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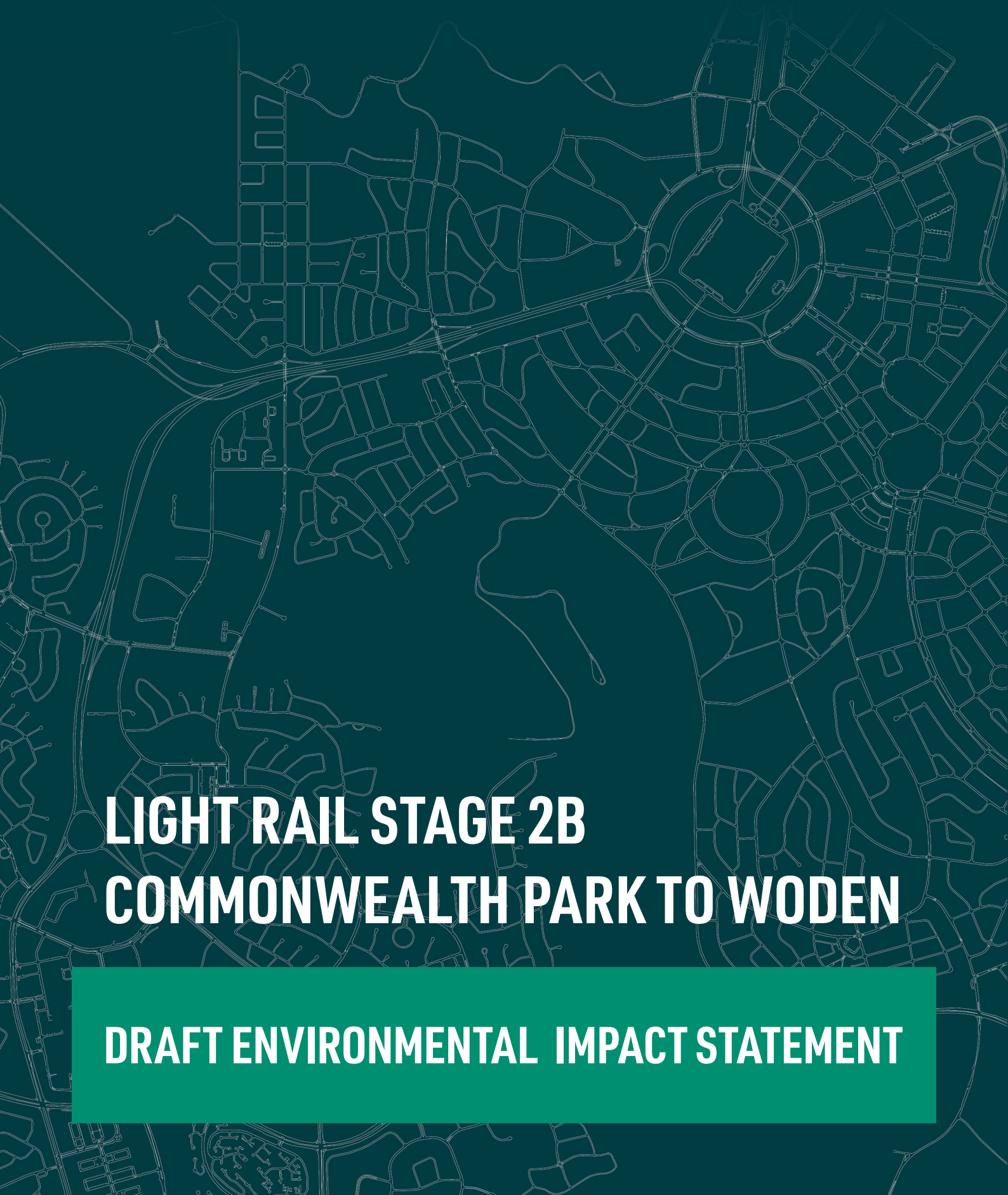

LIGHT RAIL STAGE 2B
COMMONWEALTH PARK TO WODEN

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Acknowledgement of Country

AECOM and Infrastructure Canberra recognises the Traditional Custodians of the Australian Capital Territory and their connections to land, sea and community. We recognise that Traditional Custodians have occupied and cared for this Country over countless generations and that much of the built environment today is located on places and pathways that still hold cultural significance for First Nations people.

We celebrate their continuing contribution to life in the region and we pay our respects to their Elders past and present and furthermore, extending that respect to all First Nations peoples today as well as non-First Nations people.

Environmental Impact Statement details

Project title	Light Rail Stage 2B: Commonwealth Park to Woden Draft Environmental Impact Statement
Date of document preparation	28 May 2025
Location of the Project	Land to be developed for the Project would predominantly consist of existing roadways and blocks in the divisions of Parkes, Acton, Yarralumla, Barton, Capital Hill, Forrest, Deakin, Phillip, Hughes, Curtin and Mitchell. Refer to Appendix K (Property and land use planning) of the Environmental Impact Statement for a complete list of blocks proposed to be developed for the Project.
Proponent and applicant details	Infrastructure Canberra (formerly Major Projects Canberra) ABN: 66 676 633 401 PO Box 158 Canberra ACT 2601 mpc.lrprojectgov@act.gov.au
Document prepared by	AECOM Australia Pty Ltd on behalf of Infrastructure Canberra ABN: 20 093 846 925 Level 4, 68 Northbourne Avenue ACT 2601 Refer to Appendix F (Study team) of the Environmental Impact Statement for details of the study team.

Draft Environmental Impact Statement

Executive Summary

Client: Infrastructure Canberra

ABN: 66 676 633 401

Prepared by

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May-2025

Job No.: 60715876

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Table of Contents

PART B – ENVIRONMENTAL IMPACT ASSESSMENT

PART C - ENVIRONMENTAL MANAGEMENT AND CONCLUSION

PART D – APPENDICES AND TECHNICAL REPORTS

List of Tables

Figures

Executive summary

Introduction

Canberra's population will grow beyond half a million people in the coming years and is projected to be more than 750,000 by 2060. With this population growth comes greater demand for housing, jobs, facilities, services and transport. The ACT Government is planning to build now for a prosperous, healthy and sustainable city into the future. Fundamental to this growth, the continued economic success of the city, and the sustainability and desirability of Canberra in its role as the nation's capital, is a robust integrated transport system. The ACT Government is committed to delivering such an integrated transport system (including light rail), supporting Canberra's reputation as one of the most liveable cities in Australia and the world.

To provide our fast-growing population with the homes, facilities and services people have come to expect, it is necessary to look within the existing urban footprint for future development. Urban sprawl is simply no longer a sustainable planning option.

Overall planning for Light Rail Stage 2B (Commonwealth Park to Woden) (the Project) has necessitated looking at the big picture of how Canberrans live, work, play and move around. Planning for a liveable future is not about building more roads and adding more buses. Our public transport daily boardings will double by 2030 and traffic congestion will continue to increase over time, as will travel times.

Investing in walking, cycling and an integrated public transport network unlocks opportunities and provides more choices for how the population is moved around Canberra. In a planning and approvals context, the Project is the centre piece of this necessary transport investment.

The Light Rail network has been carefully planned and implemented in stages, with the first 12 kilometres and 14 stops already in operation (refer to Figure E-1).

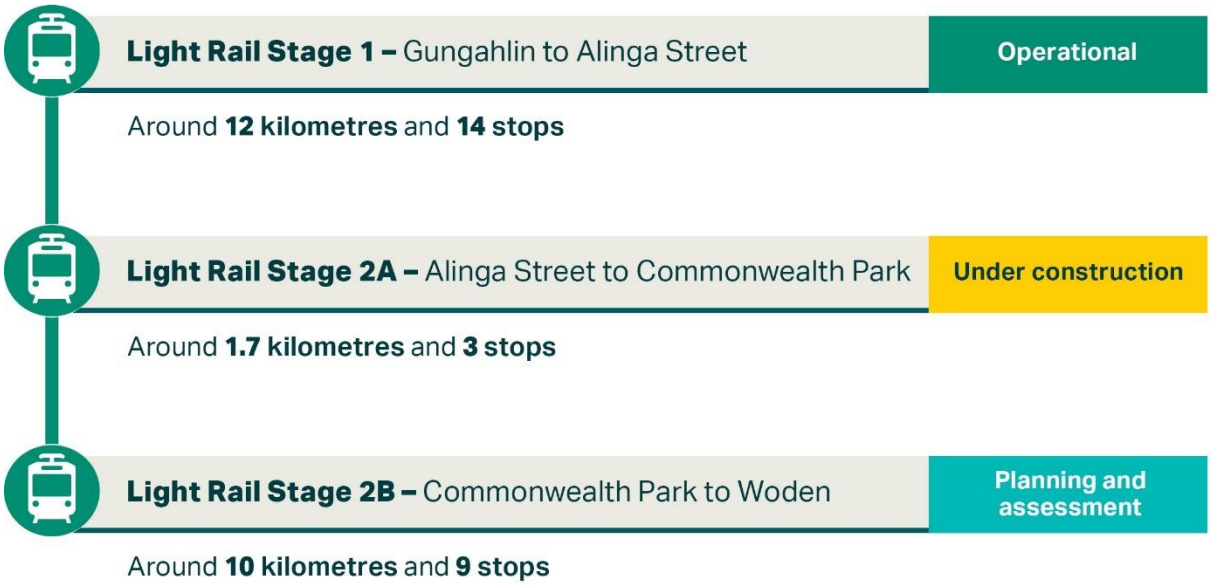


Figure E-1 Light Rail network stages

The benefits of Stage 1 of the Light Rail network are already apparent. The City, Braddon, Dickson and Gungahlin precincts are better connected by frequent and reliable transport. Development and urban renewal have been significant in areas such as Northbourne Avenue, New Acton, Verity and Odgers Lanes, Braddon, Dickson Village and Kambri at the Australian National University. The frequency, reliability and convenience of light rail has increased the overall use of public transport at night and on weekends, taken more cars off our roads, reduced congestion and contributed to our economy.

The Project would deliver light rail across Lake Burley Griffin, through the National Triangle, along Adelaide Avenue, and Yarra Glen, before terminating at Woden Town Centre. Key features of the Project are shown in Figure E-2.

Many key government offices and workplaces are within the National Triangle and a short walk, cycle or scoot from the Project. For Canberrans who work in the National Triangle, the Project would deliver certainty of journey time and the opportunity to incorporate active travel into their daily commute. The more than five million visitors who come to Canberra every year would have greater connectivity to nationally significant landmarks such as the National Gallery of Australia, the National Portrait Gallery, the National Library of Australia, the High Court of Australia and Parliament House (old and new).

Beyond the National Triangle, visitors would also be able to access key destinations along the light rail alignment such as the Lake Burley Griffin foreshore, Manuka Oval, the emerging west Deakin health precinct, embassies, the Royal Australian Mint, sporting venues and local shopping precincts. Improving connectivity with destinations is critical to attracting and retaining a high quality and talented workforce and building on Canberra's $3.4 billion per year tourism industry.

Put simply, extending the light rail south would make it easier for visitors and Canberrans alike to reach our national attractions, homes, services, institutions and employment hubs, while also enhancing the investment in, and diversification of, our economy.

The need for and benefits of the Project are described in more detail in Chapter 2 (Need for the Project).

As shown in Figure E-2, two alignment options for the Project are being considered through the National Triangle and around Parliament House to provide flexibility in planning. Both of these options have been assessed in this draft Environmental Impact Statement (EIS). These alignment options are:

- The ACT Government's preferred State Circle East alignment option: from Commonwealth Avenue along State Circle to Adelaide Avenue (shown in purple dotted lines in Figure E-2)
- An alternative National Triangle-Barton alignment option: from Commonwealth Avenue along King George Terrace, Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue, before connecting with State Circle to Adelaide Avenue (shown in teal dotted lines in Figure E-2).

The EIS process will help to inform a decision on which alignment option is ultimately progressed. Regardless of which alignment option is delivered, the Project would involve the construction and operation of:

- Light rail track and stops, including new light rail bridges on Commonwealth Avenue over Lake Burley Griffin and on Adelaide Avenue
- Road network changes to accommodate the Project, including modifications to existing road carriageways and intersections, removal of the Melrose Drive bridge over Yarralumla Creek, new intersection arrangements, changes to line markings and traffic signal phasing
- Landscaping and public domain features along and around the Project alignment, as presented in the Public Domain Master Plan (refer to Appendix I)
- Ancillary infrastructure such as drainage and stormwater management infrastructure, power and water supply, lighting and telecommunications, traction power substations (TPSs), and utility adjustments
- Active travel (walking, cycling and micromobility) infrastructure to connect the community to the stops
- Upgrades to the existing Mitchell Depot site to accommodate additional light rail vehicles (LRVs) staff and storage.

Figure E-2 Key features of the Project

The Project has been designed and would be delivered with a focus on avoiding or otherwise minimising potential environmental impacts. In this respect, consideration of heritage and landscape values has been embedded into the Project's design, including design of the associated public domain and landscaping approach. Full details of the Project are provided in Chapter 5 (Project description).

The construction duration for the Project will depend on design development, investigations (including geotechnical and utilities), and detailed construction planning, including the construction contractor's final proposed construction methodology. While early and enabling works would be required prior to the main construction works, a final decision on the packaging of the construction works would be made as part of ongoing Project development. Notwithstanding this, consistent with the scope of the Project as described above, construction is expected to cover:

- Early and enabling works
- Main construction works, including works relating to:
  - Light rail infrastructure
  - Earthworks
  - Road works
  - Bridges
  - The covered section on Commonwealth Avenue (for the State Circle East alignment option)
  - Stops
  - Integration with existing active travel links
  - Other infrastructure and utility works
- Finishing, testing, and commissioning.

These activities are described in more detail in Chapter 6 (Construction).

Construction planning has been, and would continue to be, developed with the aim of minimising disturbance to sensitive receivers, and balancing the intensity of construction activities with the desirability of completing construction in a timely and efficient manner. Key construction impacts, including traffic, noise and dust management, would be subject to a detailed Construction Environmental Management Plan(s) (CEMP).

Stakeholder and community engagement

The ACT Government has undertaken extensive community and stakeholder consultation in respect of Canberra's Light Rail network. By consulting with the community and taking into account their views (including in relation to strategic urban renewal), the first stage of light rail between the City and Gungahlin has shown that Canberrans embrace an integrated, reliable, and well-planned public transport network.

Detailed engagement on the Project EIS began in 2023, building on the engagement carried out for the broader Light Rail Stage 2 since 2017. This detailed engagement was based on a concept design and preliminary environmental investigations. This engagement increased awareness of the Project and identified issues of interest and concern to stakeholders and the broader community. Chapter 4 (Stakeholder and community consultation) details the stakeholder and community engagement undertaken and the relevant outcomes. Amongst other things, the engagement included:

- Stakeholder meetings
- Consultation with the Community Reference Group
- Community information sessions and pop-up events
- Aboriginal stakeholder consultation
- A community survey

- Business doorknocks
- Phone calls
- Distribution of printed and digital collateral.

The 'What We Heard' report also provides a summary of the community engagement that occurred between May and June 2024, and is available on the 'YourSay Conversations' (https://yoursayconversations.act.gov.au/) and 'Light Rail to Woden' (https://www.act.gov.au/lightrailtowoden) webpages.

Stakeholder and community engagement will continue through the public notification (exhibition) period for this EIS, and as the Project continues to be developed.

The outcomes of the stakeholder and community engagement activities are detailed in Chapter 4 (Stakeholder and community consultation).

Environmental and planning approvals and assessment approach

The Project requires four main environmental and planning approvals to allow for its construction and operation:

- Approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- Development approval under the *Planning Act 2023* (ACT) (Planning Act)
- Works approval under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) (PALM Act), and
- Approval under the *Parliament Act 1974* (Cth) (Parliament Act) for those parts of the Project within the Parliamentary Zone.

Further information on the environmental and planning approvals required for the Project is provided in Chapter 8 (Legislation and policy).

This document is a draft EIS, which will be subject to a public notification period (exhibition) and referred to relevant Commonwealth and Territory government entities. A revised, final EIS will be prepared, taking into account issues that may be raised in public submissions and representations in response to this draft EIS.

This EIS has adopted a precinct-based approach to the environmental assessment of the construction and operational impacts of the Project. The environmental assessment for each precinct allows focused consideration of key issues relevant to the precinct. Potential impacts with broader environmental implications, or that would be generally applicable to the whole Project, have been assessed on a Project-wide basis.

Noting the significant landscape values, tree assessments formed a large part of the investigations, with almost 3,000 individual tree assessments undertaken to inform both the biodiversity assessment (focussing more on native species with habitat value) and the landscape character and visual impact assessment (which typically focusses more on introduced species that underpin the formal landscapes around Parliament House).

