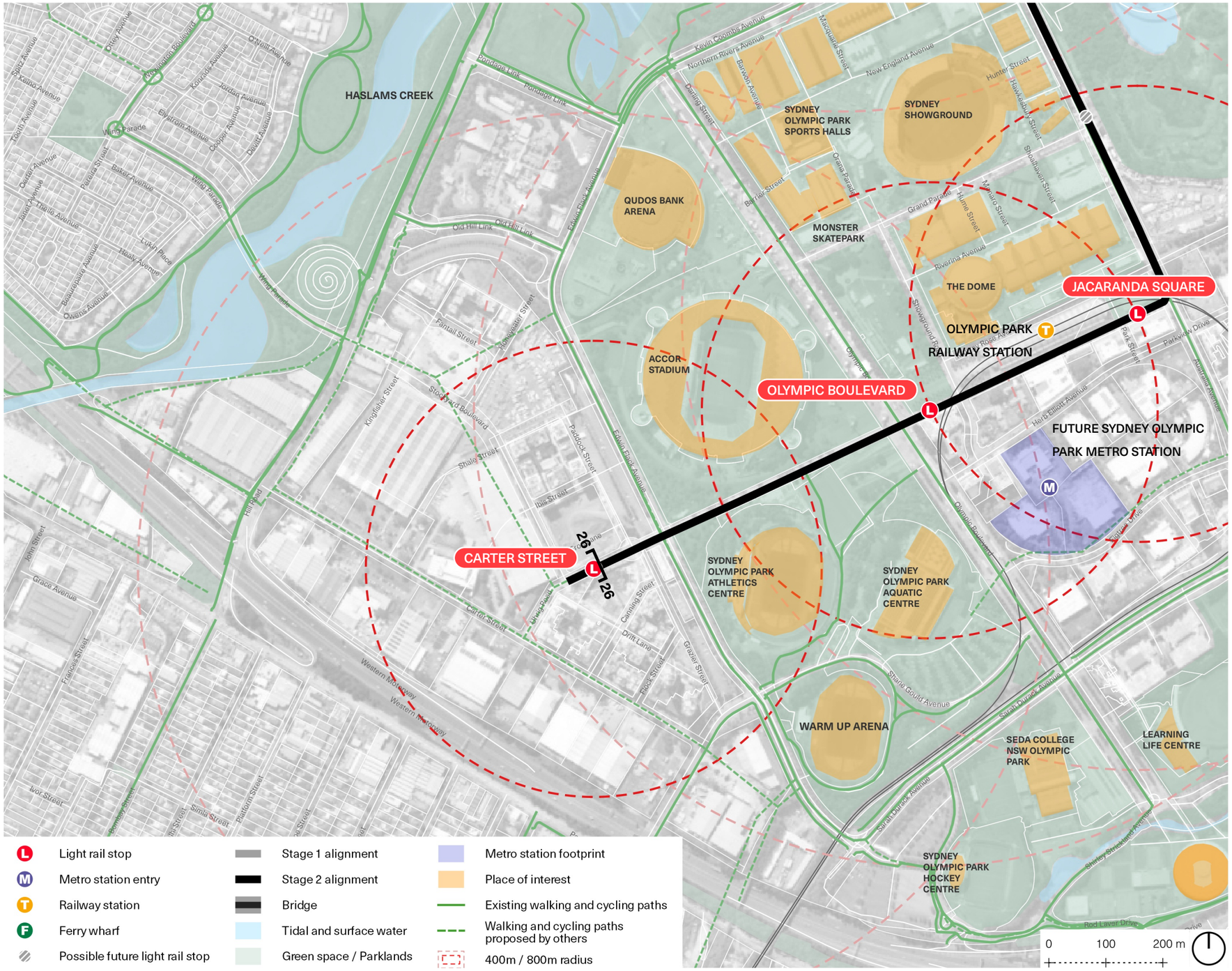


Figure 146: Overview map - Carter Street Precinct.

12.2 Designing with Country

Ngalawallah / A Gathering Space

The Carter Street Precinct is the place to celebrate the journeys people would take alongside and activated by Ancestral knowledges, stories, and ecologies as they undertake this new contemporary Songline.

As a significant node for the project, the Carter Street Precinct offers the opportunity to connect with Country at the site while also fostering broader connections through the diverse and protected ecologies beyond.

Wingara / Reading Country

In this precinct we celebrate Maramara (D'harawal eora: mullet). Also known as Wurridjal, within the Common Sydney Language (sometimes referred to as Dharug, Gadigal and "The Sydney Language") the mullet is a significant animal guiding ceremonial obligations. Every three to five years the number of mullets boom within the creeks and rivers around the Parramatta River. This provided a seasonal and ceremonial indicator that the largest and most significant lore ceremonies were to take place across the Low Country of Homebush and Sydney Olympic Park. Hosting peoples from the entire kinship system, the significant blooms of mullet also enabled surrounding nations to visit and carry out their caretaking obligations sustainably without irreparably damaging Country.

Maramara therefore signifies both the beginning and end—of seasonal cycles and of ceremony—enabling people to read and understand the cultural needs of Country. As both the beginning and end of the project, the Carter Street Precinct holds connections to the Songlines of Maramara.

As the mullets run through the waters so too would the light rail traverse over their associative habitats. Designing with landscaped seasonal and cultural indicators, and integrating other built environment solutions, we recognise the knowledge Maramara provides, enabling us to move through Country sustainably.



Figure 147: Maramara/ Wurridjal are significant cultural animals associated with this area of the project (Credit: Bangawarra).

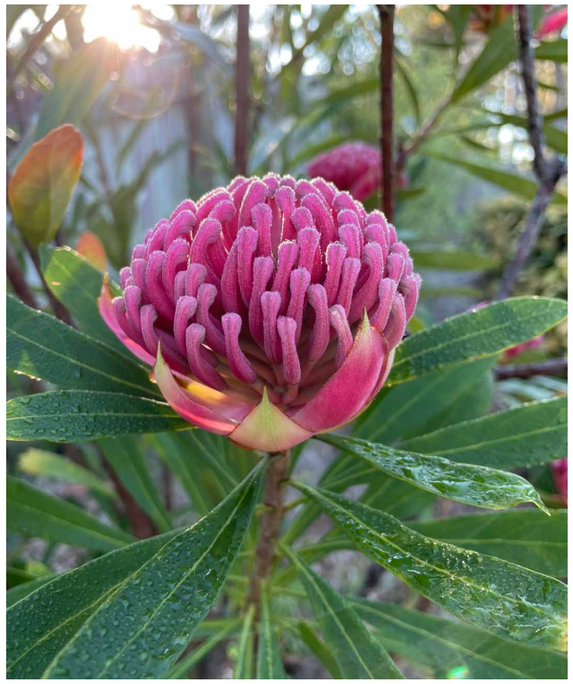


Figure 149: The flowering of waratahs indicate mullet seasons (Credit: Bangawarra).



Figure 148: Boom numbers of mullet running through local creeks and streams indicate a time for large lore ceremony (Credit: Encyclopedia of Britannica).



Figure 150: The flowering of wattles indicate mullet seasons (Credit: Bangawarra).

12.3 Vision and principles

12.3.1 Vision

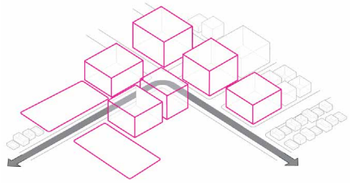
The project's vision for the Carter Street Precinct is a public place of arrival and departure within the town centre, and a focal point for the centre's public life, contributing to a vibrant, walkable main street, and a place to celebrate and connect with Country.

At the heart of this precinct would be a comfortable, accessible, and shaded high street and stop environment, where convenience and amenity is prioritised to support access to public transport in conjunction with other town centre uses.

Activating the ground plane, the Carter Street Precinct is a place that encourages people to journey along and explore the rich and diverse stories, ceremonies, and ecologies of this contemporary Songline.

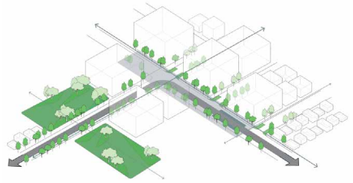
12.3.2 Principles

To deliver the above vision, precinct-specific objectives have been developed in collaboration with stakeholders. They are presented here under each of the project's design principles.



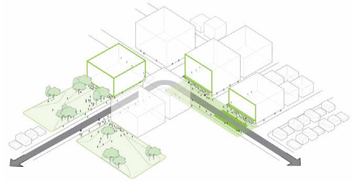
City shaping

- Consider the desired outcomes and visions included in local plans for the Carter Street Precinct including existing and proposed developments.
- A significant ceremonial node supporting people to connect to and learn for Country beyond the boundaries of this site.
- Provide potential opportunities for future expansion of the public transport network across the area, whether through future light rail or ancillary public and active transport options.



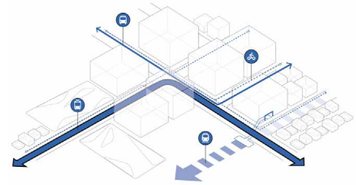
Connectivity

- Catalyse the connectivity of Carter Street Precinct generally, specifically the integration of the Carter Street Precinct with Sydney Olympic Park, blurring boundaries, and creating a seamless experience for users.
- Encourage people to explore more broadly among the important and protected ecologies close to this site.
- Integrate separated cycleways into stop environment and street corridor to serve the high density of the future neighbourhood.



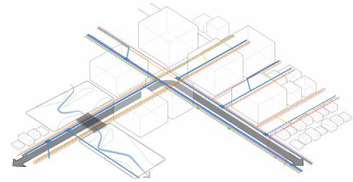
Place

- Contribute to the creation of a new, vibrant, walkable main street for the town centre.
- Take account of visual impact of the location of light rail infrastructure near the Carter Street Precinct, using land efficiently and effectively, and designing innovative structures to blend with the context.
- Create a place to celebrate the ceremonial nature of this Country and the future journeys people would take along this contemporary Songline.



Choice

- Provide a safe, legible and intuitive point of arrival and departure within the town centre.
- Provide safe and comfortable walking and cycling routes on Uhrig Road to contribute to mode shift for local journeys.



Value

- Provide a comfortable, accessible, and shaded high street and stop environment appropriate to its location within the future high-density town centre of the Carter Street Precinct, where pedestrian convenience and amenity is prioritised.

12.4 Design place and movement outcomes

12.4.1 Uhrig Road

Overview

The project would enter the Carter Street Precinct via Uhrig Road's intersection with Edwin Flack Avenue. The light rail track zone would be positioned centrally within Uhrig Road, with a single traffic lane and walking and cycling paths either side of the tracks.

Light rail services would terminate in the heart of the precinct and town centre, at the Carter Street stop. The stop would adopt side platforms with traffic lanes to their rear, allowing access to both ends of the stop platforms.

Built form

Two stop canopies would be constructed for the Carter Street stop, one on each platform, providing amenity and wayfinding for customers. Their architectural design would be in keeping with the urban visual setting of the town centre.

The terminus would require the construction of a buffer stop at its south-western end to provide safety and protection for pedestrians and motor vehicles. The buffer stop would comprise elements such as a low height wall and planted garden bed.

Power supply would be provided via a traction power substation located adjacent to residual land. A driver's facility would be also be provided in the vicinity of the stop.

Public space

The proposed Carter Street stop is designed to integrate within the town centre environment, maximising stop access for customers and town centre permeability for pedestrians and cyclists. New street trees are proposed to maximise town centre amenity.

The project would also improve access to the public spaces being delivered by surrounding development as part of the town centre. This would include improved access to a new public open space immediately south of the terminus.

Residual land

There is no residual land in this section of the project.

Stops as places

The Carter Street stop's position in the heart of the precinct would provide light rail services to the significant catchment of this growing town centre. The stop would provide a public place of arrival and departure within the town centre and become a focal point for the centre's public life, contributing to a vibrant, walkable main street.



Figure 151: Cross section 26 - Carter Street Terminus (indicative only - subject to design development).

Transport integration

Active transport would be provided through the stop precinct with separated, uni-directional bicycle paths on each side of the street. Pedestrian access would be provided on both sides of the corridor. Bicycle parking would be integrated with the stop, including allowances for future catchment enlargement beyond of the Carter Street Precinct.

Travel lanes would be located to the rear of stop platforms to provide vehicles with local access in a traffic-calmed town centre. A 2.5% grade with buffer stop infrastructure would be adopted for the terminus to best integrate the track zone and platforms within the street.

Visual amenity

The project would result in a low magnitude of change to the visual amenity of Uhrig Road.

The visual amenity of Uhrig Road would be improved with the delivery of street trees, landscape verges, footpaths, and high quality public domain fixtures and finishes. The project's design would also integrate with the planned future character of the town centre.

For further information refer to *Appendix A (Landscape and Visual Impact Assessment)*.



Figure 152: Buffer stop planting, High Street, Randwick (credit: Jason Packenham).

Chapter 13.0

13.0 Bridges

13.1 Overview

13.1.1 Introduction

The nature of the project's alignment through and across the upper Parramatta River valley would necessitate a number of significant bridges in a landscape and environment that presents particular challenges at each bridge location.

The project's bridges would offer significant benefits beyond facilitating the light rail alignment. Distinctively designed bridges would provide an opportunity to establish identity for the project and the places where they are located. Benefits would include providing new connections, uniting growing communities, and facilitating improved lifestyle and recreation for the bridge's adjoining communities and the broader Sydney region.

The project would involve the construction of five new bridges. These would include:

- a new bridge between Camellia and Rydalmere, bridging the Parramatta River from Grand Avenue, Camellia to John Street, Rydalmere
- a new bridge over Silverwater Road, bridging the Silverwater Road corridor along the alignment of South Street, Rydalmere
- a new bridge within Ken Newman Bridge, bridging the creek in Ken Newman Park, linking the park to Spurway Street, Ermington
- a new bridge between Melrose Park and Wentworth Point, bridging the Parramatta River from Wharf Road, Ermington to Wentworth Point
- a new bridge immediately west of the existing Hill Road bridge over Haslams Creek, discussed in Chapter 10 (Wentworth Point).

In addition to these new bridges, the project would make use of several existing bridges. These would include:

- the recently constructed James Ruse Drive Bridge, delivered as part of Parramatta Light Rail Stage 1, bridging James Ruse Drive between Tramway Avenue, Harris Park and Grand Avenue, Camellia
- the Holker Busway Bridge, bridging Haslams Creek on the Holker Busway within Sydney Olympic Park, where the bridge can accommodate the light rail with shared bus running within the current road width and active transport without significantly changing the structure of the bridge.

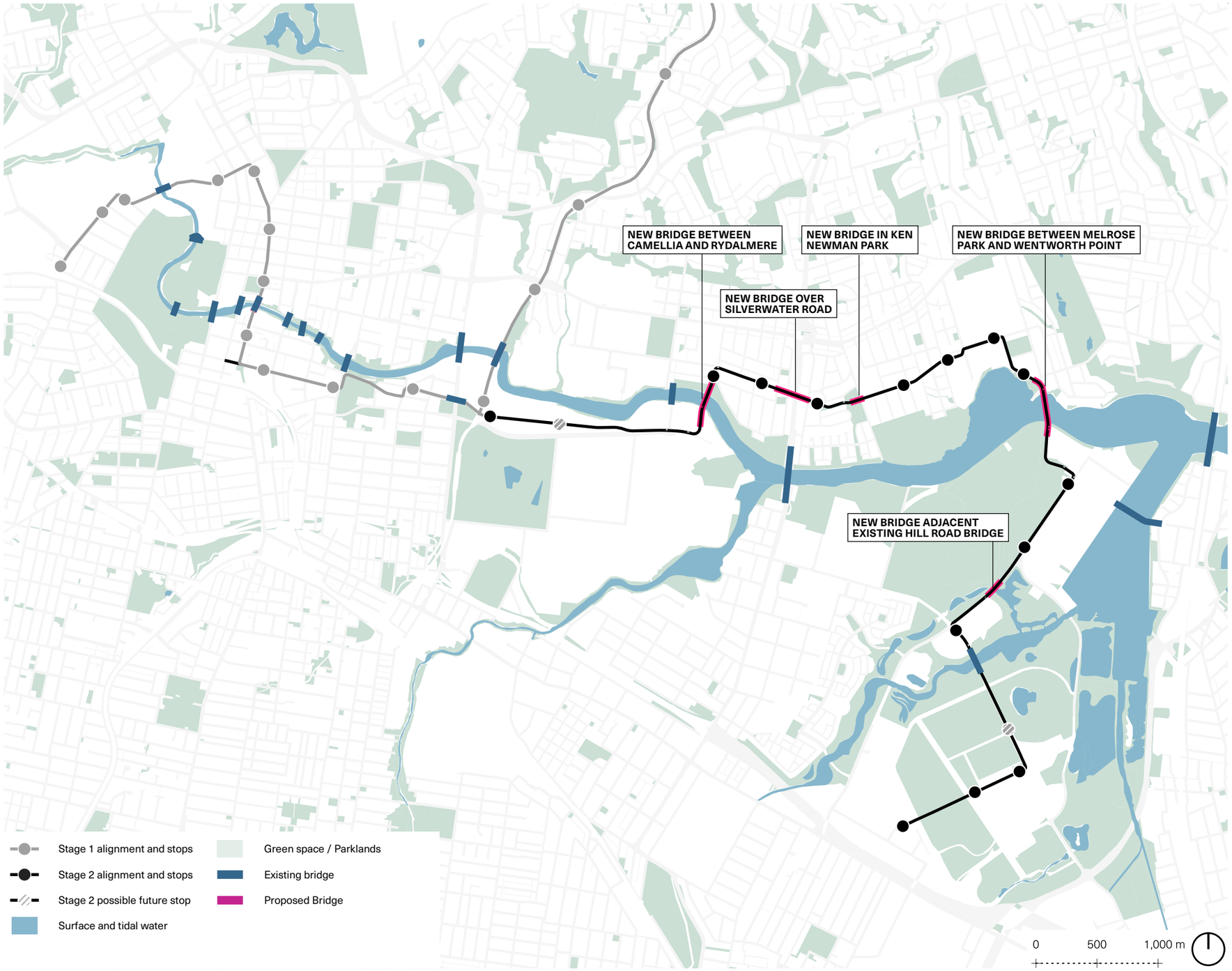


Figure 153: Overview map - bridges.

13.1.2 Existing river crossings

Bridges have been built over the Parramatta River since the days of early European settlement.

From the convict-built sandstone arch of Lennox Bridge; to Gladesville Bridge, the largest single span concrete arch bridge in the world at the time of its construction; to the recently constructed Bennelong Bridge, a balanced cantilevered bridge between Rhodes and Wentworth Point, the existing bridges of the Parramatta River reflect the trends in bridge design at their time of construction.

Figure 154 illustrates the existing bridges of the Parramatta River. Figure 155 provides a timeline of bridge construction that identifies bridge type, function, and construction date for the existing bridges over Parramatta River.

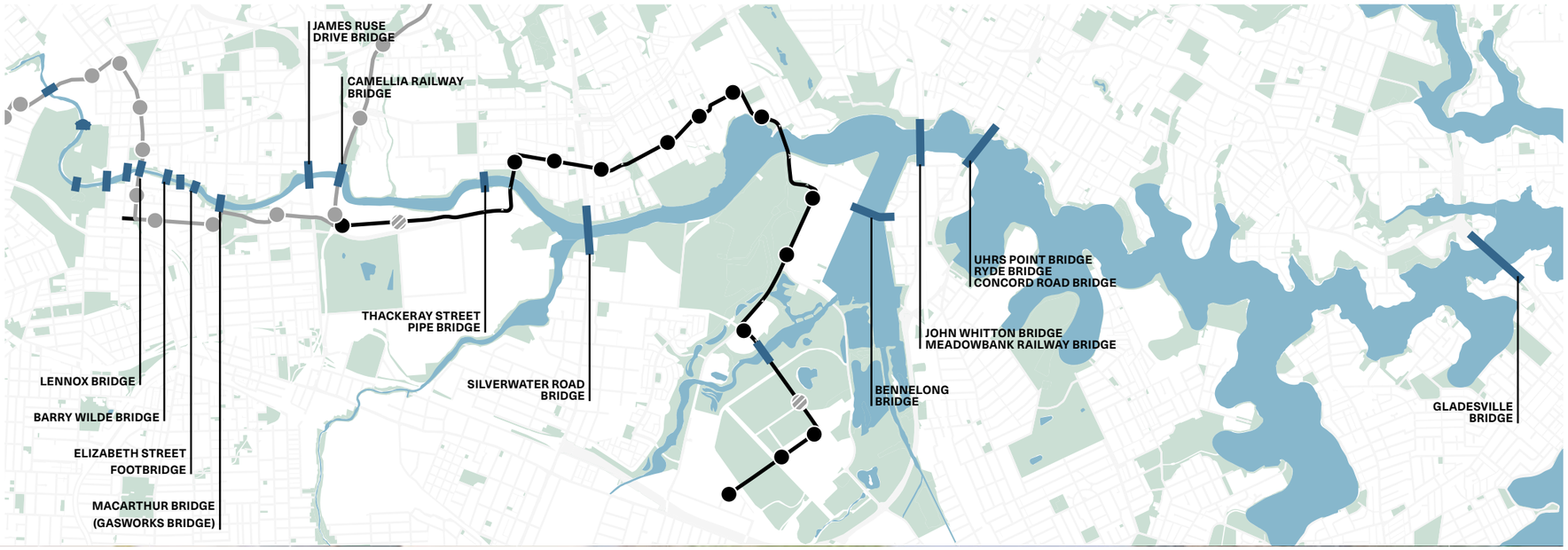
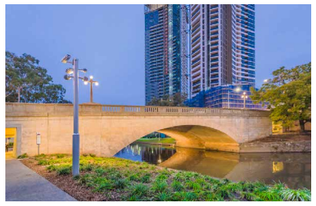


Figure 154: Existing bridges of the Parramatta River - Lennox Bridge to Gladesville Bridge.



Lennox Bridge
1839
Pedestrian & Road Traffic
Sandstone Single Arch Bridge



Meadowbank Railway Bridge
1886
Pedestrian & Cycle Traffic
Railway Bridge/ Viaduct
Iron Lattice Bridge



Macarthur Bridge (Gasworks Bridge)
1885
Road Traffic
Welded Steel Box Girder Bridge



Uhrs Point Bridge
1935
Road & Pedestrian Traffic
Steel Truss now Inoperable Vertical-Lift Bridge



Thackeray Street Pipe Bridge
1936
Pedestrian & Cycle Traffic
Steel Truss on Concrete Piers



Silverwater Road Bridge
1962
Road & Pedestrian Traffic
Pre-stressed Concrete Box Girder



Gladesville Bridge
1964
Road & Pedestrian Traffic
Concrete Arch Bridge

STONE ARCH | LATTICE TRUSS | STEEL TRUSS, CONCRETE PIERS | PRE-STRESSED CONCRETE GIRDER | CONCRETE ARCH



James Ruse Drive Bridge
1966
Road Traffic
Pre-stressed Concrete Bridge



Barry Wilde Bridge
1975
Road & Pedestrian Traffic
Concrete Girder Bridge



John Whitton Bridge
1980
Railway Bridge/ Viaduct
Steel Two-Track Box Girder Bridge



Ryde Bridge
1987
Road & Pedestrian Traffic
Pre-stressed Concrete Girder



Camellia Railway Bridge
1995
Railway Bridge/ Viaduct
Steel Truss on Concrete Piers



Elizabeth Street Footbridge
2003
Pedestrian & Cycle Traffic
Pre-stressed Concrete Girder
Artwork by Greg Stonehouse & Susan Milne



Bennelong Bridge
2016
Buses & Pedestrian/Cyclists
Concrete Balanced Cantilever

PRE-STRESSED CONCRETE GIRDER | STEEL GIRDER | PRE-STRESSED CONCRETE BRIDGES | BALANCED CANTILEVER

Figure 155: Timeline of bridge construction over the Parramatta River.

13.2 Bridge design vision and principles

13.2.1 Vision

The bridge design vision has been developed for the Parramatta Light Rail Stage 2 bridges and structures in response to analysis and stakeholder consultation.

Parramatta Light Rail Stage 2 would deliver new light rail and active transport bridges that create new regionally and locally significant connections, returning the ecologically and culturally diverse river to the public domain.

The project would provide a suite of bridges that are elegant in form and appropriate to their locations within the river landscape, parklands, and nearby neighbourhoods.

Bridges would be designed to celebrate varied strata of Country including Sky, Terrestrial, and Water. As users pass through, around, and underneath, the bridges would be activated through materiality, interpretation, and public art that celebrates the ancient ecological Songlines and tools of transport used by local Aboriginal peoples.

Bridges would access local networks in safe, legible, and convenient ways to ensure all speeds of movement are connected to Country.

13.2.2 Principles

01

Design quality

Designs are to achieve high quality outcomes and elegant proportions to reduce visual and physical impacts and create an asset to the adjacent neighbourhoods and region.

Bridge design requirements for achieving design quality would:

- Provide a contemporary, elegant asset, and contextually responsive bridge design to the surrounding neighbourhoods and Greater Parramatta area
- Provide a design where all elements are considered and integrated
- Ensure a high quality user experience on the bridge, including considering views to and from the bridge
- Highly visible structures viewed from surrounding streets, the river, parks below the bridges and the region
- Design bridges worthy of crossing Sydney's most important river and ensure designs genuinely and respectfully connect with Country
- Create public spaces to connect with Country along bridges that emphasis the importance of this river system to local ecologies and communities.

02

Responsive to context

Designs are to respond sensitively to the landscape, its history, social rituals and cultural significance.

Bridge design requirements for ensuring designs are responsive to context would:

- Ensure approach ramps tie into the context, minimise visual impact, footprint and provide opportunities for landscape mitigation
- Minimise impacts to existing ecology, habitat, and landscaping while also enhancing and strengthening new ecologies where possible
- Minimise impacts to existing residential properties, managing issues of privacy, noise, overshadowing and light pollution.
- Designs to consider, manage and reflect the surrounding topography.
- Connect and enhance active transport links
- Formally, spatially, and materially integrate culturally relevant knowledges and tools of transport that reflect the importance of water systems to travelling through Country.

03

Environmentally sensitive

Minimise impact to the environment through the placement of bridge elements and consideration of construction impacts.

Bridge design requirements for minimising environmental impact would:

- Minimise impacts to the sensitive ecological areas, particularly foreshore areas and mature trees impacted by the bridge locations and construction
- Consider ways the bridge design can enhance the ecology of the river, parks and residual land through rehabilitation and habitat creation
- Visually and physically connect all people with ecologies as they move along bridges.

04

User friendly

Provide equitable access, integrate pedestrian and bicycle facilities and connect to adjacent networks in a safe, legible and convenient way.

Bridge design requirements for ensuring designs are user friendly would:

- Provide accessible connections to the bridge and consideration of appropriate resting points providing shade and taking advantage of views where appropriate
- Provide direct and convenient connections between walking and cycling facilities on bridges and adjacent foreshore areas
- Provide safe access for pedestrians and cyclists both to, on and below the bridge, meeting best practice urban design and CPTED principles
- Provide a bridge design that can be easily navigated
- Support multiple speeds of accessible active transport including multiple speeds of cycling, wheeling, walking, guided walking, and shorelining
- Dedicate communal spaces and nodes of pause along bridges to allow visual connections to Songlines that have run east-west through the Parramatta River for millennia.

05

Value

Provide value for money and an asset of lasting value to all, through good design, innovation and collaboration.

Bridge design requirements for ensuring value is achieved would:

- Contribute to the liveability and amenity of the area
- Consideration of the use of common design elements between the bridges, establishing economies in design and construction
- Provide a bridge design that is safe to use, maintain and operate.
- Seek innovation throughout the design and construction process to continually improve and add value
- Ensure value engineering adds value without compromising the bridge design meeting the above design requirements and overall composition of the bridge whilst creating diverse and valued experiences.

13.3 New bridge between Camellia and Rydalmere

13.3.1 Overview

The project's alignment through Camellia and Rydalmere would necessitate the construction of a new bridge over the Parramatta River.

The new bridge would provide a public and active transport crossing over the Parramatta River, from the eastern end of the Camellia peninsula to Eric Primrose Reserve on the northern river foreshore in Rydalmere.

In addition to providing a public and active transport route, the bridge would unlock the potential for transport-orientated development in the former industrial lands of Camellia and provide access to the established recreational facilities on the northern foreshore, including Eric Primrose Reserve and the Parramatta Valley Cycleway. This new cross-river connection would become increasingly important in facilitating access to sites of planned future renewal in the Camellia-Rosehill precinct.

The new bridge between Camellia and Rydalmere would require a 120 metre span of the Parramatta River.

A number of options for the alignment and bridge types were developed and tested. Following a multi-criteria analysis process, a preferred alignment was selected, running along the northern side of Grand Avenue in Camellia, before turning north through the industrial lot at 37A Grand Avenue to cross the Parramatta River and Eric Primrose Reserve and land to the west of John Street.

A number of bridge types were considered and tested to meet the site constraints, with a balanced cantilever concrete box girder bridge being selected as the preferred option for the bridge design. A 3.5 metre shared path would be provided on both sides of the bridge.

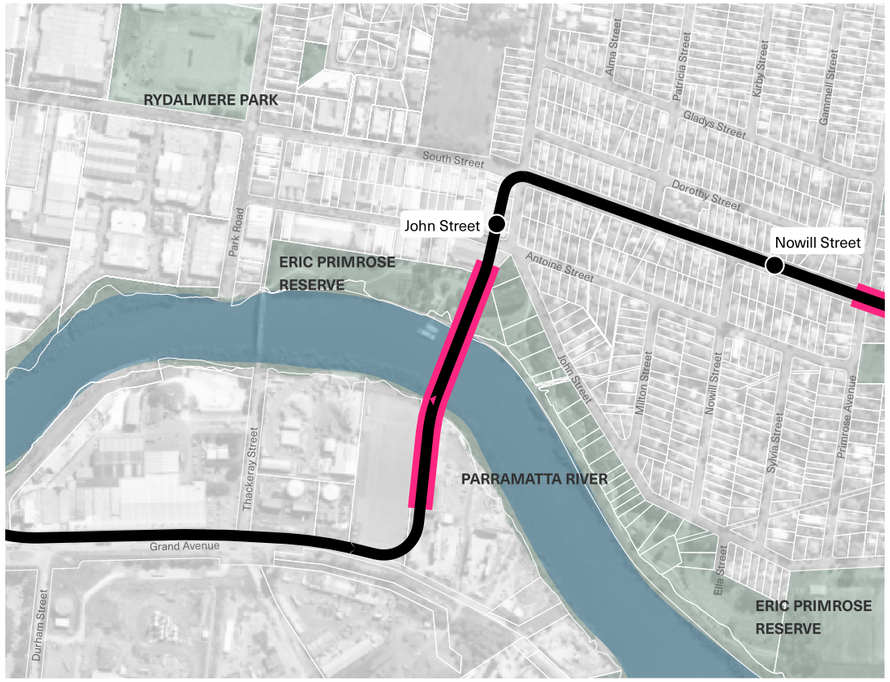


Figure 156: Overview map - New bridge between Camellia and Rydalmere.

13.3.2 Bridge design requirements

Site-specific urban design requirements have been established for the new bridge between Camellia and Rydalmere in response to the project's bridge design principles and objectives as outlined in the adjacent table.

Table 10: New bridge between Camellia and Rydalmere - principles, objectives, and design requirements

BRIDGE DESIGN PRINCIPLES + OBJECTIVES	CAMELLIA BRIDGE URBAN DESIGN REQUIREMENTS
Design quality **Objective: Designs are to achieve high quality outcomes and elegant proportions to reduce visual and physical impacts and create an asset to the adjacent neighbourhoods and region.**	• Responsive to landing in Eric Primrose Reserve, adjacent residential properties along John Street and access and function of Rydalmere Wharf. • Integration of the main span to supporting spans and all design elements - overhead wires, lighting, safety screens etc. • Bridge would provide views up and down the river and over adjacent foreshore areas. • Bridge viewed from the river and foreshore paths. Particular consideration of views from Eric Primrose Reserve and future foreshore reserves along Camellia. • First crossing of the Parramatta River for the project. Closest to Parramatta CBD. Consideration of existing and proposed bridges including Alfred Street footbridge.
Responsive to context **Objective: Designs are to respond sensitively to the landscape, its history, social rituals and cultural significance.**	• Minimise visual impact to Eric Primrose Reserve, minimise impacts to existing trees, particularly the fig trees. • Minimise visual impact to residents along John Street. Provide buffers of additional planting to manage privacy and light pollution. • Consider, manage and reflect the river edge, foreshore and parkland landscape. • Provide legible intuitive active transport connections from the bridge to the existing and proposed foreshore paths.
Environmentally sensitive **Objective: Minimise impact to the environment through the placement of bridge elements and consideration of construction impacts.**	• Minimise impacts to the foreshore areas, mangroves and the mature fig trees. Careful placement of bridge piers, bridge abutments and overall bridge design to minimise impacts both during and post construction. • Consider ways in which the pile cap design can enhance the ecology of the river. Bridge abutments to consider ecological corridors and habitat creation.
User friendly **Objective: Provide equitable access, integrate pedestrian and bicycle facilities and connect to adjacent networks in a safe, legible and convenient way.**	• Resting points, shade structures and views to be considered in the design of the bridge. Active transport link widths to allow for resting points and passing places. • Safe access to the bridge, and connections to the foreshore. CPTED issues created by bisecting the park and landing in Camellia to be carefully considered. • Ease of navigation along the river and below the bridge. Navigation by the pedestrian and cyclist on and off the bridge should be intuitive.
Value **Objective: Provide value for money and an asset of lasting value to all, through good design, innovation and collaboration.**	• Consider the amenity of the Eric Primrose Reserve and future foreshore areas in Camellia. • Consideration of the use of common design elements between the bridges, establishing economies in design and construction. • Bridge design that is safe for all users. Minimising maintenance from the river. • Seek innovation throughout the design and construction process to continually improve and add value. • Ongoing implementation of design excellence in the composition of the bridge. Maximise benefits of the bridge and outcomes for the context.

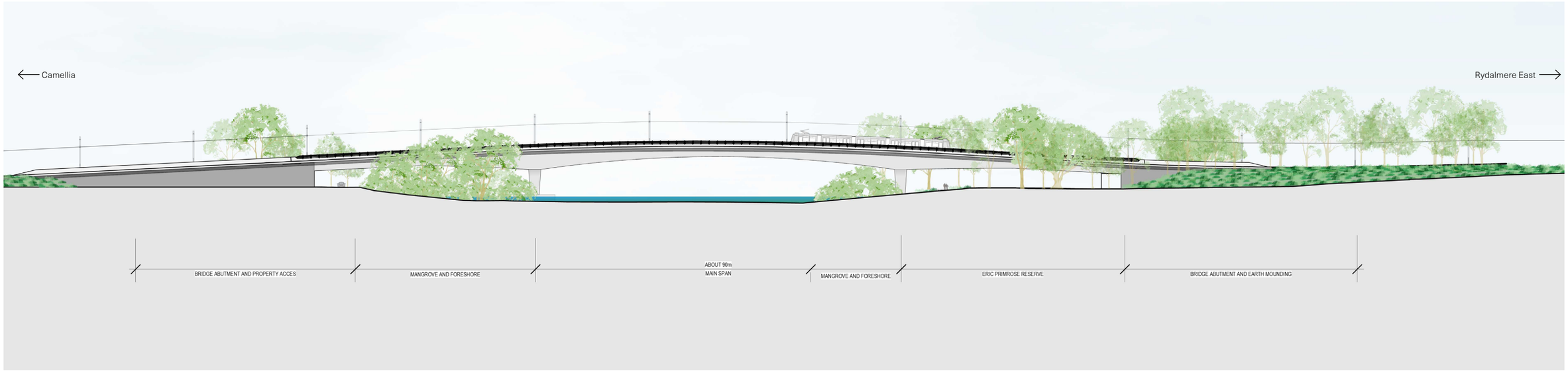


Figure 157: Elevation - New bridge between Camellia and Rydalmere (indicative only - subject to design development).

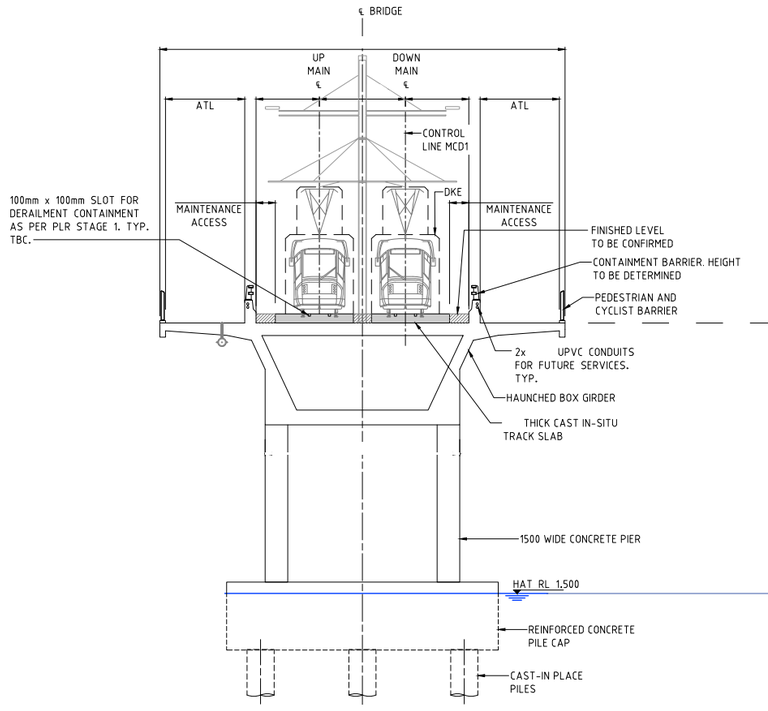


Figure 158: Typical cross section - New bridge between Camellia and Rydalmere at bridge pier (indicative only - subject to design development).

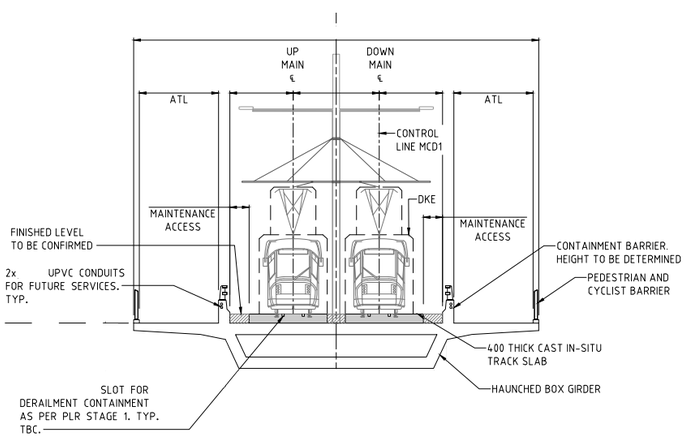


Figure 159: Typical cross section - New bridge between Camellia and Rydalmere at mid-span (indicative only - subject to design development).

13.4 New bridge over Silverwater Road

13.4.1 Overview

Light rail through Rydalmere and Ermington would necessitate the replacement of an existing pedestrian bridge with a new bridge over Silverwater Road. The bridge would provide new, direct, and safe light rail and walking and cycling connections across Silverwater Road along the existing alignment of South Street.

The new bridge would improve connections between the communities of Rydalmere and Ermington. This light rail connection would become increasingly important in facilitating access to potential future renewal of Rydalmere and Ermington.

The new bridge would require a span of about 42 metres in order for bridge piers to safely clear the Silverwater Road corridor.

A number of options for the alignment of active transport connections were developed and tested. Following a multi-criteria analysis process, a preferred active transport alignment was selected, which would provide for an active transport link as part of the main span of the bridge and the replacement of the footbridge. This option would minimise the width of the light rail bridge and minimise impacts to existing properties along South Street. Circular ramps would provide access off the main span at reasonable grades for all cyclists.

A number of bridge types were considered and tested to meet the site constraints, with steel box girders forming the main span of 42 metres and super-T girders forming the approach spans of 27 metres being selected as the preferred option and the base case for the bridge design. The option would require additional steel girders supporting the active transport paths over the main span of the bridge. The active transport ramps would provide a clear width of 3.5 metres for a bidirectional shared path and the new lifts and stairs would provide DDA complaint access.



Figure 160: Overview map - New bridge over Silverwater Road.

13.4.2 Bridge design requirements

Site-specific urban design requirements have been established for the new bridge across Silverwater Road in response to the project's bridge design principles and objectives as outlined in the adjacent table.

Table 11: New bridge over Silverwater Road - principles, objectives, and design requirements

BRIDGE DESIGN PRINCIPLES + OBJECTIVES	SILVERWATER ROAD BRIDGE URBAN DESIGN REQUIREMENTS
Design quality **Objective: Designs are to achieve high quality outcomes and elegant proportions to reduce visual and physical impacts and create an asset to the adjacent neighbourhoods and region.**	• Minimise footprint of bridge abutments and consider impacts to adjoining properties. • Integration of the main span to supporting spans and all design elements - overhead wires, lighting, safety screens etc. • Consideration of pedestrians and cyclists using the bridge. • Consideration of views from Silverwater Road and views to the bridge from South Street.
Responsive to context **Objective: Designs are to respond sensitively to the landscape, its history, social rituals and cultural significance.**	• Bridge abutments to minimise impacts to South Street. Provide planting areas to screen the retaining walls where possible. • Minimise visual impact to residents along South street. Provide buffers of additional planting to manage privacy and light pollution particularly to properties adjacent to pedestrian and cycling ramps. • Consider a design to integrate to the sloping topography and suburban landscape. • Provide legible and intuitive active transport connections to South Street.
Environmentally sensitive **Objective: Minimise impact to the environment through the placement of bridge elements and consideration of construction impacts.**	• Minimise impacts to existing trees and consider opportunities for tree planting post construction. • Consider ways in which the bridge can enhance the street setting.
User friendly **Objective: Provide equitable access, integrate pedestrian and bicycle facilities and connect to adjacent networks in a safe, legible and convenient way.**	• Active transport link widths and intersections to be designed to minimise future conflict and safety issues. • Safe access to the bridge, and connections to South Street. CPTED issues created by the bridge bisecting South Street to be minimised. • Navigation by the pedestrian and cyclist on and off the bridge should intuitive.
Value **Objective: Provide value for money and an asset of lasting value to all, through good design, innovation and collaboration.**	• Consider the amenity of South Street and connections to Silverwater Road. • Consideration of the use of common design elements between the bridges, establishing economies in design and construction. • Bridge design that is safe for all users. • Consideration of maintenance issues in proximity to Silverwater Road. • Seek innovation throughout the design and construction process to continually improve and add value. • Ongoing implementation of design excellence in the composition of the bridge. • Maximise benefits of the bridge and outcomes for the context.

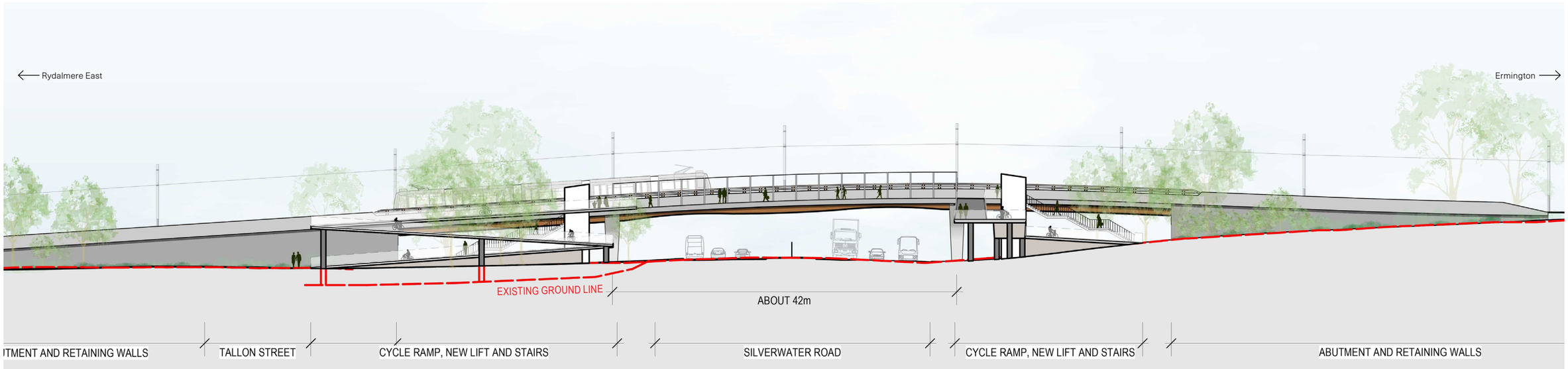


Figure 161: Elevation - New bridge over Silverwater Road (Indicative only - subject to design development).

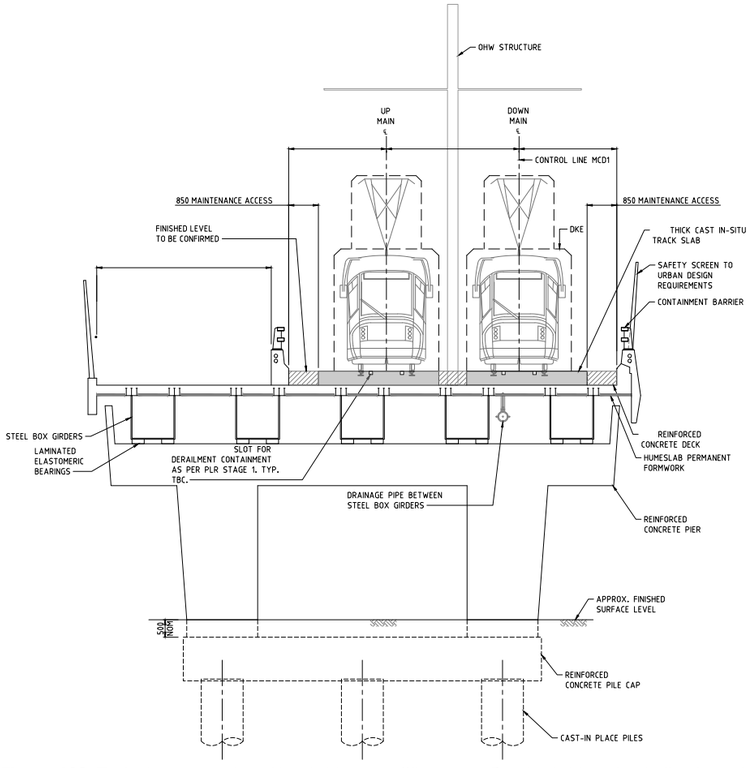


Figure 162: Typical cross section - New bridge over Silverwater Road at bridge pier (indicative only - subject to design development).

13.5 New bridge in Ken Newman Park

13.5.1 Overview

The project's alignment through Ken Newman Park would require the construction of a new bridge facilitating the light rail's alignment across the existing small creek in the eastern portion of the park.

Ken Newman Park is a highly valued public open space with a playground, native vegetation, a wetland, numerous footpaths and significant views to the south over the Sydney Basin. The steep topography of the valley and major Sydney Water trunk mains present major constraints to the light rail alignment. The light rail alignment, bridge design and structures would integrate with the park, provide functional spaces and add value to the park for the community.

The alignment would utilise maximum light rail grades to pass through Ken Newman Park, mostly on embankment and retaining walls. A short bridge would be required to carry the light rail and active transport route over the steeper sections of the valley and creek line on the eastern side of the park. The new bridge would be required to span 18 metres over the existing creek. Several alignment options and bridge arrangements were developed and tested.

Following a multi-criteria analysis process, an alignment was selected to cross Spurway Street at grade and minimise impacts to residential properties. Crossing Spurway Street at grade, the light rail enters a cutting along Boronia Street until Trumble Avenue due to the existing steep grades of the street. Spans of the bridge were maximised, while limiting the structural depth in order to improve the connections and sight lines below the bridge for park users.



Figure 163: Overview map - New bridge in Ken Newman Park.

13.5.2 Bridge design requirements

Site-specific urban design requirements have been established for the new bridge within Ken Newman Park in response to the project's bridge design principles and objectives as outlined in the adjacent table.

Table 12: New bridge in Ken Newman Park - principles, objectives, and design requirements

BRIDGE DESIGN PRINCIPLES + OBJECTIVES	KEN NEWMAN PARK BRIDGE URBAN DESIGN REQUIREMENTS
Design quality **Objective: Designs are to achieve high quality outcomes and elegant proportions to reduce visual and physical impacts and create an asset to the adjacent neighbourhoods and region.**	• Consideration of the assets the bridge can add to Ken Newman Park and surrounding neighbourhoods. • Integration of the bridge design within the park and public space. • Consideration of views from adjoining properties and impacts to existing views over the Sydney basin to the south. • Bridge viewed from surrounding streets. Particular consideration of views from Ken Newman Park.
Responsive to context **Objective: Designs are to respond sensitively to the landscape, its history, social rituals and cultural significance.**	• Minimise visual impact to Ken Newman park, minimise impacts to existing trees, and creek environment. • Minimise visual impact to residents with views over Ken Newman Park. • Consider a design to integrate ton the valley and parkland setting. • Provide legible and intuitive active transport connections across and into the park and surrounding streets.
Environmentally sensitive **Objective: Minimise impact to the environment through the placement of bridge elements and consideration of construction impacts.**	• Minimise impacts to existing trees and creekline and consider opportunities for enhancement. • Consider ways in which the bridge can enhance the park and access.
User friendly **Objective: Provide equitable access, integrate pedestrian and bicycle facilities and connect to adjacent networks in a safe, legible and convenient way.**	• Active transport link widths and intersections to be designed to minimise future conflict and safety issues. • Safe access to the bridge, and connections through the park and to surrounding streets. CPTED issues created by the bridge bisecting the park to be minimised. • Navigation by pedestrians and cyclists on and off the bridge and through the park should intuitive.
Value **Objective: Provide value for money and an asset of lasting value to all, through good design, innovation and collaboration.**	• Consider the amenity of park users and surrounding neighbourhood throughout the design process. • Consideration of the use of common design elements between the bridges, establishing economies in design and construction. • Bridge design that is safe for all users. • Consideration of maintenance issues and access through Ken Newman Park, including areas underneath the bridge in potentially confined spaces. • Seek innovation throughout the design and construction process to continually improve and add value. • Ongoing implementation of design excellence in the composition of the bridge. Maximise benefits of the bridge and outcomes for the context.

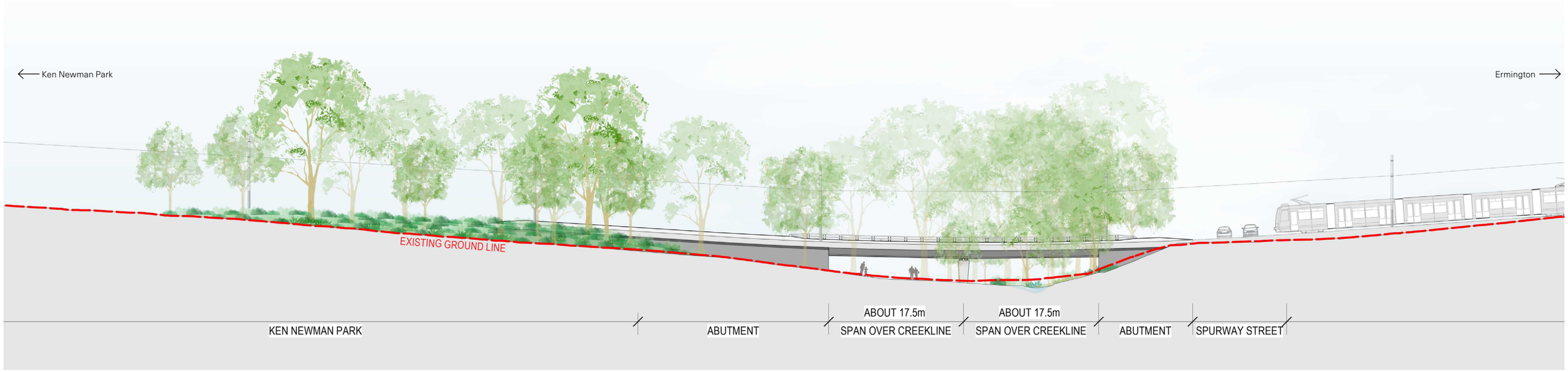


Figure 164: Elevation - New bridge in Ken Newman Park (indicative only - subject to design development).

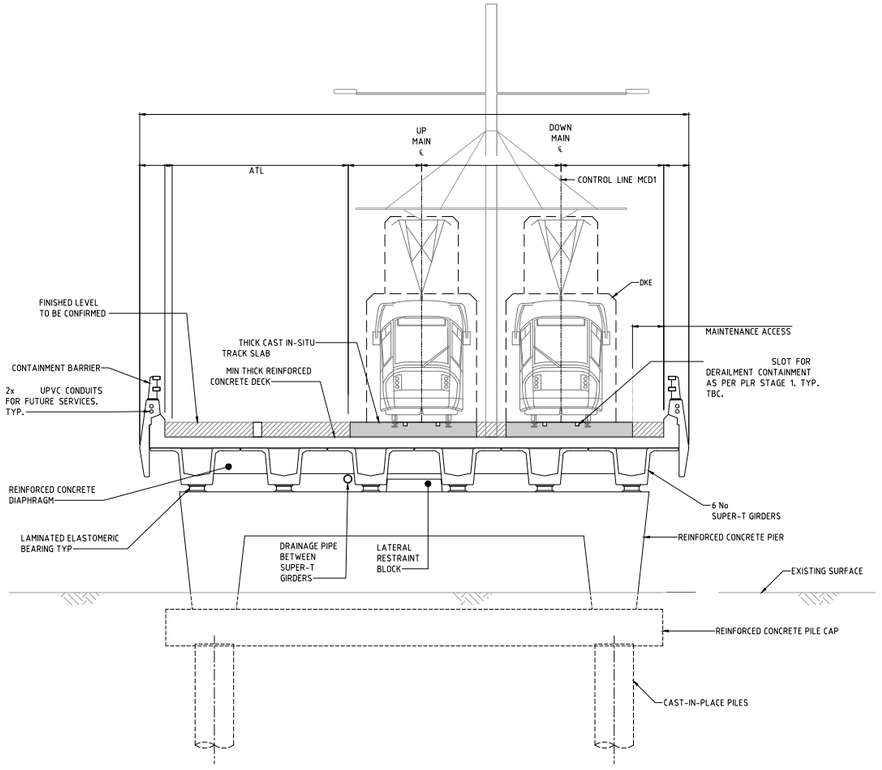


Figure 165: Typical cross section - New bridge in Ken Newman Park (indicative only - subject to design development).

13.6 New bridge between Melrose Park and Wentworth Point

13.6.1 Overview

The project's alignment would necessitate the construction of a new bridge between Melrose Park and Wentworth Point. The new bridge would provide a public and active transport crossing from Wharf Road in Melrose Park to the western side of the private development site at 14-16 Hill Road.

The bridge connects the existing communities north and south of the river, unlocking the Sydney Olympic Park peninsula and its world class recreational facilities, encouraging active travel users and opening up new walking and cycling routes.

The new bridge between Melrose Park and Wentworth Point would be the largest structure in the project and the first significant crossing over Sydney's most important waterway for 30 years, since Ryde Bridge was completed in 1987. The alignment would require a large span over the bend in the river to clear sensitive environmental constraints and established recreational facilities.

The bridge would be required to span 250 metres of the Parramatta River. A number of options for the alignment and bridge types were developed and tested for the river crossing. Following a multi-criteria analysis process, a preferred alignment was selected running parallel to the existing 132kV Ausgrid transmission lines.

A number of bridge types were considered and tested to meet the site constraints, with a balanced cantilever concrete box girder bridge being selected as the preferred option and the base case for the bridge. This bridge option would provide a 6-span, post-tensioned concrete box girder bridge with a maximum span length of 72 metres over the navigation channel. Shared paths 3.5 metre wide would be provided outside the light rail corridor, connecting to the foreshore areas on each side. Shaded rest areas are proposed on both sides of the main piers and at the bridge abutments.

The light rail corridor would also allow for buses to operate over the bridge, connecting to existing and potential new local bus routes and special event services to Sydney Olympic Park.



Figure 166: Overview map - New bridge between Melrose Park and Wentworth Point.

13.6.2 Bridge design requirements

Site-specific urban design requirements have been established for the new bridge between Melrose Park and Wentworth Point in response to the project's bridge design principles and objectives as outlined in the adjacent table.

Table 13: New bridge between Melrose Park and Wentworth Point - principles, objectives and design requirements

BRIDGE DESIGN PRINCIPLES + OBJECTIVES	WENTHWORTH POINT BRIDGE URBAN DESIGN REQUIREMENTS
Design quality **Objective: Designs are to achieve high quality outcomes and elegant proportions to reduce visual and physical impacts and create an asset to the adjacent neighbourhoods and region.**	• Responsive to landing in the parkland context of Ermington Boat ramp (in Melrose Park), the significant areas of mangroves that exist along the Parramatta River at this location; adjacent to residential properties along Wharf Road, and the access and function of Ermington Boat Ramp. • Integration of the main span to supporting spans and all design elements - overhead wires, lighting, safety screens etc. • Bridge would provide views up and down the river and over adjacent foreshore areas. • Bridge viewed from the river and foreshore paths. Particular consideration of views from Melrose Park and foreshore reserves along Wentworth Point. • Consideration given to the bridge as a significant structure spanning the river and the first bridge for the project when travelling east to west.
Responsive to context **Objective: Designs are to respond sensitively to the landscape, its history, social rituals and cultural significance.**	• Minimise visual impact to Melrose Park, minimise impacts to existing vegetation, particularly the mangroves and significant trees. • Minimise visual impact to residents along Wharf Road. Provide buffers of additional planting to manage privacy and light pollution. • Consider, manage and reflect the river edge, foreshore and parkland landscape. And the integration of the bridge design with the future Hill Road development. • Provide legible intuitive active transport connections from the bridge to the existing and proposed foreshore paths.
Environmentally sensitive **Objective: Minimise impact to the environment through the placement of bridge elements and consideration of construction impacts.**	• Minimise impacts to the foreshore areas, mangroves and wetland areas. Careful placement of bridge piers, bridge abutments and overall bridge design to minimise impacts both during and post construction. • Consider ways in which the pile cap design can enhance the ecology of the river. Bridge abutments to consider ecological corridors and habitat creation.
User friendly **Objective: Provide equitable access, integrate pedestrian and bicycle facilities and connect to adjacent networks in a safe, legible and convenient way.**	• Resting points, shade structures and views to be considered in the design of the bridge. Active transport link widths to allow for resting points and passing places. • Safe access to the bridge, and connections to the foreshore. CPTED issues created by bisecting the Melrose Park and landing in the Hill Road Development site to be carefully considered. • Ease of navigation along the river and below the bridge. Navigation by pedestrians and cyclists on and off the bridge should be intuitive.
Value **Objective: Provide value for money and an asset of lasting value to all, through good design, innovation and collaboration.**	• Consider the amenity of the Ermington Boat ramp (in Melrose Park), the recreational uses on both sides of the river and future foreshore areas in the Hill Road development. • Consideration of the use of common design elements between the bridges, establishing economies in design and construction. • Bridge design that is safe for all users. • Minimising maintenance from the river. • Seek innovation throughout the design and construction process to continually improve and add value. • Ongoing implementation of design excellence in the composition of the bridge. Maximise benefits of the bridge and outcomes for the context.

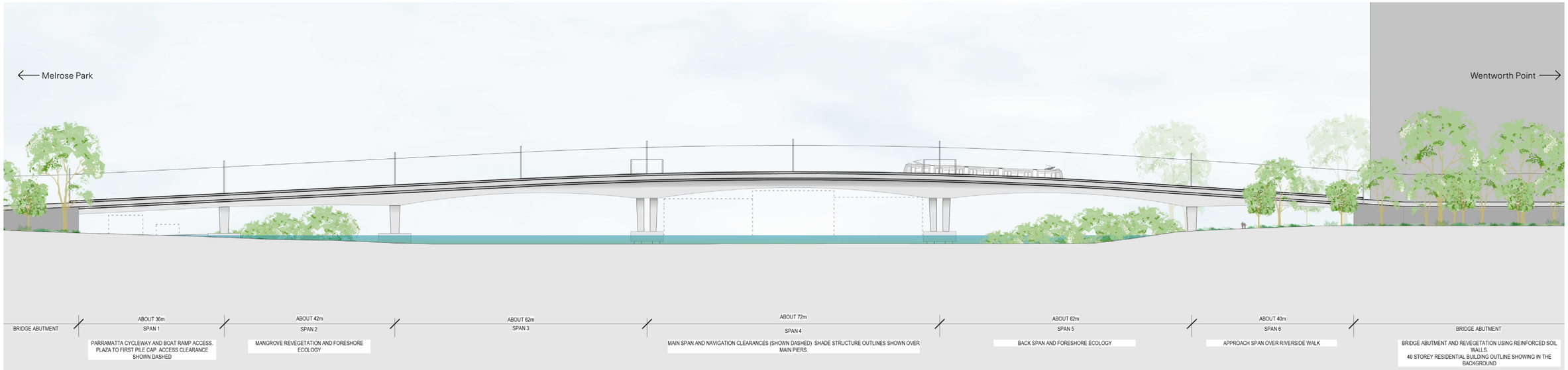


Figure 167: Elevation - New bridge between Melrose Park and Wentworth Point at bridge pier (indicative only - subject to design development).

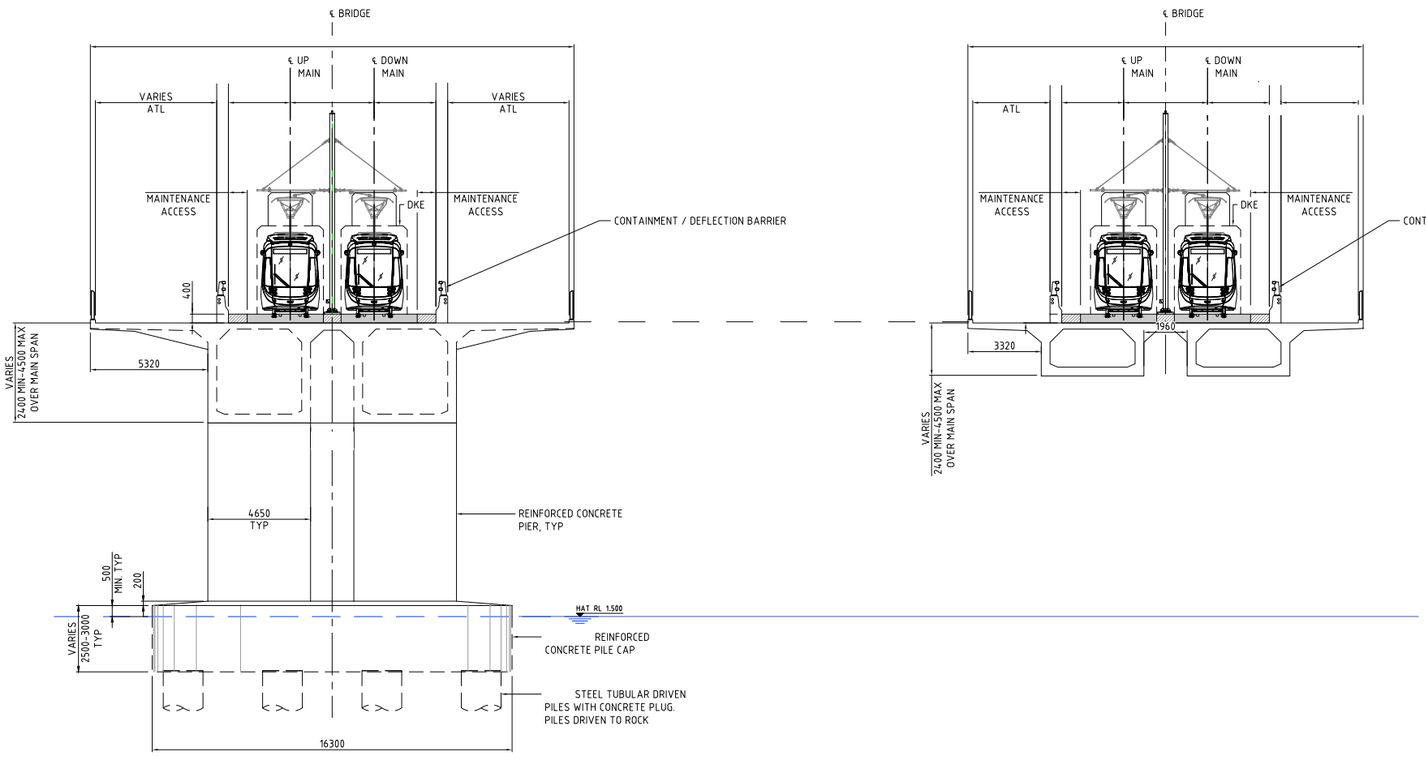


Figure 168: Typical cross section - New bridge between Melrose Park and Wentworth Point at bridge pier (indicative only - subject to design development).

Figure 169: Typical cross section - New bridge between Melrose Park and Wentworth Point at mid-span (indicative only - subject to design development).

Chapter 14.0

14.0 Design Elements

14.1 Overview

This chapter describes and illustrates design elements that would be used within the project. It describes individual design elements, provides objectives for their inclusion in the project, and illustrates best practice examples of their integration in other relevant projects and cities.

The design elements and their objectives provide more detail on the design, place, and movement outcomes described and illustrated in Chapters 5 to 13.

Design elements are presented under the following categories:

- Public domain
- Stops
- Green and blue infrastructure
- Light rail infrastructure
- Walls
- Lighting
- Wayfinding and signage
- Heritage
- Public art
- Security.

More detailed design guidelines and key requirements for each of the design elements would be prepared in collaboration with stakeholders during the design development and procurement stages of the project.

14.2 Public domain

14.2.1 Street space allocation

Overview

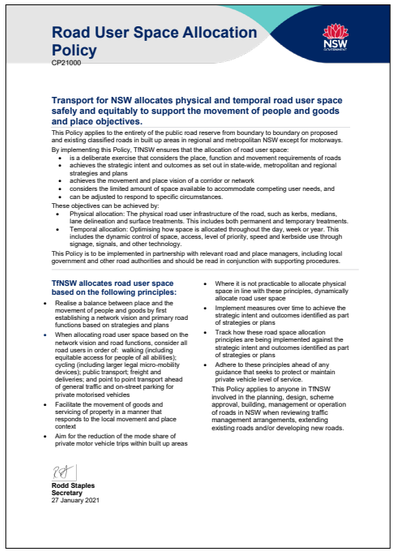
Transport for NSW allocates physical and temporal road user space safely and equitably to support the movement of people and goods and place objectives.

Transport for NSW's Road User Space Allocation Policy ensures that the allocation of street space is a deliberate exercise that considers the place, function and movement requirements of street.

As the project predominantly runs down existing streets, guidance is taken from this policy. The principles presented herein are drawn from this policy to inform the allocation of street space for the project.

Principles

- Realise a balance between place and the movement of people and goods by first establishing a network vision and primary road functions based on strategies and plans.
- When allocating road user space based on the network vision and road functions, consider all road users in order of: people spending time, walking (including equitable access for people of all abilities); cycling (including larger legal micro-mobility devices); public transport; freight and deliveries; and point to point transport ahead of general traffic and on-street parking for private motorised vehicles.
- Facilitate the movement of goods and servicing of property in a manner that responds to the local movement and place context.
- Aim for the reduction of the mode share of private motor vehicle trips within built up areas.
- Where it is not practicable to allocate physical space in line with these principles, dynamically allocate road user space.
- Implement measures over time to achieve the strategic intent and outcomes identified as part of strategies or plans.
- Track how these road space allocation principles are being implemented against the strategic intent and outcomes identified as part of strategies or plans.
- Adhere to these principles ahead of any guidance that seeks to protect or maintain private vehicle level of service.



Road User Space Allocation Policy
CP21000

Transport for NSW allocates physical and temporal road user space safely and equitably to support the movement of people and goods and place objectives.

This Policy applies to the entirety of the public road reserve from boundary to boundary on proposed and existing classified roads in built up areas in regional and metropolitan NSW except for motorways.

By implementing this Policy, TfNSW ensures that the allocation of road user space:

- is a deliberate exercise that considers the place, function and movement requirements of roads
- achieves the strategic intent and outcomes as set out in state-wide, metropolitan and regional strategies and plans
- achieves the movement and place vision of a corridor or network
- considers the limited amount of space available to accommodate competing user needs, and
- can be adjusted to respond to specific circumstances.

These objectives can be achieved by:

- Physical allocation: The physical road user infrastructure of the road, such as kerbs, medians, lane delineation and surface treatments. This includes both permanent and temporary treatments.
- Temporal allocation: Optimising how space is allocated throughout the day, week or year. This includes the dynamic control of space, access, level of priority, speed and kerbside use through signage, signals, and other technology.

This Policy is to be implemented in partnership with relevant road and place managers, including local government and other road authorities and should be read in conjunction with supporting procedures.

TfNSW allocates road user space based on the following principles:

- Realise a balance between place and the movement of people and goods by first establishing a network vision and primary road functions based on strategies and plans
- When allocating road user space based on the network vision and road functions, consider all road users in order of: walking (including equitable access for people of all abilities); cycling (including larger legal micro-mobility devices); public transport; freight and deliveries; and point to point transport ahead of general traffic and on-street parking for private motorised vehicles
- Facilitate the movement of goods and servicing of property in a manner that responds to the local movement and place context
- Aim for the reduction of the mode share of private motor vehicle trips within built up areas
- Where it is not practicable to allocate physical space in line with these principles, dynamically allocate road user space
- Implement measures over time to achieve the strategic intent and outcomes identified as part of strategies or plans
- Track how these road space allocation principles are being implemented against the strategic intent and outcomes identified as part of strategies or plans
- Adhere to these principles ahead of any guidance that seeks to protect or maintain private vehicle level of service.

This Policy applies to anyone in TfNSW involved in the planning, design, scheme approval, building, management or operation of roads in NSW when reviewing traffic management arrangements, extending existing roads and/or developing new roads.

Rodd Staples
Secretary
27 January 2021

Figure 170: Road User Space Allocation Policy (credit: Transport for NSW).

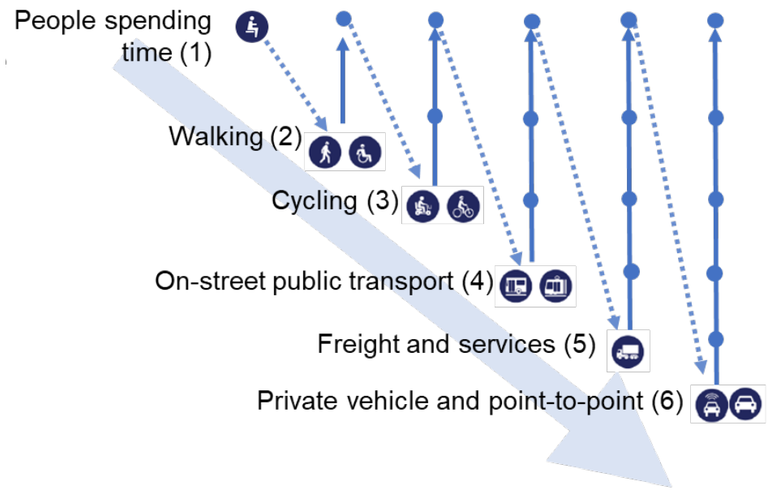


Figure 171: Iterations of road user space allocation and trade-offs based on the order of consideration (credit: Transport for NSW).

14.2.2 Walking and cycling infrastructure

Overview

Every Transport for NSW project must include provision for walking and cycling within the core scope of the project.

Transport for NSW's Providing for Walking and Cycling in Transport Projects Policy recognises that walking and cycling are integral to the greater good of our communities and customers.

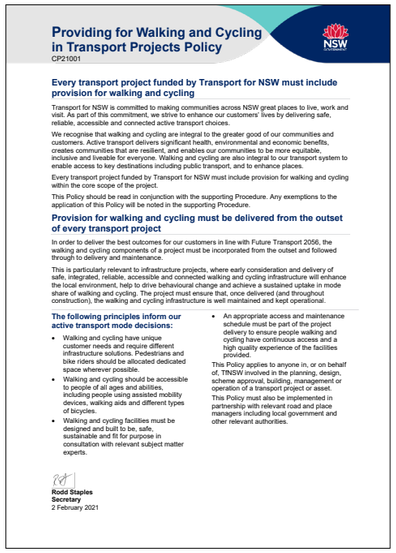
Walking and cycling delivers significant health, environmental, and economic benefits, creating communities that are resilient and enabling our communities to be more equitable, inclusive, and liveable.

Walking and cycling are also integral to the transport system to enable access to key destinations including public transport, and to enhance places.

In line with this policy, the project is committed to incorporating safe, integrated, accessible and connected walking and cycling infrastructure. The principles presented herein are drawn from this policy to inform the implementation of walking and cycling facilities.

Principles

- In order to deliver the best outcomes for our Transport for NSW customers in line with Future Transport 2056, the walking and cycling components of the project must be incorporated from the outset and followed through to delivery and maintenance.
- Early consideration and delivery of safe, integrated, reliable, accessible and connected walking and cycling infrastructure would enhance the local environment, help to drive behavioural change and achieve a sustained uptake in mode share of walking and cycling.
- Ensure that, once delivered (and throughout construction), the walking and cycling infrastructure is well maintained and kept operational.
- Walking and cycling have unique customer needs and require different infrastructure solutions. Pedestrians and bike riders should be allocated dedicated space wherever possible.
- Walking and cycling should be accessible to people of all ages and abilities, including people using assisted mobility devices, walking aids and different types of bicycles.
- Walking and cycling facilities must be designed and built to be, safe, sustainable and fit for purpose in consultation with relevant subject matter experts.
- An appropriate access and maintenance schedule must be part of the project delivery to ensure people walking and cycling have continuous access and a high quality experience of the facilities provided.
- Walking and cycling facilities must also be implemented in partnership with relevant road and place managers including local government and other relevant authorities.



Providing for Walking and Cycling in Transport Projects Policy
CP21001

Every transport project funded by Transport for NSW must include provision for walking and cycling

Transport for NSW is committed to making communities across NSW great places to live, work and visit. As part of this commitment, we strive to enhance our customers' lives by delivering safe, reliable, accessible and connected active transport choices.

We recognise that walking and cycling are integral to the greater good of our communities and customers. Active transport delivers significant health, environmental and economic benefits, creates communities that are resilient, and enables our communities to be more equitable, inclusive and liveable for everyone. Walking and cycling are also integral to our transport system to enable access to key destinations including public transport, and to enhance places.

Every transport project funded by Transport for NSW must include provision for walking and cycling within the core scope of the project.

This Policy should be read in conjunction with the supporting Procedure. Any exemptions to the application of this Policy will be noted in the supporting Procedure.

Provision for walking and cycling must be delivered from the outset of every transport project

In order to deliver the best outcomes for our customers in line with Future Transport 2056, the walking and cycling components of a project must be incorporated from the outset and followed through to delivery and maintenance.

This is particularly relevant to infrastructure projects, where early consideration and delivery of safe, integrated, reliable, accessible and connected walking and cycling infrastructure will enhance the local environment, help to drive behavioural change and achieve a sustained uptake in mode share of walking and cycling. The project must ensure that, once delivered (and throughout construction), the walking and cycling infrastructure is well maintained and kept operational.

The following principles inform our active transport mode decisions:

- Walking and cycling have unique customer needs and require different infrastructure solutions. Pedestrians and bike riders should be allocated dedicated space wherever possible.
- Walking and cycling should be accessible to people of all ages and abilities, including people using assisted mobility devices, walking aids and different types of bicycles.
- Walking and cycling facilities must be designed and built to be, safe, sustainable and fit for purpose in consultation with relevant subject matter experts.
- An appropriate access and maintenance schedule must be part of the project delivery to ensure people walking and cycling have continuous access and a high quality experience of the facilities provided.

This Policy applies to anyone in, or on behalf of, TfNSW involved in the planning, design, scheme approval, building, management or operation of a transport project or asset.

This Policy must also be implemented in partnership with relevant road and place managers including local government and other relevant authorities.

Rodd Staples
Secretary
2 February 2021

Figure 172: Providing for Walking and Cycling in Transport Projects Policy (credit: Transport for NSW).

14.2.3 Sustainability

Overview

The project is committed to raising the bar for sustainable design through the use of robust, environmentally viable strategy and material selection.

The project would adopt design principles which minimise environmental impacts, provide environmental improvements, and drive positive social outcomes for users and local communities. Sustainable design within the project can increase the health and comfort of users, thereby improving the projects performance and usage.

A commitment to materials with low embodied energy and high performance outcomes have been and would continue to be investigated throughout the lifespan of the project to ensure minimal ongoing maintenance and maximum efficiency of the light rail.

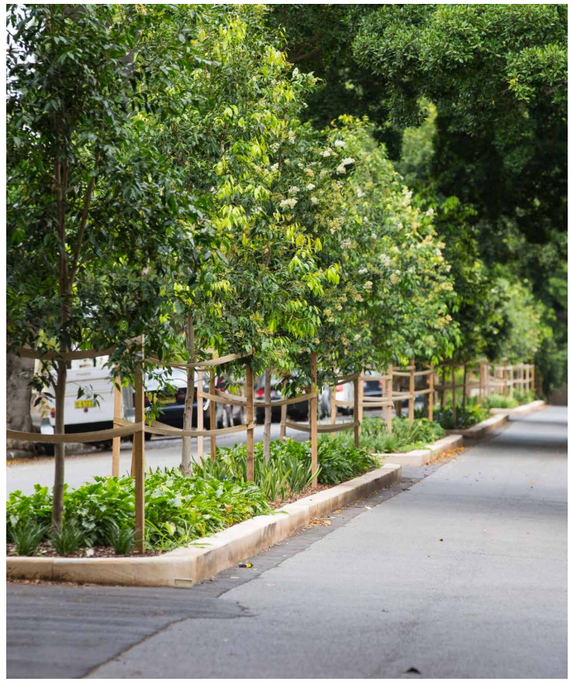
The implementation of green infrastructure along the project in the form of new public spaces, broader tree canopy, and increased vegetation contribute to a healthier and more sustainable neighbourhood environment.

Mitigation measures and future proofing have and would continue to be considered in the project, and would contribute to the sustainability targets of the light rail. This includes planning for extreme weather events such as flooding, drought, and more systematic concerns such as the Urban Heat Island (UHI) effect. An approach to consider these targets at all levels of the design stage would ensure a resilient infrastructure network that can be relied upon by its users.

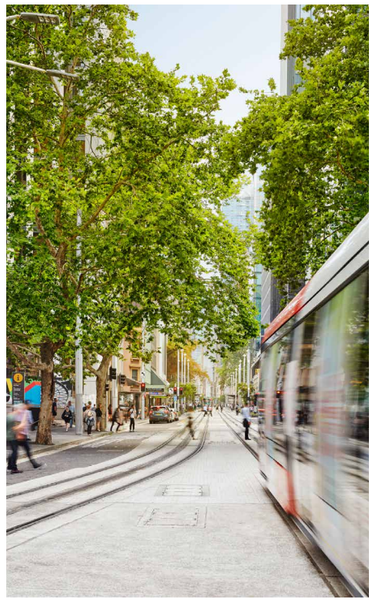
The following principles have been developed in line with the sustainability framework presented in section 3.3.

Principles

- Ensure best practice sustainable design solutions are adopted appropriately throughout the light rail alignment that minimise environmental impact, maximise environmental improvement, and contribute to a beneficial social outcome.
- Design for resilience by planning and designing infrastructure and operations to cope, adapt and improve in response to chronic stresses and acute shocks. Increase the heat resilience of streetscapes and minimise the UHI by providing green tracks and additional planting. Lower surface and air temperatures by planting trees and other vegetation, and use light-coloured surfaces to reflect light and heat.
- Reduce energy use and greenhouse gas emissions through design and during construction and operation.
- Minimise use of potable water and maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater. Incorporate water sensitive urban design (WSUD) principles in to the design of the project. Investigate the use of permeable surfaces to manage stormwater run-off.
- Provide economic, ecological, and social benefits though the incorporation of high-performing green spaces in to the project design.
- Protect and create biodiversity and habitat connectivity whilst ensuring appropriate land use development and enhancement of land.
- Stops and associated works would achieve high levels of sustainability through the implementation of ISC rating tools, Australia Buildings Green Star Tool, or other tools as appropriate.
- Materials with higher sustainability credentials and longer life cycles would be selected.
- Use of recycled materials would be integrated within the project where possible.
- Carbon footprint would be minimised through the use of local and sustainable materials when possible to minimise the embodied carbon environmental impacts.