The general approach to the environmental impact assessment of the Project is shown in Figure E-3 has included:

- Scoping and describing the Project characteristics – what it would look like, and how it would be constructed and operated
- Undertaking a preliminary environmental risk assessment based on early design to identify likely key issues for detailed assessment
- Describing the existing environmental conditions within and around the Project boundary, against which the potential impacts of the Project can be assessed
- Identifying and assessing potential impacts, with reference to existing environmental conditions

- Assessing the significance of the potential construction and operational impacts
- Identifying measures to avoid, mitigate and manage, and where needed offset these impacts
- Assessing residual environment risks.

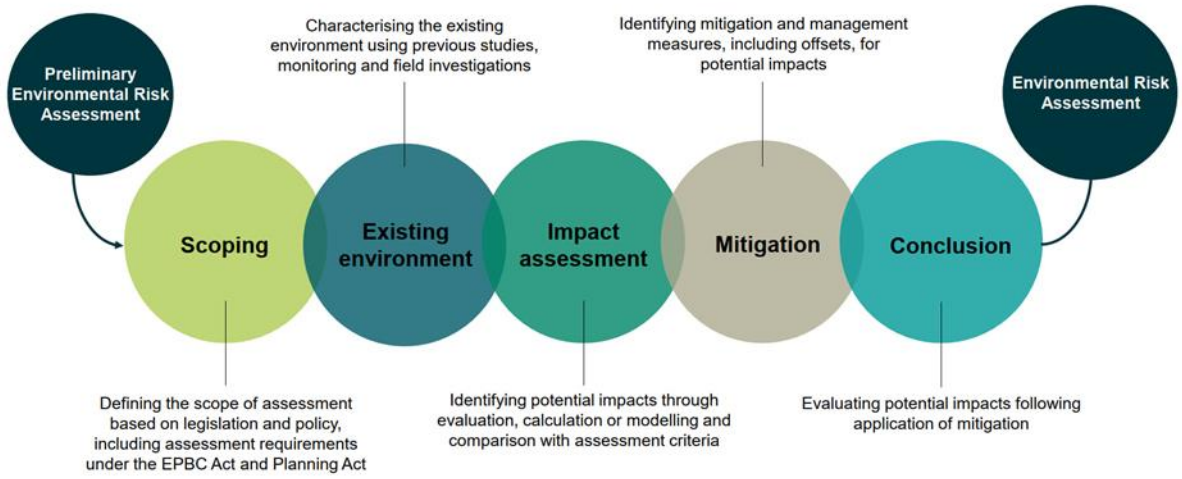


Figure E-3 General approach to the environmental impact assessment of the Project

The EIS presents a series of potential impacts associated with construction and operation of the Project, which have been assessed as 'unmitigated' and as worst-case scenarios. Working with technical specialists, the ACT Government has developed and committed to implementing an extensive set of environmental management and mitigation measures (refer to Chapter 21 (Environmental management and mitigation measures)). The implementation of these measures would in many cases avoid potential worst-case impacts from the Project and otherwise minimise impacts, resulting in improved outcomes for the community and environment.

The approach and methodologies applied to the preparation of this EIS are detailed in Chapter 9 (Approach to the environmental assessment) and Chapter 10 (Assessment methodologies).

Key findings

Consistent with current development patterns, going forward, it is expected that 70 per cent of Canberra's growth will be within the existing urban footprint. As the population grows the ambition of the ACT Government is to protect and enhance the city's liveability by taking an integrated and holistic planning approach to maintain Canberra as a compact, accessible, sustainable and vibrant city.

The Project would be a core component in unlocking this ambition for several reasons.

It would provide additional transport capacity to a key area of the existing urban footprint. Areas such as Acton Waterfront, the future North Curtin Residential Area, and the Woden Town Centre are crucial for the future provision of more sustainable housing. The urban renewal planned for these areas, facilitated by the Project, would offer thoughtfully planned, flexible, and diverse housing choices. Light rail would ensure these homes are better connected to employment, entertainment, sports, shopping, and essential services.

Light rail is a hassle-free transport mode that operates regularly and reliably, day and night, including weekends. Evidence from Light Rail Stage 1 shows that Canberrans are increasingly using public transport outside traditional peak times, connecting with entertainment, recreation, retail, and hospitality venues more than ever before.

The Project would also unlock a gateway to the south and contribute to achieving the ACT's target of net zero carbon emissions. An integrated Light Rail network is more than just the journey between stops; it creates better connections to buses and improves 'last mile' offerings, including cycling and pedestrian routes.

Encouraging more people to leave their cars, whether for commuting, exploring, or connecting, contributes to a happier and healthier community and overall wellbeing. Wellbeing involves having the opportunity to lead lives with qualities such as good health, time to enjoy important things, and an environment that promotes personal growth.

Finally, accessibility features like level boarding, hearing loops, and spaces for wheelchairs, prams, and bikes would ensure that light rail is inclusive for all Canberrans and visitors to the city.

Notwithstanding the above, a thorough assessment of the Project is required and appropriate. This EIS assesses a range of environmental, construction, heritage, transport, economic and planning issues relevant to the Project. Key environmental findings, recommendations and outcomes from this EIS are summarised below and are presented in detail in Part B (Environmental impact assessment).

Biodiversity

Assessment approach and summary

While much of the original native biodiversity in central Canberra has been removed or fragmented due to urban development, some areas of remnant native vegetation still exist, particularly along parts of Commonwealth Avenue, State Circle, Adelaide Avenue, and Yarra Glen. Species protected under both Commonwealth and ACT legislation have been considered and biodiversity values within and around the Project area have been confirmed through vegetation and habitat surveys, and targeted surveys for individual threatened species.

Key potential impacts

Anticipated biodiversity losses would include some unavoidable clearing of native vegetation and habitat. Losses would include 5 to 6 hectares of native vegetation and between 116 and 126 mature native trees (noting 15 to 19 of those trees are hollow-bearing). Most impacts would be concentrated in the Parliament House and Yarra Glen precincts, which include potential habitat for several threatened species, including the Golden Sun Moth, Superb Parrot, Gang-gang Cockatoo and Diamond Firetail.

Surveys have not identified any listed threatened flora species or endangered ecological communities in areas likely to be disturbed by the Project.

Key recommendations, mitigation and management approaches

The Project has already made significant efforts to avoid and minimise impacts on native biodiversity through careful design and construction planning – including the avoidance of around 8 hectares of Golden Sun Moth habitat and 15 hectares of Gang-Gang Cockatoo and Superb Parrot foraging habitat. Ongoing design development would seek to minimise these impacts further. Mature native trees, especially hollow-bearing trees providing potential habitat for threatened species, would be retained and protected where possible. Disturbed sites, like existing car parks, have been targeted for construction compounds to reduce the need to impact more sensitive, undisturbed areas. Ongoing design development will consider enhancing habitat and connectivity through Project landscaping, using locally endemic native plants.

Measures to minimise the impacts on native biodiversity values would be detailed in a Biodiversity Management Plan as part of the CEMP(s) for the Project. Any residual impacts would be offset in accordance with the EPBC Act Offsets Policy. A final Biodiversity Offset Strategy will be developed once suitable offset sites have been confirmed.

Heritage (First Nations heritage and historic heritage)

Assessment approach and summary

The Project has required, and will continue to require, careful and considerate planning to conserve the important cultural and heritage values of all relevant areas, to maintain the well-known Canberra vistas, and to ensure Canberrans have access to a reliable and convenient transport option.

This EIS has been prepared with an appreciation that the Project will occur in a highly sensitive landscape recognised for its cultural, heritage and social values. Important elements of First Nations heritage include the Molonglo River, the geology of the State Circle Cutting as an ochre site, and Kurrajong (Capital) Hill.

More than 30 historic heritage sites listed on the Commonwealth Heritage List, National Heritage List and/or ACT Heritage Register have been identified in proximity to the Project area. Most are located around the northern extent of the Project, including Commonwealth Avenue, Parliament House, National Triangle and Barton precincts. These are associated with historic buildings, landscapes and natural heritage associated with establishing Canberra as the Nation's Capital.

Key potential impacts

The Project is not expected to directly impact any known First Nations heritage sites. The Project would, however, directly impact listed historic heritage places including:

- Parliament House Vista – some trees are expected to be lost, although every effort will be made to replace impacted trees and integrate light rail infrastructure
- Lake Burley Griffin and Adjacent Lands – the new light rail bridge may affect visual amenity, but it has been planned and designed to minimise visual and physical impacts
- Canberra Croquet Clubhouse and Lawns – it may be necessary to remove one tree, in which case it is planned that the tree would be replaced
- Hotel Kurrajong (National Triangle-Barton Option only) – the removal of some mature oak trees along the boundary of the site. Efforts will be made to retain the trees or, if this is not possible, to replace them.

In addition to direct impacts, the more than 30 listed heritage sites identified in proximity to the Project area may be indirectly affected by the Project during construction and operation. This may include potentially elevated indirect visual and landscape impacts on important heritage items through the National Triangle, Old Parliament House and Albert Hall. There would also be potential for indirect vibration impacts on these sites during construction, subject to final Project design and construction planning.

Key recommendations, mitigation and management approaches

Options to avoid and minimise heritage impacts have been implemented to date through the design development process and consideration of various design options/alternatives. The Project will continue to seek to minimise impacts where feasible during ongoing design development, with a focus on reinforcing heritage values and integrating cultural heritage into the Project design. Minimum separation distances to protect built heritage items from construction vibration will be implemented during specific construction activities. A Conservation Management Plan will also be developed as part of the CEMP for the Project.

Landscape character and visual amenity

Assessment approach and summary

The Project design has been developed recognising the highly sensitive cultural, heritage and natural landscapes that characterise and define Canberra as the nation's capital. Opportunities to integrate the Project into the landscape and minimise potential visual impacts have been identified and considered, and this approach will continue as the Project design progresses.

Potential impacts on landscape character have been assessed in the context of the unique setting of the Project, particularly the planned geometry of the city, significant vistas within and around the National Triangle and Lake Burley Griffin, natural landscape character values and the ongoing connection of Aboriginal people with the landscape.

Visual impacts during the operation of the Project have been assessed at 29 representative viewpoints. More substantial impacts have been identified in the northern precincts (Commonwealth Avenue, Parliament House, the National Triangle, and Barton) due to their higher cultural and historical significance, and sensitivity to visual disturbance.

Key potential impacts

Construction would be visually prominent and would affect much of the visual catchment around the Project area, resulting in pronounced but temporary impacts on landscape character and visual amenity.

Of the trees assessed as part of the EIS, the State Circle East alignment option may see around 700 removed while the alternative option could result in some additional trees removed. Recognising the importance of these living assets, the Project has committed to a minimum of a two for one replacement strategy. Consistent with the approach taken on Light Rail Stage 2A, the Project would utilise advanced tree stock for important replacements.

In the operation phase, the Project would introduce new elements into the landscape and key impacts are expected through the National Triangle, across Lake Burley Griffin (given the new bridge and the operation of LRVs), and within Canberra's planned geometry.

Key recommendations, mitigation and management approaches

Measures to minimise landscape character and visual impacts during construction will be detailed in a Visual Impact Management Plan as part of the CEMP(s) for the Project.

Where feasible, development of the Project alignment has sought to minimise changes to landscape character and visual amenity by following existing transport corridors, particularly along Commonwealth Avenue and Adelaide Avenue. Opportunities to visually integrate Project infrastructure into the surrounding landscape have been considered, and will continue to be an important focus in ongoing design development.

The Project design already includes several initiatives to reduce visual intrusion. These include wire-free operation from Commonwealth Park to Hopetoun Circuit, and the location of stops in places that would minimise landscape and visual heritage impacts. A particular focus on these approaches has been along, around and within the Parliament House Vista, the National Triangle and Lake Burley Griffin.

Further design development of the Project will be guided by the Public Domain Master Plan (refer to Appendix I), a Designing with Country Framework, a Landscaping Plan, and tree succession planning.

Traffic and transport

Assessment approach and summary

Canberra is not immune to congestion-related delays which plague many cities. An important part of an integrated response to tackling this congestion and its adverse impacts is the provision of non-road base transport alternatives, such as light rail. Each LRV can carry as many passengers as three buses, and can provide an effective and efficient means of shifting the city's transport needs off the existing congested road network. This effect has already been demonstrated with traffic along the Light Rail Stage 1 corridor reducing by around 20 per cent. This is equivalent to removing 4,800 carbon-producing road vehicle trips every hour.

Traffic modelling for 2031 and 2041 has been used to assess the performance of the road network both with and without the Project. The modelling has incorporated only 'committed and funded' projects (i.e. without reference to any other future transport investment or infrastructure) in accordance with relevant and applicable guidelines.

Consistent with expected population growth, the modelled traffic for these future years shows significant peak period traffic congestion across Canberra. However, as the modelling did not take into account some of the ACT Government's planned future changes to the transport network, the transport modelling presents a worst-case, conservative assessment.

Assessment of the outcomes of the traffic modelling, both with and without the Project in future years, has highlighted:

- Without further investment in roads and public transport (including light rail), significant traffic congestion and deteriorating vehicle and bus travel times will occur, especially during peak hours
- The Project would assist in alleviating congestion along its alignment and the surrounding road network by offering a transport choice not subject to road-based congestion impacts
- Additional measures and investment will be needed over time to fully resolve all transport issues arising from the increasing population.

Key potential impacts

As would be expected with any major infrastructure project, during the construction phase:

- There would be temporary disruptions, speed limit changes, and lane and road closures leading to traffic redistribution. Key affected areas would include Commonwealth Avenue, State Circle, and Adelaide Avenue, with increased traffic on alternative routes such as King Edward Terrace and Bowen Drive
- Vehicle travel times during peak hours could increase by more than five minutes on the most affected routes
- There would be some temporary reductions in available parking spaces to cater for construction activities and compounds.

These impacts would be temporary and limited to the construction period.

During the operations phase:

- The Project would provide additional transport capacity, accommodating around 2,400 people per hour in each direction
- The Project would improve active transport connectivity with new pedestrian and cyclist infrastructure
- Some permanent changes to the road network would be required, with some lane adjustments, intersection modifications, road closures and reconfigurations, and minor reductions in car parking spaces.

Key recommendations, mitigation and management approaches

Measures to minimise and manage traffic and transport impacts (including active travel) during construction will be detailed in a Transport Management Plan as part of the CEMP(s). The Plan will include a detailed Traffic Demand Management Strategy, implementation of a Traffic and Transport Liaison Group to endorse Temporary Traffic Management Plans and a complementary Community Engagement Strategy.

Noise and vibration

Assessment approach and summary

Given the *Environment Protection Regulation 2005* (ACT) does not impose specific noise limits for construction of major transport projects, construction noise for the Project has been assessed with reference to the NSW Interim Construction Noise Guideline (NSW Department of Environment and Climate Change, 2009).[1]

The noise assessment has considered scenarios based on anticipated worst-case construction activities, without the application of mitigation measures, and has adopted conservative assumptions. Actual noise levels experienced by receivers during construction of the Project would therefore be lower than the conservative construction noise predictions presented within the assessment.

Most construction and noise generating activities would be conducted during standard construction hours. However for some specific construction activities, works would need to be undertaken outside standard hours to minimise wider disruption or for worker safety, and these have been included in the conservative modelling.

During operation, noise and vibration from operation of light rail vehicles, fixed facilities and the Mitchell Depot have been assessed. Changes in road traffic noise due to alterations to the road network required for the Project have also been assessed.

[1] https://www.environment.nsw.gov.au/resources/noise/09265cng.pdf

Key potential impacts

New noise and vibration sources would be introduced during the construction phase. Key activities causing elevated noise would include mobilisation of construction compounds, utility works, earthworks, road works, light rail infrastructure construction, stop construction, and bridge construction. However, most construction would occur during standard construction hours, with some limited activities needing to be undertaken outside of these hours (for example key intersection works). A substantial portion of the Project would be located within already busy transport corridors, with surrounding receivers already experiencing elevated background noise levels. Additional temporary construction noise impacts from the Project would occur in this context, with some masking of construction noise impacts provided by existing elevated background noise levels.

Operational noise from the Project would be generally within acceptable limits. Vibration from LRVs would not exceed criteria for the protection of human comfort at the vast majority of receivers (assuming that such vibration would be perceptible to human senses, without the application of mitigation measures) or structural integrity, including for heritage structures.

Key recommendations, mitigation and management approaches

Measures to minimise and manage construction noise and vibration will be detailed in a Noise and Vibration Management Plan as part of the CEMP(s). This will include scheduling of noise and vibration intensive activities with appropriate respite periods, and minimising works during noise sensitive periods (any out of hours works would be assessed on a case-by-case basis prior to proceeding). Furthermore:

- An Operational Noise and Vibration Review (ONVR) will be prepared as part of ongoing design development
- An Operational Environment Management Plan (OEMP) will be prepared and implemented. The OEMP will specify the environmental requirements to be implemented during the operational phase of the Project.

Social and economic considerations

Assessment approach and summary

Assessment of the socioeconomic impacts of the Project has included an analysis of the demography, economic baseline and employment profiles of catchments along and around the Project alignment. Business community engagement has been carried out to identify potential concerns, impacts and opportunities for different businesses and sectors operating near the Project. The assessment approach has included one-on-one discussions and a business survey.

Key potential impacts

The Project would provide a range of positive social impacts including provision of an efficient and reliable transport option, supporting health and wellbeing and benefits to the business community through increased connectivity. Significant economic benefits would include the provision of customer access, broadening the customer base, new opportunities with additional residential and commercial developments over time and the potential for employment and services in construction and operations phases.

The Project would contribute to the ongoing liveability and desirability of Canberra, supporting both social and economic wellbeing.

Some stakeholders have expressed concerns about the potential disruptions during the construction phase to local residents and businesses. Concerns have also been raised in relation to access to events, and a potential resource strain due to an increased demand for skilled labour. During the operation phase, stakeholders have identified concerns in relation to community safety, parking availability, and impacts on social amenity due to operational noise.

Key recommendations, mitigation and management approaches

Environmental management and mitigation measures for traffic and transport impacts, noise and vibration, and property access are described in the relevant sections of this Executive Summary.

Other measures to minimise and manage potential adverse impacts on the community will be detailed in a Community Engagement and Social Management Plan developed as part of the CEMP(s), including:

- A Community Engagement Strategy (including a range of stakeholders and communities along the Project alignment, including users of Lake Burley Griffin)
- A Business and Labor Strategy, covering support for local businesses and workforce management.

Hydrology, flooding, water quality and groundwater

Assessment approach and summary

The Project would span four sub-catchments that drain into Lake Burley Griffin and eventually into the Murrumbidgee River. These sub-catchments have existing degraded water quality due to urban runoff pollutants.

Flood modelling has been conducted to assess potential changes in flooding characteristics, including major flood scenarios and the effects of climate change.

Key potential impacts

The Project may affect water resources through surface water runoff and changes in drainage and hydrology during construction and operation.

There would also be potential for the Project to intercept perched groundwater during larger scale excavation activities, such as the transition from Commonwealth Avenue to State Circle. However, the Project is not expected to substantially impact groundwater hydrology or quality.

Construction of the new light rail bridge across Lake Burley Griffin has the potential to temporarily affect water quality in Lake Burley Griffin through sediment disturbance and accidental spills.

The Project has been designed to avoid and minimise adverse changes to hydrology, including local and regional level flooding characteristics. Flood modelling has been carried out as part of design development, and embedded in the Project's design response to identified flooding and drainage issues. The result of this approach has been no material changes to flood levels, and some areas, improvements in flood levels due to improved drainage.

Key recommendations, mitigation and management approaches

It is expected that wastewater will be collected, managed, and disposed of either to sewer or an offsite treatment facility if reuse is not possible. Intercepted groundwater will be collected, managed, and transported offsite for treatment and reuse or disposal. Water sensitive urban design will also be integrated into the Project design to effectively manage and minimise the release of pollutants to the surrounding environment.

Coffer dams and other measures will be installed to minimise sediment disturbance and turbidity in Lake Burley Griffin during the construction of the new light rail bridge. Erosion and sedimentation control measures will be applied in construction, consistent with best practice guidelines and relevant approvals. Detailed water quality and hydrology measures (including a Surface Water and Groundwater Plan and a Sediment and Erosion Control Plan) will be included in the CEMP(s) for the Project.

Ongoing design development will seek to minimise material adverse changes in flood characteristics along and around the Project. Within the Yarralumla Creek catchment, the Project has committed to establish a design, through interagency coordination and further studies, that responds to future climate change projections.

Other environmental Issues

Soils and contamination

The assessment has included review of historical and current land use, contamination data, and identified areas of environmental concern based on potential contamination. No existing sites with extensive, migrating, or intractable contamination issues have been found within or near the Project area. Further investigations will be conducted in areas with potential contamination risk to inform Project design and construction planning. Measures to minimise and manage future contamination risks will be detailed in a Soils and Contamination Management Plan as part of the CEMP(s). The ACT Environment Protection Authority will be engaged for managing contamination, including offsite transport, treatment, and disposal if a contamination issue occurs.

Land use and property

The Project has been assessed under the NCP and the Territory Plan 2023, generally aligning with their respective aims and objectives, though the National Triangle-Barton alignment option would require an NCP amendment were it to be progressed. Most infrastructure associated with the Project would be on government land, with minimal impact on privately leased land. Specific mitigation measures have been identified to enable the management of property access during the construction phase. Once complete, the Project may increase land desirability around stops, altering development types over time. Ongoing planning and design effort will minimise private land encroachment, will include engagement with leaseholders on land use and access, and will maintain ongoing consultation with planning agencies for future strategic planning in Canberra.

Air quality

The assessment approach for general construction and operations emissions has been conducted on a Project-wide basis, while potential dust generation has been evaluated considering the magnitude of dust and the sensitivity of potentially affected receivers. Key potential impacts would include emissions from construction plant and equipment (combustion fuel) and dust from excavation and construction activities, which may affect local residents and businesses. Operational emissions would be minimal, and would primarily relate to increased maintenance activities at the Mitchell Depot site. Key recommendations and mitigation measures, including air quality issues, will be detailed in the CEMP(s) and OEMP with a specific Dust Management Plan included.

Climate change and greenhouse gas emissions

The assessment of climate change and greenhouse gas (GHG) emissions for the Project has considered future climate impacts, such as extreme rainfall, flooding, and heat events, which could affect construction schedules, worker safety, and costs. During operation, the Project could face extreme weather events and temperature changes impacting design and reliability. Direct GHG emissions would come from construction activities, while indirect emissions would result from the broader economy. Electricity-related emissions would be zero due to the ACT's renewable energy sources. The Project has been designed to be resilient to climate changes, with ongoing design development focusing on minimising climate-related risks and reducing GHG emissions from major contributors like fuel consumption and selection of construction materials. A Sustainability Management Plan and a Carbon Management Plan will be part of the CEMP(s) and OEMP to ensure effective mitigation and adaptation measures.

Materials, waste and resources

To support effective waste management, the Project has identified potential waste types early, referencing the circular economy and waste hierarchy. Significant quantities of materials required for the Project would include concrete, aggregates, asphalt, metals, and smaller quantities of timber, PVC, HDPE, fuel, oils, and prefabricated items, with sufficient supply available. The Project would also require electricity and water, with utility providers confirming capacity. The largest construction waste stream would be excess spoil. Following the ACT Waste Management Strategy 2011-2025, the Project will prioritise waste avoidance, reduction, reuse, recycling, and disposal, exploring opportunities for offsite reuse of excess spoil. Waste management measures will be detailed in a Spoil and Waste Management Plan within the CEMP(s).

Hazards and risk

Constructing and operating a major transport project involves some potential hazards and risks to public safety, worker health, and the environment. Assessment of the Project has considered these risks and has included management measures to mitigate them. Key construction risks would include public and worker safety, hazardous materials, utility interactions, and bushfire risk areas, while operational risks focus on public safety and road traffic. A Work Health Safety (WHS) Management Plan and a Rail Accreditation, Safety and Systems Assurance Plan will ensure compliance with relevant laws. The Project would eliminate hazards where possible and would apply controls to minimise risks. Each site will be reviewed for potential hazards, with the CEMP(s) detailing specific risk mitigation measures. Infrastructure design will incorporate public safety features like Crime Prevention through Environmental Design, Gender Sensitive Urban Design, and universal accessibility features.

Conclusion and next steps

The Light Rail Stage 2B Project is a transformative opportunity for the ACT to capitalise on its urban structure within a central public transport corridor that would promote development in areas located close to defined activity centres and major employment hubs along key transit routes. Complemented by a mix of other transport improvement initiatives, the Project would support the ACT's plans for sustainable urban growth by providing a frequent and reliable public transport option in a planned growth corridor while also helping to reduce projected road network congestion and its associated adverse impacts to wellbeing.

By continuing to plan and develop the Project in a way that is sensitive to the ACT's heritage, its natural environment, and the needs of local communities and visitors, Canberrans would be the beneficiaries of a modern, sustainable transport option that would make an essential contribution to the city's liveability, well into the future.

This draft EIS is an essential step to make sure that all relevant environmental considerations and concerns are identified and considered before the Project progresses. It highlights the expected short term and permanent Project impacts and the ACT Government's intended mitigation and management approaches.

Key impacts of construction activities would include temporary traffic disruption, construction noise and impacts to visual amenity. As was the case during the delivery of Light Rail Stage 1, these impacts would be mitigated in accordance with appropriate industry standards and ACT guidelines, and managed via the CEMP(s). Given the highly sensitive nature of some areas along and around the Project, additional issue and location specific mitigation measures have also been developed, for example specific controls relating to construction in the vicinity of important heritage buildings, vistas and landscapes.

Key permanent impacts during operations include:

- Removal of native vegetation and habitat, and potential impacts on native species. Mature native trees, especially hollow-bearing trees providing habitat for threatened species, are avoided and protected where possible. Ongoing design development will focus on enhancing habitat and connectivity through landscaping with locally endemic native plants. Regardless, there are expected to be some residual impacts that would be offset in accordance with the EPBC Act Offsets Policy
- Historic heritage, landscape and visual amenity would be impacted by the introduction of the light rail infrastructure. The Project has been designed to minimise changes to heritage, landscape character and visual amenity, with the alignment being predominantly within existing transport corridors. A distinctly sensitive landscape design has been developed for Commonwealth Avenue including the new light rail bridge over Lake Burley Griffin and the use of wire-free technology to reduce visual intrusion. The Project will continue to seek to minimise impacts during design development, with a focus on reinforcing heritage values, landscaping succession and renewal, and integrating cultural heritage into the Project design.

This draft EIS will be subject to a public notification (exhibition) period under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Planning Act 2023* (ACT). Interested and affected stakeholders are encouraged to make a submission and/or representation the Project and the draft EIS at this time.

Following public exhibition of the draft EIS, the submissions received from community and stakeholders along with other input that may be received from regulatory agencies and public authorities will be reviewed and considered. A revised, final EIS will be prepared that responds to issues raised during the consultation process. The final EIS will describe only one alignment option and will identify potential environmental impacts and benefits of that option. The final EIS may also update aspects of the Project and its environmental impact assessment to reflect ongoing design development, additional investigations and changes aimed at further minimising environmental impacts.

1.0 Introduction

1.1 Light rail vision

The Light Rail network is a keystone project to deliver on the community objectives outlined within ACT Government strategies, to shape Canberra's future to be a more compact, competitive, and connected city.

The ACT Government announced in Canberra: A Statement of Ambition 2016 that a key direction of travel to guide policy making efforts is to 'deliver better metropolitan infrastructure that helps to renew our inner precincts, strengthening our suburbs and providing new opportunities for all' (CMTEDD, 2016).

In 2020, the ACT Government's Transport Strategy 2020 presented a vision to deliver Light Rail to develop a world-class transport system that would support a more compact, sustainable, and vibrant city (TCCS, 2020a). Light rail would boost Canberra's sustainable growth by changing and improving transport options, settlement patterns and employment opportunities (CMTEDD, 2016).

The ACT Infrastructure Plan sets out a long-term vision to build Canberra's future. Revised in 2024 with a transport update, the plan emphasises continued investment in the light rail as a cornerstone of public transport infrastructure to service a modern, growing city. It reinforces the vision for a 'connected and convenient public transport network' to encourage more Canberrans to make public transport part of their everyday lives. Light rail will help deliver a more compact, walkable and liveable city, enable more accessible services and connect communities between the north and southside of the City (ACT Government, 2024a).

1.2 Background

Light Rail Stage 1 (LRS1) is currently operational from Gungahlin Place, Gungahlin, to Alinga Street, in the city centre, as shown on Figure 1-1. LRS1 includes 12 kilometres (km) of light rail track, 14 stops, 14 light rail vehicles (LRVs), and a maintenance depot in Mitchell. LRS1 provides a sustainable, accessible, and affordable public transport option. Between January to March 2024, LRS1 was boarded, on average, around 13,950 times during weekdays, and 7,550 times during weekends (TCCS, 2024a).

Building on the success of LRS1, the ACT Government has committed to continuing to improve connectivity in Canberra by extending the current Light Rail network to Woden Town Centre (Figure 1-1). The extension of the Light Rail network from the city centre to Woden Town Centre has been separated into two projects. The first stage is Light Rail Stage 2A (LRS2A), and the second is Light Rail Stage 2B (the Project). The raising of London Circuit between Edinburgh Avenue and Constitution Avenue to provide a new at-grade, signalised intersection with Commonwealth Avenue, forms part of the LRS2A project as facilitating works.

LRS2A and the Project are shown on Figure 1-1.

LRS2A has been approved and is currently being constructed. LRS2A will connect Alinga Street (the current city centre terminus) to a stop at Commonwealth Park. LRS2A will deliver a 1.7 km extension to the existing Light Rail network, and three stops at Edinburgh Avenue, City South, and Commonwealth Park.

Detail on the strategic need and justification for the Project is included in Chapter 2 (Need for the Project).

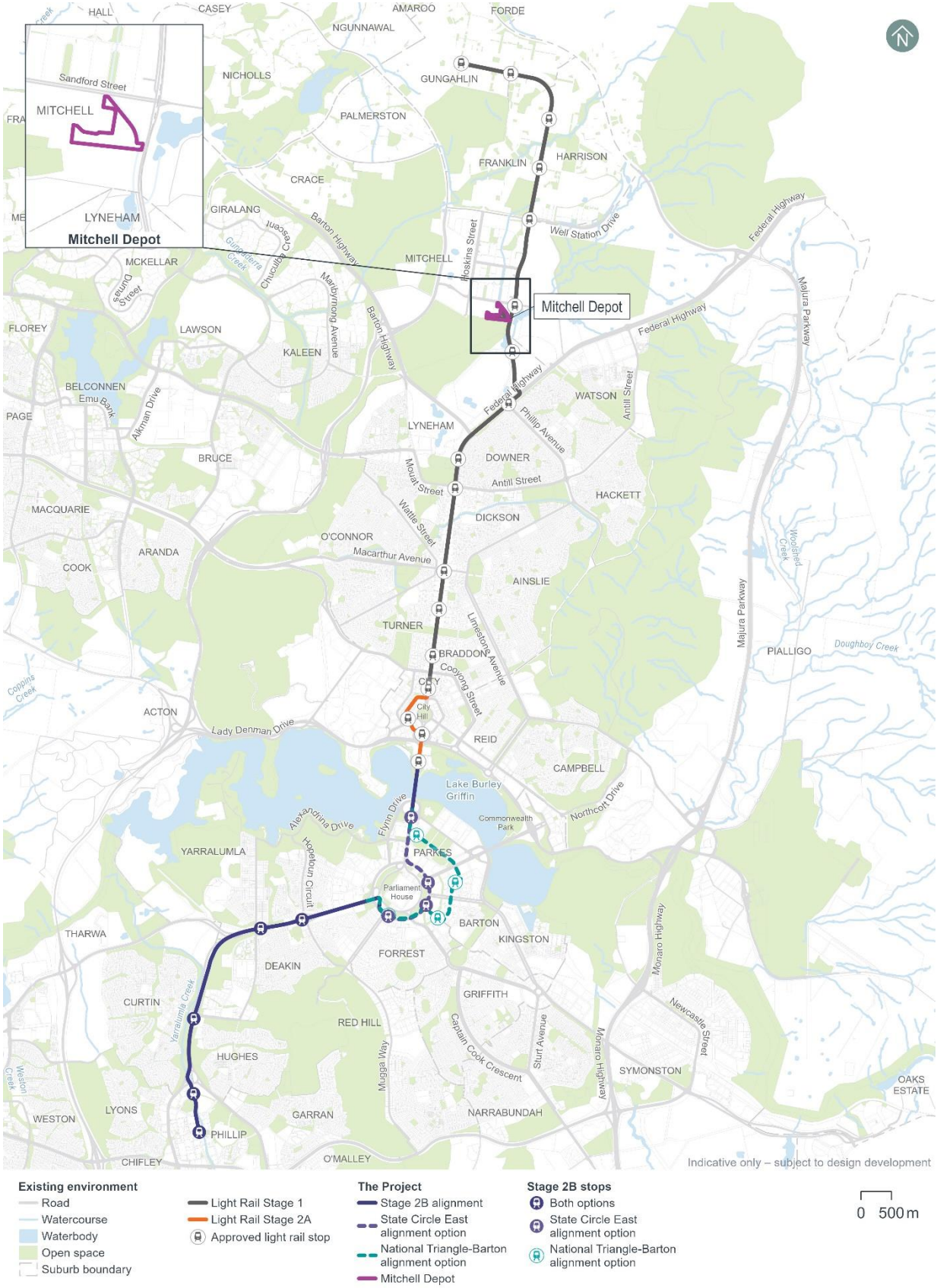


Figure 1-1 E**xisting and proposed Light Rail network**

1.3 Project overview

In this context, the proponent, Infrastructure Canberra (iCBR), is seeking approval for the construction and operation (including maintenance) of the next stage of the Light Rail network from the approved LRS2A Commonwealth Park Stop on Commonwealth Avenue, to a new terminus on Callam Street at Woden Town Centre (the Woden Interchange). The Project would be an extension of the existing LRS1 and the approved LRS2A.