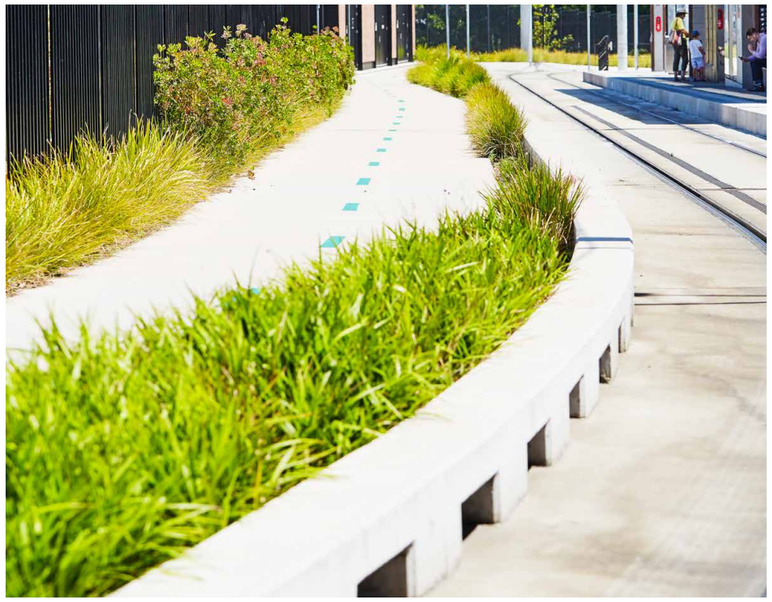


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Figure 173: Street tree planting to median providing shade and amenity, Sydney, Australia (credit: City of Sydney).

Figure 174: Water sensitive design principles integrated into streets, parkland, and stops in Broadwater Parklands, Queensland, Australia (credit: E2DESIGNLAB).

Figure 175: Water sensitive urban design principles integrated through rain water capture along kerblines in the CBD & South East Light Rail, Randwick, Australia (credit: ASPECT Studios).

Figure 176: Light coloured unit paving and canopy trees minimising the UHI in the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

14.2.4 Accessibility

Overview

Universal access is a fundamental component of a safe, equitable, and comfortable transport network. Accessible and convenient paths of travel to stop platforms, through stop environments, and throughout all public domain areas would be achieved in the project, ensuring an easy user experience.

Accessibility standards within the project would ensure that the light rail is accessible to users of all levels and ability at all times.

The design of the project's public domain environments would be undertaken in accordance with relevant Australian Standards, including AS1428 Design for access and mobility, the Disability Standard for Accessible Public Transport 2002, and Transport for NSW standards.

Principles

- Provide accessible, safe, and comfortable pathways to and from stops, throughout public domain areas for all users.
- Give particular attention to continuous accessible paths of travel and circulation spaces for people who use wheelchairs; access and facilities for people with ambulatory disabilities; and access for people with sensory disabilities.
- Ensure paths of travel are obstacle and step free where possible, with alternative routes of travel provided where this is unachievable.
- Where possible interrogate the relocation of paths of travel to minimise ramps.
- Platform information would be provided across a range of multimedia technologies including audio and visual mediums.
- Appropriate pathway widths, grades and finishes would be adopted to provide equitable pedestrian access throughout all public domain areas.
- Safe and easy access to stop platforms and through stop environments for all to use, regardless of physical mobility.
- Stairs would be avoided wherever practical as they inhibit the provision of universal access, and would be short in length where unavoidable. Clearly legible alternative circulation routes would be provided at all stair locations, as close as possible to and not isolated from primary circulation routes.
- Selective use of colour, texture, lighting, finishes and customer information would further define paths of travel, circulation spaces, and the location of key facilities.
- Tactile ground surface indicators would be used on paths of travel to warn customers with vision impairment of hazards and assist wayfinding where required.
- When setting out works using key dimensions as they pertain to accessibility requirements, appropriate allowances would be made for construction tolerance.





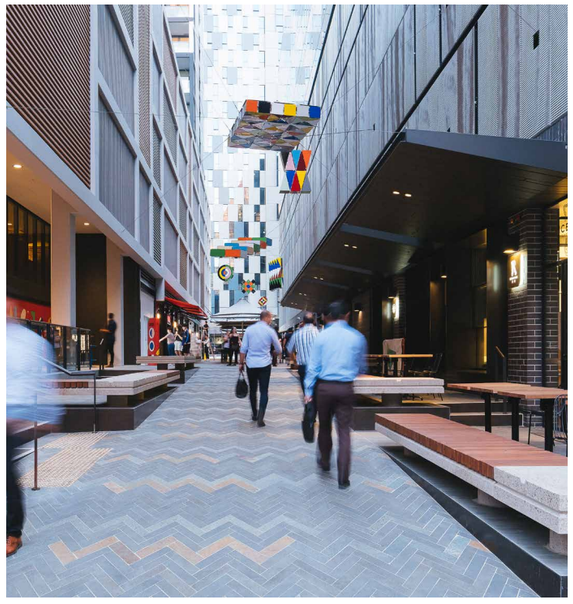

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Figure 177: Access to the Canberra light rail at the Dixon interchange, Canberra, Australia (Credit: Architectus).

Figure 178: Unit paved accessible walkway through an urban pedestrian lane, Haymarket, Australia (credit: ASPECT Studios).

Figure 179: Accessible stop platform within a residential suburb, Kingsford, Australia (credit: ASPECT Studios).

14.2.5 Crossings

Overview

Pedestrian crossings provide safe and designated points for people to cross the street.

Good pedestrian crossings also improve drivers' awareness of intersections and enhance visibility of people as they cross the street.

Principles

- The project would design in accordance with the project-specific safety assessment, and meet relevant Australian Standards, the Disability Standard for Accessible Public Transport 2002 and Transport for NSW standards.
- Adopt kerb extensions at pedestrian crossings to reduce the crossing width and calm traffic.
- Use raised pedestrian crossings to emphasise crossing points, particularly at unsignalised midblock crossing locations.
- Adopt a change in paving unit or colour to enhance the contrast between the carriageway and crossing.
- Maintain sight lines at crossing points to avoid conflicts and allow adequate space for people to use the crossing safely.
- Utilise street elements such as lighting, street trees and landscaping to assist with visually narrowing and compressing the street at crossing locations.
- Minimise corner radii to assist with creating appropriate vehicle speeds, reducing crossing distances, and minimising potential conflicts between street users.
- Pedestrian crossings would be straight wherever possible.
- Provide pedestrian crossing materials that clearly delineate pedestrian paths of travel across the light rail track zone and roadway, differentiating between general track form and crossing areas by means of material variation and luminance contrast in accordance with AS 1428.4.
- Crossings and spaces within stop precincts would have sufficient capacity to meet potential demand with consideration to user decision points.
- Key pedestrian desire lines and connections would be maintained where crossings are constrained where practical.
- Locate crossings at stops to provide direct connectivity to adjacent streets.
- Maximise pedestrian safety by widening crossing widths where possible.
- Encourage intuitive wayfinding to manage pedestrian circulation at crossings.





IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 180: Improved street crossings as part of the Crown Hill Upgrade, Surry Hills, Australia (credit: ASPECT Studios).

Figure 181: Signalised crossing with material change denoting pedestrian crossing point, Newcastle , Australia (credit: COX).

14.2.6 Ramps and stairs

Overview

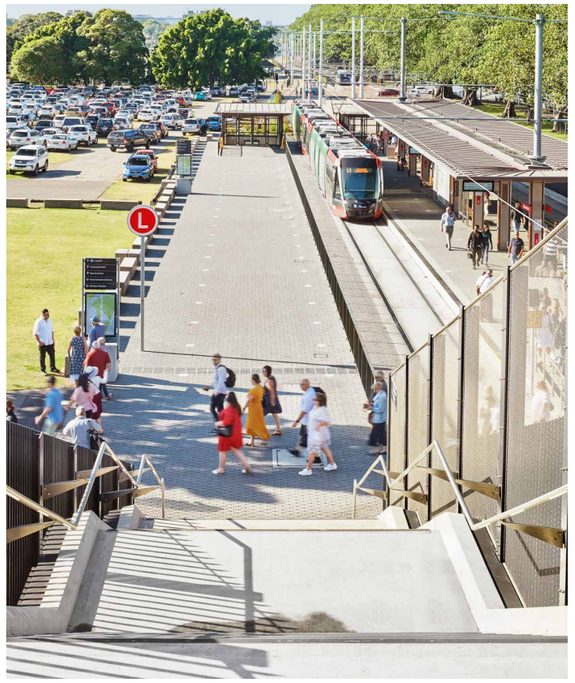
The use of ramps and stairs would be minimised in the project, with an attempt to facilitate pedestrian access throughout the public domain and to and from stop platforms at-grade wherever possible.

In those areas where at-grade access would not be possible, ramps and stairs would be provided as close to desire lines as possible, to facilitate access to users of all levels and ability.

All ramps and stairs along the alignment would be designed with consideration to AS1428 Design for access and mobility, and other legislative requirements, to provide comfortable access to stop platforms along the alignment.

Principles

- Ramps and stairs to form a clear path of travel.
- The use of stairs would be avoided where possible.
- Where stairs are unavoidable, alternative accessible circulation routes would be provided as close as possible to the stair's primary path of travel route.
- Ramps would be compliant with AS1428 Design for access and mobility.
- Where ramps are implemented, ramp grades would be maximum 5% wherever possible to minimise the need for hand rails.







IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 182: Staircase located in close proximity providing safe access to platform stop, Moore Park, Australia (credit: ASPECT Studios).

Figure 183: Staircase leading into parkland, Harold Park, Australia (credit: JMD Design).

Figure 184: Permeable bridge and ramp providing equitable access over existing wetland, Randwick, Australia (credit: ASPECT Studios).

14.2.7 Landscape design

Overview

The landscape design of the project would encompass all hard to soft landscape elements, ensuring a fully integrated project that responds to the needs of its users while integrating into the local environment.

The landscape design of the project would optimise both the form and function of the alignment, integrating with local landscape character. All elements throughout the project—from stop environments, plazas, and pathways to furniture, walls and fencing—would be expressed consistently throughout the project, with allowances for uniquely expressed design interventions based local context, history, and character to be developed.

Principles

Open space

- Ensure equitable access to all public spaces that the project permanently affects.
- Ensure a range of uses are catered for along the alignment including passive flexible spaces to highly programmed spaces such as playgrounds.
- Ensure that access to open space is facilitated through the active transport links which run along the alignment.

Embankments and earthworks

- All earthworks are to sit lightly in their context, exhibiting a 'natural fit' within their landscape setting.
- Use of retaining walls is preferred on batter slopes where gradients exceed 3H:1V.
- Planted batters are to be a minimum of 4H:1V. Where this requirements are unable to be met due to limited space, the use of retaining walls is preferred.
- Earthworks are to be rounded out at the top and bottom of batters, and at ends of formations, to achieve a 'natural' transition to adjacent landform.

Soils

- Prioritise the use of site won topsoil and subsoil before additional topsoil and subsoil is introduced.
- Ensure all existing topsoil and subsoil re-used within the landscape works is conditioned or improved to comply with recommendations of a soil scientist.
- Ensure all soils are suitable for the local environment.
- All soils must be designed and specified by a soil scientist to meet the requirements of AS 4419.
- Strip and store topsoil within all distributed works areas for reuse in the landscape works, ensuring to strip and store topsoil separately from subsoil.

Hydroseeding/hydromulching

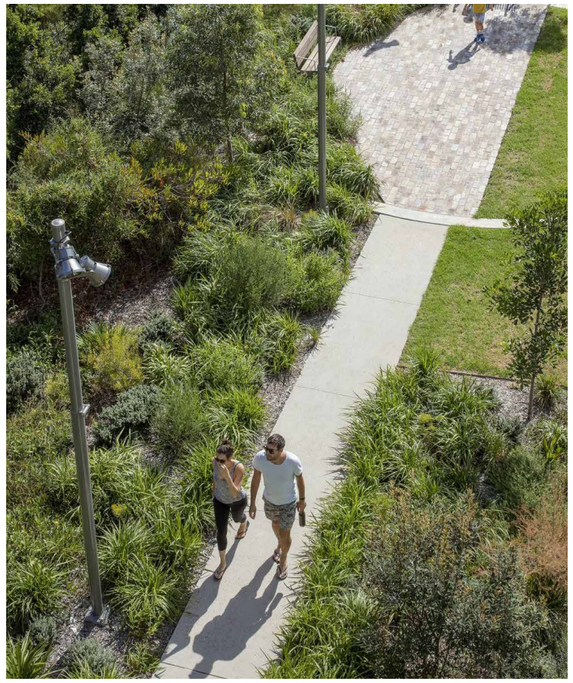
- Avoid the use of hydroseeding/hydromulching in urban environments such as stops, streets, plazas and the like.
- Utilise provenance seed collected by an appropriate seed collection contractor. Develop a strategy for seed supply, propagation and timing.

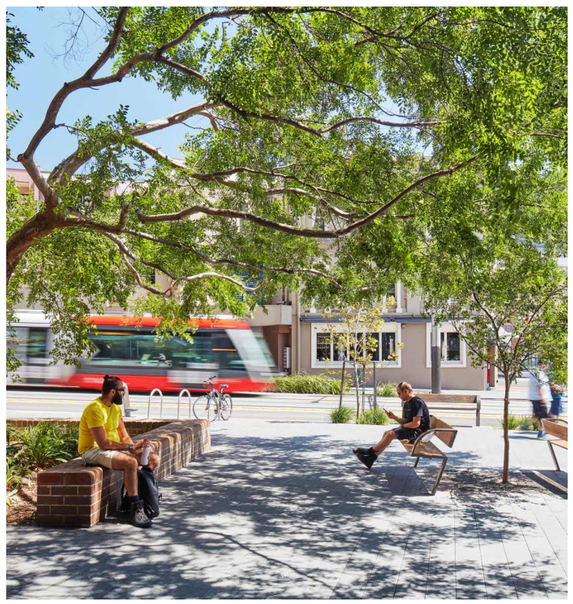
Irrigation

- Design landscape areas to minimise the need for irrigation.
- Group plants within the planting design to take advantage of the irrigation design layout.
- Provide passive irrigation to all planted areas. Grade pavement planes to fall to adjacent garden beds, turf/ grass areas and trees.
- Provide automatic irrigation to all planting areas over built structure.
- Ensure the irrigation design delivers water evenly across the soil, providing water to the full anticipated root zones of trees, turf and planting through sub-surface micro-irrigation.
- Incorporate a monitoring system to provide information on soil moisture levels to minimise the waste of irrigation water.

Planting

- In streets, plazas, stop environments and the like, the project would ensure planting provides robust, structured, dense, and verdant species that are suited for the urban environment.
- Ensure trees and planting species are selected based on the existing vegetation communities.
- Depending on location and orientation, planting would consider seasonal effects on open space, maximising shade in the hotter months, and allow for solar infiltration in colder months.
- Cultural planting would be used in appropriate areas where they are associated with heritage items or the like.
- Broad canopy trees would be used where possible to maximise shade along the alignment.
- Avoid single species mass planting arrangements.
- Assist in meeting the City of Parramatta's goal of reaching 40% canopy coverage.
- Species selection would consider form, scale, mature height, colour, and texture.
- Ensure sufficient soil provision for trees to meet maturity.
- Each tree provided must be able to grow sustainably for its natural life cycle beyond establishment period without intervention.
- Utilise naturalistic planting arrangements, creating layered planting including ground cover, flowering forbs and herbs, grasses, and shrubs where appropriate.
- Setback planting from planter bed edges so that plants when established do not spill out onto pedestrian/cycle paths, roads, or the light rail track zone.
- Undertake a safety risk assessment identifying future hazards for planting to ensure that vegetation provides a clean and safe interface with light rail operations.





IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 185: Native landscape planting character to Sub Base Platypus, North Sydney, Australia (credit: ASPECT Studios).

Figure 186: Public domain landscape treatment integrated with existing character in CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

14.2.8 Street trees

Overview

Street trees form an integral part of a neighbourhood's character through their scale, species selection and level of canopy. The implementation of substantial street trees in appropriate locations would form the landscape structure that underpins the projects public domain, providing comfort for both pedestrian and vehicular traffic along the alignment.

The City of Parramatta's goal of reaching 40% canopy coverage would be facilitated through the planting of continuous street trees, with an emphasis on broad canopy vegetation where viable. The Public Domain would be designed to retain as many existing significant street trees where possible by altering pedestrian paths of travel around significant vegetation, ensuring a level of mature planting at completion.

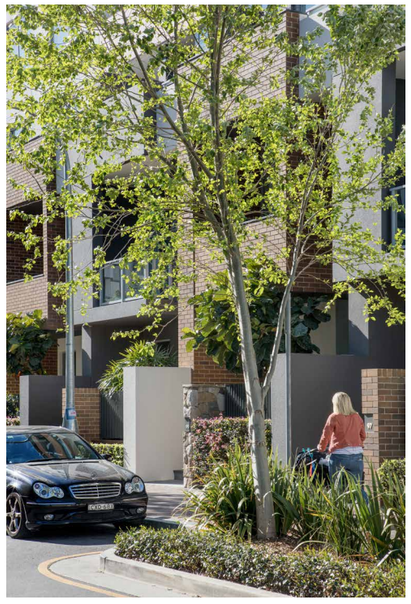
The Project is committed to providing supplementary planting on those areas where existing trees require removal, providing greater levels of new tree planting where possible.

Principles

- Tree species would be selected with consideration to the desired character of each precinct to enforce visual consistency.
- Retain significant street trees. Thorough justification for impacts to significant trees is required.
- Select street tree species which are appropriate for local soil and climate conditions, balance the need for summer shade and winter sun, maximise biodiversity, and incorporate bushfire protection requirements.
- Space street trees to create a continuity of tree canopy along the corridor, providing a visually attractive setting. Adjacent land uses may influence the pattern of spacing to accommodate active street entries and areas of parallel parking for access.
- Spacing of street trees would consider the distance from other street elements, such as lighting, driveways and waste collection areas.
- Consider the impacts of climate change and the suitability of any new tree selections in a changed climate.
- Design streets to provide soil volumes, permeable surfaces and passive irrigation appropriate for the establishment of healthy and resilient street trees.
- Ensure permeable surfaces surround the base of the tree.
- Large canopy street trees where space is available.
- Coordinate utilities to maximise the number of street trees planted in accordance with local authority guidelines on size and spacing.
- Trees would be planted in coordination with council with regards to species and installation.
- Minimise tree species planted with a habit of limb loss.
- Street trees would be located with respect to heritage items.
- Each tree provided would be able to grow sustainably for its natural life cycle beyond establishment period without intervention.
- Investigate opportunities to relocate existing utilities and services to facilitate more street tree planting.
- Tree root barriers would be applied to a maximum of two sides of a tree pit. When root barrier is installed as two parallel sides, a minimum distance of 1.5m between each side should be maintained.
- Tree root barriers would prioritise the protection of utility assets - not the constriction of tree roots - and would be located to maximise access for tree roots to adjacent areas of soil.
- Planting plans in line with the Tree Offset Strategy would be prepared in consultation with stakeholders.
- Biodiversity would be considered in each precinct, with species planted with consideration to local habitats. Species expected to disrupt sensitive ecologies (ie. Parklands within Sydney Olympic Park) would not to be introduced.
- Appropriate species would be selected based on location and immediate context, whether they are within a parkland setting, or in the road reserve. The species selected would:
    - minimise limb drop
    - minimise slippery pavements due to dropped flowers
    - minimise uneven pavements due to dropped fruits or seed pods
    - minimise displaced or heaved paving.









IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 187: Street trees providing shade, amenity, and enhancing thermal comfort along the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 188: Street tree planting to residential streets along the Harold Park Public Domain, Harold Park, Australia (credit: ASPECT Studios).

Figure 189: Cultural tree planting providing visual interest and creating comfortable outdoor spaces along Constitution Ave, Canberra, Australia (credit: John Gollings - Landzine).

Figure 190: Street trees providing scale, and defining the street character within the Harold Park public domain, Harold Park, Australia (credit: ASPECT Studios).

14.2.9 Pavements

Overview

Pavement materials would contribute to the visual identity of the light rail project and the character of the precincts through which it would pass.

Pavements within the public domain would integrate and expand upon the existing materials and landscape character of the City of Parramatta Council and Sydney Olympic Park.

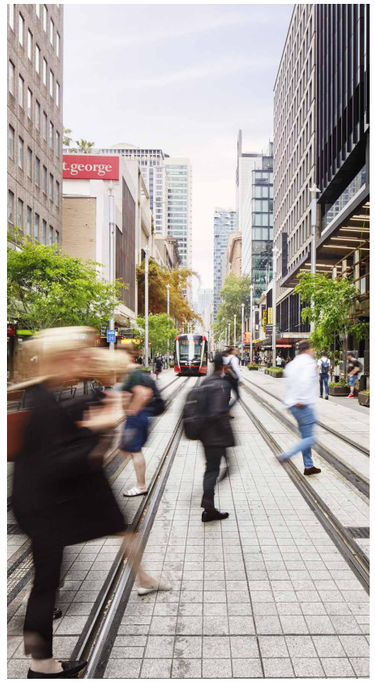
Public domain areas would incorporate a variety of pavement types, materials, and finishes that respond to the requirements of the project and align with existing and future place characteristics. They would also play a role in visually communicating the role and function of particular light rail and public domain environments, such as shared pedestrian zones or pedestrian crossings.

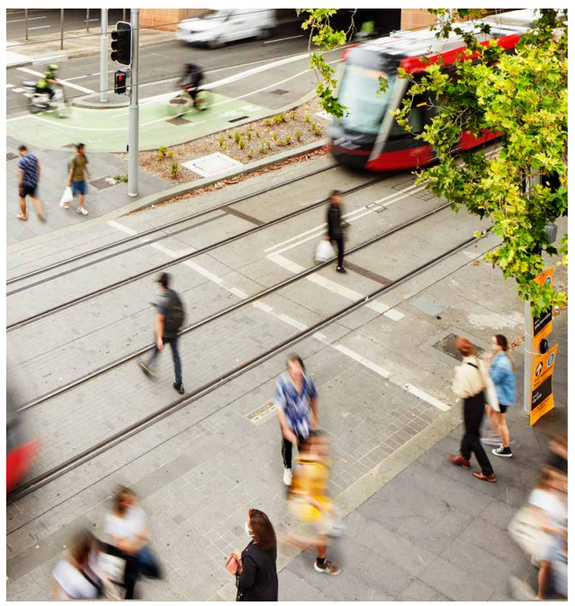
Public domain pavements include walking and cycling facilities, traffic environments, and light rail trackform. For further information on trackform, refer Section 14.4.1.

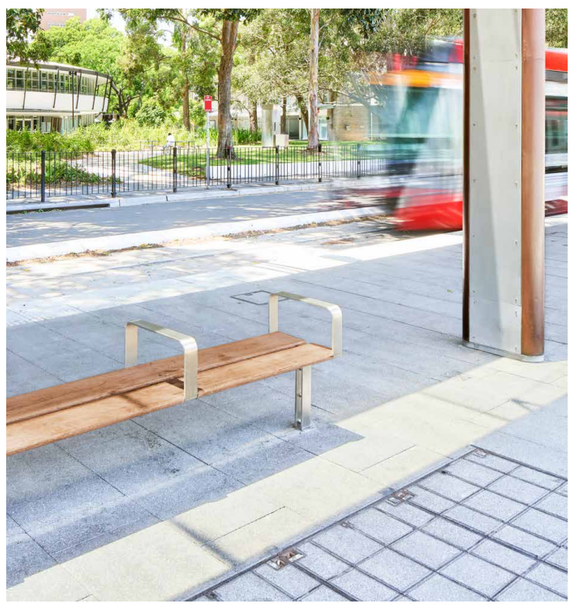
Principles

- The paving palette would be developed with reference to relevant City of Parramatta Council and Sydney Olympic Park Authority public domain guidelines.
- Special care would be taken when selecting paving so that it is responsive to the material character of its immediate surroundings, and enhance the local built and natural environment.
- Paving to the public domain would allow for the safe and efficient movement of pedestrian and vehicular traffic through the provision of high quality and robust materials suitable for all public areas of the light rail extents.
- Paving materials would meet the required standards, design codes and specifications for visual and tactile contrast and slip resistance to avoid the potential for trips and falls.
- End-users would have easy and sensible access to the transport system in the mode(s) they choose to use regardless of their abilities.
- A hierarchy of paving types would be provided such that pavements are appropriate for their location and function and include consideration of urban heat resilience and urban island effect mitigation.
- Paving design would respond to existing local conditions, site history and anticipated future character.
- Paving design would aid legibility, in particular the principal paths of travel.
- Paving materials would be durable, high quality and contribute to a recognisably civic character.
- The use of recycled materials, especially those derived from any demolition works, would be investigated.
- Material choice would maximise economies of scale and be designed for safe installation, low maintenance, and long-term durability.
- Paving design and materials would be considerate of sustainability credentials such as embodied carbon, dematerialisation, replacement and ethically sourced.
- Delineate pavements to assist asset management.









IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 191: Public domain paving materials aligned to local Council requirements in the CBD & South East Light Rail, Kingsford, Australia (credit: ASPECT Studios).

Figure 192: Trackform pavings integrating light rail infrastructure into the public domain of the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 193: Stop paving integrated with adjoining public domain palette in the CBD & South East Light Rail, Kensington, Australia (credit: ASPECT Studios).

Figure 194: Unit paving within track crossing, in the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

14.2.10 Furniture and fixtures

Overview

The integration of urban furniture and fixtures throughout the urban environment would create more targeted spots within the street with purpose and appeal. Furniture and fixtures placed in association with the project would create places to meet, greet, and interact while traveling along the alignment.

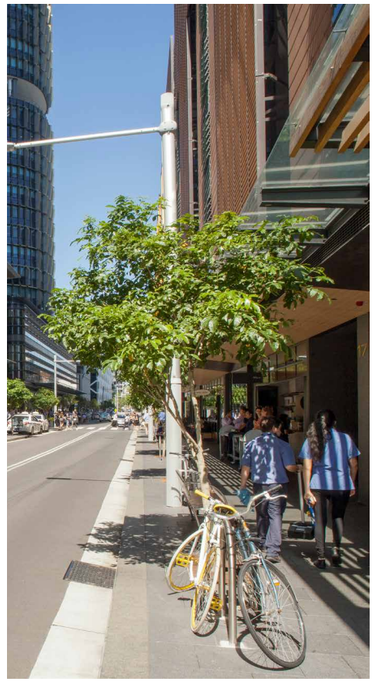
Furniture and fixtures of a high quality would be placed to ensure an easy customer experience, be a catalyst for positive social interaction, and deliver an enduring and sustainable outcome for the project.

The furniture and fixtures associated with the project would be placed with consideration to other elements within the public domain to maximise use and efficiency, and minimise clutter.

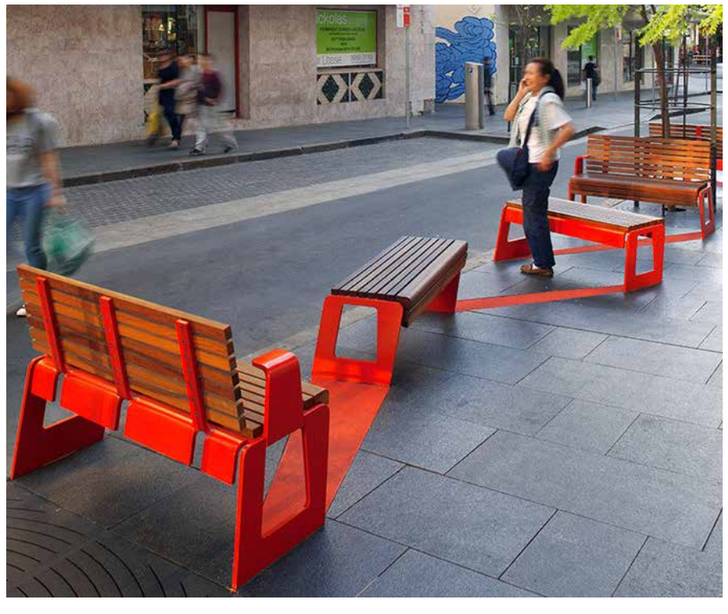
Principles

- The layout and design of street furniture would be undertaken in consultation with City of Parramatta Council and Sydney Olympic Park Authority.
- Design furniture and related fixtures as an integrated suite of elements that are high quality, durable and fit for purpose. The design of furniture and fixtures would achieve a clear, honest expression of materials, complementary to its context.
- Furniture and fixtures would be sited to avoid clutter and be co-located with street trees or other shade-providing structures. Furniture and fixtures would not obstruct pedestrian movement in stop environments.
- The use of durable, self-finished materials is desirable.
- Fencing would be visually recessive as far as possible, especially in stop environments. Fences and gates would be suitably robust and easily maintained/replaced for the public and light rail environment. Security fencing would be set back from street edges to allow for a landscape buffer. Fencing in stop environments and public domain areas would avoid creating dead ends.
- All furniture and fixtures would be accessible to the full range of potential users.
- Fixing details would be discreet and well resolved, not visually intrusive.
- Ease of maintenance access would be considered in the design of furniture and fixtures.
- Use of furniture and fixtures would be complementary to stop architecture.
- Natural and recycled materials would be used wherever possible.
- Furniture would be integrated with other landscape elements where possible and be located outside of the path of travel.
- All furniture and fixtures would be accessible to the full potential of potential users.
- Bins would be located in appropriate locations along the project.









IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 195: Seating located with shade providing trees on the Barangaroo foreshore, Sydney, Australia (credit: ASPECT Studios).

Figure 196: Furniture co-located clear of pedestrian circulation paths in Barangaroo Avenue, Sydney, Australia (credit: ASPECT Studios).

Figure 197: Street furniture integrated with public art strategy in Little Hay St, Sydney, Australia (credit: ASPECT Studios).

Figure 198: Robust material selection for stop furniture as part of the Canberra light rail, Canberra, Australia (credit: Architectus).

14.2.11 Water sensitive urban design

Overview

Water sensitive urban design (WSUD) adopts the principles of natural drainage and the ability of plants and soils to filter water. It also approaches design holistically to identify opportunities for multiple beneficial outcomes such as flooding, urban heat, and water efficiency. This requires all disciplines to collaborate on outcomes at all stages of the design process.

Setting simple and achievable WSUD objectives early in the design process ensures the project embeds these opportunities as well as avoiding clashes between different disciplines during future project stages.

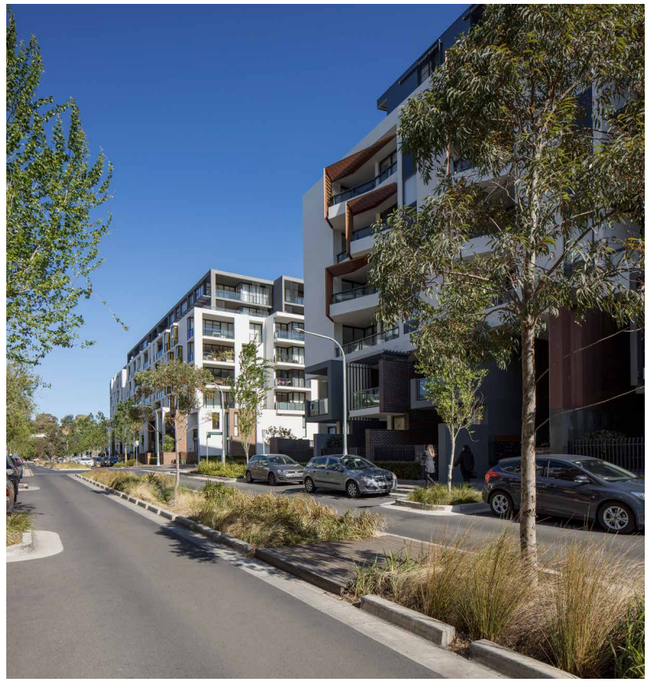
WSUD is an important feature for streets. WSUD initiatives would be integrated into the project to comply with State pollution reduction targets. The project would minimise the use of potable water, and maximise opportunities for the use of rainwater, stormwater, wastewater, and groundwater.

There are many ways of achieving WSUD in built up areas. In streets, WSUD measures such as roadside plantings and tree pits can assist with addressing water quality concerns and risks while achieving good design outcomes. Generally, the objective is to capture, slow, and filter stormwater to reduce the strain on existing waterways and stormwater infrastructure, and improve the quality of the receiving water.

Further to this, WSUD contributes to street tree health, a cooler environment through evapotranspiration, and can contribute to biodiversity in streets.

Principles

- Integrate WSUD within street elements such as kerb extensions and verges, as much as possible.
- Design WSUD features ensuring that 100% of low flows of the road catchment run-off flows into the feature.
- All surface water would flow through a vegetated system before reaching the stormwater system where appropriate.
- WSUD initiatives would be integrated along the alignment where possible and to be site responsive to create beneficial design outcomes.
- Integrate rainwater capture into all the light rail stop canopies.
- Prioritise water capture for irrigation of landscape elements associated with the alignment.
- Encourage passive drainage and irrigation to landscaped areas along the alignment.
- Incorporate permeable paving where possible.



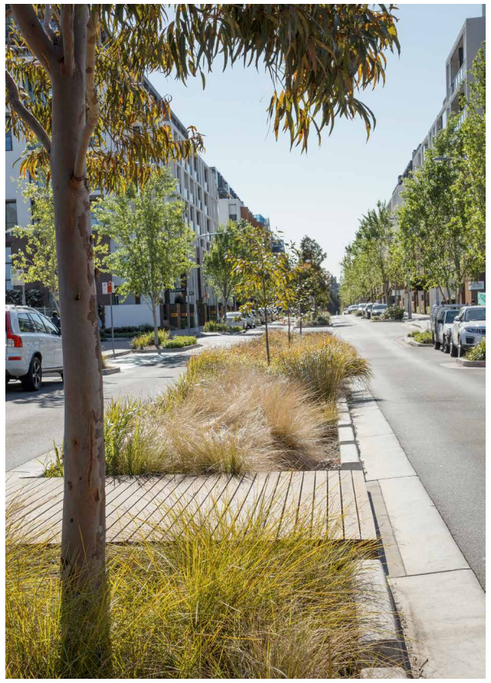


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Figure 199: Water sensitive design integrated into streets within Harold Park Public Domain, Harold Park, Australia (credit: ASPECT Studios).

Figure 200: Boardwalk crossings over rain gardens in streets within Harold Park Public Domain, Harold Park, Australia (credit: ASPECT Studios).

14.2.12 Maintenance

Overview

Maintenance of landscaped areas would contribute to a healthy and successful network of green infrastructure that would maximise public comfort and visual amenity. The proper management of landscape elements would ensure minimal plant die back and replacements, contributing to the sustainability targets of the project.

Cost effective, durable, and easily maintainable materials and assets would be included in the design and used along the alignment. These would be considered at the early stages of the design process.

Maintenance works would be compliant with all relevant local authority standards to ensure a safe and non intrusive regime for the operations of the light rail.

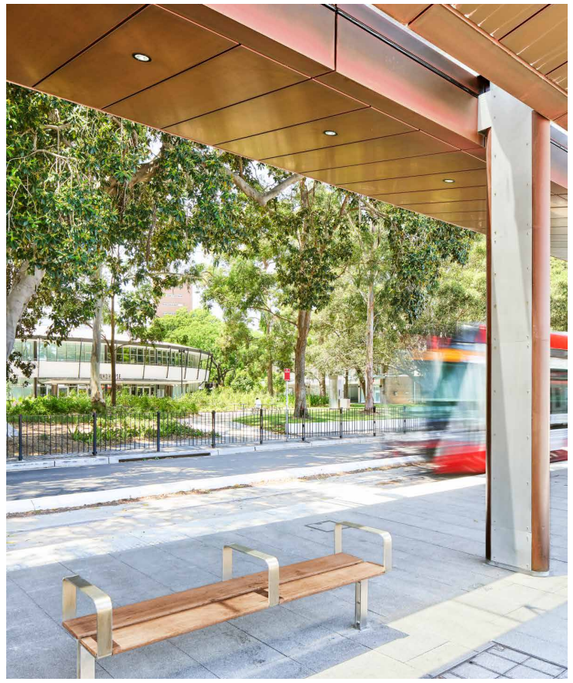
Areas that are deemed unsafe to the general public would be screened of via fencing or vegetation that can only be accessed by maintenance staff.

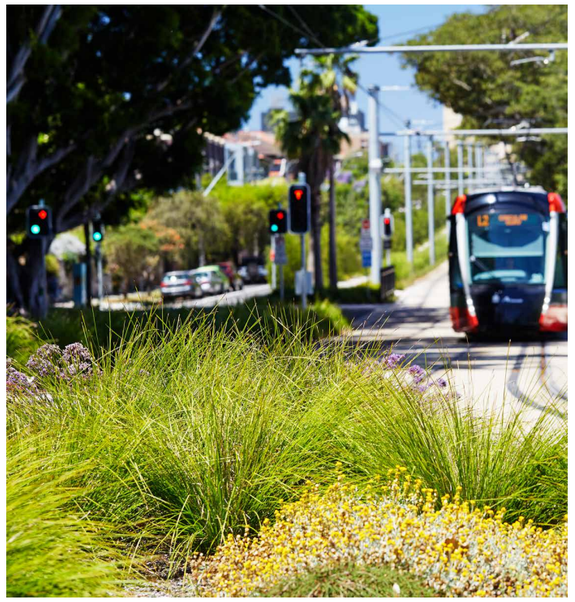
Maintenance of residual land would be undertaken by Transport for NSW prior to these areas being handed over to their final landowner

Principles

- A consistent and coordinated material palette of materials, furniture and fixtures would be implemented to serve as an efficient and cost effective management and maintenance approach.
- Robust material use within the public design that are easily cleaned and maintained to minimise the need for replacement.
- Management techniques would comply with all relevant local authority standards, facilitating consistent future management.
- All elements within the public domain would be designed to minimise vandalism and simplify maintenance. This includes: Signage, street furniture, operational equipment, and CCTV.
- Public domain elements would be consistent with adjacent materials and finishes to simplify maintenance methodology.
- Placement and design of furniture would be considerate of potential impacts from wildlife such as birds and insects, or other operational requirements to minimise maintenance requirements.
- Design elements would be approved, standardised, and modular as far as practical to streamline management.
- Energy and water systems would be designed and implemented to facilitate ongoing maintenance and improvement.
- Access to all elements of the project would be safely accessible by maintenance staff.
- Adaptive measures would be considered which respond to extreme weather events such as floods and storms.
- Resilient landscape features would be installed which require minimal maintenance.
- Passive irrigation would be prioritised in landscaped areas through grey and rain water capture.
- Landscaped areas would be automatically irrigated.







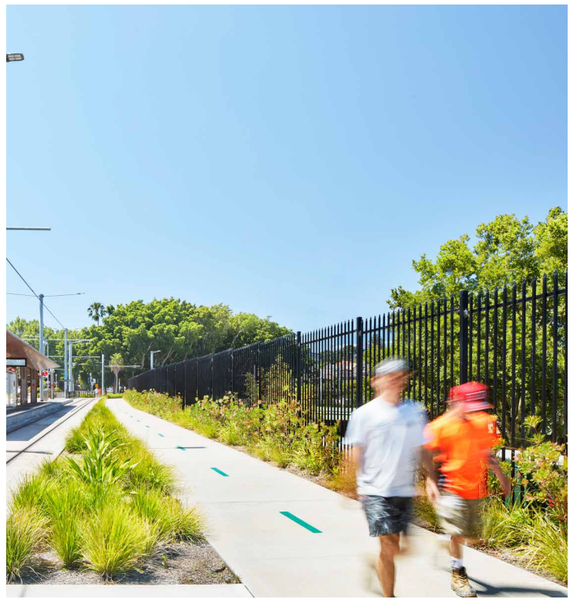


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Figure 201: Consistent furniture material selection ensuring easy and efficient maintenance and replacement for the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 202: Robust, consistent and easily maintained paving and material selection in the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 203: Consistent fencing scheme to separate maintenance and workshop areas in the CBD & South East Light Rail, Randwick, Australia (credit: ASPECT Studios).

Figure 204: Hardy and drought tolerant planting pallets in the CBD & South East Light Rail, Randwick, Australia (credit: ASPECT Studios).

14.3 Stops

14.3.1 Stop design

Overview

Stop design would aim to improve customer comfort and deliver a legacy of visual amenity and utility, with active consideration to its overall sustainability.

A series of diagrams, shown on this page, identify the design process, constraints and opportunities in stop design.

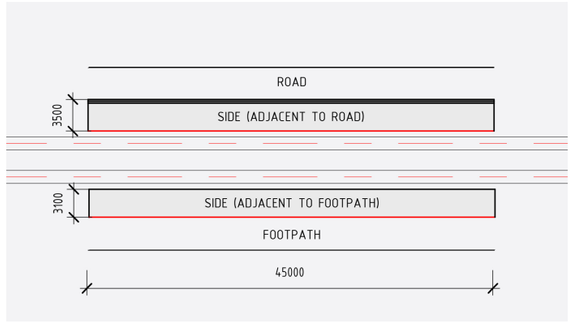
The stops would be designed to integrate with the suite of stops in Parramatta Light Rail Stage 1, adopting a modular system that would deliver architectural merit, consistency, maintainability, durability and seamless integration with the existing fabric along the light rail corridor.

The following are principles in designing stop elements:

1. Typical Platform Types
2. Consistent Grid Setout
3. Scalable Modular Canopy System
4. Access and DDA compliance
5. Furniture and Integrated Services Cabinet.

Principles

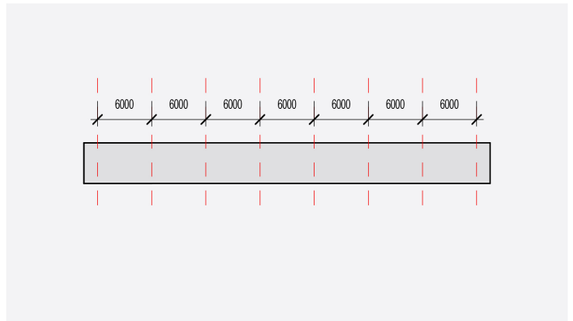
- Design stop and associated elements in compliance with Disability Standards for Accessible Public Transport (DSAPT), Australia Standard 1428, Building Code of Australia (BCA), and National Construction Code (NCC), Part H2.
- Ensure stop placement does not form a barrier to free flowing pedestrian movement.
- Design for customers and maximise accessibility and pedestrian priority.
- Integrated architecture, urban design and landscape design to reflect local character and improve active transport integration.
- Design stop environments to maximise visibility and passive surveillance.
- Create a `whole of line' stop canopy strategy which balances the need for consistency with Parramatta Light Stage 1 with the ability to deliver unique responses which respond to place.
- Ensure stop canopy design is sensitive to parkland settings, heritage precincts, and other relevant items at key locations.
- Design stops to allow room for dispersal and marshalling during event periods, where appropriate.
- Stop design would accommodate maintenance access to all elements, including components that require the use of heavy or large machinery or structures for installation of equipment, regular cleaning or repairs.



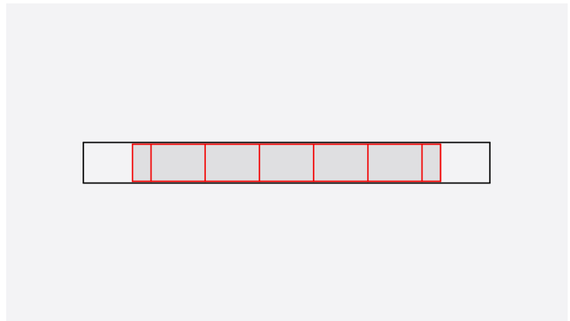
Typical Side Platform
Typical side platforms to be 45m long.
Typical side platforms to be 3.1m wide.
When a road is adjacent to the platform, typical width is to be 3.5m.



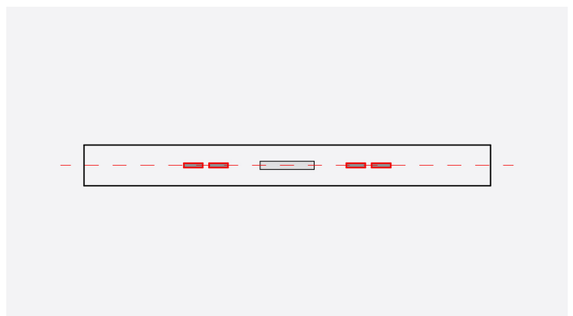
Typical Island Platform
Typical island platforms to be 45m long.
Typical island platforms to be 4.5m wide.



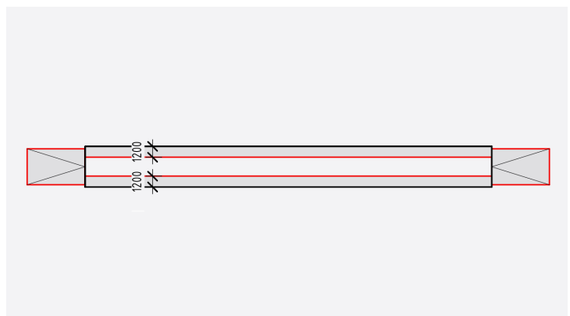
Consistent Grid Setout
The primary canopy grid is setout centrally at 6m to be consistent with paving dimensions.



Scalable Modular Canopy System
Scalable modular canopy system with consistent kit of parts for maximum flexibility and efficiency.



Furniture and Integrated Services Cabinet
Platform furniture to consist of modular elements to assist in future growing demand. Service cabinet modules to contain equipment and would be centrally located.



DDA compliance
DDA compliance requires minimum of 1.2m unobstructed clearance path on the platform.

Access walkways
Walkway access to platforms to ideally be 1:21 gradient.

IMAGES

Figure 205: Stop design principles from Parramatta Light Rail Stage 1 (credit: Transport for NSW).

14.3.2 Stop platforms

Overview

There are typically two types of platforms for light rail stops, side platforms and island platforms.

The design of stop precincts in the project would prioritise side platforms for all stops, as this arrangement provides better accessibility from both ends of the stop platforms without the need to rely on crossing signalisation.

Where space is constrained, an island platform may be warranted. This would be explored further in design development and procurement phases of the project.

Side Platforms

Side platform stop configurations occur where platforms are located to the outside of the light rail tracks. They can be used both in mixed traffic and when the light rail runs in a segregated lane.

Where centre running light rail operates, segregated from traffic running adjacent, passengers must cross the traffic lane to access the platforms from one or both ends. If the platform is located adjacent to a traffic lane, a pedestrian barrier (railing) is typically required for pedestrian safety.

Where kerbside running light rail operates (whether they are exclusive or shared) or in a pedestrianised environment, the platforms can be integrated with the footpath. In this situation, access can either be provided via: ramps at both ends of the platform; ramped or stepped access along the length of the platform at the footpath interface: or at grade with the footpath and the tracks lowered. Side platforms do not require tracks to change position and as a result passengers experience a smoother ride.

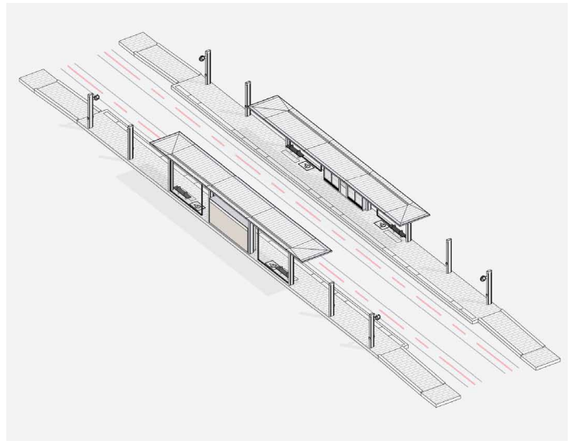
Island Platforms

An island platform stop configuration is one that is located between centre running light rail tracks and serves passengers travelling in both directions. This stop configuration can be used where light rail operates in shared or segregated lanes.

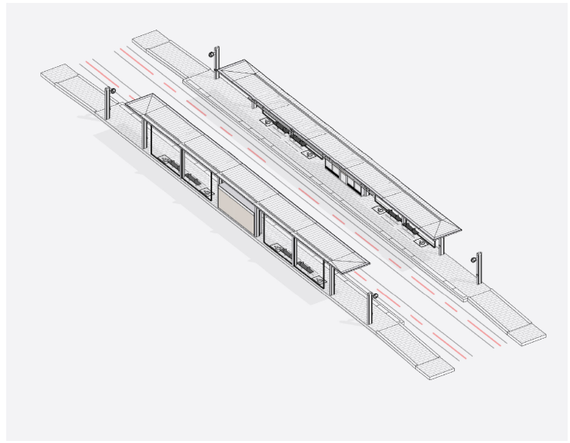
Island platforms are commonly used and consolidate ramps and access points in the ends of the platforms. Unless the line is running in a wide verge, tracks would have to diverge at stops and then converge after the platforms. Island platform stops can be accessed from one or both ends at designated at grade crossing points.

Principles

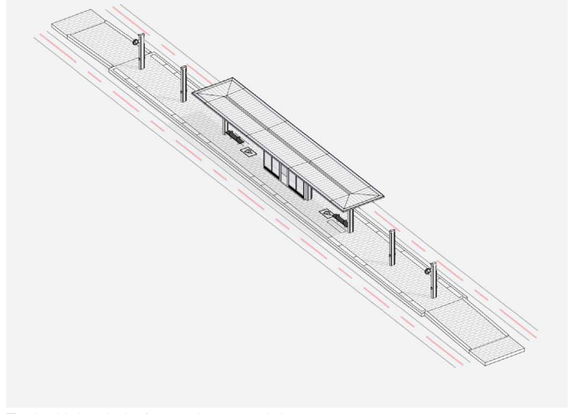
- Adopted standard platform dimensions as the basis of design. Side platforms are typically 3.1 metres wide and 45 metres long, island platforms are typically 4.5 metres wide and 45 metres long.
- Access from both ends of the stop should be prioritised. Safe and equitable access to be achieved from both ends of the platform where possible.
- Integrate side platforms flush with adjoining paving areas where kerbside light rail running operates (i.e. where there is no traffic lane to the rear of the platform).
- Employ passive design strategies to control pedestrian movement, such as planting areas, to avoid the need for fences/balustrades.
- There are two typical canopy types for side and island platforms: a three module canopy and a five module canopy.



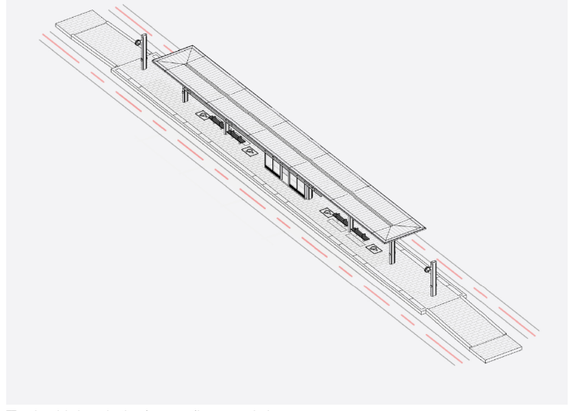
Typical side platform - three module canopy.



Typical side platform - five module canopy.



Typical island platform - three module canopy.



Typical island platform - five module canopy.

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Figure 206: Typical platform and canopy arrangements from Parramatta Light Rail Stage 1 (credit: Transport for NSW).

14.3.3 Stop crossings

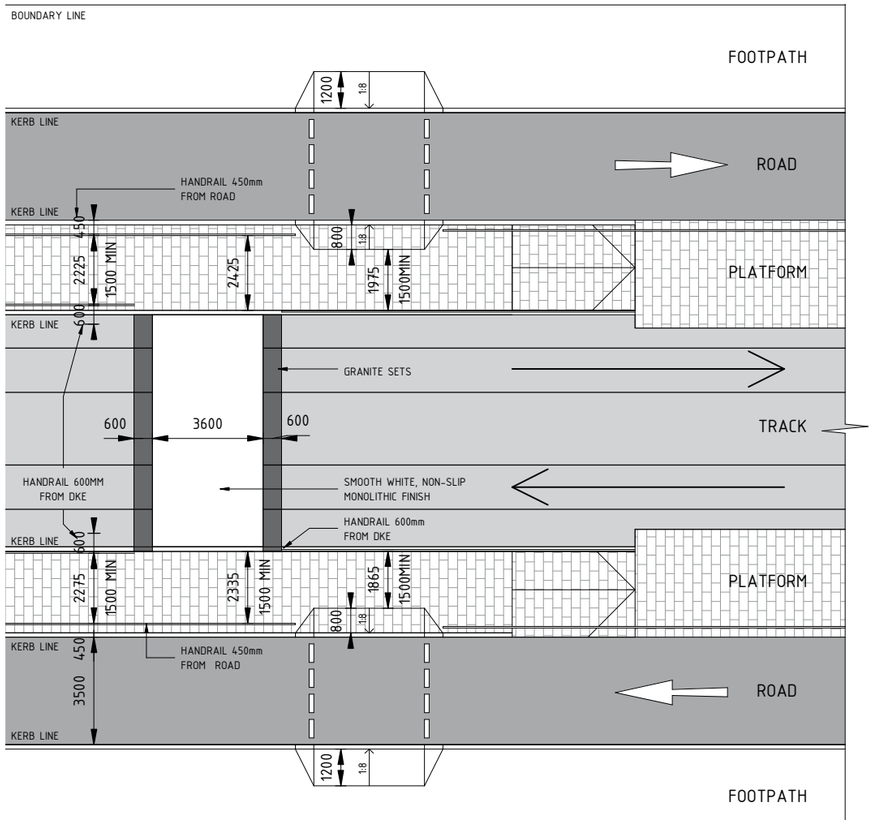
Overview

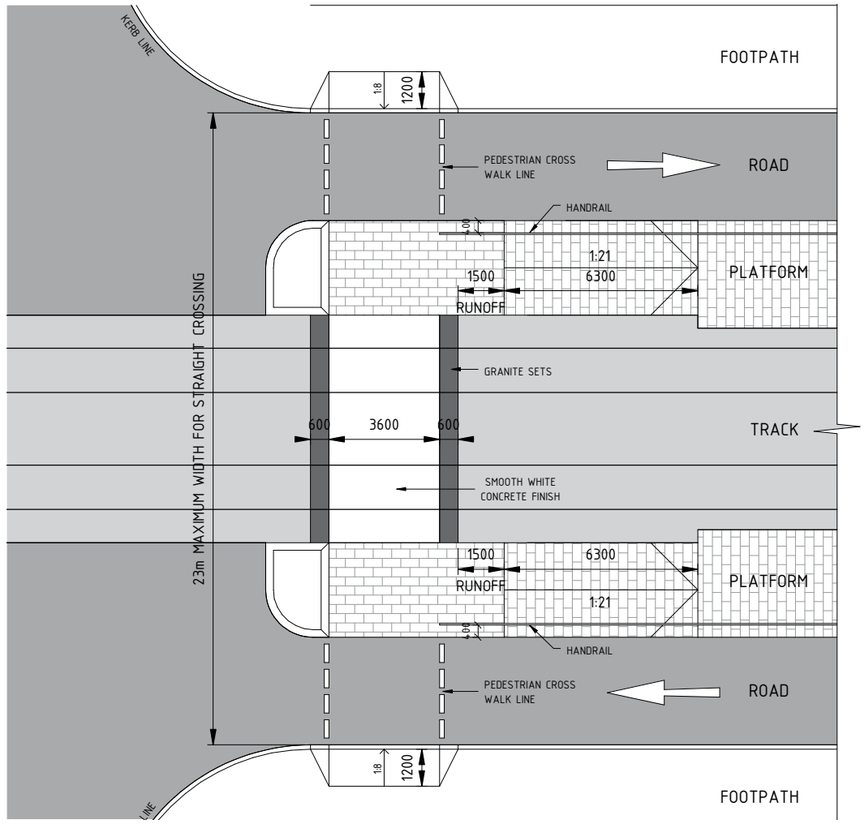
Best practice crossing design locates a crossing so it follows the path along which people would most naturally walk in the absence of a physical constraint. If a crossing is shifted too far from a natural walking route, a significant proportion of pedestrians would ignore it and instead following a more direct desire line.

Avoidance of collisions between LRVs and obstructions on the light rail track is the responsibility the LRV driver. This is termed 'line of sight' driving. Any locations where pedestrians and cyclists can move into the path of a LRV should therefore be designed to maximise the line of sight between the LRV driver and pedestrian/cyclist.

Principles

- Design in accordance with the project-specific safety assessment, and to meet relevant Australian Standards, the Disability Standard for Accessible Public Transport 2002 and Transport for NSW standards.
- Pedestrian crossings would be straight wherever possible.
- Provide pedestrian crossing materials that clearly delineate pedestrian paths of travel across the light rail track zone and roadway, differentiating between general track form and crossing areas by means of material variation and luminance contrast in accordance with AS 1428.4.
- Wherever possible, provide raised pedestrian and bicycle crossings across the roadway to remove the need for kerb ramps in verges and medians.
- Avoid handrails and balustrades adjoining the light rail track zone wherever possible.
- Provide pedestrian crossings as close as possible to the stop exits to discourage illegal and dangerous pedestrian movement.
- Locate switches and other special trackwork components clear of pedestrian crossings.





IMAGES

Figure 207: Indicative staggered pedestrian crossing arrangement and setout (credit: Transport for NSW).

Figure 208: Indicative straight pedestrian crossing arrangement and setout (credit: Transport for NSW).

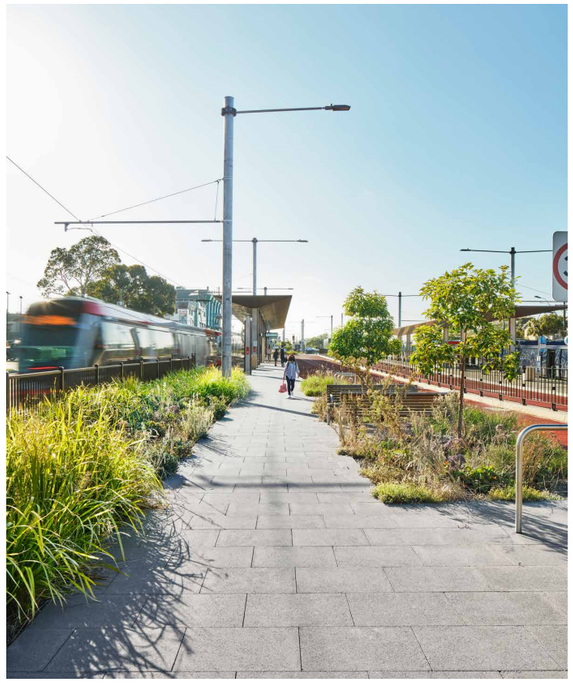
14.3.4 Stop materials

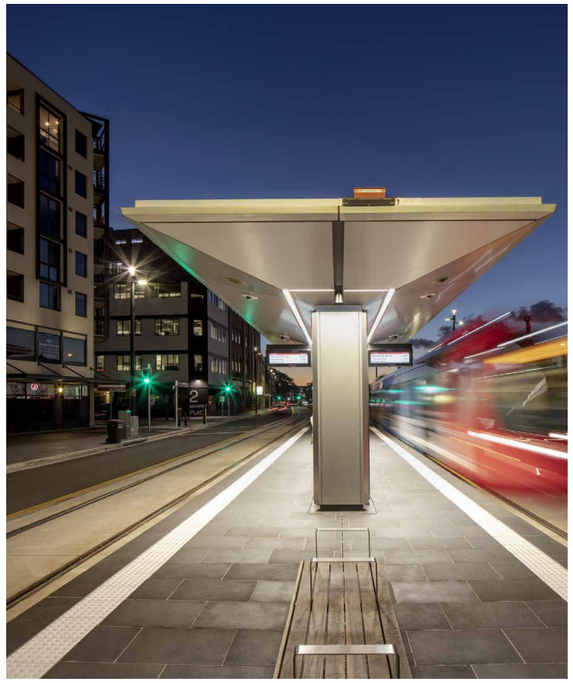
Overview

Stops environments would typically comprise platforms, paths of travel to and from platforms, light rail and roadway crossings, and other areas and elements of the public domain integrated into the design of the stop's immediate surrounds.

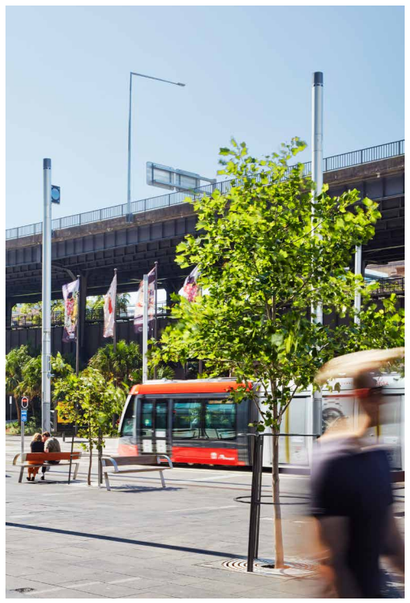
Principles

- The palette of stop materials and finishes would be developed with reference to relevant City of Parramatta Council and Sydney Olympic Park Authority public domain guidelines.
- Stop materials and finishes palettes would integrate into their immediate surrounds.
- Stop platforms and adjacent environments would incorporate materials and finishes that enhance existing place, character and the quality of the surrounding built and natural environment. Materials and finishes would be attractive, visually consistent, robust, resistant to vandalism, and responsive to setting, including heritage values, and the Parramatta River.
- Stop materials and finishes would be consistent with relevant DDA and Australian Standards particularly in regard to slip resistance.
- Preferentially select materials with higher sustainability credentials and those with a reduced whole of life cycle impact.









IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 209: Consistent material finish to all platform stops along the CBD & South East Light Rail, Kingsford, Australia (credit: ASPECT Studios).

Figure 210: Paving and furniture finishes integrated within all light rail stops along the Newcastle Light Rail, Newcastle Australia (credit: ASPECT Studios).

Figure 211: Stop materials and finishes integrated with broader public domain strategies and guiding documents in the CBD & South East Light Rail CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 212: Robust stop materials through the project of CBD & South East Light Rail, Randwick, Australia (credit: ASPECT Studios).

14.4 Light rail infrastructure

14.4.1 Trackform

Overview

The light rail trackform would be one of the most readily apparent elements of the project within the public domain.

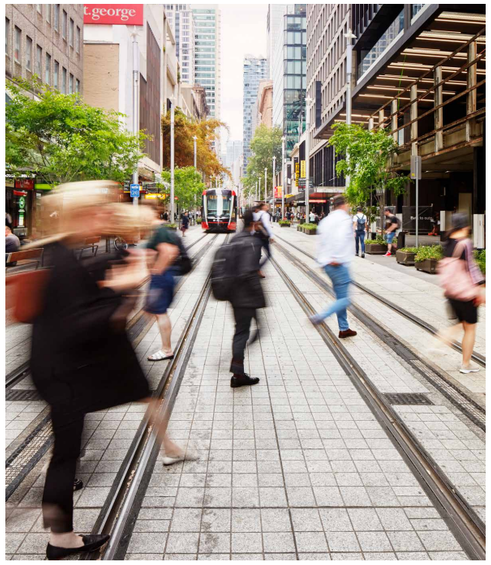
Trackform design would therefore be carefully considered in line with a number of other considerations, including run mode as well as accent materials at stop precincts and crossing locations.

Within urban street environments, trackform design would be considered as part of the full extent of the street from building to building, not simply limited to the tracks only. This would ensure the light rail project contributes to the sense of place in the city and its legibility.

Principles

- Maintain safe and efficient movement for all modes as required along different areas of the alignment, including light rail vehicles, pedestrians, cyclists, and road motor vehicles. Ensure trackform paving material is accessible to all forms of pedestrian movement and visually coherent within its setting.
- Consider sustainable track form (not concrete or paving) in locations where shared LRV/motor vehicle use of the trackzone is not required.
- Seek to minimise use of impervious surfaces in trackform.
- Consider operational and maintenance requirements of trackform surfaces and chose trackfrorm materials to suit differing operational needs.
- Consider visual impact of trackform on existing and evolving neighbourhoods and chose trackform to improve aesthetics of the neighbourhood.
- Design of the trackform in heritage sensitive areas, such as at the Atkins Road stop or in Sydney Olympic Park, would be sympathetic to the historic qualities of the area, and provide a new material layer that is coherent with existing material palettes.
- Prioritise accessibility across the trackform as a key requirement of the materials and detail. The detail of the tracks' junction with adjoining surfaces would positively contribute to and not detract from the character of the area while also clearly delineating the swept travel path of the LRV.
- Avoid the use of raised trackform, where a raised kerb is provided between the edge of the trackform and adjoining street/paving surfaces, in urban street environments. A raised trackform approach considers the track as a linear experience and does not respond to the multiple ways in which the city is traversed.
- Avoid the use of ballast track unless within a rail corridor.
- Adopt different paving materials within the trackform to define particular areas of the city, in line with either existing character areas or proposed future areas of development.
- Where kerbs are not used in separated running environments, demarcate the track zone through a change in the colour or texture of the paving material.









IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 213: Embedded concrete light trackform to the CBD & South East Light Rail, Kingsford, Australia (credit: ASPECT Studios).

Figure 214: Unit paving to trackform integrated with civic centre of the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 215: Grass tracks to light rail corridor along the Dijon Tramway, France (credit: Gordon Stewart).

Figure 216: Planted trackform to the Paris Tramway, France (credit: Gordon Stewart).

14.4.2 Power supply

Overview

In order to the power the light rail network, a range of infrastructure—poles, wires, in-ground charging, and substations—would be introduced into the public domain.

Overhead wiring can have a significant impact on the visual quality and amenity of streets. Overhead mast designs should therefore aim to reduce visual clutter and minimise impacts on the public domain.

Wire-free operations would be considered in sensitive visual and environmental areas. Overhead wiring would have a detrimental impact to the visual character of parkland open space areas and waterways as well as urbanised areas such as town centres. Overhead wires may also have ecological impacts to birds and bats moving between habitats along the river and within Sydney Olympic Park

Wire-free areas of the alignment minimise the need to include new poles into the street, which can result in increased retention of existing trees and ability to locate new street trees. Total wire-free length would need careful consideration and ongoing collaboration with the operator.

The project would require construction of five new traction power substations along the route to provide a reliable power source to the light rail system. These substations are small buildings that would need careful siting and design consideration to minimise impacts to existing streets, parks and public areas.

Principles

- Utilise multifunction poles to co-locate overhead wiring and street lighting and reduce clutter.
- Design and locate overhead masts to reduce visual clutter and minimise impacts on the public domain.
- Locate wire-free operations in areas of the project with the highest sensitivity to visual amenity, to protect the existing visual character of places like Sydney Olympic Park and integrate with future urban centres such as Camellia and Melrose Park.

14.4.3 Traction power substations and drivers' facilities

Overview

Traction power substations can have a major impact on the public domain. The location and design of traction power substations in the initial stages is part of the holistic design of the public domain. The siting of the traction power substations should not obstruct pedestrian movement, be easily accessed for maintenance and at the same time, secure from public access.

The design of the traction power substations should complement the neighbourhood character of each location and be constructed of materials robust enough to endure environmental conditions and potential damage or defacement. Screening and landscaping may be designed to reduce the visual impact of the traction power substations or alternatively, incorporating artwork may make a feature of the traction power substation. The final number and location of traction power substations would be confirmed during the design development phase.

Drivers' facilities would be installed in the Parramatta CBD and Carter Street Precinct. The end-of-journey facilities would provide amenity for light rail drivers and include wash, storage, change areas and toilet facilities including an accessible toilet. The units would be located where appropriate, within the public domain.

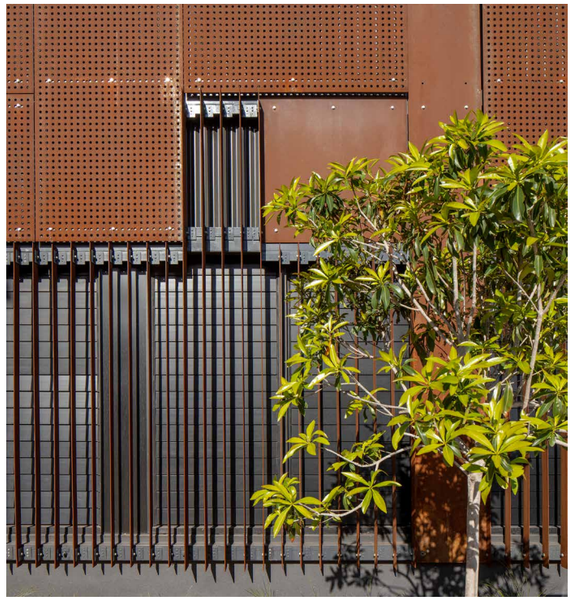
Principles

Substations

- Consider the design of traction power substations, and the setting of each location for neighbourhood character, scale, materiality in order to minimise visual impact.
- Locate traction power substations to be unobtrusive in the street and allow clear passage for pedestrians.
- Integrate the design of the traction power substation into the public domain, using planting where appropriate to minimise visual impact.
- Consider location and design of access pits if sited within the public domain.
- Design cladding material to be site specific and complement the public domain.
- Design traction power substations that are secure, robust, vandal-proof and follow CPTED principles.
- Construct traction power substations of durable materials.
- Provide parking bays adjacent to the traction power substations for maintenance vehicles, where required. Equipment loading areas, hardstand and driveways to include the use of reinforced turf, permeable surfacing and WSUD where feasible.
- Design traction power substations as a seamless part of the urban street.

Drivers' Facilities

- Locate drivers' facilities to be discrete, yet allow for passive surveillance.
- Design drivers' facilities to be simple, aesthetically pleasing and make a positive contribution to the public domain.
- Locate drivers' facilities close to the light rail termini.
- Design drivers' facilities to be sympathetic to the character of the precinct and surrounding public domain.
- Design to be of a scale that would complement the street .
- Construct with materials that are hardy and low maintenance.
- Use robust fixtures and fittings.
- Introduce sustainability initiatives such as using recycled materials, roof skylights, rain water collection and greywater re-use, photovoltaic panels to provide power.
- Locate driver's facilities to form an integrated part of the urban environment.
- Consider CPTED, night time access and use.



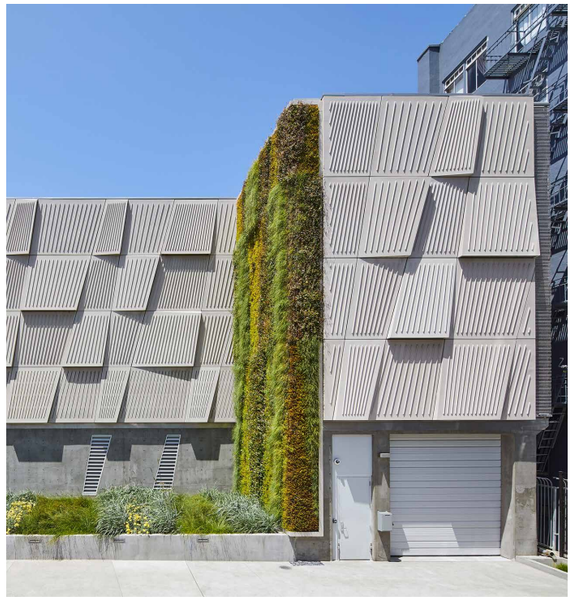




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Figure 217: Cladding and screen tree planting on Newcastle Light Rail. Newcastle, Australia (credit: COX Architecture).

Figure 218: Green wall integrated into substation facade, San Francisco, United States of America (credit: arch daily).

Figure 219: Timber cladding to substation facade with planting to base, Canberra, Australia (credit: Outdoor Design).

14.4.4 Stabling and maintenance facility

Overview

The stabling and maintenance facility currently under construction for Parramatta Light Rail Stage 1 would be utilised for the project. The facility is located in Camellia, where the main access point for light rail vehicles, pedestrians and vehicular traffic is via Grand Avenue.

The Stage 1 site has been designed with capacity for future expansion as the Parramatta Light Rail network grows. Additional stabling tracks within the existing site would be constructed to support the project's operations and the additional LRVs required.

Principles

- Landscaping, including planting of shade trees, would reduce the urban heat island effect and provide improved amenity for staff.
- Be visually screened from adjacent future residential areas as appropriate.
- Seek to design in visual or physical permeability consistent with security considerations.
- Respond to local environmental context of habitat and species.
- Maximise permeable surfacing to support stormwater detention and infiltration, subject to contamination risks. Incorporate WSUD initiatives wherever possible.

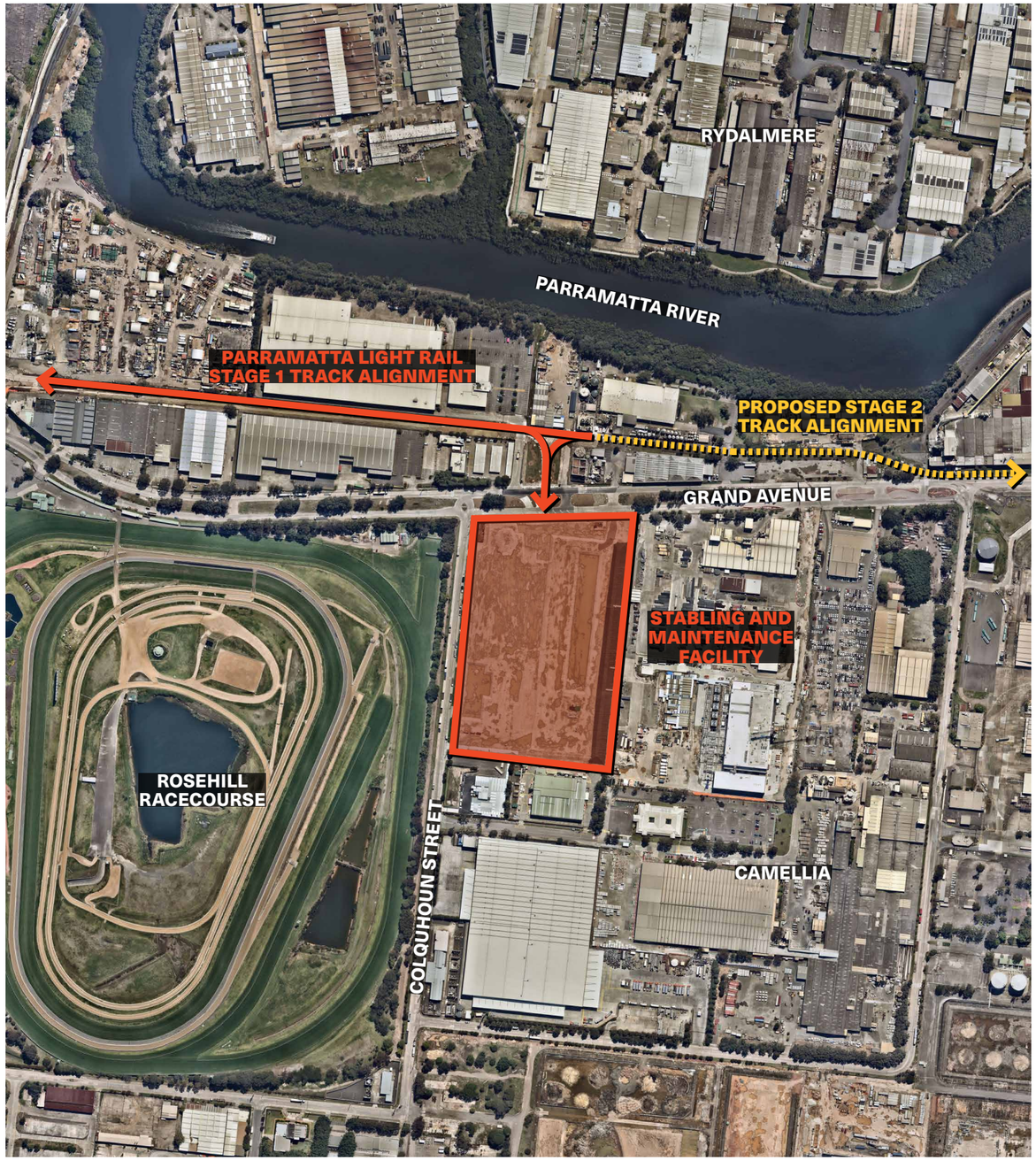

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Figure 220: Stabling and maintenance facility location map (credit: Nearmap).

14.5 Walls

Overview

The project would require walls along its alignment. This would include retaining walls to facilitate the passage of light rail, active transport, and traffic lanes throughout the project site. Walls would also include those associated with bridge abutments.

Noise walls may also be required in some locations, subject to further assessment in design development and procurement phases of the project.

Principles

- Minimise the use of walls within the public domain by adopting landscape treatments on appropriately graded slopes wherever possible.
- Where walls are required, ensure the design of walls is part of a cohesive suite of elements, unified with adjacent and associated elements such as paving, landscaping, and structures.
- Wall capping and tops of walls would address longitudinal changes of level in a controlled and consistent manner, avoiding stepping to the top of the wall.
- Vertical joints would be located at regular and consistent centres. Align vertical wall joints with vertical joints or stanchions of related elements that are added to the tops of walls.
- Divert drainage away from the face of retaining walls.
- Avoid weep-holes or other wall face drainage systems.
- Minimise blank walls.
- Shotcrete would not be used.
- Interlocking unit retaining systems, such as keystone, would not be used.
- Minimise the need for noise walls. If noise walls are unavoidable, design and construct noise walls in accordance with *Noise wall design guideline* 2016. Incorporate landscape strategies to reduce their visual impact, such as climbing plants and tree planting.
- Investigate opportunities for walls to be designed to also function as habitat for endemic fauna.

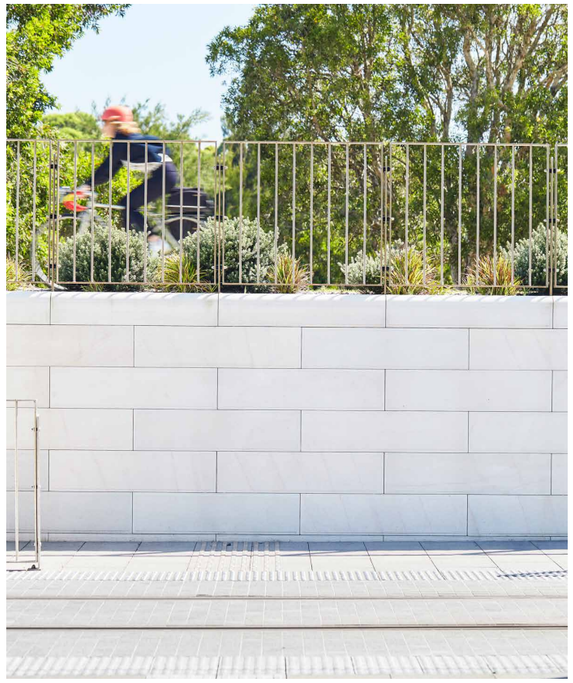



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Figure 221: Sympathetic material selection for walls, and aligned to local council requirements for CBD & South East Light Rail, Randwick, Australia (credit: ASPECT Studios).

Figure 222: Gore Hill freeway noise wall, Gore Hill, Australia (credit: Richard Goodwin Art + Architecture).

14.6 Lighting

Overview

The project would incorporate a consistent and coordinated station and precinct lighting design that is appropriate for the local context while addressing CPTED and operational requirements, contributing to a positive public perception of the project.

The approach to lighting would be varied across the alignment based on the location within the broader urban environment. Lighting integrated within suburban environments would contain a lower ambient lighting level to maintain the residential quality of the neighbourhood.

Lighting to stop precincts and highly urban environments would be of a higher ambient lighting level, contributing to increased pedestrian flows to and from event areas. The lighting design in these environments would be dynamic, providing contrast to the surrounding urban area and aid in wayfinding and recognition of the light rail.

In areas where the project interacts with parkland and nature reserves, careful consideration would be placed with lighting type, spacing, and luminance so as to minimise disturbing local wildlife habitats. The lighting design would follow the guidelines placed by the Department of Environment and Energy in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. This would be especially considered where the alignment abuts the Sydney Olympic Park Parklands and crosses waterways.

Principles

- Provide safe level of luminance to comply with relevant standards.
- Use the most efficient lights possible ensuring all standards are met.
- Conserve energy implementing the use of green energy where possible.
- Ensure coordinated lighting throughout the light rail which is appropriate for its context.
- Addresses CPTED and operational requirements.
- Lighting would contribute to a positive urban environment.
- Consistent lighting in a functional and aesthetic intent.
- Lighting would contribute to a public art and activation where appropriate.
- Lighting would highlight stop entries and access points by enhancing station architecture.
- Contribute to wayfinding throughout the light rail.
- Illumination levels are would be fit for purpose, whether wayfinding, reading, facial recognition, safety, while minimising light spill.
- Lighting would be designed to minimise light pollution.
- Lighting would be coordinated spatially and efficiently.
- Precinct lighting would be of an appropriate scale and quality consistent with surrounding context.
- Create a visually stimulating night time experience whilst not compromising design aesthetic during daylight hours.
- Lighting would be robust and vandal resistant.
- Integrate a pleasing lighting aesthetic into the stop architecture, bridges, and other infrastructure.
- Lighting would be accessible along the whole alignment for maintenance.
- All public areas would use a consistent, multifunction pole and associated luminaire.
- Precinct lighting would be of an appropriate scale and quality, consistent with surrounding local authority approaches.
- Lighting would consider policy requirements for minimising light spill and light pollution in areas of ecological sensitivity in line with AS 4282-1997, the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, and all other relevant policies.