The Project would deliver a light rail alignment across Lake Burley Griffin, through the National Triangle, along Adelaide Avenue, and Yarra Glen, before terminating at Woden Town Centre. The light rail depot at Mitchell would also be expanded, new bridges constructed and associated infrastructure developed. Further details of the Project are described in Chapter 5 (Project description) and Chapter 6 (Construction).

Two potential alignments for the Project are being considered through the National Triangle and around Parliament House, and have been assessed in this Environmental Impact Statement (EIS). These alignment options include:

- The State Circle East alignment option: from Commonwealth Avenue along State Circle to Adelaide Avenue (shown in purple dotted lines on Figure 1-1)
- The National Triangle-Barton alignment option: from Commonwealth Avenue along King George Terrace, Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue, before connecting with State Circle to Adelaide Avenue (shown in teal dotted lines on Figure 1-1).

However, only one of the two alignment options above would be constructed. The selection of an alignment option for the Project (i.e. the National Triangle-Barton alignment option or the State Circle East alignment option) will consider factors including:

- Place outcomes
- Community and stakeholder feedback on the draft EIS
- Potential environmental and social benefits and impacts.

The revised, final EIS will describe only one alignment option, and will identify potential environmental impacts and benefits of that option.

Subject to Commonwealth and ACT planning approval and a subsequent ACT Government investment decision, the first passenger services on the Project are proposed to commence in 2034.

The Project, including each alignment option, is shown on Figure 1-2. Key features of the Project are outlined in Table 1-1. Preparation of the EIS has been based on the Project at a concept design stage. The Project would be subject to ongoing design development and the final design may vary from that presented in this EIS. Further design development would integrate with other planned projects, such as those in the ACT Infrastructure Plan, and emerging projects (e.g. Southern Gateway Planning and Design Framework and active travel projects), however, these projects are not within the EIS scope.

Table 1-1 Key features of the Project

Project feature	Description	
	State Circle East alignment option	National Triangle-Barton alignment option
Light rail track	A new light rail track around 9.5 km in length, connecting from the approved Commonwealth Park Stop (LRS2A), crossing over Lake Burley Griffin, travelling along the median of Commonwealth Avenue and passing on the eastern side of Parliament House in the median of State Circle.	A new light rail track around 10.5 km in length, connecting from the approved Commonwealth Park Stop (LRS2A), crossing over Lake Burley Griffin, leaving Commonwealth Avenue to travel east along King George Terrace, Macquarie Street, Bligh Street, National Circuit, Sydney Avenue, and moving to inner running on State Circle.

Project feature	Description	
	State Circle East alignment option	National Triangle-Barton alignment option
	From State Circle, both alignment options would transition onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle before travelling along Adelaide Avenue and Yarra Glen, with a new terminus at Woden Town Centre (Woden Interchange).	
Light rail stops	A total of nine new light rail stops and ancillary infrastructure.	
Bridges	• New light rail bridge structures: – Between the existing Commonwealth Avenue road bridges over Lake Burley Griffin and separately over Flynn Drive – Between the existing Adelaide Avenue northbound and southbound carriageways over State Circle and separately over Hopetoun Circuit – Over Yarralumla Creek at the existing Melrose Drive/Yarra Glen/Yamba Drive interchange • Removal of the existing Melrose Drive road bridge over Yarralumla Creek between Yamba Drive and Melrose Drive • Removal of the existing pedestrian bridge across Yarralumla Creek north of Phillip Oval • Modification (including widening) of the existing Melrose Drive road bridge over Yarralumla Creek • New pedestrian and cyclist bridge structures over: – Adelaide Avenue at Kent Street – Yarra Glen at Carruthers Street – Yarralumla Creek, north of the Phillip Oval Stop – Yarralumla Creek main drain, to the east of Irving Street.	
Covered section	A covered section about 125 m long where the light rail would pass beneath the southbound lanes of Commonwealth Avenue and transition onto the median of State Circle.	There would be no covered sections in the National Triangle-Barton alignment option.
Active travel arrangements	Reconfiguration, modification and replacement of existing active travel (walking, cycling, and micromobility) infrastructure at various locations, and connection to existing active travel infrastructure within the Project area. New active travel arrangements would include four new pedestrian and cyclist bridges, shared paths to connect with the existing and/or planned active travel network, and bike/scooter parking at stop precincts.	
Landscaping and public domain works	Landscaping and public domain features along and around the Project alignment, as presented in the Public Domain Master Plan (refer to Appendix I).	

Project feature	Description	
	State Circle East alignment option	National Triangle-Barton alignment option
Road network changes	Road network changes to accommodate the Project, including modifications to existing road carriageways and intersections, new intersection arrangements, changes to line markings and traffic signal phasing.	
	• Realignment of the inner carriageway of State Circle into Capital Hill by up to around 20 metres to accommodate the light rail median running arrangement, generally between Commonwealth Avenue and Adelaide Avenue • Realignment into Capital Hill would be greater at intersections along State Circle to accommodate existing turning movements (by up to around 25 metres at Canberra Avenue and by up to around 28 metres near Melbourne Avenue).	• Introduction of light rail infrastructure into Capital Hill by up to around 22 metres to accommodate the inner running arrangement, generally between Sydney Avenue and Adelaide Avenue • This would be greater at intersections along State Circle to accommodate the light rail infrastructure (by up to around 35 metres at Sydney Avenue, by up to around 27 metres at Canberra Avenue and by up to around 29 metres near Melbourne Avenue.
Other facilities and infrastructure	• Modified and additional drainage and stormwater management infrastructure to accommodate the Project • Upgrade of the existing stabling depot and maintenance facility in Mitchell to accommodate additional LRVs, staff, and storage • Power supply, including TPS, inground service routes, track infrastructure, signal/lighting, communications equipment and a combination of wire-free and over-head wiring • Connection of new services (power and water supply) to light rail stops • A variety of utility adjustments, subject to agreement with relevant utility authorities	
Operation and maintenance	Operation and maintenance of the Project, including operation, storage and maintenance of up to 12 additional LRVs on the Light Rail network.	

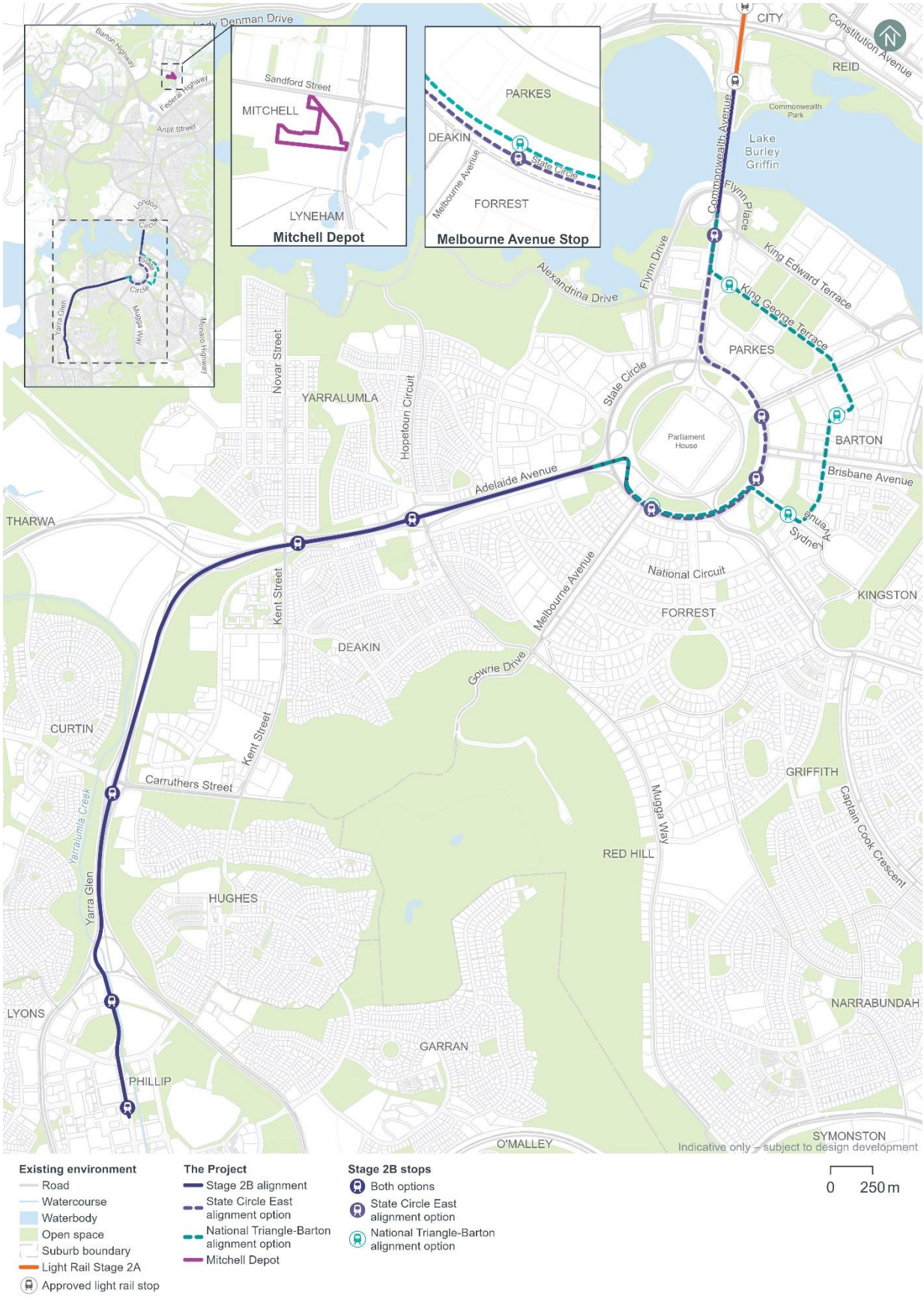


Figure 1-2 Project overview

1.4 Purpose and structure of this Environmental Impact Statement

This document is a draft EIS, prepared for public notification (exhibition) and referral to relevant entities. Following the exhibition period, a revised, final EIS will be prepared and published, which will:

- Address comments, public submissions, and representations received
- Document any changes to the Project since this draft EIS was exhibited.

Throughout this document, the draft EIS is referred to as 'the EIS'.

The purpose of the EIS is to describe the Project and existing environment, and to identify and assess the Project's potential impacts to the environment. Where applicable this EIS identifies measures that would be implemented to avoid, minimise, manage, mitigate, offset, and/or monitor the potential impacts of the Project.

The EIS has been prepared to comply with the:

- The ACT Government's Territory Planning Authority Scoping Document requirements dated 4 March 2024, provided under the *Planning Act 2023* (ACT) (Application number: 202400003)
- The Commonwealth Department of Climate Change, Energy, the Environment and Water's (DCCEEW) Guidelines for the Content of a Draft EIS (EIS Guidelines), dated 25 July 2024, in accordance with the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Reference: 2023/09753).

The structure and content of the EIS is summarised in Table 1-2.

The EIS has adopted a precinct-based approach to the environmental assessment of the construction and operational impacts of the Project. The precinct-based approach responds to the linear nature of the Project, and the unique environmental and stakeholder contexts of areas along the Project alignment.

The Project has been separated into seven precincts (across both Project alignment options) based on common environmental and stakeholder contexts. The Mitchell Depot site has also been considered in addition to the precincts along the Project alignment. Chapter 9 (Approach to the environmental assessment) identifies the precincts and provides further detail on the precinct-based assessment approach.

Table 1-2 Structure and content of this EIS

Part/chapter	Description of contents
Part A – Introduction and context	
Chapter 1 (Introduction)	The introduction and background to the Project, an overview of the Project and structure of this EIS.
Chapter 2 (Need for the Project)	The strategic need for the Project, as well as the objectives and benefits of the Project.
Chapter 3 (Project development)	How the design of the Project has been developed, including alternatives and design options that have been considered.
Chapter 4 (Stakeholder and community consultation)	Stakeholder and community engagement that has been carried out in relation to the Project, key issues that have been raised, and where these issues have been addressed.
Chapter 5 (Project description)	A description of the Project and how the Project would be operated.
Chapter 6 (Construction)	A description of how the Project would be constructed.
Chapter 7 (Sustainability)	An overview of the Project's sustainability approach.
Chapter 8 (Legislation and policy)	The legislative and policy context of the Project and the environmental and planning approvals that would be required to carry out the Project.

Part/chapter	Description of contents
Chapter 9 (Approach to the environmental assessment)	How the EIS has been developed including the methodology for the environmental risk analysis undertaken for the Project and the precinct-based approach of the EIS.
Chapter 10 (Assessment methodologies)	The assessment methodology for each environmental issue.
Part B – Environmental impact assessment	
Chapter 11 (Project-wide issues)	An assessment of environmental issues resulting from the construction and operation of the Project, where these are not precinct-specific and/or are applicable to the Project as a whole.
Chapter 12 (Commonwealth Avenue precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Commonwealth Avenue precinct.
Chapter 13 (Parliament House precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Parliament House precinct.
Chapter 14 (National Triangle precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the National Triangle precinct.
Chapter 15 (Barton precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Barton precinct.
Chapter 16 (Inner South precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Inner South precinct.
Chapter 17 (Yarra Glen precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Yarra Glen precinct.
Chapter 18 (Woden precinct)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Woden precinct.
Chapter 19 (Mitchell Depot site)	An assessment of environmental issues resulting from the construction and operation of the Project, of relevance to the Mitchell Depot site.
Chapter 20 (Cumulative impacts)	An assessment of the potential cumulative impacts as a result of the operation and construction of the Project.
Part C – Environmental management and conclusion	
Chapter 21 (Environmental management and mitigation measures)	A consolidated list of management and mitigation measures that would be adopted.
Chapter 22 (Summary of assessment and residual impacts)	Provides a summary of the assessment outcomes and residual impacts, with respect to matters relevant to the assessment of this EIS under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* (EPBC Act) and the *Planning Act 2023 (ACT)* (Planning Act).
Chapter 23 (Justification and conclusion)	Conclusions of the EIS and the justification for carrying out the Project.
Part D – Appendices and technical reports	
Appendix A	Glossary and abbreviations
Appendix B	Scoping Document
Appendix C	EIS Guidelines
Appendix D	EIS cross references
Appendix E	Proponent's environmental history
Appendix F	Information sources and references

Part/chapter	Description of contents
Appendix G	Study team
Appendix H	Consultation
Appendix I	Public Domain Master Plan
Appendix J	Environmental risk assessment
Appendix K	Property and land use planning
Appendix L	Environmental Management Plan outline
Technical Report 1	Traffic and transport
Technical Report 2	Biodiversity
Technical Report 3	Heritage
Technical Report 4	Hydrology, flooding and water quality
Technical Report 5	Contamination
Technical Report 6	Socioeconomic
Technical Report 7	Climate change risk
Technical Report 8	Greenhouse gas
Technical Report 9	Noise and vibration
Technical Report 10	Landscape character and visual amenity

2.0 Need for the Project

This chapter describes the strategic context and need for the Project. It also outlines the Project's objectives and key benefits.

2.1 Overview

For thousands of years, the Canberra region's landscape of mountains, watercourses, valleys, hills and ridges have defined the movement of people. The meaning of Canberra is 'meeting place' and the name of the city recognises the region's role and significance for different Aboriginal people (Thunderstone, 2020). Significant pathways were formed as people moved from place to place through transitional cultural boundaries following river and creek corridors and the ridges and spurs of hills and mountains. Pathways were the means of access across the region as well as a physical and visual link to major spiritual and gathering places.

In the early twentieth century, the Griffins laid out an urban form within a bush setting connected by roads and public transport routes. As new districts such as the Woden Valley were developed by the National Capital Development Commission, relatively long and narrow movement corridors connected defined activity centres. These movement corridors were typically defined by the natural features separating the districts.

Over time, the challenge of moving more people more efficiently along established transport corridors with minimal impact on the surrounding landscape and environment has been exacerbated by population growth. Canberra's population is projected to grow beyond half a million people in the coming years, and to be more than 750,000 by 2060 – an increase of more than 330,000 people compared with 2021 data (ACT Government, 2022). With this population growth will come increased demands on Canberra's transport networks, as its residents travel between home, work and a diverse range of social and recreational destinations. Without a strategic view of integrated land use and transport planning that includes delivery of additional transport capacity, Canberra's existing transport networks, particularly its road networks, will face increasing levels of congestion, reduced safety and efficiency, and decreased amenity as the population increases. These impacts will constrain the city's economic growth and prosperity as well as reduce its desirability and liveability.