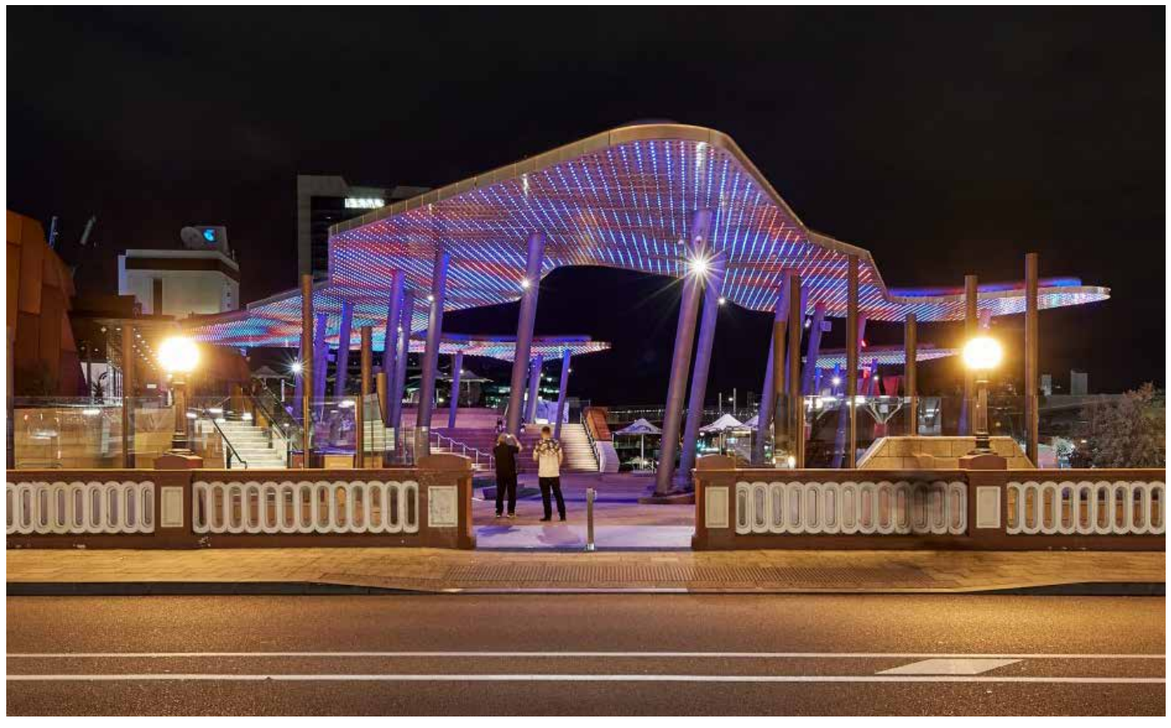

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Figure 223: Lighting integrated into stop architecture along the Canberra Light Rail, Canberra, Australia (credit: Street Furniture Australia).

Figure 224: Multifunctional pole to street (Credit: Outdoor Design Source).

Figure 225: Lighting integrated into canopy structure and public art strategy in Yagan Square, Melbourne, Australia (credit: ASPECT Studios).

14.7 Wayfinding and signage

Overview

Wayfinding and signage are key to ensuring safe and intuitive navigation for customers. It allows for an easy customer experience which is responsive to distinct local context and communities.

Wayfinding helps light rail customers orientate themselves and navigate to, from and around light rail stops. Signage provides information for customers traveling between light rail, other transport modes and destinations. Successful wayfinding is established by anticipating customer needs, providing the right information at the right time, planning and designing predictable and intuitive environments.

The project would incorporate elements of wayfinding into various design elements such as, paving, landscaping, and structure where appropriate.

Transport for NSW has a standard Kit of Parts, outlining the suite of wayfinding signage for light rail that would be applied within the light rail corridor. Directional signage outside the light rail corridor, within land owned by others, can be consistent with Transport for NSW's standard suite or in keeping with existing third party signage. Coordination with Council on the design and location of signage within the public domain would result in safe and efficient travel to destinations.

Transport for NSW Wayfinding System

Transport for NSW's wayfinding system considers a customer's end-to-end journey and provides a consistent level of signage at each stage to meet customer needs. These needs are categorised into the following six zones:

• Approach Zone - where customers need to easily identify the stop, even when arriving at a site for the first time. Maintaining clear sight lines to the mode and stop identification signs is a key consideration in these areas

• Information Zone - where customers need to plan their trip, find the right platform, see what time their service leaves, make a connection to another form of transport, or find a destination in the local precinct

• Circulation Zone - where customers need to move comfortably and efficiently. This zone would be kept clear of infrastructure

• Portal Zone - where customers need to decide on a path of travel and commit to it. Customers may need to slow down in these spaces, to understand their choices and the impact of choosing one way or another. Clear, simple information and wayfinding is the highest priority for customers in these areas. It is essential to keep these spaces free of physical and visual clutter, to allow customers to quickly get the information

• Facilities / Boarding Zone - where customers need clear information at facilities to streamline and enhance customers' experiences in the transport environment

• Waiting Zone - where customers need facilities that are comfortable for all abilities.

Principles

- Locate signs at decision points.
- Make signs legible and visible from a distance.
- Assist with intuitive wayfinding by maintaining a legible and accessible environment for customers and the public by considering the location of stops and crossings.
- Ensure travel to destinations is clear, direct and safe.
- Ensure clear sight lines to stops, along the light rail corridor, at crossings and approach paths.
- All signage would ensure users easily navigate each stop along the light rail.
- Planning for wayfinding would support all users to easily navigate along the light rail.
- Use Transport for NSW suite of signage to easily identify light rail stops and other transport modes.
- Provide floor signage and markers to provide easy, safe accessible travel.
- Incorporate wayfinding into design of the stops, light rail infrastructure and public domain.
- Coordinate wayfinding signage suite to provide clear directional signage at stops along the light rail corridor, and within the public domain.
- Design stops and public domain to assist with intuitive wayfinding.





IMAGES (CLOCKWISE FROM TOP LEFT)

Figure 226: Stop signage as part of the wayfinding strategy integrated into the CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 227: Stop and interchange information integrated into the light rail stop platform (credit: Transport for NSW).

14.8 Heritage

Overview

The presence of heritage items within the project allows for unique and culturally significant design outcomes. A holistic approach has been taken when addressing the heritage assets within the project, resulting in outcomes that appropriately respond to their history, cultural significance, and landscape.

The use of green tracks in the vicinity of heritage items would assist in sympathetically integrating the light rail within the heritage context of the setting.

The heritage items would be managed in accordance with their significance, with new communal opportunities being realised which contribute to the heritage values of place. The celebration of the neighbourhoods' unique identity through the adaptive reuse of the heritage items provides local residents with new and positive opportunities to engage with the local history of the place.

Principles

- The design would be considerate of Aboriginal and non-Aboriginal archaeology, which would be respected and enhanced through sensitive design.
- Adaptive reuse of heritage items where appropriate.
- Retain or transplant trees of heritage significance.
- Ensure new structures sensitively respond to the landscape and heritage setting.
- Ensure the application of design is responsive to the distinctive contexts and communities.
- Consider landscape and public domain design as an important mechanism for interpreting cultural landscapes along the light rail corridor and strengthening these settings through the delivery of sensitive cultural planting.
- Seamlessly integrate into the public domain of heritage precincts and places through sensitive design approach which responds to place and minimises visual clutter.
- The materials, fixtures and finishes would be consistent with or sympathetic to the existing character of the heritage items.
- The characteristics of materials used would be considered in terms of texture, colour, light and shadow.
- Where intervention with heritage items is required, best practices would be implemented so as not to interrupt or degrade the existing built form.
- The design of stations and associated light rail works would minimise the impact on heritage items, with conservation as the priority.
- New work in the vicinity of heritage items would incorporate levels of interpretation which contribute to the publics understanding of the place.
- Consider the meaningful adaptation and reuse of the Bulla Cream Dairy (Willowmere) as an integral part of the broader Atkins Road stop.

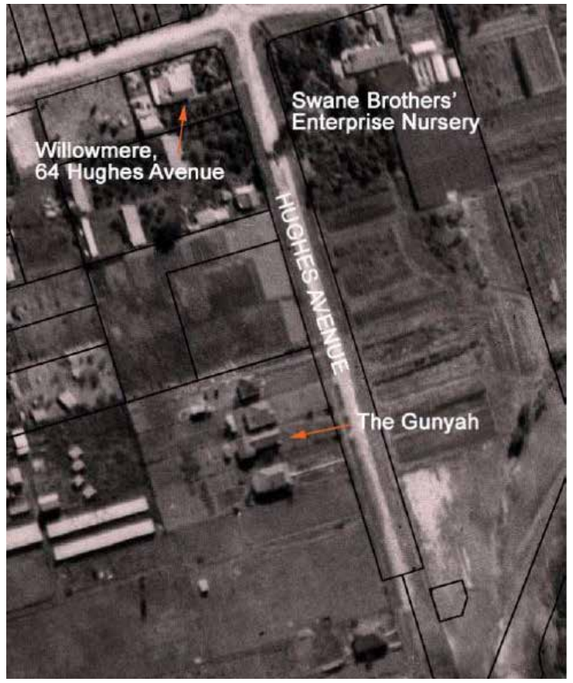





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Figure 228: 1943 Aerial showing the location of 'The Gunyah', owned and resided in by Edgar Henry Swane (credit: assessment of cultural significance by Lucas Stapleton Johnson & Partners, and Circle Square Design Landscape Architect Heritage, base aerial by City of Parramatta).

Figure 229: Ermington boat ramp (credit: Foursquare).

Figure 230: Abattoir Heritage precinct located within Sydney Olympic Park, (credit: Sydney-City and suburbs).

14.9 Public art

Overview

Public art adds enormous value to the cultural, aesthetic, and economic vitality of a community. It contributes to intensity, enhances quality of life, and allows for a sense of ownership by local community members.

The incorporation of considered, site responsive, and culturally significant art within the project would enhance the public domain, contributing to the local identity of the place and creating a more enjoyable urban experience for both customers and the general public.

The project would develop a Public Art Strategy as part of design development and procurement. This would involve engagement with stakeholders, local community members, and Aboriginal groups.

Potential opportunities for public art would include integration with stop infrastructure and furniture, public spaces along the alignment, and the bridges. This would elevate the experience of these places and enhance the project's outcomes.

Principles

- Public art would enhance the traveling experience for customers within stop environments, adjacent public spaces, and while travelling on the light rail vehicle along the alignment.
- High quality and robust public art solutions would be used.
- Artwork would be designed in collaboration with relevant stakeholders.
- Artwork would be created by local members of the community where appropriate.
- Engage with the Western Sydney Arts community where possible.
- Ensure all public art is developed in partnership with, and meets any relevant public art strategies of City of Parramatta Council and Sydney Olympic Park Authority.
- Integration of both Aboriginal and non-Aboriginal public art throughout the project.
- Reinstate any disturbed public artworks by the project.
- Artwork would designed to support platform functions such as wayfinding, sight lines, facilities and amenities where appropriate.
- Art would be integrated as part of the design, construction and operation of the light rail system.
- Considerations for site specific installations responsive to a sites context and story.
- Artwork would be innovative.
- Artwork should engage users at light rail stops while they wait.
- The public art strategy would be integrated with the heritage interpretation strategy across the whole of the alignment.





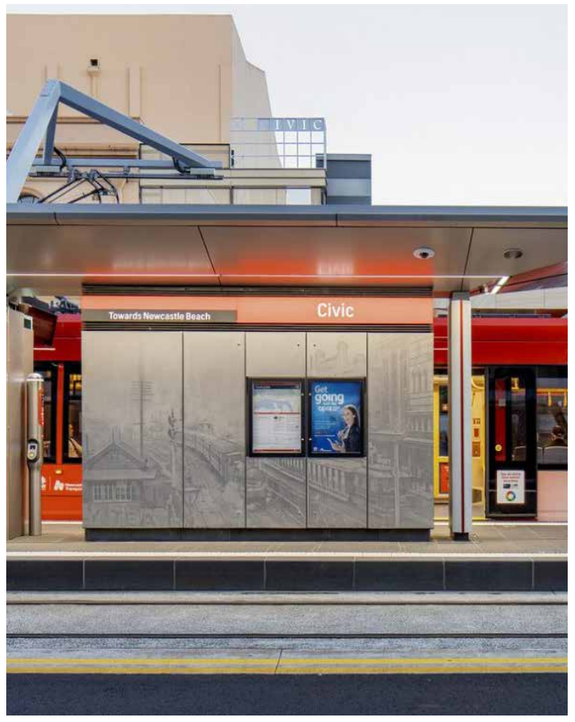



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Figure 231: Artwork integrated into paving treatments within the Chinatown public domain upgrades, Sydney, Australia (credit: ASPECT Studios).

Figure 232: Public art integrated into stop platform along the Inner West Light Rail, Dulwich Hill, Sydney (credit: Transport for NSW).

Figure 233: Stop architecture integrated with the public art strategy along thee Canberra light rail, Canberra, Australia (credit: Flinders Lane Gallery).

Figure 234: Heritage interpretation integrated into stop architecture as part of the Newcastle light rail, Newcastle, Australia (credit: COX Architecture).

14.10 Security

14.10.1 Hostile Vehicle Mitigation

Overview

Due to their frequent and predictable use, crowded places such as transport systems and infrastructure would continue to be an appealing target for terrorist acts. As such the Australian- New Zealand Counter Terrorism Committee (ANZCTC) prepared Australia's Strategy for Protecting Crowded Places from Terrorism (the Strategy).

The Strategy outlines how the Australian Government would work with the private sector to implement strategies intended on protecting domestic crowded spaces.

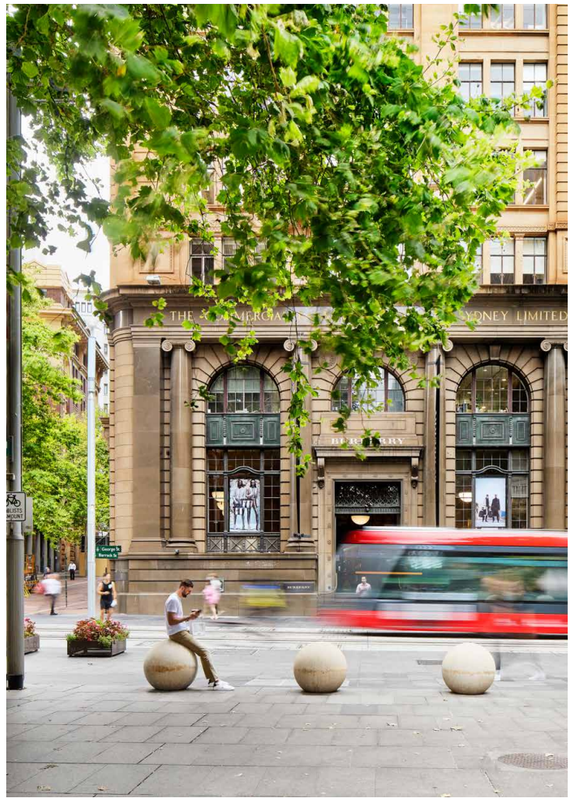
Design thinking is also a major factor when considering preventative measures for hostile acts when in the public domain. Best practice ensures that design for hostile mitigation is integrated and appear invisible in the context of its use.

The project is committed to achieving the targets outlined in Australia's Strategy for Protecting Crowded Places from Terrorism, by developing sustainable and strong partnerships at all levels of the government and private sector.

Physical barriers would also be designed and incorporated at key areas along the alignment to prevent any undesired vehicular access to the project, whether hostile or otherwise.

Principles

- Develop sustainable and strong partnerships at all levels of the governments and private sector.
- Enable better information sharing by participating in forums which provide owners and operators with emerging information.
- Implementation of effective security, and seek appropriate guidance where necessary.
- Build a strong security culture via strong communication strategies.
- Regularly train staff.
- Evaluate and test policies and procedures.
- Ensure that physical design elements intended for hostility mitigation such as bollards are fully integrated into the design and blend into their environment.



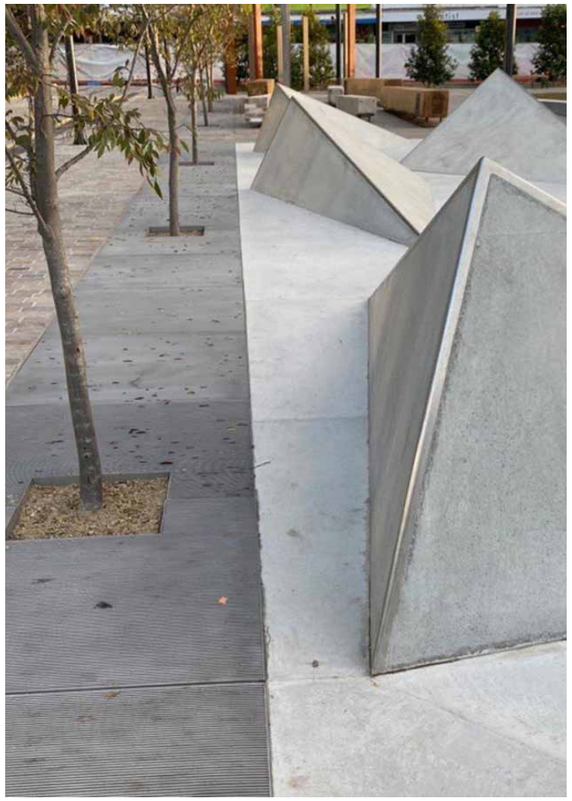


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Figure 235: Concrete bollards integrated into the public art strategy as part of CBD & South East Light Rail, Sydney, Australia (credit: ASPECT Studios).

Figure 236: Hostile vehicle infrastructure designed as a public art amenity in Warrick Lane, Blacktown, Australia (credit: Build Magazine).

14.10.2 Crime Prevention through Environment Design

Overview

Crime Prevention through Environmental Design (CPTED) is a crime prevention strategy that focuses on the planning, design, and structure of places, precincts, neighbourhoods and cities.

CPTED reduces opportunities for crime by using design and place management principles that reduce the likelihood of essential crime ingredients (e.g. law, offender, victim or target, opportunity) from occurring at different times and in different spaces.

CPTED employs four key strategies. These are:

- territorial re-enforcement
- surveillance
- access control
- space/activity management.

All CPTED strategies aim to create the perception or reality of capable guardianship.

* Drawn from NSW Police Safe by Design (https://www.police.nsw.gov.au/safety_and_prevention/policing_in_the_community/safer_by_design).

Principles*

Overarching principle:

- The design of streets, public spaces, and stop environments should enhance urban safety and support crime prevention.

Territorial Re-enforcement

- Community ownership of public space sends positive signals to the community. Places that feel owned and cared for are likely to be used, enjoyed and revisited.
- People who have guardianship or ownership of areas are more likely to provide effective supervision and to intervene in crime.
- Use actual and symbolic boundary markers, spatial legibility and environmental cues to 'connect' people with space, to encourage communal responsibility for public areas and facilities, and to communicate to people where they should/not be and what activities are appropriate.

Surveillance

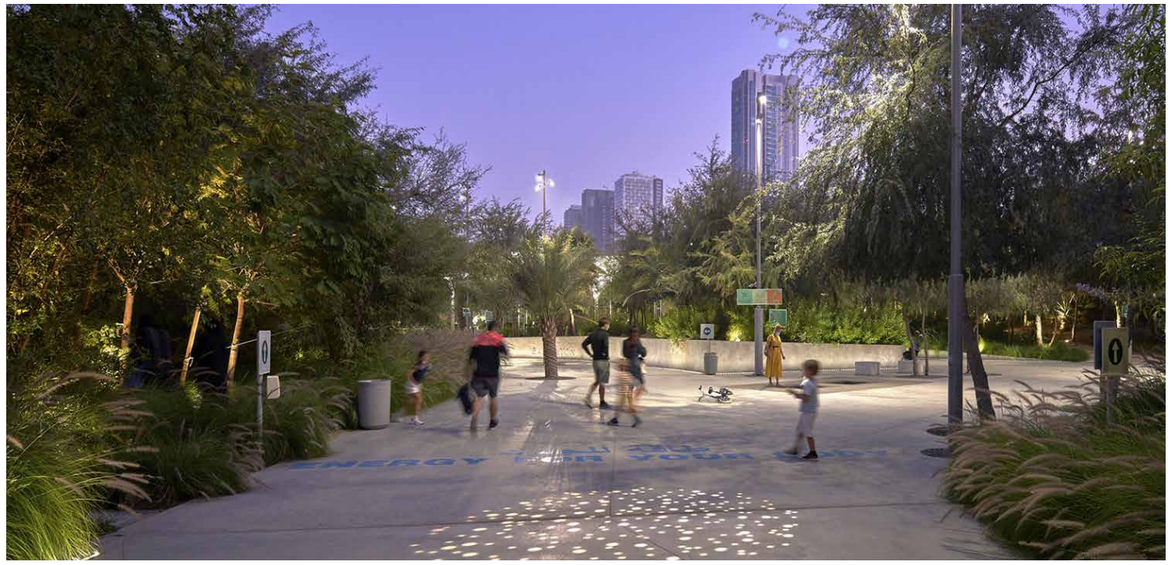
- People feel safe in public areas when they can see and interact with others, particularly people connected with that space, such as shopkeepers or adjoining residents. Criminals are often deterred from committing crime in places that are well supervised.
- Natural surveillance is achieved when normal space users can see and be seen by others. Technical/mechanical surveillance is achieved through mechanical/electronic measures such as CCTV, help points and mirrored building panels. Formal (or Organised) surveillance is achieved through the tactical positioning of guardians.

Access Control

- Access control treatments restrict, channel and encourage people and vehicles into, out of and around the development.
- Wayfinding, desire lines, and formal/informal routes are important crime prevention considerations.

Space/Activity Management

- Space/Activity Management strategies are an important way to develop and maintain natural community control. Space management involves the formal supervision, control and care of the development. Places that are infrequently used are commonly abused. There is a high correlation between urban decay, fear of crime and avoidance behaviour.





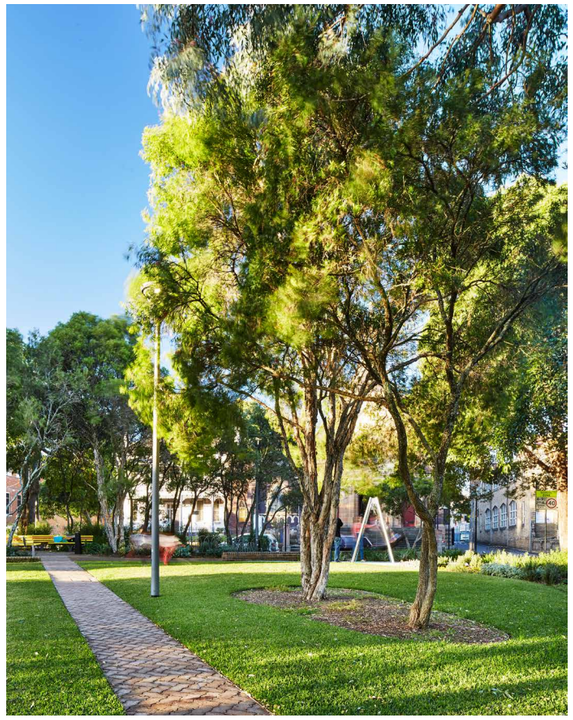


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Figure 237: Lighting to the public domain integrated with public art strategy to create safe and enjoyable spaces, Al Fay Park, Abu Dhabi (credit: iGuzzini).

Figure 238: Clear sight lines provided with clear stemmed trees allowing for passive surveillance of open space, Glebe, Australia (credit: Build Magazine).

Figure 239: Painted treatments integrated with the public art strategy, and as a method of managing graffiti within the public domain, Caulfield to Dandenong Level Crossing Removal Project, Melbourne (credit: ASPECT Studios)

14.11 Resting points

Overview

Opportunities for rest would be provided along the alignment whether through street furniture within the street corridor, or within the parklands associated or created by the project.

The Parramatta River bridges and their connecting foreshore paths would become increasingly attractive in their own right, with strong usage by recreational cyclists, family groups, walkers and commuters.

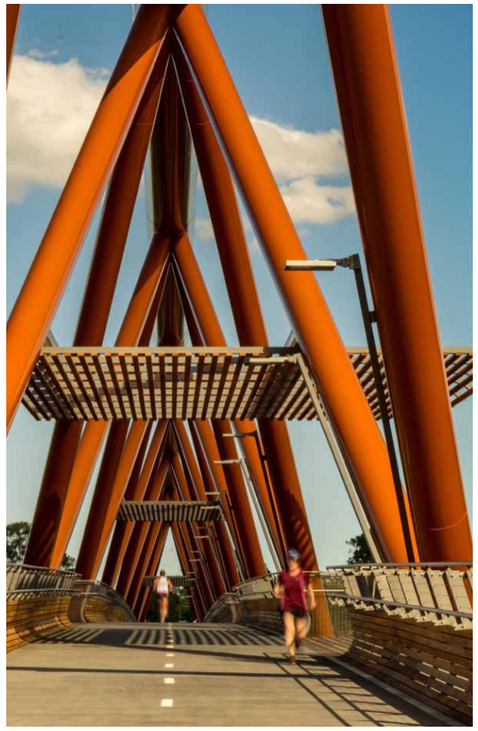
Feedback from the City of Parramatta and the Sydney Olympic Park Authority has highlighted user conflict on the Bennelong Bridge, which mixes walkers and cyclists on a 3.5m path between Rhodes and Wentworth Point.

Potential conflict on the larger Parramatta Light Rail Parramatta River bridges may be exacerbated by the longer distances and steeper grades, which would result in relatively high cyclist speeds. For this reason, it is proposed to separate pedestrians and cyclists on either side of the bridge.

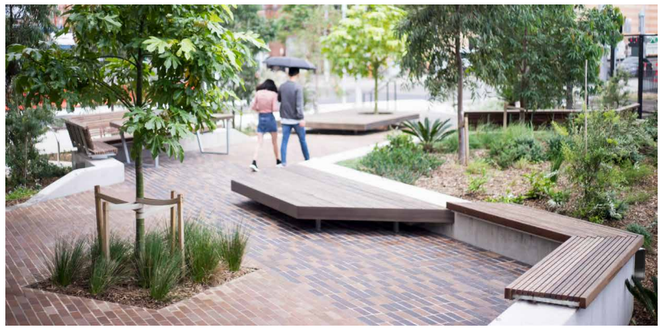
Anticipated co-design between the urban design teams would implement rest stops along the Camellia and Wentworth Point bridges at scenic locations.

Principles

- Opportunities for rest would be provided in key, safe locations along the alignment.
- Rest points would include furniture and fixtures coordinated with the materials and finishes provided along the project.
- Opportunities for interpretations would be investigated in line with *Technical Paper 4 (Aboriginal Cultural Heritage Assessment Report)* recommendations at the rest points where possible.
- Rest points would be provided within the existing and new open spaces along the alignment.
- Rest points along the bridges would be located on both pedestrian and cycle lanes either side of the bridge.
- Shade would be provided at key rest stops without compromising the visual amenity as seen from the river, or on foreshore.
- Rest points to be fully integrated into bridge architecture with consistent and robust material finishes.
- Rest points would integrate Aboriginal and non-Aboriginal heritage interpretation to tell the unique stories of the local context.







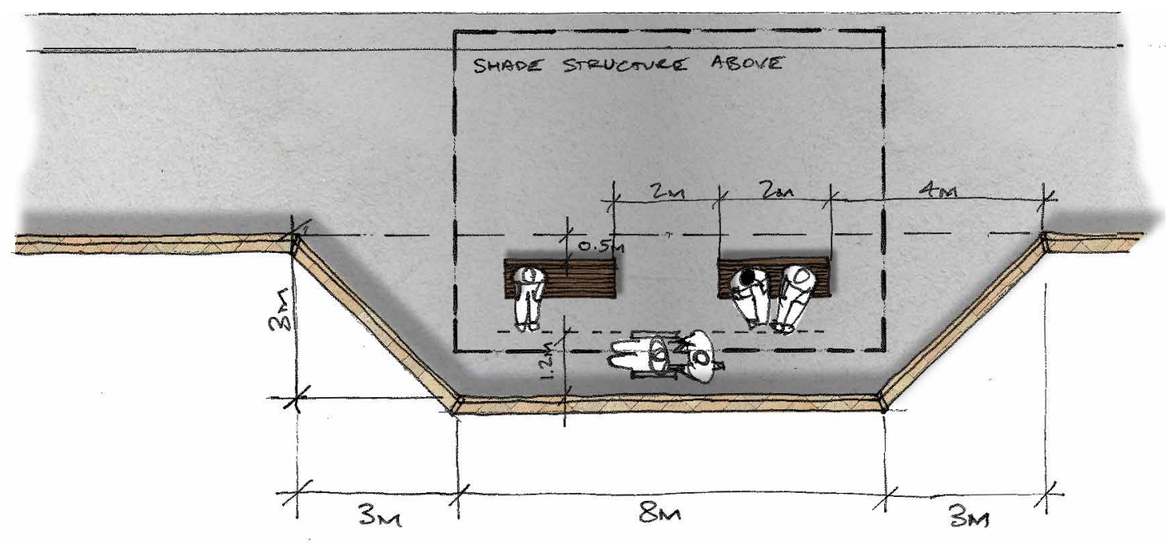


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Figure 240: Shared path and sheltered rest area with open views of the river, Yandhai Nepean Crossing (credit: KI Studio).

Figure 241: Cantilevered rest point along the Yandhai Nepean Crossing (credit: KI Studio).

Figure 242: Opportunities for seating and rest within the public domain, Haymarket, Sydney (credit: ASPECT Studios).

Figure 243: Sketch plan of potential sheltered rest area design for Camellia and Wentworth Point bridges (credit: ASPECT Studios).

15.0 Actions and Next Steps

15.1 Chapter overview

This chapter outlines the next steps in the design development process and the actions which would be taken by the project to further reduce identified amenity impacts during design development and construction.

15.2 Design development phase

The urban design for the proposed works has been developed through an iterative process between the urban design and engineering teams, and in consultation with project stakeholders. The design seeks to meet the project's urban design and placemaking aspirations within the constraints of the project's engineering and operational requirements. Some of the main constraints to realising these outcomes included:

- Space constraints within the project's operational boundary, including avoiding and reducing where possible impacts to adjacent properties.
- Light rail operational constraints including accessibility for all users and safety requirements for light rail operations in streets and other public spaces.
- Environmental constraints including but not limited to existing local access and circulation, sensitive areas of Parramatta River foreshore, flooding, and contamination.

The outcomes of this process are illustrated in Chapters 5 to 13. The urban design vision, principles and outcomes in this report are the guiding principles for ongoing development of the urban design.

During development of the urban design:

- The urban design requirements would be finalised, to provide detailed urban design guidelines and key requirements for the project, including individual design elements. These requirements would be finalised in consultation with stakeholders, the Operator, and the rail regulator, and with the advice from the project-specific Design Review Panel.
- A Public Art Strategy would be developed and would outline potential opportunities for public art integration in stop infrastructure, furniture, and in public spaces along the alignment and the bridges. This strategy would involve consultation with stakeholders, local community members, and Aboriginal groups.
- A Green Infrastructure Strategy would be developed to embed sustainability outcomes throughout the project. The strategy would encourage the design and construction of assets that integrate environmental strategies and natural systems into the built environment.
- The urban design would also be considerate of and integrated with other plans, strategies and reviews completed during design development where appropriate, including:
    - Operational noise and vibration review
    - Heritage interpretation strategy for Aboriginal and non-Aboriginal heritage
    - Residual land management plan
    - Tree offset strategy.

15.3 Construction phase

Mitigation measures have been identified to manage and minimise impacts associated with changes to residential and community amenity during construction, including as a result of noise, vibration, dust, traffic and visual changes. These measures and an assessment of impact are detailed in:

- *Appendix A (Landscape and Visual Impact Assessment)* of this report
- *Technical Paper 2 (Transport and Traffic)*
- *Technical Paper 3 (Noise and Vibration)*
- *Technical Paper 7 (Social Impact Assessment)*
- *Technical Paper 9 (Biodiversity Development Assessment Report).*

Chapter 16.0

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16.2 Data sources

Landuse (including open space/parklands): Landuse Mapping for NSW 2017 v1.2 © State Government of NSW and Department of Planning and Environment 2020.

Hydrography: NSW Hydrography 2 © State Government of NSW and Department of Planning and Environment 2020.

Cadastre and roads areas: NSW Cadastre © State Government of NSW and Department of Planning and Environment 2020.

Transport: Route data derived from TfNSW Open Data API (Creative Commons Attribution 4.0 International (CC BY 4.0)).

Cycling and walking: Existing and proposed bike network derived from shapefile for the TfNSW bicycle network maintained by Roads and Maritime Services © State Government of NSW RMS (Creative Commons Attribution 4.0 International (CC BY 4.0)). Additional proposed and existing bike network data derived from *Parramatta Ways Walking Strategy: Implementing Sydney's Green Grid,* City of Parramatta and *Parramatta Bike Plan,* City of Parramatta (updated 26/09/2019).

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Appendix A – Landscape and Visual Impact Assessment

PARRAMATTA LIGHT RAIL STAGE 2

Appendix A – Landscape and Visual Impact Assessment



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Prepared for:

Transport for New South Wales

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GLOSSARY AND ABBREVIATIONS

Term/ Abbreviation	Definition
Cumulative impact	Consideration of the result of the incremental impact of the proposal when added to other past, current and known likely future activity (Transport for NSW - Centre for Urban Design, 2020).
DCP	Development Control Plan
DEM	Digital elevation model
Desired future character	A term used to capture the desirable future outcome or vision for an area as set down in planning documents or as professionally assessed and envisaged by urban designers or other built environment professionals (Transport for NSW - Centre for Urban Design, 2020).
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
GIS	Geographic information system
GPOP	Greater Parramatta and Olympic Peninsula
Impact	The effect of a proposal, which can be adverse or beneficial, when measured against an existing condition (Transport for NSW - Centre for Urban Design, 2020).
Landscape	All aspects of a tract of land, including landform, vegetation, buildings, villages, towns, cities and infrastructure (Transport for NSW - Centre for Urban Design, 2020)
Landscape character	The combined quality of built, natural and cultural aspects which make up an area and provide its unique sense of place (Transport for NSW - Centre for Urban Design, 2020)
Landscape character type	Multiple similar landscape character zones repeated within a larger study area, grouped to avoid repetition in their description (Transport for NSW - Centre for Urban Design, 2020)
Landscape character zone	An area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby (Transport for NSW - Centre for Urban Design, 2020)
LCZ	Landscape character zone
LEP	Local Environmental Plan
LGA	Local Government Area
Magnitude	The measurement of the scale, form and character of a development proposal when compared to the existing condition. Examples of assessing magnitude provided in Guideline for landscape character and visual impact assessment Environmental impact assessment practice note EIA-N04 (Transport for NSW - Centre for Urban Design, 2020) include: • a large interchange would have a very different impact on landscape character than a localised road widening in the same area • a more distant bridge would have a lesser magnitude than one nearer to residents • a vegetated embankment facing a parkland would have less contrast than a retaining wall in the same location.
PCRC SEPP	State Environmental Planning Policy (Precincts – Central River City) 2021
Permeable track	Permeable track allows for infiltration of water to reduce stormwater runoff and improve integration with surrounding open space, parks and vegetated areas. Types include ‘green’ track (grass), crushed stone, permeable pavers or ballast.
Project alignment	Refers to the physical horizontal and vertical location, position and direction of the light rail tracks.
Project site	Refers to the area that would be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the location of construction activities, compounds and work sites, and the location of permanent infrastructure.
SEARs	Secretary’s Environmental Assessment Requirements

Term/ Abbreviation	Definition
Sensitivity	The sensitivity of a landscape character zone or view and its capacity to absorb change of the nature of the proposal. An example of assessing sensitivity provided *in Guideline for landscape character and visual impact assessment Environmental impact assessment practice note EIA-N04* is that "a pristine natural environment is likely to be more sensitive to a change of the nature of a four lane motorway than a built up industrial area" (Transport for NSW - Centre for Urban Design, 2020). The design quality of the proposed development does not make the area less sensitive to change but instead affects the magnitude of the impact.
Stage 1 (of the Parramatta Light Rail network)	Referred to as 'Stage 1'. The approved Stage 1 of Parramatta Light Rail between Westmead and Carlingford via Parramatta and Camellia.
The project	Parramatta Light Rail Stage 2, which comprises two main elements: • construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park • operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.
Transport for NSW	Transport for NSW is the lead agency of the NSW Transport cluster.
TPSs	Traction power substations
View	The sight or prospect of a landscape or scene (Transport for NSW - Centre for Urban Design, 2020)
Visibility	The state or fact of being visible or seen (Transport for NSW - Centre for Urban Design, 2020)
Visual impact	The impact on the views from residences, workplaces, and public places (Transport for NSW - Centre for Urban Design, 2020)
ZTI	Zone of theoretical (visual) influence

EXECUTIVE SUMMARY

This report is a technical appendix to Technical Paper 1 (Design, Place and Movement) and has been prepared to support the environmental impact statement (EIS) for Stage 2 of the Parramatta Light Rail network (the 'project'). This report responds to parts of the Secretary's Environmental Assessment Requirements (SEARs) related to visual impacts and also establishes landscape character to help inform the visual impact assessment and urban design considerations.

Approach and methodology

The landscape character and visual amenity assessment has been undertaken using the framework from the *Guideline for Landscape Character and Visual Impact Assessment Environmental Impact Assessment Practice Note EIA-N04* (Transport for NSW - Centre for Urban Design, 2020) and with reference to *Landscape and Visual Assessment AILA Guidance Note for Queensland* (Australian Institute of Landscape Architects, 2018).

A desktop study of the study area was undertaken to:

- determine potential landscape character zones (LCZs) around the project site
- map potential viewing envelopes of the project
- determine critical or significant views and vistas for visual amenity assessment.

Site inspections were carried out during September 2021 and February 2022 to test the findings of the desktop study.

The methodology for the assessment is described in Section 2.

Landscape character assessment

A landscape character assessment was undertaken to assist in determining the "the overall impact of a project on an area's character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it)." (Transport for NSW - Centre for Urban Design, 2020).

The desktop and site assessment identified 18 LCZs associated with the project site.

For each of the LCZs an assessment was undertaken to understand the values of the landscape which in turn informs the sensitivity of both landscapes and views (visual amenity) around the identified LCZS to potential change.

As well, for each of the LCZs the scale, form, and character of project construction and operation was assessed as compared to the existing condition to determine a level of magnitude of change.

Visual impact assessment

A visual impact assessment was undertaken to assist in determining the "the overall impact of a project on an area's character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it)." (Transport for NSW - Centre for Urban Design, 2020).

The desktop study and site inspection identified 36 viewpoints with potential for visual amenity impacts associated with the project.

For each of the viewpoints, using the sensitivity outputs from the LCZs associated with the viewpoints, an assessment was undertaken to understand the values of the landscape within the views, and the sensitivity of those views to change.

As well, for each of the viewpoints a level of magnitude of change was assessed using the scale, form, and character of project construction and operation.

The combination of sensitivity of a viewpoint to change, and the magnitude of change within that view, provides a rating of visual impact for each of the identified views during construction and operation.

Findings – Landscape character assessment

The assessment of LCZs found that the project would result in negligible, low, or moderate-low impacts except for those noted in Table 0.1-1.

Table 0.1-1: LCZs with greater than moderate landscape character zone impacts during construction and/or operation

LCZ	Landscape character impact during construction	Landscape character impact during operation
Rydalmere – Eric Primrose Reserve and John Street	High landscape character impact during construction	High-Moderate landscape character impact during operation
Ermington – River Road	High landscape character impact during construction	Moderate-Low landscape character impact during operation
Ermington - Ken Newman Park	High landscape character impact during construction	High landscape character impact during operation
Wentworth Point – Interface with 14-16 Hill Road	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation
Wentworth Point – Hill Road (north of Bennelong Parkway)	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation
Wentworth Point - Hill Road (south of Bennelong Parkway)	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation

Positive landscape character outcomes across the project include:

- improved urban outcomes for the former freight rail (Sandown Line) in Camellia
- improved interface between residential areas at John Street and adjacent light industrial areas in Rydalmere
- the provision for an active transport link to Ken Newman Park, Ermington and the upgrade of the active transport link through Archer Park in Melrose Park
- the pedestrianisation of Dawn Fraser Avenue adjacent Olympic Park Station.

The moderate and high impact rating of the LCZs during construction are being driven by a number of factors including:

- construction works being a juxtaposition to existing landscape character type
- construction works at proximity to residents
- construction works at proximity to residents in areas of highly valued landscape type (open space) or heritage listed sites/conservation areas
- construction works at proximity to areas of highly valued landscape type (e.g. open space or iconic sporting facilities).

The moderate and high impact rating of the LCZs during operation are being driven by a number of factors including:

- change of scale in the landscape in areas of highly valued landscape type (open space)
- change of land use type in or adjacent to areas of highly valued landscape type (open space)
- change of land use type in areas of moderately valued landscape type (heritage place).

Findings – Visual impact assessment

The assessment of visual impacts found that the project would result in negligible, low, moderate-low or moderate impacts to the majority of viewpoints except for the following:

- 13 viewpoints would have potentially moderate or higher impacts during construction
- six viewpoints would have potentially moderate or higher impacts during day time operation
- six viewpoints would have potentially moderate of higher impacts during night time operation.

Refer Table 0.1-2 for those viewpoints with higher than moderate visual impact rating.

Table 0.1-2: Viewpoints with moderate or higher visual impact rating

View-point	Name	Sensitivity	Construction		Operation			
			Magnitude of change	Visual impact	Magnitude of change – Day time	Visual impact – Day time	Magnitude of change – Night time	Visual impact – Night time
VPN05	**Rydalmere Wharf**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN07	**South Street at John Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN08	**South Street at Nowill Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN12 A	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN12 B	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact
VPN13	**Hilder Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	High magnitude of change	High-Moderate visual impact
VPN14	**Tristram Street, Ermington**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact
VPN15	**Heysen Avenue, Ermington**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact
VPN16	**Broadoaks Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN17	**Boronia Street at Murdoch Street, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN18	**Boronia Street at Atkins Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN19	**Hope Street at Bulla Cream Dairy**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact
VPN22	**Ermington Boat Ramp**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact

The moderate and high impact rating of the viewpoints during construction are being driven by a number of factors including:

- construction works being a juxtaposition to existing landscape setting within viewpoint
- construction works at proximity to residents
- construction works at proximity to residents in areas of highly valued landscape type (open space) or heritage listed sites/conservation areas.
- construction works at proximity to areas of highly valued landscape type (e.g. open space)
- construction works at close proximity to customers using Olympic Park Station.

The moderate and high impact rating of the viewpoints during day time operation are being driven by a number of factors including:

- change of scale in the landscape in area of highly valued landscape setting (open space)
- changes in streetscape environments at close proximity to residents
- change of land use type in areas of highly valued landscape setting (open space)
- change of land use type in area of moderately valued landscape setting (heritage place).

The moderate and high impact rating of the viewpoints during night time operation are being driven by a number of factors including:

- changes in lighting over and around the Parramatta River
- proximity of residents to increases in lighting associated with the operation of the project.

Mitigation and next steps

The following mitigation strategy is proposed as the design progresses to minimise potential landscape and visual impacts:

- continued iteration of the design to realise the urban design visions, principles and objectives as set out in Technical Paper 1 (Design, Place and Movement), including ongoing engagement with community and stakeholders
- incorporate the value of Aboriginal Knowledge Holders and progress the project's Connecting with Country process with a view to facilitating input from a Country-led approach on landscape character and visual amenity
- development of a Tree Offset Strategy to define the measures to offset the loss of trees and achieve a net increase in tree canopy
- consolidation of the design approach to public open space areas including Eric Primrose Reserve, Ken Newman Park, the proposed Atkins Road open space (incorporating the Bulla Cream Dairy (Willowmere)), Ermington Boat Ramp and Archer Park and the Millennium Parklands
- design development and iteration to mitigate potential landscape character and visual impacts:
  - for light rail stops and bridges
  - for streetscapes through Rydalmere, Ermington, and Melrose Park, including track finishes and the use of permeable tracks in agreed areas
  - for the interface of Hill Road with the surrounding open spaces areas of Wentworth Point and Sydney Olympic Park
  - for overhead wiring and feasibility of wire-free operation for agreed areas in the project
  - for the traction power stations across the project
  - for the radio communication towers across the project.

The full list of recommended mitigation measures is provided in Section 8. These next steps and the mitigation strategies would be integrated into the proposed outcomes for Technical Paper 1 (Design, Place and Movement).

1 INTRODUCTION

1.1 Parramatta Light Rail

The NSW Government's Greater Sydney Region Plan *A Metropolis of Three Cities* (Greater Sydney Commision, 2018) outlines a vision for a three-city metropolis. The Central River City covers the four local government areas of the City of Parramatta, Blacktown City, Cumberland City and The Hills Shire. *A Metropolis of Three Cities* highlights Greater Parramatta as the focal point for the Central River City, with employment growth and public transport being of key importance.

The Greater Parramatta and the Olympic Peninsula area (GPOP), which extends from Westmead and Parramatta in the west to Sydney Olympic Park to the east, is fast emerging as the heart of Sydney's Central River City and is set to grow and change significantly over the next 20 years. Forecasts predict that GPOP will accommodate almost 170,000 new residents by 2041. Employment opportunities will also grow, with an additional 100,000 jobs predicted by 2041 (SGS, May 2017).

Parramatta Light Rail will deliver an integrated light rail service that supports the population and employment growth expected throughout GPOP. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

Parramatta Light Rail will be delivered in stages to keep pace with development:

- Stage 1 will connect Westmead to Carlingford via the Parramatta central business district (CBD) and Camellia. The construction and operation of Parramatta Light Rail Stage 1 was approved by the NSW Minister for Planning in May 2018. Major construction is underway, with the track installation complete and light rail stop construction in progress. Stage 1 is expected to start operating in 2024. Further information on Stage 1 is available at Parramatta Light Rail
- Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Figure 1-1 provides an overview of Parramatta Light Rail showing both stages.

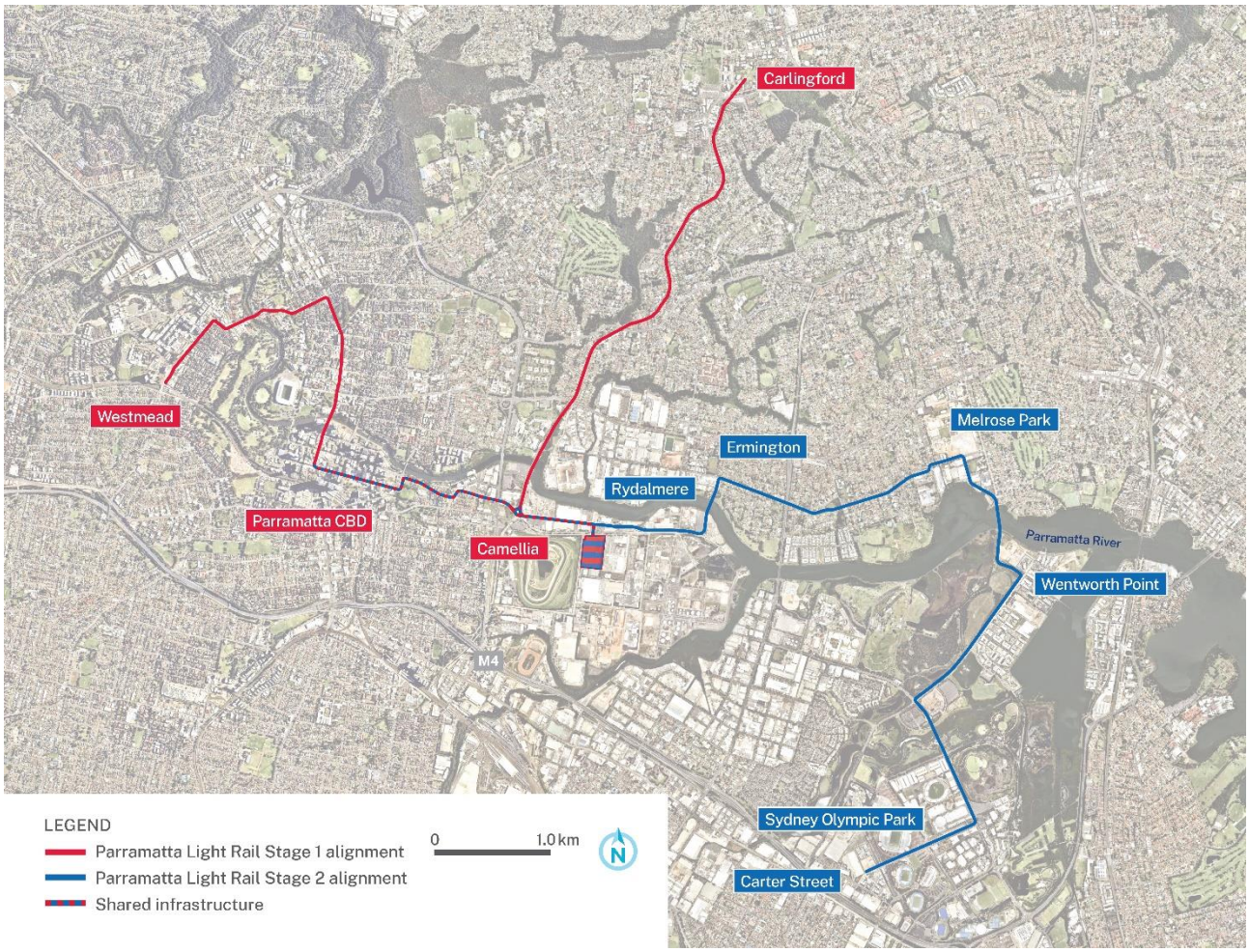


Figure 1-1: Parramatta Light Rail network

1.2 Project overview

The project comprises two main elements:

- construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
- operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.

Further information on the location of the project, and a description of the project site for the purposes of this document, is provided in the environmental impact statement (EIS).

1.2.1 Key features

The key features of the project, which are shown on Figure 1-2, include:

Light rail track and bridges

- a new 10 kilometre long dual light rail track, with 14 stops, between the Parramatta Light Rail Stage 1 line in Camellia and the Carter Street precinct adjacent to Sydney Olympic Park
- two bridges over the Parramatta River between Camellia and Rydalmere, and between Melrose Park and Wentworth Point
- a bridge over Silverwater Road between Rydalmere and Ermington

- other bridge works in Ken Newman Park and Sydney Olympic Park.

Active and public transport integration

The project would also deliver:

- about 8.5 kilometres of new active transport links between Camellia and the Carter Street precinct, which would connect with the existing cycling and pedestrian network
- interchanges with other forms of public transport, including trains, ferries, buses and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Rydalmere and Sydney Olympic Park
- a light rail and pedestrian zone (no through vehicle access) within Sydney Olympic Park along Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard
- bus access over the proposed bridge between Melrose Park and Wentworth Point.

Other works

Works proposed to support the project's operation:

- turnback facilities, including along part of Macquarie Street in the Parramatta CBD
- adjustments to the Parramatta Light Rail stabling and maintenance facility at Camellia
- five new traction power substations to convert electricity to a form suitable for use by light rail vehicles
- new and improved open spaces and recreation facilities at Ken Newman Park, the Atkins Road stop and Archer Park.

Further information on the project's features is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

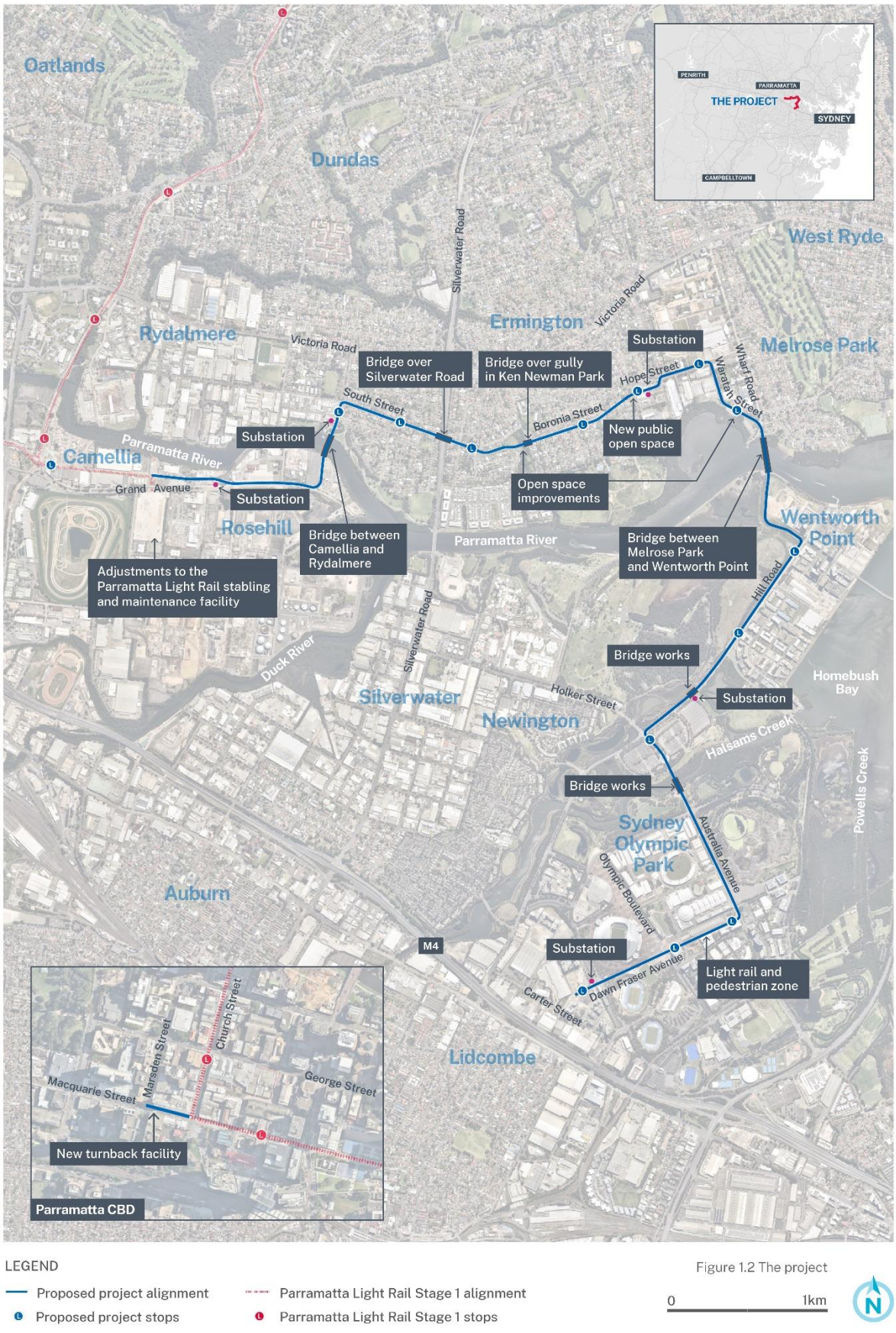


Figure 1-2: Key features of the project

1.2.2 Operation

The project would operate between the Parramatta CBD and the Carter Street precinct, using a section of the Parramatta Light Rail Stage 1 alignment and the alignment constructed as part of the project.

Between the Parramatta CBD and Camellia, the project would operate along about three kilometres of the Parramatta Light Rail Stage 1 alignment. Parramatta Light Rail Stage 2 services would terminate at the Stage 1 Parramatta Square stop to allow customers direct and convenient access to Parramatta's CBD, and interchange with Stage 1 light rail services, trains, buses and Sydney Metro West.

From Camellia, the project would operate along the light rail infrastructure proposed as part of Stage 2, terminating at the proposed Carter Street stop.

The project would operate as a turn-up-and-go light rail service from 5am to 1am, seven days a week, in line with Parramatta Light Rail Stage 1. The project would have travel times of around 31 minutes from the Carter Street stop in Lidcombe to the proposed Sandown Boulevard stop in Camellia, and a further seven minutes to the Parramatta Square stop in the Parramatta CBD.

Further information on the project's operation is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

1.2.3 Timing

It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and the first passenger services are proposed to start from 2030/2031.

An indicative construction methodology is provided in the EIS (see Chapter 7 (Project description – construction)).

1.2.4 Approval requirements

The project is State significant infrastructure and is subject to approval by the NSW Minister for Planning under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The project is also determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and requires approval from the Australian Minister for the Environment and Water.

1.3 Purpose and scope of this report

The EIS has been prepared to support an application for approval of the project in accordance with Division 5.2 of the EP&A Act. It addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment (SEARs).

This report has been prepared as part of the EIS to assess the potential landscape character and visual amenity pacts from constructing and operating the project. The report:

a. addresses the relevant SEARs listed in Table 1-1
b. uses a landscape character assessment to:
    i. understand the existing landscape character
    ii. understand and extrapolate intended landscape character
    iii. describe the existing environment
c. uses the outcomes of i. to iii. to formulise a baseline to assess changes in both landscape character and visual impacts for the project
d. recommends measures to mitigate and manage the impacts identified.

The methodology for the assessment is described in Section 2.

Table 1-1: Secretary's Environmental Assessment Requirements – Design, Place and Movement

Design, Place and Movement SEAR	Where addressed in this report
1. A **design led process** that is informed, collaborative and iterative, which: (c) retains and enhances existing and new views and vistas;	Technical Paper 1 (Design, Place and Movement) details broadly the design led process that has been adopted for the project. Section 2.4 of this report discusses how a collaborative, iterative assessment process has been undertaken to work with the design team to ensure that the project retains and enhances existing and new views and vistas. The potential impact of the design as it relates to views and vistas is discussed in Section 4 (landscape character assessment) and in Section 7 (Visual impact assessment). Section 8 of this report proposes further measures to be considered during design development to mitigate assessed impacts to views and vistas from the nominated 36 viewpoints.
3. Include and illustrate **place designs, outcomes and actions** that protect and facilitate improvements to the built environment and place, including in relation to: (e) views and vistas (including an assessment of visual impact, and visual representations of the proposal from key locations to illustrate the proposal where visual impacts that are deemed greater than medium).	This report responds to item (e) of this SEAR. Section 4 of this report provides an assessment of impacts from landscape character zones that are associated with the project site. Section 7 of this report provides an assessment of visual impacts from 36 viewpoints inclusive of visual representations from 13 key locations which demonstrate the potential visual changes. Visual representation of five viewpoints likely to experience a High-Moderate or High visual impact during the day time have been prepared and included in the relevant viewpoint assessments in Section 7 (see viewpoint 05, 12B, 14, 15 and 22). A visual representation for viewpoint 18 has been prepared which is representative of the potential changes that also may be experienced at viewpoint 19 (which is anticipated to experience a High-Moderate impact during the day time). Section 7 of this report provides an assessment of visual impacts on those elements not already covered in the viewpoint assessment. Section 8 of this report proposes measures to mitigate assessed impacts to views and vistas from the 36 viewpoints. Mitigation measures for viewpoints assessed as having medium or higher impacts are proposed in Section 8.
Section 8 (part)	
Visual representations of the proposal must be provided from key receiver locations to illustrate the proposal and its visual impacts and how the proposal has responded to the visual impact through urban design and landscaping.	The photomontages in Section 7 of this report provide a visual representation of the project from key receiver locations. Refer to Technical Paper 1 (Design, Place and Movement) for how the project has responded to visual impact through urban design and landscaping and to Section 8 for further measures to be considered during design development.

1.4 Study limitations

This assessment is intended to be an objective report, based on professional analysis of the provided design. This report seeks to establish the anticipated landscape character and visual impacts of the project.

Landscape character and visual impact assessment requires qualitative (subjective) judgements to be made based on our professional background and expertise as Landscape Architects. The assessment process aims to be objective and describe any changes factually. Potential changes because of the project have been defined, however the significance of these changes requires qualitative (subjective) judgements to be made. The conclusions of this assessment therefore combine objective measurement and subjective professional interpretation.

The opinions, conclusions and any recommendations in this report are based on assumptions made by RPS as described in this report.

2 METHODOLOGY

The methodology for the landscape character assessments and visual impact assessments in this report have been developed with reference to the following documents:

- *Guideline for Landscape Character and Visual Impact Assessment Environmental Impact Assessment Practice Note EIA-N04* (Transport for NSW - Centre for Urban Design, 2020)
- *Landscape and Visual Assessment AILA Guidance Note for Queensland* (Australian Institute of Landscape Architects, 2018).

This report undertakes two types of assessments, landscape character impact and visual impact assessment.

- Landscape character assessment "helps determine the overall impact of a project on an area's character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it)" (Transport for NSW - Centre for Urban Design, 2020).
- Visual impact assessment "helps define the day to day visual effects of a project on people's views (what people see at a place, when they are there)" (Transport for NSW - Centre for Urban Design, 2020).

The way people think and feel about a place (landscape character) informs the sensitivity of how individuals might perceive changes in both landscape character and on views in the landscapes (visual impact).

The methodology for the assessment process in this report can be described at a high level in eight steps:

1. review of existing legislation/policies
2. review of the project design vision, objectives, and principles
3. desktop evaluation for landscape character elements, visual field and potential viewsheds
4. review of the project design
5. site verification of landscape character elements, visual field and potential viewsheds
6. assess landscape character impacts
7. assess visual impact impacts
8. propose recommendations for mitigation.

Steps 4 through 8 should be considered an iterative process; as the design develops, and in the process addresses previous landscape character and visual impacts, the new resultant impacts of the design should be reassessed and reviewed so that a mitigation strategy is required only for residual impacts of an ultimate design.

2.1 Review of existing legislation/policies

Planning legislation and policies provide guidance on the valued qualities of landscape and those landscape qualities which are expected, and/or are to be protected.

Published planning legislation and policies produced at international, federal, State and local level were reviewed for guidance in establishing "landscape values" for the project and surrounds. Approved master plans and development applications also provide guidance in establishing "landscape values".

The planning instruments applying to the landscape character and visual amenity assessment are described in Section 3.

2.2 Review of project design vision, objectives, and principles

The project design vision, objectives, and principles were reviewed to see how they informed the design and what the intended response was to existing planning legislation and policies.

The vision for the whole Parramatta Light Rail network is:

To deliver integrated light rail services that support the NSW Government's vision for the Greater Parramatta to the Olympic Peninsula priority growth area.

As part of Technical Paper 1 (Design, Place Movement) a design, place and movement vision has been developed specifically for the project in response to analysis and stakeholder consultation. The vision for the project is that:

The project would deliver comfortable, attractive, convenient, and safe places, maximising transport choice and public amenity for the communities through which it passes.

Fostering environmental and social resilience, and celebrating local character, the project would underpin the future liveability of the Greater Parramatta and Olympic Peninsula precinct.

The review of the project design vision, objectives, and principles found the following underpinning themes relating to landscape character and visual amenity for the overall project:

- city shaping and providing uplift to throughout the project area.
- creating a network of green infrastructure
- providing connectivity to open space
- the activation of underutilised space
- fostering connection with Country
- the creation of vibrant community centres
- delivery of comfortable, safe and resilient streets
- minimising negative impacts on local ecology and sensitive landscapes
- providing active and sustainable transport choices along the alignment to prioritise walkable neighbourhoods
- increasing canopy cover
- enhancement of wayfinding
- minimise impacts on adjoining property, existing utilities and infrastructure.

The review of the objectives, and principles for the bridge design found the following underpinning themes relating to landscape character and visual amenity:

- contemporary, elegant, bridge design
- bridge designs responding to the existing context
- consideration of views to and from the bridge from surrounding streets, the river, parks below the bridges and the region
- design bridges worthy of crossing Sydney's most important river and ensure designs genuinely and respectfully connect with Country
- minimising visual impact relating to approach ramps, footprint, lighting, overshadowing
- minimising negative impacts on local ecology and sensitive landscapes
- the contribution of the bridge design to amenity
- enhancement of wayfinding.

The project design vision, objectives, and principles are fully described in Technical Paper 1 (Design, Place Movement).

2.3 Desktop evaluation

A desktop evaluation was undertaken to landscape character elements, potential visual field of the project and potential viewsheds in and around the project.

2.3.1 Landscape character elements

The project site was analysed for shared landscape characteristics using a variety of aerial photography and street-view infrastructure of the landscape on, and directly adjacent to the project site.

Aerial photography software and tools included Google Maps, Google Earth, Nearmap, Sixmaps, and maps available online through GIS platforms were utilised to find these shared landscape characteristics. The landscape character zones were initially identified through a review of the following characteristics adapted from *Guideline for landscape character and visual impact assessment Environmental impact assessment practice note EIA-N04* (Transport for NSW - Centre for Urban Design, 2020):

- geological quality of the area – whether it is rocky, alluvial, has deep or thin soils, etc
- topographical qualities of the area – whether it is hilly, rolling, flat, mountainous, etc
- natural drainage of the area – the rivers, creeks, drainage lines and how these affect character
- ecological characteristics and land cover of an area – whether it is forested, wetland, scrub, grass etc and the quality and type of cover and dominant flora species
- Aboriginal and non-Aboriginal heritage and cultural qualities of the area whether they are formally designated in planning documents, including the presence of individual items and broader conservation areas or instead are not listed but reflect local traditions around community, cultural practice, stories, prior occupancy and significant events
- planning designations of an area relating to landscape character (including desired future character), including listing on registers of significant places, whether international, federal, State or local
- how the settlement patterns fit into their natural setting and topography
- built form of the environment, the composition of buildings, open space, civic and business areas and transport networks
- character and quality of parks and other open space throughout the area
- contribution of green infrastructure and vegetation including the prevalence and nature of trees, shrubs and groundcover, and the significance of individual trees or groups of trees including their contribution to canopy cover
- main cultural and recreational elements of an area – the parks, popular walks, meeting places, community features and cultural icons
- demographics of an area and how that extends to influence aspects of character
- style of architecture, the materials, forms, historical mixes and design qualities
- infrastructure environment – the scale and pattern of rail, footpaths, roads, active transport, bridges, electricity pylons, dams, etc and the style and form of boundaries, fences, walls, lighting, and other associated infrastructure elements
- major economic or industrial features such as factories, business parks etc
- spatial qualities of an area – how enclosed or open it is, as defined by ridge lines, vegetation and built form
- characteristics which may be harder to objectively define but still would be important in understanding how a place is valued such as sensory aspects of a place (for example its scenic quality, the prevalence of particular sounds or smells), or the spiritual aspects of a place
- how the area changes daily and seasonally – whether there is substantial night time activity, whether there are peaks which coincide with cyclical periods or the dominant climatic conditions.

The findings of RPS' investigation into areas of shared landscape characteristics were then verified against those landscape areas identified by Technical Paper 1 (Design, Place and Movement) to determine potential landscape character zones (LCZs) for landscape character assessment.

2.3.2 Potential visual field of the project and potential viewsheds

Using the same aerial photography and street-view infrastructure tools alongside GIS potential visual field and viewsheds were generated prior to the site verification.

Zones of theoretical visual influence (ZTI) were generated using the GIS software Global Mapper. Table 2-1 lists the configurations that were used to generate the ZTI.

Table 2-1: Configuration for generation of ZTI

Item	Configuration
Base Topographical Data	NSW Elevation data service – DEM at 5m Resolution
ZTI base point frequency	Maximum 100m spacing along the project route and at all changes in route direction
Eye Height	1.5m from ground level as determined by the DEM
Receptor Height	1.5m from ground level as determined by the DEM
Maximum radius of assessment from each base point	2500m

Vegetation, buildings and other barriers in the landscape are not included in this digital elevation model (DEM) data. The results of the ZTI assessment are presented in Section 5.

2.4 Review of project design

Throughout the landscape and visual assessment process, RPS has reviewed the iterative design updates. Each iteration of the design is reviewed:

- to ascertain the project site and any increase or decrease
- to review for alignment with the future intended design character of planning instruments
- to determine increases and reduction in view fields
- to determine increases and reduction in magnitudes of change to LCZs and viewpoints.

2.5 Site verification

The RPS team carried out site inspections on the following dates to validate the desktops analysis and to provide context to the landscape character impact and visual amenity impact assessments:

- 21 to 23 September 2021
- 20 to 22 February 2022.

2.6 Assessment of landscape character impacts

A landscape character assessment was undertaken to determine the "the overall impact of a project on an area's character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it)" (Transport for NSW - Centre for Urban Design, 2020).

To determine potential landscape character impacts the sensitivity for each of the LCZs to change is assessed along with the magnitude of change that the project imparts on that LCZs.

2.6.1 Sensitivity for LCZs

The assessment of sensitivity considers the LCZs capacity to absorb change. An example of assessing sensitivity provided in *Guideline for landscape character and visual impact assessment Environmental impact assessment practice note EIA-N04* is that "a pristine natural environment is likely to be more sensitive

to a change of the nature of a four lane motorway than a built up industrial area." (Transport for NSW - Centre for Urban Design, 2020).

The assessment for sensitivity of a landscape interprets the landscape values found in published planning legislation (refer Section 3) including the desired future character. The design quality of the project does not make the area less sensitive to change but instead affects the magnitude of the impact. The sensitivity assessed for landscape character assessment informs both the sensitivity of LCZs to change and the sensitivity of change to views in the landscapes (visual impact).

Planning strategies, approved master plans and development applications also provide guidance in establishing "landscape values" and the sensitivity of landscape to change. Projects, planning strategies, approved master plans, and development applications which were considered when establishing "desired future character" and which have informed the sensitivity rating for this project include:

- *Draft Camellia–Rosehill Place Strategy* (NSW Department of Planning, Industry and Environment, 2021a)
- Melrose Park Urban Renewal Precinct – Northern Structure Plan and Southern Structure Plan (City of Parramatta, 2021)
- Development Approval for Sanctuary Wentworth Point at 14-16 Hill Road, Wentworth Point
- Development Approval for 37-39 Hill Road, Wentworth Point
- *The Sydney Olympic Park Master Plan 2030* (2018 review) (Sydney Olympic Park Authority, 2018)
- *Sydney Metro West – between Westmead and the Bays - Concept and Stage 1* (NSW Government, n.d.)
- *Carter Street Precinct Master Plan 2020.*

2.6.2 Magnitude of change for LCZs

Magnitude of change is the measurement of the scale, form and character of a development proposal when compared to the existing condition.

Examples of assessing magnitude provided in *Guideline for landscape character and visual impact assessment Environmental impact assessment practice note EIA-N04 (*Transport for NSW – Centre for Urban Design, 2020) include:

- a large interchange would have a very different impact on landscape character than a localised road widening in the same area
- a more distant bridge would have a lesser magnitude than one nearer to residents
- a vegetated embankment facing a parkland would have less contrast than a retaining wall in the same location.

The magnitude of change for landscape character zones is assessed for:

- construction phase
- operational phase.

2.6.3 Assessment ranking – landscape character

The combination of sensitivity and magnitude of landscape character change provide a rating of the landscape character impact for a project per matrix shown in Table 2-2**.** Rankings for sensitivity and magnitude are combined to generate the landscape character impact in the body of the table.

Table 2-2: Impact ranking matrix - landscape character

Sensitivity	Magnitude of change			
	High magnitude of landscape character change	Moderate magnitude of landscape character change	Low magnitude of landscape character change	Negligible magnitude of landscape character change
High sensitivity	High landscape character impact	High-moderate landscape character impact	Moderate landscape character impact	Negligible landscape character impact
Moderate sensitivity	High-moderate landscape character impact	Moderate landscape character impact	Moderate-low landscape character impact	Negligible landscape character impact
Low sensitivity	Moderate landscape character impact	Moderate-low landscape character impact	Low landscape character impact	Negligible landscape character impact
Negligible sensitivity	Negligible landscape character impact	Negligible landscape character impact	Negligible landscape character impact	Negligible landscape character impact

2.7 Assessment of visual impact impacts

A visual impact assessment is undertaken to assist in determining the "the overall impact of a project on an area's character and sense of place (what people think and feel about a place and how society values it, whether or not they are physically present at it)." (Transport for NSW - Centre for Urban Design, 2020)

Using the data from the desktop evaluation potential viewpoint locations were generated for site verification and visual impact assessment. The selection of viewpoints also considered viewpoints representative of potential receptor groups and locations.

For each of the viewpoints the current visual situation (the baseline) is described, referring to elements within various parts of the view (foreground, midground, background). The photography used to represent viewpoints in this report was taken at set parameters, used to correspond to the perception of the view to the normal human eye.

2.7.1 Sensitivity for viewpoints

Each of the selected viewpoints are then rated to their sensitivity to change. Sensitivity of a viewpoint is "related to the direction of view, the composition of the view and may cross more than one landscape character zone. While it may be also important to assess length of exposure to a particular viewpoint as a factor of sensitivity, it is important to recognise whether a view is particular to an identifiable location (such as a vista across the corridor from a resident's living room) or representative of a situation which exists across a broader length (such as the experience of a motorist along a length of corridor of a consistent treatment)." (Transport for NSW - Centre for Urban Design, 2020).

A key consideration in the visual impact assessment of the project will be the sensitivity of residents, passengers and other stakeholders to specific elements, which may result in a variety of responses, both positive and negative. Whilst the degree to which the scale of the project is visible from certain vantage points can be quantified, ultimately, the residents and users of the landscape surrounding the site would reflect a range of sensitivities. The degree to which the changes to the landscape are perceived would depend on the values of the actual users / residents.

This report considers views from passengers, motorists, habitable room windows, outdoor areas of the home yard dwelling as the most sensitive receivers. Views from residual land beyond the home yard area (such as recreational land) are treated as less sensitive receivers. This report also adopts the standard methodology of sensitivity relating to proximity, in that the greater the distance between the visual receiver and the project, the lesser the visual sensitivity

The sensitivity of LCZs (refer Section 2.6.1) informs the sensitivity for each of the selected viewpoints.

Refer to Section 2.6.1 for projects, planning strategies, approved master plans, and development applications that were considered in establishing “desired future character”.

2.7.2 Magnitude of change for viewpoints

The potential magnitude for change is assessed from each viewpoint location. Magnitude refers to “the form – scale, size, character – of the project and its proximity to the viewer.” (Transport for NSW - Centre for Urban Design, 2020).

The magnitude of change from a viewpoint is assessed for:

- construction phase day and night times
- operational phase – day time
- operation phase – night times.

Magnitude of change also considers the impact of overshadowing that would be caused by the project.

The magnitude of change has been assessed using the definition design referenced in Technical Paper 1 (Design, Place and Movement) and project scope as described in the EIS (Chapter 6 (Project description – infrastructure and operation) and Chapter 7 (Project description – construction)).

Note that due to the limited proposed changes at the turnback facility in Macquarie Street (Parramatta CBD) a viewpoint was not placed in this location.

2.7.3 Photomontages

Photomontages are used in this report as an assessment tool to explore magnitude of change and to demonstrate to readers of this report potential changes in views. They are also used to provide a visual representation of the project from viewpoints that have been assessed as having a higher than moderate impact.

- The photomontages have been selected in this report to:
- demonstrate a variety of different situations in which the project passes
- demonstrate the possible visual change in the environment for those areas with a potential higher magnitude of change
- provide context overall to the look and feel of the project at a high level and based on the current definition design of the project. It is noted the photomontages are indicative only and subject to design development.

The development of photomontages for this report utilises the following tools:

- aerial photography software and tools included Google Maps, Google Earth, Nearmap, Sixmaps, and other mapping available online through GIS platforms
- AutoCAD base data of the design provide by the project design team to spatially locate elements of the project
- Navisworks models of the bridge structures and the Parramatta Light Rail Stage 1 light rail stops
- AutoDesk Formit to adjust the Navisworks models and assist in spatial location
- Revit to adjust the Navisworks models and develop basic three-dimensional collateral
- Lumion to develop three-dimensional collateral, to add appropriate shadowing and to prepare the photomontage imagery
- Photoshop to refine the photomontage imagery.

As materials have not yet been selected for some of the larger structures in the project, those items are shown in grey shade to demonstrate the scale and magnitude of the structure.

Surrounding future development proposed by others is shown shaded in pink to give context to items in the scale of the future intended character.

2.7.4 Assessment ranking - visual amenity impact

The rankings for sensitivity and magnitude of change from a viewpoint are combined for each viewpoint to generate the visual amenity impact in the body of the table per matrix shown in Table 2-3.

Table 2-3: Impact ranking matrix - visual amenity impact

	Magnitude of change				
Sensitivity (informed by LCZ sensitivity)	**High magnitude of change from a viewpoint**	**Moderate magnitude of change from a viewpoint**	**Low magnitude of change from a viewpoint**	**Negligible magnitude of change from a viewpoint**	**Nil magnitude of change from a viewpoint**
High sensitivity	High visual amenity impact	High-moderate visual amenity impact	Moderate visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact
Moderate sensitivity	High-moderate visual amenity impact	Moderate visual amenity impact	Moderate-low visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact
Low sensitivity	Moderate visual amenity impact	Moderate-low visual amenity impact	Low visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact
Negligible sensitivity	Negligible visual amenity impact	Negligible visual amenity impact	Negligible visual amenity impact	Negligible visual amenity impact	Nil visual amenity impact

2.8 Proposal for mitigation measures

In order to manage and mitigate potential landscape character and visual impacts, RPS worked with the project design team and Transport for New South Wales to develop strategies for those LCZs and viewpoints which have a moderate or higher impact rating during construction and/or operation of the project.

Additionally, a number of general strategies are provided to manage and mitigate potential landscape character and visual impacts during either construction or operation of the project.

3 PLANNING LEGISLATION AND POLICY

Planning legislation and policies play an important role in providing guidance on the valued qualities of landscape and those landscape qualities which are expected or are to be protected. The *project* and the *study area* are subject to legislation and policies across State and local levels of government in Australia. The following is an outline of those planning legislation and policies as they are relevant to the study area and landscape character and visual amenity noting no specific legislation at an international level was found to be directly applicable to the project and study area.

3.1 State legislation and policy

Given the importance of the Parramatta area to the future expansion of greater Sydney, a range of State level planning legislation and policies highlight requirements around the protection of landscape character and visual amenity. The following State level documents have been reviewed for their guidance on public attitudes and sentiments relating to landscape character and visual amenity:

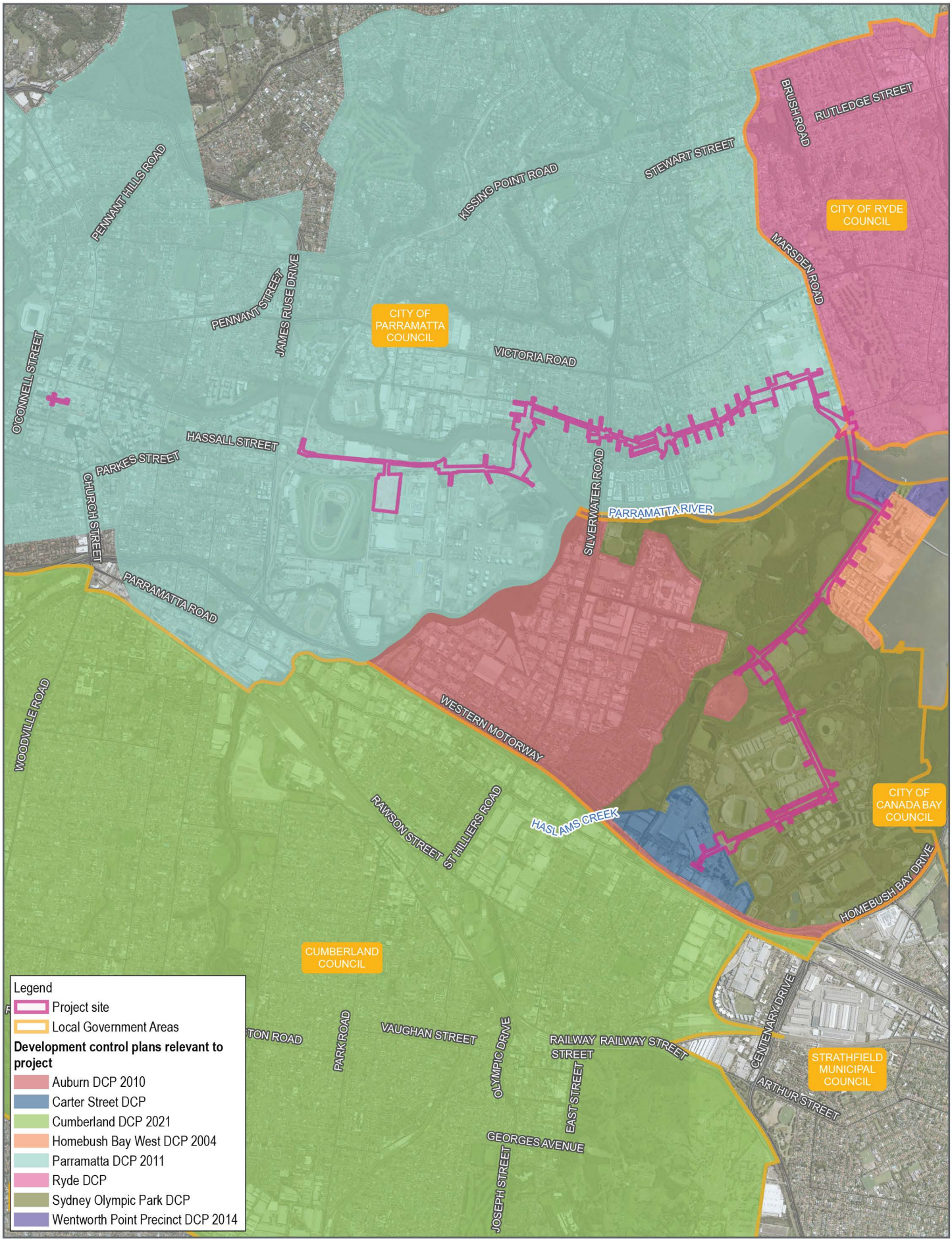
- *Better Placed: An integrated design policy for the built environment of New South Wales* (Government Architect - New South Wales, 2017).
- *Greener Places Framework* (Government Architect - New South Wales, 2020) and *Draft Greener Places Design Guide* (Government Architect - New South Wales, 2020).
- *Connecting with Country* (Draft) (Government Architect - New South Wales, 2020) and *Designing with Country Discussion P*aper (Government Architect - New South Wales, 2020).
- *Aligning Movement and Place* (NSW Government, 2021).
- *Sydney Olympic Park Master Plan 2030 (2018 review)* (Sydney Olympic Park Authority, 2018).
- *Directions for Camellia–Rosehill Place Strategy* (NSW Department of Planning, Industry and Environment, 2021).
- *Future Transport 2056* (NSW Government - Transport for NSW, 2021).
- *Greater Sydney Region Plan: A Metropolis of Three Cities* (Greater Sydney Commision, 2018).
- *Our Greater Sydney 2056 - Central City District Plan - connecting communities* (Greater Sydney Commission, 2018a).
- *A City Supported by Infrastructure: Place-based Infrastructure Compact Pilot* (Greater Sydney Commision, 2019).

The relationship of these planning instruments to landscape character and visual amenity assessment are described in Technical Paper 1 (Design, Place and Movement).

3.2 Local government legislation and policy

The project is declared State significant infrastructure (SSI) and is therefore subject to assessment and approval by the Minister for Planning under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and is not subject to local government planning controls. However, local planning documents provide context and guidance to community values/expectation in relation to landscape character and visual amenity outcomes.

The project site is located across two local government areas: City of Parramatta and City of Ryde. In some cases, interim planning schemes still apply from some former local government areas. Figure 3-1 shows the various local planning scheme areas in which the project site traverses.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

MAKING COMPLEX EASY

Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Planning schemes applicable to the project site

Project No. **12557728**
Revision No. **A**
Date **29/06/2022**

FIGURE 3-1

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Print date: 29 Jun 2022 - 09:47

Data source: LGA - DFSI2022; Cadastre, Watercourse - NSWSS2022, Metromap Tile Service: extracted 29/06/2022. Created by: dschmidt

The following local government legislation, policy and accepted masterplans have been reviewed to provide context to this landscape character and visual amenity study:

- *Parramatta Local Environmental Plan 2011*
- *Parramatta Development Control Plan 2011*
- *Auburn Local Environmental Plan 2010*
- *Auburn Development Control Plan 2010*
- *Ryde Local Environmental Plan 2014*
- *Ryde Development Control Plan 2014*
- *Wentworth Point Precinct Developmental Control Plan 2014*
- *Local Strategic Planning Statement City Plan 2036* (Parramatta).

The relationship of these planning instruments to the project, including landscape character and visual amenity assessment, are described in Technical Paper 1 (Design, Place and Movement).

4 LANDSCAPE CHARACTER ASSESSMENT

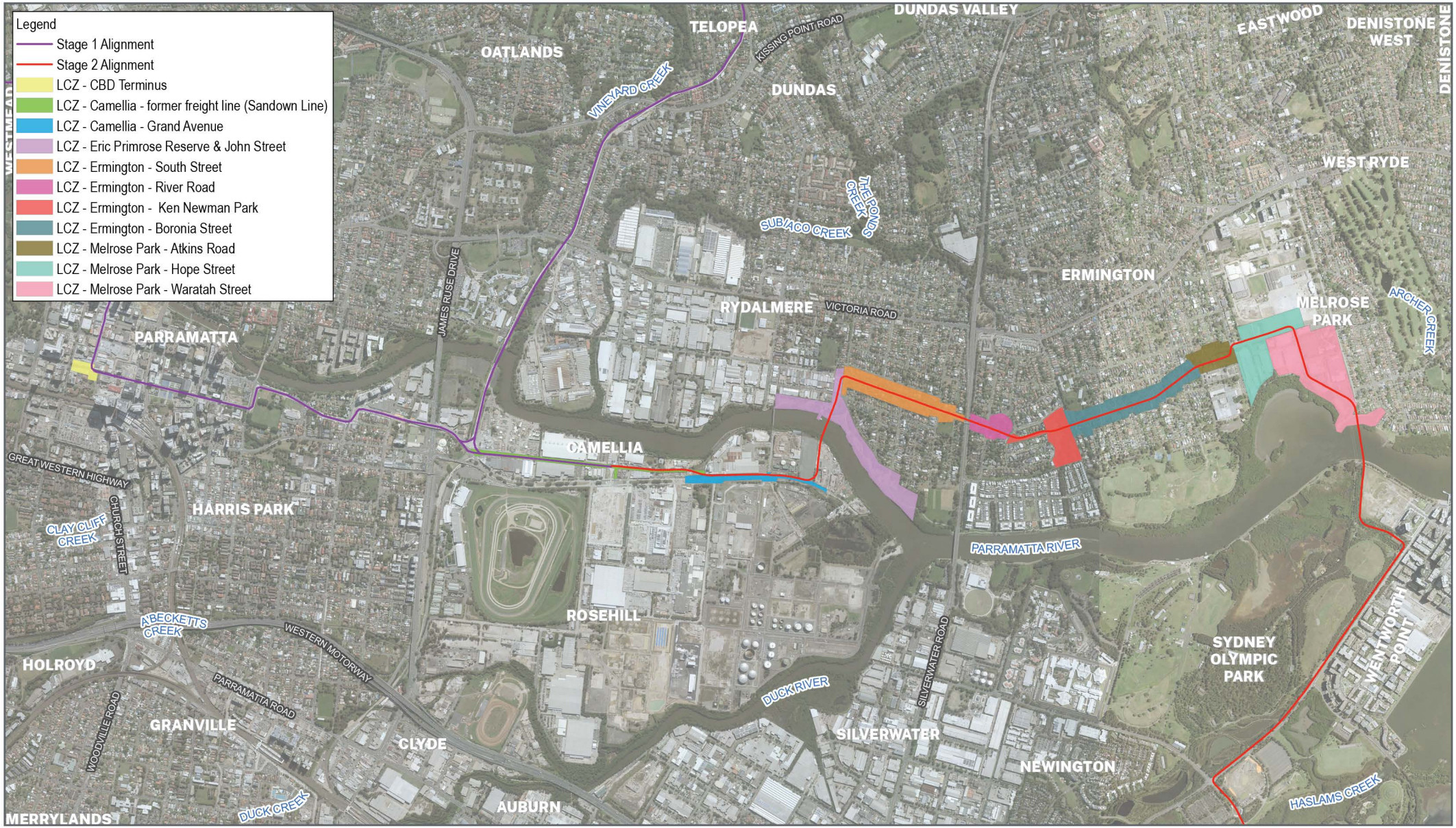
This section provides an understanding of the existing visual environment, identifying landscape character zones (LCZs) associated with the site. This section classifies the sensitivity and magnitude of change that project has on these LCZs during construction and operation. The combination of sensitivity and magnitude of change are used to identify potential landscape character impacts in each of the LCZs.

The LCZs are also used to inform the visual baseline for viewpoints in Section 7 and the resultant sensitivity for each LCZ then informs the sensitivity of viewpoints assessed in Section 7.

The culmination of the desktop evaluation, the site verification and co-ordination with the project design team resulted in the identification of the following LCZs, which are shown in Figure 4-1 and Figure 4-2:

- Parramatta CBD turnback facility
- Camellia – Former freight rail (Sandown Line)
- Camellia – Grand Avenue
- Rydalmere – Eric Primrose Reserve and John Street
- Rydalmere – South Street
- Ermington – River Road
- Ermington – Ken Newman Park
- Ermington – Boronia Street
- Melrose Park – Atkins Road
- Melrose Park – Hope Street
- Melrose Park – Waratah Street
- Wentworth Point – Interface with 14-16 Hill Road
- Wentworth Point – Hill Road (north of Bennelong Parkway)
- Wentworth Point – Hill Road (south of Bennelong Parkway)
- Sydney Olympic Park – Holker Busway
- Sydney Olympic Park – Australia Avenue
- Sydney Olympic Park – Dawn Fraser Avenue
- Carter Street – Uhrig Road

In the following sections the specific characteristics for each LCZ have been identified and the impacts to the LCZ have been evaluated and described.



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Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Landscape Character Zones - Camellia to Melrose Park

Project No. **12557728**
Revision No. **A**
Date **29/06/2022**

FIGURE 4-1

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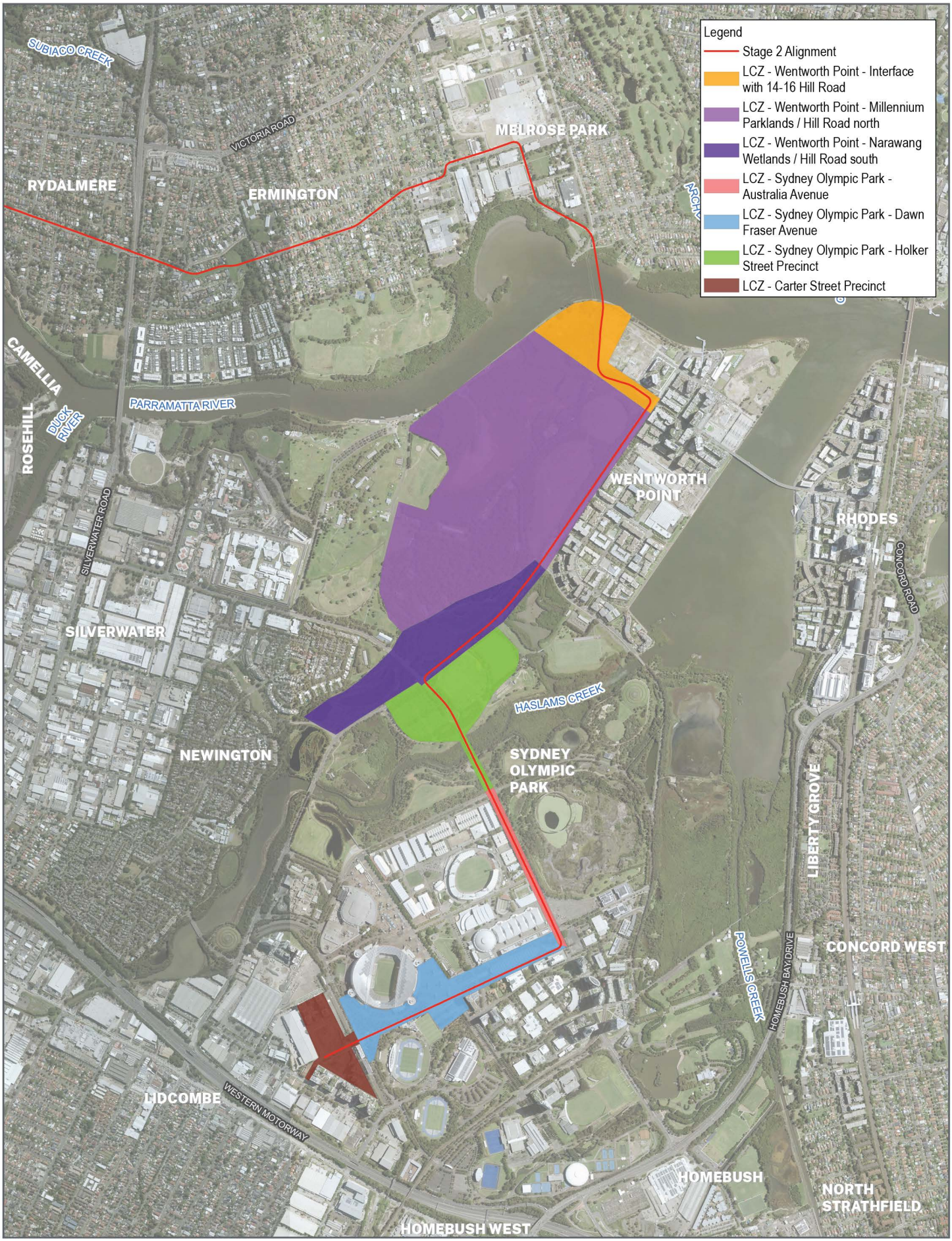
Print date: 29 Jun 2022 - 09:47

Data source: Alignment - GHD2022; Precincts - DPIE2021; Suburb - DFSI2022; Stations - TINSW2018; Road, Watercourse - NSWSS2022; Metromap Tile Service: .
Created by: dschmidt



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Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Landscape Character Zones - Wentworth Point to Carter Street

Project No. **12557728**
Revision No. **A**
Date **29/06/2022**

FIGURE 4-2

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Print date: 29 Jun 2022 - 09:46

Data source: Alignment - GHD2022, Precincts - DPIE2021, Suburb - DFSI2022, Stations - TfNSW2018; Road, Watercourse - NSWSS2022, Metromap Tile Service: extracted 29/06/2022. Created by: dschmidt

4.1 Parramatta CBD turnback facility

4.1.1 Existing landscape character description

This LCZ is the highly urbanised area on Macquarie Street east of Central Square in Parramatta's CBD (refer Figure 4-3). The defining characteristics of this LCZ are:

- commercial buildings, two storeys in height, at the intersection of Church Street, rising to taller buildings further west
- views to larger skyscrapers beyond Macquarie Street
- recently constructed streetscapes associated with Parramatta Light Rail Stage 1
- art deco finishings to two storey buildings
- the following heritage items (with further information provided in Technical Paper 5 (Statement of Heritage Impact – Built Heritage)):
  - *Shop (and potential archaeological site)* (Parramatta LEP Item No. I655) located on the northern side of Macquarie Street.
  - *Horse parapet façade and potential archaeological site* (Parramatta LEP Item No. I656) located on the northern side of Macquarie Street
  - *Bicentennial Square and adjoining buildings* (Parramatta LEP Item No. I651) located on the southern side of Macquarie Street
  - *Murrays' Building (and potential archaeological site)* (Parramatta LEP Item No. I652) located on the southern side of Macquarie Street, immediately east of Bicentennial Square
  - *Parramatta Town Hall (and potential archaeological site)* (Parramatta LEP Item No. I650) located immediately south of Murray's Building and fronts onto Bicentennial Square
  - *Centennial Memorial Clock* (Parramatta LEP Item No. I654) located on the southern side of Macquarie Street in Bicentennial Square
  - *St John's Parish Hall* (Parramatta LEP Item No. I713), *Warden's cottage (verger's cottage)* (Parramatta LEP No. I653) and *St John's Anglican Cathedral* (SHR No. 01805, Parramatta LEP Item No. I01805) are located immediately south of Bicentennial Square
  - *Telstra House (former post office) (and potential archaeological site)* (Parramatta LEP No. I657) and *HMV (former Commonwealth Bank) (and potential archaeological site)* (Parramatta LEP No. I1658) located north of the project site along Church Street
- commercial signage throughout the street level
- hard surfaces dominate the streetscape
- the area is generally flat
- limited vegetation – all located in Central Square
- vehicles parked in and around the roads
- overhead power and signage throughout.



Figure 4-3: Landscape character - Macquarie Street – Parramatta (Photo: RPS)

4.1.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is currently an urbanised area. • Some distinctive heritage elements are located within the landscape.	
Magnitude of change	Moderate magnitude of change during construction	Negligible magnitude of change during operation
	• The construction works would result in hoarding, temporary fencing and other elements in the landscape not already found in this LCZ. • The construction works would result in a moderate magnitude of change from the existing landscape character.	• The modifications would be limited to street pavement treatments, extension of lines within the roadway and end of line treatments being heavy bollards or a small wall. • Some trees would likely be removed in this area but would not impact the urban character of this environment (refer Appendix B of Technical Paper 1 (Design, Place and Movement)).
Landscape character impacts	Moderate-Low landscape character impact during construction	Negligible landscape character impact during operation
		• There would be little change in character associated with the turnback facility in Macquarie Street.

4.2 Camellia – former freight rail (Sandown Line)

4.2.1 Existing landscape character description

This LCZ is located in the industrial areas bordered by the Parramatta River in the north and Grand Avenue in the south (refer Figure 4-4). The defining characteristics of this LCZ are:

- large industrial warehouse buildings of one to two storeys on both sides of the Sandown Line
- construction works associated with Parramatta Light Rail – Stage 1
- the LCZ is generally flat
- nil vegetation in the LCZ Camellia – former freight rail (Sandown Line) easement
- large vehicles parked in and around the LCZ
- overhead power and signage prominent on the sites around the LCZ.



Figure 4-4: Typical image to Camellia - Sandown Line LCZ over construction works for Parramatta Light Rail – Stage 1 (Photo: RPS)

4.2.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is currently of an industrial nature, flat topography with no vegetation. • There is a master plan to change the land use of the area to a town centre type character. • The desired future character of the site is compatible with the project.	
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during operation
	• Construction works are limited in the to the installation of the active transport link in the former freight rail (Sandown Line). • Adjacent areas are currently industrial in nature so the changes during construction would be low.	• The project is proposed in the former freight rail (Sandown Line). • The proposed use is a character improvement from the current use. • The project would provide increased vegetation which would improve the aesthetic of this section of the project site.
Landscape character impacts	Low landscape character impact during construction	Low landscape character impact during operation
		• The project would improve landscape character through the addition of vegetation in this LCZ. • The proposed future desired character of the LCZ would be a new town centre development and the project would be in line with the future land use of the site.

4.3 Camellia – Grand Avenue

4.3.1 Existing landscape character description

This LCZ is located in the industrial areas bordered by the Parramatta River in the north and Grand Avenue in the south (refer Figure 4-5). The defining characteristics of this LCZ are:

- large industrial warehouse buildings of one to two storeys
- the area is generally flat
- hardstand (paved and concreted) areas are prominent throughout the LCZ
- car parking is prominent throughout the LCZ
- limited vegetation – mainly shrubs that provide limited screening through the area
- large fuel and storage silos evident in the surrounding environment
- large vehicles parked in and around the LCZ
- overhead power and signage throughout.



Figure 4-5: Typical streetscape image representative of the Camellia – Grand Avenue LCZ (Photo: RPS)

4.3.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is currently of an industrial nature, flat topography with little vegetation. • There are planning proposal to change the land use of the areas surrounding to town centre. • The desired future character of the site is compatible with the project proposal.	
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during operation
	• Adjacent areas are industrial in nature so the changes such as construction hoarding, increased vehicle movement and alike during construction would be low. • Construction works would occur as part of Parramatta Light Rail Stage 1 to cross Grand Avenue east of Colquhoun Street. • Construction works associated with the expansion of the stabling and maintenance facility would be at the edge of the character zone.	• The project is proposed in the existing road reserve and would also involve modifications to the stabling and maintenance facility. • The existing road reserve is under-maintained and has poor visual qualities. • The project would provide landscaped areas and new trees to increase canopy cover which would also improve the aesthetic of the area.
Landscape character impacts	Low landscape character impact during construction	Low landscape character impact during operation
		• The project would improve landscape character through the addition of vegetation along Grand Avenue. • The proposed surrounding future land use adjacent to the LCZ is proposed to be a new town centre development. • The project would be in line with the desired future character surrounding the site.

4.4 Rydalmere – Eric Primrose Reserve and John Street

4.4.1 Existing landscape character description

This LCZ is the riverfront precinct by the Parramatta River (refer Figure 4-6). The defining characteristics of this LCZ are:

- desirable views in parts to open water (Parramatta River)
- areas of mangroves along the riverfront
- established vegetation adjacent to, and at, the edge of the water
- large and established non-remnant native and exotic vegetation inclusive of large *Ficus species* specimens located at the Rydalmere Wharf car park
- turfed/grassed and open ground layer
- park infrastructure (play equipment, fencing, bollards, power, etc) are evident in the LCZ
- the open space areas are contrived in nature except for mangrove areas
- the area generally slopes to the Parramatta River
- parts of the riverfront are heritage listed on the Parramatta LEP as “Wetlands” (Parramatta LEP Item No. I1).



Figure 4-6: Typical image representative of the character found in the Eric Primrose Reserve LCZ (Photo: RPS)

4.4.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	High sensitivity	High sensitivity
	• Several planning instruments describe the Parramatta River as a valued landscape type and that this landscape type should be retained. • Additionally, the nature-like elements in this landscape, in an otherwise urban environment, are a valued character type.	
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during operation
	• Construction works would include the use of pontoons, cranes and other infrastructure. • The construction works would result in a high magnitude of change from the existing landscape character.	• The project is proposed to cross a small section of this open space area running along the northern side of Parramatta River. • The changes include the removal of significant trees (*Ficus microcarpa var.hillii*) and potential impacts to mangroves in this small section of the LCZ. • The changes to landscape in the small area the bridge would cross the open space would be in terms of the massing of the bridge, and scale of the landscape (human scale to urban scale). • The project has made changes prior to the definition design to contain the magnitude of change through positioning of the bridge piers and the type and style of the bridge structure.
Landscape character impacts	High landscape character impact during construction	High-Moderate landscape character impact during operation
		• On the basis of the value the community places on this character type, and the limiting of change to a small part of this LCZ there would be a moderate landscape character impact across the whole of the LCZ. • The impacts are experienced more in the area of the bridge crossing. • The interface with adjacent light industrial areas on John Street would be improved by the project through the use of improved urban design finishes and vegetation screening.

4.5 Rydalmere – South Street

4.5.1 Existing landscape character description

This LCZ is within the residential areas of Rydalmere (refer Figure 4-7). The defining characteristics of this LCZ are:

- residential buildings of one to two storeys
- brick construction is dominant
- tiled roofs for older housing, Colorbond roofing evident in newer housing
- South Street has some rear property fencing along its north side
- there are properties with driveway access on the north side of South Street
- established vegetation in the streetscape and on properties – both non-remnant native vegetation is exotic species are present
- overhead power infrastructure evident
- front fencing (eclectic materials), or vegetation defining the front boundary of many properties
- topography is generally undulating.



Figure 4-7: Typical image representative of the character found along South Street (Photo: RPS)

4.5.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is a residential area. • The LCZ has little distinctive or defining character which distinguishes it from other surrounding areas.	
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements not already found in this LCZ. • Construction works would result in a high magnitude of change from the existing landscape character.	• The project would include changes in the width of the South Street roadway changing the character along this east-west alignment. • The project would include improved urban design finishes and increased quality in the landscape.
Landscape character impacts	High landscape character impact during construction	Moderate-low landscape character impact during operation
	.	• The project would offset any perceived negative changes in landscape character through the addition of vegetation and improvement in urban design finishes along South Street.

4.6 Ermington – River Road

4.6.1 Existing landscape character description

This LCZ is within the residential areas of Ermington and encompasses an aera between Silverwater Road and Hilder Road (refer Figure 4-8). The defining characteristics of this LCZ are:

- residential buildings of one to two storeys and unit blocks up to four storeys
- brick construction is dominant to adjacent residential buildings
- tiled roofs to older housing, Colorbond roofing evident in newer housing
- eclectic range fencing materials and types
- established vegetation in the streetscape and on properties – the vegetation is a mix of exotic species and non-remnant native vegetation
- overhead power infrastructure dominates the open space easement
- topography is undulating through the open space easement.



Figure 4-8: Image along River Road open space easement (Photo: RPS)

4.6.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is an easement in a residential area. • The LCZ and its surrounding residential use has little distinctive or defining character which distinguishes it from other surrounding areas.	
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during operation
	• Demolition works associated with acquisition would change the character of the landscape adjacent to the alignment. • Construction works would result in hoarding, temporary fencing and other elements in the landscape not already found in this LCZ. • Construction works would result in a high magnitude of change from the existing landscape character.	• Acquisition either side of the alignment would open up the space visually. • Hilder Road would be reconfigured for limited access. • The route through the easement would result in change from an open grassed area to a light rail transport use with active transport link. • Screening and attenuation barriers, although not defined in the definition design, are likely to be required either side of the alignment for mitigation. • The inclusion of a light rail stop in this location, would provide activation to the zone.
Landscape character impacts	Moderate landscape character impact during construction	Moderate-low landscape character impact during operation
		• The project proposes to offset any perceived negative changes in landscape character through the addition of vegetation, improvement in urban design finishes and provision of connections through the easement. • Screening and attenuation barriers adjacent to the residential areas would change the open nature of the LCZ.

4.7 Ermington – Ken Newman Park

4.7.1 Existing landscape character description

Ken Newman Park is a local level park surrounded by residential housing in Ermington (refer Figure 4-9). The defining characteristics of this park are:

- large and established non-remnant native vegetation and exotic vegetation throughout the park and easements
- turfed/grassed and open ground layer at the central and western end of the parkland
- vegetated ephemeral creek/drainage gully in the eastern end of the parkland
- park infrastructure (play equipment, fencing, bollards, power, etc) are evident
- the parkland enables views south to the wider landscape
- the area at the western end of the park is an underground water utilities easement, with overhead power and this area is devoid of vegetation except grass
- the open space areas are human-made and not reflective of the endemic landscape
- the area is generally sloping south to the Parramatta River.



Figure 4-9: Ken Newman Park with view to Sydney Olympic Park (Photo: RPS)

4.7.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	High sensitivity	High sensitivity
	• The nature-like elements in this landscape in an otherwise urban environments are considered a valued character type. • The larger areas of open space in and around Ermington are located on the Parramatta River foreshores, but open space otherwise is limited away from the river front and therefore the open space could be seen as a valued landscape type.	
Magnitude of change	High magnitude of change during construction	High magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape not already found in this LCZ. • Scale of proposed construction compound would result in a change from an open environment to a closed construction site. • Construction works would result in a high magnitude of change from the existing landscape character.	• There would be substantial changes to the form, scale, character and usability proposed to the park. • Parts of the LCZ would be converted from open space to light rail transport use. • Screening and attenuation barriers, although not defined in the definition design, are likely to be required at the park edge for mitigation. • The light rail alignment in Ken Newman Park would include a bridge over the drainage gully at the eastern end of the park. The bridge would be a two-span, concrete or steel bridge about 36 metres long, consisting of two equal length spans. It would be about 15 metres wide with the active transport link on the southern side of the bridge.
Landscape character impacts	High landscape character impact during construction	High landscape character impact during operation
	.	• Based on the sensitivity of the character of the park and the proposed magnitude of changes there is considered to be high landscape character impact in this LCZ. • In conjunction with the City of Parramatta Council, Transport for NSW is developing concepts for the park to increase its usability and amenity to minimise the anticipated negative changes in character resulting from the project.

4.8 Ermington – Boronia Street

4.8.1 Existing landscape character description

This LCZ is located within the residential areas in the suburb of Ermington (refer Figure 4-10). The defining characteristics of this LCZ are:

- residential buildings of one to three storeys
- fibro or brick construction with tiled roofs is the dominant housing type
- some areas of infill residential with more modern building styles (rendered block construction and Colorbond roofs)
- established vegetation in the streetscape and on properties – vegetation is non-remnant native or exotic species
- overhead power infrastructure evident in the landscape
- front fencing (eclectic materials), and front hedging is evident throughout
- rolling topography.



Figure 4-10: Typical image representative of the character found along Boronia Street (Photo: RPS)

4.8.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is a residential area. • The LCZ has little distinctive or defining character which distinguishes it from other surrounding areas and subsequently has low sensitivity to change.	
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape not already found in this LCZ. • Construction works would result in a high magnitude of change from the existing landscape character.	• The route through the residential area would encompass changes in the width of the Boronia Street road reserve and involve the change in character along this LCZ. • The proposed lowering of the light rail alignment in the middle of the street would cut Boronia Street into two distinct parts at the western end between Spurway Street and Murdoch Street. • The project would include improved urban design finishes and increased quality in the landscape. • The inclusion of a light rail stop at Murdoch Street, would provide activation to the zone.
Landscape character impacts	Moderate landscape character impact during construction	Moderate-Low landscape character impact during operation
		• The project proposes to offset any negative changes in landscape character through the addition of vegetation and improvement in urban design finishes along Boronia Street.

4.9 Melrose Park – Atkins Road

4.9.1 Existing landscape character description

This LCZ is located in the area around Hope Street between Atkins Road and Hughes Avenue (refer Figure 4-11 and Figure 4-12). The defining characteristics of this LCZ are:

- Bulla Cream Dairy (Willowmere) at 64 Hughes Avenue is a locally listed built heritage item (Parramatta LEP Item No. I64) and is located at the eastern end of the LCZ (refer also to Technical Paper 5 (Statement of Heritage Impact – Built Heritage). It comprises:
  - the Californian 1920s bungalow style residence (Main House) of high heritage significance
  - the southern boundary garden bed with three Canary Island date palms, Oleander and Crepe Myrtle trees which are elements of high heritage significance
  - the Bulla Cream Factory building and associated infrastructure, rated as of little heritage significance
- commercial and light industrial uses, ranging in age, on the southern side of Hope Street (closer to Atkins Road)
- on the northern side of the road; residential buildings of one to two storeys with fibro or brick construction, and tiled roofs.
- front hedging distinguishes the property boundary of many of the properties on this side of the street
- established vegetation in the streetscape and on the street interface with properties – vegetation is exotic species or non-remnant native vegetation
- overhead power infrastructure evident in the landscape
- topography that is falling to the east
- on street parking.

To the south of Hope Street there is a planning proposal for Melrose Park South known as the Holdmark Sites at 112 Wharf Road, 30 & 32 Waratah Street, Melrose Park and 82 Hughes Avenue, Ermington. The planning proposal seeks to provide approximately 1,925 new dwellings and 1,000 square metres of non-residential floor space to promote job creation with an increased building height of up to 77 metres in some sections. The planning proposal for Melrose Park South is yet to be exhibited. It is reasonable to assume some level of development will eventually progress in this southern portion as well.



Figure 4-11: View west down Hope Street to Atkins Road (Photo: RPS)



Figure 4-12: View east down Hope Street to Hughes Avenue (Photo: RPS)

4.9.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Moderate sensitivity	Moderate sensitivity
	• The LCZ is mix of residential and commercial/light industrial area. • Technical Paper 5 (Statement of Heritage Impact – Built Heritage) notes that the Main House of the Bulla Cream Dairy (Willowmere) is a 1920s bungalow (to be retained) and is rated as having high local heritage significance. • Technical Paper 5 (Statement of Heritage Impact – Built Heritage) notes the Bulla Cream factory building and associated infrastructure (to be removed), are rated as of little heritage significance. • Outside of the Bulla Cream Dairy (Willowmere) heritage curtilage there is little distinctive or defining character which sets it aside from other surrounding areas. • Current planning and approvals for the area involve gentrification and replacement of industry with residential offerings with medium to high density living.	
Magnitude of change	Moderate magnitude of change during construction	Moderate magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• The project proposes to retain the 1920s bungalow Main House which is of high local significance. • However, the project would have a visual impact specific to the heritage setting through the removal of tree plantings (of high and moderate significance) and landscape features, reduction of the heritage curtilage and introduction of light rail infrastructure. • The area south of Hope Street is proposed to contain three tracks and a new light rail stop, both of which would be complimented by open space surrounding the Main House. • There would be changes to the scale and form along this section of Hope Street, removing the light industrial/commercial uses and replacing them with open space.
Landscape character impacts	Moderate landscape character impact during construction	Moderate landscape character impact during operation
		• The proposed open space around the Main House would provide a visual break in the landscape different from this LCZ type and the adjacent Ermington residential LCZ type. • The area to the south of the LCZ is proposed for gentrification as part of the Parramatta DCP and current planning proposals. • The disruption to ancillary items around the Main House would inadvertently open public views up to the building increasing the value in landscape character in this LCZ.

Timeframe	Construction	Operation
		• Retention or relocation of significant trees at the Bulla Cream Dairy (Willowmere) would be investigated during the next stages of design noting the heritage setting and amenity value they provide. • With the proposed open space, improvement in usability, urban design finishes and the increase in vegetation/canopy along Hope Street (including section of green track), the project would go some way to offsetting the change in landscape character in the LCZ. The result would be a moderate level of landscape character impact.

4.10 Melrose Park – Hope Street

4.10.1 Existing landscape character description

This LCZ is Hope Street between Hughes Avenue and Waratah Street (refer Figure 4-13). The defining characteristics of this LCZ are:

- two storey commercial buildings and warehouses
- street frontages dominated by business car parking
- some non-remnant vegetation
- major power infrastructure including towers and overhead power crossing the landscape
- local level overhead power infrastructure evident
- fencing, bins, traffic devices evident in the landscape
- slightly sloping towards the Parramatta River.

There are two planning proposal that surround Hope Street which will define the desired future character of the LCZ and surrounds:

- the planning proposal for Melrose Park South (known as the Holdmark Sites at 112 Wharf Road, 30 & 32 Waratah Street, Melrose Park and 82 Hughes Avenue, Ermington) as described in Section 4.9.1
- the Melrose Park North planning proposal (Payce Site) that seeks to increase the permissible building height (up to 90 metres) and density. The proposal would provide approximately 5,500 new dwellings and 30,000 square metres of retail and employment floorspace. Public exhibition of the northern planning proposal has been undertaken, with post exhibition outcomes being considered by City of Parramatta Council.



Figure 4-13: View west along Hope Street at intersection with Waratah Street (Photo: RPS)

4.10.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is currently commercial/industrial with areas already approved for future development. • The areas around the LCZ are evolving with residential towers to the north along Victoria Road. • There are further planning approvals in place for the replacement of industry with residential offerings with medium to high density on both sides of Hope Street.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing, and other elements in the landscape. • There are current construction works in the Melrose Park precinct that would pose a cumulative impact during construction. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• There would be changes to the scale and form of Hope Street that would improve the streetscape and urban design outcomes. • The inclusion of a light rail stop in this location, and the future intended landscape character would provide activation to the zone.
Landscape character impacts	Moderate-low landscape character impact during construction	Low landscape character impact during operation
	.	• This LCZ type is proposed for gentrification as part of the Parramatta DCP and current planning proposals. • The LCZ is already subject to changes in landscape outside of this project. • The project is complimentary to the proposed desired future character of LCZ.

4.11 Melrose Park – Waratah Street

4.11.1 Existing landscape character description

This LCZ is Waratah Street between Hope Street and Archer Park. The LCZ can be divided into two distinct areas:

- Waratah Street between Hope Street and Archer Park (refer Figure 4-14).
- area adjacent to the Parramatta River including parts of the Ermington Bay Nature Trail, Ermington Boat Ramp and Archer Park (refer Figure 4-15 which shows the starting point for the Ermington Bay Nature Trail).

The defining characteristics of the area of Waratah Street between the Hope Street and Archer Park LCZ are:

- two storey commercial and light industrial buildings/warehouses on the westerns side of Waratah Street
- the eastern side of Waratah Street is a mix of commercial and the Melrose Park Public School frontage
- some established, non-remnant vegetation line either side of Waratah Street
- the Melrose Park Public School frontage has a low fence with oval area adjacent to the Waratah Street
- local level overhead power infrastructure evident
- fencing, bins, traffic devices evident in the landscape
- slightly sloping towards the Parramatta River.

The defining characteristics of area adjacent to the Parramatta River including parts of the Ermington Bay Nature Trail, Ermington Boat Ramp and Archer Park are:

- the Parramatta Valley Cycleway connecting the two parts of Waratah Street
- the LCZ has signage, street furniture and power infrastructure which demonstrate administration of this area
- the LCZ is bordered on one side by dense vegetation associated with the Ermington Bay Nature Trail
- opposite the Ermington Bay Nature Trail is open space and car parking to the rear of current light industrial uses
- these car parking and open space areas have established non-remnant vegetation.

The planning proposal for Melrose Park South (known as the Holdmark Sites at 112 Wharf Road, 30 & 32 Waratah Street, Melrose Park and 82 Hughes Avenue, Ermington) is proposed for the commercial industrial use areas on both sides of Waratah Street. The proposal is described in Section 4.9.1.



Figure 4-14: View south along Waratah Street at intersection with Hope Street (Photo: RPS)



Figure 4-15: View north-west along Waratah Street (Photo: RPS)

4.11.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ has areas dominated by commercial/industrial areas. • The industrial areas on Waratah Street are already approved for future development. • The southern side of the LCZ is dominated by the vegetation in the adjacent parkland. • The open spaces within the LCZ have little character of value.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing, and other elements in the landscape. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• There would be changes to the scale and form along Waratah Street. • The new streetscape on Waratah Street would provide a more fluent transition between the Melrose Park Public School's outdoor spaces and the current / future land uses on the western side of Waratah Street. • The changes adjacent to Archer Park would result in a more formalised and managed landscape character in that area of the LCZ. • Archer Park is proposed to be improved in collaboration with City of Parramatta Council. • The inclusion of a light rail adjacent to Archer Park, and the future intended landscape character (based on the development proposal for this area) would provide activation to the zone.
Landscape character impacts	Moderate-Low landscape character impact during construction	Low landscape character impact during operation
	.	• Part of this LCZ is proposed for gentrification as part of the Parramatta DCP and current planning proposals. • The project is complimentary to the proposed future intended character of adjacent areas.

4.12 Wentworth Point – Interface with 14-16 Hill Road

4.12.1 Existing landscape character description

There are two sub areas within this LCZ with defining characteristics:

- Newington Nature Reserve Wetland adjacent to 14-16 Hill Road (refer Figure 4-16)
- Sanctuary Hill (refer Figure 4-17).

The Newington Nature Reserve Wetland is a precinct of the Millennium Parklands which is a heritage listed item under the State Environmental Planning Policy (Precincts – Central River City) 2021 (PCRC SEPP) (Item No. A). Information on the heritage impacts on this area of the LCZ are available in Technical Paper 5 (Statement of Heritage Impact – Built Heritage). For the areas associated with Newington Nature Reserve Wetland the following landscape characteristics are noted:

- valued natural environments
- areas of wetlands and mangroves representative of pre-colonial era vegetation at the edge of the Parramatta River
- large tracts of now-established vegetation
- views through the parklands are limited by the vegetation
- major power infrastructure including towers and overhead power crossing the landscape
- large and established exotic vegetation species and non-remnant native species limit views through the space
- park infrastructure (walking paths, fencing, bollards, etc) are evident in this area
- the lowlands of the LCZ are gently undulating.

For the area associated with Sanctuary Hill the following landscape characteristics are noted:

- Sanctuary Hill is raised above the surrounding topography
- devoid of significant canopy vegetation
- Sanctuary Hill, along with the adjacent Woo-la-ra, are iconic markers within the landscape of Sydney Olympic Park and Wentworth Point
- walking paths and other elements of open space furniture evident on Sanctuary Hill and Woo-la-ra.



Figure 4-16: Typical footpath through Newington Nature Reserve Wetland precinct of the Millennium Parklands (Photo: RPS)



Figure 4-17: View to From Sanctuary Hill over electrical easement to Wentworth Point (Photo: RPS)

4.12.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	High sensitivity	High sensitivity
	• Planning instruments describe the Sanctuary Hill as a valued landscape types and that these landscape types should be retained. • The Millennium Parklands is a heritage listed item under the PCRC SEPP (Item No. A). • The natural elements in this landscape in an otherwise urban environment would be considered a valued character type. • Sanctuary Hill is a significant landmark within the Sydney Olympic Park.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing, and other elements in the landscape. • Construction works would result in a moderate magnitude of change from the existing publicly accessible landscape character type.	• The project site overlaps the northern section of the Millennium Parklands. • This northern alignment zone would be screened from within the parklands. • The project site runs in the electrical easement adjacent to the Sanctuary development and would be an extension of the intended character found within this development.
Landscape character impacts	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation
		• 14-16 Hill Road, adjacent to the LCZ is proposed for gentrification as part current planning proposals (Sanctuary Wentworth Point). • The project is complimentary to the desired future character of adjacent development areas.

4.13 Wentworth Point – Hill Road (north of Bennelong Parkway)

4.13.1 Existing landscape character description

There are two sub areas within this LCZ with defining characteristics:

- Woo-la-ra (refer Figure 4-18)
- Hill Road (north of Bennelong Parkway) (refer Figure 4-19).

For the areas associated with Woo-la-ra the following landscape characteristics are noted:

- Woo-la-ra is raised above the surrounding topography
- devoid of significant canopy vegetation
- Woo-la-ra, along with the adjacent Sanctuary Hill, are iconic markers within the landscape of Sydney Olympic Park and Wentworth Point
- walking paths and other elements of open space furniture evident on Sanctuary Hill and Woo-la-ra.

For the areas associated with Hill Road (north of Bennelong Parkway) the following landscape characteristics are noted:

- for the western side of Hill Road established non-remnant native planting extending the look and feel of parklands into the roadside
- a dual direction asphalt pedestrian and cycle path is evident on the western side of Hill Road
- post-millennium era residential and commercial buildings to nine storeys at interface with eastern side of Hill Road
- the post-millennium era residential and commercial buildings have a mix of native and exotic plant species fronting Hill Road.



Figure 4-18: View to Sydney Olympic Park from Woo-la-ra (Photo: RPS)



Figure 4-19: View north along Hill Road at intersection with Bennelong Parkway (Photo: RPS)

4.13.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	High sensitivity	High sensitivity
	• Planning instruments describe Woo-la-ra as a valued landscape types and that these landscape types should be retained. • The natural elements in this landscape in an otherwise urban environments would be considered a valued character type. • The Woo-la-ra is a significant landmark within the Sydney Olympic Park. • Hill Road itself would be considered low sensitivity as it a streetscape with limited character values.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing, and other elements in the landscape. • A large amount of trees would be removed during the construction process. • Construction works would result in a moderate magnitude of change from the existing open landscape character type.	• This northern alignment zone would be screened from within the parklands. • Trees removed during construction would be offset locally and in surrounding areas to partially offset changes in character in this area. • The Hill Road corridor is already a highly utilised public transport and active transport corridor. The addition of light rail in this area would not be out of character.
Landscape character impacts	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation
	.	• The area to the northeast of the LCZ is proposed for gentrification as part of the Parramatta DCP and current planning proposals. • The project is complimentary to the current and desired future character of adjacent Wentworth Point areas.

4.14 Wentworth Point – Hill Road (south of Bennelong Parkway)

4.14.1 Existing landscape character description

There are two sub areas within this LCZ with defining characteristics:

- Narawang Wetland (refer Figure 4-21)
- Hill Road Reserve (south of Bennelong Parkway) (refer Figure 4-20).

For the areas associated with Narawang Wetland the following landscape characteristics are noted:

- desirable natural environments
- large tracts of now-established vegetation and wetlands
- views through the parklands are limited by the vegetation
- park infrastructure (informal walking paths, fencing, bollards, etc) are evident in this area
- this area of the LCZ is gently undulating.

For the areas associated with Hill Road Reserve (south of Bennelong Parkway) the following landscape characteristics are noted:

- four lane roadway (two lanes in each direction) with formalised kerb and channel
- divided median in the roadway with some established native, non-remanent vegetation
- lighting, signage and other street furniture
- pathways on both shoulders of the roadway
- established non-remanent native vegetation on both sides of the road corridor
- views through to open space and urban areas beyond.



Figure 4-20: View into the Narawang Wetland from Hill Road (Photo: RPS)



Figure 4-21: Typical streetscape for Hill Road past the Narawang Wetland (Photo: RPS)

4.14.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	High sensitivity	High sensitivity
	• Planning instruments describe the Narawang Wetland as a valued landscape type and that this landscape types should be retained. • The natural elements in this landscape in an otherwise urban environment would be considered a valued character type. • The Hill Road (south of Bennelong Parkway) road reserve would be considered low sensitivity as it a streetscape with limited character values.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing, and other elements in the landscape. • Construction works would result in a moderate magnitude of change from the existing open low-urbanised landscape character type.	• The project site abuts the eastern edge of the Narawang Wetland. • The Hill Road corridor is already a highly utilised public transport and active transport corridor. The addition of light rail in this area would not be out of character. • The changes would result in the removal of some vegetation adjacent to Hill Road which would be supplemented with new vegetation. • The project proposes a new light rail bridge adjacent to the existing road bridge. The new light rail bridge would widen the perceived trafficked area of Hill Road, but not in a way which would have a major impact on the landscape character. • The project would result in a change in landscape character in the Hill Road (south of Bennelong Parkway) section of the LCZ which would not be visible from large parts of the balance of the LCZ.
Landscape character impacts	High-Moderate landscape character impact during construction	Moderate landscape character impact during operation
	.	• The landscape character impacts would occur in a small corridor directly beside Hill Road and outside of the Narawang Wetland. • The landscape character impacts would be low when compared to the area and scale of the total LCZ.

4.15 Sydney Olympic Park – Holker Busway

4.15.1 Existing landscape character description

The LCZ associated with the Holker Busway (refer Figure 4-22 to Figure 4-24) has the following defining characteristics:

- car parks with a divided median road with significant planting within the road reserve
- busway (Holker Busway) and a two-lane roadway (one lane in each direction)
- pathways on both shoulders of the roadway
- established non-remanent native vegetation on both sides of the road corridor
- some lengths of the busway have concrete barriers adjacent to roadway protection pedestrian connection and galvanised steel protective railing on both sides of the road at Haslams Creek
- the roadway is elevated over the vegetated Haslams Creek.



Figure 4-22: View east down Holker Busway from intersection with Hill Road (Photo: RPS)



Figure 4-23: View west down Holker Busway to intersection with Hill Road (Photo: RPS)



Figure 4-24: View west down Holker Busway to intersection with Hill Road from adjacent Kronos Hill (Photo: RPS)

4.15.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• Planning instruments describe the soft landscape area surrounding this LCZ as a valued landscape type and that the retention of the landscape type is maximised. • The bridge/road corridor itself is not sensitive to landscape character changes.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape that would be different from the soft type landscape surrounding this LCZ. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• The project is proposed to be mainly contained within the existing road corridor with some impacts on the adjacent landscape. • The removal of vegetation from Haslams Creek would not significantly change the current character of the busway. • There is little magnitude in change to scale and mass in the LCZ.
Landscape character impacts	Moderate-Low landscape character impact during construction	Low landscape character impact during operation
	.	• Due to the combination of low the sensitivity of the road corridor to landscape change, and the low magnitude of change proposed changes in character there is assessed to be a low level of landscape character impact.

4.16 Sydney Olympic Park – Australia Avenue

4.16.1 Existing landscape character description

The LCZ is the Australia Avenue streetscape between Marjorie Jackson Parkway and Dawn Fraser Avenue (refer Figure 4-25). The LCZ has the following defining characteristics:

- four lane roadway (two lanes in each direction)
- divided roadway with concrete median and central lighting
- established vegetation line both sides of the northern parts of the roadway
- the southern end of the LCZ is devoid of canopy vegetation
- the western side of the road has a series of larger buildings associated with the Sydney Showground
- the eastern side of the road is a variety of land use types including parkland, car parks and commercial use.



Figure 4-25: Typical streetscape for Australia Avenue past Sydney Showground (Photo: RPS)

4.16.1.1 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• Planning instruments describe the soft landscape area to the east of this LCZ as a valued landscape type and that the retention of the landscape type to the east is maximised. • The road corridor itself is not sensitive to landscape character changes.	
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape that would be different from the current character of this LCZ. • Construction works would result in a low magnitude of change from the existing landscape character.	• The project is proposed to be mainly contained within the existing road corridor with some impacts on the adjacent landscape. • The project would result in the loss of existing established street trees. To offset this loss the project would propose additional tree planting and landscape works. • The character of the LCZ would remain very similar to its current state for the operational phase of the project. • There is little magnitude in change to scale and mass in the LCZ. • The project proposes improvements in terms of additional landscape.
Landscape character impacts	Low landscape character impact during construction	Low landscape character impact during operation
	.	• Due to the combination of low the sensitivity of the road corridor to landscape change, and the low magnitude of change proposed changes in character there is assessed to be a low level of landscape character impact.

4.17 Sydney Olympic Park – Dawn Fraser Avenue

4.17.1 Existing landscape character description

The LCZ is the Dawn Fraser Avenue streetscape between Australia Avenue and Edwin Flack Avenue (refer Figure 4-26 and Figure 4-27). The LCZ has the following defining characteristics:

- two lane roadway (one lane in each direction) with parallel parking both sides
- cycle lane in both directions
- trees located between parallel parking bays
- row of established *Jacaranda mimosifolia* at back of kerb in addition to trees in the roadway
- fully paved footpaths on both sides so the roadway to the property interface
- lighting, signage and other elements evident in the streetscape
- building interface both sides of the roadway between Showground Road and Australia Avenue
- west of Showground Road the interface opens up with the forecourts of Stadium Australia and the fountain associated with the Sydney Olympic logo sculpture.



Figure 4-26: Streetscape – Dawn Fraser Avenue at Olympic Park Station (Photo: RPS)



Figure 4-27: Stadium Australia forecourt to Dawn Fraser Avenue (Photo: RPS)

4.17.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Moderate sensitivity	Moderate sensitivity
	• The landscape area was established as a core component of the Sydney Olympic Park design for delivery as part of the Sydney 2000 Olympics. • The *Jacaranda mimosifolia* planted each side of the roadway are valued landscape character elements. • The landscape character of the surrounding Stadium Australia is iconic at a national scale. • This LCZ is otherwise an urbanised environment. • The road corridor itself is not highly sensitive to landscape character changes.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape that would be different from the plaza/streetscape character of this LCZ. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• The project is proposed to be contained within the existing road corridor with minimal impacts on the adjacent hardscape areas. • The project proposes retention of the *Jacaranda mimosifolia* planted each side of the roadway except at the proposed light rail stop at Jacaranda Square. • The *Pyrus ussuriensis* located in the streetscape would be removed. • The project proposes the pedestrianisation of the roadway between Australia Avenue and Olympic Boulevard. This pedestrianisation would provide a positive urban design outcome. • There is a commitment in the project to utilise wire-free track in this location. • There is low magnitude in change to scale and mass in the corridor in this already urbanised corridor.
Landscape character impacts	Moderate landscape character impact during construction	Moderate-Low landscape character impact during operation
	.	• Based on the sensitivity of the road corridor to landscape change, the magnitude of change proposed (the project site is mainly contained within the current road corridor), and the offset created (by pedestrianisation of the avenue at the eastern end of the LCZ and the wire free track), there is assessed to be a Moderate-Low level of landscape character impact.

4.18 Carter Street precinct – Uhrig Road

4.18.1 Existing landscape character description

This LCZ encompasses the Uhrig Road corridor between Edwin Flack Avenue and Carter Street in Lidcombe (refer Figure 4-28). The defining characteristics of this LCZ are:

- two lane roadway with one lane in each direction
- unmarked parking on either side of the road surface
- construction fencing lines both sides of the roadway
- temporary building behind the fencing
- some vegetation is evident in the landscape but otherwise the area is currently open.

The Carter Street Precinct Master Plan was finalised on 18 December 2020 and allows the transition of the area from industrial to high density residential and mixed-use planning outcomes. Building heights are proposed up to 115 metres.



Figure 4-28: Current streetscape of Uhrig Road (Photo: RPS)

4.18.2 Assessment of potential landscape character impacts

Timeframe	Construction	Operation
Sensitivity	Low sensitivity	Low sensitivity
	• The LCZ is currently surrounded by construction. • The proposed landscape character for the area following current construction is a highly urbanised precinct with high density residential and mixed use outcomes.	
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during operation
	• Construction works would result in hoarding, temporary fencing and other elements in the landscape. There are current construction works in the precinct that would pose a cumulative impact during construction. • Construction works may result in cumulative impacts if adjacent construction is concurrent. • Construction works would result in a moderate magnitude of change from the existing landscape character.	• There is a commitment in the project to utilise wire-free track in this location. • Uhrig Road would change from a traffic only street to a street with a centrally located light rail stop as a result of the project.
Landscape character impacts	Moderate-Low landscape character impact during construction	Low landscape character impact during operation
	.	• This LCZ type is proposed for gentrification as part of the Carter Street Masterplan and current planning proposals. • The area is already subject to changes in landscape outside of this project. • The proposed changes are complimentary to the proposed changes in use.

4.19 Summary of potential landscape character impacts

Positive landscape character outcomes across the project include:

- improved urban outcomes for the former freight rail (Sandown Line) in Camellia
- improved interface between residential areas at John Street and adjacent light industrial areas in Rydalmere
- the proposed addition of an active transport link to Ken Newman Park, Ermington and the upgrade of the active transport link through Archer Park in Melrose Park
- the pedestrianisation of Dawn Fraser Avenue adjacent Olympic Park Station.

Table 4-1 provides a summary of the assessment for potential landscape character impacts across all 18 LCZs.

Table 4-1: Summary of potential landscape character impacts

LCZ	Sensitivity (apply to both operation and construction)	Magnitude of change during Construction	Landscape character impacts during construction	Magnitude of change during operation	Landscape character impacts during operation
Parramatta CBD turnback facility	Low sensitivity	Moderate magnitude	Moderate-Low landscape character impact	Negligible magnitude	Negligible landscape character impact
Camellia -– former freight rail (Sandown Line)	Low sensitivity	Low magnitude	Low landscape character impact	Low magnitude	Low landscape character impact
Camellia -– Grand Avenue	Low sensitivity	Low magnitude	Low landscape character impact	Low magnitude	Low landscape character impact
Rydalmere – Eric Primrose Reserve and John Street	High sensitivity	High magnitude	High landscape character impact	Moderate magnitude	High-Moderate landscape character impact
Rydalmere – South Street	Low sensitivity	High magnitude	Moderate landscape character impact	Moderate magnitude	Moderate-Low landscape character impact
Ermington -– River Road	Low sensitivity	High magnitude	Moderate landscape character impact	Moderate magnitude	Moderate-Low landscape character impact
Ermington -– Ken Newman Park	High sensitivity	High magnitude	High landscape character impact	High magnitude	High landscape character impact
Ermington – Boronia Street	Low sensitivity	High magnitude	Moderate landscape character impact	Moderate magnitude	Moderate-Low landscape character impact
Melrose Park -– Atkins Road	Moderate sensitivity	Moderate magnitude	Moderate landscape character impact	Moderate magnitude	Moderate landscape character impact
Melrose Park -– Hope Street	Low sensitivity	Moderate magnitude	Moderate-Low landscape character impact	Low magnitude	Low landscape character impact
Melrose Park -– Waratah Street	Low sensitivity	Moderate magnitude	Moderate-Low landscape character impact	Low magnitude	Low landscape character impact
Wentworth Point -– Interface with 14-16 Hill Road	High sensitivity	Moderate magnitude	High-Moderate landscape character impact	Low magnitude	Moderate landscape character impact
Wentworth Point – Hill Road (north of Bennelong Parkway)	High sensitivity	Moderate magnitude	High-Moderate landscape character impact	Low magnitude	Moderate landscape character impact

LCZ	Sensitivity (apply to both operation and construction)	Magnitude of change during Construction	Landscape character impacts during construction	Magnitude of change during operation	Landscape character impacts during operation
Wentworth Point -– Hill Road (south of Bennelong Parkway)	High sensitivity	Moderate magnitude	High-Moderate landscape character impact	Low magnitude	Moderate landscape character impact
Sydney Olympic Park -– Holker Busway	Low sensitivity	Moderate magnitude	Moderate-Low landscape character impact	Low magnitude	Low landscape character impact
Sydney Olympic Park – Australia Avenue	Low sensitivity	Low magnitude	Low landscape character impact	Low magnitude	Low landscape character impact
Sydney Olympic Park – Dawn Fraser Avenue	Moderate sensitivity	Moderate magnitude	Moderate landscape character impact	Low magnitude	Moderate-Low landscape character impact
Carter Street – Uhrig Road	Low sensitivity	Moderate magnitude	Moderate-Low landscape character impact	Low magnitude	Low landscape character impact

In summary, the project would result in negligible, low, or moderate-low impacts to those landscape character zones identified with the exception of those LCZs noted in Table 4-2 (during construction) and Table 4-3 (during operation) which would experience greater than moderate impacts.

The key drivers for the landscape character impacts for LCZs across the project during construction include:

- construction works being a juxtaposition to existing landscape character type
- construction works at proximity to residents
- construction works at proximity to residents in areas of highly valued landscape type (open space) or heritage listed sites/conservation areas
- construction works at proximity to areas of highly valued landscape type (e.g. open space or iconic sporting facilities).

The key drivers for the landscape character impacts for LCZs across the project during operation include:

- change of scale in the landscape in areas of highly valued landscape type (open space)
- change of land use type in or adjacent to areas of highly valued landscape type (open space)
- change of land use type in areas of moderately valued landscape type (heritage place).

Table 4-2: Greater than moderate landscape character zone impacts during construction

Name	Landscape character impact during construction
Rydalmere – Eric Primrose Reserve and John Street	High landscape character impact during construction
Rydalmere – South Street	Moderate landscape character impact during construction
Ermington – River Road	High landscape character impact during construction
Ermington – Ken Newman Park	High landscape character impact during construction
Ermington – Boronia Street	Moderate landscape character impact during construction
Melrose Park - Atkins Road	Moderate landscape character impact during construction
Wentworth Point – Interface with 14-16 Hill Road	High-Moderate landscape character impact during construction
Wentworth Point – Hill Road (north of Bennelong Parkway)	High-Moderate landscape character impact during construction
Wentworth Point – Hill Road (south of Bennelong Parkway)	High-Moderate landscape character impact during construction
Sydney Olympic Park – Dawn Fraser Avenue	Moderate landscape character impact during construction

Table 4-3: Greater than moderate landscape character zone impacts during operation

Name	Landscape character impact during operation
Rydalmere – Eric Primrose Reserve and John Street	High-Moderate landscape character impact during operation
Ermington - Ken Newman Park	High landscape character impact during operation
Melrose Park - Atkins Road	Moderate landscape character impact during operation
Wentworth Point – Interface with 14-16 Hill Road	Moderate landscape character impact during operation
Wentworth Point – Hill Road (north of Bennelong Parkway)	Moderate landscape character impact during operation
Wentworth Point - Hill Road (south of Bennelong Parkway)	Moderate landscape character impact during operation

5 TREE REMOVAL

Trees within the project site would need to be removed to enable the project to be constructed and operated safely. It is estimated, based on the current stage of the design, that up to about 4,000 trees may need to be removed. For more detailed information on tree removal impacts refer to the Arboricultural Report (see Appendix B of Technical Paper 1 (Design, Place and Movement)).

About 70 per cent of the trees likely to be removed would be removed from within Sydney Olympic Park. The majority are street trees located along Hill Road, Holker Busway, Australia Avenue, Murray Rose Avenue and Dawn Fraser Avenue, many of which are also noted as 'significant trees' in the 2030 Sydney Olympic Park Masterplan.

Table 5-1 outlines key locations where trees would need to be removed within Sydney Olympic Park. These three locations make up about 45 per cent of the total estimated impacts on trees.

Table 5-1: Key locations where trees are to be removed in Sydney Olympic Park

Location	Infrastructure proposed in affected area/reason for impacts	Indicative percentage of total trees	Types of vegetation and dominant species
Electricity transmission line easement/Millennium Parklands, west of Wattlebird Road and Hill Road	Construction of the light rail tracks and active transport link between the southern end of the proposed bridge and the section of alignment along Hill Road would require clearing of vegetation (including trees).	20	Planted vegetation, consisting mainly of *Acacia* species*, Pittosporum undulatum, Bursaria spinosa and Kunzea ambigua*
Along Hill Road north of Holker Street/Holker Busway, adjacent to Millennium Parklands	To minimise impacts on Hill Road (a critical access road for the suburb of Wentworth Point) the project alignment encroaches on the eastern edge of the Millennium Parklands. Construction of the light rail tracks, stops (Footbridge Boulevard and Hill Road) and works to the Hill Road bridge would require clearing of vegetation (including trees).	15	Planted vegetation, consisting of *Eucalyptus* species, *Casuarina* species, *Melaleuca* species
Sydney Olympic Park (Kevin Coombes Road, Australia Avenue, Murray Rose Avenue, Dawn Fraser Avenue and intersecting roads)	Construction of the light rail tracks, stops (Grand Parade, Jacaranda Square and Olympic Boulevard), active transport links and associated road works would require clearing of planted vegetation/removal of street trees.	10	*Eucalyptus* species, *Corymbia species, Pyrus ussurensis*

The Arboricultural Report (Appendix B of Technical Paper 1 (Design, Place and Movement)) identifies specific trees, and tree groups, which contribute to the amenity and character of the local area and/or screen views from sensitive receivers. A number of these amenity and character trees are likely to be removed which would have the potential to affect visual amenity.

Amenity and character trees of note likely to be removed (and which have been considered in the assessment of viewpoints in Section 7) include:

- In Rydalmere:
  - fig trees *(Ficus rubiginosa* and *Ficus microcarpa var.hillii x)* near Rydalmere Wharf
  - trees on or adjacent to South Street

- In Ermington:
  - Sydney Red Gum (*Angophora costata)* adjacent to Ken Newman Park
  - Norfolk Island Pines (*Araucaria heterophylla*) located in Spofforth Street
  - trees along or adjacent to Boronia Street
  - trees around the locally heritage listed Bulla Cream Dairy (Willowmere) at 64 Hughes Avenue
- In Melrose Park:
  - trees along Hope Street
- In Sydney Olympic Park:
  - trees adjacent to the Louise Sauvage Pathway/within Millennium Parklands
  - trees in and around the Holker Busway and associated car parks
  - Lemon-scented gum (*Corymbia citriodora)* on Australia Avenue
  - *Pyrus ussuriensis* species on Dawn Fraser Avenue
  - *Eucalyptus* and *Corymbia* species adjacent to Stadium Australia on Dawn Fraser Avenue.

The project would continue to be refined to avoid or minimise impacts on trees within the project site, and feasible options to reduce impacts on trees would be considered in design development and construction planning. This would include investigating retention of trees with high amenity value, where possible.

The approach to managing impacts on trees is described in Section 8.1 and would include preparation of a Tree Offset Strategy in consultation with key stakeholders, to identify how a net increase in tree canopy would be achieved.

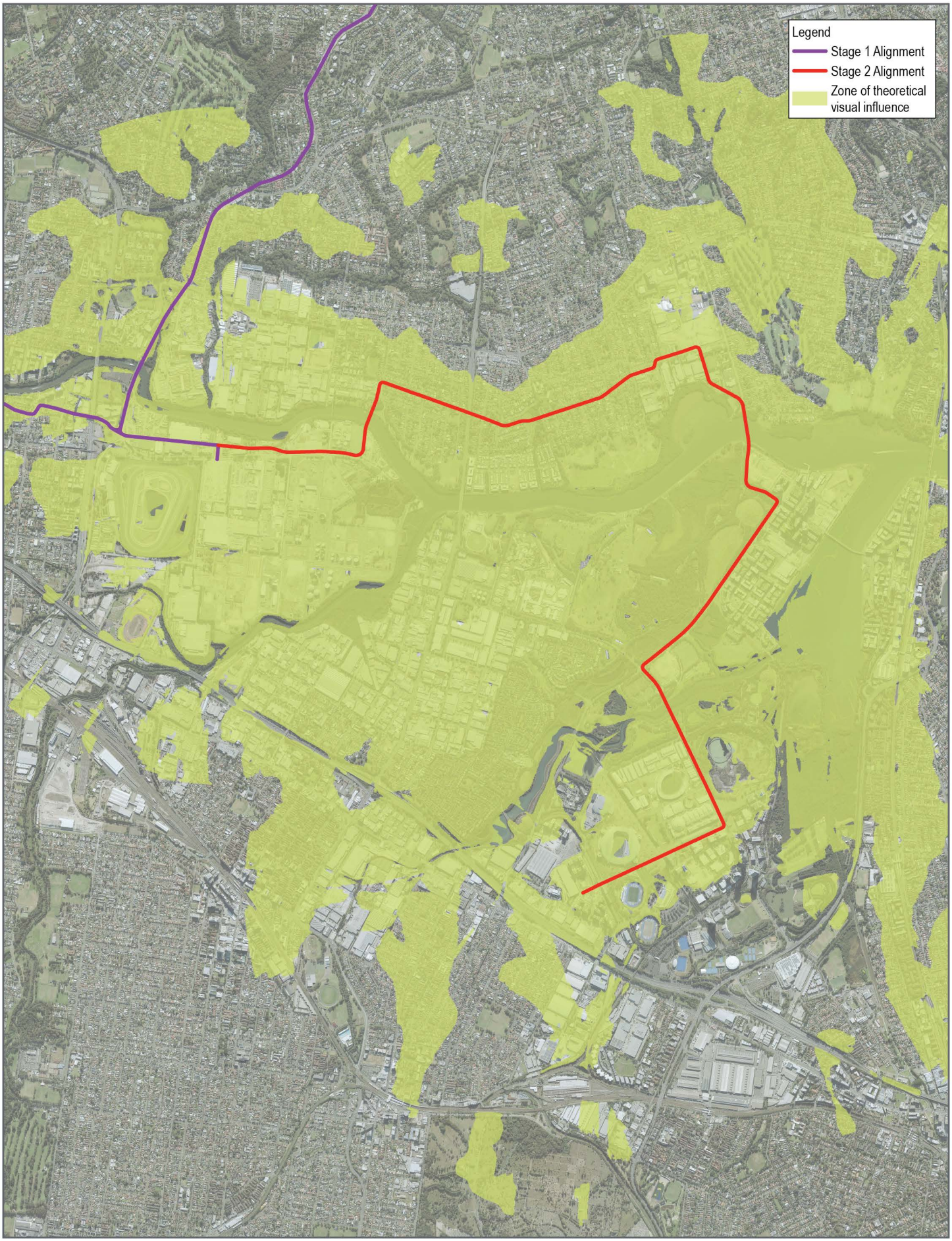
6 VISUAL ENVELOPE MAPPING

In order to determine potential viewing locations, and therefore those areas which might be visually impacted by the project, the zone of theoretical visual influence (ZTI) of the project is mapped using a series of software tools.

Vegetation, buildings and other barriers in the landscape are not included in this digital elevation model (DEM) data and subsequently the zone of theoretical visual influence (ZTI) was ground truthed onsite to confirm the information output by the desktop study.

The ZTI was used as one of the desktop tools to determine potential location for viewpoints to undertake visual impact assessment. Because of the limitations of the DEM, the ZTI was reviewed as part of the site verification process.

Figure 6-1 shows the generated ZTI and potential viewing locations of the project in the absence of vegetation, buildings, and other barriers in the landscape.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

MAKING COMPLEX EASY

Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Zone of theoretical visual influence

Project No. **12557728**
Revision No. **A**
Date **22/08/2022**

FIGURE 6-1

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Print date: 22 Aug 2022 - 12:56

Data source: Alignment - GHD2022; Precincts - DPIE2021; Suburb - DFSI2022; Stations - TfNSW2018; Road, Watercourse - NSWSS2022; Metromap Tile Service: extracted 22/08/2022. Created by: lmanasan

7 VISUAL IMPACT ASSESSMENT

The project would result in temporary visual impacts during construction due to visible elements such as work areas, machinery and equipment, hoarding and fencing, soil stockpiles, waste materials and partially constructed structures.

During operation, visual impacts would occur as a result of the presence of project infrastructure, removal of vegetation and changes to existing roadways.

A visual impact assessment was undertaken to determine the visual impacts associated with the presence of construction activities and infrastructure and the presence of project infrastructure during operation. The assessment is provided in this chapter.

A total of 36 viewpoints were identified in the desktop evaluation as having the potential for visual impacts and are shown in Figure 7-1. The extent to which the project would be visible from the identified viewpoints would vary depending on existing topography, vegetation, buildings and land uses, as well as the form of the project when viewed from each viewpoint.

The assessment described in sections 7.1 to 7.36 provides a classification of sensitivity and magnitude of change from each of the identified viewpoints due to:

- construction activities and infrastructure
- key project infrastructure, including tracks, bridges, overhead wires, stops including platforms, shelters, and active transport links, and ancillary light rail infrastructure such as traffic signals, light rail signals, buffer stops, screens and fencing.

The magnitude of change from each viewpoint has been assessed for:

- construction phase (day and night times)
- operational phase – day time
- operation phase – night time.

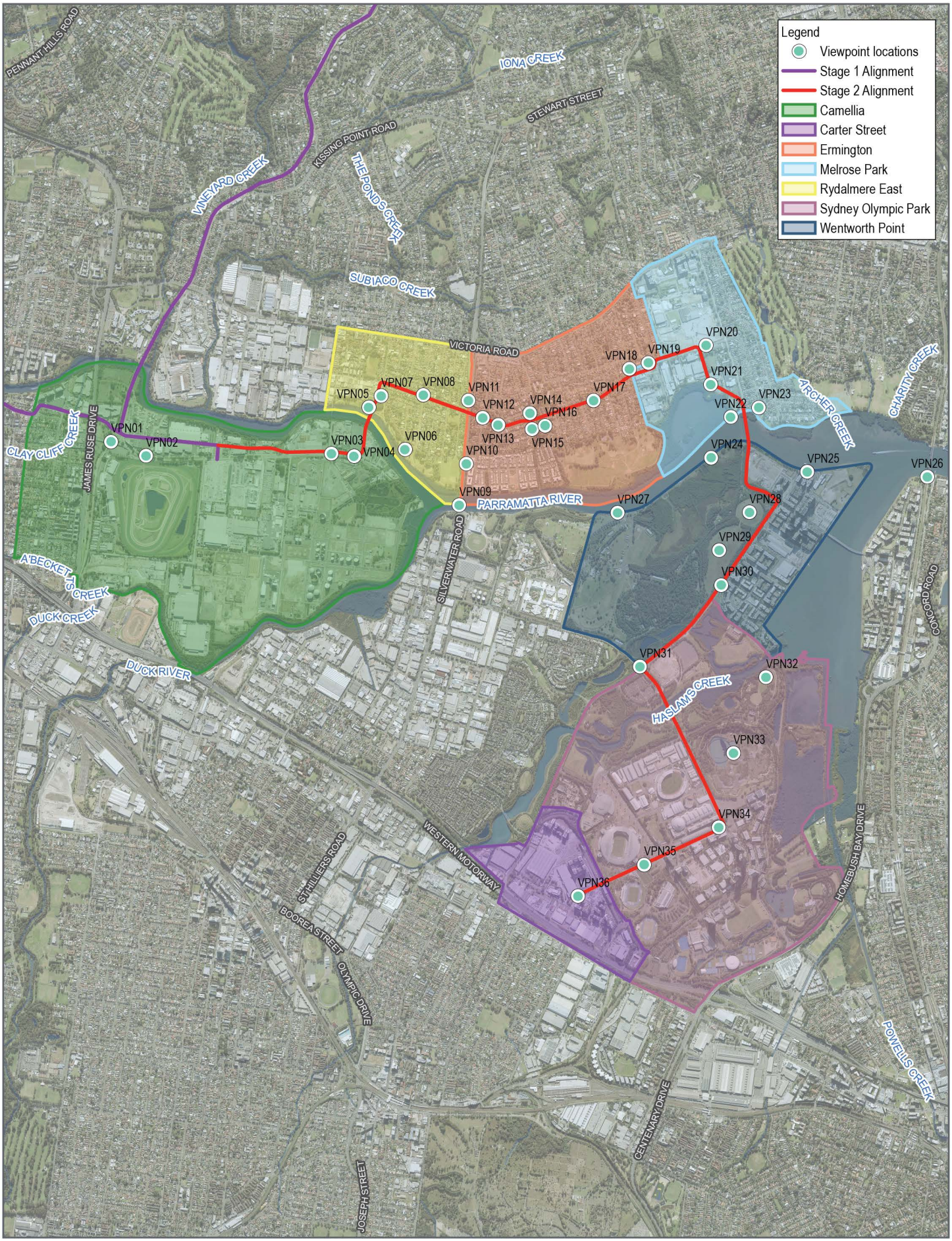
Sensitivity is the value individuals perceive in the landscape and as such is independent of timing and phase.

The combination of sensitivity and magnitude of change has been used to identify potential visual impacts at each of the viewpoints as per the rating matrix shown in Table 2-3.

In addition to the impacts from the identified viewpoints noted above, the visual impacts from the following project elements have also been assessed, as described in Section 7.37:

- traction power substations
- radio communications.

These project elements were not considered as part of the viewpoint assessment as there is greater potential for the location and quantum of this infrastructure to change subject to further design development. However, the assessment provided in Section 7.37 identifies the viewpoints from which traction power substations may be viewed, based on the locations proposed currently.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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MAKING COMPLEX EASY

Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Project No. **12557728**
Revision No. **A**
Date **22/08/2022**

Identified viewpoint locations

FIGURE 7-1

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Data source: Alignment - GHD2022; Precincts - DPIE2021; Suburb - DFSI2022; Stations - TfNSW2018; Road, Watercourse - NSWSS2022, Metromap Tile Service: extracted 22/08/2022. Created by: lmanasan

7.1 Viewpoint 1: Grand Avenue Overpass, Camellia

7.1.1 Viewpoint 1 – description

Viewpoint description	
Precinct:	Camellia
Heading (approximate):	East
Direction:	View down existing railway corridor east to proposed alignment.
Latitude and Longitude:	33° 49' 10.71" S, 151° 01' 24.69" E
LCZ(s) associated with viewpoint:	Camellia – former freight rail (Sandown Line)
Existing viewpoint description – refer Figure 7-2:	• Current construction for Parramatta Light Rail Stage 1 is evident and dominates the view lineally in the view to the midground. • Power and other infrastructure evident throughout the view. • Views over highly industrialized areas. • Established vegetation is evident across the horizon.
Viewpoint impacts (day time including construction impacts):	• New Sandown Boulevard stop would be evident in the right of the mid view. • New walking and cycling paths with vegetation shade in parts would be evident running lineally beside the light rail stop. • Overhead power and lighting infrastructure associated with the project would evident lineally down the view. • During construction, heavy vehicles, safety fencing and alike would be evident in the view.
Viewpoint impacts (night time including construction impacts):	• New lighting would be evident lineally down the view. • The lighting of the new light rail stop would be evident in the foreground.



Figure 7-2: Viewpoint 1 – Grand Avenue Overpass, Camellia (Photo: RPS)

7.1.2 Viewpoint 1 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The view is from road corridor with mobile receivers. • Construction works associated with Parramatta Light Rail Stage 1 already evident in the landscape. • The view is otherwise an industrialised setting consistent with the current LEP. • The Draft Camellia-Rosehill Place Strategy proposes to change the character in parts of this view to a highly urbanised town centre and residential area. • Vegetation is noted throughout; the plantings are exotic/introduced species. • Those natural elements in the view are contrived. • Based on the industrialised type character, and the disturbed/contrived nature of the view, the view has low sensitivity to change.		
Magnitude of change	Negligible magnitude of change during construction	Negligible magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the Sandown Boulevard light rail stop would be evident in the view. • Construction in view would be concentrated into a different location to that shown in the current viewpoint.	• The new Sandown Boulevard light rail stop would provide high level urban design finishes. • The active transport landscaping would introduce vegetation to this otherwise industrialised view and provide net improvement in terms of change. • The viewpoint would not be materially impacted by shade or shadowing from any elements in the project.	• Lighting levels would remain consistent with the construction and industrial levels of lighting within this view.
Potential visual impact rating	Negligible visual impact during construction	Negligible visual impact during day time operation	Negligible visual impact during night time operation

The visual impact during operation, if it were to be assessed on the basis of future development in the area (referencing the Draft Camellia-Rosehill Place Strategy), would have a negligible magnitude of change and a negligible visual impact at both day and night time.

7.2 Viewpoint 2: Grand Avenue, Camellia

7.2.1 Viewpoint 2 – description

Viewpoint description	
Precinct:	Camellia
Heading (approximate):	North
Direction:	View from Grand Avenue through to proposed alignment (representative of views from Rosehill Gardens Racecourse)
Latitude and Longitude:	33° 49' 14.25" S, 151° 01' 34.61" E
LCZ(s) associated with viewpoint:	Camellia – Grand Avenue
Existing viewpoint description – refer Figure 7-3:	• Foreground is roadway and parked cars. • Power and other infrastructure evident throughout the view. • Cars parked and passing traffic are evident in the mid view. • Two storey building terminate the view at the horizon. • Advertising materials are evident throughout.
Viewpoint impacts (day time including construction impacts):	• The project cannot be seen from this viewpoint and is unlikely to be seen from most publicly accessible parts of the Rosehill Gardens Racecourse. • Limited glimpses of the alignment would be available along the Grand Avenue corridor.
Viewpoint impacts (night time including construction impacts):	• The project would not be seen from this viewpoint and is unlikely to be seen from most publicly accessible parts of the Rosehill Gardens Racecourse.

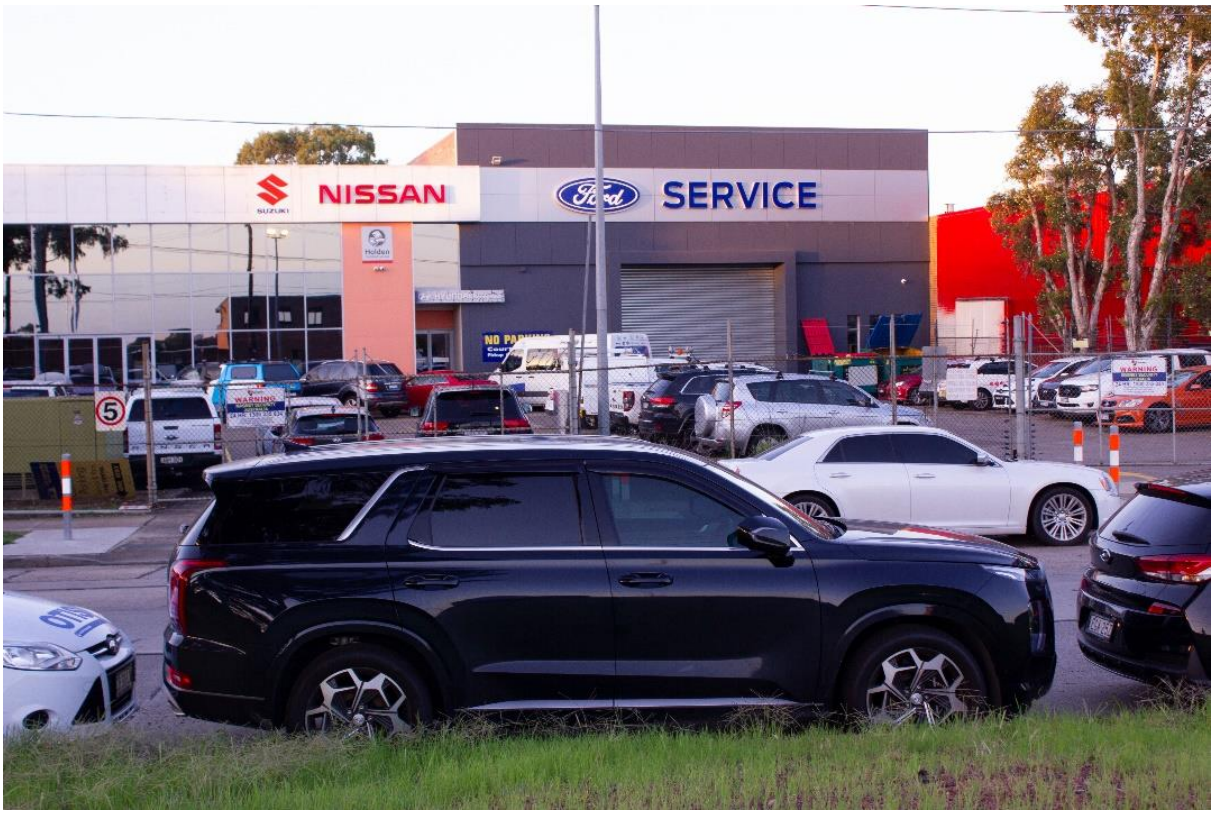


Figure 7-3: Viewpoint 2 – Grand Avenue, Camellia (Photo: RPS)

7.2.2 Viewpoint 2 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is representative of the views from Rosehill Garden Racecourse. • The racecourse has already blocked views onto this area using a range of devices. • The view is otherwise already highly commercial in nature. • Vegetation is noted throughout; the plantings are exotic/introduced species. • Those natural elements in the view are heavily influenced human inhabitation.		
Magnitude of change	Negligible magnitude of change during construction	Negligible magnitude of change during day time operation	Negligible magnitude of change during day time operation
	• The project construction for the most part would not be seen from this viewpoint and is unlikely to be seen from most publicly accessible parts of the Rosehill Gardens Racecourse. • Limited glimpses of the construction works would be available along the Grand Avenue road corridor.	• The project for the most part would not be seen from this viewpoint and is unlikely to be seen from most public accessible parts of the Rosehill Gardens Racecourse. • Limited glimpses of the alignment would be available along the Grand Avenue corridor. • The viewpoint would not be impacted by shade or shadowing from the project.	• The project for the most part would not be seen from this viewpoint and is unlikely to be seen from most publicly accessible parts of the Rosehill Gardens Racecourse. • Limited glimpses of the alignment would be available along the Grand Avenue corridor.
Potential visual impact rating	Negligible visual impact during construction	Negligible visual impact during day time operation	Negligible visual impact during night time operation

The visual impact during operation, if it were to be assessed on the basis of future development in the area (referencing the Draft Camellia-Rosehill Place Strategy), would have a negligible magnitude of change and a negligible visual impact at both day and night time.

7.3 Viewpoint 3: Grand Avenue at Thackeray Street

7.3.1 Viewpoint 3 – description

Viewpoint description	
Precinct:	Camellia
Heading (approximate):	West
Direction:	View west along Grand Avenue
Latitude and Longitude:	33° 49' 14.56" S151° 02' 26.81" E
LCZ(s) associated with viewpoint:	Camellia – Grand Avenue
Existing viewpoint description – refer Figure 7-4:	• Foreground is dominated by Grand Avenue roadway. • Power and other infrastructure evident throughout the view. • Established vegetation is evident either side of Grand Avenue (on private land). • Silos and storage evident in the left of the view. • Security fencing evident throughout.
Viewpoint impacts (day time including construction impacts):	• The new alignment of the light rail would be evident on the northern side of Grand Avenue. • The roadway would be realigned and formalised to two lanes in both directions. • New centre median would be evident, that is planted towards the horizon of this viewpoint. • The walking and cycling paths would be evident between the new light rail and new roadway. • Planting would be removed from the southern side of the street with new planting proposed for the northern side of the street between the walking and cycling paths and the light rail alignment.
Viewpoint impacts (night time including construction impacts):	• The road alignment would experience an increase of lighting above its current levels.