In response to these challenges, the ACT Government in close collaboration with Commonwealth agencies such as the National Capital Authority (NCA), has adopted a strategic vision for Canberra and the ACT based on:

- Strategic land use planning delivered through the National Capital Plan (NCP), the Territory Plan and associated District Strategies and the ACT Planning Strategy 2018, that provide a framework for land use planning and development integrated and coordinated with timely infrastructure delivery
- Comprehensive infrastructure planning through the ACT Transport Strategy 2020 and the ACT Infrastructure Plan (Transport sector update, 2024) to complement the strategic land use planning vision for the city
- Recognition, particularly through the ACT Transport Strategy 2020 and ACT Infrastructure Plan, of the need to provide a diverse and resilient transport system that includes both improvements to the road network, and alternative public transport options, including non-road dependent modes such as light rail infrastructure
- A commitment to reducing the ACT's greenhouse gas emissions and contributions to climate change, delivered in part by a modal shift from a current reliance on motor vehicles for transport to less greenhouse gas intensive public transport options
- A desire to maintain and improve Canberra's liveability and prosperity by recognising the mobility, accessibility and reliability needs of its population, particularly in relation to efficient transport networks.

Further details of the integrated land use and transport planning context for the future of Canberra and the Project are provided in Section 2.2.

2.2 Strategic land use and transport planning policy context

The ACT Government, in collaboration with Commonwealth agencies such as the NCA, has developed a series of integrated land use and transport planning policies and initiatives targeted at maintaining Canberra as a prosperous, liveable and desirable city, and recognising its significant place as the nation's capital. Key strategies, policies and plans that provide a framework for land use and transport planning in Canberra and across the ACT are summarised in Section 2.2.1 to 2.2.4.

Statutory planning processes, including the assessment and approvals processes under legislation such as the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), the *Planning Act 2023* (ACT) (Planning Act) and the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) (PALM Act) are discussed in Chapter 8 (Legislation and policy).

In relation to planning and delivery of transport infrastructure, these strategies, policies and plans present a series of key themes, including:

- Providing high quality, safe, convenient, and efficient transport
- Providing access to key destinations, such as employment hubs, social services, and tourist destinations
- Improving transport to support the development of compact urban centres
- Maximising accessibility to public transport
- Improving public transport use to reduce greenhouse gas emissions
- Delivering light rail as a sustainable transport option, and catalyst for urban renewal and economic development.

Delivering a light rail network in Canberra is one part of a broader response to key ACT Government transport policies and strategies, aimed at providing a diverse, resilient and sustainable transport network to support Canberra's future growth and prosperity.

2.2.1 The National Capital Plan

The NCP is the strategy and blueprint giving effect to the Australian Government's interests and intentions for planning, designing, and developing Canberra and the ACT. It is prepared and delivered by the NCA under the PALM Act and is focused on planning and development matters of national significance.

The NCP includes provisions in three key areas that are relevant to the Project:

- The Statement of Planning Principles that aim to give effect to the objectives of the NCP to ensure that Canberra and the Territory are planned and developed in accordance with their national significance, including:
    - Productivity: ensure that infrastructure supports the development of Canberra's National Capital functions
    - Sustainability: ensure the development of a city that both respects environmental values and reflects national concerns with the sustainability of Australia's urban areas
    - Liveability: enhance and preserve Canberra's symbolic and unique design and role as the National Capital
    - Accessibility: support a connected and equitable multi-modal transport system
- Land use plans and general land use controls
- Requirements applicable to Designated Areas, particularly the Central National Area and Main Avenues.

The NCP sets out the locations of an inter-town public transport system within the Territory, including a public transport route along Commonwealth Avenue, State Circle and Adelaide Avenue. The State Circle East alignment option is consistent with this corridor. The NCP policies provide for the reservation of a route to develop a segregated public transport service such as light rail with priority right of way to link major employment nodes, and a corridor between the city centre, town centres and major employment nodes.

Both Project alignment options would affect land within Designated Areas regulated under the NCP and would be subject to planning principles, policies, and the requirements of the NCP. The Project would require a Works Approval from the NCA for development proposed within the Designated Areas. Further information on approvals required for the Project, including a future Works Approval, are discussed in Section 8.1 of Chapter 8 (Legislation and policy). The consistency of the Project with the NCP, including alignment with its provisions relating to public transport corridors, is detailed in Section 11.8 of Chapter 11 (Project-wide issues).

2.2.2 ACT Transport Strategy 2020

The ACT Transport Strategy 2020 sets the ACT Government's objectives for developing Canberra's transport network (ACT Government, 2020). The strategy establishes three principal outcomes for Canberra's public transport network which would be supported by extending the Light Rail network, including:

- Managing congestion
- Reducing emissions
- Supporting a compact and efficient city.

A key concept within this strategy includes the 30-minute city concept, to ensure all Canberrans can travel around Canberra in an efficient way.

The strategy highlights the positive outcomes of light rail and specifically identifies the Project as a key priority investment in further developing the public transport network. The strategy recognises that the Project would be a catalyst for the transformation and revitalisation of Adelaide Avenue.

2.2.3 ACT Infrastructure Plan

The ACT Infrastructure Plan 2019 (Infrastructure Plan) provides a framework for how the ACT Government will build new and renew established infrastructure to cater for a city of 500,000 people (ACT Government, 2019b). The Infrastructure Plan is a comprehensive, multi-decade plan detailing over $14 billion worth of infrastructure investments, with a focus on health, education, transport, and community services.

Delivering the Project is a key priority for the Infrastructure Plan as it recognises the Project as a key enabler of more sustainable and efficient transport for Canberra.

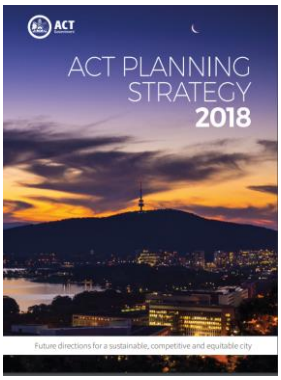
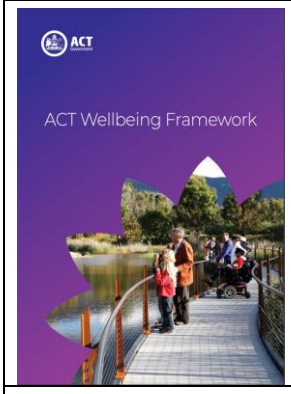
The ACT Infrastructure Plan update (Transport) was released in 2024 (ACT Government, 2024). It includes a transport sector update and commitments to progress the planning and approvals for Light Rail to Woden as a priority project, including preparation of this EIS. The plan also identifies several other transport improvement projects, including road, public transport, and active travel enhancements.

2.2.4 Other key strategic plans, policies, and guidelines

The Project has and would continue to be designed and planned with consideration of the NCP and the Territory Plan. Further details on the Project's consistency with statutory requirements, including under the NCP and Territory Plan, are provided in Chapter 8 (Legislation and policy). Other key strategic plans, policies and guidelines relevant to the Project are listed in Table 2-1.

Section 7.2 of Chapter 7 (Sustainability) also provides an overview of key strategies and documents that are relevant to the Project's sustainability approach.

Table 2-1 Key strategic plans, policies, and guidelines relevant to the Project

Guiding policy documents	
	**ACT Planning Strategy 2018** The ACT Planning Strategy 2018 (Planning Strategy) is the key strategic document for managing growth and change in the ACT (ACT Government, 2019a). A key priority of the Planning Strategy is improving Canberra's public transport network, by encouraging uptake, supporting sustainable transport options, encouraging active travel, and planning for a compact and efficient city. Delivering the Project forms part of two actions under the Planning Strategy, those being: • Prioritise improving public transport services and supporting infrastructure, including buses, light rail and connecting services • Maximise accessibility to the rapid bus and light rail networks through feeder services and expanding the Park and Ride network.
	**ACT Wellbeing Framework** The ACT Government's Wellbeing Framework highlights factors contributing to Canberrans' wellbeing and liveability. A key domain is 'access and connectivity'. The Project supports this domain and others like social interaction, access to community services, housing options, efficient transport, and low-carbon transport. Section 3 of Technical Report 6 – Socioeconomic provides an overview of how the Project addresses the wellbeing domains identified in the Framework.
	**City Renewal Authority 2025 Strategic Plan** The City Renewal Authority 2025 Strategic Plan focuses on revitalising central Canberra in the designated City Renewal Precinct. The Plan aims to achieve the following objectives, which the Project would support: • Curating high-quality places and precinct development with a people-focused and design-led approach • Implementing robust and innovative social and environmental sustainability principles and programs to support comprehensive precinct renewal. The Plan focuses on the renewal of areas in and around the city which include City Hill and the Acton Waterfront.

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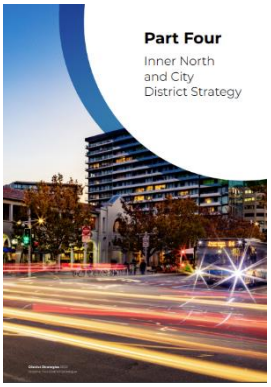
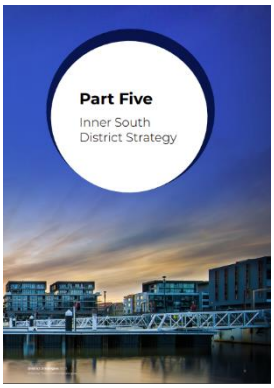


District Strategies: Inner North and City District Strategy 2023

There are nine strategic districts considered under the Territory Plan, each with its own corresponding strategic planning document. The aim of each document is to guide how each district within Canberra will change and grow towards 2038 and beyond to 2050.

The Inner North and City District Strategy 2023 is one of nine district strategies that captures the area centrally located just north of Lake Burley Griffin, and includes the Canberra City Centre (City Centre), as shown in Figure 2-1 (EPSDD, 2023a).

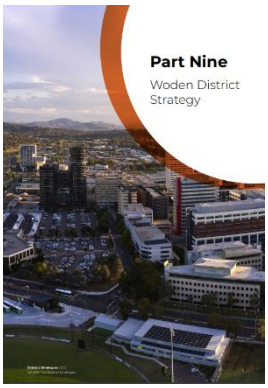
The Project would provide greater connection to Commonwealth Park and the Acton Waterfront which are identified as key destinations within the Strategy. The Strategy also states that the community values Light Rail Stage 1 (LRS1), and that the extension is a key opportunity for growth and change within the district.



District Strategies: Inner South District Strategy 2023

The Inner South District Strategy 2023 captures the area extending from the Fyshwick Industrial precinct in the east to Yarralumla and Deakin in the west, as shown in Figure 2-1 (EPSDD, 2023b). The State Circle East alignment option would provide connections to key destinations identified in this Strategy including the National Library of Australia, Albert Hall, Lennox Gardens, National Archives, Parliament House, John James Memorial Hospital, and the Royal Australian Mint. The National Triangle- Barton alignment option would provide connections to these destinations as well as Old Parliament House including the Museum of Australian Democracy, Questacon, the National Portrait Gallery of Australia, the High Court of Australia, and the National Gallery of Australia.

The Project is identified as a key opportunity for transformation within the district that would enhance accessibility to employment and reduce traffic congestion.



District Strategies: Woden District Strategy 2023

The Woden District Strategy 2023 captures the area towards the southern part of the city and contains Woden Town Centre, as shown in Figure 2-1 (EPSDD, 2023c).

The Project would provide connections to all nine key destinations identified within this strategy, including the Woden Interchange, Canberra Hospital and Woden Shopping Centre. Further, the Project is identified as a catalysing initiative for the district, including support for planned growth at key sites and change areas including Woden town centre, Woden North and North Curtin, and would act as the north-south alignment of Canberra's public transport network.

The strategy emphasises that, as redevelopment occurs in Woden District, consideration will be given to plan and enhance the network of green spaces and waterways (the blue-green network), thereby protecting environmental and cultural values and enhancing their sustainability and resilience to climate change (p. 25). Initiatives of relevance to the Project, and how the Project would respond to these, are described below:

1.1 Enhance connectivity corridors for priority areas of grassland and woodland and areas of threatened species and nature reserves including between Red Hill Nature Reserve and Yarralumla Creek

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tributaries and Scrivener Creek and connection between Oakey Hill Nature Reserve and Yarralumla Creek.

A Public Domain Master Plan (refer to Appendix I) has been prepared to outline the urban design vision for the Project, based on a landscape-led approach to design. The Public Domain Master Plan includes design guidance to promote positive biodiversity outcomes. As outlined in the Public Domain Master Plan, opportunities for habitat enhancement, connectivity and the rehabilitation of disturbed areas with locally endemic trees, shrubs, and native grasses would be explored as part of ongoing design development. Biodiversity sensitive urban design (BSUD) opportunities are discussed further below in relation to initiative 1.5.

1.4 Undertake more detailed planning for the Yarralumla Creek corridor as an enhanced blue-green network connection, landscape feature and public park, aligned with planning for light rail corridor.

The Project would be aligned alongside Yarralumla Creek, within a dedicated light rail corridor adjacent to existing open space. Planning for the Project has and would continue to apply BSUD and water sensitive urban design (WSUD) opportunities, as discussed further below in relation to initiative 1.5.

1.5 Implement enhanced water sensitive urban design (WSUD) and biodiversity sustainable urban design (BSUD) and improved tree canopy cover and permeability as part of all future development planning in the district, including around the town centre and light rail corridor.

Section 3.13 and Section 3.14 of the Public Domain Master Plan (refer to Appendix I) outline the Project's approach to implementing BSUD and WSUD.

Examples of BSUD considerations applied across the Project include:

- Design development considering the protection of habitat for threatened fauna species, including the Golden Sun Moth (*Synemon plana*), Gang-gang Cockatoo (*Callocephalon fimbriatum*) and Superb Parrot (*Polytelis swainsonii*)
- Increased tree density, creating a vegetated wall adjacent the light rail corridor along Yarra Glen to reduce bird strike from low flying birds
- New trees and planting at all light rail stops to connect people to nature
- Increased tree and shrub planting from Yarra Glen, along Yarralumla Creek to Launceston Street to extend and connect natural areas
- Consideration of native tree planting across the Project to increase habitat for biodiversity, including the threatened Gang-gang Cockatoo and Superb Parrot.

Examples of WSUD considerations applied across the Project include:

- Directing runoff from hard surfaces directed to small wetlands and bio-retention basins to help filter water
- Use of permeable surfaces to reduce the urban runoff generated from the Project
- Consideration of plant species which are climate resistant and drought tolerant
- Application throughout the suburbs within this district would assist with reducing flood risk through the Woden town centre and improve water quality outcomes for Yarralumla Creek.

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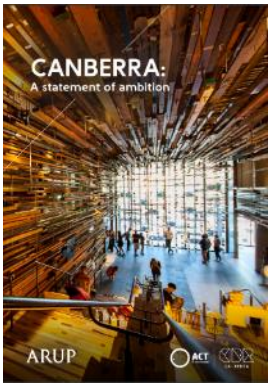
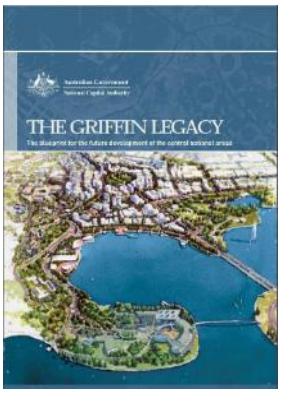
BSUD and WSUD opportunities would continue to be investigated as part of ongoing design development.



Canberra: A Statement of Ambition 2016

Canberra: A Statement of Ambition 2016 outlines a plan for developing a compact and competitive city, which attracts and retains talented people, has a diversified economy, delivers high-quality metropolitan infrastructure, and embraces a digital mindset (CMTEDD, 2016).

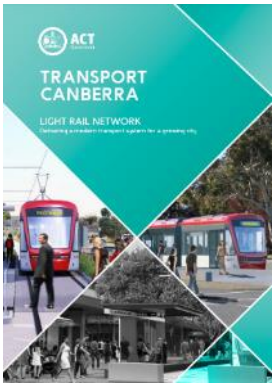
Building the Light Rail network is specifically identified as a key urban renewal task, that will be critical to meeting the needs of a growing population, developing compact urban centres, and boosting sustainable growth by improving transport options, settlement patterns and employment opportunities.



The Griffin Legacy 2007

In 2007, the NCA prepared The Griffin Legacy – A Policy Framework 2007 as a major strategy to unlock the potential of Canberra's Central National Area, its landscape setting, and approaches.

The Project responds to key Griffin Legacy propositions including linking the City Centre to the Central National Area, extending the City Centre to Lake Burley Griffin, reinforcing Canberra's main avenues as primary corridors for transport, and the development of improved linkages with high quality and efficient public transport networks. Furthermore, wire-free technology would be implemented around the National Triangle to minimise potential visual impacts.