Figure 7-4: Viewpoint 3 – Grand Avenue at Thackeray Street, Camellia (Photo: RPS)

7.3.2 Viewpoint 3 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The view is from road corridor with mobile receivers. • The view is industrialised setting consistent with the current LEP. • The Draft Camellia-Rosehill Place Strategy proposes to change the character in parts of this view to a highly urbanised town centre and residential area. • Vegetation is noted throughout; the plantings are exotic/introduced species. • Those natural elements in the view are contrived. • Based on the industrialised type character, and the disturbed/contrived nature of the view, the view has low sensitivity to change.		
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• The magnitude of change during construction would be low given the industrial nature of the current land use.	• The project would improve the visual amenity of the road corridor. • The project would improve finishes throughout the view. • Planting would be introduced to the centre median to offset loss in other vegetation. • The project would provide a strong consistent vegetation strategy. • The viewpoint would not be materially impacted by shade or shadowing from any elements in the project.	• The alignment in this location would see increase in lighting to match adjacent current land uses. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.4 Viewpoint 4: 14 Grand Avenue, Camellia

7.4.1 Viewpoint 4 – description

Viewpoint description	
Precinct:	Camellia
Heading (approximate):	West
Direction:	View down Grand Avenue
Latitude and Longitude:	33° 49' 15.33" S, 151° 02' 34.35" E
LCZ(s) associated with viewpoint:	Camellia – Grand Avenue
Existing viewpoint description – refer Figure 7-5:	• Foreground is dominated by Grand Avenue roadway and power infrastructure. • Established vegetation is evident in the within adjacent lots. • Silos and storage evident in the left of the view. • Security fencing evident throughout.
Viewpoint impacts (day time including construction impacts):	• The new alignment of the light rail would be evident as it ramps up to the bridge between Camellia and Rydalmere. • The new bridge would be evident as it crosses the Parramatta River. • New property access would be evident in the view in front of the track alignment. • Vegetation introduced as part of the project would be evident at the front of the view and along the property access. • Moderate impact during construction would be evident due to the scale of project construction in this area (being the construction of the new bridge).
Viewpoint impacts (night time including construction impacts):	• The project alignment would experience an increase of lighting above its current levels at this location.



Figure 7-5: Viewpoint 4 – 14 Grand Avenue, Camellia (Photo: RPS)

7.4.2 Viewpoint 4 - assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The view is from industrial area with few static and mobile receivers. • The view is of an industrialised setting consistent with the current LEP. • Vegetation is noted throughout; the plantings are exotic/introduced species. • Based on the industrialised type character, and the disturbed/contrived nature of the view, the view has low sensitivity to change.		
Magnitude of change	Low magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• The magnitude of change during construction would be low given the current land use and its industrial nature.	• The project would improve the visual amenity of the roadway corridor. • The project would improve finishes throughout the view. • Planting would be introduced to the corridor to the creek in an area which is currently hardstand. • The project provides a strong consistent vegetation strategy. • The viewpoint would not be impacted by shade or shadowing from the project.	• The alignment in this location would see increase in lighting to match adjacent current land uses. • Note that the increase in lighting would provide benefits to safety of road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Low visual impact during construction	Moderate-Low visual impact during day time operation	Moderate-Low visual impact during night time operation

7.5 Viewpoint 5: Rydalmere Wharf

7.5.1 Viewpoint 5 – description

Viewpoint description	
Precinct:	Rydalmere
Heading (approximate):	East
Direction:	View looking east along Parramatta River
Latitude and Longitude:	33° 49' 03.66" S, 151° 02' 38.81" E
LCZ(s) associated with viewpoint:	Rydalmere – Eric Primrose Reserve and John Street
Existing viewpoint description – refer Figure 7-6:	• Foreground is the waterway of the Parramatta River. • The view is lined by native vegetation. • Buoys mark the Parramatta River. • Glimpses to adjacent Eric Primrose Reserve to the left of the view. • Larger buildings are evident on the horizon of the view.
Viewpoint impacts (day time including construction impacts):	A photomontage of the bridge between Camellia and Rydalmere has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-7. • The new bridge between Camellia and Rydalmere would cross through the centre of the view above the horizon line. • Power infrastructure associated with the light rail network (if utilised on the bridge) would be evident above the bridge. • Visual impacts associated with the loss of canopy trees may be experienced in this view. • Shadowing impacts would be experienced by customers at Rydalmere Wharf in the morning hours due to the new bridge structure between Camellia and Rydalmere. • Shadowing may impact vegetation along the riverfront. Further information regarding shadowing impacts on biodiversity is provided in Technical Paper 9 (Biodiversity Development Assessment Report).
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new bridge between Camellia to Rydalmere (related to navigational requirements of the river ferries). • Night time works would be necessary to build the new bridge between Camellia and Rydalmere over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction.



Figure 7-6: Viewpoint 5 – Rydalmere Wharf, Rydalmere (Photo: RPS)



Figure 7-7: Viewpoint 5 – Photomontage of bridge between Camellia and Rydalmere from Rydalmere Wharf, Rydalmere (Photo: RPS)

7.5.2 Viewpoint 5 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from Parramatta River transport corridor, the Parramatta Valley Cycleway, and Eric Primrose Reserve with mobile receivers. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is in a landscape character type protected by local and state planning instruments. • There is evidence of urban / non-natural elements throughout the view.		
Magnitude of change	High magnitude of change during construction	High magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Camellia and Rydalmere would be evident in the view. • The scale of the construction activities would be highly present in the visual realm of receivers within close proximity during the course of construction.	• The form and scale of the project at this location is larger than the existing scale. • The magnitude of change decreases moving away from this viewpoint up and down the Parramatta River. • The bridge between Camellia and Rydalmere is subject to design development and may result in changes to the magnitude of change. The design process should explore what interest and identity that these structures might add to the landscape. • The structure of the bridge between Camellia and Rydalmere would impart areas of increased shade to east of the structure in the afternoon and west of the structure in the morning.	• The project would increase lighting in this location associated with the new bridge between Camellia and Rydalmere crossing over the river. • These increases in lighting are associated with navigational requirements of the river ferries.
Potential visual impact rating	High-Moderate visual impact during construction	High-Moderate visual impact during day time operation	Moderate visual impact during night time operation

7.6 Viewpoint 6: Eric Primrose Reserve

7.6.1 Viewpoint 6 – description

Viewpoint description	
Precinct:	Rydalmere
Heading (approximate):	West Northwest
Direction:	View looking west to Rydalmere Wharf
Latitude and Longitude:	33° 49' 13.95" S, 151° 02' 48.99" E
LCZ(s) associated with viewpoint:	Rydalmere – Eric Primrose Reserve and John Street
Existing viewpoint description – refer Figure 7-8:	The viewpoint is representative of various views along the Parramatta River from Eric Primrose Reserve. • Footpaths and grassland in the foreground. • Vegetation adjacent to Parramatta River in the midground heavily screens views beyond. • Residents on John Street have another line of vegetation screening views onto the river.
Viewpoint impacts (day time including construction impacts):	• Construction activities of the project may be possible from parts of the Eric Primrose Reserve. • During operation the project would not be seen from this viewpoint in this direction.
Viewpoint impacts (night time including construction impacts):	• Night time works would be necessary to build the new bridge between Camellia and Rydalmere over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction. • During operation the project would not be seen from this viewpoint in this direction.



Figure 7-8: Viewpoint 6 –Eric Primrose Reserve to Rydalmere Wharf (Photo: RPS)

7.6.2 Viewpoint 6 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from the Parramatta Valley Cycleway with mobile cycle and pedestrian receivers. • The views in Eric Primrose Reserve are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is a in a landscape character type protected by local and State planning instruments. • There is evidence of urban / non-natural elements throughout the view which reduces the sensitivity of the view.		
Magnitude of change	Negligible magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Construction works and activities associated with the project would be almost entirely screened in the view.	• Nil – The project would not be seen from this viewpoint in this direction during operation.	• Nil – The project would not be seen from this viewpoint in this direction during operation.
Potential visual impact rating	Negligible visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.7 Viewpoint 7: South Street at John Street, Rydalmere

7.7.1 Viewpoint 7 – description

Viewpoint description	
Precinct:	Rydalmere
Heading (approximate):	South
Direction:	View looking south along John Street
Latitude and Longitude:	33° 49' 01.03" S, 151° 02' 42.44" E
LCZ(s) associated with viewpoint:	Rydalmere – Eric Primrose Reserve and John Street
Existing viewpoint description – refer Figure 7-9:	• This view is representative and considers views from several residences along John Street. • Foreground intersection of John Street and roundabout. • Established vegetation terminates the view in the midground. • Residential building evident amongst the vegetation on left of the view. • Commercial building evident on the right of the view. • Power infrastructure and signage evident throughout the view.
Viewpoint impacts (day time including construction impacts):	A photomontage of the John Street light rail stop has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-10. Proposed future development (by others) is shown in pink in the photomontage. • The new alignment of the light rail would replace the roundabout. • The intersection would become a signalised intersection. • The area on the right of the photo (industrial businesses on John Street) would be acquired for the project. • The new John Street light rail stop would be evident in the centre of this view. • Trees removed would be evident in the background of the view. • The new bridge crossing between Camellia and Rydalmere may be evident dependent on the viewer location. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery associated with construction of the project.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-9: Viewpoint 7 – South Street at John Street, Rydalmere (Photo: RPS)



Figure 7-10: Viewpoint 7 – Photomontage - South Street at John Street, Rydalmere

7.7.2 Viewpoint 7 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from a residential area with static receivers from habitable rooms. • The view is a residential setting consistent with the current LEP. • Infill and urbanisation of the area is envisioned by the various planning instruments at local and state level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the John Street light rail stop would be evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• Two residential receivers would be within close proximity of the change. • The magnitude of change would decrease as it is perceived by the wider group of receivers with increasing distance to the project. • The project proposes widening of John Street to accommodate the new light rail stop. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced between the receivers and the light rail stop to offset visual impacts. • The residents to the east of the light rail stop would have additional shade extending over the western side fences during the late afternoon.	• The alignment in this location would see an increase in lighting to match adjacent current land uses. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	Moderate visual impact during night time operation

7.8 Viewpoint 8: South Street at Nowill Street, Rydalmere

7.8.1 Viewpoint 8 – description

Viewpoint description	
Precinct:	Rydalmere
Heading (approximate):	East
Direction:	View east along South Street
Latitude and Longitude:	33° 49' 00.9622" S, 151° 02' 54.4916" E
LCZ(s) associated with viewpoint:	Rydalmere – South Street
Existing viewpoint description – refer Figure 7-11:	• This view is representative and considers views from a number of residences along South Street. • Foreground intersection of Nowill Street and South Street. • The road corridor is long and linear, terminating at the horizon of the view. • Power infrastructure and vegetation line the northern side of South Street. • Mature introduced vegetation evident in residences on the south side of South Street. • Eclectic range of fencing styles evident.
Viewpoint impacts (day time including construction impacts):	• Nowill Street light rail stop with side platforms would be evident at the foreground of the view. • The new alignment of the light rail would be evident along the length of South Street inclusive of power and other associated infrastructure. • The intersection would be signalised to accommodate the light rail network. • Power infrastructure would be undergrounded. • *Eucalyptus microcorys* in the right of the view in Figure 7-11 would be removed and some of the corner block acquired. • Other vegetation removal impacts would be evident along South Street. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery associated with construction of the project.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-11: Viewpoint 8 – South Street at Nowill Street, Rydalmere (Photo: RPS)

7.8.2 Viewpoint 8 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The views in this area are from a residential area with static receivers from habitable rooms. • The views are a residential setting consistent with the current LEP. • Infill and urbanisation of the area are envisioned by the various planning instruments at local and state level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with South Street light rail alignment would be evident in the view. • The scale of the construction would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are a large number of receivers within close proximity of the change. • The project proposes changes within the South Street alignment to accommodate the new light rail and light rail stop and associated infrastructure. • The project may require fencing relocation on the southern side of South Street. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced along South Street to offset visual impacts. • The residents near this viewpoint would not be impacted by shade or shadowing from the project as the residents are orientated to the north and south of the project changes.	• The alignment in this location would see increase in lighting along the road corridor. • Note that the increase in lighting would provide benefits to safety of road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	Moderate visual impact during night time operation

7.9 Viewpoint 9: Silverwater Bridge over Parramatta River

7.9.1 Viewpoint 9 – description

Viewpoint description	
Precinct:	Rydalmere
Heading (approximate):	West
Direction:	View looking west to the Parramatta CBD
Latitude and Longitude:	33° 49' 27.53" S, 151° 03' 04.26" E
LCZ(s) associated with viewpoint:	Rydalmere – Eric Primrose Reserve and John Street
Existing viewpoint description – refer Figure 7-12:	This view is from the existing bridge (Silverwater Bridge) that carries Silverwater Road (A6) over the Parramatta River to link Silverwater in the south to Rydalmere and Ermington in the north. • Parramatta River in the foreground. • Vegetation lining both sides of the river. • Shipping containers and industrial areas noted in the view. • Camellia wetlands screened from view on the left of view. • Built structures noted throughout the view. • Limited visual impacts associated with construction – cranes for bridges would be seen from this point.
Viewpoint impacts (day time including construction impacts):	A photomontage of the view towards the bridge between Camellia and Rydalmere has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-13. As final materials have not been finalised, the bridge is shown in grey tone. • Parts of the bridge between Camellia to Rydalmere would be evident up river above the mangrove line but below the horizon line. • Other elements of the project would not be seen from this viewpoint. • Construction activities associated with the project would be screened by elements in the landscape.
Viewpoint impacts (night time including construction impacts):	• Lighting from the bridge between Camellia and Rydalmere would be evident above the mangrove line and below the horizon line. • Night time works would be necessary to build the bridge between Camellia and Rydalmere over the Parramatta River.



Figure 7-12: Viewpoint 9 – From existing Silverwater Bridge over Parramatta River to Rydalmere Wharf (Photo: RPS)



Figure 7-13: Viewpoint 9 – Photomontage of bridge between Camellia and Rydalmere – From existing Silverwater Bridge over Parramatta River to Rydalmere Wharf

7.9.2 Viewpoint 9 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The view is from a bridge with mobile, short-term receivers. • There are existing views to industrial and urban environments. • The views along the Parramatta River are valued and desirable because of the natural elements within the view (river views). • The view is in a landscape character type in line with the proposed land use under the LEP.		
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during day time operation	low magnitude of change during night time operation
	• Construction impacts would be low given the screening provide by the vegetation to the construction areas of the project.	• The form and scale of the project at this location is below the horizon line and would have little impact in the view in terms of scale and magnitude. • The design of the bridges would continue to be refined during design development and may result in changes to the magnitude of change. The design process should explore the interest and identity that the bridge between Camellia and Rydalmere materials might add to the landscape. • The viewpoint would not be impacted by shade or shadowing from any parts of the project.	• The lighting for the bridge would be evident above the mangrove line. • Note that the increase in lighting would provide safety benefits of road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.10 Viewpoint 10: Silverwater Road – Northbound

7.10.1 Viewpoint 10 – description

Viewpoint description	
Precinct:	Rydalmere/Ermington
Heading (approximate):	North
Direction:	View north along Silverwater Road
Latitude and Longitude:	33° 49' 17.65 S, 151° 03' 06.48" E
LCZ(s) associated with viewpoint:	Rydalmere – South Street
Existing viewpoint description – refer Figure 7-14:	• Foreground is the roadway (three lanes in each direction). • Established vegetation lines each side of the roadway. • Existing pedestrian bridge is in the centre of the view, accentuated by the perspective of the vegetation and roadway. • Vegetation species are introduced. • Road furniture and other elements are evident in the view.
Viewpoint impacts (day time including construction impacts):	A photomontage of the new light rail bridge with integrated active transport link over Silverwater Road has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-13. • The existing pedestrian bridge would be removed. • The new light rail bridge with integrated active transport link over Silverwater Road would be evident in the midground, centre of the view. • Some changes in the vegetation on the southern side of the bridge would be evident from this location. • Construction infrastructure would be evident either side of Silverwater Road.
Viewpoint impacts (night time including construction impacts):	• The new light rail bridge would be somewhat evident at night time given the current lighting in this location. • Night time works would be necessary to build the new bridge between over Silverwater Road – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction.



Figure 7-14: Viewpoint 10 – Silverwater Road - Northbound (Photo: RPS)



Figure 7-15: Viewpoint 10 – Photomontage – Showing new light rail bridge over Silverwater Road - Northbound

7.10.2 Viewpoint 10 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views from Silverwater Road are from mobile receivers in vehicles. • The view is already a traffic movement corridor.		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, cranes, vehicle movements and construction associated with the Silverwater Road Bridge would be evident in the view. • The scale of the construction activities would be present in the visual realm of transient receivers during construction.	• The mass and scale of the bridge structure over Silverwater Road would be similar to that of the existing pedestrian bridge. • Proposed landscaped areas and new trees would increase the canopy cover and screen visual impacts to parts of the bridge along Silverwater Road. • Minor additional shading would occur over the roadway by the new light rail bridge. • The proposed vegetation on the east and west of the roadway would throw shade over the road but not impact the usage of the Silverwater Road corridor.	• The lighting on the bridge would be somewhat evident during night time.
Potential visual impact rating	Moderate-Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.11 Viewpoint 11: Silverwater Road – Southbound

7.11.1 Viewpoint 11 – description

Viewpoint description	
Precinct:	Rydalmere/Ermington
Heading (approximate):	South
Direction:	View south along Silverwater Road
Latitude and Longitude:	33° 49' 02.48" S, 151° 03' 07.49" E (final to be confirmed)
LCZ(s) associated with viewpoint:	Rydalmere – South Street
Existing viewpoint description – refer Figure 7-16:	• Foreground is the roadway (three lanes in each direction). • Established vegetation lines each side of the roadway. • Existing pedestrian bridge is in the centre of the view, accentuated by the perspective of the vegetation and roadway. • Vegetation is introduced. • Road furniture and other elements are evident in the view.
Viewpoint impacts (day time including construction impacts):	• The existing pedestrian would be removed. • The new light rail bridge with integrated active transport link over Silverwater Road would be evident. • Vegetation removal would be evident on the left of the viewpoint behind the bridge. • Construction infrastructure would be evident either side of Silverwater Road.
Viewpoint impacts (night time including construction impacts):	• The new light rail bridge would be somewhat evident at night time given the current lighting in this location. • Night time works would be necessary to build the new bridge between over Silverwater Road – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction.



Figure 7-16: Viewpoint 11 – Silverwater Road - Southbound (Photo: RPS)

7.11.2 Viewpoint 11 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views from Silverwater Road are from mobile receivers in vehicles. • The view is already a traffic movement corridor.		
Magnitude of change	Moderate magnitude of change	Low magnitude of change	Low magnitude of change
	• Hoarding, cranes, vehicle movements and construction associated with the Silverwater Road Bridge would be evident in the view • construction activities would be present in the visual realm of transient receivers during construction.	• The changes in this view would be at the same position as the existing pedestrian bridge. • The mass and scale of the bridge structure over Silverwater Road would be similar to that of the existing pedestrian bridge. • Proposed landscaped areas and new trees would increase the canopy cover and screen visual impacts to parts of the bridge along Silverwater Road. • Minor additional shading would occur over the roadway by the new light rail bridge. • The proposed vegetation on the east and west of the roadway would throw shade over the road but not impact the usage of the Silverwater Road corridor.	• The lighting on the bridge would be somewhat evident during night time.
Potential visual impact rating	Moderate Low magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation

7.12 Viewpoint 12: South Street at River Road, Ermington

7.12.1 Viewpoint 12 – Direction A (west)- description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	West
Direction:	View looking west along South Street
Latitude and Longitude:	33° 49' 06.73" S, 151° 03' 11.48" E
LCZ(s) associated with viewpoint:	Rydalmere – South Street
Existing viewpoint description – refer Figure 7-17:	• This view is representative and considers views from a number of residences on South Street. • Foreground is the roadway of South Street. • Midground contains the existing pedestrian overpass of Silverwater Road screened somewhat by existing vegetation. • Vegetation frames the view. • The vegetation is introduced/contrived. • Lighting, fencing and other street furniture are evident in the view.
Viewpoint impacts (day time including construction impacts):	• The new alignment of the light rail including the abutments for the new bridge over Silverwater Road would result in a change of levels and removal of vehicular access to Silverwater Road. • The streetscape would become highly pedestrianised with access limited to residents. • The construction would result in the loss of two street trees. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery associated with construction of the project. Cranes during construction would be required for installation of the bridge structure.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with pedestrianisation of the streetscape.



Figure 7-17: Viewpoint 12 – direction A – South Street at River Road looking to Silverwater Road, Ermington (Photo: RPS)

7.12.2 Viewpoint 12 – Direction A (west) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from residential area with static receivers from habitable rooms. • The view is a residential setting consistent with the current LEP. • The area is beside a highly urbanised roadway. • Infill and urbanisation of the area is envisioned by the various planning instruments at local and state level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment South Street would be evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are several receivers within close proximity of the project at this location. • The project would result in a change in levels and increased scale in this area. • The abutments of the new bridge structure over Silverwater Road would impose on views from 101/101a South Street. • Vegetation would screen the active transport link to the bridge from residences in close proximity at 174 South Street and 53 Fallon Street. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced offset visual impacts. • The receivers would not be materially impacted by shade or shadowing from the project as they sit north and south of the new raised bridge structure over Silverwater Road.	• The project in this location would result in an increase in lighting in this view. • Note that the increase in lighting would provide customer safety benefits, particularly those using the active transport link.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact change during day time operation	Moderate visual impact change during night time operation

7.12.3 Viewpoint 12 – Direction B (east) – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	East
Direction:	View looking east to proposed River Road light rail stop
Latitude and Longitude:	33° 49’ 06.73” S, 151° 03’ 11.48” E
LCZ(s) associated with viewpoint:	Ermington – River Road
Existing viewpoint description - refer Figure 7-18:	• This view is representative and considers views from a number of residences near the intersection. • The view is dominated by the linear open space and overhead power down the perspective of the view. • Established vegetation across the mid-ground screens views beyond. • The vegetation is exotic and non-remnant native species. • The open space draws views to termination at the hill at the horizon. • Residential buildings of various scales are in either side of the open space.
Viewpoint impacts (day time including construction impacts):	A photomontage of the project has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-19. • The project would result in the introduction of a signalised intersection. • The project would result in the acquisition of the property right of view. • The open space would be widened and utilised for the light rail track and the active transport link connection. • The River Road light rail stop would be located within the easement. • Vegetation in the background would be removed and partially offset by new planting in the widened open space. • Due to the constrained width of the open space, construction impact would be evident with safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in the open space to provide safe access to the light rail stop.

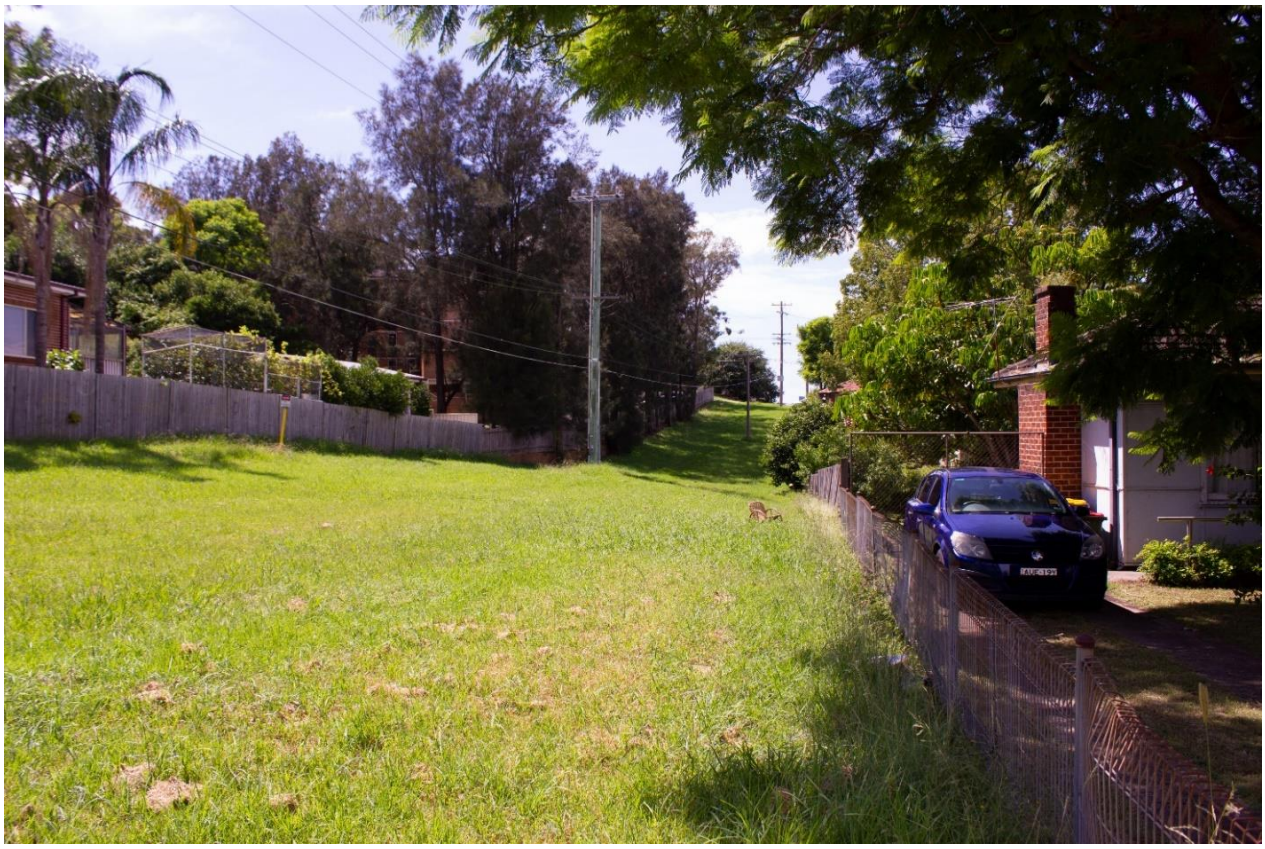


Figure 7-18: Viewpoint 12- direction B – South Street at River Road, Ermington (Photo: RPS)



Figure 7-19: Viewpoint 12- direction B – Photomontage – showing new River Road light rail stop

7.12.4 Viewpoint 12 – Direction B (east) - assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• There are views in this area from residential properties with static receivers from habitable rooms. • The view is a residential setting consistent with the current LEP. • Infill and urbanisation of the area is envisioned by the various planning instruments at local and state level.		
Magnitude of change	High magnitude of change during construction	High magnitude of change during day time operation	High magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment South Street would be evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are a number of receivers within close proximity of the change. • The project would result in changes in topography and increased scale in this area. • The project proposes introduction of active transport link alongside the light rail. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced to offset visual impacts. • The surrounding receivers would not be materially impacted by shade or shadowing from the River Road light rail stop as receivers sit north and south of the changes.	• The project would include the introduction of lighting along the open space. • Note that the increase in lighting would provide safety benefits to customers, particularly those using the active transport link.
Potential visual impact rating	High-Moderate visual impact during construction	High-Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

7.13 Viewpoint 13: Hilder Road, Ermington

7.13.1 Viewpoint 13 – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	East to south-east
Direction:	View looking east to Ken Newman Park
Latitude and Longitude:	33° 49' 08.44" S, 151° 03' 15.84" E
LCZ(s) associated with viewpoint:	Ermington – Ken Newman Park
Existing viewpoint description - Figure 7-20:	This view is representative and considers views from a number of residences near the intersection. • The view includes open space and overhead power. • Views of green suburbs expand to the Sydney Olympic Park precinct. • Modern residential buildings in the mid view. • The view is falling away to the Parramatta River vegetation. • Views to Sydney Olympic Park. • Park infrastructure evident in the foreground.
Viewpoint impacts (day time including construction impacts):	• The new light rail alignment would be evident in the front of the view replacing the park infrastructure. • The light rail alignment would run off to the left of the viewpoint. • Sparse tree planting in view would be replaced with vegetation which would screen the view to modern housing. • The project would result in the closure of Hilder Road. • Due to the constrained width of the open space construction impact would be evident with safety fencing, traffic redirections, and movement of plant and machinery. • A primary construction compound is proposed on the eastern side of Hilder Road which would be evident in the view during the construction period.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in the open space to provide safe use of the active transport link.



Figure 7-20: Viewpoint 13 –Hilder Road – looking east, Ermington (Photo: RPS)

7.13.2 Viewpoint 13 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• There are views in this area from residential properties with static receivers from habitable rooms including those overlooking the green space from higher storeys. • The view is a residential setting consistent with the current LEP. • Infill and urbanisation of the area is envisioned by the various planning instruments at local and State level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	High magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be highly evident in the view and replace the open space areas/ • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction	• There are several receivers within close proximity of the change. • The project would result in increased scale of development in this area. • The project would not block the expansive views across the landscape. • The project proposes introduction of an active transport link adjacent to the light rail. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced offset visual impacts. • Positive outcomes include the undergrounding of the existing overhead power lines running through Ken Newman Park. • The surrounding receivers would not be materially impacted by shade or shadowing from the light rail infrastructure as the receivers sit north and south of the changes.	• The project would include the introduction of lighting along the open space. • Note that the increase in lighting would provide customer safety benefits, particularly those using the active transport link.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

7.14 Viewpoint 14: Tristram Street, Ermington

7.14.1 Viewpoint 14 – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	South to south-east
Direction:	View looking over Ken Newman Park
Latitude and Longitude:	33° 49' 05.80" S, 151° 03' 25.08" E
LCZ(s) associated with viewpoint:	Ermington – Ken Newman Park
Existing viewpoint description – refer Figure 7-21:	This view is representative and considers views from a number of residences along Tristram Street. • The view includes Ken Newman Park. • Overhead power is present in the view. • Creek/drainage gully is evident on the left of the view. • Views over vegetation expand to Sydney Olympic Park. • Modern residential buildings in the mid view. Note – Vegetation on Tristram Street screens views for lower levels of housing on this street frontage.
Viewpoint impacts (day time including construction impacts):	A photomontage of the project has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-23. • The new light rail alignment would be evident in the mid view in front of the playground area. • The light rail alignment would run off both side of the view. • New bridge crossing over creek/drainage gully would result in loss of vegetation in that area of the creek/drainage gully. • New terracing would occur in the Ken Newman Park. • Utility relocation on Tristram Street which involves large excavation during construction. • Construction would be evident with safety fencing, traffic redirections, and movement of plant and machinery associated with construction of the project. This impact would be increased by the need for construction of a bridge crossing over the drainage gully. • A construction compound is proposed adjacent to Heysen Avenue which would result in viewpoint impacts during construction.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in the open space to provide safe use of the active transport link.



Figure 7-21: Viewpoint 14 – Tristram Street, overlooking Ken Newman Park – view south-east, Ermington (Photo: RPS)



Figure 7-22: Viewpoint 14 – Tristram Street, overlooking Ken Newman Park – view south-west, Ermington (Photo: RPS)



Figure 7-23: Viewpoint 14 –Photomontage of new light rail alignment – Tristram Street, view over Ken Newman Park, Ermington

7.14.2 Viewpoint 14 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	High sensitivity	High sensitivity	High sensitivity
	• There are views in this area from residential properties with static receivers from habitable rooms including those overlooking the open space from higher storeys. • Ken Newman Park is currently open space for public use. • Open spaces are highly valued in urbanised settings.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be highly evident in the view and replace the open space areas. • A construction compound is proposed for this area. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are several receivers within close proximity of the change. • The project would result in introducing urbanised development to the open space. • The development would not block the expansive views across the landscape. • The project proposes introduction of active transport link adjacent to the light rail. • The project proposes to utilise high quality urban design finishes. • Ken Newman Park improvements are proposed and would result in positive changes throughout this view including the undergrounding of the existing overhead power lines running through Ken Newman Park. • The surrounding receivers would not be materially impacted by shade or shadowing from the light rail alignment, nor the bridge over the drainage gully, as the receivers sit north and south of the changes.	• There would be increased lighting in Ken Newman Park associated with the project. • Note that the increase in lighting would provide customer safety benefits, particularly those using the active transport link.
Potential visual impact rating	High visual impact during construction	High-Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

7.15 Viewpoint 15: Heysen Avenue, Ermington

7.15.1 Viewpoint 15 – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	North to north-east
Direction:	View looking up to Ken Newman Park
Latitude and Longitude:	33° 49' 09.59" S, 151° 03' 25.50" E
LCZ(s) associated with viewpoint:	Ermington – Ken Newman Park
Existing viewpoint description – refer Figure 7-24:	This view is representative and considers views from a number of residences along Heysen Avenue and considers views across the parkland including to the bridge over the drainage/creek line. • The view includes a Ken Newman Park. • Overhead power is present in the view. • Drainage gully is evident on the right of the view. • Views are terminated by the residences on Tristram Street.
Viewpoint impacts (day time including construction impacts):	A photomontage of the light rail alignment through the park has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-25. • The new light rail alignment would be evident in the mid view in behind the park area. • The light rail alignment would run off both side of the view. • New bridge crossing over the drainage gully would result in loss of vegetation in that area of the drainage gully – this would be offset with revegetation with canopy trees and layered planting to minimise the visual impact over time. • Construction impact would be evident with safety fencing, traffic redirections, and movement of plant and machinery. • This construction impact would be increased by the need for large vehicles for the installation of the new bridge crossing over the drainage gully.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in the open space to provide safe use of the active transport link.



Figure 7-24: Viewpoint 15 – Heysen Avenue, view to Ken Newman Park, Ermington (Photo: RPS)



Figure 7-25: Viewpoint 15 – Photomontage of new light rail alignment – Heysen Avenue, view to Ken Newman Park, Ermington

7.15.2 Viewpoint 15 - assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	High sensitivity	High sensitivity	High sensitivity
	• There are views in this area from residential properties with static receivers from habitable rooms. • The area is currently open space for public use. • Open spaces are highly valued in urbanised settings.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be highly evident in the view and replace the open space areas. • A construction compound is proposed for this area. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are a number of receivers within close proximity of the change. • The project would result in introducing urbanised development to an open space. • The project proposes introduction of an active transport link adjacent to the light rail. • The project proposes to utilise high quality urban design finishes. • Ken Newman Park improvements are proposed and would result in positive changes throughout this view. • The surrounding receivers would not be materially impacted by shade or shadowing from the light rail alignment, nor the bridge over the drainage gully, as the receivers sit north and south of the changes.	• There would be increased lighting in Ken Newman Park associated with the project. • Note that the increase in lighting would provide safety benefits to customers and users of the park, particularly those using the active transport link.
Potential visual impact rating	High visual impact during construction	High-Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

7.16 Viewpoint 16: Broadoaks Street, Rydalmere

7.16.1 Viewpoint 16 – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	North
Direction:	View north along Broadoaks Street to intersection with Boronia Street
Latitude and Longitude:	33° 49' 09.8158" S, 151° 03' 24.0924" E
LCZ(s) associated with viewpoint:	Ermington – Ken Newman Park, Ermington – Boronia Street
Existing viewpoint description – refer Figure 7-26:	This view is representative and considers views from a number of residences on Broadoaks Street. • Foreground roadway and footpath. • The vegetated drainage gully running alongside Ken Newman Park is on the left of the view. • Power infrastructure evident in the view. • Cars and residential housing evident throughout the view.
Viewpoint impacts (day time including construction impacts):	• Existing roundabout would be converted to signalised intersection and raised to accommodate the transition to Boronia Street. • Some vegetation replacement would be evident in the view from the construction of the new bridge over the drainage gully on the left of the view. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery – these impacts would extend down Broadoaks Street and Spurway Street.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new traffic intersection.

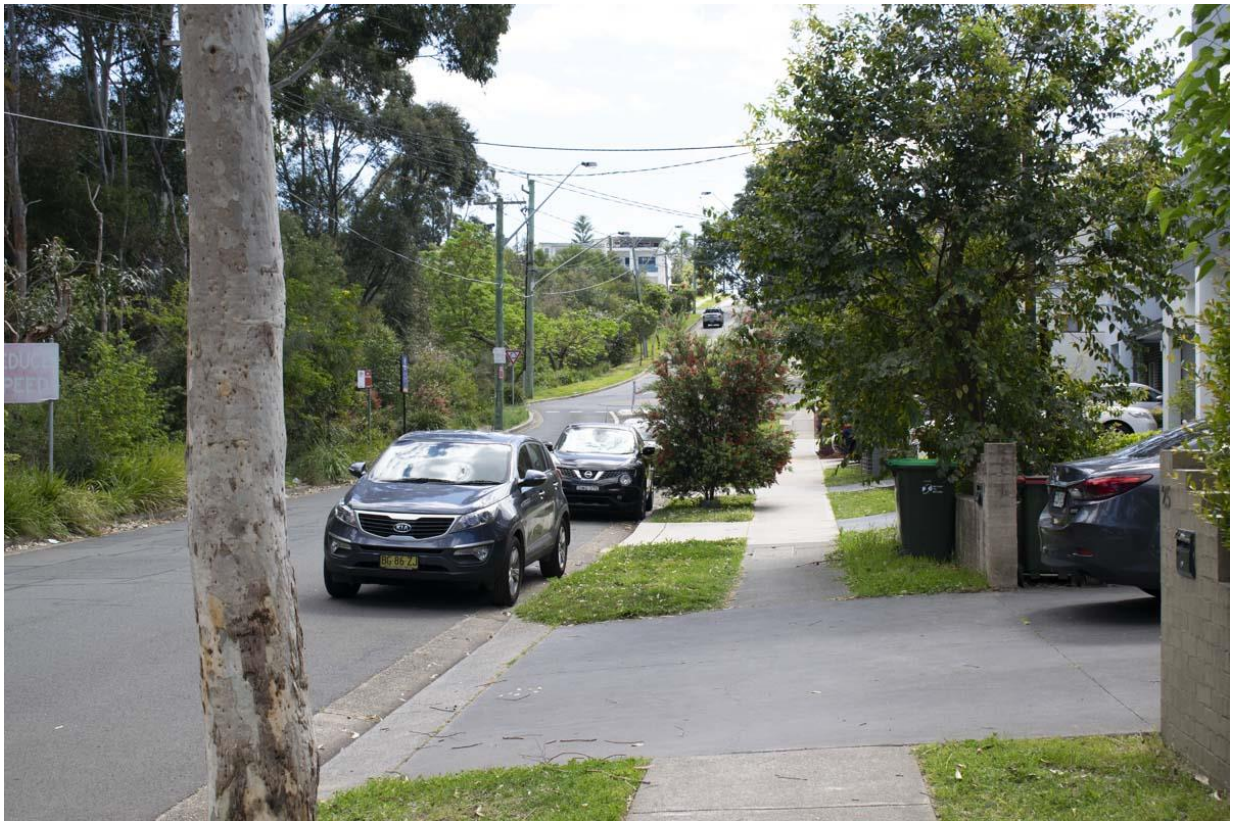


Figure 7-26: Viewpoint 16 – Broadoaks Street, Ermington (Photo: RPS)

7.16.2 Viewpoint 16 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The views in this area are from residential properties with static receivers from habitable rooms. • The view is a residential setting consistent with the current LEP. • Infill and urbanisation of the area are envisioned by the various planning instruments at local and state level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	**Moderate** magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are numerous receivers within close proximity of the change. • The project proposes changes within Boronia Street to accommodate the new light rail and light rail stop infrastructure including the use of retaining walls on Boronia Street to meet grade requirements for the light rail route. • The project proposes to utilise high quality urban design finishes. • The surrounding receivers would not be materially impacted by shade or shadowing from the light rail infrastructure as the receivers sit north and south of the changes.	• The would be an increase lighting along Broadoaks Street, due to the intersection upgrade. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	Moderate visual impact during night time operation

7.17 Viewpoint 17: Boronia Street at Murdoch Street, Ermington

7.17.1 Viewpoint 17 – description

Viewpoint description	
Precinct:	Ermington
Heading (approximate):	East
Direction:	View east along Boronia Street
Latitude and Longitude:	33° 49' 03.05" S, 151° 03' 43.34" E
LCZ(s) associated with viewpoint:	Ermington – Boronia Street
Existing viewpoint description – refer Figure 7-27:	This view is representative and, considers views from a number of residences on Boronia Street. • Foreground is Boronia Street. • The view down Boronia Street is long and linear, terminating at the horizon of the view. • Power infrastructure and vegetation line the northern side of Boronia Street. • Mature introduced vegetation lines the south side of Boronia Street. • Eclectic range of building styles evident.
Viewpoint impacts (day time including construction impacts):	A photomontage of the Murdoch Street light rail stop has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-28. • Murdoch Street light rail stop with side platforms would be evident at the foreground of the view. • The new light rail alignment would be evident along the length of Boronia Street inclusive of power and other associated infrastructure. • The new active transport link and associated planting would be evident to along Boronia Street. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new light rail stop.



Figure 7-27: Viewpoint 17 – Boronia Street at Murdoch Street, Ermington



Figure 7-28: Viewpoint 17 – Photomontage of new Murdoch Street light rail stop - Boronia Street at Murdoch Street, Ermington

7.17.2 Viewpoint 17 - Assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The views in this area are from residential properties with static receivers from habitable rooms. • The view is a residential setting consistent with the current LEP. • Infill and urbanisation of the area are envisioned by the various planning instruments at local and State level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the project would be evident in the view • the scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are numerous receivers within close proximity of the change. • The project proposes changes within Boronia Street to accommodate the new light rail and stop infrastructure. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced along Boronia Street to offset visual impacts. • The surrounding receivers would not be materially impacted by shade or shadowing from the Murdoch Street light rail stop as the receivers sit north and south of the changes.	• There would be an increase in lighting along Boronia Street, associated with the project. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	Moderate visual impact during night time operation

7.18 Viewpoint 18: Boronia Street at Atkins Road, Ermington

7.18.1 Viewpoint 18 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	South-east
Direction:	View to future Atkins Road light rail stop
Latitude and Longitude:	33° 48' 55.63" S, 151° 03' 53.81" E
LCZ(s) associated with viewpoint:	Melrose Park – Atkins Road
Existing viewpoint description – refer Figure 7-29:	This view is representative and considers views from a number of residences on Boronia Street, Hope Street and Atkins Road, • The foreground is the intersection of Boronia Street and Atkins Road. • Residential and commercial buildings are evident in the view. • Power infrastructure and vegetation are evident throughout the view. • Eclectic range of building styles evident. • Street verges are generally devoid of street tree planting with planting located in front yards.
Viewpoint impacts (day time including construction impacts):	A photomontage of the Atkins Road light rail stop has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-28. Existing houses exposed by this project are shown in grey tone, new proposed adjacent development (by others) is shown in pink tone. The Main House of the Bulla Cream Dairy (Willowmere) is shown in blue and would be largely screened by the light rail stop. • Commercial properties on the southern side of Hope Street would be acquired for the Atkins Road light rail stop. • The light rail stop with two side platforms and one island platform would be evident at the midground of the view. • A new open space and parts of the proposed walking and cycling paths and new planting would be evident in the view. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery associated with the removal of the existing infrastructure and construction of the project.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new intersection configurations and the Atkins Road light rail stop.



Figure 7-29: Viewpoint 18 – Boronia Street at Atkins Road, Ermington (Photo: RPS)



Figure 7-30: Viewpoint 18 – Photomontage of new Atkins Road light rail stop- Hope Street at Atkins Road, Ermington

7.18.2 Viewpoint 18 - assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The views in this area are from residential properties with static receivers from habitable rooms to an already commercial and light industrial area. • The view is to a commercial and light industrial setting consistent with the current LEP. • High density urbanisation of the area is envisioned by the “Melrose North precinct” and “Melrose South precinct” master plans.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view • the scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are a number of receivers within close proximity of the change. • The project proposes to accommodate a new light rail and Atkins Road light rail stop infrastructure. • The changes in this area would result in a change away from current commercial type of use. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced through this area of the project to offset visual impacts. • The surrounding receivers are not materially impacted by shade or shadowing from the Atkins Road light rail stop as the receivers sit north and south of the change. • New open space improvements are proposed to the nearby heritage listed Bulla Cream Dairy (Willowmere) and would result in positive changes throughout this view.	• The location would see increase in lighting associated with the new light rail stop. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	High-Moderate visual impact during construction	Moderate visual impact during day time operation	Moderate visual impact during night time operation

Based on current planning proposals for “Melrose North precinct” and “Melrose South precinct”, the area to the south of this viewpoint have a proposed desired future character of high density residential (R4), with areas of complimentary public open space.

The operational visual impact, if it were to be assessed on the basis of proposed future development in the area, would have a low magnitude of change and a low visual impact at day and night time.

7.19 Viewpoint 19: Hope Street at Bulla Cream Dairy (Willowmere)

7.19.1 Viewpoint 19 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	South to south-east
Direction:	View looking towards Bulla Cream Dairy (Willowmere)
Latitude and Longitude:	33° 48' 53.517" S, 151° 04' 01.62 E
LCZ(s) associated with viewpoint:	Melrose Park – Atkins Road
Existing viewpoint description - Figure 7-31:	• Foreground is roadway including roundabout. • Fencing and vegetation screening heritage listed Bulla Cream Dairy (Willowmere) (Parramatta LEP Item No. I64).
Viewpoint impacts (day time including construction impacts):	• Roundabout removed and intersection upgraded to traffic signals. • Light rail alignment running through intersection. • Planting removed from in front of the Bulla Cream Dairy (Willowmere) Main House to accommodate light rail alignment. • Active transport link on Hope Street in front of the Bulla Cream Dairy (Willowmere) Main House.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new intersection configurations.

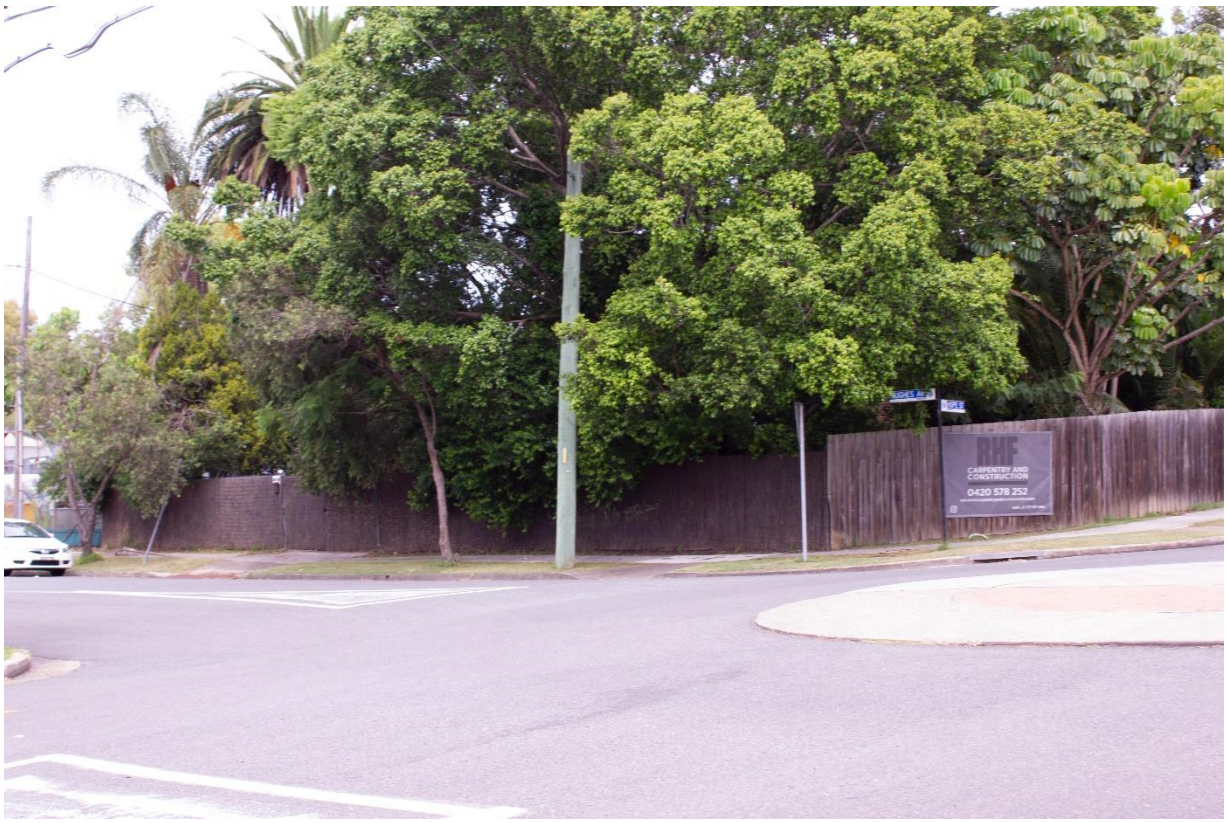


Figure 7-31: Viewpoint 19 – View to Bulla Cream Dairy (Willowmere) (Photo: RPS)

7.19.2 Viewpoint 19 - assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	High sensitivity	High sensitivity	High sensitivity
	• The views are to a locally listed built heritage site (Bulla Cream Dairy (Willowmere) – Parramatta LEP Item No. I64). • The views in this area are from residential properties with static receivers from habitable rooms to a local heritage listed item. • High density urbanisation of the area is envisioned by the various approvals and planning instruments at local and State level.		
Magnitude of change	High magnitude of change during construction	Moderate magnitude of change during day time operation	Moderate magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident throughout the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are numerous receivers within close proximity of the change. • The project proposes to accommodate a new light rail and large light rail stop infrastructure. • The changes in this area would result in the light rail being directed down Hughes Avenue in front of the Main House building of the Bulla Cream Dairy (Willowmere). • The changes in this area would result in the removal of the Bulla Cream factory building and associated infrastructure (little significance), and tree plantings. The alignment runs close to the Billiards Room which has heritage significance, and it is possible construction would also require this structure to be removed. • The changes would inadvertently open up views to the Bulla Cream Dairy (Willowmere) Main House to/from residential receivers and rail customers. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced through this area of the project to offset visual impacts. • The surrounding receivers would not be materially impacted by shade or shadowing from the light rail	• This location would see increase in lighting associated with the new light rail alignment and intersection upgrades. • Note that the increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.

		alignment as receivers are located north of the light rail alignment. • There are no significant structures proposed as part of the project that would cast shadows onto the retained structures within the Bulla Cream Dairy (Willowmere) heritage item. • New open space improvements (including green track) are proposed to the heritage asset and would result in positive changes throughout this view. • Retention or relocation of significant trees at Bulla Cream Dairy (Willowmere) would be investigated during the next stages of design noting the heritage setting and amenity value they provide.	
Potential visual impact rating	High visual impact during construction	High-Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

Reference is made to Section 7.1.11 of Technical Paper 5 (Statement of Heritage Impact - Built Heritage) which describes the heritage impacts in relation to Bulla Cream Dairy (Willowmere) item.

Based on current planning proposals, the areas surrounding Bulla Cream Dairy (Willowmere) intended future character is proposed to be a high density residential (R4) and public open space.

The operational visual impact, if it were to be assessed on the basis of future proposed development around this area and the intended future character, would have remained unchanged. The high sensitivity rating due to the proximity to Bulla Cream Dairy (Willowmere) is driving the overall visual impact rating.

7.20 Viewpoint 20: Hope Street at Waratah Street, Melrose Park

7.20.1 Viewpoint 20 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	West to south-west
Direction:	View westbound along Hope Street
Latitude and Longitude:	33° 48' 50.31" S, 151° 04' 15.96" E
LCZ(s) associated with viewpoint:	Melrose Park – Hope Street
Existing viewpoint description – refer Figure 7-32:	• The foreground is the intersection of Hope Street and Waratah Street. • The Hope Street road corridor is long and linear, terminating near the horizon of the view. • Power infrastructure and vegetation are evident throughout the view. • Cleared/demolished areas to the north of Hope Street. • Large established vegetation throughout the view.
Viewpoint impacts (day time including construction impacts):	• The Hope Street and Waratah Street intersection would be reconfigured to accommodate light rail turning from Hope Street onto Waratah Street and vice versa. • The Hope Street light rail stop with two side platforms would be evident at the midground of the view and on the northern side of Hope Street. • The proposed active transport link and new planting would be evident on the southern side of Hope Street. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new intersection configuration.



Figure 7-32: Viewpoint 20 – Hope Street at Waratah Street, Melrose Park (Photo: RPS)

7.20.2 Viewpoint 20 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views in this area are from an already commercial and light industrial area. • The view is to a commercial and light industrial setting consistent with the current LEP. • High density urbanisation of the area is envisioned by the Melrose North and Melrose South master plans, as well as planning instruments at local and state level.		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Demolition, hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view. • The area is currently commercial and light industrial area in nature. Scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• There are few receivers within proximity of the change. • The project proposes to accommodate light rail infrastructure. • The project proposes to utilise high quality urban design finishes. • Planting would be introduced through this area of the project to offset visual impacts. • The surrounding receivers would not be materially impacted by shade or shadowing from the project as the receivers sit north and south of the change.	• The intersection would see a minor increase in lighting in an already well-lit industrial area. • Note that any increase in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate – Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

Based on current master plan proposals for Melrose North and South, the area's desired future character is proposed to be a high density residential (R4) and public open space.

The operational visual impact, if it were to be assessed on the basis of future development in the area and the intended future character, would have a low magnitude of change and a low visual impact at day and night time.

7.21 Viewpoint 21: Waratah Street, Melrose Park

7.21.1 Viewpoint 21 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	South-east
Direction:	View along existing walking and cycling paths to Ermington Boat Ramp
Latitude and Longitude:	33° 48’ 59.77” S, 151° 04’ 17.09” E
LCZ(s) associated with viewpoint:	Melrose Park – Waratah Street
Existing viewpoint description – refer Figure 7-33:	• The existing Parramatta Valley Cycleway dominates the centre of the view. • Large scale power infrastructure is evident in the view. • Native and introduced vegetation frame the view. • Fencing with view protection on the left of the view. • Wentworth Point buildings evident in the right background of the view.
Viewpoint impacts (day time including construction impacts):	• The new light rail alignment combined with bus access would lead to the Waratah Street light rail stop. • Waratah Street light rail stop would have two side platforms slightly above the existing ground level. • The active transport link and new planting would be evident on the right-hand side of the light rail alignment. • Construction impacts would include safety fencing, redirection of the active transport link, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would add lighting in this location associated with the new light rail stop, the light rail alignment and the active transport link.



Figure 7-33: Viewpoint 21 – Waratah Street, Melrose Park (Photo: RPS)

7.21.2 Viewpoint 21 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The receivers in this location are likely to be mobile receivers using the Parramatta Valley Cycleway. • The views in this area are from an already light industrial area. • The view is to the existing Parramatta Valley Cycleway. • High density urbanisation of the area which is currently light industrial is envisioned by various approvals and planning instruments at local and State level.		
Magnitude of change	High magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Demolition, hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view • The location of construction laydown for the bridge between Melrose Park and Wentworth Point could impact the magnitude of change during construction in this area. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• The project proposes to accommodate a new light rail and stop infrastructure as well as improve the existing active transport link. • The changes in this area would result in a wider transport network solution consistent with existing transport facilities. • The project proposes to utilise high quality urban design finishes. • There is negligible shade or shadowing from the project in this location.	• This view would see introduction of lighting. • Note that the introduction in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

Based on current planning proposals, the area's intended future character is proposed to be a high density residential (R4) and public open space.

The operational visual impact, if it were to be assessed on the basis of future development in the area, and the future intended character, would have a low magnitude of change and a low visual impact at day and night time.

7.22 Viewpoint 22: Ermington Boat Ramp

7.22.1 Viewpoint 22 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	South-east
Direction:	View looking towards Wentworth Point
Latitude and Longitude:	33° 49’ 07.6335” S, 151° 04’ 22.6356” E
LCZ(s) associated with viewpoint:	Melrose Park – Waratah Street
Existing viewpoint description – refer Figure 7-34:	• Foreground is the waterway of the Parramatta River. • Vegetation is noted on the opposite shoreline. • The background is the development on Wentworth Point. • Buoys mark the Parramatta River. • Overhead power infrastructure is evident in the view.
Viewpoint impacts (day time including construction impacts):	A photomontage of the proposed bridge between Melrose Park to Wentworth Point has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-35. As final materials for the bridge have not been finalised, the bridge is shown in grey tone. Adjacent future development as part of Sanctuary Wentworth Point (by others) is shown indicatively in pink. • The bridge between Melrose Park and Wentworth Point would cross through the centre of the view above the horizon line. • The bridge pier locations would impact the continuity of this view down Parramatta River. • Power infrastructure associated with the light rail network (if utilised on the bridge) would be evident above the bridge.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new bridge crossing over the river (related to navigational requirements of the river ferries). • Night time works would be necessary to build the new bridge between Melrose Park and Wentworth Point over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction.



Figure 7-34: Viewpoint 22 – View from Ermington Boat Ramp (Photo: RPS)

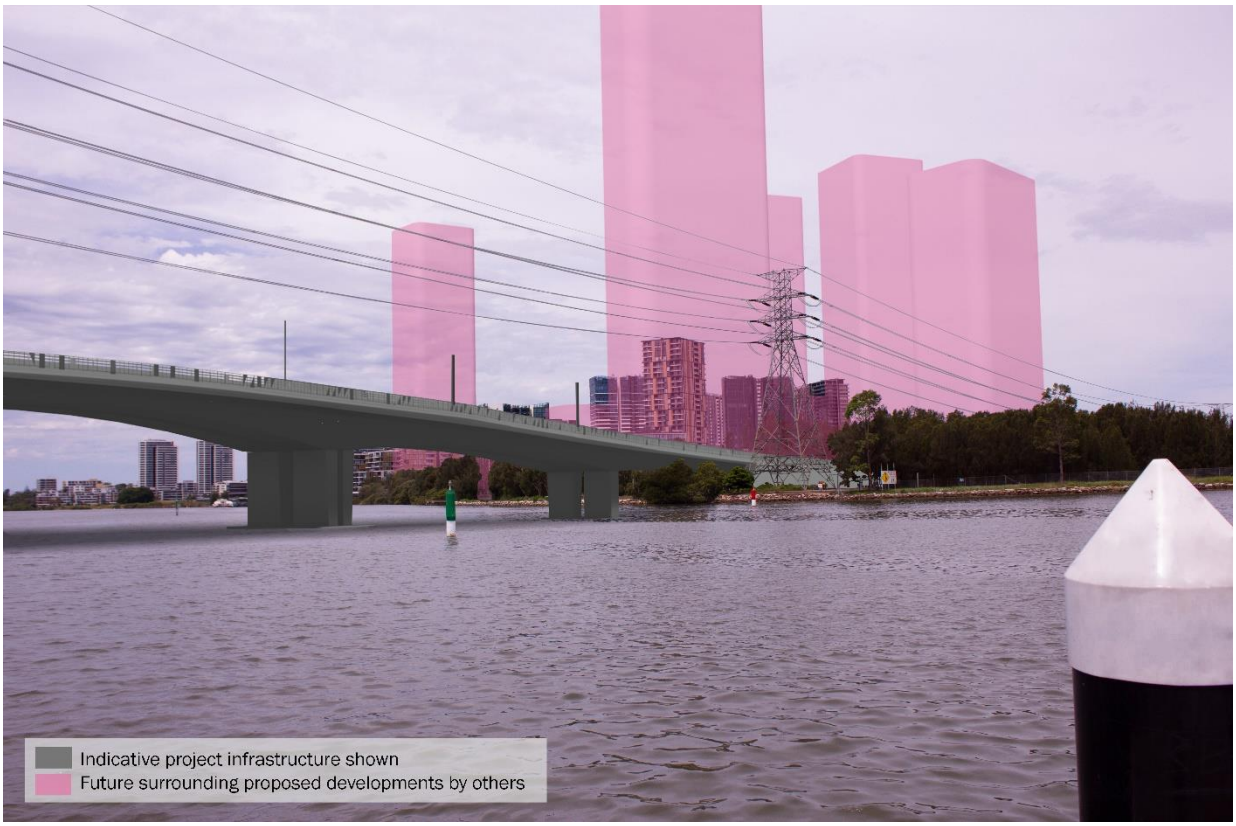


Figure 7-35: Viewpoint 22 – Photomontage of bridge between Melrose Park and Wentworth Point – View from Ermington Boat Ramp

7.22.2 Viewpoint 22 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from Parramatta River transport (ferry) corridor and Ermington Boat Ramp with mobile receivers. • There are existing views to major development (Sanctuary Wentworth Point) on the opposite shoreline. • The views along the Parramatta River are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is a in a landscape character type protected by local and state planning instruments. • There are low levels of terrestrial natural items outside of the foreshore planting.		
Magnitude of change	High magnitude of change during construction	High magnitude of change during day time operation	High magnitude of change during night time operation
	• Temporary construction impacts include work platforms that are proposed on both sides of the river which would be elevated above the mangroves adding to the visual change. • Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Melrose Park and Wentworth Point would be evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• The form and scale of the project at this location is large. • The magnitude of change decreases moving away from this viewpoint up and down the Parramatta River. • The design process should explore the interest and identity that these structures might add to the landscape. • The bridge would impart areas of increased shade to east of the structure in the afternoon (impacting this viewpoint) and west of the structure in the morning.	• The project would increase lighting in this location associated with the new bridge crossing over the river • The increases in lighting are associated with navigational requirements of the river ferries.
Potential visual impact rating	High-Moderate visual impact during construction	High-Moderate visual impact during day time operation	High-Moderate visual impact during night time operation

7.23 Viewpoint 23: Melrose Park playground

7.23.1 Viewpoint 23 – description

Viewpoint description	
Precinct:	Melrose Park
Heading (approximate):	South-west
Direction:	View looking east along Parramatta River
Latitude and Longitude:	33° 49’ 05.48” S, 151° 04’ 30.76” E
LCZ(s) associated with viewpoint:	Melrose Park – Waratah Street
Existing viewpoint description – refer Figure 7-36:	• Foreground turf with mangroves at the front mid ground blocking large parts of this view • Some of the existing development at Wentworth Point is visible to the left background of the view.
Viewpoint impacts (day time including construction impacts):	• The bridge between Melrose Park and Wentworth Point would be heavily screened by vegetation within the park. • The bridge abutment would be visible in the open space corridor between the park and Ermington Boat Ramp (this open corridor is not shown in photo).
Viewpoint impacts (night time including construction impacts):	• The bridge between Melrose Park and Wentworth Point would be heavily screened by vegetation within the park – some lighting on the bridge may be apparent. • Night time works would be necessary to build the new bridge between d Melrose Park and Wentworth Point over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction but would be largely screened from this viewpoint.



Figure 7-36: Viewpoint 23 – Melrose Park Playground (Photo: RPS)

7.23.2 Viewpoint 23 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from a recreational area with short term receivers. • There are views to existing native vegetation • The views are valued and desirable because of the natural elements within the view (open space in an otherwise urban environment).		
Magnitude of change	Low magnitude of change during construction	Negligible magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Cranes on the Parramatta River may be evident over the close tree line within this view.	• The bridge between Melrose Park and Wentworth Point would be heavily screened by vegetation within the park – this change would be negligible given the screening of the vegetation. • The bridge abutment would be visible in the open space corridor between the park and Ermington Boat Ramp (not shown in photo). • The area would not be materially impacted by shade or shadowing from the bridge between Melrose Park and Wentworth Point.	• The bridge between Melrose Park and Wentworth Point would be heavily screened by vegetation within the park – some lighting on the bridge may be apparent. • This change in lighting would be negligible given the screening of the vegetation.
Potential visual impact rating	Moderate low visual impact during construction	Negligible visual impact during day time operation	Negligible visual impact during night time operation

7.24 Viewpoint 24: River Walk

7.24.1 Viewpoint 24 – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	North-east
Direction:	View looking north-east along Parramatta River
Latitude and Longitude:	33° 49’ 17.27” S, 151° 04’ 16.76” E
LCZ(s) associated with viewpoint:	N/A
Existing viewpoint description – refer Figure 7-37:	• Left foreground is the waterway of the Parramatta River. • Right foreground is the River Walk. • The view is lined by native vegetation. • Large scale power infrastructure evident near the horizon line. • Buildings are evident on the horizon of the view.
Viewpoint impacts (day time including construction impacts):	• The bridge between Melrose Park and Wentworth Point would cross through the centre of the view above the horizon line. • The bridge pier locations would likely impact the continuity of this view down river. • Bridge abutments would be obscured by the vegetation at this distance.
Viewpoint impacts (night time including construction impacts):	• At this distance there would be little impact from the lighting of the bridge. • Night time works would be necessary to build the bridge between Melrose Park and Wentworth Point over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction – at this distance there would be little impact from this construction lighting.



Figure 7-37: Viewpoint 24 – River Walk, looking towards Ermington Boat Ramp (Photo: RPS)

7.24.2 Viewpoint 24 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from Parramatta River transport (ferry) corridor and River Walk with mobile receivers. • The views over the Parramatta River are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is in a landscape character type (Parramatta River) which is protected by local and State planning instruments. • There is evidence of urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Temporary construction impacts include work platforms that are proposed on both sides of the river which would be elevated above the mangroves adding to the visual change. • Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Melrose Park and Wentworth Point would be evident in the view. • Construction activities would be within a distant view during the course of construction at a scale consistent with the surrounding landscape.	• The form and scale of the project at this location would be consistent with the scale of the surrounding landscape. • The design process should explore the interest and identity that these structures might add to the landscape. • The area would not be impacted by shade or shadowing from the bridge between Melrose Park and Wentworth Point.	• The project would increase lighting in this location associated with the new bridge crossing over the river (noting that the River Walk is only currently accessible during daylight hours).
Potential visual impact rating	Moderate-Low visual impact during construction	Moderate-Low visual impact during day time operation	Moderate-Low visual impact during night time operation

7.25 Viewpoint 25: Sydney Olympic Park Ferry Wharf

7.25.1 Viewpoint 25 – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	West north-west
Direction:	View looking upriver
Latitude and Longitude:	33° 49’ 21.08” S, 151° 04’ 44.32” E
LCZ(s) associated with viewpoint:	N/A
Existing viewpoint description – Figure 7-38:	• Foreground is hardstand. • Midground is open water of the Parramatta River. • Parramatta River contains various buoys and watercraft infrastructure. • The view is lined by non-remnant native vegetation. • Large scale power infrastructure evident near the horizon line. • An eclectic range of low-density residential buildings are evident on the horizon of the view.
Viewpoint impacts (day time including construction impacts):	A photomontage has been prepared to assist in demonstrating the potential day time visual impacts of the bridge between Melrose Park and Wentworth Point. The photomontage shows a cantilever concrete box girder with five intermediate piers (refer Figure 7-39). As materials for the bridge have not been finalised, the bridge is shown in grey tone. Adjacent future development as part of Sanctuary Wentworth Point (by others) is shown indicatively in pink. • The bridge between Melrose Park and Wentworth Point would cross through the centre of the view above the horizon line. • The bridge piers would be evident in the river. • Bridge abutments would be obscured by the vegetation at this distance.
Viewpoint impacts (night time including construction impacts):	• At this distance there would be little impact from the lighting of the bridge. • Night time work would be necessary to build the bridge between Melrose Park and Wentworth Point over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction – at this distance there would be little impact from this construction lighting.



Figure 7-38: Viewpoint 25 – Parramatta River towards Ermington Boat Ramp (Photo: RPS)



Figure 7-39: Viewpoint 25 – Photomontage with cantilever type bridge - Parramatta River towards Ermington Boat Ramp (Photo: RPS)

7.25.2 Viewpoint 25 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from the Parramatta River transport (ferry) corridor and the open water recreational area with mobile receivers. • The views along the Parramatta River are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The views of the Parramatta River are protected by local and state planning instruments. • There are urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Moderate magnitude of change during construction	Moderate magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Temporary construction impacts include work platforms that are proposed on both sides of the river which would be elevated above the mangroves adding to the visual change. • Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Melrose Park and Wentworth Point would be evident in the view. • Construction activities would be within a distant view during the course of construction at a scale consistent with the surrounding landscape.	• The form and scale of the project at this location would be consistent with the scale of the surrounding landscape. • The design of the bridge would continue to be refined during design development and may result in changes to the magnitude of change. The design process should explore the interest and identity that these structures might add to the landscape. • The area would not be impacted by shade or shadowing from the bridge between Melrose Park and Wentworth Point.	• The project would increase lighting in this location associated with the new bridge crossing over the Parramatta River. • At this distance the lighting would be close to imperceptible.
Potential visual impact rating	Moderate visual impact during construction	Moderate visual impact during day time operation	Negligible visual impact during night time operation

7.26 Viewpoint 26: John Whitton Reserve

7.26.1 Viewpoint 26 – description

Viewpoint description	
Precinct:	N/A
Heading (approximate):	West to north-west
Direction:	View looking upriver
Latitude and Longitude:	33° 49’ 22.80” S, 151° 05’ 18.72” E
LCZ(s) associated with viewpoint:	N/A
Existing viewpoint description – refer Figure 7-40:	• Foreground open water of the Parramatta River. • The Parramatta River contains various buoys and watercraft infrastructure. • The view is lined by vegetation. • Large scale power infrastructure evident near the horizon line.
Viewpoint impacts (day time including construction impacts):	• The new bridge between Melrose Park and Wentworth Point would cross through the centre of the view at the horizon line. • The bridge piers may be evident into the river from this distance. • The bridge abutments would be obscured by the vegetation at this distance.
Viewpoint impacts (night time including construction impacts):	• At this distance there would be negligible impact from the lighting of the bridge. • Night time work would be necessary to build the bridge between Melrose Park and Wentworth Point over the Parramatta River – sufficient lighting would be required to undertake the scope and as such a lighting impact would occur in the vicinity of construction – at this distance there would be little impact from this construction lighting.



Figure 7-40: Viewpoint 26 – Parramatta River towards Ermington Boat Ramp (Photo: RPS)

7.26.2 Viewpoint 26 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is representative of the John Whitton Bridge above the viewpoint, Parramatta River transport (ferry) corridor, and recreational users of the Parramatta River (all being mobile receivers). • The views of the Parramatta River are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view of the Parramatta River is in a landscape character type protected by local and state planning instruments. • There are urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Melrose Park and Wentworth Point would be evident in the view. • Construction activities would be within a distant view during the course of construction at a scale consistent with the surrounding landscape.	• The form and scale of the project at this location is consistent with the scale of the surrounding landscape. • The design process should explore the interest and identity that the bridge between Melrose Park and Wentworth Point might add to the landscape. • The area is not impacted by shade or shadowing from the project.	• The project would increase lighting in this location associated with the bridge between Melrose Park and Wentworth Point. • At this distance the lighting changes would be close to imperceptible.
Potential visual impact rating	Moderate-Low visual impact during construction	Moderate-Low visual impact during day time operation	Negligible visual impact during night time operation

7.27 Viewpoint 27: Newington Armory Wharf

7.27.1 Viewpoint 27 – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	North-east
Direction:	View looking northeast along Parramatta River
Latitude and Longitude:	33° 49’ 30.05” S, 151° 03’ 49.63” E
LCZ(s) associated with viewpoint:	N/A
Existing viewpoint description – refer Figure 7-41:	• Foreground is wharf over open water of the Parramatta River. • The open water contains various buoys and watercraft infrastructure. • The view is lined by native vegetation. • Large scale power infrastructure evident near the horizon line. • Buildings from the existing Wentworth Point development are evident on the horizon in the view.
Viewpoint impacts (day time including construction impacts):	• The bridge between Melrose Park and Wentworth Point would cross through the centre of the view at the far horizon line. • The details of the bridge would not be discernible at this distance.
Viewpoint impacts (night time including construction impacts):	• At this distance there would be little impact from the lighting of the bridge.



Figure 7-41: Viewpoint 27 – Parramatta River, down river, towards Ermington Boat Ramp (Photo: RPS)

7.27.2 Viewpoint 27 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is of an open space recreational area with mobile receivers. • The Millennium Parklands precinct overlaps the project site and is a heritage item listed under the SEPP CPRC. (The Millennium Parklands precinct also overlaps the curtilage of the State heritage listed Newington Armament Depot and Nature Reserve but which is outside the project site). • The views up the Parramatta River are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view of the Parramatta River is a in a landscape character type protected by local and state planning instruments. • There are urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Low magnitude of change during construction	Negligible magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Hoarding, temporary work platforms, cranes, vehicle movements and construction associated with the bridge between Melrose Park and Wentworth Point would be evident in the view. • Construction activities would be within a distant view during the course of construction at a scale consistent with the surrounding landscape.	• The form and scale of the project at this location would be consistent with the scale of the surrounding landscape. • The design process should explore the interest and identity that these structures might add to the landscape. • The area is not impacted by shade or shadowing from the bridge between Melrose Park and Wentworth Point.	• The project would increase lighting in this location associated with the bridge between Melrose Park and Wentworth Point. • At this distance the increased lighting may be close to imperceptible.
Potential visual impact rating	Moderate-Low visual impact during construction	Negligible visual impact during day time operation	Negligible visual impact during night time operation

7.28 Viewpoint 28: Sanctuary Hill

7.28.1 Viewpoint 28 – Direction A (north) – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	North
Direction:	View north to Parramatta River
Latitude and Longitude:	33° 49’ 30.48” S, 151° 04’ 27.49” E
LCZ(s) associated with viewpoint:	Wentworth Point – Interface with 14-16 Hill Road
Existing viewpoint description – refer Figure 7-42:	• Foreground grasslands surrounding the landscape feature mound. • Vegetation adjacent to the Parramatta River evident in midground. • Large scale power infrastructure in the middle of the view. • Vegetation is evident across the horizon. • Buildings across the river are evident within the landscape.
Viewpoint impacts (day time including construction impacts):	A photomontage of the bridge between Melrose Park and Wentworth Point has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-43. As final materials for the bridge have not been finalised, the bridge is shown in grey tone. Adjacent future development as part of Sanctuary Wentworth Point (by others) is shown indicatively in pink. • The new bridge between Melrose Park and Wentworth Point would cross the Parramatta River adjacent to the power infrastructure. • Details of the bridge would be indiscernible at this distance. • The light rail alignment as it passes to the north of Sanctuary Hill would be screened by the existing vegetation.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new bridge crossing over the river (related to navigational requirements of the river ferries). • There would be some discernible lighting changes at the base of Sanctuary Hill associate with the connection to Hill Road.



Figure 7-42: Viewpoint 28 – direction A – Sanctuary Hill towards Ermington Boat Ramp (Photo: RPS)



Figure 7-43: Viewpoint 28 – direction A – Photomontage of bridge between Melrose Park to Wentworth Point with proposed development shown indicatively

7.28.2 Viewpoint 28 – Direction A (north) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is a recreational area with mobile receivers. • The view site is of state and national significance because of its association with the Sydney Olympics redevelopment. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is a in a landscape character type protected by local and state planning instruments. • There are urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Low magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Construction works associated with bridge between Melrose Park and Wentworth Point would be heavily screened in the view by the vegetation adjacent to the Parramatta River. • Construction works associated with the connection to Hill Road would also be heavily screened by vegetation at the base of Sanctuary Hill.	• The form and scale of the project at this location would be consistent with the scale of the surrounding landscape. • The works being conducted at the base of Sanctuary Hill would be screened by the existing retained vegetation • The view would not be impacted by shade or shadowing from the light rail alignment or light rail stops.	• The project would increase lighting in this location associated with the new bridge crossing over the river. • These would be increases in lighting associated with navigational requirements of the river ferries. • For the bridge, the lighting would only be associated with a small part of the horizon due to the angle of the view – as there would be other light elements in view the new bridge would add little additional light to the view. • For the works at the base of Sanctuary Hill there would be lighting changes visible in this space. • Lighting would be in accordance with the guidelines presented in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds.
Potential visual impact rating	Moderate-Low visual impact during construction	Moderate-Low visual impact during day time operation	Moderate-Low visual impact during night time operation

7.28.3 Viewpoint 28 – Direction B (south) – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	South
Direction:	View to Wentworth Point
Latitude and Longitude:	33° 49’ 30.48” S, 151° 04’ 27.49” E
LCZ(s) associated with viewpoint:	Wentworth Point – Hill Road (north of Bennelong Parkway)
Existing viewpoint description – refer Figure 7-44:	• Foreground open grasslands. • Woo-la-ra is visible on the right of the view. • Existing Wentworth Point development in left midground. • Parramatta River inlet obscured in the mid background. • Sydney Olympic Park area on the horizon line. • Little vegetation is evident in the view (except for the foreground).
Viewpoint impacts (day time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction. • Construction works and activities associated with the light rail alignment would be entirely screened in the view by the vegetation adjacent to Hill Road.
Viewpoint impacts (night time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.



Figure 7-44: Viewpoint 28 – direction B – Sanctuary Hill towards Sydney Olympic Park (Photo: RPS)

7.28.4 Viewpoint 28 – Direction B (south) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is a recreational area with mobile receivers. • The view site is of State and national significance because of its association with the Sydney Olympics redevelopment. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is a in a landscape character type protected by local and state planning instruments. • There are urban / non-natural elements throughout the view – for example the large overhead power structures on the horizon.		
Magnitude of change	Nil magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.
Potential visual impact rating	Nil visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.29 Viewpoint 29: Woo-la-ra

7.29.1 Viewpoint 29 – Direction A (north-east)- description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	North-east
Direction:	View to Sydney Olympic Park Ferry Wharf.
Latitude and Longitude:	33° 49’ 39.47” S, 151° 04’ 18.59” E
LCZ(s) associated with viewpoint:	Wentworth Point – Hill Road (north of Bennelong Parkway)
Existing viewpoint description – refer Figure 7-45:	• Foreground open grasslands. • Existing Wentworth Point development in view. • The streetscapes blocked by native vegetation.
Viewpoint impacts (day time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction. • Construction works and activities associated with the light rail alignment would be entirely screened in the view by the vegetation adjacent to Hill Road.
Viewpoint impacts (night time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.



Figure 7-45: Viewpoint 29 – direction A – Woo-la-ra towards Parramatta River (Photo: RPS)

7.29.2 Viewpoint 29 – Direction A (north-east) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from a recreational area with mobile receivers. • The view site is of state and national significance because of its association with the Sydney Olympics redevelopment. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is in a landscape character type protected by local and State planning instruments. • There are urban / non-natural elements throughout the view – for example the large buildings on the horizon.		
Magnitude of change	Nil magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.
Potential visual impact rating	Nil visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.29.3 Viewpoint 29 – Direction B (west) – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	West
Direction:	View west to Camellia and the Parramatta CBD
Latitude and Longitude:	33° 49’ 39.47” S, 151° 04’ 18.59” E
LCZ(s) associated with viewpoint:	N/A
Existing viewpoint description – refer Figure 7-46:	• Foreground open grasslands. • Newington Nature Reserve in midground. • Glimpses of the Parramatta River are evident in the midground behind the nature reserve. • Parramatta CBD is evident on the horizon. • Built elements evident throughout the view.
Viewpoint impacts (day time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.
Viewpoint impacts (night time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.



Figure 7-46: Viewpoint 29 – direction B – Woo-la-ra toward Camellia (Photo: RPS)

7.29.4 Viewpoint 29 – Direction B (west) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is from a recreational area with mobile receivers. • The view site is of State and national significance because of its association with the Sydney Olympics redevelopment. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is in a landscape character type protected by local and State planning instruments. • There are urban / non-natural elements throughout the view – for example the large buildings on the horizon.		
Magnitude of change	Nil magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.
Potential visual impact rating	Nil visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.29.5 Viewpoint 29 – Direction C (east)– description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	East
Direction:	View to Wentworth Point
Latitude and Longitude:	33° 49’ 39.47” S, 151° 04’ 18.59” E
LCZ(s) associated with viewpoint:	Wentworth Point – Hill Road (north of Bennelong Parkway)
Existing viewpoint description – refer Figure 7-47:	• Foreground open grasslands. • Existing Wentworth Point development in midground. • Vegetation in the midground blocks views to streetscapes.
Viewpoint impacts (day time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction. • Construction works and activities associated with the light rail alignment would be entirely screened in the view by the vegetation adjacent to the Hill Road.
Viewpoint impacts (night time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.



Figure 7-47: Viewpoint 29 – direction C – Woo-la-ra towards Rhodes (Photo: RPS)

7.29.6 Viewpoint 29 – Direction C (east) – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity		Moderate sensitivity	
	• The view is from a recreational area with mobile receivers. • The view site is of State and national significance because of its association with the Sydney Olympics redevelopment. • The views are valued and desirable because of the natural elements within the view (water, established vegetation, long views to the horizon). • The view is in a landscape character type protected by local and State planning instruments. • There are urban / non-natural elements throughout the view – being the residential buildings of Wentworth Point.		
Magnitude of Change	Nil magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.
Potential visual impact rating	Nil visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.30 Viewpoint 30: Hill Road at Woo-la-ra car park

7.30.1 Viewpoint 30 – description

Viewpoint description	
Precinct:	Wentworth Point
Heading (approximate):	North to north-east
Direction:	View northbound along Hill Road
Latitude and Longitude:	33° 49’ 47.79” S, 151° 04’ 19.05” E
LCZ(s) associated with viewpoint:	Wentworth Point – Hill Road (north of Bennelong Parkway)
Existing viewpoint description – refer Figure 7-48:	• Foreground is Hill Road. • Hill Road is long and linear, terminating past vegetation in the landscape. • Residential tower buildings block the horizon on the right of the picture. • Mature introduced vegetation is evident in streetscape both sides of Hill Road.
Viewpoint impacts (day time including construction impacts):	• Hill Road light rail stop with side platforms would be evident at the foreground of the view. • The new alignment of the light rail would be evident along the length of Hill Road inclusive of power and other associated infrastructure. • The car park at Woo-la-ra would be removed, with new trees provided. • The intersection at Stromboli Strait would be signalised to accommodate the light rail network. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-48: Viewpoint 30 – Hill Road at Woo-la-ra car park (Photo: RPS)

7.30.2 Viewpoint 30 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views in this area are from residential properties with static receivers from habitable rooms. • The view is within a highly urbanised setting consistent with the current LEP and other planning instruments. • The project would be in line with the desired landscape character of this environment.		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view • the scale of the construction activities would be highly present within the visual realm of receivers within close proximity during the course of construction.	• Residential receivers would be within close proximity of the change. • The project proposes changes within Hill Road to accommodate the new light rail and stop infrastructure. • The scale of the project in this location would be in keeping with the urbanised environment. • The project proposes to build on the existing high quality urban design finishes. • Planting would be introduced along Hill Road to provide a visual barrier to the light rail alignment. • There would be negligible shade or shadowing from the light rail and stop infrastructure in this location.	• The light rail and stop infrastructure would see an increase in lighting but the lighting levels would be in keeping with the existing landscape character as this is an urbanised environment. • Lighting would be in accordance with the guidelines presented in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. • Note that the introduction in lighting would provide safety benefits to road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate-Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.31 Viewpoint 31: Holker Busway

7.31.1 Viewpoint 31 – description

Viewpoint description	
Precinct:	Sydney Olympic Park
Heading (approximate):	South-east
Direction:	View south-east along Holker Busway
Latitude and Longitude:	33° 50’ 06.93” S, 151° 03’ 55.23” E
LCZ(s) associated with viewpoint:	Sydney Olympic Park – Holker Busway
Existing viewpoint description – refer Figure 7-49:	• Foreground is divided median road. • Native (non-remnant) vegetation is prolific in the view. • Street furniture is evident throughout the view. • Mature trees terminate the view in the mid ground.
Viewpoint impacts (day time including construction impacts):	• The intersection would be reconfigured to accommodate the light rail network. • The median would be removed and replaced with the new light rail stop at this location. • Vegetation removal would be evident through the road corridor.
Viewpoint impacts (night time including construction impacts):	• The project would increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-49: Viewpoint 31 – Holker Busway at Hill Road (Photo: RPS)

7.31.2 Viewpoint 31 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The area is currently used as a public transport corridor with bus stop.		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view. • The scale of the construction activities would be highly present within the visual realm of receivers within close proximity during the course of construction.	• The project proposes to upgrade the existing public transport corridor with infrastructure at a similar scale and mass to the existing. • The project proposes to build on the existing high quality urban design finishes. • There would be negligible shade or shadowing from the light rail and stop infrastructure in this location.	• The light rail and stop infrastructure would see an increase in lighting but the lighting levels would be in keeping with the existing landscape character as a public transport hub. • Lighting would be in accordance with the guidelines presented in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. • Note that the increase in lighting would provide benefits to safety of road users and customers using the project.
Potential visual impact rating	Moderate-Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.32 Viewpoint 32: Spiral Hill (Bay Marker)

7.32.1 Viewpoint 32 – description

Viewpoint description	
Precinct:	Sydney Olympic Park
Heading (approximate):	South-west
Direction:	View to Stadium Australia
Latitude and Longitude:	33° 50’ 10.07” S, 151° 04’ 31.38” E
LCZ(s) associated with viewpoint:	Sydney Olympic Park – Holker Busway
Existing viewpoint description – refer Figure 7-50:	• Foreground open grasslands. • Midground is dominated by vegetation. • Sydney Showground and Stadium Australia evident in the background.
Viewpoint impacts (day time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction. • Construction works and activities associated with the light rail alignment would be entirely screened in the view.
Viewpoint impacts (night time including construction impacts):	• Nil – The project would not be seen from this viewpoint in this direction.



Figure 7-50: Viewpoint 32 – Spiral Hill (Bay Marker) towards Australia Avenue (Photo: RPS)

7.32.2 Viewpoint 32 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is recreational area with mobile receivers. • The view site is a landscape recognisable at a local, State and national level. • The views are valued and desirable because of the natural elements within the view (established vegetation, long views to the horizon). • The view is in a landscape character type protected by local and State planning instruments. • There are urban / non-natural elements throughout the view – for example the stadiums within the view.		
Magnitude of change	Nil magnitude of change during construction	Nil magnitude of change during day time operation	Nil magnitude of change during night time operation
	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.	• Nil – The project would not be seen from this viewpoint in this direction.
Potential visual impact rating	Nil visual impact during construction	Nil visual impact during day time operation	Nil visual impact during night time operation

7.33 Viewpoint 33: Brickpit Ring Walk

7.33.1 Viewpoint 33 – description

Viewpoint description	
Precinct:	Sydney Olympic Park
Heading (approximate):	South-west
Direction:	View to Stadium Australia
Latitude and Longitude:	33° 50’ 28.08” S, 151° 04’ 21.58” E
LCZ(s) associated with viewpoint:	Sydney Olympic Park – Australia Avenue
Existing viewpoint description – refer Figure 7-51:	• Foreground is the Brickpit and the Brickpit Ring Walk. • Midground is dominated by vegetation. • Commercial buildings, Sydney Showground and Stadium Australia evident in the background.
Viewpoint impacts (day time including construction impacts):	• The light rail alignment would be evident, but highly screened behind the existing vegetation adjacent to Australia Avenue. • Construction works would be evident, but highly screened behind the existing vegetation adjacent to Australia Avenue.
Viewpoint impacts (night time including construction impacts):	• Lighting from the light rail alignment would be evident, but highly screened behind the existing vegetation adjacent to Australia Avenue.



Figure 7-51: Viewpoint 33 – Brickpit towards project alignment (Photo: RPS)

7.33.2 Viewpoint 33 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The view is a recreational area with mobile receivers • The view site is of State and national significance because of its association with the Sydney Olympics as well as its association with the conservation of Green and Golden Bell Frog. • The views are valued and desirable because of the distinctiveness of the landscape (being a rehabilitated brickpit). • The view is in a landscape character type protected by local and State planning instruments. • There are urban / non-natural elements throughout the view.		
Magnitude of change	Low magnitude of change during construction	Negligible magnitude of change during day time operation	Negligible magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the distance of this view. • The scale of the construction activities would be low within the landscape and field of view.	• The light rail would have little viewable field from the Brickpit given the screening provided by the existing mature planting adjacent to Australia Avenue. • There would be no shade or shadowing from the light rail alignment passing this location.	• The light rail alignment in this view field would see increase in lighting but in keeping with the urbanised environment of Sydney Olympic Park. • Note that the increase in lighting would provide safety benefits to road users and customers using the project. • Lighting would be in accordance with the guidelines presented in the National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds. • The Brickpit Ring Walk is only open during day light hours.
Potential visual impact rating	Moderate-Low visual impact during construction	Negligible visual impact during day time operation	Negligible visual impact during night time operation

7.34 Viewpoint 34: Jacaranda Square

7.34.1 Viewpoint 34 – description

Viewpoint description	
Precinct:	Sydney Olympic Park
Heading (approximate):	South-west
Direction:	View south-west along Dawn Fraser Avenue
Latitude and Longitude:	33° 50’ 45.78” S, 151° 04’ 16.97” E
LCZ(s) associated with viewpoint:	Sydney Olympic Park – Dawn Fraser Avenue
Existing viewpoint description – refer Figure 7-52:	• Foreground is dominated by street pavement. • Iconic vegetation (Jacarandas) throughout the view. • On-street car parking throughout the view. • Street furniture is evident throughout the view. • Views to background blocked by commercial buildings.
Viewpoint impacts (day time including construction impacts):	• Jacaranda Square light rail stop with side platforms would be evident at the foreground of the view. • Car parking and vehicle lanes would be removed and the roadway pedestrianised. • The trees planted within the parking bays (*Pyrus ussuriensis*) would be removed as part of the project. • Jacarandas would be retained on square side of the street. • Jacarandas on southern side of the street and line of tree in pavement would be removed at the extent of the proposed light rail stop. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would slightly increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-52: Viewpoint 34 – Jacaranda Square (Photo: RPS)

7.34.2 Viewpoint 34 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views in this area are from commercial and special purpose areas. • The view is within a highly urbanised setting consistent with the current LEP and other planning instruments. • The project would not be out of place in this environment.		
Magnitude of change	High magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be highly evident in the view. • The scale of the construction activities would overwhelm the visual realm of receivers within close proximity during the course of construction.	• The project proposes changes within the current streetscape to accommodate the new light rail and stop infrastructure. • The area would be pedestrianised improving the urban design outcome. • The scale of the project (including the light rail stop) is in keeping with the urbanised environment. • The project proposes to build on the existing high quality urban design finishes. • There would be negligible shade or shadowing from the light rail and stop infrastructure in this location.	• The light rail and stop infrastructure would see an increase in lighting but the lighting levels would be in keeping with this urbanised environment. • Note that the increase in lighting would provide safety benefits to pedestrians and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

7.35 Viewpoint 35: Stadium Australia

7.35.1 Viewpoint 35 – description

Viewpoint description	
Precinct:	Sydney Olympic Park
Heading (approximate):	North-east
Direction:	View north-east along Dawn Fraser Avenue
Latitude and Longitude:	33° 50' 54.37" S, 151° 03' 55.35" E
LCZ(s) associated with viewpoint:	Sydney Olympic Park – Dawn Fraser Avenue
Existing viewpoint description – refer Figure 7-53:	• Foreground is dominated by street pavement. • Iconic towers and artwork within the view. • Little vegetation within the centre of view. • Views to background blocked by train station and commercial buildings.
Viewpoint impacts (day time including construction impacts):	A photomontage of the Dawn Fraser Avenue light rail stop has been prepared from this viewpoint to assist in demonstrating the potential day time visual impacts – refer Figure 7-54. • The light rail alignment would traverse down the middle of this view. • Dawn Fraser Avenue light rail stop with side platforms would be evident at the midround of the view. • The trees planted within the parking bays *(Pyrus ussuriensis*) would be removed as part of the project. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would slightly increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-53: Viewpoint 35 – Dawn Fraser Avenue towards Olympic Park Station (Photo: RPS)



Figure 7-54: Viewpoint 35 – Photomontage of upgraded streetscape and new light rail stop - Dawn Fraser Avenue towards Olympic Park Station

7.35.2 Viewpoint 35 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Moderate sensitivity	Moderate sensitivity	Moderate sensitivity
	• The views in this area are from iconic and special purpose areas with special values to many in the community. • The view is within a highly urbanised setting consistent with the current LEP and other planning instruments. • The project would not be out of place in this environment.		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view. • The scale of the landscape in this area is large and expansive and the scale of the construction activities would feel like a moderate change to receivers.	• The project proposes changes within the current streetscape to accommodate the new light rail and stop infrastructure. • The scale of the project would be in keeping with the urbanised environment. • The project proposes to build on the existing high quality urban design finishes. • There would be negligible shade or shadowing from the light rail and stop infrastructure in this location. • The project proposes to have this section of the alignment wire free in order to mitigate visual impacts.	• The light rail and stop infrastructure would see an increase in lighting but the lighting levels would be in keeping with this urbanised environment. • Note that the increase in lighting would provide benefits to safety of pedestrians and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate visual impact during construction	Moderate-Low visual impact during day time operation	Moderate-Low visual impact during night time operation

7.36 Viewpoint 36: Uhrig Road

7.36.1 Viewpoint 36 – description

Viewpoint description	
Precinct:	Carter Street
Heading (approximate):	Northeast
Direction:	View north-east along Uhrig Road
Latitude and Longitude:	33° 51' 01.6194" S, 151° 03' 36.1701" E
LCZ(s) associated with viewpoint:	Carter Street precinct – Uhrig Road
Existing viewpoint description – refer Figure 7-55:	• Foreground is dominated by street pavement. • Limited vegetation in the view. • Current construction happening either side of the main alignment in this view. • On-street car parking throughout the view. • Street furniture is evident throughout the view. • Views to background blocked by Stadium Australia and commercial buildings.
Viewpoint impacts (day time including construction impacts):	• Carter Street stop with side platforms would be evident at the foreground of the view. • Car parking would be removed from the roadway. • Vegetation would be removed during construction with additional vegetation installed on both sides of the road corridor during construction. • Construction impacts would include safety fencing, traffic redirections, and movement of plant and machinery.
Viewpoint impacts (night time including construction impacts):	• The project would slightly increase lighting in this location associated with the new traffic intersection and the new light rail stop.



Figure 7-55: Viewpoint 36 – Uhrig Road (Photo: RPS)

7.36.2 Viewpoint 36 – assessment of potential visual impacts

Phase	Construction	Operation – day time	Operation – night time
Sensitivity	Low sensitivity	Low sensitivity	Low sensitivity
	• The views in this area are from areas not containing construction activities. • The view is within what is proposed to be a highly urbanised setting (approved, with construction underway). • The project would complement the desired future character of the view (being a highly urbanised and high density residential environment).		
Magnitude of change	Moderate magnitude of change during construction	Low magnitude of change during day time operation	Low magnitude of change during night time operation
	• Hoarding, vehicle movements and construction associated with the light rail alignment would be evident in the view. • The scale of the landscape in this area is large and expansive and the scale of the construction activities would feel like a moderate change to receivers in an environment where construction is already being undertaken.	• The project proposes changes within the current streetscape to accommodate the new light rail and stop infrastructure. • The scale of the project would be in line with the proposed landscape character. • The project proposes high quality urban design finishes. • The new light rail and stop infrastructure would not provide any additional shade impacts (noting the area would be heavily shaded by the proposed adjacent development works by others).	• The view would experience an increase in lighting levels but the levels proposed by the project would be in line with an urbanised environment. • Note that the increase in lighting would provide benefits to safety of road users and customers using Parramatta Light Rail Stage 2.
Potential visual impact rating	Moderate-Low visual impact during construction	Low visual impact during day time operation	Low visual impact during night time operation

Based on current planning proposals for the Carter Street precinct, the area's intended future character is proposed to be a high density residential (R4).

The operational visual impact, if it were to be assessed on the basis of future development in the area surrounding the view, would have a low magnitude of change and a low visual impact at day and night time.

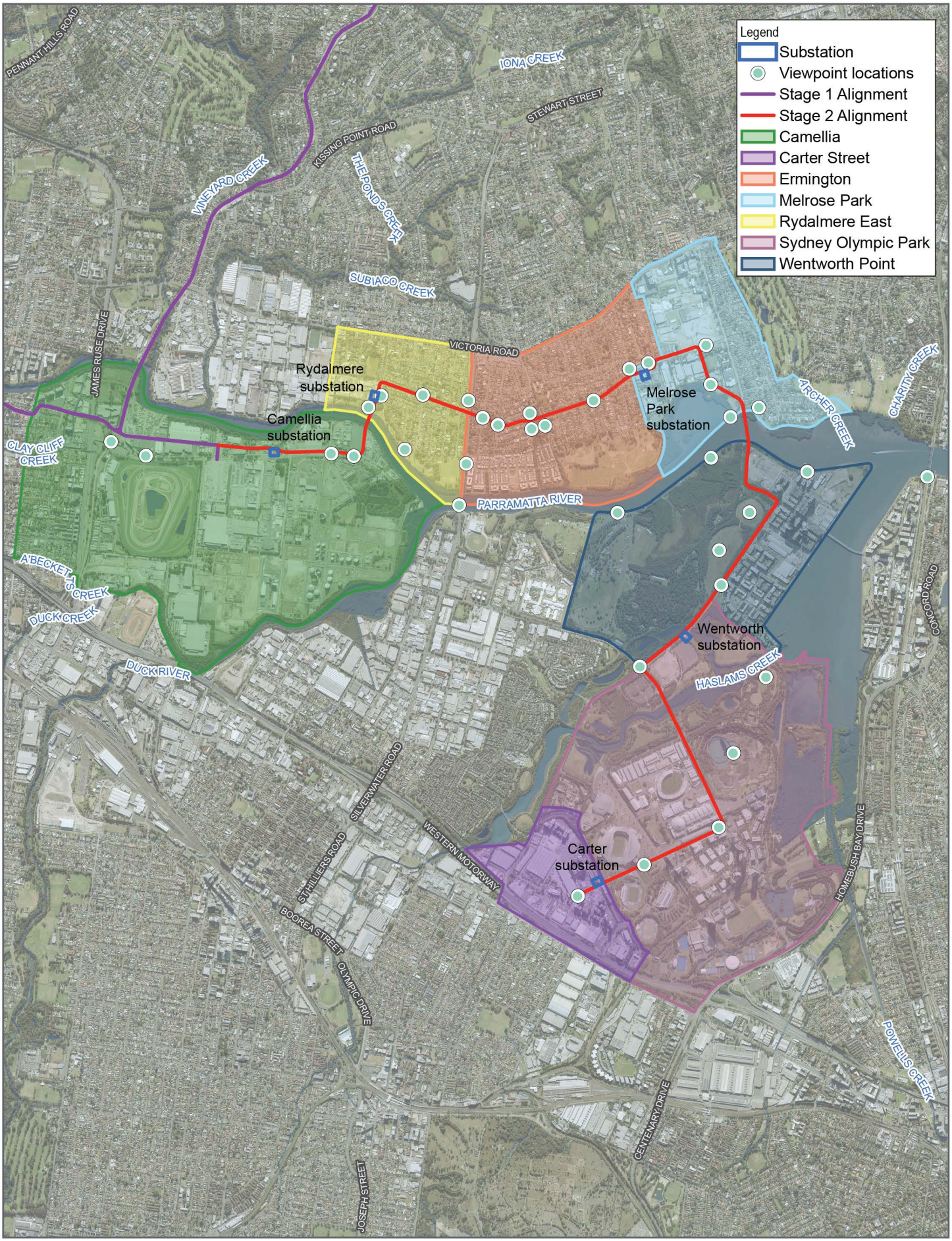
7.37 Other items requiring visual amenity consideration

7.37.1 Traction power substations

Five traction power substations (TPSs) are proposed to service the project (refer Figure 7-56). The final location and configuration are subject to the next stages of design. Table 7-1 provides a high level summary of the potential impact of each substation based on its approximate location.

Table 7-1: Traction power substation assessment

Code	Precinct and LCZ	Nearby viewpoints	Sensitivity	Magnitude of change	Overall potential visual impact rating
TPS A	Camellia – Grand Avenue	Nil	Low Sensitivity – this TPS site is proposed within an existing industrial landscape character type with few static receivers.	Low Magnitude of change - This TPS is proposed to be well screened from the north and the east. The scale of the TPS is in keeping with the scale of the existing landscape.	Low visual impact
TPS B	Rydalmere East – Eric Primrose Reserve and John Street	VP7	Low Sensitivity – this TPS site is proposed within an existing light industrial landscape character type with few static receivers.	Low Magnitude of change - This TPS is proposed to nestle into the topography to the western side of the bridge between Camellia to Rydalmere. The scale of the TPS is in keeping with the scale of the existing landscape surrounds and would be hidden from residential uses by the bridge abutment.	Low visual impact.
TPS C	Melrose Park – Atkins Road	VP18	Moderate Sensitivity – this TPS site is proposed within an existing light industrial landscape character type with few static receivers. The site is opposite the locally heritage listed Bulla Cream Dairy.	Low Magnitude of change - This TPS is proposed to nestle into the adjacent proposed residential developments (part of Melrose Park south). The scale of the structure would be dwarfed by the surrounding future proposed development.	Low-Moderate visual impact.
TPS D	Wentworth Point – Hill Road (south of Bennelong Parkway)	Nil	Low Sensitivity – this TPS site is proposed at the edge of the Hill Road corridor adjacent to the URBN SURF car park. There are no static receivers.	Low Magnitude of change - This TPS is proposed to be located with the shortest side facing the carriageway of Hill Road. The existing trees in the vicinity would be retained which would maintain the scale with the contact.	Low visual impact.
TPS E	Carter Street – Uhrig Road	VP36	Low Sensitivity – this TPS site is proposed at the edge of the Dawn Fraser Avenue, east of an existing car park., The intended landscape character drawn from the 2030 Sydney Olympic Park Masterplan is for the car park area to be changed to hotels, serviced apartments and commercial.	Low Magnitude of change - This TPS is proposed to be located with views screened by new vegetation east and existing vegetation west. The scale of the structure would be dwarfed by the surrounding development.	Low visual impact.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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MAKING COMPLEX EASY

Transport for NSW
Parramatta Light Rail Stage 2 EIS
Landscape and Visual Impact Assessment

Traction Power Substation Location

Project No. **12557728**
Revision No. **A**
Date **22/08/2022**

FIGURE 7-56

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Print date: 22 Aug 2022 - 13:00

Data source: Alignment - GHD2022; Precincts - DPIE2021, Suburb - DFSI2022, Stations - TfNSW2018; Road, Watercourse - NSWSS2022; Metromap Tile Service: extracted 22/08/2022. Created by: lmanasan

7.37.2 Radio communications

The project would require a radio system for reliable operation of the light rail system. The radio system for the project includes five to eight new TETRA radio system masts.

The mast heights of the radio towers would be between 12 and 25 metres. The diameters of the poles holding the radio system would be about 0.45 metres and the radio infrastructure at the top would have a radius of up to 2.8 metres.

The size and height of these radio masts mean that in multi-storey residential and industrial environment these towers would likely pose a lower visual impact due to the relative scale of the towers. In residential and open space environments the radio masts would pose a higher visual impact than in multi-story residential and industrial environments, as the radio masts would appear out of scale with the existing environments in these landscape character types.

In summary, radio masts located in the following precincts are more likely to have a higher visual impact due to the scale difference the radio mast would have to the surrounding environment:

- Rydalmere
- Ermington
- Melrose Park.

For Melrose Park; the radio masts would be in scale for the future intended character of the master plan proposal in this precinct.

Given the final quantity and location of the radio masts is still to be confirmed, mitigation measures have been recommended to inform the future sighting of these items so that they are sympathetic to the local environment in which they are placed.

7.38 Summary of potential visual impacts from viewpoints

Table 7-2 provides a summary of the assessment for potential visual impacts across all 36 viewpoints.

Table 7-2: Summary of potential visual impacts

Viewpoint	Name	Sensitivity	Magnitude of Change – Const.	Visual Impact – Const.	Magnitude of Change – Day time	Visual Impact – Day time	Magnitude of Change – Night time	Visual Impact – Night time
VPN01	**Grand Avenue Overpass, Camellia**	Low sensitivity	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact
VPN02	**Grand Avenue Camellia**	Moderate sensitivity	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact
VPN03	**Grand Avenue at Thackeray Street Camellia**	Low sensitivity	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN04	**14 Grand Avenue, Camellia**	Low sensitivity	Low magnitude of change	Low visual impact	Moderate magnitude of change	Moderate-Low visual impact	Moderate magnitude of change	Moderate-Low visual impact
VPN05	**Rydalmere Wharf**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN06	**Eric Primrose Reserve**	Moderate sensitivity	Negligible magnitude of change	Negligible visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact
VPN07	**South Street at John Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact

Viewpoint	Name	Sensitivity	Magnitude of Change – Const.	Visual Impact – Const.	Magnitude of Change – Day time	Visual Impact – Day time	Magnitude of Change – Night time	Visual Impact – Night time
VPN08	**South Street at Nowill Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN09	**Silverwater Bridge over Parramatta River**	Low sensitivity	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN10	**Silverwater Road – Northbound**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN11	**Silverwater Road – Southbound**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN12A	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN12B	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	High magnitude of change	High-Moderate visual impact	High magnitude of change	High-Moderate visual impact
VPN13	**Hilder Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	Moderate magnitude of change	Moderate visual impact	High magnitude of change	High-Moderate visual impact
VPN14	**Tristram Street, Ermington**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact
VPN15	**Heysen Avenue, Ermington**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact

Viewpoint	Name	Sensitivity	Magnitude of Change – Const.	Visual Impact – Const.	Magnitude of Change – Day time	Visual Impact – Day time	Magnitude of Change – Night time	Visual Impact – Night time
VPN16	**Broadoaks Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN17	**Boronia Street at Murdoch Street, Ermington**	Moderate sensitivity	High magnitude of change	High-moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN18	**Boronia Street at Atkins Road, Ermington**	Moderate sensitivity	High magnitude of change	High-moderate visual impact	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact
VPN19	**Hope Street at Bulla Cream Dairy**	High sensitivity	High magnitude of change	High visual impact	Moderate magnitude of change	High-Moderate visual impact	Moderate magnitude of change	High-Moderate visual impact
VPN20	**Hope Street at Waratah Street, Ermington**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN21	**Waratah Street, Melrose Park**	Low sensitivity	High magnitude of change	Moderate visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN22	**Ermington Boat Ramp**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact	High magnitude of change	High -Moderate visual impact	High magnitude of change	High-Moderate visual impact
VPN23	**Melrose Park Playground**	Moderate sensitivity	Low magnitude of change	Moderate-Low visual impact	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact
VPN24	**River Walk**	Moderate sensitivity	Low magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-Low visual impact

Viewpoint	Name	Sensitivity	Magnitude of Change – Const.	Visual Impact – Const.	Magnitude of Change – Day time	Visual Impact – Day time	Magnitude of Change – Night time	Visual Impact – Night time
VPN25	**Sydney Olympic Park Ferry Wharf**	Moderate sensitivity	Moderate magnitude of change	Moderate visual impact	Moderate magnitude of change	Moderate visual impact	Negligible magnitude of change	Negligible visual impact
VPN26	**John Whitton Reserve**	Moderate sensitivity	Low magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-Low visual impact	Negligible magnitude of change	Negligible visual impact
VPN27	**Newington Armory Wharf**	Moderate sensitivity	Low magnitude of change	Moderate-Low visual impact	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact
VPN28a	**Sanctuary Hill**	Moderate sensitivity	Low magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-low visual impact	Low magnitude of change	Moderate-Low visual impact
VPN28b	**Sanctuary Hill**	Moderate sensitivity	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact
VPN29a	**Woo-la-ra**	Moderate sensitivity	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact
VPN29b	**Woo-la-ra**	Moderate sensitivity	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact
VPN29c	**Woo-la-ra**	Moderate sensitivity	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact
VPN30	**Hill Road at Woo-la-ra car park**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN31	**Holker Busway**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN32	**Spiral Hill (Bay Marker)**	Moderate sensitivity	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact	Nil magnitude of change	Nil visual impact

Viewpoint	Name	Sensitivity	Magnitude of Change – Const.	Visual Impact – Const.	Magnitude of Change – Day time	Visual Impact – Day time	Magnitude of Change – Night time	Visual Impact – Night time
VPN33	**Brickpit Ring Walk**	Moderate sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Negligible magnitude of change	Negligible visual impact	Negligible magnitude of change	Negligible visual impact
VPN34	**Jacaranda Square**	Low sensitivity	High magnitude of change	Moderate visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact
VPN35	**Stadium Australia**	Moderate sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-Low visual impact	Low magnitude of change	Moderate-Low visual impact
VPN36	**Uhrig Road**	Low sensitivity	Moderate magnitude of change	Moderate-Low visual impact	Low magnitude of change	Low visual impact	Low magnitude of change	Low visual impact

In summary:

- the 13 viewpoints listed in Table 7-3 would have potentially moderate or higher visual impacts during construction
- the six viewpoints listed in Table 7-4 would have potentially moderate or higher visual impacts during day time operation
- the six viewpoints listed in Table 7-5 would have potentially moderate or higher visual impacts during night time operation.

The key drivers for the higher rated visual impacts for the viewpoints across the project during construction include:

- construction works being a juxtaposition to existing landscape setting within viewpoint
- construction works at proximity to residents
- construction works at proximity to residents in areas of highly valued landscape type (open space) or heritage listed sites/conservation areas.
- construction works at proximity to areas of highly valued landscape type (e.g. open space)
- construction works at close proximity to customers using Olympic Park Station.

The key drivers for the higher rated visual impacts for the viewpoints across the project during day time operation include:

- change of scale in the landscape in area of highly valued landscape setting (open space)
- changes in streetscape environments at close proximity to residents
- change of land use type in areas of highly valued landscape setting (open space)
- change of land use type in area of moderately valued landscape setting (heritage place).

The key drivers for the higher rated visual impacts for the viewpoints across the project during night time operation include:

- changes in lighting over and around the Parramatta River
- proximity of residents to increases in lighting associated with the operation of the project.

Table 7-3: Viewpoints with higher than moderate visual impact rating – construction

Viewpoint	Name	Sensitivity	Magnitude of Change – Construction	Visual Impact – Construction
VPN05	**Rydalmere Wharf**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact
VPN07	**South Street at John Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact
VPN08	**South Street at Nowill Street, Rydalmere**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact
VPN12A	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact
VPN12B	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High- Moderate visual impact
VPN13	**Hilder Road, Ermington**	Moderate sensitivity	High magnitude of change	High Moderate visual impact
VPN14	**Tristram Street, Ermington**	High sensitivity	High magnitude of change	High visual impact
VPN15	**Heysen Avenue, Ermington**	High sensitivity	High magnitude of change	High visual impact
VPN16	**Broadoaks Street, Rydalmere**	High sensitivity	High magnitude of change	High visual impact
VPN17	**Boronia Street at Murdoch Street, Ermington**	Moderate sensitivity	High magnitude of change	High-moderate visual impact
VPN18	**Boronia Street at Atkins Road, Ermington**	Moderate sensitivity	High magnitude of change	High-moderate visual impact
VPN19	**Hope Street at Bulla Cream Dairy**	High sensitivity	High magnitude of change	High visual impact
VPN22	**Ermington Boat Ramp**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact

Table 7-4: Viewpoints with higher than moderate visual impact rating during operation – day time

Viewpoint	Name	Sensitivity	Magnitude of Change – Day time	Visual Impact – Day time
VPN05	**Rydalmere Wharf**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact
VPN12B	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact
VPN14	**Tristram Street, Ermington**	High sensitivity	Moderate magnitude of change	High-Moderate visual impact
VPN15	**Heysen Avenue, Ermington**	High sensitivity	Moderate magnitude of change	High-moderate visual impact
VPN19	**Hope Street at Bulla Cream Dairy**	High sensitivity	Moderate magnitude of change	High-Moderate visual impact
VPN22	**Ermington Boat Ramp**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact

Table 7-5: Viewpoints with higher than moderate visual impact rating – night time operation

Viewpoint	Name	Sensitivity	Magnitude of Change – Night time	Visual Impact – Night time
VPN12B	**South Street at River Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact
VPN13	**Hilder Road, Ermington**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact
VPN14	**Tristram Street, Ermington**	High sensitivity	Moderate magnitude of change	High-Moderate visual impact
VPN15	**Heysen Avenue, Ermington**	High sensitivity	Moderate magnitude of change	High-Moderate visual impact
VPN19	**Hope Street at Bulla Cream Dairy**	High sensitivity	Moderate magnitude of change	High-Moderate visual impact
VPN22	**Ermington Boat Ramp**	Moderate sensitivity	High magnitude of change	High-Moderate visual impact

7.39 Cumulative impacts

A cumulative impact is the “consideration of the result of the incremental impact of the proposal when added to other past, current and known likely future activity” (Transport for NSW - Centre for Urban Design, 2020).

The planning proposals and approvals for various development sites along the project alignment provide a context for the basis of the cumulative impact review. Table 7-6 provides an assessment of magnitude of change for past, current and known likely future activities:

Table 7-6: Magnitude of change - potential cumulative impacts

Adjacent development	Magnitude of change potential cumulative impacts: During construction of the project	Magnitude of change potential cumulative impacts: During operation of the project
Draft Camellia-Rosehill Place Strategy	Low magnitude of change – There are only small amounts of project work proposed adjacent to the interface with the Draft Camellia-Rosehill Place Strategy with large parts of the interface with the future town centre being constructed as part of Parramatta Light Rail Stage 1.	Negligible magnitude of change - The Draft Camellia-Rosehill Place Strategy considers the presence of the project therefore there would be negligible impact as this is part of proposed future development.
Melrose North precinct	Moderate magnitude of change – There are construction works associated with the Melrose North precinct currently being undertaken adjacent to the project site. The proposed scope of construction works for both projects combined would result in a moderate magnitude of change in views near the juncture of these two projects.	Negligible magnitude of change - The Melrose North precinct master plan considers the presence of the project therefore there would be negligible impact as this is part of proposed future development.
Melrose South precinct	Moderate magnitude of change – There is a likely chance that the construction programs for both Melrose South precinct and the project would be concurrent. The proposed scope of construction works for both projects combined would result in a moderate magnitude of change in views near the juncture of these two projects.	Negligible magnitude of change - The Melrose South precinct master plan considers the presence of the project therefore there would be negligible impact as this is part of proposed future development.
Sanctuary Wentworth Point, Wentworth Point	Moderate magnitude of change – There is a likely chance that the construction programs for parts of Sanctuary Wentworth Point and the project would be concurrent. The proposed scope of construction works for both projects combined would result in a moderate magnitude of change in views near the juncture of these two projects.	Low magnitude of change - An interface with the project was integrated with iterations of the Sanctuary Wentworth Point master plan. The subsequent relocation of the project alignment to south of Sanctuary Wentworth Point would result in low operational cumulative magnitude of change at the juncture of these two projects.
37-39 Hill Road, Wentworth Point	Moderate magnitude of change – There is a likely chance that the construction programs for parts of the Hill Road development and the project would be concurrent. The proposed scope of construction works for both projects combined would result in a moderate magnitude of change in views near the juncture of these two projects.	Low magnitude of change - The project alignment would be divided away by the Streetscape in the Hill Road road reserve. As a result, there would be low operational cumulative magnitude of change at the juncture of these two projects.
Sydney Metro West	Moderate magnitude of change – The large scale nature of construction for both the project and Sydney Metro West	Low magnitude of change – Sydney Metro West proposes an underground rail system with a station

Adjacent development	Magnitude of change potential cumulative impacts: During construction of the project	Magnitude of change potential cumulative impacts: During operation of the project
	may result in moderate magnitude of change in views near the juncture of these two projects.	entry proposed near the project site at Sydney Olympic Park and the Parramatta CBD – as such the resultant operational cumulative magnitude of change at the juncture of these two projects would be low.
Carter Street Precinct master plan.	Moderate magnitude of change – The concentration of construction activities if the implementation of the Carter Street Precinct Masterplan and the construction of the Carter Street light rail stop were concurrent may result in moderate magnitude of change in views.	Negligible magnitude of change - The Carter Street Precinct Master Plan considers the presence of the project therefore there would be negligible impact as this is part of proposed future development.

8 LANDSCAPE CHARACTER AND VISUAL IMPACT MITIGATION STRATEGY

Mitigation measures to manage and minimise the potential visual impacts have been identified based on the findings in this report (see Table 8-1 and sections 0 to 8.3). Mitigation measures, where not already provisioned by the project design, are proposed in response to impact assessment ratings of moderate or above, to help further reduce the visual impacts of the project during the construction and operational stages.

Design recommendations have been made with the aim of meeting the key urban design and landscape objectives as outlined in Technical Paper 1 (Design, Place and Movement) and maintaining the current design considerations relating to mitigating visual amenity.

8.1 Recommended mitigation measures

Table 8-1: Recommended mitigation measures

Landscape and visual impacts	
Design	
Minimising visual impacts	The urban design requirements will be finalised in accordance with the vision, principles and outcomes defined in Technical Paper 1 (Design, Place and Movement), to provide detailed urban design guidelines and key requirements for the project, including individual design elements. The urban design requirements will be finalised in consultation with key stakeholders, the operator, the rail regulator, and the Design Review Panel.
	Design development will be undertaken in accordance with the urban design requirements and with advice from the Design Review Panel.
Managing impacts to trees	A tree register will be prepared by a qualified arborist to identify all trees with the potential to be impacted by the project, and the proposed impacts to trees, including: • definitions of tree and canopy • definition of what constitutes an impact (generally more than minor crown or root pruning of more than 10 per cent) • location of each tree • tree values and condition • where a tree requires removal, whether, in the opinion of the arborist, it can be successfully transplanted • the extent of the proposed impact (complete removal or extent of pruning).
	The design will continue to be refined to avoid or minimise impacts on trees identified by the tree register, and will include consideration of options to reduce impacts on trees, including: • operational requirements in relation to tree locations • adjustments to the design to avoid impacting trees (such as opportunities for localised narrowing of footpaths, use of porous pavement) • reduction in the standard offset distances required for underground services • consideration of the health of each tree, including its vigour and likely ability to survive in situ pruning or transplanting.
	A Tree Offset Strategy will be developed to offset the loss of trees and achieve a net increase in tree canopy. The strategy will define and identify: • how impacts on trees will be offset • locations for replacement trees • species and trees sizes to ensure a mix of species and a range of mature heights to provide visual diversity as appropriate to proposed planting locations • requirements for monitoring and maintenance.

Landscape and visual impacts	
	The strategy will be developed in consultation with City of Parramatta Council, City of Ryde Council and Sydney Olympic Park Authority.
Light spill	Lighting will be designed and sited to minimise glare and light spill into adjoining areas in accordance with Australian/New Zealand *AS/NZS 4282–2019 Control of the obtrusive effects of outdoor lighting* and relevant Australian standards in the series *AS/NZS 1158:2005 Lighting for roads and public spaces.*
Construction	
Managing impacts to trees	Construction planning will demonstrate consideration of all practicable options to avoid or minimise impacts on trees, including: • review of the construction methodology and layout of work sites, compounds, ancillary infrastructure and fencing • consideration of alternative construction methods. Trees to be retained and trees with the potential to be impacted during construction, will be protected prior to the commencement of construction in accordance with Australian Standard *AS 4970-2009 Protection of trees on development sites.*
	Any tree pruning that is more than minor will be undertaken by a qualified arborist in accordance with *AS 4373-2007 Pruning of amenity trees*.
Construction site management	Construction site hoarding and fencing will be designed, erected and maintained to minimise potential visual impacts. This will include: • erecting hoarding/fencing as early as possible in the site establishment phase to provide visual screening • using high quality materials suitable for parks and public spaces where sites are located close to sensitive receivers and public open space • featuring graphics, artwork or project information at appropriate locations in consultation with Transport for NSW • maintaining hoarding/fencing regularly, including the prompt removal of graffiti.
	Lighting of work areas, compounds, and work sites will be oriented to minimise glare and light spill impact on adjacent receivers.
Site restoration and rehabilitation	Following completion of construction, site restoration will be undertaken in accordance with the rehabilitation strategy (refer EIS Chapter 13 (Land use and property)). Temporary impacts on public open space will be rehabilitated in consultation with the relevant local council or Sydney Olympic Park Authority.
	Early planting and revegetation works will be undertaken where practicable to provide a screening buffer that has time to mature before the project is operational.
	Construction programming will provide for the progressive rehabilitation of disturbed areas as far as practicable, to minimise the duration and extent of temporary visual and landscape character impacts.

8.2 General design recommendations

8.2.1 Designing with Country

This visual impact assessment is positioned to commentate on the visual impacts as drawn from specific planning literature and documentation. The values drawn from these documents encompass a wide range of voices and views distilled through the lens of legislative requirements.

Transport for NSW is committed to embedded Country-led collaboration and design into the ongoing development of the project, embracing an Aboriginal co-design approach to deliver positive community and place-making benefits.

To maximise the visual amenity outcomes for Country the following measure are recommended:

- a formal review of the visual amenity assessment through the lens of Country through the co-design approach. This should include information sessions for participants of this approach on the mechanics of visual impact assessment
- review potential contributions that the co-design process may have on design development, landscape treatments including plant selections, integration of wayfinding signage, heritage interpretation and public art. This may include workshopping with the design team, walking on Country and other means to facilitate the Designing with Country process
- review the impacts of the Country-led approach design outcomes on the visual impact in relation to the standing legislative frameworks
- feedback of the recommendation of the above into the design iteration process.

8.2.2 Design for Greener Places

As noted in Section 5 the project proposes to increase the urban tree canopy cover in the areas around the project. In order to maximise the visual amenity outcomes of the following design recommendations are made to align to the *Design for Greener Places* requirements:

- ensure the proposed plant species are in keeping with the landscape character of the area in which they are being planted (for example: native species in remnant corridors, riverine species adjacent to waterways)
- maximise canopy cover to produce share (a desirable element for landscape amenity)
- tree and vegetation placement to maintain desirable view lines and screen less desired view lines.

8.3 Element specific design recommendations

The following element specific design recommendations are proposed to support the recommended mitigation measures and the general design recommendations.

These element-specific recommendations provide guidance to further mitigate potential landscape character and visual impacts associated with the next stages of design where this assessment has found that those elements have greater than moderate impacts.

8.3.1 Light rail stops

8.3.1.1 John Street light rail stop

The iterative design process of the area around John Street light rail stop should consider:

- the use of vegetated batter in lieu of retaining walls to mitigate the visual impacts of the change in level on John Street
- the location of vegetation to screen views from habitable spaces of residences on John Street
- the linear views down John Street to the Parramatta River and how that view could be funnelled to the east of the alignment.

8.3.1.2 Nowill Street light rail stop

The iterative design process of the area near Nowill Street light rail stop should consider:

- how the final location of stop shelters, signage and other infrastructure could be seen from habitable areas of adjacent residences
- final materials that would be unobtrusive in the streetscape environment
- the location of vegetation within the landscape to screen any obtrusive stop or alignment infrastructure.

8.3.1.3 River Road light rail stop

The iterative design process of the area near River Road light rail stop should consider:

- how to maintain the soft green nature of the corridor
- the use of permeable track form through the greenspace
- limiting the overhead power requirements through the corridor including undergrounding of existing power infrastructure
- how to maintain the linear nature of the corridor without compromising the amenity of exposing the individual elements within the stop; this might be achieved through the strategic position of tree canopies within the view line.

8.3.1.4 Murdoch Street light rail stop

The iterative design process of the area near Murdoch Street light rail stop should consider:

- how the final location of stop shelters, signage and other infrastructure could be seen from habitable areas of adjacent residences
- final materials that would be unobtrusive in the streetscape environment
- the location vegetation within the landscape to screen any obtrusive stop or alignment infrastructure.

8.3.1.5 Atkins Road light rail stop

The iterative design process of the area adjacent to Atkins Road light rail stop and the Bulla Cream Dairy (Willowmere) should consider:

- how the scale, form, materials, and landscape elements of the project would best compliment the landscape character of the area around the retained 1920s Californian bungalow Main House
- how the final location of stop shelters, signage and other infrastructure could be seen from habitable areas of adjacent residences
- final materials that would be unobtrusive in the streetscape environment
- the location of vegetation within the landscape to screen any obtrusive stop or alignment infrastructure.

8.3.2 Bridges

8.3.2.1 Bridge between Camellia and Rydalmere

The iterative design process for the bridge between Camellia to Rydalmere should consider:

- how the bridge pier locations and the final massing of the bridge structure would frame the landscape from viewing points along the foreshore near Rydalmere Wharf
- the impact of pier location on views up and down the river, with reference to how people would view and experience the open spaces of Eric Primrose Reserve

- bridge form and materials to complement the existing landscape characters
- how the embankment of the bridge abutments would be treated, and the type of landscape character changes these embankments are having in the precinct; consideration may be given to vegetated embankments more in keeping with the current green landscape character.
- whether the bridge piers could provide artistic or landmark type structures in the landscape; that is celebrate the changes in the landscape instead of minimising the perceived visual impact.

8.3.2.2 Bridge between Melrose Park and Wentworth Point

The iterative design process of the bridge between Melrose Park and Wentworth Point should consider:

- how the bridge pier locations and the final massing of the bridge structure would frame the landscape from viewing points along the foreshore around Melrose Park
- bridge form and materials to complement the existing landscape characters
- whether the bridge piers could provide artistic or landmark type structures in the landscape; that is celebrate the changes in the landscape instead of minimising the perceived visual impact
- how the embankment of the bridge abutments would be treated and the type of landscape character changes these embankments are having in the precinct; consideration may be given to vegetated embankments more in keeping with the current green landscape character.
- what the resultant cumulative impacts of the bridge are with the existing overhead power located in the area.

8.3.3 Public open space

8.3.3.1 Ken Newman Park

The final outcomes for Ken Newman Park are subject to discussions between parties at several levels of government pertaining to the refurbishment of the park during the design and construction process. This process would potentially result in changes to the assessed level of magnitude.

The iterative design process of Ken Newman Park should consider:

- what design features could be included to mitigate the scale of the development within the Ken Newman Park open space, minimising changes to, or complimenting the current landscape character
- leveraging the broader green space of Ken Newman Park to offset the changes in landscape character throughout the Park
- if additional vegetative screening on Tristram Street could screen views from habitable rooms on Tristram Street
- the use of permeable track through Ken Newman Park
- what form the rest of Ken Newman Park might take through a master planning process for the entirety of the parkland
- how the removal of trees adjacent to the drainage gully might open up some desirable or non-desirable views to beyond the space
- limiting the overhead power requirements through Ken Newman Park
- how to maintain and frame the existing views to the Sydney Olympic Park
- vegetative screening on Heysen Avenue which could screen views from habitable rooms
- how the lower embankment of the earthworks for the track alignment are treated to maintain visual amenity; for example, soft landscape in preference to retaining walls.

8.3.3.2 Ken Newman Park – park land easement east of Hilder Road

The iterative design process of the light rail alignment through the park land easement east of at Hilder Road should consider:

- how to maintain the soft green nature of the park land easement east of at Hilder Road
- the use of permeable track form through the park land easement east of at Hilder Road
- limiting the overhead power requirements through the park land easement east of at Hilder Road
- how to maintain and frame the existing views to the Sydney Olympic Park.

8.3.4 Streetscapes

8.3.4.1 South Street at River Road

The iterative design process of the light rail alignment on South Street near Silverwater Road should consider:

- how the configuration of the driveway accesses could be designed to communicate the desired use of the space without large and obtrusive interventions in the landscape
- how the materials of hardstand areas might be used to reduce the visual field, for example the use of multiple materials might break up larger spaces
- the location of vegetation within the landscape to reduce the perceived width of the alignment.

8.3.4.2 Broadoaks Street

The iterative design process of the light rail alignment near the intersection of Boronia and Broadoaks streets should consider:

- how the removal of trees might open opportunities to frame views into Ken Newman Park
- how views to less desired elements of the project could be screened; for example, through strategic location of vegetive screening
- the sympathetic design of the retaining wall systems in this area of the project to minimise the visual impact associated with the change in level – this might include a review of how materials used for the retaining system could be used to appropriately mitigate visual impacts
- how revegetation adjacent the bridge in Ken Newman Park could mitigate its visual impact.

8.3.4.3 Hill Road alignment

The iterative design process of the light rail alignment along Hill Road should consider:

- how the light rail alignment would interface and be screened from the wetlands
- how the light rail alignment would interface and blend with the parkland.

8.3.5 Overhead wiring

Overhead wiring is proposed to encompass the length of the trackway. Consideration should be given to reviewing where overhead wiring could be removed to improve visual outcomes with a focus in descending order on the following locations:

- within residential areas with single or two storey building stock, with dual facing residences – Boronia Street
- within Ken Newman Park

- within residential areas with single or two storey building stock, with single facing residences including Boronia Street, Hope Street, South Street, John Street and around Hughes Avenue (Main House at the Bulla Cream Dairy (Willowmere))
- on the bridge between Camellia and Rydalmere
- on the bridge between Melrose Park and Wentworth Point
- other locations, where possible.

The locations above are put in descending order based on the scale of the potential improvements that the removal of overhead wiring would have in each of those zones.

8.3.6 Traction power substations

The current locations of the five traction power substations for the project are noted as have low or moderate low impacts. A number of measures that should be considered during the next stages of design include:

- screening of the traction power substation units from sensitive views
- colours and materials for the screen treatment of the traction power substation units are to be in keeping with those found in the landscape character zones, or those character elements proposed by the intended landscape character of the zones – this may include provision for using green walls as a potential solution for screening.
- access pathway and easements are built using colours and materials in line with the landscape character zones, or those character elements proposed by the intended landscape character of the zones
- signage related to the traction power substation units is fit for purpose, in line with appropriate Australian Standard, but in keeping with the current or intended character of the surrounding landscape.

8.3.7 Radio communications

The locations of the radio communication towers would be determined during the next stages of design. The following measures should be considered as the design progresses:

- the selected colours of the mastheads should be in line with required safety standards but also be sympathetic to views in and around the viewable locations
- the final locations should be determined such that the masts are not located on prominent view lines or vistas.

8.3.8 Ancillary light rail infrastructure

Ancillary light rail infrastructure includes items such as:

- overhead wires
- traffic signals
- light rail signals
- buffer stops
- screens
- fencing.

The details of the ancillary light rail infrastructure would be determined during the next stages of design. The following measures should be considered as the design progresses:

- the final organisation of the overhead wiring system to minimise visual impacts along the project alignment
- materiality of screens and fencing to be in keeping with LCZs and to reduce visual impacts

- the location of light rail signals, traffic signals and buffer stops adjacent to, and in close proximity to, habitable spaces.

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Appendix B – Arboricultural Report

Appendix B Arboricultural Report

Parramatta Light Rail Stage 2

Transport for NSW

November 2022



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Glossary and abbreviations

Acronyms	Name
BC Act	*Biodiversity and Conservation Act 2016* (NSW)
DBH	Diameter at Breast Height
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Cth)
DCP	Development Control Plan
DPE	Department of Planning and Environment (NSW)
DRC	Diameter of leader above root crown
EIS	Environmental impact statement
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
GIS	Geographic information system
km	Kilometre
m	Metre
MNES	Matters of National Environmental Significance
NSW	New South Wales
SRZ	Structural Root Zone
SULE	Safe Useful Life Expectancy
TBDC	Threatened Biodiversity Data Collection
TEC	Threatened Ecological Community
TPZ	Theoretical Tree Protection Zone
Transport for NSW	Transport for NSW is the lead agency of the NSW Transport cluster.

1. Introduction

1.1 Parramatta Light Rail

The NSW Government's Greater Sydney Region Plan *A Metropolis of Three Cities* (Greater Sydney Commission, 2018) outlines a vision for a three-city metropolis. The Central River City covers the four local government areas of the City of Parramatta, Blacktown City, Cumberland City and The Hills Shire. *A Metropolis of Three Cities* highlights Greater Parramatta as the focal point for the Central River City, with employment growth and public transport being of key importance.

The Greater Parramatta and the Olympic Peninsula area (GPOP), which extends from Westmead and Parramatta in the west to Sydney Olympic Park to the east, is fast emerging as the heart of Sydney's Central River City and is set to grow and change significantly over the next 20 years. Forecasts predict that GPOP will accommodate almost 170,000 new residents by 2041. Employment opportunities will also grow, with an additional 100,000 jobs predicted by 2041 (SGS, 2017).

Parramatta Light Rail will deliver an integrated light rail service that supports the population and employment growth expected throughout GPOP. It will integrate with existing and future modes of transport, including buses, trains, ferries and active transport (pedestrian and cycle networks), as well as Sydney Metro West services and the existing road network.

Parramatta Light Rail will be delivered in stages to keep pace with development:

– Stage 1 will connect Westmead to Carlingford via the Parramatta central business district (CBD) and Camellia. The construction and operation of Parramatta Light Rail Stage 1 was approved by the NSW Minister for Planning in May 2018. Major construction is underway, with the track installation complete and light rail stop construction in progress. Stage 1 is expected to start operating in 2024. Further information on Stage 1 is available at **Parramatta Light Rail**
– Transport for NSW is now proposing to construct and operate Stage 2 of Parramatta Light Rail ('the project'). Stage 2 would connect the Parramatta CBD and Stage 1 to Camellia, Rydalmere, Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park.

Figure 1.1 provides an overview of Parramatta Light Rail network showing both stages.

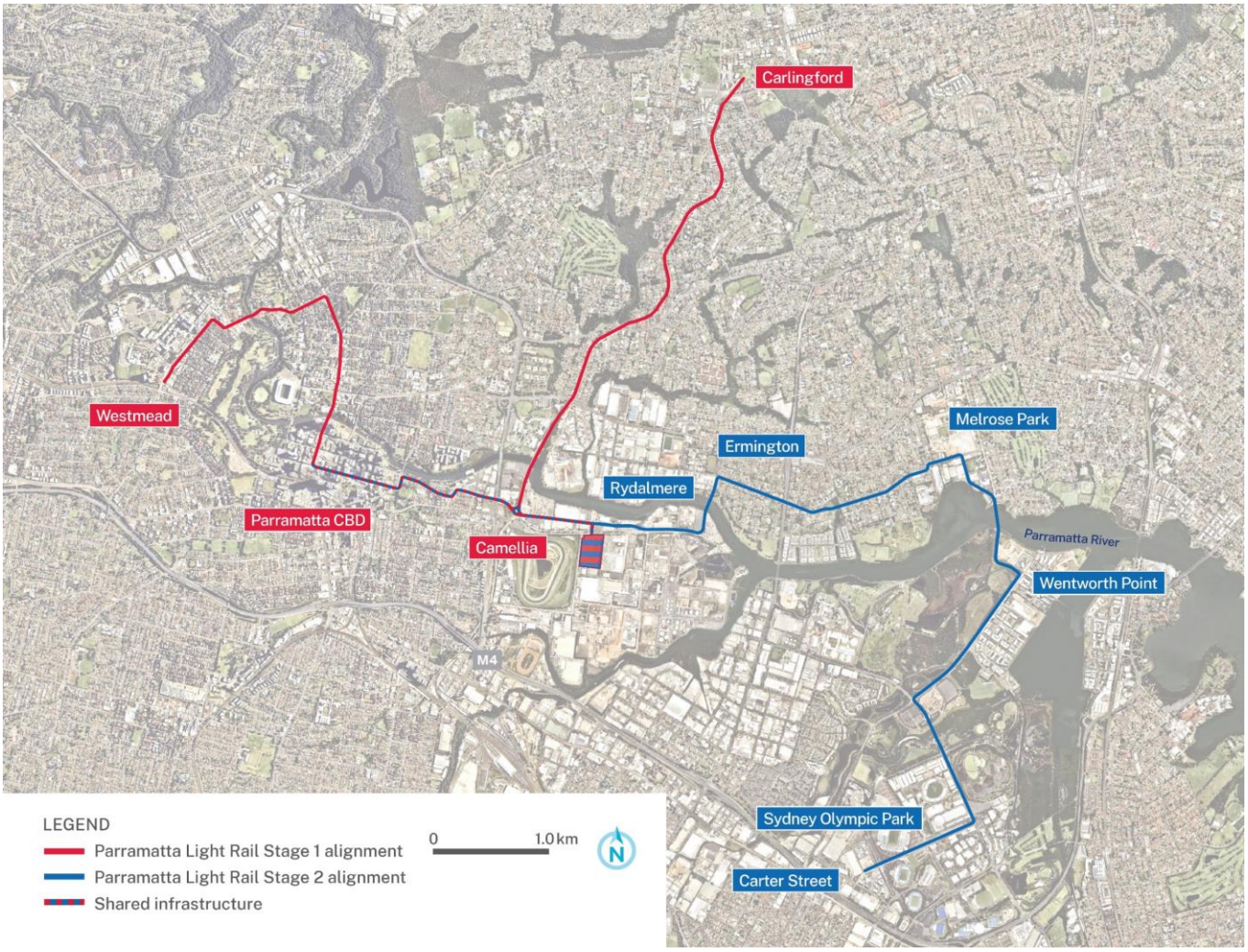

Figure 1.1 Parramatta Light Rail network

1.2 Project overview

The project comprises two main elements:

– construction of about 10 kilometres of light rail infrastructure between Camellia and the Carter Street precinct adjacent to Sydney Olympic Park

– operation of about 13 kilometres of light rail alignment between the Parramatta CBD and the Carter Street precinct, including a section of infrastructure constructed by Parramatta Light Rail Stage 1 between Camellia and the Parramatta CBD.

Further information on the location of the project, and a description of the project site for the purposes of this document, is provided in the environmental impact statement (EIS).

1.2.1 Key features

The key features of the project, which are shown on Figure 1.2, include:

Light rail track and bridges

– a new 10 kilometre long dual light rail track, with 14 stops, between the Parramatta Light Rail Stage 1 line in Camellia and the Carter Street precinct adjacent to Sydney Olympic Park

– two bridges over the Parramatta River between Camellia and Rydalmere, and between Melrose Park and Wentworth Point

– a bridge over Silverwater Road between Rydalmere and Ermington
– other bridge works in Ken Newman Park and Sydney Olympic Park.

Active and public transport integration

The project would also deliver:

– about 8.5 kilometres of new active transport links between Camellia and the Carter Street precinct, which would connect with the existing cycling and pedestrian network
– interchanges with other forms of public transport, including trains, ferries, buses and Sydney Metro West, with the main interchanges located in the Parramatta CBD, Rydalmere and Sydney Olympic Park
– a light rail and pedestrian zone (no through vehicle access) within Sydney Olympic Park along Dawn Fraser Avenue between Australia Avenue and Olympic Boulevard
– bus access over the proposed bridge between Melrose Park and Wentworth Point.

Other works

Works proposed to support the project's operation:

– turnback facilities, including along part of Macquarie Street in the Parramatta CBD
– adjustments to the Parramatta Light Rail stabling and maintenance facility at Camellia
– five new traction power substations to convert electricity to a form suitable for use by light rail vehicles
– new and improved open spaces and recreation facilities at Ken Newman Park, the Atkins Road stop, and Archer Park.

Further information on the project's features is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

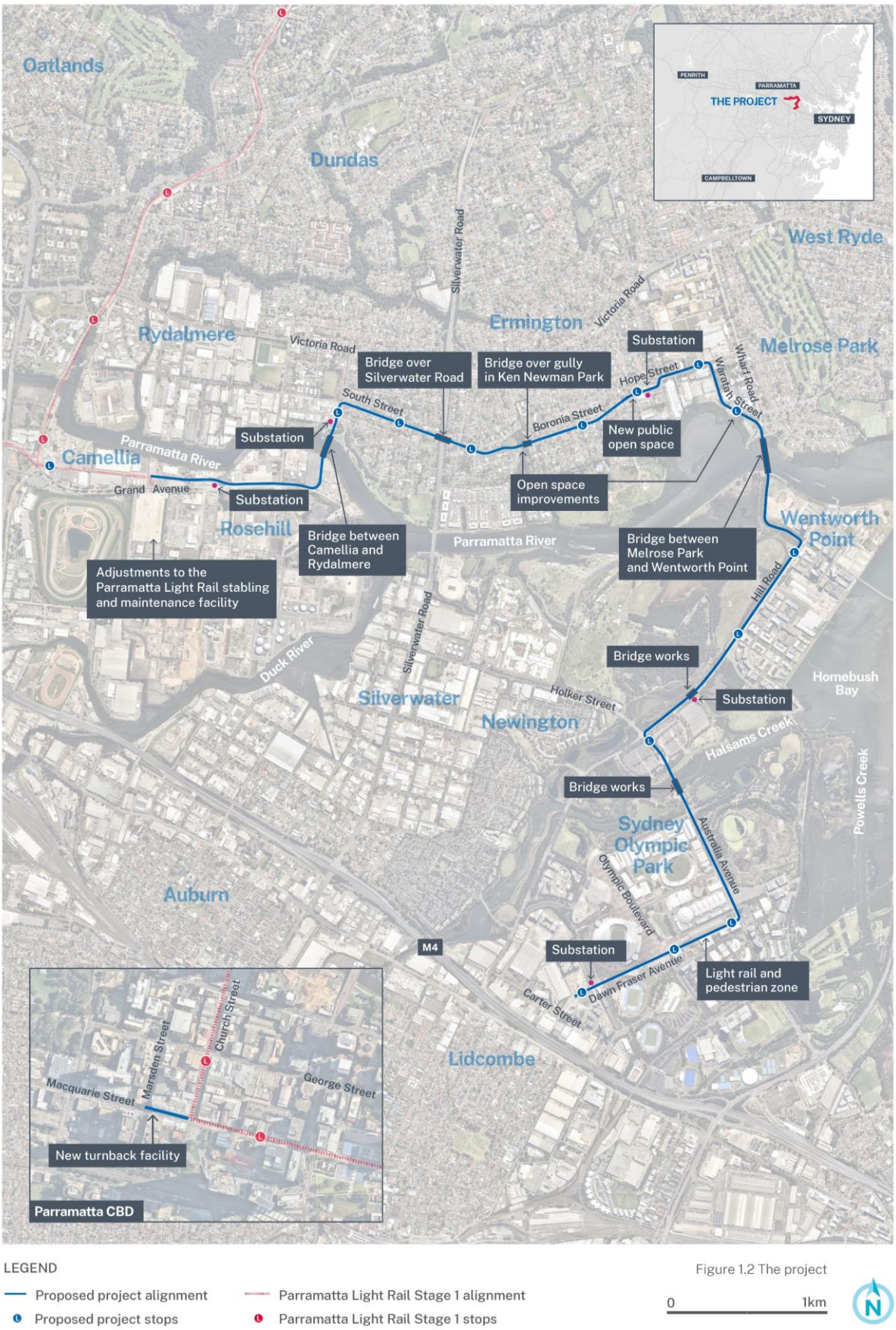

Figure 1.2 Key features of the project

1.2.2 Operation

The project would operate between the Parramatta CBD and the Carter Street precinct, using a section of the Parramatta Light Rail Stage 1 alignment and the alignment constructed as part of the project.

Between the Parramatta CBD and Camellia, the project would operate along about three kilometres of the Parramatta Light Rail Stage 1 alignment. Parramatta Light Rail Stage 2 services would terminate at the Stage 1 Parramatta Square stop to allow customers direct and convenient access to Parramatta's CBD, and interchange with Stage 1 light rail services, trains, buses and Sydney Metro West.

From Camellia, the project would operate along the light rail infrastructure proposed as part of Stage 2, terminating at the proposed Carter Street stop.

The project would operate as a turn-up-and-go light rail service from 5am to 1am, seven days a week, in line with Parramatta Light Rail Stage 1. The project would have travel times of around 31 minutes from the Carter Street stop in Lidcombe to the proposed Sandown Boulevard stop in Camellia, and a further seven minutes to the Parramatta Square stop in the Parramatta CBD.

Further information on the project's operation is provided in the EIS (see Chapter 6 (Project description – infrastructure and operation)).

1.2.3 Timing

It is anticipated that construction would start in 2025, subject to obtaining all necessary approvals, and the first passenger services are proposed to start from 2030/2031.

An indicative construction methodology is provided in the EIS (see Chapter 7 (Project description – construction)).

1.2.4 Approval requirements

The project is State significant infrastructure and is subject to approval by the NSW Minister for Planning under Part 5, Division 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

The project is also determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and requires approval from the Australian Minister for the Environment and Water.

1.3 Purpose and scope of this report

An environmental impact statement (EIS) has been prepared to support an application for approval of the project in accordance with Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). It addresses the environmental assessment requirements of the Secretary of the Department of Planning and Environment (the SEARs).

This report has been prepared as part of the EIS to assess the potential tree impacts from constructing and operating the project. The report:

– addresses the relevant SEARs listed in Table 1.1
– describes the existing environment with respect to existing trees and their amenity value
– identifies those trees which would likely require removal to facilitate construction and operation of the project, and those trees which could likely be retained, given appropriate protection
– recommends measures to mitigate and manage the impacts identified.

The methodology for the assessment is described in section 2.

This Arboricultural Report is Appendix B to Technical Paper 1 (Design, Place and Movement) and has also been prepared to inform the landscape and visual impact assessment in Appendix A of Technical Paper 1.

For the purposes of this assessment, a tree has been defined according to the definition provided in *Australian Standard (AS) 4970 Protection of trees on development sites* and section 4 (Impacts on trees) only includes those that have not been assessed as part of the Biodiversity Development Assessment Report (Technical Report 9) or would be offset under a biodiversity offset strategy. More information on vegetation communities and the biodiversity offset strategy under the NSW *Biodiversity Conservation Act 2016* and the NSW *Fisheries Management Act 1994* is provided in Technical Paper 9 (Biodiversity Development Assessment Report).

Table 1.1 Secretary's environmental assessment requirements relevant to trees

Item	Section	Where addressed in this report
Key issue 2. Design, Place and Movement	6(b) how the proposal will achieve a net increase in tree numbers and canopy within proximity of the impacted area. (This relates to the number of trees to be cleared by the proposal (a tree is defined by Australian Standard 4970) that will not be covered by a biodiversity offset strategy).	In relation to trees to be cleared by the project (not covered by a biodiversity offset strategy), section 4 provides an assessment of trees likely to be removed with maps included in Appendix A and a tree table in Appendix C. The assessment has been undertaken for trees as defined by Australia Standard 4970, as discussed in section 2.2.1. Section 5 lists mitigation measures including measures to increase tree numbers and canopy.

1.4 Qualifications

The qualifications of the project team are presented in Table 1.2.

Table 1.2 Qualifications of the project team

Name	Position/Role on project	Qualifications	Relevant experience
Gary Leonard	Senior Arborist/Botanist Arboriculture assessment and reporting	International Society of Arboriculture membership no. 212238 Arboriculture Australia membership no. 2173 Diploma of Education, National Diploma of Horticulture (NZ), Horticulture Certificate (NSW).	40+ years
Cindy Murphy	Ecologist Field assistance and reporting	BSc (Env.Mngmt, Env.Earth.Science)	4 years
Dr Kirsten Crosby	Technical Director -Biodiversity Technical Review	PhD (Zoology) 2003. BSc (Hons) Zoology. 1998 Accredited Biodiversity Assessment Methodology Assessor	17+ years

1.5 Disclaimer

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2. Methods

2.1 Desktop review

The following studies, standards and planning instruments were reviewed prior to the tree survey:

- *Taken for Granted. The Bushland of Sydney and its Suburbs* (Benson and Howell 1990)
- *The Natural Vegetation of the Sydney 1:100 000 map sheet* (Benson and Howell 1994)
- *Soil Landscapes of the Sydney 1:100 000 Map* (Chapman, Murphy, Tille, Atkinson and Morse 1989)
- *Soil Landscapes of the Sydney 1:100 000 Sheet* (Chapman and Murphy 1989)
- Parramatta Development Control Plan (DCP) (2011) - 5.3 Preservation of Trees or Vegetation
- *Significant Tree Register* (Sydney Olympic Park Authority 2008)
- *Guidelines for Protection of Trees on construction sites* (Sydney Olympic Park Authority 2009)
- *Protection of trees on development sites, AS 4970 – 2009* (Standards Australia 2009)
- *Australian Standard: pruning of amenity trees, AS 4373 – 2007* (Standards Australia 2007)
- *Australian Standard: Composts, soil conditioners and mulches, AS 4454 – 2003* (Standards Australia 2003)
- *Transport for NSW Biodiversity Policy*, No. CP22004, effective date 1 August 2022 (NSW Government 2022)
- *Guide to managing risks of tree trimming and removal work* (Safe Work Australia 2016)
- *Sydney Olympic Park Master Plan 2030* (Sydney Olympic Park Authority 2018)
- Technical Paper 9 (Biodiversity Development Assessment Report)
- *Willowmere, 64 Hughes Avenue, Ermington, Assessment of Cultural Significance* (Lucas Stapleton Johnson & Partners; and Circle Square Design Landscape Architect Heritage Consultant).

2.2 Arboricultural survey

The EIS has defined a 'project site' which refers to the area that would be directly disturbed by construction of the project (for example, as a result of ground disturbance and the construction of foundations for structures). It includes the location of construction activities, compounds and work sites, and the location of permanent infrastructure (see Figure 2 in Appendix C). A survey of trees within, and immediately adjacent to, the project site was conducted on 28 and 29 June and 1, 2, 6, 7 and 8 July 2022 by Gary Leonard (Arborist and Senior Botanist) and Cindy Murphy (Ecologist).

Trees within and immediately adjacent to the project site that met the definition of tree provided in section 2.2.1, were the basis for tree assessment in this report. This excluded stands of native vegetation and vegetation communities assessed in Technical Paper 9 (Biodiversity Development Assessment Report) (see also section 3.2).

The assessment assumed the following:

- All trees / tree groups within the project site may need to be removed due to a potential conflict with infrastructure.
- Trees / tree groups immediately adjacent to the project site may require protection or may need to be removed (where a portion of the canopy or root zone extends into the project site to such an extent that protection is not possible (i.e. the tree is likely to not survive construction activities or may become unstable and present a safety risk)).

The assessment also identified high amenity trees that are recommended to be investigated for retention (where possible) during design development and construction planning and/or may be suitable for relocation (see section 3.4).

This approach represents a 'worst-case' scenario as it is noted that there are likely to be opportunities to avoid the removal of many trees during design development and construction planning. Alternatively, should the project site be refined to include additional areas outside the assessed project site boundary, then further assessment may be required.

2.2.1 Definition of a tree

For the purposes of this assessment, a tree has been defined according to the definition provided in *Australian Standard 4970 Protection of trees on development sites* (AS 4970) (Standards Australia, 2009) as

> "*a long-lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks (or as defined by the determining authority)*".

2.2.2 Visual tree assessment

Trees within and immediately adjacent the project site were surveyed by conducting a ground-based Visual Tree Assessment (VTA) (see Matheney and Clark 1994a and 1994b) and with reference to the requirements stipulated in the *Sydney Olympic Park Master Plan 2030.* The assessment included identification and assessment of trees over three metres in height.

Identification to species level was carried out with reference to the following sources:

– PlantNET (National Herbarium of NSW (2019)
– *Horticultural Flora of South-eastern Australia* Volumes 1 to 4 (Spencer 1997-2002).

Attributes for each tree recorded included:

– tree number or tree group number
– botanical name of tree species
– height of tree in metres (m)
– spread (radius m)
– Diameter at Breast Height (DBH) (m)
– health
– structure
– Tree Protection Zone (TPZ)
– Safe Useful Life Expectancy (SULE).

The height and crown spread of trees were estimated. The diameter of each tree at breast height was either estimated, or in the case of large specimens, measured with a Forestry DBH tape. No diagnostic equipment, aerial inspection (climbing) or tree root mapping was undertaken.

The estimate of a tree's age was based on the definitions outlined by Draper and Richards (2009). Trees were classed as follows:

– Young (early mature): age <20 per cent of their life expectancy in situ
– Mature: aged between 20 to 80 per cent of their life expectancy in situ
– Over-mature: aged >80 per cent of their life expectancy in situ.

Individual trees or tree groups comprising multiple trees, were numbered and logged using way points saved with Collector for ArcGIS on a Smart phone. Given the density of similar street plantings in the Sydney Olympic Park area, the majority of trees in this area have been mapped as tree groups.

A tree map was prepared for identification purposes which numbered trees and tree groups within and immediately adjacent to the project site (see Appendix A). The details of individual trees and the trees that make up tree groups were documented in a tree table (see Appendix C) with reference to the unique numerical identifier indicated on the tree map. Where trees within a tree group were the same species and age class, averages for height, canopy spread and DBH were calculated.

The information provided in this report reflects the condition of the trees at the time of inspection and only relates to the trees surveyed.

2.2.3 Structure and health

For each tree, the SULE was determined based on the health and structure of the subject tree (after Barrell, 2001). The SULE code is provided in Appendix B. The health and structural integrity of each tree was evaluated in accordance with the criteria outlined in Table 2.1.

Table 2.1 SULE criteria

Structural considerations	
Presence/absence of cankers (abnormal growth caused by fungi or bacteria)	Evidence of 'end weight' (accumulation of mass at the end of a branch)
Presence/absence of cavities (open wound with evidence of decay)	Presence/absence of epicormic shoots (shoots arising from latent or adventitious buds)
Presence/absence of co-dominant stems (stems or branches of equal diameter, often weakly attached)	Presence/absence of previous branch or trunk failure
Presence/absence of conks (fruiting body of decay fungi e.g. Bracket Fungus)	Evidence of girdling roots (roots that encircle the base [above ground] of the stem)
Presence/absence of decay (degradation of wood by fungi/bacteria)	Leaning trunk (bias)
Evidence of decline (loss of vigour)	Low canopy (branches that are close to ground may require heavy pruning for construction clearance)
Evidence of dieback (death of twigs and branches)	Presence/absence of wounds (injuries on the surface of a stem or branch)
Health considerations	
Presence/absence of pest and diseases	Proportion of necrotic material in platform
Amount of extension growth	Absence/presence of epicormic growth
Density of canopy	Foliage size and colour

* Adapted from Matheny & Clark (1994a).

2.2.4 Tree protection zones

A theoretical TPZ was calculated for all trees assessed during the field survey and should be considered for all trees within the project site, particularly trees assessed as having amenity value (see section 3.4).

The calculations of the TPZs for assessed trees were based on the estimated or measured DBH as outlined in AS 4970 (see Appendix C):

TPZ radius = DBH x 12
(where: DBH = Diameter at Breast Height in metres)

Where the tree has co-dominant leaders, the following formula was applied, in order to calculate DBH:
$DBH = (DBH1^2+DBH2^2+...+DBHn^2)^{0.5}$

Where a group of trees are described, calculations for an average height, canopy radius, DBH and TPZ were made.

The TPZ calculation according to AS 4970 is stated for each tree in Appendix C.

2.3 Incidental fauna habitat assessment

Technical Paper 9 (Biodiversity Development Assessment Report) provides an assessment of biodiversity impacts, including for threatened species, hollows and fauna habitat. However, potential fauna habitats observed during the tree survey were recorded in the field with an aim to inform the management of potential fauna and fauna habitats during the removal of trees (i.e. such features may indicate presence of fauna that should be checked prior to tree removal).

Fauna habitat assessments included searches for the following:

– bird nests or other potential fauna roosts
– tree hollows and evidence of use (e.g. worn edges, whitewash)
– specific food trees and evidence of foraging
– evidence of fauna activity, such as feeding scars, scratches and diggings
– distinctive scats or pellets at the base of trees.

3. Existing environment

3.1 Landscape context

The location and extent of the project site is shown in the figures included in Appendix A. The project site varies in width from 30 metres to 100 metres. It extends from the Parramatta central business district (CBD) where a proposed turnback facility would be constructed, then through Camellia, crossing the Parramatta River to Rydalmere, through Ermington and Melrose Park, crossing the river again to Wentworth Point, and extending through sections of Sydney Olympic Park and through to the Carter Street precinct in Lidcombe. Large sections of the project site pass through industrial land in Camellia and Melrose Park, as well as through suburban streets in Rydalmere, Ermington and Wentworth Point.

Soil landscapes encountered at the site are shown in Table 3.1, based on information from Chapman et al (1989).

Table 3.1 Soil landscapes in the project site

Soil landscape	Description	Location
Lucas Heights (lh)	Gently undulating crests and ridges on plateau surfaces of the Mittagong formation, with slopes <10% and absent rock outcrop. Dry sclerophyll low forest and woodland is extensively or completely cleared. Soils moderately deep, including hardsetting yellow podzolic soils and yellow soloths with yellow earths on outer edges.	Melrose Park, Ermington and Rydalmere
Blacktown (bt)	Gently undulating rises on Wianamatta Group shales and Hawkesbury shale with slops usually <5%. Cleared eucalypt woodland and tall open-forest (wet sclerophyll forests). Soils are shallow to moderately deep soils and include red and brown Podzolic Soils on crests, upper slopes and well-drained areas and deep Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage.	Rydalmere and parts of Sydney Olympic Park
Glenorie (gn)	Undulating to rolling low hills on Wianamatta Group shales. Local relief 50–80 metres, slopes 5–20%. Extensively cleared tall open-forest (wet sclerophyll forests). Shallow to moderately deep Red Podzolic Soils on crests; moderately deep Red and Brown Podzolic Soils on upper slopes; deep Yellow Podzolic Soils and Gleyed Podzolic Soils along drainage lines.	Parts of Camellia and Ermington
Birrong (bg)	Level to gently undulating alluvial floodplain draining Wianamatta Group shales with slopes <3%. Tall open-forest and woodland is extensively cleared. Soils comprises deep Yellow Podzolic Soils and Yellow Solodic Soils on older alluvial terraces and deep Solodic Soils and Yellow Solonetz on current floodplain.	Occurs in a disturbed condition over large parts of Sydney Olympic Park and Homebush Bay

Benson and Howell (1990) observed that *"….the low rain and undulating Wianamatta Shale soils of the Cumberland Plain …….originally supported grassy woodlands and was important from the earliest days of settlement, providing the main grazing and agricultural lands ……in 1815. More recently it has received, and will continue to accommodate, the bulk of Sydney's expanding urban population…."*

In the context of Sydney Olympic Park, Benson and Howell (1990) state that *"….there is very little undisturbed saltmarsh in the nearby Bicentennial Park, although it has extensive stands of the mangrove Avicennia marina…".*

3.2 Trees within and immediately adjacent to the project site

The locations of trees and tree groups surveyed for this assessment are indicated on the Tree map in Appendix A. Details of surveyed trees and tree groups are presented in the tree table in Appendix C.

A total of 4,923 trees were surveyed within and immediately adjacent to the project site. The trees assessed comprise a mixture of indigenous species *(*i.e. indigenous to the Parramatta local government area (LGA)), Australian native species and exotic ornamental or invasive specimens (see Appendix C).

The assessed trees within the project site are almost all planted specimens. This includes street trees in an urban setting (e.g. in Parramatta and Sydney Olympic Park), park plantings *(*e.g. in Ken Newman Park (see Photo 1), Eric Primrose Reserve), footpath, nature strip or garden specimens (e.g. in Rydalmere, Ermington and Melrose Park, see Photo 2), and trees in or adjacent to industrial sites in Camellia, Rydalmere and Melrose Park.

A large proportion of the trees were described as “Mature”, with occasional “Over-mature” individuals as well as “Early-mature” specimens in recently planted areas (see Appendix C).

Representative photographs of trees, tree groups and tree conditions observed during the survey are provided in Photo 2 to Photo 6.

Some tree groups identified during the survey comprise stands of native vegetation which have been assessed formally under the relevant legislation as part of Technical Paper 9 (Biodiversity Development Assessment Report), and therefore have not been included as part of the tree counts in section 4 (Impacts on trees) or Appendix C Tree table. These trees and other native vegetation areas assessed in Technical Paper 9 (Biodiversity Development Assessment Report) are shaded in red in the Appendix A Tree map.



Photo 1 **Planted native vegetation in Ken Newman Park (Tree Group 284)**



Photo 2 **Example of mature trees, growing in a private garden (Tree Group 317)**

3.3 Tree condition

The trees that were surveyed ranged from fair to moderate condition, especially considering the proximity of many specimens to busy roads and residential and industrial sites. A large proportion of the trees have a SULE rating of 2A, indicating that they *"appear to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance."* (Barrell 2001).

Maintenance of trees within and immediately adjacent to the project site is variable, with trees growing in footpaths and nature strips, council parklands as well as in suburban gardens, along the boundaries of industrial sites and in sections of the Sydney Olympic Park.

Self-recruitment of exotic species is apparent in some areas of parkland and industrial sites, although in most cases it is unlikely that the exotic species are inhibiting the growth of adjacent trees. There is evidence of suppressed growth, especially along the edges of planted thickets and near tall buildings. One planted species, *Cupaniopsis anacardioides* (Tuckeroo) is self-recruiting throughout parts of the planted tree thickets along Hill Road.

Distorted growth was evident in some trees (see Photo 3) that may have been subject to stress factors caused by vortex effects (see Harris *et al.* 1999; James *et al.* 2006). Some specimens growing within sealed areas (see Photo 4) indicated evidence of stress factors associated with reduced availability of soil water and soil air or from factors associated with urban heat islands (Harris *et al.* 1999; Hitchmough 1994; Sailor 2011).

Termite activity in planted trees was most evident in specimens of *Angophora floribunda*, growing along Hill Road, adjacent to the Green and Golden Bell-frog habitat (see Photo 5). Hadlington and Johnston (1999) describe the construction of galleries and large mud nests by the termite species *Nasutitermes walkeri* and *Nasutitermes graveolus* which suggests that *"….the nest indicates that the tree is degenerating and is usually not worth retaining".*



Photo 3 **Example of distorted growth, in response to suppression from adjacent building and from vortex effects over and around buildings; Waratah Street, Melrose Park (Tree Group 381)**



Photo 4 **Trees in Fair to Poor condition, growing in central road median; Hill Road, Wentworth Point (Tree Group 435a)**



Photo 5 **Planted specimens of Angophora floribunda at Hill Road. Note the galleries formed by termites (indicated with yellow arrows) (Tree Group 447)**

3.4 Trees with amenity value

3.4.1 Significant and heritage trees

Sydney Olympic Park Master Plan

The *Sydney Olympic Park Master Plan* (2030) includes a "Significant Tree Register". The criteria for identifying significant trees included: size; heritage; functionality; form/aesthetics and health.