Transport Canberra - Light Rail Network 2015

The Transport Canberra - Light Rail Network 2015 plan is Transport Canberra and City Services' (TCCS) vision for light rail that showcases Canberra as a prosperous, sustainable, and liveable city (Transport Canberra and City Services, 2015a). The plan highlights that the City to Woden corridor is a high priority corridor, that is highly valued by public transport passengers. It highlights that providing light rail within this corridor would support the role and identity of Woden Town Centre and provide economic opportunities at key centres along and adjacent to the corridor.

The ACT Infrastructure Plan update (Transport) was released in 2024 and identifies that a Light Rail Network Strategy (an in-progress refresh to the 2015 Light Rail Network Plan) is planned and will incorporate lessons learned from Light Rail Stage 1 (now operating), and reflect updated land use and transport planning ideas since the Light Rail Network Plan was originally published in 2015-16. This refresh will inform and guide the necessary pre-feasibility studies and investigations that will develop confidence for an alignment that can connect more parts of Canberra into a wider light rail network.

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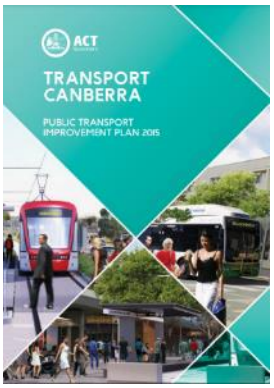


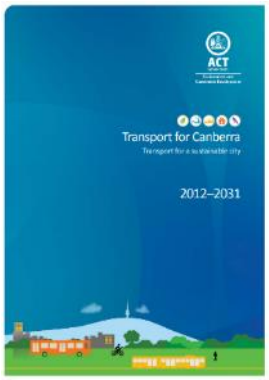
Public Transport Improvement Plan 2015

The Public Transport Improvement Plan 2015 sets out how TCCS will deliver the ACT Government's vision for a quality public transport system that is convenient and easy to use, efficient, affordable, reliable, and integrated (Transport Canberra and City Services, 2015b). The Plan emphasises that the light network would be pivotal for delivering a modern transport system, and that it would play a pivotal role in building the next stage of Canberra's public transport network. Furthermore, the plan emphasises that the Project would support economic development opportunities along and adjacent to the alignment.

Light Rail Sustainability Policy 2021

An overarching Light Rail Sustainability Policy 2021 has been developed for Light Rail to Woden (MPC, 2021). This Policy sets the themes and key objectives for sustainability and resilience for development and operation of Light Rail to Woden. The Policy aims to capture themes from ACT policies and best practice guidelines to underpin planning and design decision making.

The Policy identifies commitments against sustainability themes to drive sustainable outcomes in Project development. The adoption of such commitments assists to successfully deliver targets and initiatives to address themes under the Sustainability Policy for the Project. The Project's approach to sustainability is discussed further in Chapter 7 (Sustainability).



Transport for a Sustainable City 2012-2031

Transport for a Sustainable City 2012-2031 is the ACT Government's plan that establishes mode share targets and frames an integrated transport and land use approach to create a cleaner, more sustainable Canberra (EPSDD, 2012). A key action within the plan includes planning for high-capacity public transport such as light rail.

Key messages from the Canberra community included within the plan highlighted that the community generally supports a shift from car dependency to more sustainable options, such as light rail. Additional objectives within the plan include managing travel demand, by promoting sustainable transport options.

ACT Climate Change Strategy 2019-2025

The ACT Climate Change Strategy 2019-2025 outlines the ACT Government's response to climate change (EPSDD, 2019). Specifically, it details how the ACT Government aims to reach a 50-60 percent reduction in emissions by 2025 and establishes the foundations for reaching net zero emissions by 2045. The Strategy strongly focuses on reducing emissions from transport, since it was one of the largest sources of emissions in 2020, in the ACT. The Strategy specifically identifies the Project as a key objective for increasing public transport use and reducing emissions in the ACT from private vehicle use.

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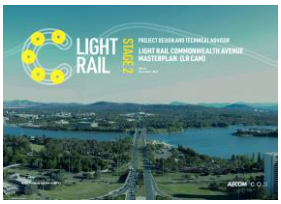
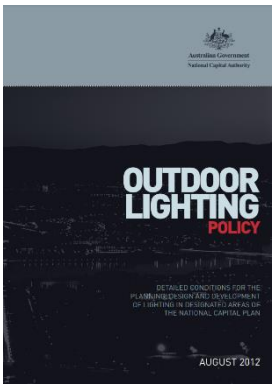


The Light Rail Commonwealth Avenue Masterplan 2022

The Light Rail Commonwealth Avenue Masterplan (LRCAM) seeks to deliver on the Griffins' vision for Commonwealth Avenue as a 'Main Avenue', direct and efficient providing lines for 'rapid transit' between principal destinations of the city (AECOM, 2022a). LRCAM is a companion document to the Commonwealth Avenue Landscape Heritage Advice and the Commonwealth Avenue Landscape Structure Plan.



Outdoor Lighting Policy 2012

The Outdoor Lighting Policy 2012 provides detailed conditions for the planning, design, and development of lighting in Designated Areas of the NCP (NCA, 2012). The Policy seeks to ensure that the planning, design, and operation of outdoor lighting balances the needs of people and the environment and strengthens the role that lighting plays in the understanding and appreciation of the National Capital and Canberra's urban landscape.

The Project has considered the requirements of this Policy as part of ongoing design development, and preparation of the Public Domain Master Plan (refer to Appendix I of this EIS).

Tree Management Policy 2021

The Tree Management Policy 2021 details the approach to the management of NCA urban trees and treescape and the Lindsay Pryor National Arboretum (NCA, 2021). Three key targets of the Policy include increasing tree canopy cover to 40 percent by 2030, improving age diversity of the treescape and improving existing diversity of species.

The Project would consider the requirements of this Policy as part of design development.

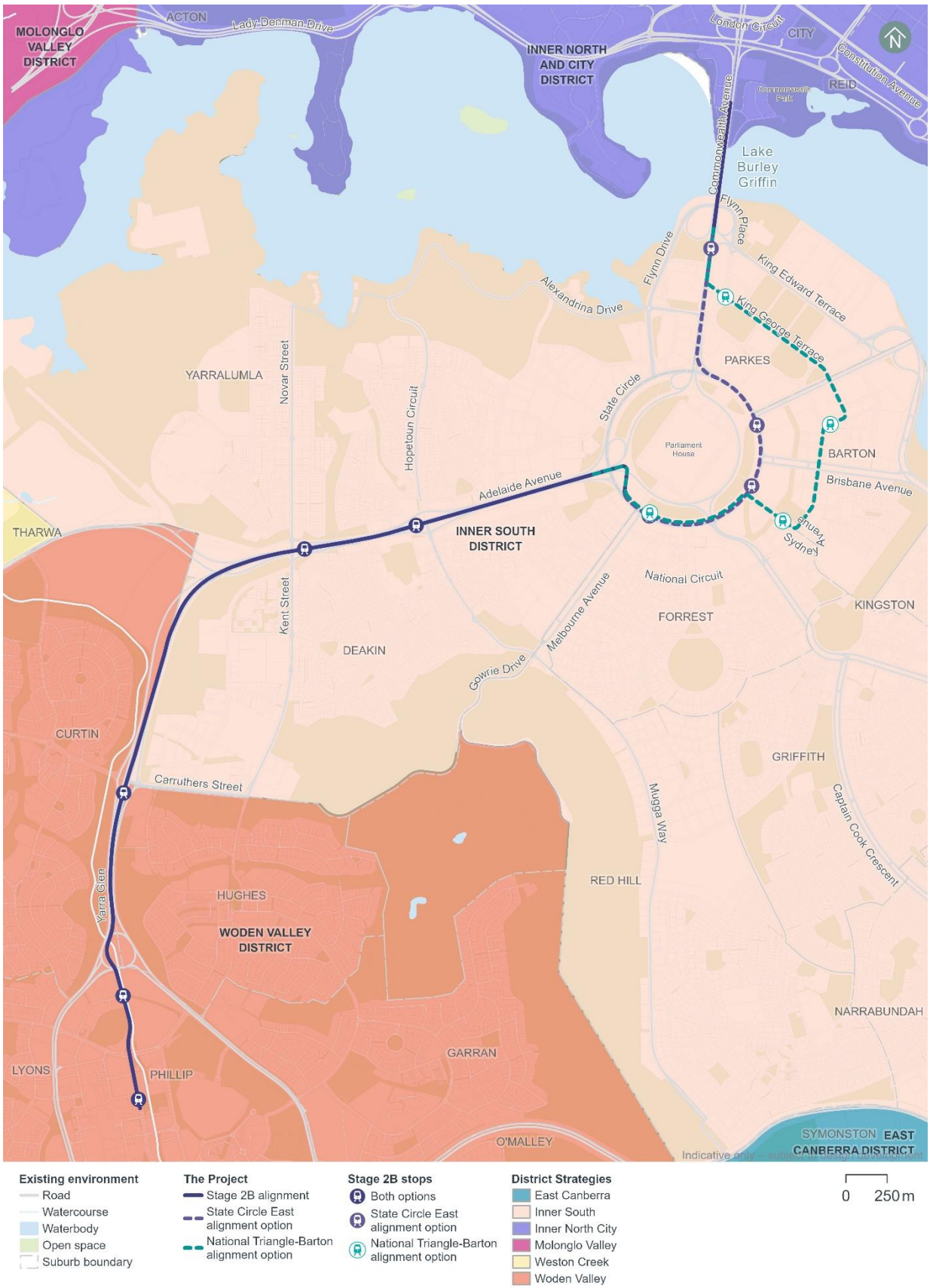


Figure 2-1 Territory Plan Districts

2.3 Current and future challenges in Canberra

This section identifies current and future challenges faced in Canberra and how these challenges have helped frame the Project objectives (refer to Section 2.4.3) that have been developed to respond to the strategic land use and transport needs of the city. The Project benefits discussed in Section 2.5.2 demonstrate how the Project responds to these current and future challenges.

Continued growth in population will lead to increased travel demand across the ACT. Australian Bureau of Statistics (ABS) data (ABS, 2021) highlights that car travel is the predominant mode of commuting in Canberra. Given the existing low residential densities and dispersed nature of activity centres and employment in Canberra, the majority of this forecast travel demand growth is expected to be via private vehicle travel, resulting in increased traffic demand on the ACT road network. Over time, with no major infrastructure additions or land use changes, arterial roads including within the City to Woden corridor are likely to become significantly more congested, impacting journey times and reliability for trips by motor vehicle and public transport bus services.

Without a strategic view of integrated land use and transport planning that includes measures to increase and improve transport network capacity, increased demands placed on the existing transport networks across Canberra, including those through the City to Woden corridor, will lead to:

- Traffic congestion and constraints on the existing public transport network (buses) that relies on the road network
- Constraints on sustainable city development associated with traffic congestion and increased travel times across the road network
- Limits on the ability to achieve net zero carbon emissions through continued reliance on motor vehicle transport, and increased emissions associated with inefficient travel through a congested road network
- Decreases in wellbeing, accessibility and liveability in the nation’s capital, driven by increased congestion and deteriorating safety and amenity along congested road corridors.

2.3.1 Traffic congestion and constraints on existing public transport

In 2022, just under 1.6 million weekday vehicle trips were made within a study area defined in the ACT & Queanbeyan Household Travel Survey 2022 (Sift Research, 2023). ABS data (ABS, 2021) highlights that travelling by car is the dominant method of travel to work in Canberra. By the 2030s these commuter car trips are forecast to increase by one third.

If the high proportion of private vehicle trips continues unchanged into the future, traffic congestion will significantly worsen as the city’s population increases (ACT Government 2020). In 2016, the daily cost of congestion was around $800,000 which will increase to around $1.5 million in 2031 and the cost of public transport crowding will also rise (ACT Transport Strategy 2020, (ACT Government, 2020)).

Public transport in Canberra is currently provided by a bus network and the existing light rail line between Gungahlin and the City (LRS1). Despite the broad coverage of the bus network, there is a limit to its capacity to meet the needs of a growing city and to support its projected population growth. This is not only related to the comparatively smaller capacity of buses compared with light rail, but also because the bus network directly relies on the road network that is becoming increasingly congested as a result of population growth.

Without changes in government policy to alter trip behaviours and patterns, coupled with major transport infrastructure investment, future development within the City to Woden corridor is anticipated to lead to a decline in traffic speeds, increasing travel time and reducing access to employment opportunities, community facilities, and social and recreational activities. Projected future road network conditions (with and without the Project) are discussed further in Technical Report 1 – Traffic and transport.

2.3.2 Sustainable city development

Sustainable city development seeks to minimise urban sprawl by planning for new housing at higher densities in areas with high levels of transport accessibility, thereby reducing reliance on greenfield development and private vehicle use into the future. The low residential densities and the dispersed

nature of activity centres and employment in Canberra currently do little to improve productivity of the Canberra economy, reduce car dependency, sustain efficient public transport operations or reduce greenhouse gas emissions. Low densities result in increased car dependency, placing upward pressure on per capita costs for providing public transport and community services over larger areas and raising social exclusion and service access issues.

The District Strategies (Volume 1 - Metropolitan context and big drivers) (ACT Government, 2023) highlight the need to meet housing requirements based on expected population increases with reference given to ACT Treasury population projections released in 2023 indicating a need for 100,000 new homes by 2050.

Without measures to increase and improve transport network capacity that support sustainable city development, projected population growth will exacerbate these problems, leading to greater urban sprawl, avoidable land use inefficiencies and high costs of infrastructure provision.

2.3.3 Net zero carbon emissions

The ACT Government has committed to reducing carbon emissions from 1990 levels by 100% by 2045. The Climate Change Strategy (EPSDD, 2019) states that transport is one of the largest sources of emissions for the ACT, and reductions in this sector will require active participation from the whole community.

High car use, combined with population growth is likely to lead to increased adverse environmental impacts, including air quality impacts (ACT Government, 2024). In 2022-2023, transport was the highest source of greenhouse gas emissions for the ACT, providing 65% of the total emissions for the year (ACT Government, 2023).

2.3.4 Wellbeing and accessibility

One of Canberra's strategic advantages is that the city offers access to employment and other key services generally within a 30-minute commute. However, the ACT and Queanbeyan Household Travel Survey (Swift Research, 2022) indicates that in 2022 Canberrans spent 70 minutes commuting to and from work on average per day. Minimising the amount of time spent travelling for work on a daily basis, and improving the reliability of travel, contributes to wellbeing.

Wellbeing is also linked to social connection and social inclusion and the ability to easily travel to connect with family, friends and the community. As discussed above, public transport in Canberra is heavily reliant on the road network that is becoming increasingly congested as a result of population growth, making connection with family and friends and the community challenging, especially where people have an increased reliance on the public transport network to make those connections.

A failure to continue to improve public transport infrastructure is unsustainable for a growing city in the long term and does not support key wellbeing and accessibility needs of the community.

2.4 Project need and strategic alternatives considered

2.4.1 Overarching strategic need

Strategic investment in city-shaping infrastructure is needed to address the current and future challenges of Canberra's growing population, traffic congestion, public transport reliability, mobility, access and wellbeing. In response to these challenges, the ACT Government, in collaboration with Commonwealth agencies such as the NCA, have developed and committed to a series of integrated land use and transport planning strategies aimed at supporting growth and prosperity as well as maintaining and improving the wellbeing and liveability of the national capital.

A key component of the response to Canberra's current and future challenges is planning for and delivery of a robust, sustainable and efficient transport network. This includes a series of complementary initiatives and projects focused on well planned development, improvements to road network capacity and efficiency, and provision of a comprehensive public transport network. To mitigate the impacts of future growth on the road network, the ACT Government is considering a mix of transport improvement projects, including road, public transport, and active travel enhancements, many of which are discussed in the ACT Infrastructure Plan update (Transport) (ACT Government, 2024). Non-road dependent transport infrastructure such as light rail, is considered a fundamental part of managing future road network congestion.

2.4.2 Project need

The combination of an increasing population, low residential densities and the dispersed nature of activity centres and employment in Canberra provides challenges for growth, including increased road vehicle use and road network congestion that has an overall impact on the productivity of the Canberra economy.

Recognising the challenges identified in Section 2.3, the needs for the Project have been identified as:

- Future-proofing the transport network by providing public transport infrastructure that responds to current needs and provides strategic capacity for non-road based transport given future growth assumptions
- Providing sustainable transport options that contribute to reaching net zero greenhouse gas emissions and providing public transport that utilises renewable energy
- Supporting the transition to a compact and connected city by providing more public transport closer to existing local, group and town centres as well as key sites and potential future change areas to limit urban sprawl and reduce car use, helping to mitigate the impacts of a growing Canberra population.

These needs for the Project are discussed further below. Their relationship with the Project objectives (refer to Section 2.4.3) and benefits (refer to Section 2.5.2) is shown in Figure 2-2.