Trees 460 to 464, 464a, and 465 to 474 growing within the following streets are located within the master plan area, and may be impacted by the project: Australia Avenue, Kevin Coombs Avenue, Grand Parade, Murray Rose Avenue, Dawn Fraser Avenue, Showground Road, Olympic Boulevard and Edwin Flack Avenue. Typical Plane trees planted within Sydney Olympic Park are shown on Photo 6. Significant trees as nominated by the Master Plan in the Appendix A Tree map are shown in purple.



Photo 6 **Lines of Plane trees within Sydney Olympic Park (Tree Group 463)**

Parramatta LEP

A search of City of Parramatta documents online did not identify a list of heritage trees. However, the heritage schedule of the Parramatta Local Environmental Plan 2011 lists the Bulla Cream Dairy (Willowmere) at 64 Hughes Avenue, Ermington as a local heritage item (I64) which comprises significant and contributory tree plantings of high and moderate heritage value, respectively.

Technical Paper 5 (Statement of Heritage Impact – Built Heritage) provides a heritage assessment of the trees, including reference to a previous cultural heritage assessment prepared for the item (Lawrence Stapleton Johnson and Partners 2018) that included a list of trees within the heritage curtilage:

– significant plant species:
  - three Canary Island date palms (*Phoenix canariensis*)
  - Oleander (*Nerium oleander*)
  - Crepe Myrtle (*Lagerstroemia indica*).
– contributory plant species:
  - Shiny Xylosma (*Xylosma senticosa*)
  - Weeping fig (*Ficus benjamina*)
  - Miniature date palm (*Phoenix roebelinii*)
  - Jacaranda *(Jacaranda mimosifolia)*
  - White Feather Honeymyrtle (*Melaleuca décor).*

The trees within the heritage curtilage are described in this report as Tree Group 390. Heritage trees in the Appendix A Tree map are shown in orange.

It is noted that the Wetlands are also of heritage value (listed as Item I1) however the assessment of these as a vegetation community has been undertaken as part of Technical Paper 9 (Biodiversity Development Assessment Report) and as a heritage item in Technical Paper 5 (Statement of Heritage Impact - Built Heritage). As such, Wetlands (mangroves) have been excluded from section 4 of this report (Impacts on trees).

State Environmental Planning Policies

The Millennium Parklands Heritage Precinct in Sydney Olympic Park is listed as a heritage conservation area under the State Environment Planning Policy (Precincts – Central River City) 2021 and the project site encroaches on the heritage curtilage at the Louise Sauvage Pathway. The statement of significance notes that the precinct comprises a number of different landscape types - woodland, wetland, and an open park-like area with ornamental trees and landforms, which gives the area great visual interest, viewed from within the parklands and from the river. The planted trees within the heritage curtilage are identified in this report as Tree Groups 399 and 399a. Heritage trees in the Appendix A Tree map are shown in orange.

The State Abattoir locality and heritage conservation area on Dawn Fraser Avenue in Sydney Olympic Park is listed under the State Environment Planning Policy (Precincts – Central River City) 2021 and partially overlaps the project site. The street trees (Tree Group 466) in this conservation area are not considered to be of heritage value, but are noted as significant trees in the *Sydney Olympic Park Master Plan* (2030).

3.4.2 Planted threatened species

No threatened species which are indigenous to Parramatta LGA were recorded within or immediately adjacent to the project site. Other threatened species not indigenous to the local area are described in the sections below.

Eucalyptus nicholii

Several specimens of Narrow-leaved Black Peppermint (*Eucalyptus nicholii*) occur throughout suburban streets and gardens in Ermington and Rydalmere (see Photo 7). In most cases the specimens are in moderate to fair condition. *Eucalyptus nicholii* is listed as a vulnerable species under both the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This species naturally occurs only in the New England Tablelands from Nundle to north of Tenterfield but is widely planted as an urban street tree.

The project site is well outside the species' natural distribution and the individuals within the project site are clearly planted specimens of uncertain provenance and outside of natural habitat. In this context, the specimens of *Eucalyptus nicholii* in the project site have not been attributed the conservation significance of a threatened species.



Photo 7 ***Eucalyptus nicholii,* growing in nature strip; Boronia Street, Ermington (Tree 265)**

Eucalyptus scoparia

Several specimens of Wallangarra White Gum (*Eucalyptus scoparia*) were recorded in the project site (see Photo 8). Numbers of this species have been planted within the P5 car park at Sydney Olympic Park. Most specimens are stunted, with sparse canopies, possibly in response to the surroundings which possess the characteristics of an Urban Heat Island (see Sailor 2011).

Wallangarra White Gum is listed as a vulnerable species under the EPBC Act and an endangered species under the BC Act. Although this species is a popular ornamental planting, its natural occurrence is restricted to several small patches of woodland on granitic hilltops, slopes and outcrops on both sides of the border between southeast Queensland and northeast NSW.

The specimens in the project site are all clearly planted specimens of uncertain provenance, growing within atypical habitat, well beyond the geographical limit of distribution of this species. In this context, the specimens of *Eucalyptus scoparia* within and immediately adjacent to the project site have not been attributed the conservation significance of a threatened species.



Photo 8 ***Eucalyptus scoparia,* growing in car park P5 at Sydney Olympic Park (Tree Group 452)**

Syzygium paniculatum

Several individuals of Magenta Lilly Pilly (*Syzygium paniculatum*) occur within or immediately adjacent to the project site. In most cases these specimens have been planted within suburban gardens.

The Magenta Lilly Pilly is endemic to NSW, with scattered occurrences of 43 recorded sub-populations between Jervis Bay and Seal Rocks. Preferred habitat for this species is Littoral Rainforest.

Syzygium paniculatum, S. australe, *S. oleosum* and *S. smithii* were popular plantings in Sydney parks and gardens, especially during the 1960s and some fine old specimens may be seen, more typically in the Eastern Suburbs and North Shore. The specimens of Magenta Lilly Pilly which were assessed within the project site are mostly 20 to 30 years old.

The Magenta Lilly Pilly is listed as an endangered species under both the EPBC Act and the BC Act. The nearest natural occurrences of this species to the project site are on coastal sand in Kurnell. The individuals within the project site are clearly planted specimens of uncertain provenance and outside of natural habitat. In this context, the specimens of Magenta Lilly Pilly in the project site have not been attributed the conservation significance of a threatened species.



Photo 9 ***Syzygium paniculatum*, growing in private garden (Tree Group 312)**

3.4.3 Trees with high landscape value

Trees with high landscape value were identified by the arborist based on attributes such as aesthetic value, ecological value or provided amenity (ie shade), or if they were good specimens. They include (but are not necessarily limited to due to the subjectiveness of the assessment) the following:

- *Ficus* species, especially the indigenous *Ficus macrophylla* f. *macrophylla* and *Ficus rubiginosa* (Group 460) throughout Sydney Olympic Park and in Eric Primrose Reserve (Group 163) and specimens of *Ficus microcarpa* var. *hillii,* (Groups 383, 386, 390 and 428) planted in industrial sites, as well as in parkland and private gardens (see Photos 10 and 11)
- mature specimens of *Eucalyptus* species (trees 239 and 252) see Photo 12 [Groups 170 and 171] and Photo 14 [Group 324a]), *Angophora* species (Group 241 and tree 281c) and *Corymbia* species (Groups 162, 346, 382 and 462) mostly planted in private gardens but also occasionally on council footpaths
- tall or large specimens of exotic species, especially Norfolk Island Pines (Tree 245 and Group 334) and Cook Pines (Groups 224 and 295) (*Araucaria heterophylla* and *A. columnaris, respectively*) (see Photo 14), Deodar Cedar (*Cedrus deodara)* and Monterey Cyprus *(Cupressus macrocarpa)* at Group 223; and *Jacaranda mimosifilia* and *Liquidambar styraciflua* at Group 224.
- amenity trees as identified by the arborist in the Appendix A Tree map are shown in green.



Photo 10 **Parkland plantings of *Ficus microcarpa var. hillii* in Eric Primrose Reserve near Rydalmere Ferry Wharf (Tree Group 163)**



Photo 11 **Large, mature *Ficus microcarpa var. hillii* in industrial property; Hope Street, Melrose Park (Tree Group 383)**



Photo 12 **Large mature Woollybutt (*Eucalyptus longifolia)* growing in backyard; John Street, Rydalmere (Tree 171)**



Photo 13 **Flooded Gum (*Eucalyptus grandis*) growing in nature strip; Atkins Road, Melrose Park (Tree 324a)**



Photo 14 **Cook Pine *Araucaria columnaris* growing on edge of nature strip; Boronia Street, Ermington (Tree Group 295)**

3.5 Fauna and fauna habitats

The project site comprises a highly modified urban environment that is subject to reasonably high levels of disturbance, light, noise and vibration, most notably from the adjacent road traffic and industrial areas, particularly in Rosehill and Camellia. Habitat features were generally less present in those areas than in areas such as Wentworth Point and Sydney Olympic Park.

The established (i.e. mature and over-mature) trees throughout the project site would provide broadly suitable habitat (foraging and roosting resources) for common, generalist bird species typical of, and capable of persisting in highly modified urban landscapes. Table 3.2 below provides a summary of incidental fauna habitat features observed within and immediately adjacent to the project site (also see Photos 15-19).

Table 3.2 ***Fauna habitats observed on site***

Location (Tree or Tree Group No.)	Habitat item
Tree 19	Stick nest in *Lophostemon confertus*
Group 32	Small hollow in *Eucalyptus tereticornis*
Group 116	Small hollow in *Lophostemon confertus*
Group 224	Small hollows in *Jacaranda mimosifolia*
Tree 239	Small hollow and stick nest in *Eucalyptus cladocalyx*
Group 246	Hollows in *Jacaranda mimosifolia*
Group 248	Hollows in *Fraxinus excelsior*
Group 251	Hollows in *Jacaranda mimosifolia*
Group 255	Medium sized hollows and stick nest in *Liquidambar styraciflua* closest to corner of South Street and Fallon Street
Group 258	Small hollows in *Jacaranda mimosifolia*

Location (Tree or Tree Group No.)	Habitat item
Group 283	Small hollow and stick nest in *Eucalyptus saligna*
Group 284	Small stick nest in *Eucalyptus saligna*
Group 304	Stick nest and potential hollows in *Afrocarpus falcatus*
Group 312	Small hollow in *Callistemon* 'Harkness'
Group 314	Stick nest in *Eucalyptus microcorys*
Group 334	Small hollow in *Lagerstroemia indica*
Group 340	Small nest in *Callistemon* 'Harkness' (likely Spotted Turtle Dove nest)
Group 361	Large hollow in *Ficus rubiginosa*
Group 368	Small hollow in *Quercus robur*
Group 371	Small stick nest in *Angophra costata*
Group 371	Small nest in *Eucalyptus microcorys*
Group 382	Stick nest in *Eucalyptus microcorys*
Group 384	Stick nest in *Callistemon citrinus*
Group 395	Potential hollow in *Cedrus deodara*
Group 398	Stick nest in *Jacaranda mimosifolia*
Group 419	Medium stick nest in *Eucalyptus* sp.
Group 420	Small hollows and stick nest in *Melaleuca quinquenervia*
Group 428	Stick nest in *Ficus microcarpa*
Group 432	Stick nests in two *Eucalyptus saligna*
Group 436	Small stick nest in *Melaleuca* sp.
Group 439	Small feather nest and small hollow in *Melaleuca* sp.
Group 440	Small to large stick nests and small hollows in multiple trees (*Melaleuca and Eucalyptus*)
Group 450	Small stick nest in *Eucalyptus* sp. Hollow in tree fork.
Group 457	Stick nest in *Eucalyptus* sp.
Group 459	Small mud nest in Eucalyptus sp.
Group 460	Stick nest in *Eucalyptus microcorys*
Group 462	Stick nests in multiple *Corymbia citriodora*



Photo 15 **Large hollow in trunk of *Liquidambar styraciflua* (Tree Group 225)**



Photo 16 **Small hollow near base of tree in suburban setting (Tree Group 268)**



Photo 17 **Stick nest in *Eucalyptus* (Tree Group 384)**



Photo 18 **Nest (potential possum drey) in *Eucalyptus* (Tree Group 440)**

No threatened fauna species were observed during the field survey, it is noted that a diverse range of threatened fauna species have been previously recorded or are predicted to occur in the locality, such as the Green and Golden Bell Frog (*Litoria aurea*) in Wentworth Point and Sydney Olympic Park (refer to Technical Paper 9 (Biodiversity Development Assessment Report)).

A number of highly mobile threatened fauna species may forage on occasion in vegetation in the project site as part of a wider home range. These include species such as the Grey-headed Flying-fox (*Pteropus poliocephalus*) that may forage in myrtaceous trees when flowering and microbats that may forage for insects in vegetated areas. Evidence of bats feeding on *Doryanthes excelsa x D. palmeri* hybrid flowers was observed along the northern boundary of Ken Newman Park. Pedestrian and road bridges in the vicinity of Tree Group 446 have the potential as suitable roost sites for cave-roosting microchiropteran bats. Tree-roosting microbats may also utilise cracks and crevices in trees for diurnal shelter and may use hollows within the project site.

As noted in section 2.3, reference should be made to Technical Paper 9 (Biodiversity Assessment Development Report) for in depth biodiversity impacts, including for threatened species, hollows and fauna habitat.

4. Impacts on trees

4.1 Trees likely to be removed

Trees likely to be removed during construction are summarised in Table 4.1. This includes all trees within the project site and those immediately adjacent where a portion of the canopy or root zone extends into the project site to such an extent that protection is not possible (i.e. the tree is likely to not survive construction activities or may become unstable and present a safety risk)).

The trees to be removed have been planted or are self-recruited specimens; they vary in age, suggesting different planting events, and also vary in health and form, depending on location and maintenance history.

About 68 per cent of the trees to be removed are native species and the remainder are non-indigenous native species or exotic species.

Trees with high amenity value, as identified in section 3.4 are noted in the table, and where possible these should be investigated for retention during design development and construction planning.

Refer to the tree table (Appendix C) for a list of individual trees and tree groups and their respective characteristics (i.e. height, canopy spread, age, health, form, DBH) and any specific comments or observations relevant to each tree/tree group.

Table 4.1 Trees likely to be removed

Suburb	Total number of trees to be removed	Native species	Non-indigenous native species	Exotic species	Trees/tree groups with high amenity
Parramatta CBD	10	0	10	0	N/A
Camellia/ Rosehill	247	119	84	44	N/A
Rydalmere	288	147	77	64	162, 163, 223, 224, 241, 245
Ermington	296	130	97	69	281c, 295, 346, 390
Melrose Park	186	108	55	23	
Wentworth Point	192	67	56	69	N/A
Sydney Olympic Park	2,854	2,218	451	185	399, 399a, 428, 460, 461, 463, 464a, 465, 466, 467, 468, 469, 471, 472, 473, 474
Carter Street/ Lidcombe	16	0	15	1	N/A
Total	**4,089**	**2,789**	**845**	**455**	**1,246**

4.2 Trees likely to require protection

Trees immediately adjacent to the project site that may require protection during construction, are summarised in Table 4.2.

Trees with high amenity value, as identified in section 3.4 are also noted in the table.

Refer to the tree table (Appendix C) for a list of individual trees and tree groups and their respective characteristics (i.e. height, canopy spread, age, health, form, DBH) and any specific comments or observations relevant to each tree/tree group.

Table 4.2 Trees immediately adjacent to the project site likely to require protection

Suburb	Total number of trees to be retained	Native species	Non-indigenous native species	Exotic species	Trees/tree groups with high amenity
Parramatta CBD	2	0	2	0	N/A
Camellia/ Rosehill	121	44	53	24	N/A
Rydalmere	49	22	9	18	170, 171, 239, 252
Ermington	20	6	4	10	324a, 334
Melrose Park	21	5	10	6	382, 383, 386
Wentworth Point	37	7	8	22	NA
Sydney Olympic Park	581	380	158	43	462, 464
Carter Street/ Lidcombe	3	0	1	2	N/A
Total	**834**	**464**	**245**	**125**	**245**

5. Mitigation measures

5.1 Approach to mitigation and management

The project will be refined during design development and construction planning to avoid or minimise impacts to trees within the project site. Tree removal has environmental, amenity and community impacts and should be minimised, with special consideration made to investigate retention of the trees with high amenity, as discussed in section 3.4. Feasible options to reduce impacts on trees would be considered during design development and construction planning.

A tree register will be prepared during design development and updated throughout construction to identify trees with the potential to be impacted, the extent of impacts (that is, removal or pruning), and trees that would be protected during construction.

The most appropriate mitigation measure with the highest potential for success is to carry out planting in suitable locations of native trees, shrubs and groundcovers. Tubestock (which are plant seedlings in a tube-shaped container) will eventually overtake planted advanced and semi-advanced plantings with a greater survival rate (see Knox Environment Society 2009 kes.org.au; Harris *et al.* 1999). As such, a tree offset strategy will be developed to define how the loss of trees would be offset to achieve a net increase in tree canopy. The strategy will identify:

– objectives, requirements and delivery strategy
– how impacts on trees would be offset
– locations for replacement trees, including locations outside the project site identified in consultation with key stakeholders
– species and trees sizes to ensure a mix of species and a range of mature heights to provide visual diversity appropriate to the proposed planting locations – taking into account the operational requirements of the project, the surrounding environment, including sensitive ecological areas, and the urban design requirements
– requirements for monitoring and maintenance of planted trees.

The tree offset strategy will be developed in consultation with relevant stakeholders, including City of Parramatta Council, City of Ryde Council and Sydney Olympic Park Authority.

Mitigation measures that Transport for NSW are committing to are listed in Table 5.1, while supporting management measures for consideration are listed in Table 5.2.

Table 5.1 Tree mitigation measures

Mitigation measure	Timing
A tree register will be prepared by a qualified arborist to identify all trees with the potential to be impacted by the project, and the proposed impacts on trees, including: – definitions of tree and canopy – definition of what constitutes an impact (generally more than minor crown or root pruning of more than 10 per cent) – location of each tree – tree values and condition – where a tree requires removal, whether, in the opinion of the arborist, it can be successfully transplanted – the extent of the proposed impact (complete removal or extent of pruning).	Design, construction
The design will continue to be refined to avoid or minimise impacts on trees and will include consideration of options to reduce impacts on trees, including: – operational requirements in relation to tree locations – adjustments to the design to avoid impacting trees (such as opportunities for localised narrowing of footpaths, use of porous pavement) – reduction in the standard offset distances required for underground services	Design

Mitigation measure	Timing
– consideration of the health of each tree, including its vigour and likely ability to survive in situ pruning or transplanting.	
A tree offset strategy will be developed to offset the loss of trees and achieve a net increase in tree canopy. The strategy would define and identify: – how impacts on trees will be offset – locations for replacement trees – species and trees sizes to ensure a mix of species and a range of mature heights to provide visual diversity as appropriate to proposed planting locations – requirements for monitoring and maintenance. The strategy will be developed in consultation with City of Parramatta Council, City of Ryde Council and Sydney Olympic Park Authority.	Design
Construction planning will demonstrate consideration of all practicable options to avoid or minimise impacts on trees, including: – review of the construction methodology and layout of work sites, compounds, access, ancillary infrastructure and fencing – consideration of alternative construction methods and equipment. Trees to be retained, and trees with the potential to be impacted during construction, will be protected in accordance with Australian Standard *AS 4970 2009 Protection of trees on development sites.*	Pre-construction, Construction
Any tree pruning that is more than minor will be undertaken by a qualified arborist in accordance with *AS 4373-2007 Pruning of amenity trees.*	Construction
Early planting and revegetation works will be undertaken where practicable to provide a screening buffer that has time to mature before the project is fully operational.	Construction
Construction programming will provide for the progressive rehabilitation of disturbed areas as far as practicable, to minimise the duration and extent of temporary visual and landscape character impacts.	Construction

Table 5.2 Recommended management measures

Impact	Mitigation
Tree removal	– Tree removal should be carried out according to the guidelines outlined in Safe Work Australia (2016). – An ecologist or suitably qualified wildlife handler to be present for removal of the hollow-bearing trees in case of any unexpected finds (e.g. nestlings). – Any unexpected finds should be removed by the wildlife handler and released into the care of WIRES, Sydney Wildlife or other appropriate wildlife rescue organisation as necessary.
Disturbance of the TPZ of retained trees during construction	– A Project Arborist would be appointed to advise on tree protection measures for retained trees proximate to the project site prior to and during construction. – The Project Arborist would determine the requirement for fencing and the location and extent of protective fencing for trees which are proposed for retention proximate to the project site. This would be completed prior to construction commencing, once the limits of ground disturbance are known. – If further locations of disturbance are identified during design development, the Project Arborist, would reassess potential impacts to the TPZs of retained trees. If protection of the full TPZ of some trees is not possible, the Project Arborist would: • determine the optimal TPZ • review existing plans and determine if they can be altered to accommodate the full extent of retained tree's TPZs. For example if permeable surfaces or bridging over the extent of the tree's TPZ is possible. – Tree fencing would comply with Australian Standards 2009. An example of appropriate fencing is indicated in Appendix D. The fencing should be installed prior to commencement of clearing and should be retained in place until the completion of construction. – Where fencing or protection is nominated for trees located on private property, consultation with the landowner would be undertaken to confirm if/how protection should be installed.

Impact	Mitigation
	The following actions would not be permitted within the TPZ of any tree: – storage of materials, plants or equipment – installation of site sheds or portable toilets – excavations, trenching, ripping or cultivation of soils – modification of existing soil level or addition of fill materials – disposal of waste materials and chemicals (both solid or liquid) – mechanical removal of vegetation – pedestrian or vehicular movement.
	During construction the Project Arborist would inspect any required excavated areas within retained tree TPZs, which reveal quantities of live tree roots. – Any root pruning required within the TPZ would be approved by the Project Arborist, prior to being carried out, and any digging and pruning of roots (only roots less than five centimetres may be pruned) within the TPZ would be conducted by hand for a clean cut. – Where larger roots require pruning the Project Arborist would provide advice as to whether the loss of tree roots constitutes a safety risk to workers (because of reduced tree stability), a potential long-term risk, or if it is apparent that the amount of root loss would cause accelerated rate of decline in adjacent retained trees.
	The Project Arborist would advise if: – A layer of organic mulch is to be applied to protect soil within the TPZ of any tree or Tree Group which may be affected by construction, excavation or level changes. Mulch is to be applied no more than 75 mm thick. Any mulch used would comply with the Australian Standard – composts, soil conditioners and mulches AS 4454-2012 (SA 2012). – Irrigation systems need to be installed for retained trees where the TPZs have been affected by construction, if an extended period of drought occurs. The Project Arborist would advise on the frequency of watering needed. As a guide, the watering should occur at least once per week and allow deep soil penetration. The specific watering requirements would also depend on the climatic conditions.
	Once the construction works are completed: – Any retained trees located near construction sites where the TPZ has been affected, would be re-inspected by the Project Arborist who would carry out an assessment that would prescribe remedial work where necessary to reduce any identified risk to pedestrians or parked vehicles. – The Project Arborist would identify if any of the retained trees that have had disturbance of their TPZ require further monitoring to assess their health, vigour and to identify potential hazards. This is of particular importance given the proximity of the trees to areas of public access. In consultation with Transport for NSW, the contractor and the landowner, the method of monitoring, duration and responsibilities will be agreed.

5.2 Considerations for translocation

A large proportion of the trees growing within the project site are mature specimens, many of which not be suitable for translocation and the amount of time and cost required for successful translocation could be prohibitive, considering the number of trees which will require removal. Exceptions include recent plantings, such as those along the nature strip on the northern side of South Street Rydalmere, in Ken Newman Park and along Boronia Street. These plantings appear to be quite recent and transplanting of these specimens to more suitable locations may be feasible.

If a decision is made to transplant mature trees from the site, the following requirements for a successful translocation include:

– species which generally have a shallow root plate and a dependence on soil mycorrhizae (especially for Australian species)
– a well-developed root system
– trees growing in fertile, well-aerated soils tend to have a compact root system and are therefore more amenable to transplanting

– site conditions: e.g. is there paving, are there adjacent plants, are there overhead wires or underground services? Level surfaces are easier than sloping surfaces
– time of year: Palms should only be transplanted during the growing season; Other trees are traditionally transplanted in the winter months, especially in the case of deciduous species. Whatever the season, the transplanted specimens may be damaged by desiccating winds and solar radiation, drought or mechanical damage during and after transplanting.

Transplanted mature specimens may demonstrate stress symptoms, especially loss of foliage, necrosis in laterals and an increased susceptibility to infestations by harmful organisms.

Transplanting of mature specimens also requires the use of specialised machinery, which greatly increases costs – costs that could be better utilised by carrying out compensatory planting.

Specific recommendations regarding the successful transplanting of the *Phoenix canariensis* are provided in section 5.2.1.

5.2.1 *Phoenix canariensis* transplanting

Recommendations for the for the successful transplanting of the *Phoenix canariensis* within the heritage curtilage of Bulla Cream Dairy (Willowmere) (Paramatta LEP I64) are detailed as follows.

– Palms are best transplanted during the growing season, i.e. October to March. Palms transplanted during the dormant period may remain dormant for several years, if not permanently and are likely to be more susceptible to disease and insect infestation.
– Prepare the palm tree for transplanting by irrigating several times prior to removal to ensure optimal water status around the root ball and maximum soil adhesiveness. The soil around the root ball should be evenly moist at the time of removal, from the surface to the bottom of the root ball.
– The palms are currently growing in a sheltered garden. If the palms are translocated to a more open, exposed location, it is possible that the trees will be slow to recommence growth, and may become more susceptible to disease and insect infestation. Selection of an appropriately sheltered location should be a consideration in planting location.
– When re-planting, ensure that the tree is planted at original grade. A transplanted palm is less likely to survive if planted deeper than the original level, mainly because of reduced oxygen levels around the root zone. The transplanted palm will be self-supporting in reasonably sheltered locations but may need temporary support if the location is exposed to strong winds or draughts.
– Prepare the holes prior to palm removal. Holes should be appropriately sized, around twice as wide as the root ball of the excavated palm. The hole depth should be the same as the root ball. The holes should be evenly moist prior to planting.
– The palms may be removed after hand-digging or with use of specialised mechanical equipment. A crane is the usual method of transferring the palm to its new hole. Ideally, the palm should be re-located immediately after removal. Remove dead or damaged fronds but try to retain as much healthy leaf area as possible, to ensure adequate photosynthetic capacity. Staff involved with frond removal and frond protection should be especially careful to avoid the prickles along the edge of the primary rachis and petiole.
– Depending on the soil texture and structure, the excavated soil may need to be supplemented with thoroughly decomposed, nitrogen-stabilized organic material (see AS 4454 Composts, soil conditioners and mulches). Once the palm is installed in the excavated hole, firmly tamp the backfilled soil to remove all air pockets and then flood-irrigate several times to ensure proper settling of the soil. The water used for irrigation may be supplemented by the addition of rooting hormone, although recent research indicates that the benefits of adding rooting hormone may be minimal (see Hodel *et al.* 2009).
– An organic mulch to a maximum depth of 75 millimetres may be installed around the base of the palm.
– Irrigation should be carried out regularly after planting. Sufficient water should be applied to ensure that the entire root ball and surrounding infill to a depth of 300 millimetres is uniformly moist.
– The health and stability of the transplanted palms should be regularly monitored by a suitably qualified arborist for 12 months.

6. Areas for further assessment

Due to access limitations (e.g. safety or private land), certain areas could not be properly assessed during the survey. The following tree groups would require further assessment in the event that works extend into these areas:

- Group 150 (*Eucalyptus scoparia* and *Grevillea robusta)* behind an industrial lot in Camellia
- Group 262 (*Eucalyptus nicholii, Liquidambar styraciflua, Glochidion ferdinandi* var. *Ferdinand, Grevillea robusta*, *Pittosporum undulatum Photinia x fraseri* 'Robusta' trees in a private backyard in Ermington
- Trees in a private backyard at River Road, Ermington
- Trees in private backyards at Hilder Road, Ermington
- Group 364 (*Schinus molle var. areira, Magnolia grandiflora, Jacaranda mimosifolia, Cinnamomum camphora, and Liquidambar styraciflua*) growing in private gardens in Melrose Park
- Group 365 (*Jacaranda mimosifolia)* growing in private garden bed in Melrose Park
- Group 366 (*Glochidion ferdinandi var. ferdinandi, Eriobotrya japonica, Callistemon salignus, Brachychiton acerifolius, Ficus rubiginosa and Persea americana)* growing in private gardens along roadside in Melrose Park.

In addition to the above, a more detailed tree survey would be required for accurate buffer zones to be determined in Ken Newman Park.

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Appendix A

Tree map



Legend

- Project site
- Study area for biodiversity assessment
- Individual tree

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2a

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Print date: 26 Oct 2022 - 12:33

Data source: Metromap Tile Service: . Created by: dschmidt



Legend

- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2b

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Data source: Metromap Tile Service: . Created by: dschmidt



Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2c

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Legend

- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2d

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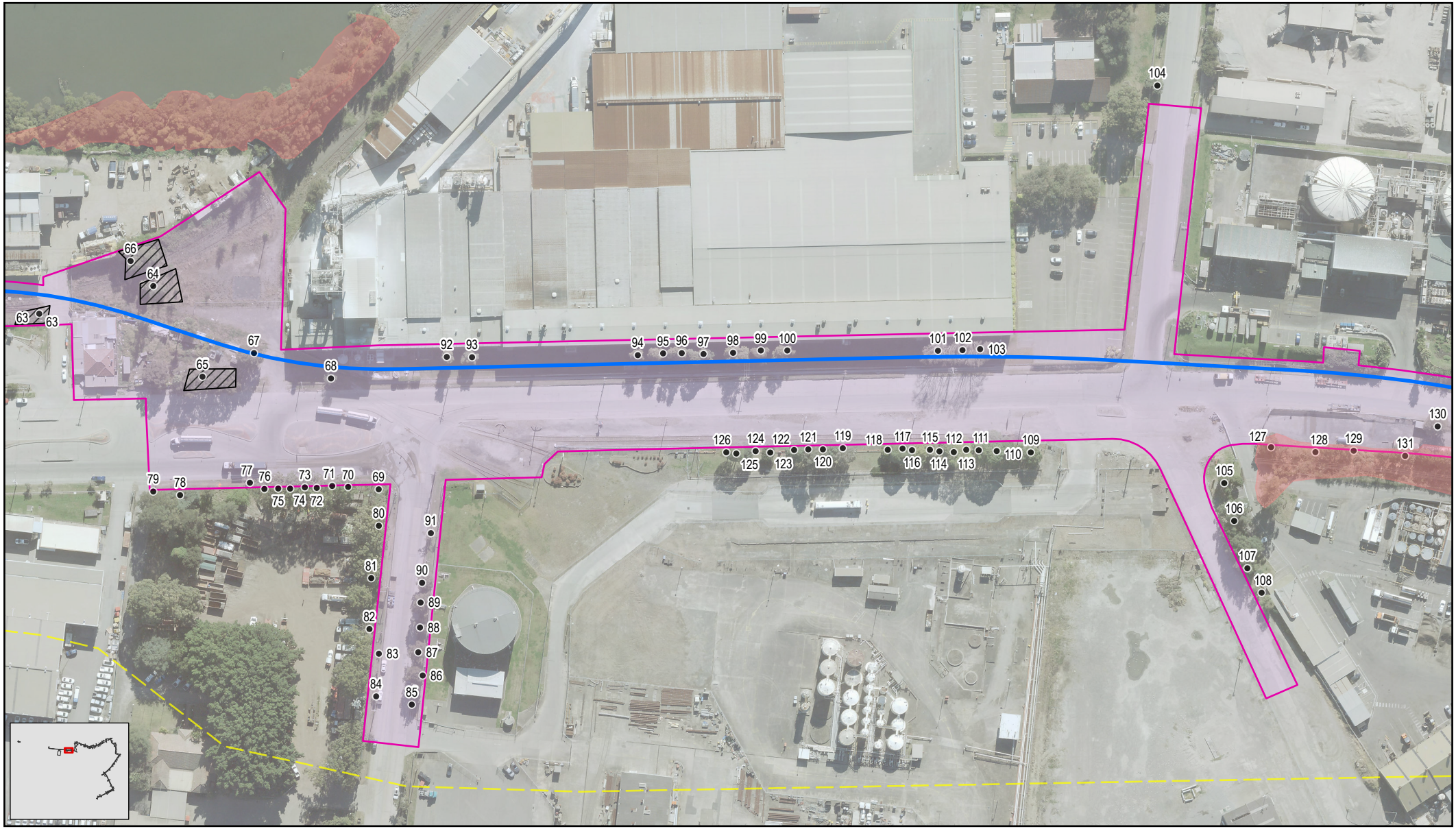

Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2e

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Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

Tree survey

FIGURE 2f

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Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Amenity tree identified by arborist
- Individual tree
- Amenity tree identified by arborist
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2g

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Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Amenity tree identified by arborist

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2h

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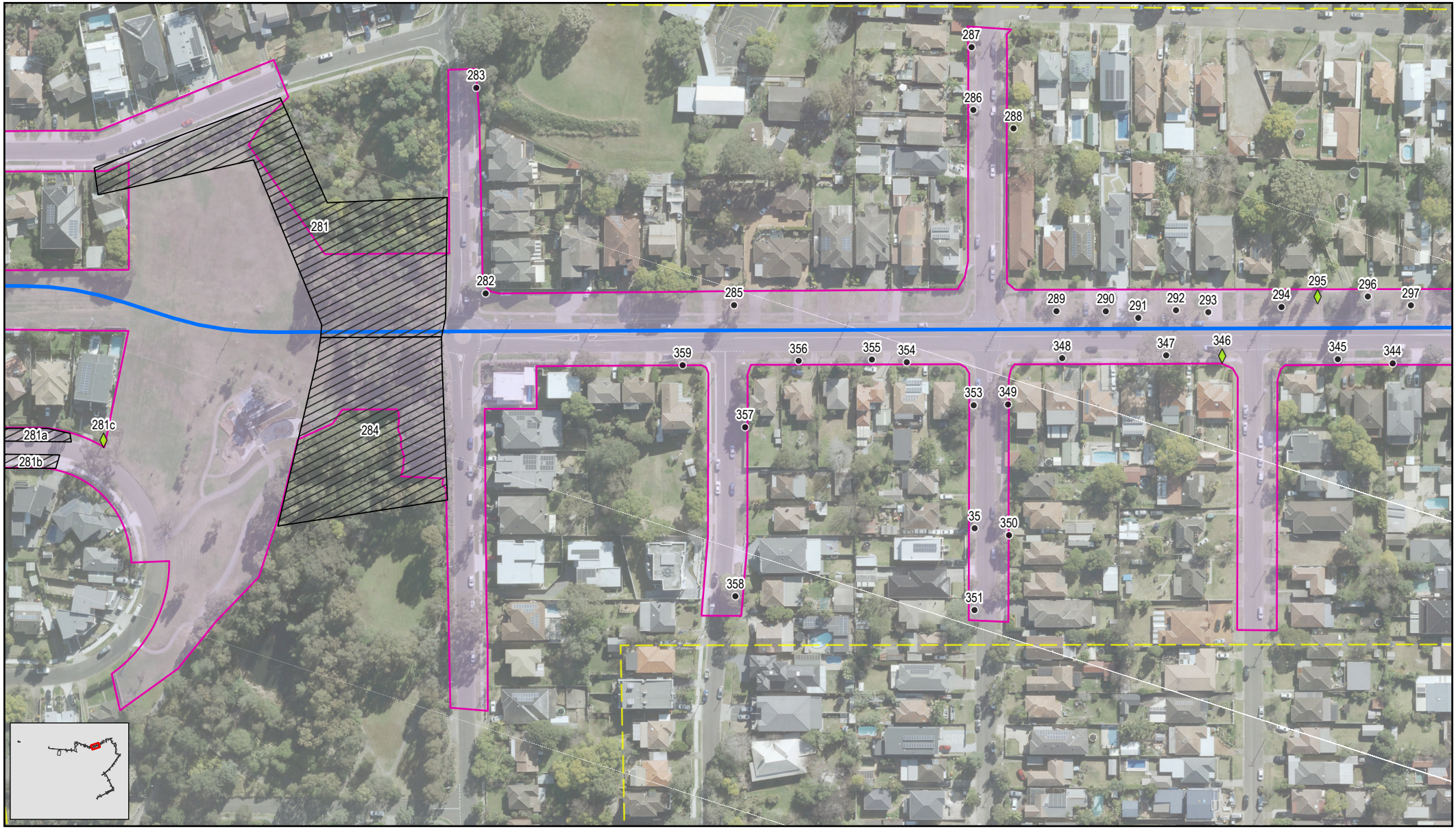

Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Amenity tree identified by arborist

Paper Size ISO A4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2i

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Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Heritage trees
- Individual tree
- Amenity tree identified by arborist

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2j

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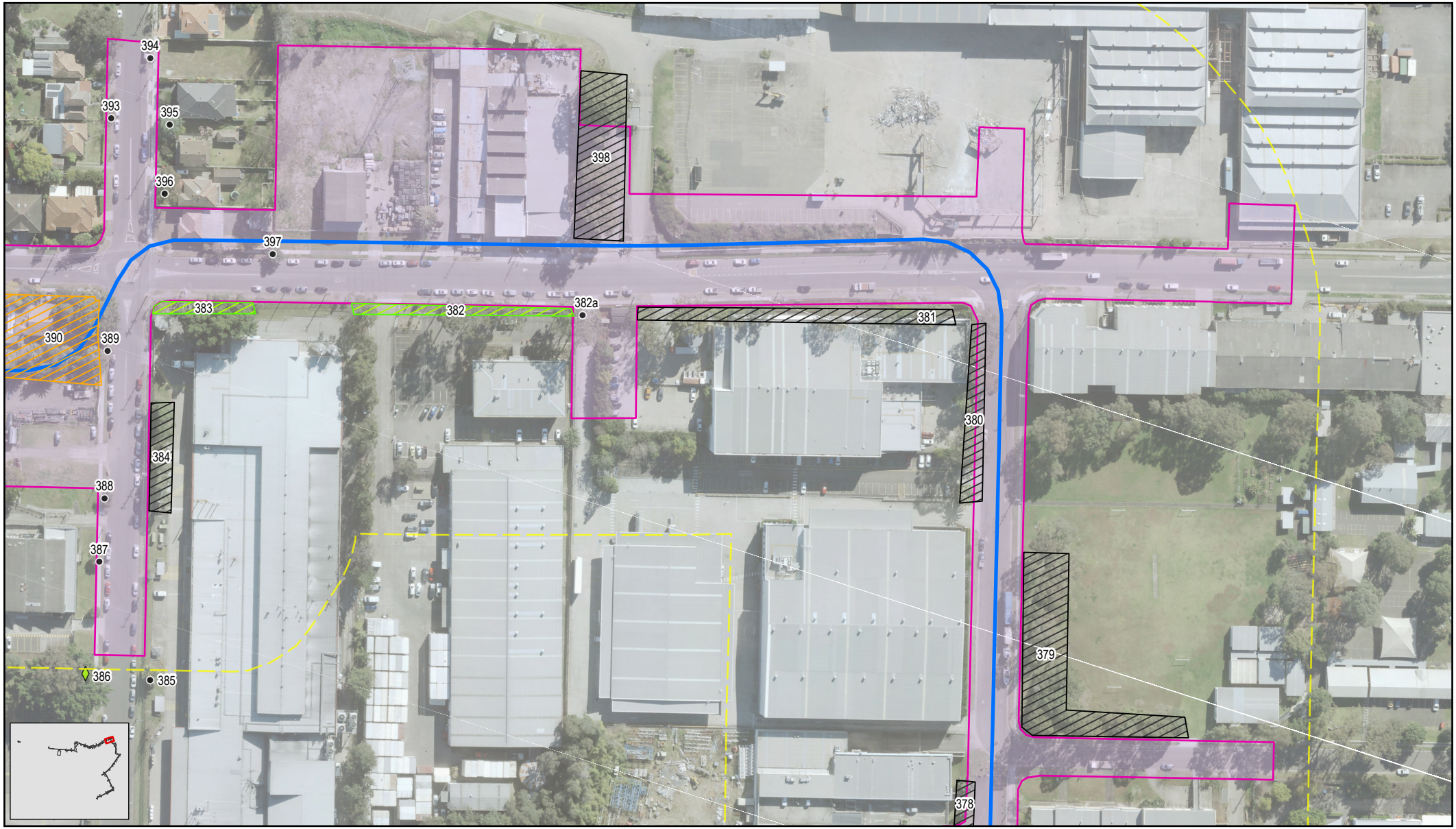

Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Amenity tree identified by arborist
- Heritage trees
- Individual tree
- Amenity tree identified by arborist

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2k

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Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2I

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Data source: Metromap Tile Service: . Created by: dschmidt



Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Heritage trees
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2m

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Print date: 26 Oct 2022 - 12:34

Data source: Metromap Tile Service: . Created by: dschmidt



Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Amenity tree identified by arborist
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Transport for NSW
Parramatta Light Rail Stage 2 EIS

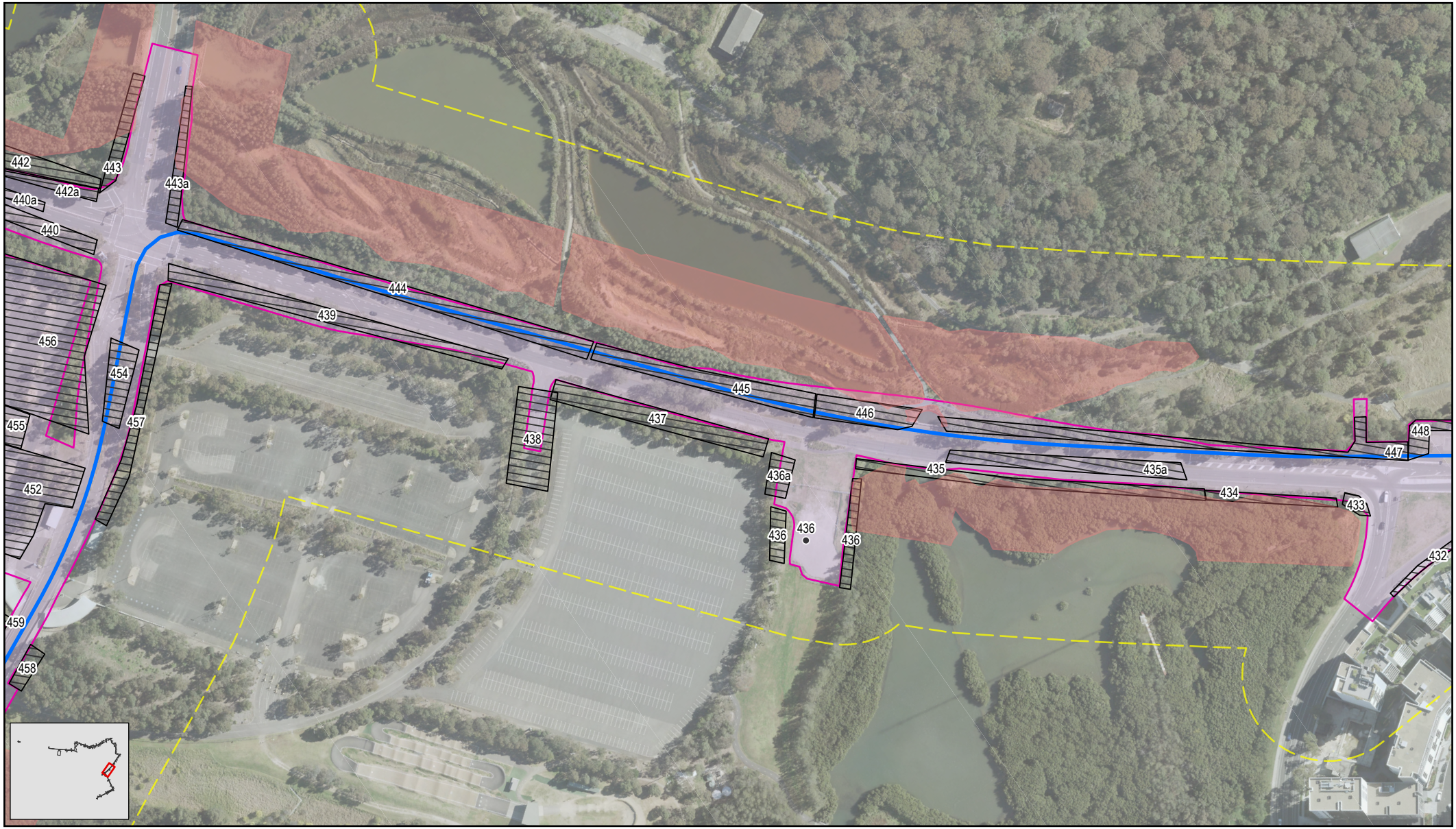
Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2n

N:\AU\Sydney\Projects\21\12557728\GIS\Maps\Aboricultural_0.aprx\12557728_ABC002_TreeSurvey_A4
Print date: 26 Oct 2022 - 12:35

Data source: Metromap Tile Service: . Created by: dschmidt



Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2o

N:\AU\Sydney\Projects\21\12557728\GIS\Maps\Aboricultural_0.aprx\12557728_ABC002_TreeSurvey_A4
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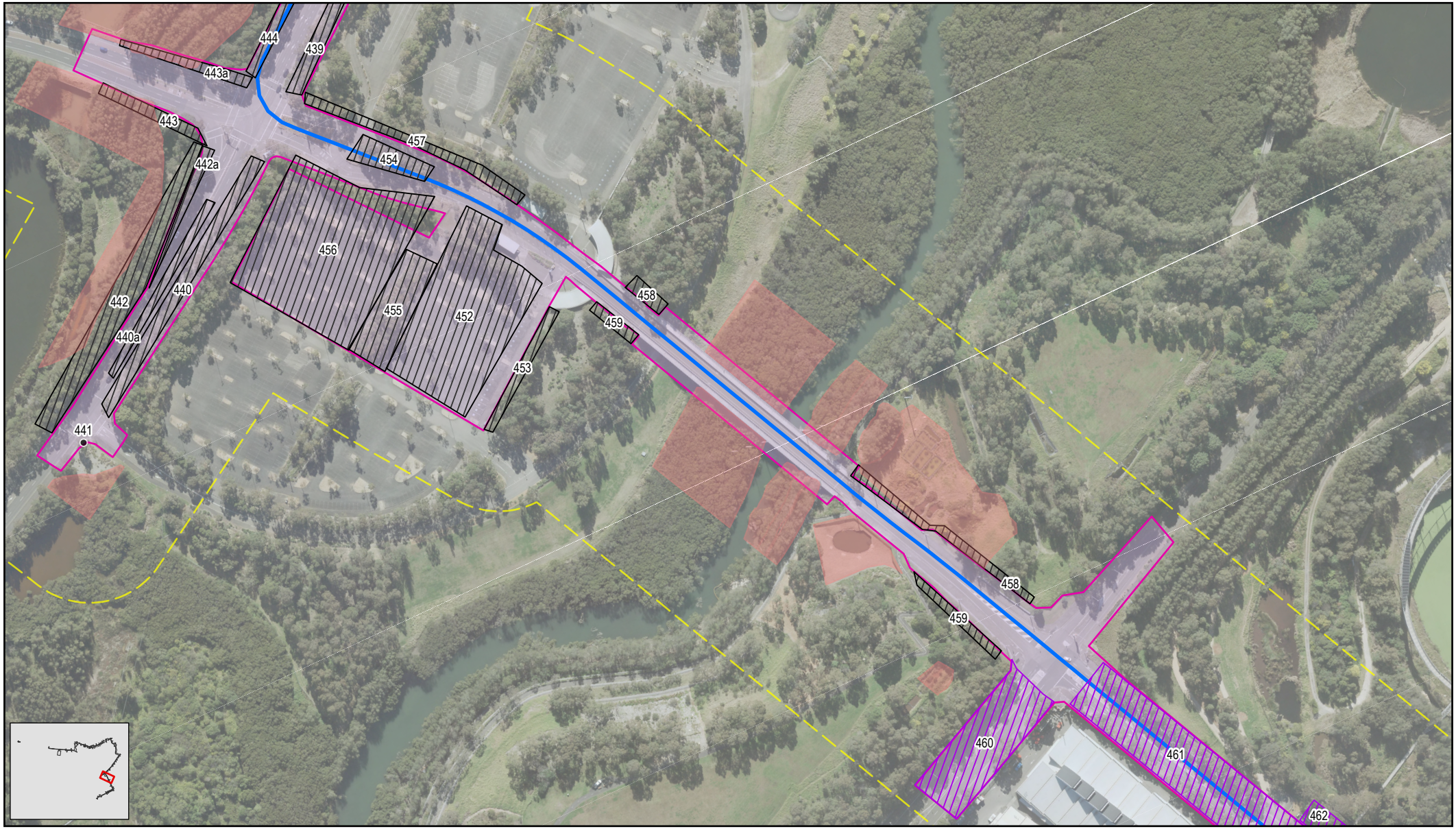

Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Significant tree under Sydney Olympic Park Master Plan
- Individual tree
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2p

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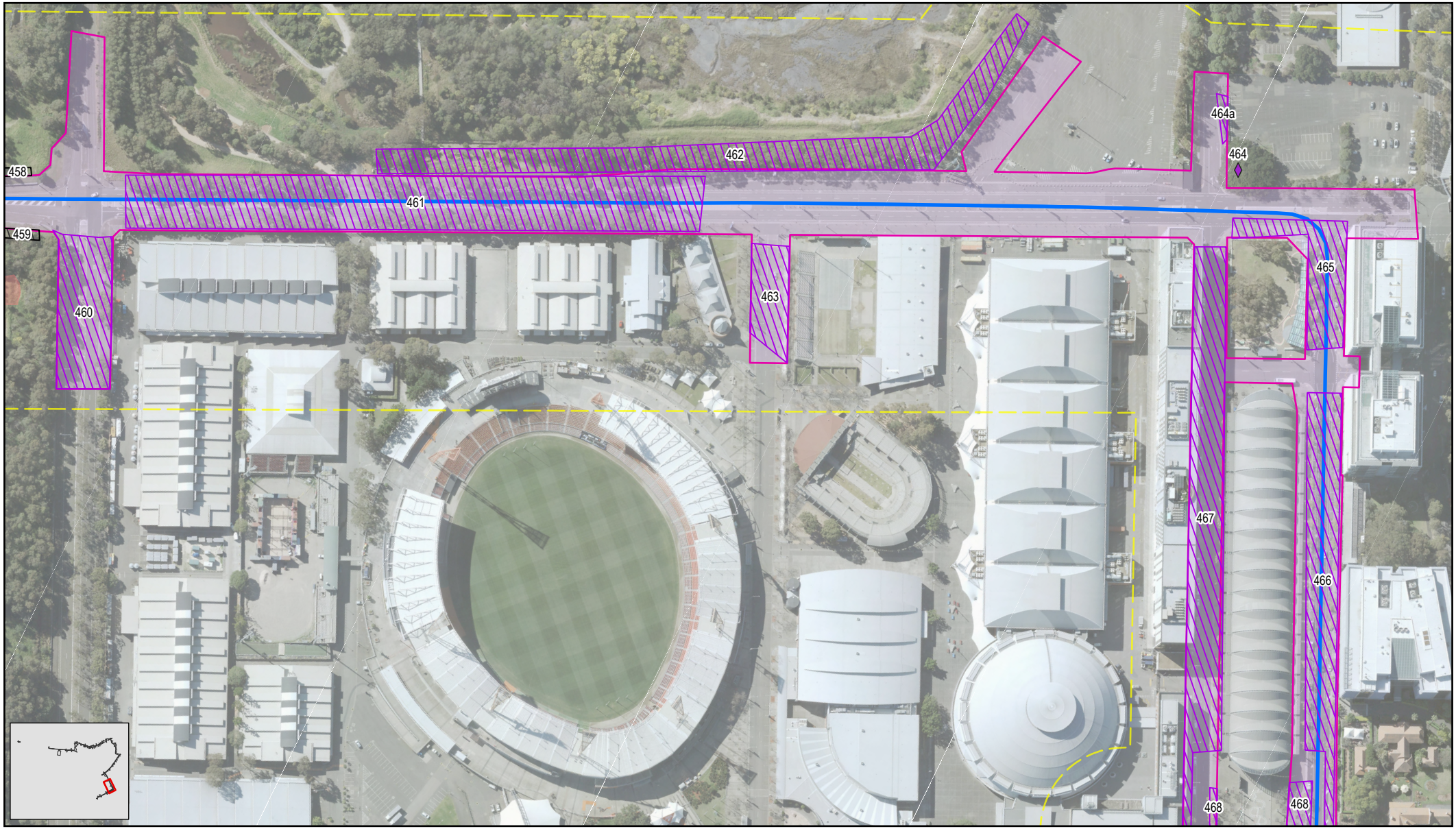

Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Significant tree under Sydney Olympic Park Master Plan
- Significant tree under Sydney Olympic Park Master Plan
- Vegetation assessed in the Biodiversity Development Assessment Report

Paper Size ISO A4

0 25 50

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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GHD

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2q

N:\AU\Sydney\Projects\21\12557728\GIS\Maps\Aboricultural_0.aprx\12557728_ABC002_TreeSurvey_A4
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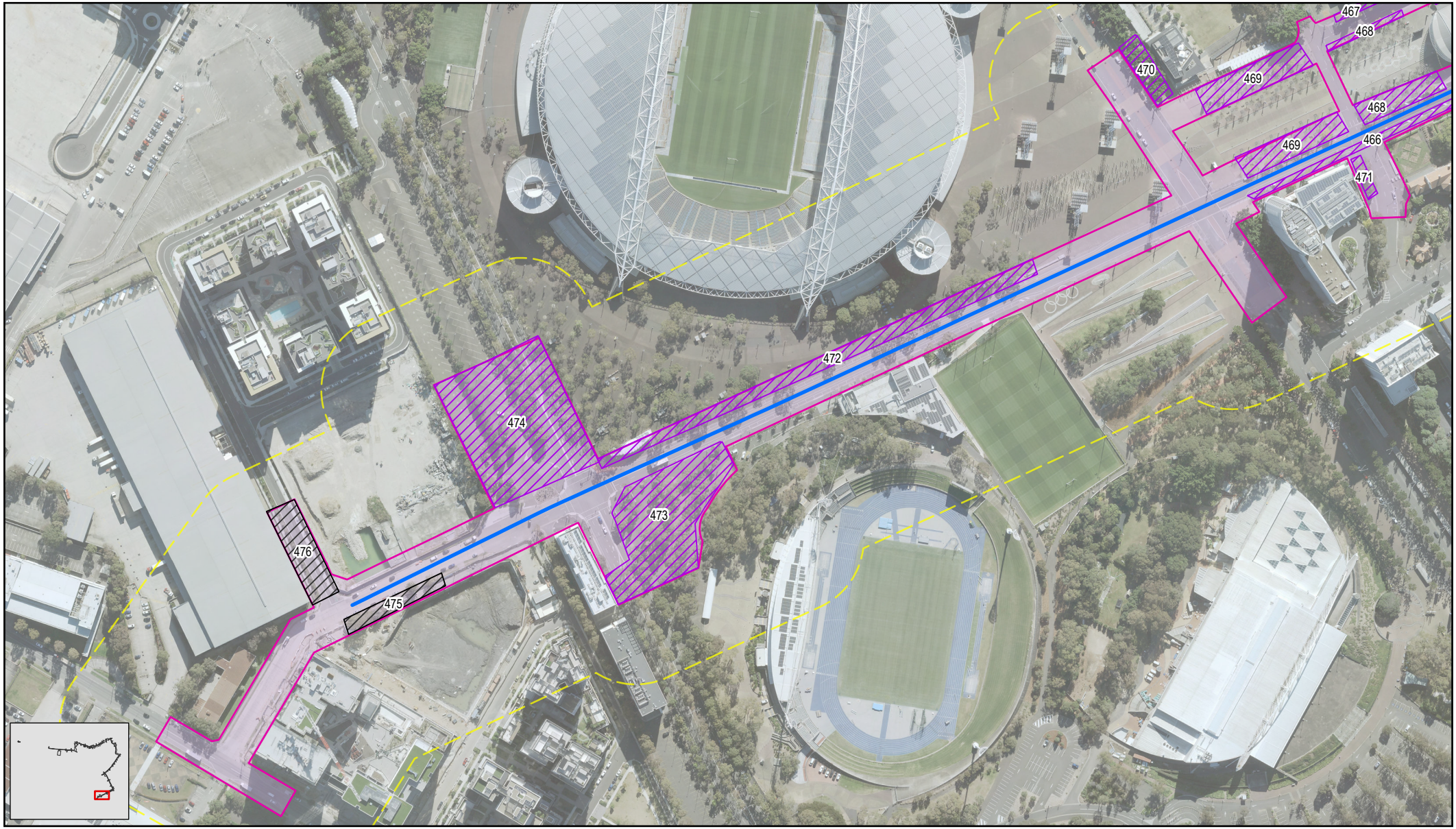


Legend

- Project alignment
- Project site
- Study area for biodiversity assessment
- Tree group
- Significant tree under Sydney Olympic Park Master Plan

Paper Size ISO A4

0 25 50

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Transport for NSW
Parramatta Light Rail Stage 2 EIS

Tree survey

Project No. **12557728**
Revision No. **0**
Date **26/10/2022**

FIGURE 2r

N:\AU\Sydney\Projects\21\12557728\GIS\Maps\Aboricultural_0.aprx\12557728_ABC002_TreeSurvey_A4
Print date: 26 Oct 2022 - 12:35

Data source: Metromap Tile Service: . Created by: dschmidt

Appendix B

The SULE code

The SULE value generated by the below matrix gives an indication of the time a tree is expected to be usefully retained. Adapted from Barrell (2001).

	1 Long SULE	2 Medium SULE	3 Short SULE	4 Removal	5 Move or Replace
A	Tree that appear to be retainable at the time of assessment for >40 years with an acceptable degree of risk, assuming reasonable maintenance.	Tree that appear to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance.	Tree that appear to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance.	Trees which should be removed within the next 5 years.	Trees which can be readily moved or replaced.
B	Structurally sound trees located in positions that can accommodate for future growth.	Trees that may only live for 15-40 years.	Trees that may only live for another 5-15 years.	Dead, dying, suppressed or declining trees.	Small trees <5 (m) in height.
C	Trees that could be made suitable for retention in the long term by remedial tree care.	Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.	Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.	Dangerous trees because of instability or loss of adjacent trees.	Young trees less than 15 years old but over 5m in height.
D	Trees of special significance that would warrant extraordinary efforts to secure their long term retention.	Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide for new planting.	Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.	Dangerous trees because of structural defects.	
E		Trees that could be made suitable for retention in the medium term by remedial tree care.	Trees that require substantial remedial tree care and are only suitable for retention in the short term.	Damaged trees not safe to retain.	
F				Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.	
G				Trees that are damaging or may cause damage to existing structures within 5 years.	

Appendix C

Tree table

Tree table

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
1	*#Lophostemon confertus*	12	5	M	0.29	G	G	2A	4	Growing on footpath Marsden Street	Likely to be removed
2	*#Lophostemon confertus*	12	5	M	0.27	G	G	2A	4	Growing on footpath Marsden Street	Likely to be removed
3	*#Lophostemon confertus*	12	5	M	0.27	G	M	2A	4	Growing on footpath Marsden Street Cavity at base of leader	Likely to be removed If retained, cavity requires occasional safety inspection
4	*#Lophostemon confertus*	12	5	M	0.24	G	G	2A	4	Growing on footpath Marsden Street	Likely to be removed
5	*#Lophostemon confertus*	12	2	M	0.28	G	G	2A	4	Growing on footpath Marsden Street	Likely to be removed
6	*#Lophostemon confertus*	7	2.5	M	0.26	G	G	2A	4	Growing on footpath Marsden Street	Likely to be removed
7	*#Lophostemon confertus*	14	6	M	0.33	G	G	2A	4	Growing on footpath Marsden Street; at intersection	Likely to be removed
8	*#Eucalyptus scoparia*	15	2.5	M	0.26	M	M	3A	3	Growing in bed beside footpath; Macquarie Street Surrounded by *Murraya paniculata* hedge This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act). Bird nest in upper canopy	May require removal
9	*#Harpullia pendula*	4	1.5	EM	0.12	G	G	3A	2.5	Growing in footpath; recent planting Macquarie Street	Likely to be removed
10	*#Harpullia pendula*	4	1.5	EM	0.12	G	G	3A	2.5	Growing in footpath; recent planting Macquarie Street	Likely to be removed

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
11	#*Harpullia pendula*	4	1.5	EM	0.11	G	G	3A	2.5	Growing in footpath; recent planting Macquarie Street	May require protection
12	#*Harpullia pendula*	4	1.5	EM	0.11	G	G	3A	2.5	Growing in footpath; recent planting Macquarie Street	May require protection
13	#*Lophostemon confertus*	24	4	M	0.22	G	G	2A	3.5	Adjacent to Stage 1 light rail alignment Self-recruited invasive shrubs; incl. **Ligustrum lucidum*, **Cinnamomum camphora*, *Olea europaea* subsp. *cuspidata*	May require protection
14	#*Lophostemon confertus*	24	34	M	0.24	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection
15	#*Lophostemon confertus*	24	4	M	0.23	G	G	2A	3.5	Adjacent to Stage 1 light rail alignment	May require protection
16	#*Lophostemon confertus*	24	4	M	0.22	G	G	2A	3.5	Adjacent to Stage 1 light rail alignment	May require protection
17	#*Lophostemon confertus*	24	3	M	0.23	G	G	2A	3.5	Adjacent to Stage 1 light rail alignment	May require protection
18	#*Lophostemon confertus*	24	3	M	0.25	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
19	#*Lophostemon confertus*	24	4	M	0.26	G	G	2A	4	Adjacent to Stage 1 light rail alignment Stick nest	May require protection during construction
20	#*Lophostemon confertus*	22	4	M	0.25	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
21	#*Lophostemon confertus*	22	4	M	0.26	G	G	2A	4	Adjacent to Stage 1 light rail alignment Self-recruited #*Grevillea robusta* growing nearby	May require protection during construction
22	#*Lophostemon confertus*	22	4	M	0.25	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
23	*#Lophostemon confertus*	23	4	M	0.24	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
24	*#Lophostemon confertus*	23	4	M	0.27	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
25	*#Lophostemon confertus*	23	4	M	0.26	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
26	*#Lophostemon confertus*	24	3	M	0.26	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
27	*#Lophostemon confertus*	24	4	M	0.25	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
28	*#Lophostemon confertus*	24	4	M	0.24	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
29	*#Lophostemon confertus*	22	3	M	0.28	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
30	*#Lophostemon confertus*	23	4	M	0.27	G	G	2A	4	Adjacent to Stage 1 light rail alignment	May require protection during construction
31	*#Lophostemon confertus*	24	4	M	0.24	G	G	3A	3	Adjacent to Stage 1 light rail alignment	May require protection during construction
32 group	*Eucalyptus tereticornis* *Ficus rubiginosa*	26 5	3 1.5	OM EM	0.35 0.14	M G	M G	3A 2A	4 2	Adjacent to Stage 1 light rail alignment Epicormic growth and necrotic laterals Fig will eventually grow over Eucalypt Small hollow in *E. teretricornis*	May require protection during construction
33	*Casuarina glauca*	12	2	M	0.19	M	M	3A	3	Adjacent to Stage 1 light rail alignment Bias and asymmetrical growth; previous pruning associated with fence construction	Growth towards easement has been previously removed <10% of TPZ extends into easement May require protection during construction

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
34	*Casuarina glauca*	15	5	M	0.25	M	M	2A	3	Adjacent to Stage 1 light rail alignment Bias and asymmetrical growth; previous pruning associated with fence construction	Growth towards easement has been previously removed <10% of TPZ extends into easement May require protection during construction
35	*Casuarina glauca*	15	4	M	0.26	M	M	2A	3	Adjacent to Stage 1 light rail alignment Bias and asymmetrical growth; previous pruning associated with fence construction *Melaleuca armillaris* growing nearby	Growth towards easement has been previously removed <10% of TPZ extends into easement May require protection during construction
36	*Eucalyptus tereticornis*	22	5	M	0.34	G	M	2A	4	Growing near fence in Stage 1 light rail alignment One leader has been previously lopped	Likely to be removed
37	**Cinnamomum camphora*	17	4	M	0.26	M	M	4A	3	Adjacent to Stage 1 light rail alignment Invasive exotic species	All growth towards easement has been previously removed TPZ does not extend into easement
38	*Casuarina glauca*	8	2	M	0.18	M	M	2A	2.5	Adjacent to Stage 1 light rail alignment Previous damage to base of leader	TPZ does not extend into easement
39	*Allocasuarina littoralis*	7	2	M	0.14	G	G	2A	2	Adjacent to Stage 1 light rail alignment	May require protection
40	*Angophora costata*	15	3	M	0.16	G	G	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
41	*Angophora costata*	15	3	M	0.15	G	G	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
42	*Angophora costata*	15	3	M	0.14	G	M	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
43	*Angophora costata*	15	3	M	0.14	G	G	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
44	*Angophora costata*	15	3	M	0.14	G	M	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
45	*Angophora costata*	15	3	M	0.15	G	G	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
46	*Angophora costata*	15	3	M	0.15	G	M	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
47	*Angophora costata*	14	3	M	0.15	G	G	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
48	*Angophora costata*	14	3	M	0.14	G	M	2A	2.5	Adjacent to Stage 1 light rail alignment Growing between fence and factory building	May require protection
49	*Casuarina glauca*	7	1.5	EM	0.11	M	M	3A	1.5	Growing within project site Apomyctic thicket	Likely to be removed

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
50	*Casuarina glauca*	12	3	M	multi	G	G	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
51	*Casuarina glauca*	10	3	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
52	*Casuarina glauca*	10	3	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
53	*Casuarina glauca*	6	2	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
54	*Casuarina glauca*	9	2	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
55	*Casuarina glauca*	4	2	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	May require protection during construction
56	*Casuarina glauca*	4	2	EM	multi	G	M	3A	2	Growing within project site Apomyctic thicket	Likely to be removed
57	*Casuarina glauca*	15	3	M	0.26	G	G	2A	3	Growing within project site	Growth towards easement has been removed Likely to be removed
58	*Casuarina glauca*	6	2	M	multi	G	G	3A	2	Apomyctic thicket Growing along edge of former freight (Sandown) line	Likely to be removed
59 group	**Cupressus sempervirens x 4*	9	1	M	0.09	G	G	3A	1	Growing in industrial property adjacent to former freight (Sandown) line	Likely to be removed
60	*Eucalyptus saligna x Eucalyptus botryoides* hybrid	17	4	M	0.33	G	G	2A	4	Growing in industrial property adjacent to former freight (Sandown) line	Likely to be removed

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
61 group	*Casuarina glauca x 7*	10	2	EM	multi	G	M	3A	2	Growing at end of former freight (Sandown) line In thicket with *Bursaria spinosa* and *#Grevillea robusta*	Likely to be removed
62 group	*Casuarina glauca x 5*	7	2	EM	multi	M	M	3A	2	Growing in industrial property adjacent to former freight (Sandown) line In thicket with **Lantana camara* and *Acacia parramattensis*	In project site; removal will be required
63 group	*Casuarina glauca x 5*	5	2	EM	multi	M	M	3A	2	Growing in industrial property adjacent to former freight (Sandown) line In thicket with **Lantana camara* and *Acacia parramattensis*	In project site; removal will be required
64 group	*Pittosporum undulatum*	9	2	M	0.22	G	M	3A	3	In thicket with **Washingtonia robusta* and **Olea europaea* subsp. *cuspidata*	In project site; removal will be required
65 group	*#Melaleuca quinquenervia x 9*	15	2.5	M	0.25	M	F	3A	3	Growing in industrial property adjacent to former freight (Sandown) line Co-dominant leaders; sparse growth	In project site; removal will be required
66	*Casuarina glauca x3*	10	2	M	multi	G	M	3A	2	Growing in industrial property adjacent to former freight (Sandown) line - in thicket with *Acacia parramattensis*	In project site; removal will be required
67	*Casuarina glauca*	12	3	M	0.25	G	G	2A	3	In industrial land; possibly within easement	In project site; removal will be required
68	*Casuarina glauca*	9	3	EM	0.22	G	G	2A	3	Grand Avenue; footpath; possibly within easement	In project site; removal will be required