Future-proofing the transport network

Traffic forecasting and modelling has been carried out to assess the performance of the road network in the future, both with and without the Project. Without changes in government policy to alter trip behaviours and patterns, coupled with major transport infrastructure investment, future development within the City to Woden corridor is anticipated to lead to a decline in traffic speeds, increasing travel time and impeding access to employment opportunities, community facilities, and social and recreational activities. As a result, by 2031 the ACT would face a highly congested road network during weekday peak hours. Due to this peak hour congestion, some drivers may choose to travel earlier or later to avoid delays. Without intervention, most intersections along the north-south transport corridor are expected to deteriorate to a poor level of service with significant traffic delays over the coming decades.

The Project would provide additional transport capacity along this north-south transport corridor, and would provide a choice for travellers to avoid anticipated future road network congestion. It has been planned and designed as a dedicated light rail route to take advantage of existing major transport corridors, particularly along the main avenues of Commonwealth Avenue, State Circle and Adelaide Avenue.

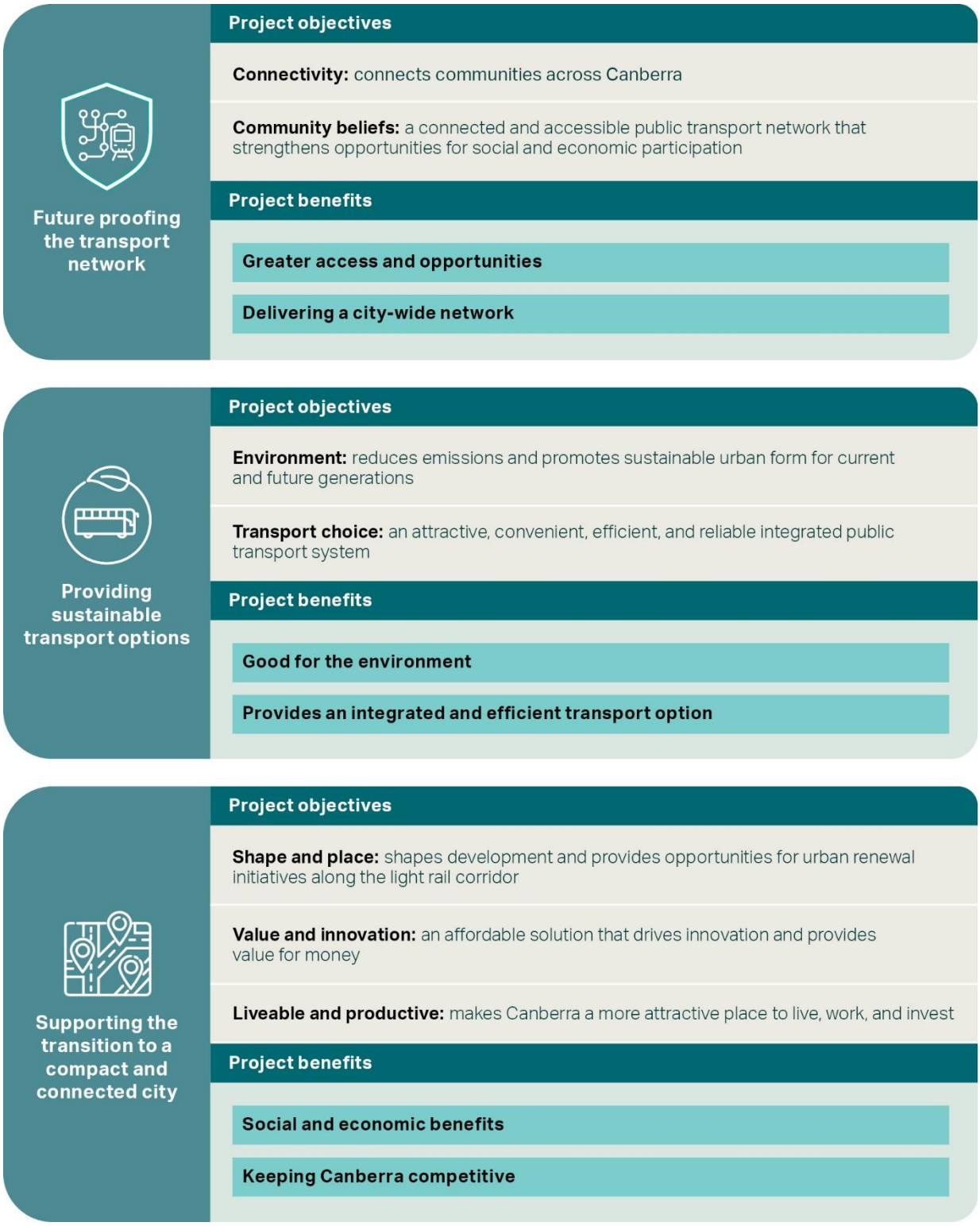


Figure 2-2 Objectives and benefits of the Project

The Project would increase the people-carrying capacity of the City to Woden corridor, providing capacity for an additional 2,400 person trips per hour in each direction (in comparison, major avenues currently provide an estimated capacity for around 4,000 to 4,400 vehicles per hour). The Project would also enhance existing public transport services by providing a reliable and attractive option between Commonwealth Park and Woden that is less affected by forecast traffic congestion, compared to buses that share road space with general traffic. By providing a dedicated public transport option that avoids shared running with road vehicles and is part of an integrated and robust transport network, the Project would directly respond to an increasingly congested road network and the potential adverse impacts arising from that congestion.

Wellbeing would be improved through increased amenity associated with attractive and well designed, gender sensitive infrastructure. Improved active travel infrastructure and bike and scooter parking at stops would encourage interchange with light rail and would promote a more active lifestyle and improved health and wellbeing. Further details of social benefits are discussed in socioeconomic assessment sections in Part B (Environmental impact assessment) and Technical Report 6 – Socioeconomic.

City-shaping public transport would make Canberra more accessible. It would provide an opportunity to connect existing local, group and town centres as well as key sites and potential future change areas by providing light rail stops at locations that promote public transport integration. Public transport services integration (bus and light rail) would be further developed closer to the opening date of the Project, with opportunities to optimise it over time.

Stop locations that generate new public transport catchments would not only bring public transport closer to where people live, they would provide access to areas of significant job growth in the National Triangle and Barton (e.g. the National Security Precinct) and would connect to destinations not adequately served by the current rapid public transport network. Improved access to employment precincts would give people access to different kinds of jobs.

Access to transport and the ability to travel more easily between locations would also promote social inclusion, allowing for greater connections with family, friends, and the community. Accessibility is particularly important for people who cannot or do not want to drive a car such as tourists, students, and those with mobility restrictions. Without action to deliver responsive transport network improvements, mobility, accessibility and reliability challenges are likely to impact the quality of life that residents, students, and workers currently enjoy.

Providing sustainable transport options

Traditionally road network congestion would be addressed through duplication of roads or building new road corridors. However, to complement planning, transport and climate change management strategies, the approach to integrated land use and transport planning in the ACT (refer to Section 2.2) includes moving more people by increasing public transport capacity utilising light rail where practicable within existing road reserves. This offers the best opportunity for the ACT to sustainably increase transport capacity while offering alternative sustainable travel choices and responding to the strategic planning drivers and objectives identified in the District Strategies under the ACT Planning Strategy.

The Project aims to support compact and efficient growth within the City to Woden corridor. Combined with other planned infrastructure projects it would provide additional transport capacity and provide a reliable travel alternative for Canberrans living in, working in or visiting places along the corridor. Connecting centres over a 25 km Light Rail network (which would be achieved with the combination of LRS1, LRS2A and the Project) would offer Canberra a plan to reduce predicted private vehicle based congestion, and release capacity for a broader range of road users, while improving journey time reliability for public transport users.

The Project would also provide a lower carbon intensity transport option compared with private motor vehicle use on the existing road network. Over time, road network congestion leading to less efficient travel and longer travel times would contribute to a relative increase in transport-related carbon

emissions. By providing a more efficient transport option separate to a congested road network, the Project would contribute to the achievement of the ACT's target of a net zero carbon footprint.

Supporting the transition to a compact and connected city

The ACT Planning Strategy (ACT Government, 2019a) includes a strategic direction to drive a 'compact and efficient city' to support sustainable urban growth by working towards delivery of up to 70% of new housing within the existing urban footprint, and by concentrating development in areas located close to the city centre, town and group centres and along key transit corridors. District Strategies (refer to Table 2-1) identify 'change areas' and 'key sites' for renewal and 'potential urban regeneration areas' that may be suitable for a range of residential and non-residential uses (including consideration of education, health, and recreation facilities).

The Project supports the ACT Planning Strategy and District Strategies, including support for planned growth at key sites and change areas including Woden town centre, Woden North and North Curtin, that seek to manage these challenges by providing opportunities for urban intensification in centres and along public transport corridors, maintaining compact urban form and limiting urban sprawl. Transitioning to a more compact and connected city by improving public transport along central corridors identified in the ACT Transport Plan is critical to alleviating the pressure of a growing Canberra population.

The District Strategies (Volume 1 - Metropolitan context and big drivers) (ACT Government, 2023) identifies 'Strategic movement to support city growth' as one of the five big drivers and objectives of district planning. Legislated and potential future light rail corridors (that align with the ACT Transport Strategy) are key factors in delivering the city-shaping infrastructure to support planned growth.

The District Strategies (Volume 1 - Metropolitan context and big drivers) also identifies the combined Stage 1 and Stage 2 Light Rail network as a transformative opportunity for the ACT to capitalise on its urban structure and centres hierarchy, creating a central mass-transit corridor from Gungahlin to Woden, allowing Canberrans to travel to key destinations including employment centres north to south, along the line in a single trip.

2.4.3 Strategic alternatives considered

A review of the strategic alternatives to the Project has been carried out considering the current and future challenges for Canberra and the need for the Project as outlined in the sections above. As identified in Section 2.2, various strategic planning documents identify light rail as the preferred transport option to address future network congestion between Woden and the City.

Notwithstanding, the following strategic alternatives have been considered:

- Do nothing
- Do minimum – rapid bus augmentation
- Rapid bus – major intervention
- Project case (integrated public transport network with light rail between Woden and the City).

Do nothing

The do nothing alternative would rely on the continued operation of the existing rapid bus network, which includes T2 bus priority lanes on Yarra Glen and Adelaide Avenue.

The primary mode of commuting in Canberra is via private vehicle, which is expected to continue into the future. With projected population growth, this will therefore lead to increased travel demand on the road network. A do-nothing alternative would result in an increasingly congested transport network over time and would fail to provide additional sustainable and reliable transport alternatives from Commonwealth Park to Woden. A do nothing alternative would provide no improvement in transport connectivity, capacity or transport choice.

In relation to the current and future challenges for Canberra outlined in Section 2.3:

- **Traffic congestion and constraints on existing public transport network**: A do-nothing alternative would further exacerbate traffic congestion on the road network and an associated deterioration in travel times is expected to lead to a spreading of peak traffic periods as motorists seek to avoid travel constraints. Without intervention most intersections along the north-south transport corridor are expected to deteriorate to a poor level of service with significant traffic delays over the coming decades
- **Sustainable city development**: A do nothing alternative would not respond to planned growth as contemplated by the guiding policy documents outlined in Section 2.2. The do nothing alternative would be inconsistent with the District Plans and strategies and *Canberra: A Statement of Ambition 2016* (ACT Government, 2016) that highlight the reliance on the light rail network to support Canberra's urban renewal objectives. As land uses continue to evolve and intensify, particularly within the Barton and Woden precincts, and as travel demand increases and continues to expand from its focus on Civic alone, the existing structure and service offering of the public transport system would become increasingly out of step with public expectations
- **Net zero carbon emissions**: The approach to integrated land use and transport planning in the ACT discussed in Section 2.2 includes moving more people by increasing public transport capacity. A do nothing alternative would not achieve this objective and would reinforce private motor vehicle use on the existing road network, a higher carbon intensive transport option compared with public and active transport. Over time, road network congestion is forecast to lead to less efficient travel and longer travel times, and would contribute to a relative increase in transport-related carbon emissions
- **Wellbeing and accessibility**: A do nothing alternative would not improve wellbeing, amenity nor accessibility. It would not provide an opportunity to deliver attractive, well designed and gender sensitive infrastructure and supporting landscape outcomes. It would not encourage active travel and interchange opportunities with public transport that are required to promote a more active lifestyle and improved health and wellbeing. Further, a do nothing alternative would not provide improved access to employment, education and recreation precincts, including access to significant jobs growth in National Triangle and Barton (e.g. the National Security Precinct) or destinations not adequately served by the current rapid public transport network.

Furthermore, the do nothing alternative has the potential to decrease levels of customer satisfaction and result in an inability to effectively meet the transport demand with the available public transport options. A do nothing alternative would not provide a catalyst for building more vibrant precincts and places, or would it encourage business growth and tourism. With increasingly longer journey times and poorer reliability forecast for the road network, a do nothing alternative cannot deliver the broader economic benefits for Canberra as it would not attract increased investment to the area nor support an overall improvement in productivity.

Do minimum – rapid bus augmentation

The impacts presented for the do nothing alternative generally apply to augmented rapid bus scenarios that use the existing road network and bus priority lanes in the corridor. An augmented rapid bus scenario assumes an upgrade to the current bus fleet to a fully electric fleet operating in the corridor with larger capacity vehicles and/ or increased service frequency. As this scenario would rely on the existing road network, future bus travel would be subject to increasing road network congestion constraints with corresponding impacts on public transport reliability and travel times.

While potentially supporting growth in the shorter term it is unlikely in the longer term that an augmented rapid bus network would achieve the capacity and reliability requirements that can be achieved by light rail, which would be wholly separated from an increasingly congested future road network.

Rapid bus – major intervention

This strategic alternative assumes additional capital investment for new bridges, dedicated off road busways, new bus vehicles and associated depot and maintenance facilities. While improved public transport reliability could be achieved through extension of bus priority lanes through the City to Woden corridor (Commonwealth Avenue, Melrose Drive, Launceston Street), dedicated off-road busways or bus improvements as part of a broader suite of land use, transport planning and infrastructure delivery initiatives would have its own impacts, likely to include heritage and broader landscape impacts.

By its nature, this alternative would still need to integrate with the existing road network and travel time and reliability benefits would therefore still be limited by the performance of the road network, and ultimately its increasing congestion and travel time impacts.

Large capacity rapid buses with onboard guidance systems (i.e. 'trackless trams') have not been contemplated, since these are oversize and overweight vehicles which the road network is not designed for, nor are the vehicles permitted to operate on them.

Ultimately this strategic alternative would rely heavily on the continued operation and functionality of existing transport networks. According to the Light Rail Five Years On: Benefits Realisation Report 2024, 43% of passengers using LRS1 have never previously used the bus network, indicating a preference for light rail as a transportation option (Transport Canberra and City Services, 2024).

No intervention on its own is going to holistically address the future road network challenges forecast for Canberra (and this is a matter for broader whole-of-Government coordination beyond just the Project). This is reflected in the ACT Infrastructure Plan update – Transport (ACT Government, 2024), which identifies project priorities identified beyond the current budget, noting that these projects are indicative and may change in response to community preferences, shifts in demand for services and the availability of funding.

Project case (integrated public transport network with light rail between Woden and the City)

The Project case would deliver a light rail extension from Commonwealth Park to Woden, integrated with rapid and local bus services as well as other modes of travel. The Project case builds on the benefits already evidenced on LRS1 and expected for LRS2A. Combined, LRS1 and LRS2 would provide direct connections between Canberra's north and Woden.

More specifically, the Project case would provide a sustainable and reliable transport option from Commonwealth Park to Woden. It would increase the people-carrying capacity of the transport corridor that best meets the needs of anticipated population growth, including planned growth within the corridor. Each light rail vehicle can provide up to three times the capacity of a rapid bus that uses the existing road lanes. Light rail would therefore increase the people-carrying capacity of the corridor by an additional 2,400 trips per hour in each direction.

By operating in its own corridor, light rail would also be less affected by traffic congestion, compared to buses that share road space with general traffic. Separation of light rail from increasing road network congestion means that light rail would provide journey time reliability into the future, irrespective of the performance of the future road network.

In providing additional public transport capacity capable of supporting planned growth in the corridor, that is integrated with other transport modes, that is less affected by increasing congestion, and that has well-designed, accessible stops, the Project case provides the best opportunity to encourage those using private vehicles to make a more sustainable travel choice.

The Project case responds to planned growth proposed in the guiding policy documents outlined in Section 2.2, in particular the District Plans and strategies and Canberra: A Statement of Ambition 2016 (CMTEDD, 2016) that highlight the reliance on light rail network to support Canberra's urban renewal task. As land uses continue to evolve and intensify, particularly within the Barton and Woden precincts, and travel demand increases and continues to expand from its focus on Civic alone and provide opportunities at centres such as Deakin, Dickson and Gungahlin, a new public transport service offering with connections to the broader system would better meet customer expectations. The enhanced legibility of the light rail network supports urban renewal objectives and the promotion of a more liveable and connected city.