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
69 group	Necrotic x 2	10	2	NA	NA	NA	NA	NA	NA	Grand Avenue; in industrial property, adjacent to easement	Remove for safety
70	*#Eucalyptus microcorys*	19	4	M	0.26	G	G	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
71	*#Eucalyptus microcorys*	15	3	M	0.25	G	G	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
72	*#Eucalyptus microcorys*	15	3	M	0.25	G	M	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
73	*#Eucalyptus microcorys*	19	4	M	0.27	G	G	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
74	*#Eucalyptus microcorys*	18	4	M	0.26	G	M	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
75	*#Eucalyptus microcorys*	18	5	M	0.27	G	G	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
76	*#Eucalyptus microcorys*	18	5	M	0.27	G	G	2A	4	Grand Avenue; in industrial property, adjacent to easement	May require protection
77 group	*#Melaleuca quinquenervia*	14	3	M	0.24	G	M	2A	3	Grand Avenue; in industrial property, adjacent to easement	May require removal
78	**Cedrus deodara* *Casuarina glauca*	12 11	4 2	M M	0.29 0.22	M G	M G	3A 2A	4 3	Grand Avenue; in industrial property, adjacent to easement	May require protection
79 group	*Casuarina glauca x 8*	10	2	M	0.18	G	G	2A	3	Grand Avenue; in industrial property, adjacent to easement	May require protection
80	*#Eucalyptus microcorys*	14	3	M	0.19	G	G	5A	3	Durham Street; in industrial land adjacent to fence	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
81	*#Eucalyptus microcorys*	14	3	M	0.22	G	G	5A	3	Durham Street; in industrial land adjacent to fence	May require protection
82	necrotic	NA	NA	NA	NA	NA	NA	NA	NA	Durham Street; in industrial land adjacent to fence	Remove for safety reasons
83	*#Eucalyptus microcorys*	14	3	M	0.25	G	G	2A	4	Durham Street; in industrial land adjacent to fence	In project site; removal will be required
84 group	*#Melaleuca quinquenervia x 4*	3	1.5	M	0.18	M	M	3A	2.5	Durham Street; in footpath; growing under wires; have been pollarded	Removal will be required
85	*#Melaleuca quinquenervia*	12	3	M	0.23	G	G	2A	3	Durham Street; in footpath	May require removal
86	*#Melaleuca quinquenervia*	12	3	M	0.25	G	G	2A	3	Durham Street; in footpath	May require removal
87	*#Melaleuca quinquenervia*	12	3	M	0.24	G	G	2A	3	Durham Street; in footpath	May require removal
88	*#Melaleuca quinquenervia*	12	3	M	0.24	G	G	2A	3	Durham Street; in footpath	May require removal
89	*#Melaleuca quinquenervia*	12	3	M	0.23	G	G	2A	3	Durham Street; in footpath	May require removal
90	*#Melaleuca quinquenervia*	4	1.5	M	0.23	M	M	3A	2.5	Durham Street; in footpath; growing under wires; have been pollarded	May require removal
91	*#Melaleuca quinquenervia*	4	1.5	M	0.22	M	M	3A	2.5	Durham Street; in footpath; growing under wires; have been pollarded	May require removal
92	**Lagunaria patersonii*	12	3	M	0.21	G	G	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
93	**Lagunaria patersonii*	12	3	M	0.24	G	M	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
94	**Lagunaria patersonii*	11	3	M	0.27	G	G	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
95	**Lagunaria patersonii*	12	3	M	0.23	G	G	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
96	**Lagunaria patersonii*	12	3	M	0.22	G	M	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
97	**Cinnamomum camphora*	11	4	M	0.32	G	G	4A	4	Grand Avenue; in industrial property, adjacent to building Invasive species	Likely to require removal
98	**Lagunaria patersonii*	10	3	M	0.22	G	G	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
99	**Lagunaria patersonii*	11	3	M	0.24	G	G	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
100	**Lagunaria patersonii*	11	2	M	0.23	G	M	3A	3	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
101	**Platanus x hispanica* 'Acerifolia'	12	4	M	0.36	M	M	3A	4	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
102 group	**Platanus x hispanica* 'Acerifolia'	12	4	M	0.38	M	M	3A	4	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
103	**Platanus x hispanica* 'Acerifolia'	12	3	M	0.34	M	M	3A	4	Grand Avenue; in industrial property, adjacent to building	Likely to require removal
104	*#Lophostemon confertus*	5	2	M	0.21	M	M	3A	3	Colquhoun Street; on footpath, under wires; has been pollarded	May require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
105 group	**Cupressocyparis x leylandii x 8*	11	3	M	0.29	G	G	2A	4	Growing in industrial property, adjacent to fence	May require protection
106	*Eucalyptus botryoides*	14	4	M	0.27	G	G	2A	4	Growing in industrial property, adjacent to fence	May require protection
107 group	*Casuarina glauca x 8*	8	2.5	M	0.21	G	G	2A	3	Growing in industrial property, adjacent to fence	May require protection
108 group	*#Corymbia citriodora x C. maculata x 9*	6	1.5	EM	0.13	G	G	2A	2	Growing in industrial property, adjacent to building	May require protection
109 group	**Cinnamomum camphora x 2*	8	3	M	0.26	G	G	4A	4	Grand Avenue; growing in industrial property, adjacent to fence Invasive exotic species	May require protection
110	*#Lophostemon confertus*	12	3	M	0.24	G	G	2A	3	Grand Avenue; growing in industrial property	May require protection
111	*#Lophostemon confertus*	13	3	M	multi	G	M	2A	3	Grand Avenue; growing in industrial property	May require protection
112	*#Lophostemon confertus*	13	3	M	0.23	G	G	2A	3	Grand Avenue; growing in industrial property	May require protection
113	*#Lophostemon confertus*	12	3	M	0.22	G	M	2A	3	Grand Avenue; growing in industrial property	May require protection
114	*#Melaleuca quinquenervia*	12	3	M	0.34	G	M	2A	5	Grand Avenue; growing in industrial property	May require protection
115	*#Lophostemon confertus*	12	4	M	0.33	G	M	2A	5	Grand Avenue; growing in industrial property	May require protection
116 group	*#Lophostemon confertus* **Lagunaria patersonii*	12 7	3 2	M M	0.25 0.18	G M	G M	2A 3A	4 3	Grand Avenue; growing in industrial property Small hollow in *L.confertus*	May require protection
117	*Glochidion ferdinandi* var. *ferdinandi*	9	5	M	0.24	G	G	3A	3	Grand Avenue; growing in industrial property	May require protection
118	*#Melaleuca quinquenervia*	12	4	M	0.28	G	M	2A	5	Grand Avenue; growing in industrial property	May require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
119 group	*#Lophostemon confertus*	10	4	M	0.22	G	G	2A	3	Grand Avenue; growing in industrial property	May require protection
120	*#Melaleuca quinquenervia*	11	3	M	0.29	G	G	2A	4	Grand Avenue; growing in industrial property	May require protection
121 group	*#Melaleuca quinquenervia* **Lagunaria patersonii*	10 8	3 2	M M	0.27 0.16	M M	M M	3A 3A	4 2.5	Grand Avenue; growing in industrial property	May require protection
122	*#Lophostemon confertus*	14	4	M	0.29	G	M	2A	4	Grand Avenue; growing in industrial property	May require protection
123	*#Callistemon* 'Kings Park Special'	4	1.5	M	multi	G	M	3A	2	Grand Avenue; growing in industrial property	May require protection
124	*#Lophostemon confertus*	11	3	M	0.26	G	G	2A	3	Grand Avenue; growing in industrial property	May require protection
125	*#Lophostemon confertus*	12	3	M	0.25	G	G	2A	3	Grand Avenue; growing in industrial property	May require protection
126	*#Lophostemon confertus*	12	3	M	0.23	G	M	2A	3	Grand Avenue; growing in industrial property	May require protection
127 group	**Cinnamomum camphora* **Triadica sebifera*	9 5	5 2	M M	0.25 0.14	G G	G G	4A 4A	3 2	Grand Avenue; growing in industrial property Both are invasive species	Not located within project site, but replacement with more suitable species should be considered
128 group	**Cinnamomum camphora* **Triadica sebifera* *Melia azedarach* *Glochidion ferdinandi* var. *ferdinandi* *Homalanthus populifolius*	6 5 5 7 4	2 2 2 3 2	M M M M M	0.22 0.11 0.15 0.18 0.12	G G G G G	G G G G G	4A 4A 3A 3A 3A	3 2 2 3 2	Grand Avenue; growing in industrial property	May require protection
129 group	*Glochidion ferdinandi* var. *ferdinandi* **Cinnamomum camphora*	6 9	2 3	M M	0.17 0.20	G G	G G	3A 4A	2 3	Grand Avenue; growing in industrial property	May require protection
130	*Casuarina glauca*	12	4	M	0.29	G	G	1A	4	Grand Avenue; growing in industrial property	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
131 group	**Cinnamomum camphora x 4* *Glochidion ferdinandi* var. *ferdinandi x 3*	8 5	3 2	M M	0.23 0.16	G G	G G	4A 3A	3 3	Grand Avenue; growing in industrial property	Not located within project site, but replacement of Camphor Laurels with more suitable species should be considered
133 group	*Casuarina glauca x 2* **Cinnamomum camphora*	12	3	M	0.23	G	G	2A	3	Grand Avenue; growing in industrial property	May require removal
134	*#Eucalyptus microcorys*	14	4	M	0.30	G	G	1A	5	Grand Avenue; growing in industrial property	May require removal
135	*Glochidion ferdinandi var. ferdinandi x 2* **Cinnamomum camphora x 2*	8	2	M	0.16	G	G	2A	3	Grand Avenue; growing in industrial property	May require removal
139	*Casuarina glauca*	20	3	M	0.29	G	M	2A	4	Grand Avenue; growing in industrial property	May require removal
140	**Cupressocyparis x leylandii*	12	4	M	0.25	M	M	3A	3	Grand Avenue; growing in industrial property Partially pruned to avoid power lines	May require removal
141	*#Acacia saligna*	4	2	OM	0.12	M	M	4A	1.5	Grand Avenue; growing in industrial property	Short-lived invasive species May require removal
143 group	*Casuarina glauca x 8*	8	2	EM	0.11	G	G	2A	2	Growing on terrace above mangroves	May require protection
144 group	*#Ficus macrocarpa* var. *hillii*	7	2	M	0.18	G	G	2A	3	Growing in industrial site off Grand Avenue	Growing on edge of project site; will require protection
145 group	*Casuarina glauca* **Erythrina x sykesii*	11 10	3 3	M M	0.23 0.29	G G	M G	2A 3A	3 3	Growing on industrial site adjacent to Grand Avenue	Growing on edge of project site; will require protection
146 group	*Casuarina glauca x 18*	5	1.5	M	0.12	M	F	4A	2	Growing along edge of Grand Avenue under wires	Growing on edge of project site; will require protection
147 group	*Casuarina glauca* *#Acacia saligna*	7 3	1.5 1	EM M	0.14 0.10	G G	G G	2A 4A	3 1.5	Growing in industrial site, adjacent to Grand Avenue	Growing on edge of project site; will require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
148 group	#*Acacia saligna* *Glochidion ferdinandi* var. *ferdinandi*	3 4	2.5 2	M M	0.11 0.13	G G	M G	4A 3A	2 2	Growing in industrial site, adjacent to Grand Avenue	Growing on edge of project site; will require protection
149	*Angophora costata*	6	2		0.20	G	G	2A	3	Growing in industrial site, adjacent to Colquhorn Street	May require protection
150	#*Eucalyptus scoparia* #*Grevillea robusta x 2*	12 6	4 2	M M	0.27 0.21	G M	G M	2A 3A	4 3	Growing along margins of project site *Eucalyptus scoparia* (Wallangarra White Gum) is listed as Endangered (NSW BC Act) and Vulnerable (Commonwealth EPBC Act) 3 other specimens which could not be accessed	May require protection
151	*Casuarina glauca x 3*	12	5	M	0.24	G	M	2A	3	Growing in Eric Primrose Reserve, Rydalmere	Likely to require removal
153 group	*Casuarina glauca*	11	2.5	M	0.22	G	G	2A	3	Growing at top of embankment	Likely to require removal
154	*Casuarina glauca x 2*	12	3	M	0.24	G	G	2A	4	Growing at top of embankment	Likely to require removal
157	*Casuarina glauca x 2*	10	5	EM	0.11	G	G	2A	3	Growing at top of embankment	Likely to require removal
159 group	**Robinia pseudoacacia x 2* *Callistemon* 'Harkness'	6 2	2 1	M EM	0.18 0.10	G M	G M	3A 3A	2 2	Garden bed near ferry jetty	Likely to require removal
160	*Casuarina glauca*	15	3	M	0.27	G	G	1A	4	Garden bed near ferry jetty	Likely to require removal
161	*Ficus rubiginosa*	11	4	M	0.27	G	G	1A	4	Garden bed near ferry jetty	Likely to require removal
162	*Ficus rubiginosa*	11	4	M	0.25	G	G	1A	4	Garden bed near ferry jetty	Likely to require removal
163 group	#*Ficus microcarpa* var. *hillii x 14*	16	7	M	0.41	G	G	1A	5	Two lines of trees in Eric Primrose Reserve	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
164	*Ficus rubiginosa*	12	6	M	0.28	G	G	1A	4	Garden beds near entrance and car park	Likely to require removal
165	*Ficus rubiginosa*	12	6	M	0.27	G	G	1A	4	Garden beds near entrance and car park	Likely to require removal
166	*Ficus rubiginosa*	12	6	M	0.28	G	G	1A	4	Garden beds near entrance and car park	Likely to require removal
167 group	**Jacaranda mimosifolia x 5*	5	2.5	EM	0.11	G	G	3A	2.5	Two lines of trees in parkland, upslope of river	Likely to require removal except for two easternmost trees that may require protection
	Brachychiton acerifolius x 5	5	2	EM	0.12	G	G	2A	2.5		
	Eucalyptus crebra	5	2	EM	0.10	G	G	1A	2.5		
168	*Corymbia maculata*	11	2.5	M	0.22	G	G	1A	3	Parkland, upslope of river	Growing on edge of project site; will require protection
169 group	*#Callistemon* 'Harkness' *x 6*	6	1.5	M	0.16	M	M	3A	3	Footpath, along John Street Under wires; have been lopped	May require removal
170 group	*Eucalyptus longifolia*	19	6	M	0.28	G	G	1A	4	In adjacent property, John Street *Corymbia citriodora* has distorted, biased growth from suppression.	Growing on edge of project site; may require protection
	#Corymbia citriodora	7	2	M	0.18	M	F	3A	2		
171	*Eucalyptus longifolia*	23	8	M	0.39	G	G	1A	5	Back of property, John Street	Growing on edge of project site; may require protection
172	*Ficus rubiginosa*	9	4	M	0.32	G	G	1A	4	In garden bed at carpark entrance	Likely to require removal
173 group	*#Ficus macrocarpa* var. *hillii x 4*	16	6	M	0.29	G	G	1A	4	In bed adjacent to car park	Likely to require removal
174 group	*#Lophostemon confertus x 4*	16	4	M	0.28	G	M	2A	4	In bed adjacent to car park	Likely to require removal
175 group	*#Lophostemon confertus x 4*	14	3	M	0.23	M	M	2A	3	In bed adjacent to building Inappropriate pruning in early stages	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
176	*#Lophostemon confertus*	12	5	M	0.25	M	M	2A	3	Adjacent to cycleway Broadly spreading canopy over cycleway	Likely to require removal
177 group	*Livistona australis x 5*	7	3	M	0.28	G	G	1A	2	In bed near ferry wharf	Likely to require removal
178 group	*Acacia parramattensis x 10* *Casuarina glauca*	5 7	2 2	EM EM	0.12 0.11	G G	G G	3A 2A	2 2	Adjacent to cycleway	Likely to require removal
179	*Ficus rubiginosa*	7	5	M	0.34	G	G	1A	4	In garden bed near Rydalmere Wharf	Likely to require removal
180	*Ficus rubiginosa*	7	5	M	0.34	G	G	1A	4	In garden bed near Rydalmere Wharf	Likely to require removal
181 group	*Casuarina glauca x 2*	12	3	M	0.27	G	G	1A	4	In garden bed adjacent to Rydalmere Wharf	Likely to require removal
182 group	*Casuarina glauca x 2*	10	2	M	0.21	M	M	1A	3	In garden bed adjacent to Rydalmere Wharf	Likely to require removal
185 group	*Casuarina glauca x 14*	3	2	M	Multi	G	G	2A	2	Along drainage channel; west side	Likely to require removal
186	*#Corymbia citriodora*	16	4	M	0.31	G	G	2A	4	Near drainage channel and footbridge	Likely to require removal
188 group	*#Acacia saligna x 6* *Casuarina glauca x 7* **Jacaranda mimosifolia*	3 3 2.5	1.5 1 1	OM EM EM	0.10 0.10 0,10	M G M	M G M	4A 2A 3A	2 2 2	Growing in garden adjacent to culvert outlet	Likely to require removal
189	*Eucalyptus saligna*	17	5	M	0.26	G	G	1A	4	Growing in small garden bed at entrance from Antoine Street	Likely to require removal
190 group	*Eucalyptus botryoides* *Casuarina glauca x 3* *Callistemon salignus x 2* *Acacia decurrens x 12*	8 6 4 3	2 2 1 1	EM EM EM EM	0.13 0.10 0.10 0.09	M G G G	M G G G	2A 2A 2A 3A	3 3 2 2	Adjacent to cycleway	Likely to require removal
191 group	*Eucalyptus botryoides* *Casuarina glauca x 2*	8 5	2 1	EM EM	0.12 0.11	G G	G G	2A 2A	2 2	Adjacent to cycleway	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
192 group	*Eucalyptus botryoides x 2* *Hakea teretifolia 4* *Kunzea ambigua x 10* *Acacia decurrens x 12*	8 2 1.5 1.5	2 1 1 1	EM EM EM EM	0.13 Multi Multi 0.08	G G G G	G G G G	2A 3A 3A 3A	2 1 1 1	Adjacent to cycleway	Likely to require removal
193 group	*Melaleuca linariifolia* *Leptospermum polygalifolium* subsp. *polygalifolium* *Kunzea ambigua* *Casuarina glauca*	2.5 2 1 3	1 1 1 1.5	EM EM EM EM	0.09 0.08 Multi 0.11	G G G G	G G G G	2A 3A 3A 2A	1 1 1 2	Adjacent to cycleway	Likely to require removal
194 group	*Corymbia maculata* *Pittosporum undulatum*	17 3	4 2	M M	0.28 multi	G G	G G	1A 2A	4 2	Antoine Street; garden bed adjacent to footpath	Likely to require removal
195 group	*#Callistemon* 'Hannah Ray' x 3	5	1.5	M	multi	G	G	3A	2	In raised garden bed, Antoine Street	Likely to require removal
196 group	*#Callistemon* 'Harkness'	5	2	M	0.21	G	M	3A	3	Growing in footpath under wires Has been lopped	Likely to require removal
197	*Casuarina glauca*	12	2.5	M	0.25	G	M	2A	4	Growing in school grounds near fence	May require protection
198	*Casuarina glauca*	12	3	M	0.27	G	M	2A	4	Growing in Rydalmere School grounds near fence	May require protection
199 group	**Jacaranda mimosifolia x 3*	7	3	M	0.22	G	M	3A	3	Growing in footpath Bias; co-dominant leaders	Likely to require removal
200	*Melia azedarach*	10	4	M	0.32	G	M	3A	4	Growing in private property, adjacent to footpath Co-dominant leaders	Likely to require removal
201	**Robinia pseudoacacia*	7	3	M	0.24	G	G	3A	3	Growing in private property, adjacent to footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
202	*#Callistemon* 'Harkness'	7	3	M	0.32	G	M	2A	4	Growing in footpath Lateral has recent mechanical damage Co-dominant leaders; bias	Likely to require removal
203	*#Callistemon* 'Harkness'	5	2.5	M	0.24	G	M	2A	4	Growing in footpath under wires Has been lopped	Likely to require removal
204	*#Callistemon* 'Harkness'	5	2.5	M	0.26	G	M	2A	4	Growing in footpath under wires Has been lopped	Likely to require removal
205	*#Callistemon* 'Harkness'	5	2.5	M	0.29	G	M	2A	4	Growing in footpath Has been lopped Co-dominant leaders; evidence of stress	Growing on edge of project site; will require protection Requires remediation
206	*#Callistemon* 'Harkness'	4	1.5	M	0.16	G	M	3A	2.5	Growing in footpath under wires Has been lopped	Growing adjacent to project site; may require protection
207 group	**Jacaranda mimosifolia x 2* *#Macadamia integrifolia*	11 5	4 2.5	M M	0.27 0.16	G G	M G	2A 2A	4 3	Growing in footpath Canopies extend over road	Likely to require removal
208 group	*Casuarina glauca x 5*	14	3	M	0.25	G	G	1A	4	Growing in footpath	Likely to require removal
209 group	*Eucalyptus botryoides x 2*	14	5	M	0.24	G	G	1A	4	Growing in footpath	Likely to require removal
210	*#Corymbia citriodora*	15	6	M	0.27	G	G	2A	4	Growing in private property, adjacent to footpath	Likely to require removal
211	*#Callistemon viminalis*	6	1.5	M	0.12	M	M	3A	2.5	Growing in private property, adjacent to footpath Bias in leader; sparse canopy	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
212	*Eucalyptus scoparia*	10	3	M	0.23	M	M	2A	3	Growing in footpath; corner Patricia and Dorothy Streets This species is listed as Endangered (NSW BC Act) and Vulnerable (Commonwealth EPBC Act)	May require protection
213 group	#*Melaleuca quinquenervia* **Yucca filamentosa*	12 4	3 1.5	M M	0.27 0.16	G G	G G	1A 3A	4 2	Growing in private property, adjacent to footpath	Likely to require removal
214	**Jacaranda mimosifolia*	11	4	M	0.31	G	M	3A	4	Growing in private property, adjacent to footpath Co-dominant leaders	Likely to require removal
215 group	**Chamaecyparis obtusa x 3*	12	4	M	0.25	G	G	2A	4	Growing in private property, adjacent to footpath	Likely to require removal
216	#*Lophostemon confertus*	14	4	M	0.36	G	M	1A	5	Growing in private property, adjacent to footpath Co-dominant leaders	May require removal
217	#*Eucalyptus microcorys*	15	4	M	0.27	G	M	2A	4	Growing in private property, adjacent to footpath Co-dominant leaders	Canopy and TPZ extends into footpath; may require protection
218 group	#*Callistemon viminalis* #*Callistemon viminalis*	5 7	1.5 3	M M	0.18 0.25	M G	M G	3A 2A	2.5 3	Growing in footpath; co-dominant leaders; sparse canopy Growing in private property adjacent to footpath	May require removal May require removal
219	*Callistemon salignus*	10	4	M	0.23	G	G	2A	3	Growing in private property, adjacent to footpath Co-dominant leaders	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
220	*Callistemon salignus*	9	2	M	0.19	M	M	3A	3	Growing in footpath; Severely lopped	May require removal
221	*Melaleuca bracteata*	11	3	M	0.24	G	M	3A	3	Growing in private property, adjacent to footpath	Canopy and TPZ extends into footpath; may require protection
222 group	**Araucaria heterophylla x 2*	14	3	M	0.28	M	M	2A	4	Growing in private property, adjacent to footpath Sparse growth; evidence of stress	May require removal
223 group	**Cedrus deodara x 2* **Cupressus macrocarpa*	12 14	3 4	M M	0.25 0.34	G G	M G	2A 1A	3 4	Growing in private property, adjacent to footpath Bias in leader Apical growth lopped	May require removal
224 group	**Jacaranda mimosifolia* **Liquidambar styraciflua* **Cotoneaster parneyi*	13 12 4	3 4 3	M M M	0.23 0.27 multi	M M G	M M G	3A 2A 3A	3 4 2	Growing in private property, adjacent to footpath Hollow in *J. mimosifolia*	May require removal
225 group	*Eucalyptus botryoides* **Jacaranda mimosifolia* *Brachychiton acerifolius*	19 13 10	5 3 3	M M M	0.33 0.21 0.27	M M G	M M G	2A 3A 2A	4 3 4	Growing in private property, adjacent to footpath Co-dominant leaders	May require removal
226	*#Callistemon* 'Kings Park Special'	9	3	M	0.27	G	M	3A	4	Growing in footpath	May require removal
227	*#Callistemon* 'Kings Park Special'	7	2.5	M	0.19	M	M	3A	2.5	Growing in footpath	May require removal
228	**Liquidambar styraciflua*	13	4	M	0.25	G	G	2A	4	Growing in private property, adjacent to footpath	Canopy and TPZ extends into footpath; may require protection
229	*#Callistemon* 'Harkness'	7	3	M	0.22	M	M	3A	3	Growing in footpath Co-dominant leaders	May require removal
230	*#Callistemon* 'Harkness'	8	3	M	0.25	M	M	3A	3	Growing in footpath Co-dominant leaders	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
231 group	*Angophora floribunda x 4*	15	3	M	0.22	G	M	2A	3	Primrose Ave; adjacent to footpath	May require protection
232 group	**Pinus patula* **Jacaranda mimosifolia*	14 12	6 3	M M	0.31 0.23	G M	G M	2A 3A	4 3	Near fence in private property; park land other side	Canopy and TPZ extends into Broadoaks Park; may require protection
233 group	*#Lophostemon confertus x 2*	17	5	M	O.33	G	G	2A	4	Near fence in private property; parkland other side	Canopy and TPZ extends into Broadoaks Park; may require protection
234 group	*Corymbia maculata* **Araucaria heterophylla*	12 16	3 5	M M	0.26 0.34	M G	M G	2A 1A	3 4	Near fence in private property; parkland other side	Canopy and TPZ extends into Broadoaks Park; may require protection
235 group	**Jacaranda mimosifolia x 3* *#Eucalyptus microcorys*	8 14	3 4	M M	0.22 0.35	G G	G G	3A 1A	3 5	Growing in private property, near footpath and corner	May require removal
236 group	**Jacaranda mimosifolia* *#Schefflera actinophylla*	14 5	6 2	M M	0.29 multi	G G	G G	2A 3A	4 2	Growing in private property, near footpath	Canopy and TPZ extends into footpath; may require protection
237 group	**Triadica sebifera* **Ficus benjamina* **Acer negundo*	12 3 9	4 2 3	M EM M	0.21 Multi 0.18	G G G	G G G	3A 1A 3A	3 2 2.5	Growing in private property, near footpath	Canopy and TPZ extends into footpath; may require protection
238	**Jacaranda mimosifolia*	15	5		0.42	G	G	2A	5	Growing in private property, near footpath	Canopy and TPZ extends into footpath; may require protection
239	*#Eucalyptus cladocalyx*	24	6	M	0.81	g	g	1A	10	Growing in private property, near footpath Stick nest	Growing on edge of project site; will require protection
240 group	*#Schefflera actinophylla* **Ulmus procera* **Lagerstroemia indica*	10 9 7	4 2 2	M M M	0.25 0.19 0.26	G M G	G G G	3A 3A 3A	4 3 3	South Street. Behind bus shelter	May require protection
241 group	*Angophora costata* **Lagerstroemia indica x 2*	21 6	5 2	M M	0.34 multi	G G	G G	1A 3A	5 2	South Street, Growing in private property, near footpath	Likely to require removal
242 group	**Acer negundo* *#Eucalyptus acaciiformis*	15 15	6 3	M M	0.40 0.29	G G	G G	2A 2A	5 4	Growing in private property, near footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
243 group	**Jacaranda mimosifolia* **Ligustrum lucidum* **Eriobotrya japonica*	11 NA 5	3 NA 2	M NA M	0.31 NA 0.23	G NA G	G NA G	2A 4A 3A	4 NA 3	Growing in private property, near footpath	May require protection
244 group	*#Callistemon* 'Harkness' *#Grevillea* 'Sandra Gordon'	5 5	1.5 1.5	M M	0.12 0.11	G G	M M	3A 3A	2 2	Growing in footpath beneath wires	Likely to require removal
245	**Araucaria heterophylla*	19	4	M	0.34	G	G	1A	4	Growing in private property, near footpath	Likely to require removal
246 group	**Jacaranda mimosifolia* **Cupressus sempervirens* **Ficus benjamina* 'Variegata'	11 11 6	4 2 1.5	M M M	0.27 0.24 013	G G G	G G G	2A 2A 3A	4 3 3	Growing in private property, near footpath	Likely to require removal
247	*Callistemon* 'Kings Park Special'	5	2	M	0.18	M	M	3A	3	Fallon Street footpath Growing under wires; pollarded	Likely to require removal
248 group	*#Leptospermum petersonii x 2* *Callistemon* 'Kings Park Special' *#Grevillea robusta* **Fraxinus excelsior* **Thuja orientalis*	6 5 15 12 11	2 2 3 4 2	M M M M M	Multi 0.21 0.27 0.24 0.20	G G G G G	M M G M G	3A 3A 3A 3A 2A	2 3 4 4 4	Fallon Street footpath Growing in private property	Likely to require removal
249	*Callistemon* 'Kings Park Special'	5	2	M	0.26	G	M	3A	4	Growing in footpath under wires	Likely to require removal
250	*Callistemon* 'Kings Park Special'	7	2	M	0.28	M	G	3A	4	Growing in footpath	Likely to require removal
251 group	*Callistemon* 'Kings Park Special' **Jacaranda mimosifolia*	8 11	2.5 4	M M	0.28 0.31	G G	G M	3A 2A	4 4	Growing in footpath Growing in private property adjacent to footpath Hollows in *J. mimosifolia*	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
252	*Eucalyptus tereticornis*	19	4	M	0.34	G	G	1A	4	Form with pink stamens Significant tree growing in private property adjacent to footpath	May require protection
253 group	*Corymbia maculata x 2* *Corymbia maculata x 4*	5 16	1 3	M M	0.18 0.19	G G	M G	2A 2A	3 3	Growing against sound wall, corner of South Street and Silverwater Road	Likely to require removal
254 group	**Photinia x fraseri* 'Robusta' *#Callistemon* 'Hannah Ray'	3 3	1.5 1.5	M M	0.13 0.14	G G	G G	3A 3A	2 2	Growing adjacent to pathway along South Street, adjacent to footbridge	Likely to require removal
255 group	**Liquidambar styraciflua x 4* *#Schefflera actinophylla* *Pittosporum undulatum* **Populus nigra x 2* *Callistemon* 'Kings Park Special'	15 8 8 15 6	2.5 1 1 1 1	M M M M M	0.21 0.16 0.13 0.18 0.14	G G G G G	G G G G G	2A 3A 3A 2A 3A	3 3 3 3 3	Growing around dwellings Medium sized hollows and stick nest in *L. styraciflua* close to corner of South Street and Fallon Street	Likely to require removal
256	*Callistemon* 'Kings Park Special'	5	1.5	M	0.15	G	M	3A	3	Growing in grassed footpath under wires Has been pollarded	Likely to require removal
257	*Callistemon* 'Kings Park Special'	5	1.5	M	0.13	G	M	3A	3	Growing in grassed footpath under wires Has been pollarded	Likely to require removal
258 group	**Jacaranda mimosifolia* **Triadica sebifera*	15 5	3 1.5	M M	0.22 0.12	G G	G G	2A 4A	3 2	Growing in front garden Invasive exotic	May require protection
259	*Callistemon* 'Kings Park Special'	4	1.5	M	0.16	G	M	3A	3	Growing in grassed footpath under wires Has been pollarded	May require protection
260 group	*Callistemon* 'Kings Park Special' *#Callistemon viminalis*	5 5	1.5 1.5	M M	0.18 0.15	M M	M N	3A 3A	3 3	Growing in grassed footpath under wires Have been pollarded	May require removal
261	**Lagerstroemia indica*	6	1.5	M	0.18	G	M	3A	3	Growing in grassed footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
262 group	*#Eucalyptus nicholii*	17	5	M	0.26	G	G	2A	4	Growing in footpath	Likely to require removal
	**Liquidambar styraciflua*	8	2	M	0.19	G	G	2A	3	This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act)	
	Glochidion ferdinandi var. *ferdinandi*	8	2	M	0.20	G	G	3A	3		
	#Grevillea robusta	17	1	M	0.19	G	G	3A	3	Growing in private property which may be included in project site	
	Pittosporum undulatum	6	1	M	0.17	G	G	2A	3		
	**Photinia x fraseri* 'Robusta'	4	1	M	0.15	G	G	3A	3		
				M	multi	G	G	3A	2		
263 group	*Casuarina cunninghamiana* subsp. *Cunninghamiana x 2*	10	2	M	0.17	G	M	3A	3	Growing adjacent to Silverwater road; against sound screen	Likely to require removal
	Allocasuarina torulosa	6	2	M	0.16	G	M	3A	3		
	Casuarina glauca x 3	7	2	M	0.15	G	M	3A	3		
264 group	**Lagerstroemia indica x 2*	9	2	M	0.22	G	G	3A	3	Growing in footpath	Likely to require removal Two *Backhousia myrtifolia* have been recently planted
265	*#Eucalyptus nicholii*	14	5	OM	0.39	F	F	4A	5	Growing in footpath This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act). Bird nest in upper canopy	Likely to require removal
266 group	**Liquidambar styraciflua x 2*	8	2	EM	0.19	G	G	2A	3	Growing in private property adjacent to footpath	Likely to require removal
	Ficus rubiginosa	5	2.5	M	0.27	G	M	1A	4	Growing in footpath under wires	
267	**Liquidambar styraciflua*	7	2	M	0.29	G	M	2A	4	Growing in private property adjacent to footpath Co-dominant leaders	May require protection
268 group	*Eucalyptus botryoides*	11	4	M	0.31	G	G	1A	4	Growing in private property adjacent to footpath	May require protection
	**Cinnamomum camphora*	8	3	M	0.36	G	G	4A	4		
	#Grevillea robusta	7	2	M	0.19	G	G	3A	3		
	Corymbia maculata	10	2	M	0.18	G	G	2A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
269 group	*#Agonis flexuosa x 2*	9	2.5	M	0.34	G	M	3A	4	Growing in footpath	Likely to require removal
270 group	**Lagerstroemia indica x 4*	4	1.5	EM	0.07	G	G	3A	2	Growing in footpath	Likely to require removal
271 group	*#Agonis flexuosa x 2* **Pinus patula*	5 17	2 2.5	M M	0.27 0.24	G G	M M	3A 2A	3 3	Growing in footpath In property, near fence	Likely to require removal
272	**Schinus molle* var. *areira* *#Agonis flexuosa*	6 8	4 3	M M	0.26 0.25	G G	G G	2A 3A	4 4	 Growing in footpath	Likely to require removal
273	*#Agonis flexuosa*	10	3	M	0.28	G	G	2A	4	Growing in footpath	May require protection
274	*#Agonis flexuosa*	5	3	M	0.25	G	M	3A	4	Growing in footpath, under wires	Likely to require removal
275	*#Agonis flexuosa*	5	3	M	0.27	G	M	3A	4	Growing in footpath, under wires	Likely to require removal
276 group	*Casuarina glauca x 21*	16	3	M	0.25	G	G	2A	4	Growing in car park and on other side of fence	Likely to require removal
277 group	*Eucalyptus botryoides x E. saligna* hybrid	16	3	M	0.25	G	G	2A	4	Growing in car park adjacent to Hilder Road	May require protection Has been inappropriately pruned because of proximity to wires
278	*Eucalyptus botryoides x E. saligna* hybrid	15	4	M	0.33	G	G	2A	4	Growing in garden bed, adjacent to Hilder Road footpath	May require protection
279	**Ulmus parvifolia*	15	4	M	0.41	G	G	4A	6	Growing in private property adjacent to footpath	Likely to require removal
280 group	*Corymbia maculata* *Eucalyptus racemosa subsp. racemosa* *Eucalyptus moluccana x 2* *Eucalyptus crebra*	5 4 5 4	1 1 1 1	EM EM EM EM	0.12 0.11 0.12 0.09	G G G G	G G G G	2A 2A 2A G	2 2 2 2	Growing in parkland; eastern end of Ken Newman Park	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
281	**Yucca filamentosa x 12*	3	1	M	Multi	G	G	3A	1	Growing along the northern edge of Ken Newman Park	Trees within the project site would likely require removal; vegetation outside and along construction edges will require protection
	#Doryanthes excelsa x D. palmeri hybrid x 10	3	1	M	Multi	G	G	3A	2		
	Eucalyptus robusta x 6	6	2.5	EM	0.12	G	G	1A	2		
	Angophora floribunda x 3	6	1	EM	0.11	G	G	1A	2		
	Acacia floribunda x 6	5	2	M	0.06	G	G	3A	2		
	Acacia parramattensis x 9	3	1	M	0.08	G	G	3A	2		
281a group	*#Callistemon* 'Kings Park Special' x 8	5	1.5	M	0.24	G	G	3A	3	Growing in grassed footpath; north side of Heysen Avenue	Likely to require removal
281b group	*#Callistemon* 'Kings Park Special' x 6	5	1.5	M	0.26	G	G	3A	3	Growing in grassed footpath; north side of Heysen Avenue, Ermington	Likely to require removal
281c	*Angophora costata*	24	5	M	0.41	G	G	1A	5	Growing in private property, opposite parkland	Canopy in project site, Tree with high amenity. Likely to require removal though protection should be considered
282	*#Lophostemon confertus*	14	2.5	M	0.22	G	G	1A	4	Growing in footpath	Likely to require removal
283 group	*Eucalyptus saligna x E. botryoides* hybrid x 2	18	3	M	0.36	G	G	1A	5	Along boundary of Rydalmere East Public School grounds Small hollow and stick nest in *E. saligna*	Likely to require removal
284 group	*Melaleuca linariifolia x6*	5	1	M	0.14	G	G	2A	3	Planted in Ken Newman Park; Stick nest observed in *E. saligna*	Trees within the project site would likely require removal; vegetation outside and along construction edges will require protection
	Eucalyptus tereticornis x 8	12	2	M	0.16	G	G	1A	3		
	Eucalyptus saligna/E. botryoides hybrid x 5	14	3	M	0.16	G	G	1A	3		
	Pittosporum undulatum x 22	5	1.5	M	0.10	G	G	3A	2		
	Melaleuca styphelioides x 12	8	1.5	M	0.14	G	G	2A	3		
	Brachychiton acerifolius x 5	6	1	M	0..2	G	G	2A	2		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
285	#*Eucalyptus nicholii*	15	2.5	M	0.32	M	M	3A	4	This species is listed as Vulnerable (NSW BC Act) and Vulnerable (Comm. EPBC Act). In nature strip	Likely to require removal
286	#*Callistemon* 'Hannah Ray'	13	3	M	0.17	M	M	3A	3	Growing in grassed footpath	Likely to require removal
287	#*Callistemon* 'Hannah Ray'	12	3	M	0.16	M	M	3A	3	Growing in grassed footpath	Likely to require removal
288	**Jacaranda mimosifolia*	15	5	M	0.38	G	M	2A	5	Growing in private property; canopy extends over fence	Located near edge of project site; will require protection
289 group	#*Callistemon* 'Harkness' x 2	4	1.5	M	0.23	M	M	3A	3	Growing in nature strip	Likely to require removal
290	#*Corymbia calophylla*	6	2	M	0.22	M	M	3A	3	Growing in nature strip	Likely to require removal
291 group	#*Callistemon viminalis* #*Callistemon* 'Hannah Ray' x 4	9 5	2 2	M M	0.18 0.17	M M	M M	3A 3A	3 3	Growing in nature strip	Likely to require removal
292 group	#*Eucalyptus nicholii* **Liquidambar styraciflua* #*Callistemon* 'Harkness'	6 5 5	3 2 2	M M M	0.27 0.22 0.18	M M G	M M M	3A 3A 3A	4 3 3	This species is listed as Vulnerable (NSW BC Act) and Vulnerable (Comm. EPBC Act). Growing in nature strip Growing under wires; has been pollarded	Likely to require removal
293	#*Lophostemon confertus*	3	1	EM	0.10	G	G	1A	1.5	Growing in nature strip	Likely to require removal
294	#*Callistemon* 'Hannah Ray'	6	2	M	0.18	M	M	3A	3	Growing in nature strip	Likely to require removal
295 group	**Araucaria columnaris* #*Lophostemon confertus* #*Callistemon* 'Harkness' **Cupressus macrocarpa*	15 8 5 9	2 2 2 2	M M M M	0.30 0.21 0.20 0.16	G G M G	G G M G	1A 2A 3A 2A	4 3 3 3	Growing in nature strip Growing in front garden	Likely to require removal
296 group	**Aracauria columnaris* #*Lophostemon confertus*	14 8	2 2.5	M M	0.27 0.25	G G	G G	1A 1A	4 4	Growing in private property Growing in nature strip	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
297 group	*#Callistemon* 'Harkness' x 3	5	2	M	0.18	G	G	3A	3	Growing in nature strip	Likely to require removal
298 group	*#Melaleuca quinquenervia*	17	3	M	0.46	G	G	2A	6	Growing in footpath	Likely to require removal
	#Callistemon 'Harkness'	6	3	M	0.29	G	G	3A	4		
299 group	*#Callistemon* 'Harkness' x 2	5	2	M	0.19	G	G	3A	3	Growing in footpath	Likely to require removal
300	*#Callistemon* 'Hannah Ray'	5	2	M	0.16	M	M	3A	3	Growing in footpath	Likely to require removal
301	*#Callistemon* 'Hannah Ray'	5	2	M	0.18	M	M	3A	3	Growing in footpath	Likely to require removal
	**Mangifera indica*	5	2	M	0.15	G	M	3A	3	Growing in garden, near fence	
302 group	*#Lophostemon confertus*	7	2	M	0.17	G	G	1A	3	Growing in nature strip	Likely to require removal
	#Callistemon 'Harkness'	5	2	M	0.14	G	G	3A	3		
303	**Cupressocyparis x leylandii*	6	3	M	0.18	G	G	3A	3	In private property, close to fence	Likely to require removal
304 group	**Triadica sebifera*	4	1.5	M	0.12	M	M	4A	3	Invasive species	Likely to require removal
	Pittosporum undulatum x 2	4	2	M	0.11	G	G	3A	3	In private property	
	**Afrocarpus falcatus*	15	5	M	0.09	G	G	1A	12	Good specimen of uncommon African species – nests present	
305	*#Lophostemon confertus*	4	1.5	M	0.14	G	M	2A	3	Growing in nature strip Beneath wires; has been lopped	Likely to require removal
306	*#Callistemon* 'Hannah Ray'	5	2	M	0.15	G	G	3A	3	Growing in nature strip Beneath wires; has been lopped	Likely to require removal
307	*#Callistemon* 'Hannah Ray'	6	2	M	0.16	G	G	3A	3	Growing in nature strip Beneath wires; has been lopped	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
308 group	#*Callistemon* 'Harkness' x 2	5	2	M	0.14	G	G	3A	3	Growing in nature strip	Likely to require removal
	#*Callistemon* 'Hannah Ray'	6	2	M	0.13	G	G	3A	3	Beneath wires; has been lopped	
309 group	#*Callistemon* 'Harkness' x 2	6	2	M	0.15	G	G	3A	3	Growing in grassed footpath	Likely to require removal
	**Camellia sasanqua*	5	2	M	Multi	G	G	3A	2		
	**Jacaranda mimosifolia*	12	3	M	0.22	G	M	2A	3	Growing in private property near fence	
310 group	#*Callistemon* 'Harkness' x 3	3	1.5	M	0.12	M	M	3A	2	Growing in grassed footpath	Likely to require removal
311 group	#*Callistemon* 'Harkness' x 2	5	2	M	0.17	G	G	3A	3	Growing in grassed footpath	Likely to require removal
312 group	*Syzygium paniculatum*	10	2	M	0.17	G	G	1A	3	*Syzygium paniculatum* (Magenta Lilly Pilly) is listed as Endangered (NSW BC Act) and Vulnerable (Commonwealth EPBC Act)	Likely to require removal
	#*Callistemon* 'Harkness' x 2	5	2	M	0.13	G	G	3A	2	Growing in private property, near fence Growing in grassed footpath. Small hollow.	
313 group	#*Melaleuca bracteata*	5	2	M	0.15	G	G	3A	3	Growing in nature strip	Likely to require removal
	Callistemon citrinus	3	2	M	0.12	G	G	3A	2		
	#*Callistemon* 'Harkness'	5	2	M	0.12	G	G	3A	2		
314 group	**Cupressus torulosa*	12	3	M	0.19	G	G	1A	3	Growing in front garden	Likely to require removal
	#*Eucalyptus microcorys*	15	4	M	0.22	G	G	1A	3	Stick nest in *E. mycrocorys*	
	#*Lophostemon confertus*	3	1	EM	0.11	G	G	2A	2	Growing in nature strip	

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
315 group	**Triadica sebifera*	5	2	M	0.14	G	G	4A	2	Invasive species	Likely to require removal
	#Callistemon 'Hannah Ray'	5	2	M	0.12	G	G	3A	2	Growing in nature strip	
	#Callistemon 'Harkness'	4	2	M	0.11	G	G	3A	2		
	**Prunus serrulata*	3	1.5	M	0.10	G	G	3A	2		
	#Melaleuca bracteata	4	1.5	M	0.13	G	G	3A	3		
316	*#Callistemon* 'Harkness'	5	2	M	0.16	G	M	3A	3	Growing in nature strip	Likely to require removal
317 group	*Corymbia maculata x 2*	16	4	M	0.31	G	G	1A	4	Growing in front garden	Likely to require removal
318 group	*#Eucalyptus microcorys*	15	4	M	0.32	G	G	1A	4	Growing in front garden	Likely to require removal
	#Grevillea robusta	12	2	M	0.23	G	G	2A	3		
319	*#Eucalyptus microcorys*	15	3	M	0.34	G	M	1A	4	Growing in front garden	Growth of leader is biased towards road; Likely to require removal
	**Jacaranda mimosifolia*	8	2	M	0.22	G	G	2A	3		Canopies extend over road; Likely to require removal
	#Leptospermum petersonii	7	3	M	0.27	G	G	3A	3		
320	**Phoenix canariensis*	14	3	M	0.33	G	G	2A	1	Growing in front garden	Growing near construction edge; will require protection
	**Cupressus macrocarpa*	14	2	M	0.20	G	G	2A	3		
321	**Bauhinia x blakeana*	8	3	M	0.23	G	G	3A	3	Growing in front garden	Likely to require removal
322	**Eriobotrya japonica*	5	2	M	0.17	G	G	3A	3	Growing in footpath	Likely to require removal
323	**Ulmus parvifolia*	5	2.5	M	0.20	M	M	3A	3	Growing in private property adjacent to footpath	May require protection
324 group	*#Melaleuca quinquenervia x 3*	12	2	M	0.23	G	M	2A	3	Growing in footpath	Likely to require removal
	#Agonis flexuosa	7	3	M	Multi	M	M	3A	2	Growing in private property, adjacent to footpath	Likely to require removal
	**Jacaranda mimosifolia x 2*	6	2	EM	0.14	G	G	2A	2.5		Likely to require removal
324a	*#Eucalyptus grandis*	13	2	M	0.24	G	G	1A	3	Growing in private property, adjacent to footpath	Noted as a high landscape tree May require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
325	*#Lophostemon confertus*	10	2.5	M	0.20	G	G	1A	3	Growing in footpath	Likely to require removal
326	**Platanus x hispanica* 'Acerifolia'	17	4	M	0.23	G	G	1A	3	Growing in footpath	Likely to require removal
327	*#Callistemon* 'Harkness'	5	2	M	0.21	G	M	3A	2.5	Growing in footpath	Likely to require removal
328 group	*#Callistemon* 'Harkness' x 4	5	2	M	0.21	G	M	3A	2.5	Growing in footpath	Likely to require removal
329 group	*#Callistemon* 'Hannah Ray' x 3	5	2	M	0.22	G	M	3A	2.5	Growing in footpath	Likely to require removal
330 group	*#Callistemon* 'Harkness' x 2	5	2	M	0.20	M	M	3A	2.5	Growing in footpath	Likely to require removal
331 group	*#Lophostemon confertus* *#Callistemon* 'Harkness'	13 5	3 2	M M	0.23 0.24	G M	G M	1A 3A	3 3	Growing in footpath	Likely to require removal
332	*#Lophostemon confertus* *#Callistemon* 'Harkness'	11 5	2.5 2	M M	0.19 0.22	G M	G M	1A 3A	3 2.5	Growing in footpath	Likely to require removal
333	**Liquidambar styraciflua*	18	5	M	0.30	G	G	1A	4	Growing in private property adjacent to footpath	Likely to require removal
334	**Araucaria heterophylla* **Lagerstroemia indica*	21 4	5 2	M M	0.35 0.21	G G	G G	1A 3A	5 3	Growing in private property adjacent to footpath Growing in footpath – small hollow	May require protection
335	*#Lophostemon confertus* *#Callistemon* 'Harkness'	6 4	4 2	M M	0.27 0.23	G M	G M	1A 3A	4 3	Growing in private property adjacent to footpath Growing in footpath Small nest in *Callistemon* 'Harkness'	Likely to require removal
336	*#Lophostemon confertus*	14	4	M	0.26	G	G	1A	4	Growing in footpath	Likely to require removal
337	**Pinus radiata*	11	4	M	0.29	M	M	4A	4	Growing on footpath beneath wires Has been inappropriately pruned	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
338	#*Melaleuca quinquenervia* #*Callistemon 'Kings* Park Special'	11 5	2.5 2	M M	0.31 0.16	M M	M M	3A 3A	4 3	Growing on footpath beneath wires Has been inappropriately pruned	Likely to require removal
339	#*Melaleuca quinquenervia*	11	3	M	0.33	M	M	3A	4	Growing on footpath beneath wires Has been inappropriately pruned	Likely to require removal
340	#*Melaleuca quinquenervia x 2*	14	3	M	0.24	G	G	1A	4	In nature strip	Likely to require removal
341 group	*Callistemon citrinus* **Jacaranda mimosifolia*	5 9	2 3	M M	0.19 0.15	G G	G G	3A 2A	3 3	In nature strip	Likely to require removal
342 group	**Ficus benjamina* #*Melaleuca quinquenervia*	4 17	2 4	M M	0.22 0.38	G G	G M	1A 1A	3 5	In property, near fence In footpath	Likely to require removal
343 group	#*Lophostemon confertus* #*Callistemon* 'Harkness'	15 4	4 2	M M	0.27 0.18	G G	G G	2A 3A	4 2.5	In footpath	Likely to require removal
344	#*Callistemon* 'Harkness'	4	2	M	0.23	G	G	3A	3	In footpath	Likely to require removal
345 group	#*Callistemon* 'Harkness' #*Lophostemon confertus*	5 11	2 3	M M	0.22 0.27	G G	G G	3A 1A	3 4	In footpath	Likely to require removal
346 group	#*Lophostemon confertus x 2* #*Corymbia citriodora x 2*	6 19	4 6	M M	0.19 0.34	G G	M G	1A 1A	3 5	In footpath	Likely to require removal
347	#*Callistemon* 'Harkness'	5	2.5	M	0.22	G	M	3A	3	In footpath, under wires Tree has been pollarded	Likely to require removal
348 group	#*Callistemon* 'Harkness' x 2	5	2	M	0.21	G	M	3A	3	In footpath, under wires Trees have been pollarded	Likely to require removal
349	#*Callistemon* 'Hannah Ray'	8	2.5	M	0.25	G	M	3A	3	Growing in footpath Trumble Avenue	Likely to require removal
350 group	#*Callistemon* 'Hannah Ray' x 2	8	2.5	M	0.25	G	M	3A	3	Growing in footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
351	#Callistemon 'Hannah x 2 Ray' *Cedrus atlantica*	8 14	2.5 5	M M	0.25 0.29	M G	M M	3A 2A	3 4	Growing in footpath Growing in front garden, near footpath	Likely to require removal
352	#*Callistemon* 'Harkness' x 2	4.5	1.5	M	multi	M	M	3A	2	Growing in footpath	Likely to require removal
353	#*Callistemon* 'Harkness'	5	2	M	0.23	G	G	3A	3	Growing in footpath	Likely to require removal
354	#*Callistemon* 'Harkness'	5	1.5	M	multi	M	M	3A	2	In footpath, under wires Tree has been pollarded	Likely to require removal
355	**Cupressocyparis x leylandii*	9	2.5	M	0.31	G	G	2A	4	Growing in front yard, adjacent to footpath	Likely to require removal
356	#*Callistemon* 'Harkness'	5	1.5	M	multi	M	M	3A	2	In footpath, under wires Tree has been pollarded	Likely to require removal
357	*Syzygium smithii*	12	3.5	M	0.28	G	G	2A	4	Growing in private property, near fence	Likely to require removal
358	#*Lophostemon confertus x 3*	13	3	M	0.31	M	M	3A	4	In footpath Co-dominant leaders	Likely to require removal
359	#*Callistemon* 'Harkness'	5	1.5	M	multi	M	M	3A	2	In footpath, under wires Tree has been pollarded	Likely to require removal
360	*Eucalyptus tereticornis* *Ficus rubiginosa x 3*	17 16	3 3	M M	0.26 0.29	G G	G G	1A 1A	4 4	Archer Park Tree group in island near Ermington Boat Ramp	Likely to require removal
361	*Ficus rubiginosa x 4*	11	3	M	0.28	G	G	1A	4	Archer Park Large hollow in *F. rubiginosa* Adjacent to Ermington Boat Ramp	Likely to require removal
363	*Casuarina glauca x 20* *Melia azedarach*	11 9	2 2	M M	0.14 0.16	G G	G G	2A 3A	3 3	Growing in parkland	Likely to require removal
364	**Schinus molle* var. *areira* **Magnolia grandiflora* **Jacaranda mimosifolia* **Cinnamomum camphora* **Liquidambar styraciflua*	9 8 11 10 20	2 2 2 2 4	M M M M M	0.19 0.16 0.20 0.31 0.38	G G G G G	G G G G G	3A 3A 2A 2A 1A	3 3 3 3 3	Growing in private garden adjacent to footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
365	**Jacaranda mimosifolia*	12	3	M	0.26	G	G	2A	4	Growing in private garden, near footpath	Likely to require removal
366	*Glochidion ferdinandi var. ferdinandi*	8	2	M	0.16	G	G	2A	3	Growing in private yards to the south of Wharf Road	Likely to require removal
	**Eriobotrya japonica x 2*	4	1.5	M	0.14	G	G	3A	3		
	Callistemon salignus x 2	6	1	M	0.15	G	G	3A	3		
	Brachychiton acerifolius	7	1	M	0.13	G	G	2A	3		
	Ficus rubiginosa	10	2	M	0.19	G	G	1A	3		
	**Persea americana*	3	1.5	M	0.16	G	G	3A	3		
367 group	*Casuarina glauca x 8*	12	2	M	0.14	G	G	2A	3	Koonadan Reserve Adjacent to cycleway	Likely to require removal
368	**Quercus robur*	13	3	M	0.29	G	G	1A	4	Growing in private garden	May require protection
369	*Tristaniopsis laurina x 2*	4	1.5	M	0.16	G	G	2A	3	Growing in grassed footpath	Likely to require removal
	Pittosporum undulatum	4	1.5	M	0.14	G	G	3A	3	pollarded	
370	*Callistemon citrinus*	3	1	EM	0.10	M	M	3A	2	Growing in footpath	Likely to require removal
372 group	*Eucalyptus crebra*	11	2	M	0.14	F	G	3A	3	Growing in bed adjacent to footpath Appears necrotic	May require protection
	**Liquidambar styraciflua*	9	2	M	0.15	G	G	2A	3		
374 group	*Casuarina glauca*	11	2	M	0.17	G	G	2A	3	Growing in industrial site	Likely to require removal
	Melaleuca linariifolia	8	1	M	0.12	G	G	2A	3		
	Melaleuca styphelioides	10	2	M	0.18	G	G	2A	3		
377 group	*Eucalyptus robusta x 4*	10	2	M	0.14	G	G	1A	3	Growing in industrial site	Likely to require removal
	Casuarina glauca x 13	11	2	M	0.12	G	G	1A	3		
	**Cupressus sempervirens*	11	1.5	M	0.12	G	G	2A	3		
	**Populus nigra*	10	1.5	M	0.16	G	G	2A	3		
378 group	*Elaeocarpus reticulatus x 3*	6	1	M	0.12	G	G	2A	3	Growing on grassed footpath	Likely to require removal
	#Agonis flexuosa x 5	7	2	M	0.19	G	G	2A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
379	*Eucalyptus saligna/ Eucalyptus botryoides* hybrid *x 5*	16	3	M	0.18	G	G	1A	3	Melrose Park Public School grounds	Growing near edge of project site; will require protection
	Syncarpia glomulifera subsp. *glomulifera x 3*	11	2	M	0.16	G	G	1A	3		
	Angophora costata x 3	15	2	M	0.15	G	G	1A	3		
	Corymbia maculata x 2	13	2	M	0.13	G	G	1A	3		
	Eucalyptus paniculata subsp. *paniculata*	12	2	M	0.15	G	G	1A	3		
	#Eucalyptus microcorys	15	2	M	0.15	G	G	1A	3		
380 group	*#Lophostemon confertus*	10	1.5	M	0.13	G	G	1A	3	Growing in industrial site, near footpath	Likely to require removal
	Callistemon citrinus	5	1	M	0.12	G	G	3A	3		
	**Phoenix canariensis*	12	2	M	0.35	G	G	1A	5	Growth suppressed by proximity to industrial buildings	
	#Melaleuca quinquenervia x 3	14	2	M	0.24	G	G	1A	44		
	#Corymbia maculata/ C. citriodora hybrid *x 4*	15	2.5	M	0.26	G	G	1A			
381	*#Melaleuca quinquenervia x 11*	12	2	M	0.18	G	G	1A	3	Growing in footpath adjacent to industrial buildings Sparse canopies	May require protection
	#Corymbia maculata/ C. citriodora hybrid	14	2	M	0.17	M	G	2A	3		
	Eucalyptus robusta	12	2	M	0.16	G	G	2A	3		
	#Eucalyptus microcorys	13	2	M	0.19	G	G	1A	3		
	**Citharexylum spinosum*	5	1	M	0.10	G	G	3A	2		
	Eucalyptus saligna/ Eucalyptus botryoides hybrid	12	2	M	0.20	M	G	2A	3		
382	*#Corymbia citriodora x 9*	22	3	M	0.21	G	G	2A	3	Growing in industrial site	May require protection
	#Eucalyptus microcorys	21	3	M	0.19	G	G	2A	3	Stick nest in *E. mycrocorys*	
	Callistemon salignus	12	1	M	0.14	G	G	2A	3		
382a	*#Corymbia citriodora*	22	3	M	0.21	G	G	2A	3	Growing in industrial site	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
383	**Jacaranda mimosifolia*	6	2	M	0.20	M	M	3A	3	Growing in grassed footpath	May require protection
group	*Eucalyptus saligna/ Eucalyptus botryoides* hybrid	11	3	M	0.29	M	M	3A	4	Growing beneath wires; have been pollarded	
	#Ficus microcarpa var. *hillii*	21	5	M	0.42	G	G	1A	5		
		16	5	M	0.67	G	G	1A	8	Growing in industrial property, near fence	
384	*Callistemon citrinus*	6	1.5	M	0.13	G	M	3A	3	Growing in footpath Has been pruned directionally, away from road. Stick nest present.	May require protection
	Angophora floribunda x 2	7	1.5	EM	0.12	G	G	2A	3	Bias towards road	
385	**Phoenix canariensis*	5	2	EM	0.24	G	G	2A	3	Growing in private property, near fence	Growing near proposed construction site; will require protection
386	*#Ficus microcarpa* var. *hillii*	15	4	M	0.28	G	G	1A	4	Growing in private property, near fence	Growing near proposed construction site; will require protection
387	**Photinia x fraseri* 'Robusta'	4	1	M	0.15	G	G	3A	3	Growing in footpath	Likely to require removal
388	*#Callistemon* 'Harkness'	4	1	M	0.11	M	M	3A	2	Growing in footpath	Likely to require removal
389	*#Callistemon* 'Harkness' x2	5	1	M	0.13	M	M	3A	2	Growing in footpath	Likely to require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
390 group	*#Schefflera actinophylla*	7	2	M	0.22	G	G	3A	3	Growing around the locally heritage listed Bulla Cream Dairy (Willowmere) Trees are included within the heritage curtilage	Likely to require removal, although proposed for retention (see Lucas Stapleton Johnson and Partners 2018) Protect where possible.
	#Ficus microcarpa var. *hillii*	10	2	M	0.34	G	G	1A	4		
	**Ficus benjamina*	7	2	M	0.21	G	M	2A	3		
	#Grevillea robusta	11		M	0.16	M	M	3A	3		
	**Ulmus parviflora*	9	2								
	Glochidion ferdinandi var. *ferdinandi*	9	2.5	M	0.18	G	G	2A	3		
	**Phoenix canariensis x 3*	15	2	M	0.32	G	G	1A	3		
	**Jacaranda mimosifolia*	17	2.5	M	0.21	M	M	3A	1		
	**Citharexylum spinosum*	12	2	M	0.19	M	G	2A	3		
	**Cinnamomum camphora*	10	2	M	0.21	G	G	3A	3		
		8	2	M	0.22	G	G	3A	3		
		10	2.5	M	0.30	G	G	4A	4		
391	*#Callistemon* 'Harkness'	5	1	M	0.16	G	M	3A	3	Growing in footpath	Likely to require removal
392	*#Callistemon* 'Harkness'	5	1	M	0.16	G	M	3A	3	Growing in footpath	Likely to require removal
393	*#Callistemon* 'Harkness'	5	1.5	M	0.15	G	M	3A	3	Growing in footpath	Likely to require removal
	#Corymbia ptychocarpa	4	1	EM	0.12	G	G	3A	3		
	**Acer palmatum*	5	1.5	M	0.14	M	G	3A	3		
394	*#Callistemon* 'Harkness'	6	1.5	M	0.15	G	M	3A	3	Growing in footpath	Likely to require removal
395	**Cedrus deodara*	12	5	M	0.28	G	G	2A	4	Growing in garden	May require protection
396	*Angophora costata*	10	2	M	0.17	G	G	2A	3	Growing in garden Small hollow	May require protection
397	**Eriobotrya japonica*	6	2	M	0.18	G	G	3A	3	Growing in garden, adjacent to concrete drive	Likely to require removal
	#Grevillea robusta	25	2.5	M	0.72	G	G	3A	8		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
398	**Eriobotrya japonica x 2* **Mangifera indica* **Jacaranda mimosifolia*	5 6 14	2 2 4	M M M	0.13 0.14 0.34	G G G	G G G	3A 3A 2A	2 2 4	Growing in narrow bed adjacent to concrete drive Growing in garden opposite; canopy extends over driveway. Stick nest	Likely to require removal
399 group	*#Melaleuca quinquenervia x 6* *Casuarina glauca x 5* *#Ficus macrophylla* f. *macrophylla* *Pittosporum undulatum*	6 4 6 3	2 1.5 2.5 1.5	M M EM M	0.10 0.11 0.32 Multi	G G G G	G G G	2A 2A 1A 3A	1.5 1.5 4 2	Planted specimens growing beside River Walk track	Likely requiring removal Moreton Bay Fig may be on edge and therefore would require protection
399a group	*Acacia decurrens x 250* *Pittosporum undulatum x250* *Bursaria spinosa* subsp. *spinosa x100* *Kunzea ambigua x100* *Acacia longifolia* subsp. *longifolia x100*	7 11 8 5 4	1 2 1.5 1 1.5	M M M M M	0.12 0.14 Multi Multi multi	G G G G M	M G G G M	3A 2A 3A 3A 3A	2 2 2 2 2	Growing beside walking track from river to Hill Road.	Likely to require removal Edge of retained patch will require protection
400	*Eucalyptus robusta*	7	1.5	EM	0.11	G	G	2A	1.5	Planted specimen growing beside river walk	Will not be affected by construction
401 group	*#Melaleuca quinquenervia* *Casuarina glauca x 16* *Corymbia maculata x 2* *Angophora costata* *Syzygium smithii*	10 12 10 11 8	1.5 1.5 1 1 1	M M M M M	0.13 0.12 0.13 0.12 0.10	G G G G G	G G G G G	2A 2A 2A 2A 2A	3 3 3 3 3	Planted specimens growing beside river walk	Will not be affected by construction
402 group	*Casuarina glauca x 10* **Lagerstroemia indica*	12 4	1.5 1	M EM	0.15 0.10	M G	G G	2A 3A	3 2	Planted specimens in mulched island	Will not be affected by construction
403	*#Cupaniopsis anacardioides*	4	1.5	EM	0.10	G	M	3A	2	In footpath garden bed	Will not be affected by construction
404 group	**Lagerstroemia indica x 5*	4	1.5	EM	0.10	G	G	3A	2	In footpath garden bed	Will not be affected by construction
405 group	*#Cupaniopsis anacardioides x 10*	4	1.5	EM	0.10	G	M	3A	2	In footpath garden bed	Will not be affected by construction

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
406 group	**Magnolia grandiflora x 4*	5	1.5	EM	0.12	G	G	2A	2	In footpath garden bed	May require removal
407 group	*Livistona australis* **Plumeria rubra x 3*	7 3	1 1.5	EM M	0.28 0.18	G G	G G	1A 3A	1 2	In garden bed	May require protection
408 group	*Livistona australis x 4* **Ulmus procera*	6 5	1 1.5	EM M	0.27 0.16	G G	G G	1A 3A	1 2	In garden bed	May require removal
409 group	**Ulmus procera x 2* **Platanus x hispanica* 'Acerifolia' x 6	5 8	1.5 2	M M	0.16 0.19	G G	G G	3A 1A	2 3	In garden bed	May require removal
410 group	**Magnolia grandiflora* *Livistona australis* **Ulmus parvifolia* **Ulmus procera x 3*	4 8 4 5	1 1 1 1	M EM M M	0.12 0.26 0.14 0.14	G G G G	G G G G	3A 1A 3A 3A	2 1 2 2	In garden bed	May require removal
411 group	*Livistona australis x 2*	9	1	EM	0.28	G	G	1A	1	In garden bed	May require protection
412	*Livistona australis*	8	1	EM	0.26	G	G	1A	1	In garden bed	May require protection
413 group	**Fraxinus excelsior x 2* **Pyrus calleryana x 2*	5 4	1.5 1	M M	0.11 0.12	G G	G G	3A 3A	2 2	In raised garden beds	May require removal
414 group	*#Syzygium floribundum x 8* **Magnolia grandiflora x 6*	7 5	1.5 1.5	M M	0.13 0.13	G G	G G	3A 3A	2 2	In garden bed	May require protection
415 group	*Eucalyptus paniculata* subsp. *paniculata x 7*	14	2	M	0.15	G	G	2A	3	In mulched earth	May require removal
416 group	*Casuarina glauca x 3* *Eucalyptus baueriana x 9* *#Cupaniopsis anacardioides x 6* *Angophora floribunda x 3* *Eucalyptus tereticornis x 12* *Syncarpia glomulifera x 2*	12 11 6 9 11 9	2 2 1 1.5 2 1.5	M M M M M M	0.14 0.16 0.09 0.12 0.14 0.12	G G G G G G	G G G G G G	2A 2A 3A 3A 2A 2A	3 3 2 3 3 3	In mulched earth	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
417 group	*Casuarina glauca x 15*	12	2	M	0.13	G	G	2A	3	In mulched earth	May require removal
	Eucalyptus baueriana x 15	11	2	M	0.13	G	G	2A	3		
	#Cupaniopsis anacardioides x 4	5	1	M	0.09	G	G	3A	2		
	Eucalyptus tereticornis x 5	12	2	M	0.14	G	G	2A	3		
418 group	*Eucalyptus punctata x 7*	11	1.5	M	0.14	G	G	2A	3	In mulched earth	May require removal
	Casuarina glauca x 2	12	1.5	M	0.13	G	G	2A	3		
	Corymbia maculata	12	2	M	0.14	G	G	2A	3		
	Eucalyptus tereticornis	12	2	M	0.15	G	G	2A	3		
419 group	*Eucalyptus crebra x 2*	10	1.5	M	0.15	G	G	2A	3	In mulched earth	May require removal
	Eucalyptus baueriana x 6	10	1.5	M	0.14	M	M	2A	3		
	Eucalyptus moluccana 3	12	1.5	M	0.14	G	G	2A	3		
	Eucalyptus pilularis x 6	12	2	M	0.15	G	G	2A	3		
	Corymbia maculata x 14	11	1.5	M	0.12	G	G	2A	3		
	Eucalyptus paniculata x 6	13	2	M	0.14	G	G	2A	3		
	**Triadica sebifera*	5	1	M	0.10	M	G	4A	1		
	Casuarina glauca	12	1.5	M	0.13	G	G	2A	3		
	Eucalyptus tereticornis	12	1.5	M	0.14	G	G	2A	3		
420 group	*Angophora costata x 2*	14	2	M	0.15	G	G	2A	3	In mulched earth	May require removal
	Brachychiton populneus subsp. *populneus*	8	2	M	0.11	G	G	2A	3	Small hollows and stick nest in *M. quinquenervia*	
		12	2	M	0.13	G	G	2A	3		
	Casuarina glauca x 21	11	2	M	0.16	G	G	2A	3		
	#Melaleuca quinquenervia x 7										
422 group	*Corymbia maculata x 12*	12	2	M	0.14	G	G	2A	3	In mulched earth	Will not be affected by construction
	Eucalyptus robusta	11	2	M	0.15	G	G	2A	3		
	Callistemon salignus	12	2	M	0.15	G	G	2A	3		
	Eucalyptus saligna x E. botryoides hybrid *x 8*	12	2	M	0.16	G	G	2A	3		
	Melaleuca styphelioides	11	2	M	0.16	G	G	2A	3		
423 group	*Syncarpia glomulifera x 7*	5	1	EM	0.11	G	G	2A	2	In garden bed	Will not be affected by construction

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
424 group	*Livistona australis x 7*	6	1	M	0.26	G	G	1A	1	In garden bed	May require removal
425 group	**Pyrus calleryana x 13* *#Cupaniopsis anacardioides x 10*	5 3	1 1	M M	0.12 0.11	G G	G G	3A 3A	2 2	In garden bed	May require removal
426 group	*#Lophostemon confertus x 10*	5	1	EM	0.16	M	G	2A	3	In grassed border	May require removal
427 group	**Pyrus calleryana x 8* **Lagerstroemia indica x 10*	3 3	0.5 1	EM EM	0.09 0.11	G G	G G	3A 3A	1.5 2	Growing in garden bed; traffic island Growing in grassed footpath	May require removal
428 group	*#Ficus microcarpa* var. *hillii x 2*	14	5	M	0.57	G	M	2A	7	Growing in garden bed; canopy overhangs road Stick nest	May require removal
429 group	*Corymbia maculata x 5* *#Melaleuca quinquenervia x 4* *Livistona australis x 6* **Magnolia grandiflora*	12 11 12 5	2 2 1 1	M M M M	0.14 0.14 0.26 multi	G G G G	G G G G	2A 2A 1A 3A	3 3 1 2	Growing in garden bed	May require removal
430 group	**Magnolia grandiflora x 5* *Livistona australis x 12*	5 12	1.5 1	M M	Multi 0.27	G G	G G	3A 1A	2 1	Growing in garden beds	May require removal
431 group	*#Melaleuca quinquenervia x 5* *Livistona australis x 5* *Magnolia grandiflora* *Eucalyptus botryoides* *Corymbia maculata x 2* *Acacia binervia x 2*	14 12 5 13 12 5	1.5 1 1.5 1.5 1.5 1	M M M M M M	0.15 0.27 Multi 0.17 0.15 multi	G G G G G G	G G G G G G	2A 1A 3A 2A 2A 3A	3 1 2 3 3 2	Growing in garden beds	May require removal
432 group	*Eucalyptus saligna x E. botryoides* hybrid *x 5* *Corymbia maculata x 2*	12 13	2 1.5	M M	0.15 0.18	G G	G G	2A 2A	3 3	Growing in grassed footpath. Stick nests in two *E. saligna*	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
433 group	*#Cupaniopsis anacardioides x 6*	5	0.5	M	0.09	G	G	3A	2	Growing in mulched earth	May require removal
	Casuarina glauca x 3	15	1.5	M	0.14	G	G	2A	3		
	#Melaleuca quinquenervia x 11	12	1.5	M	0.16	G	G	2A	3		
	Angophora floribunda	9	1.5	M	0.14	M	M	3A	3		
	Eucalyptus tereticornis	13	2	M	0.15	G	G	2A	3		
	Eucalyptus punctata x 3	13	2	M	0.15	G	G	2A	3		
434 group	*Casuarina glauca x 23*	14	1.5	M	0.12	G	G	2A	3	Growing in mulched earth	May require protection Tuckeroos are self-recruiting in planted areas
	#Melaleuca quinquenervia x 12	12	1.5	M	0.15	G	G	2A	3		
	#Cupaniopsis anacardioides x 6	4	1	M	0.09	G	G	3A	3		
	Eucalyptus punctata x 6	12	1.5	M	0.14	M	M	2A	3		
435 group	*Eucalyptus punctata x 3*	12	2	M	1.4	G	G	2A	3	Growing in mulched earth	May require protection
	Eucalyptus pilularis x 3	14	2	M	1.5	G	G	2A	3		
	#Melaleuca quinquenervia x 6	13	2.5	M	1.7	G	G	2A	3	Southern side of Hill Road	
	Casuarina glauca	12	1.5	M	1.4	G	G	2A	3		
	Casuarina glauca x 7										
435a group	*Casuarina glauca x 7*	12	1.5	M	1.3	G	G	2A	3	In traffic island	May require removal
436 group	*Eucalyptus punctata x 25*	12	2	M	1.4	G	G	2A	3	South of creek crossing	May require protection
	Melaleuca styphelioides x 5	12	2.5	M	1.6	G	G	2A	3	Growing in mulched earth	
	Eucalyptus tereticornis x 6	14	2	M	1.5	G	G	2A	3	Stick nest in *Melaleuca*	
	#Melaleuca quinquenervia x 4	12	2	M	1.6	G	G	2A	3		
	Eucalyptus fibrosa x 8	12	2	M	1.7	G	G	2A	3		
436a group	*Corymbia eximia*	5	1.5	M	1.3	G	G	2A	3	South of creek crossing	May require removal
	#Eucalyptus microcorys	14	2.5	M	1.5	G	G	2A	3		
	#Melaleuca quinquenervia x 4	12	2	M	1.6	G	G	2A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
437 group	*Eucalyptus moluccana*	15	2	M	1.4	G	G	2A	3	Hill Road; south side	May require protection
	Eucalyptus paniculata x 19	15	2	M	1.4	G	G	2A	3	Growing in mulched earth	
	Eucalyptus punctata x 15	13	2	M	1.4	G	G	2A	3		
	Melaleuca styphelioides x 7	12	2.5	M	1.5	G	G	2A	3		
	#Melaleuca quinquenervia x 5	14	2	M	1.5	G	G	2A	3		
	Casuarina glauca x 14	12	1.5	M	1.3	M	G	3A	3	Hill Road, in traffic island	
438 group	*Eucalyptus tereticornis*	12	2	M	1.4	G	G	2A	3		May require protection
	Eucalyptus paniculata x 4	12	2	M	1.4	G	G	2A	3	Hill Road, south side	
	#Eucalyptus microcorys x 2	14	2	M	1.5	G	G	2A	3	At intersection with BMX access road	
	Melaleuca styphelioides x 2	12	2.5	M	1.6	G	G	2A	3	Growing in mulched earth	
	Eucalyptus punctata	11	2	M	1.2	G	G	2A	3		
439 group	*Eucalyptus paniculata x 23*	13	2	M	1.4	G	G	2A	3	Hill Road, south side	May require removal
	Eucalyptus punctata x 2	12	2	M	1.4	G	G	2A	3	Growing in mulched earth	
	#Eucalyptus microcorys x 4	14	2.5	M	1.6	G	G	2A	3	Small feather nest and small hollow in *Melaleuca* sp.	
	Melaleuca styphelioides x 4	14	2.5	M	1.6	G	G	2A	3		
	Corymbia maculata x 2	14	2	M	1.4	G	G	2A	3		
	#Eucalyptus grandis x 3	15	2	M	1.3	G	G	2A	3		
	Eucalyptus tereticornis x 9	14	2	M	1.4	G	G	2A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
440 group	*Corymbia maculata x 2*	14	2	M	0.13	G	G	2A	3	Hill Road, near Holker Busway intersection	May require removal
	Eucalyptus moluccana x 3	12	2	M	0.13	M	G	2A	3	Growing in mulched earth	
	Eucalyptus tereticornis x 20	14	2.5	M	0.15	G	G	2A	3	Small to large stick nests and small hollows in multiple trees (*Melaleuca* and *Eucalyptus*)	
	Eucalyptus paniculata x 38	12	2	M	0.16	G	G	2A	3		
	Eucalyptus punctata x 12	12	2	M	0.14	M	G	2A	3		
	Melaleuca styphelioides x 8	11	2.5	M	0.16	G	G	2A	3		
	Casuarina glauca x 26	12	1.5	M	0.15	M	G	3A	3	In traffic island	
441 group	*Eucalyptus punctata x 3*	11	2	M	1.5	G	G	2A	3	Adjacent to intersection, Hill Road and Holker Busway	May require removal
	#Eucalyptus microcorys	14	2.5	M	1.3	G	G	2A	3		
	Eucalyptus baueriana x 4	11	2	M	1.5	G	G	2A	3	Growing in mulched earth	
	Angophora floribunda x 2	9	1.5	M	1.4	M	M	3A	3		
442 group	*Eucalyptus paniculata x 13*	12	2	M	1.4	G	G	2A	3	Adjacent to intersection, Hill and Holker Roads	May require protection
	Eucalptus punctata	10	2	M	1.4	G	G	2A	3		
	Casuarina glauca x 30	13	2	M	1.5	G	G	2A	3	Growing in mulched earth	
442a group	*Eucalyptus paniculata x 13*	12	2	M	1.4	G	G	2A	3	Adjacent to intersection, Hill and Holker Roads	May require removal
443 group	*Casuarina glauca x 10*	13	2	M	1.5	G	G	2A	3	Growing in mulched earth	May require protection
	Eucalyptus paniculata x 5	11	2	M	1.4	G	G	2A	3		
443a group	*Casuarina glauca x 10*	13	2	M	1.5	G	G	2A	3	Growing in mulched earth	May require removal
	Eucalyptus paniculata x 10	11	2	M	1.4	G	G	2A	3		
	Eucalyptus tereticornis	13	2	M	1.5	G	G	2A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
444 group	*Eucalyptus baueriana x 29* *Eucalyptus punctata x 5* *Eucalyptus paniculata x 33* *Eucalyptus tereticornis x 27* *Eucalyptus moluccana x 3*	11 10 11 12 11	2 2 2 2 2	M M M M M	1.5 1.3 1.5 1.5 1.4	G G G G M	G G G G M	2A 2A 2A 2A 2A	3 3 3 3 3	Hill Road, northern side Opposite URBN SURF adjacent to Green and Golden Bell Frog habitat Growing in mulched earth	May require removal
445	*Eucalyptus baueriana x 10* *Eucalyptus paniculata x 4* *Eucalyptus tereticornis x 20* *Angophora floribunda x 11* *Casuarina glauca x 3*	10 12 14 8 11	2 2 2 1.5 1.5	M M M M M		G G G M G	G G G M G	2A 2A 2A 3A 2A	3 3 3 3 3	Growing in mulched earth	May require removal
446 group	*Eucalyptus tereticornis x 11* *Eucalyptus punctata x 5* *Eucalyptus pilularis*	12 11 12	2 2 2	M M M	0.14 0.13 0.15	G M G	M M G	2A 2A 2A	3 3 3	Growing in mulched earth Small to large termite mounds in multiple trees	May require removal
447 group	*Angophora floribunda x 18* *Eucalyptus punctata x 7* *Eucalyptus saligna/E. botryoides* hybrid *Eucalyptus tereticornis* x 28 *Brachychiton populneus* subsp. *populneus*	9 10 12 12 8	2 2 2.5 2 1.5	M M M M M	0.14 0.14 0.15 0.14 0.12	M M G G G	M M M G G	3A 2A 2A 2A 2A	3 3 3 3 3	Growing in mulched earth Small to large termite mounds in multiple trees	May require removal
448 group	*Eucalyptus robusta x 8* *Casuarina glauca x 3* *Eucalyptus racemosa* subsp. *racemosa x 2*	10 11 9	2 2 2	M M M	0.15 0.13 0.15	G G G	G G G	2A 2A 2A	3 3 3	Mostly sealed surface	May require removal

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
449 group	*Eucalyptus punctata x 5*	12	2	M	0.16	G	M	2A	3	Growing in mulched earth	May require removal
	Casuarina glauca x 14	13	1.5	M	0.14	G	G	2A	3		
	Brachychiton populneus subsp. *trilobus x 2*	6	1	M	0.13	G	G	2A	3		
	#Melaleuca quinquenervia	9	1.5	M	0.16	G	G	2A	3		
450 group	*Casuarina glauca x 26*	12	2	M	0.15	G	G	2A	3	Growing in mulched earth	May require removal
	#Eucalyptus microcorys x 3	12	2	M	0.15	G	G	2A	3	Small stick nest in *Eucalyptus* sp.	
	Eucalyptus moluccana x 22	11	2	M	0.17	M	G	2A	3		
	Eucalyptus tereticornis x 42	12	2	M	0.18	G	M	2A	3		
	Eucalyptus paniculata x 59	11	2	M	0.15	G	M	2A	3		
	Syncarpia glomulifera subsp. *glomulifera x 21*	10	2	M	0.19	G	M	2A	3		
	Angophora floribunda	8	1.5	M	0.11	M	M	2A	3		
451 group	*Eucalyptus paniculata x 21*	15	2	M	1.6	G	G	2A	3	Growing in mulched earth, Hill Road	May require removal
	Eucalyptus baueriana x 20	11	2	M	1.4	G	M	2A	3		
	Syncarpia glomulifera subsp. glomulifera x 10	10	2	M	1.7	M	M	2A	3		
	Eucalyptus longifolia x 8	12	2	M	1.4	G	G	2A	3		
	Casuarina glauca x 4	11	1.5	M	1.3	G	G	2A	3		
	Eucalyptus tereticornis x 32	12	2	M	1.4	G	G	2A	3		
	Eucalyptus moluccana x 10	11	2	M	1.4	M	M	2A	3		
	Angophora floribunda x 6	9	1.5	M	1.3	M	M	3A	3		
	Melaleuca decora x 4	9	1.5	M	1.4	G	G	2A	3		
	Eucalyptus punctata x 6	11	2	M	1.2	M	M	3A	3		

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
452 group	*#Eucalyptus scoparia x 15* *Eucalyptus robusta x 9*	11 12	2 2	M M	0.17 0.19	M G	M G	3A 2A	3 3	This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act). Sealed carpark	May require removal
453 group	*Eucalyptus punctata x 25* *Eucalyptus paniculata x 15* *Eucalyptus robusta* *Eucalyptus fibrosa x 3*	15 16 12 10	2.5 2 2 2	M M M M	0.23 0.24 0.21 0.25	G G G G	G G G G	2A 2A 2A 2A	3 3 3 3	Growing in mulched earth	May require protection
454 group	*Corymbia maculata x 27*	17	2	M	0.20	G	G	2A	3	Growing in mulched earth	May require removal
455 group	*#Eucalyptus scoparia x 16* *Eucalyptus robusta x 5* *Corymbia maculata x 3* *Eucalyptus tereticornis x 9* *Eucalyptus punctata x 2*	9 10 11 12 9	1.5 1.5 1.5 1.5 1.5	M M M M M	0.14 0.14 0.12 0.13 0.12	M M M M	M M M M	3A 3A 3A 3A	3 3 3 3	This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act). Sealed car park	May require removal
456 group	*#Eucalyptus scoparia x 15* *Eucalyptus robusta x 8* *Corymbia maculata x 2*	9 10 11	1.5 1.5 1.5	M M M	0.14 0.14 0.13	M M M	M M M	3A 3A 3A	3 3 3	This species is listed as Endangered (NSW BC Act) and Vulnerable (Comm. EPBC Act). Sealed car park	May require removal
457 group	*Corymbia maculata x 28* *Melaleuca styphelioides x 5* *Eucalyptus robusta* *Eucalyptus paniculata x 18*	11 10 11 10	1.5 1.5 1.5 1.5	M M M M	0.13 0.15 0.13 0.14	M M M M	M M M M	3A 3A 3A 3A	3 3 3 3	Sealed car park	May require protection
458 group	*Casuarina glauca x 3* *Eucalyptus robusta x 5* *Corymbia maculata x 8*	11 9 10	1.5 1.5 1.5	M M M	0.14 0.18 0.15	M M M	M M M	3A 3A 3A	3 3 3	Sealed car park	May require protection

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
459 group	*Angophora costata x 12* *Eucalyptus paniculata x 7* *Eucalyptus racemosa* subsp*. racemosa x 5* *Ficus rubiginosa x 5*	16 12 11 8	2.5 2.5 2.5 2.5	M M M EM	0.27 0.24 0.22 0.29	G G G G	G G G G	1A 1A 1A 1A	4 3 3 4	Growing in grassed beds, raised above roadway Small mud nest in Eucalyptus sp.	May require protection
460 group	*#Eucalyptus microcorys x 7* *Ficus macrophylla* f. *macrophylla x 4*	8 5	2.5 2	M EM	0.28 0.19	G G	G G	1A 1A	4 3	Growing on east side of Marjorie Jackson Parkway, in grass Stick nest in *E. microcorys*	May require removal Located within Heritage curtilage (see Knox and Partners 2008)
461 group	*#Eucalyptus microcorys x 33*	19	2.5	M	0.25	G	G	1A	4	Growing both sides of Australia Avenue, south of intersection with Kevin Coombs Avenue; growing in grassed strips	May require removal Nominated as Significant (see Knox and Partners 2008)
462 group	*#Corymbia citriodora x 72* *#Corymbia citriodora x C. maculata* hybrid x 70 *Eucalyptus tereticornis*	24	3	M	0.27	G	G	2A	4	Growing along steep slopes below Australia Avenue from Brickpit Ring walk to car park Stick nests in multiple *C. citriodora*	May require protection Nominated as Significant (see Knox and Partners 2008)
463 group	**Platanus x hispanica* 'Acerifolia' x 20	11	1.5	EM	0.19	G	G	1A	3	Growing on both sides of Grand Parade, in footpaths	May require removal Nominated as Significant (see Knox and Partners 2008)
464	*Ficus macrophylla f. macrophylla*	15	7	M	1.24	G	G	1A	15	Growing below road level, at busy intersection	Canopy projects over roadway, although TPZ is probably restricted to lower ground level One of the largest and oldest native trees on the site Will require protection
464a group	**Pyrus ussuriensis x 10*	5	1.5	M	0.14	G	G	3A	3	Growing along Parkview Drive	May require removal Nominated as Significant (see Knox and Partners 2008)

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
465 group	*#Corymbia citriodora x 33* **Pyrus ussuriensis x 6* **Jacaranda mimosifolia x 14*	17 7 8	2.5 2 2.5	M M M	0.21 0.15 0.19	G G G	G G G	2A 3A 2A	3 3 3	Growing in parkland to east of railway station	May require removal Nominated as Significant (see Knox and Partners 2008)
466 group	**Pyrus ussuriensis x 21*	8	1.5	M	0.16	G	G	3A	3	Growing along both sides of Dawn Fraser Avenue; adjacent to railway station; sealed footpaths	May require removal Nominated as Significant (see Knox and Partners 2008)
	**Jacaranda mimosifolia x 22*	12	2	M	0.24	G	G	2A	3	Jacarandas along Dawn Frazer Avenue	May require protection Nominated as Significant (see Knox and Partners 2008)
	Corymbia maculata x 5	15	3	M	0.27	G	G	2A	4	Corner Showground Road and Dawn Fraser Avenue Three specimens growing in footpath; two in small garden beds	
467 group	**Pyrus ussuriensis x 26*	7	2	M	0.24	G	G	3A	3	Growing along both sides of Murray Rose Avenue	May require removal Nominated as Significant (see Knox and Partners 2008)
	Jacaranda mimosifolia x 32	8	2.5	M	.023	G	G	2a	3		May require protection Nominated as Significant (see Knox and Partners 2008)
468 group	**Pyrus ussuriensis x 38*	7	2	M	0.23	G	G	3A	3	Growing along concourse from railway station to Showground Road; sealed surfaces.	May require removal Nominated as Significant (see Knox and Partners 2008)
	Jacaranda mimosifolia x 12	8	2,5	M	0.23	G	G	2A	3	Jacarandas on outer margins of concourse	May require protection Nominated as Significant (see Knox and Partners 2008)

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
469 group	**Pyrus ussuriensis x 34*	7	2	M	0.23	G	G	3A	3	Growing along concourse from Showground Road to Olympic Boulevard	May require removal Nominated as Significant (see Knox and Partners 2008)
	Jacaranda mimosifolia x 12	8	2.5	M	0.23	G	G	2A	3	Growing along concourse from Showground Road to Olympic boulevard	May require protection Nominated as Significant (see Knox and Partners 2008)
470	*#Ficus microcarpa* var. *hillii*	18	4	M	0.45	G	G	1A	6	Growing in grass island	Canopy extends over road; May require protection Nominated as Significant (see Knox and Partners 2008)
471 group	*#Lophostemon confertus x 3* *Corymbia maculata x 6*	7 8	1.5 1.5	EM	0.12 0.11	G G	G G	1A 2A	3 3	Growing in garden bed beside Murray Rose Avenue	May require removal Nominated as Significant (see Knox and Partners 2008)
472 group	*Eucalyptus crebra x 11* *Corymbia maculata x 19* *#Corymbia citriodora x 21* *Eucalyptus paniculata x 9* *#Eucalyptus microcorys x 12*	14 14 15 14 15	2.5 2.5 2.5 3 3	M M M M M	0.23 0.24 0.21 0.24 0.24	G G G G G	G G G G G	2A 2A 2A 2A 2A	3 3 3 3 3	Open area between Edwin Flack Avenue and Stadium	May require removal Nominated as Significant (see Knox and Partners 2008)
473 group	*Eucalyptus robusta x 11* *#Eucalyptus microcorys x 15* *#Corymbia citriodora x 8* *#Corymbia maculata x 7* *Eucalyptus paniculata x 12* *#Corymbia ptychocarpa*	14 15 15 14 14 4	2.5 3 2.5 2.5 2 1	M M M M M EM	0.25 0.22 0.24 0.25 0.23 0.13	G G G G G G	G G G G G G	2A 2A 2A 2A 2A 3A	3 3 3 3 3 1.5	Growing in garden beds and parkland; corner of Dawn Fraser Avenue and Edwin Flack Avenue	May require removal Nominated as Significant (see Knox and Partners 2008)

Tree or Tree Group no.	Tree name	Height (m)	Canopy spread (radius in m)	AGE	DBH[1] (m)	Health[2]	Form[3]	SULE[4]	TPZ[5] (m)	Location and comments	Impact
474 group	*#Eucalyptus microcorys x 7*	16	3	M	0.25	G	G	2A	3	Footpath adjacent to parking Llot, Edwin Flack Avenue	May require removal
	#Eucalyptus microcorys x 5	14	2.5	M	0.22	M	M	3A	2.5	Traffic island; Edwin Flack Avenue	Nominated as Significant (see Knox and Partners 2008)
475 group	**Harpephyllum caffrum x 2*	14	3	M	0.22	M	M	3A	3	Footpath adjacent to The Retreat construction site, Uhrig Road	May require removal; or remedial treatment and protection if retained
	**Phoenix canariensis*	15	4	M	0.42	M	M	2A	1.5		
	#Ficus microcarpa var. *hillii*	17	5	M	0.54	G	G	2A	6	In construction site, adjacent to fence	May require protection
476 group	*#Melaleuca quinquenervia x 10*	3	1	EM	0.11	M	M	3A	1.5	Western side of Stockyard Boulevard	Some damage associated with adjacent construction
	#Eucalyptus microcorys x 5	3	1	EM	0.1	M	M	3A	1.5	Eastern side of Stockyard Boulevard	May require removal

Tree schedule legend:

Australian species or cultivar, but not indigenous to Parramatta LGA

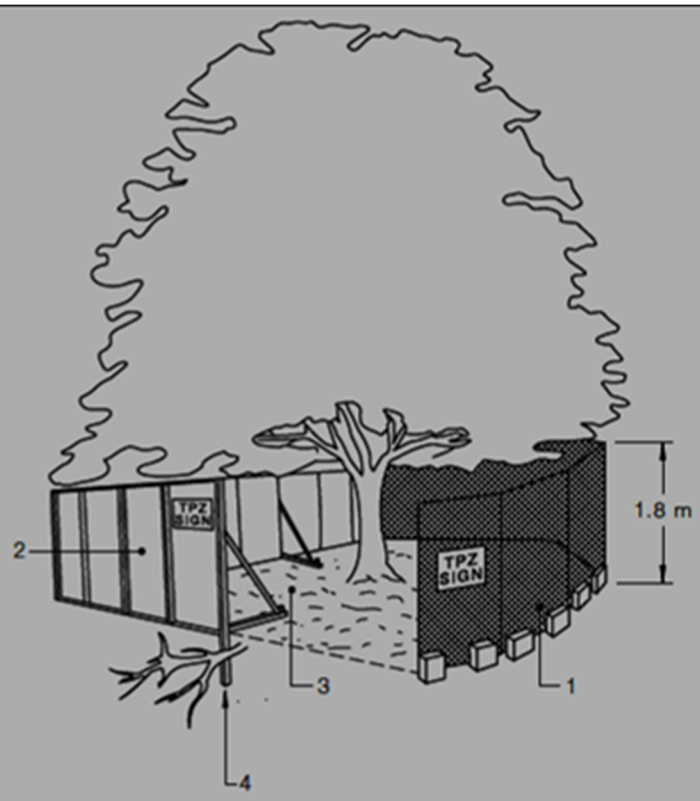
*Exotic species; i.e. not indigenous to Australia

(no prefix applied to species which are indigenous to Parramatta LGA)

1 DBH = Diameter at Breast Height
2 Health: G = Good; M = Moderate; F = Fair
3 Form: G = Good; M = Moderate; F = Fair
4 SULE = Safe Useful Life Expectancy (see SULE Matrix Attachment B)
5 TPZ = Tree Protection Zone

Appendix D

Example of tree fencing



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.

2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.

3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

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