The result would be potentially improved levels of customer satisfaction and the subsequent ability to effectively meet the transport demand with new public transport options and capacity. This strategic alternative would also support economic benefits that come with increased investment and associated productivity uplift. As light rail is zero-emissions, it would also reduce greenhouse gas emissions from the transport sector along with reduced noise and improved air quality.

2.5 Project objectives and benefits

2.5.1 Project objectives

The ACT Government made a clear commitment in Canberra: A Statement of Ambition 2016 (CMTEDD, 2016) and the City Plan 2014 (ACT Government, 2014) to construct the light rail network to help achieve its vision for Canberra.

The Project objectives presented in Figure 2-3 have been developed to respond to the NCP, the Territory Plan and other strategic plans, policies and guidelines and guide the Project's contribution to the ACT Government's vision for Canberra. They also consider and respond to the identified transport challenges faced by Canberrans now and into the future.

Figure 2-3 Objectives of the Project

2.5.2 Project benefits

The key benefits of the Project are outlined in Figure 2-2 and would include:

- **Greater access and opportunities:** The Project would connect people with Canberra's lakeside, cultural institutions, festivals, education and events precincts. It would support vibrant towns and local centres which can house Canberra's growing population while limiting extra pressure on the transport network or green spaces on the edges of Canberra
- **Delivering a city-wide network:** Canberra's population growth requires a transport network that provides choice by linking the city and suburbs. The Project would create a frequent and reliable transport option that better connects major town centres and residential employment hubs, including direct connection for North Woden and Inner South districts

- **Good for the environment:** Light Rail Stage 1 is fully electric and connected to the ACT grid, which has been 100% renewable since 2019. Travel by light rail is free of greenhouse gas emissions, making it one of the cleanest travel options in Canberra and providing an attractive alternative to car travel
- **Provides an efficient transport option:** In comparison to buses, light rail provides greater capacity to move passengers, making it a more efficient transportation option by moving more people with fewer vehicles
- **Social and economic benefits:** Construction of the Project would support local jobs, while facilitating further job creation into the future. The Project would support an estimated peak construction workforce of around 900 to 1000 people (as identified in Section 6.6.2 of Chapter 6 (Construction)), as well as additional jobs during the pre-construction period (such as advisory and professional services roles), and in the Project operations phase. In operation, the Project is also estimated to deliver broader economic benefits for Canberra by improving overall productivity due to improved journey time reliability and reduced congestion delays. Design principles for the Project, including gender sensitive urban design principles, would contribute to creating attractive spaces that foster a safer and more inclusive public transport experience
- **Keeping Canberra competitive:** Linking Canberra's north and south, the Project would support reliable and efficient transport that:
    - Provides direct connections to key activity centres outlined in the NCP including Woden Town Centre, West Deakin, the city (and when combined with LRS1 and LRS2A, Gungahlin Town Centre) as well as group centres as defined in the ACT District strategies
    - Is a catalyst for building more vibrant precincts and places
    - Encourages business growth and tourism
    - Attracts and retains the best talent and businesses
    - Increases trip capacity per hour, providing Canberrans with an alternative to reduce pressure on existing networks
    - Transports people of all abilities safely, including people using mobility aids and prams
    - Supports active travel over greater distances, with users being able to have a bike or scooter on board comfortably.

Social and economic benefits from the construction and operation of the Project are further evaluated in the socioeconomic assessment sections in Part B (Environmental impact assessment) and Technical Report 6 – Socioeconomic. Based on design maturity, key benefits are expected to include employment and training opportunities; improved wellbeing and safety associated with inclusive urban design, and increased public transport accessibility providing more equitable access to jobs, businesses and social facilities. A detailed business case would be developed following completion of necessary planning approvals outlined in Chapter 8 (Legislation and policy). This approach enables the scope and alignment to be well defined prior to government considering an investment decision. The process would be undertaken in accordance with the Capital Framework and include consideration of technical studies, options analysis, delivery model assessment, economic analysis (including cost-benefit assessment and Wellbeing Impact Assessment) to support an investment decision.

2.6 Related and complementary projects

The Project would extend and complement the benefits of the existing light rail network, as described in the following sections.

2.6.1 Light Rail Stage 1

LRS1 is the first stage of the Light Rail network in Canberra, which became operational in 2019. The alignment is a 12 km route that acts as the primary transport corridor connecting Canberra's northern suburbs of Gungahlin with the City. LRS2 (LRS2A and the Project) would further consolidate and build on the benefits realised by LRS1.

Since the introduction of LRS1 in 2019, light rail has demonstrated its effectiveness as an attractive and reliable public transport option. LRS1 has achieved high levels of customer satisfaction, attracted more people to public transport, moved more people through the corridor at peak hours, reduced congestion and contributed to economic and residential growth.

The benefits of LRS1 have been highlighted recently with the release of Light Rail Five Years On: Benefits Realisation Report 2024 (Transport Canberra and City Services, 2024). In the roughly five years since operations between Gungahlin and the City commenced, some of the benefits identified include:

- Over 16.5 million light rail passenger trips
- Approximately 99.98% of on-time light rail services
- Approximately 43% new public transport passengers (i.e. not previously used the bus network)
- Reduction of motor vehicle traffic at the Northbourne and Macarthur Avenue intersection by 18%
- Increase in business growth by 26.4% in the Gungahlin district (Gungahlin Place to EPIC and Racecourse stops) between 2018-2022 and by 19.7% in the Canberra and Central district (Phillip Avenue to Alinga Street) along the corridor over the same period
- Approximate 20% share of all public transport patronage in the ACT
- Approximate 95% passenger satisfaction rating with Transport Canberra light rail services.

2.6.2 Light Rail Stage 2A

LRS2A is an approximately 1.7 km extension to the first stage of light rail from Alinga Street to Commonwealth Park and will better connect the City to Lake Burley Griffin. LRS2A is the first stage of the light rail extension from the City to Woden. LRS2A will frame the future shape of development along the London Circuit-Commonwealth Avenue corridor, supporting the activation of underutilised land around City West, City Hill and the Acton Waterfront and enabling the delivery of city-wide initiatives for urban renewal and diversity of place. The raising of London Circuit (RLC project) between Edinburgh Avenue and Constitution Avenue to provide a new at-grade, signalised intersection with Commonwealth Avenue, forms part of the LRS2A project as facilitating works.

Extending the light rail network along London Circuit will bring the network closer to businesses along London Circuit and the Australian National University. LRS2A is scheduled to be operational by 2027.

3.0 Project development

3.1 Background

3.1.1 Public transport in the Griffins' vision for Canberra

Canberra has been carefully designed and developed through several key planning documents, which have contributed to the foundation and formation of the National Capital. From the Griffins' prize-winning design, to Thomas Charles Weston and planners in the National Capital Development Commission and the National Capital Authority, Canberra has developed to reflect its unique position as a purpose-built capital.

Between 1912 and 1918, Walter Burley Griffin and Marion Mahoney Griffin created a series of plans that evolved into an overarching master plan in 1925. This plan outlined a series of wide main avenues of traffic and landscaped corridors, with provision for public transport corridors, including a future tramway**.** The vision was to ensure balanced and integrated transport outcomes could be achieved without compromising the integrity of the highly valued aesthetic and landscape features.

The Federal Government officially adopted a version of the "Griffin Plan" in 1925, and while not all aspects have been fully realised, its intent and core principles of axial lines, formal vistas, landscape and connections to the surrounding open space still guide Canberra's development.

Modern planning continues to build on these concepts, including the Griffin Legacy**,** which ensures that the city's growth respects its designed landscape and maintains its national significance. It also reinforces Main Avenues by providing sustainable public transport systems that reduce car dependency. The National Capital Plan (NCP), first approved in 1990, incorporates these principles to guide ongoing development in areas of national significance in a way that respects Canberra's historic design while allowing for modern growth and sustainability.

3.1.2 Initial planning for a light rail network

Planning for the Light Rail network commenced with the 2012 Transport for Canberra Policy (Environment and Sustainable Development, 2012). The Policy updated the Frequent Network map of public transport services identifying where future bus transit or light rail would be located. It also committed to a corridor study for City to Gungahlin and an Infrastructure Australia funding submission that included light rail.

The ACT Government subsequently made a policy commitment to plan, finance, and develop the first stage of Canberra's Light Rail network in 2012. Given the rapid growth in Canberra's north, it identified the Gungahlin to City corridor as a priority first stage.

An evaluation of mode alternatives (light rail, bus rapid transit and a 'do nothing' scenario) to serve the City to Gungahlin Transit Corridor found that, while bus rapid transit was a cost-effective option, light rail provided greater benefits and generated the best overall future outcome for Canberra's public transport needs. A subsequent business case evaluated the potential benefits of light rail, and construction of Light Rail Stage 1 (LRS1) commenced in 2016. A detailed business case would be developed following completion of necessary planning approvals outlined in Chapter 8 (Legislation and policy). This approach enables the scope and alignment to be well defined prior to government considering an investment decision. The process would be undertaken in accordance with the Capital Framework and include consideration of technical studies, options analysis, delivery model assessment, economic analysis (including cost-benefit assessment and Wellbeing Impact Assessment) to support an investment decision.

Following commencement of LRS1 operations in 2019, a Light Rail Five Years On: Benefits Realisation Report released in 2024 evaluated the observed benefits (Transport Canberra and City Services, 2024). This report confirmed that the first stage of Light Rail to date has realised the benefits and changed the way in which Canberrans live, travel, and interact, providing confidence in the benefits of extending the Light Rail network.

3.1.3 Light rail network priorities – Stage 2 City to Woden

Strategic planning context

From 2012, feasibility studies and investigations informed the first Light Rail Masterplan in 2013. Community engagement on an updated Light Rail Network Plan (ACT Government, 2015) occurred in late 2015. This plan identified a broader Light Rail network and priorities for network development. Stage 2 from the City to Woden was identified as the next priority due to its capacity to connect key residential, cultural, commercial, and employment centres across Canberra using an integrated public transport network.

Community consultation on the potential routes for the expansion of light rail to Woden began in mid-2017, with feedback indicating a preference for a corridor via City West, Commonwealth Avenue, and Adelaide Avenue.

As shown in Figure 3-1, Canberra's Light Rail network was further refined in the Infrastructure Plan: Planning for the future (ACT Government, 2019) which identified extension of light rail from the city to the Parliamentary Zone and Woden as the next priority. The ACT Government's vision for Canberra's transport system was further articulated in the ACT Transport Strategy 2020 (ACT Government, 2020) which was released for community consultation in late 2018 and adopted in 2020. The Strategy confirmed the City to Woden stage as the next priority for investigation.

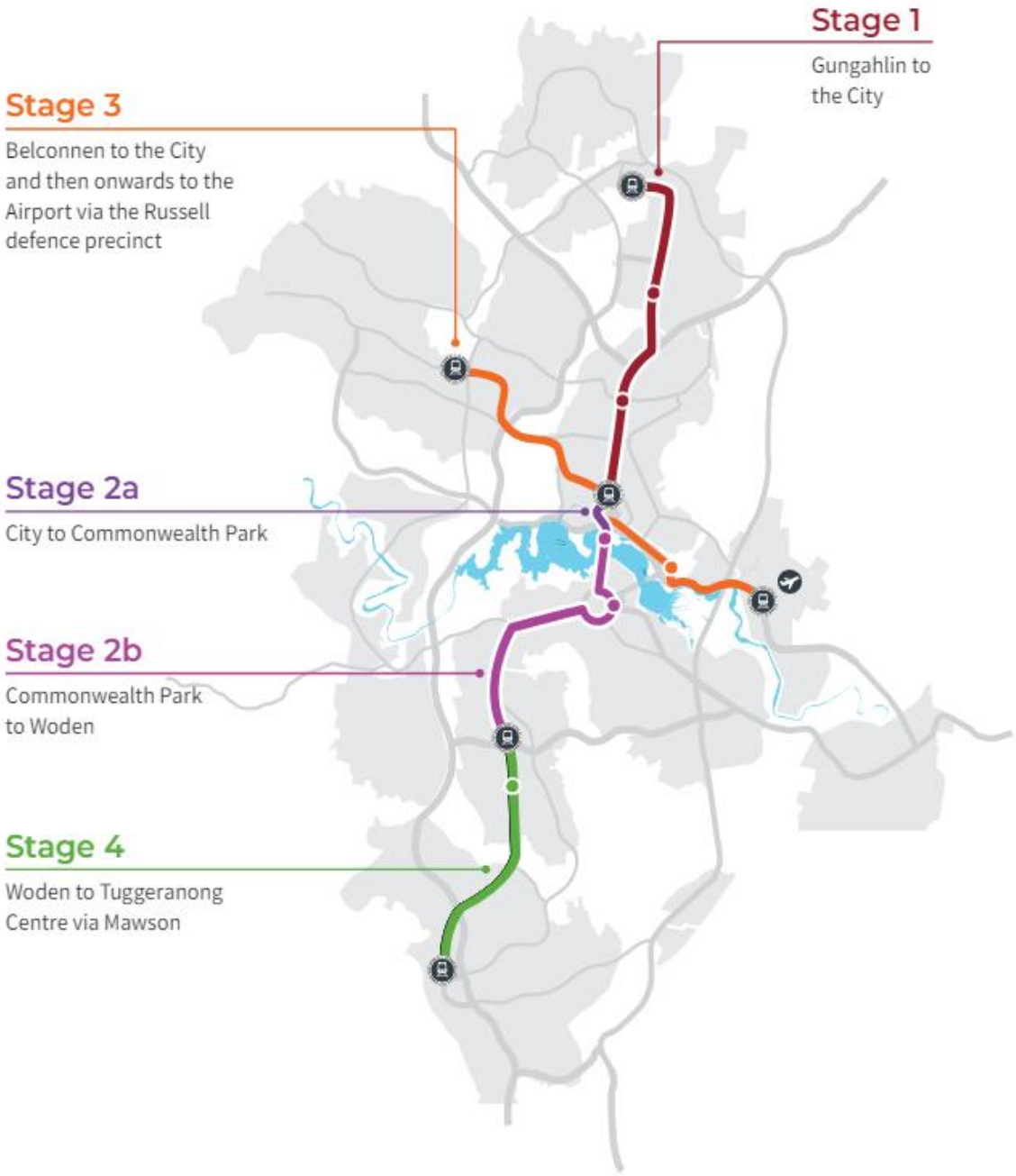


Figure 3-1 Canberra's light rail network as presented in the *Infrastructure Plan: Planning for the future* (ACT Government, 2019)

Inquiry into Commonwealth and Parliamentary approvals for Stage 2 of Canberra Light Rail

Around the same time as community feedback was being sought for the ACT Transport Strategy, in 2018 and 2019 there was a Commonwealth Joint Standing Committee (JSC) on the National Capital and External Territories inquiry into Commonwealth and Parliamentary approvals for Stage 2 of Canberra Light Rail (JSC inquiry) regarding:

- The relevant Parliamentary approval processes for works within the Parliamentary Zone
- The roles of the NCA and the Australian Government, and the associated approval processes
- Possible impacts on the Parliamentary Zone and Parliamentary precincts, including any impacts on the heritage values and national importance of the Parliamentary Zone and the national capital
- The identification of matters that may be of concern prior to formal Parliamentary or Australian Government consideration of the Project
- Any other relevant matter the JSC wishes to examine.

The JSC inquiry considered several route options either proposed by the ACT Government, including in response to JSC inquiry findings, or in submissions to the inquiry. This included strategic alignment options for the crossing of Lake Burley Griffin as well as alignment options through the Parliamentary Zone. The outcome of the inquiry was a comprehensive report prepared by the committee that included background and context for the project, a summary of the public submissions, and a series of recommendations. Following the release of the report the Australian Government agreed, or agreed in principle, to all of the inquiry recommendations.

As a result of the JSC Inquiry Report and associated Australian Government Response, the ACT Government resolved to pursue the State Circle East alignment option as the preferred alignment option based on in-principle support from the Australian Government as it is wholly consistent with the Inter-Town Public Transport System (Indicative Route) map contained within the NCP, a plan endorsed by the Australian Parliament, providing access to cultural institutions in the National Triangle and employment areas in Barton.

ACT Government response to the JSC inquiry

The ACT Government's response to the JSC inquiry included:

- A decision to divide Light Rail Stage 2 into two parts, Light Rail Stage 2A (LRS2A) and Light Rail Stage 2B (LRS2B; the Project). Division into two parts was based on faster project delivery that allowed LRS2A design and construction to proceed independently of LRS2B given Australian Government planning requirements through the National Triangle and Parliamentary Zone
- The inclusion of both LRS2A and LRS2B in the Infrastructure Plan (as shown in Figure 3-1 and discussed above)
- Identification of the alignment for:
    - The preferred option through the Parliamentary Zone from Commonwealth Avenue along State Circle to Adelaide Avenue
    - The alternative alignment option via National Triangle and Barton from Commonwealth Avenue along King George Terrace, Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue, before connecting with State Circle.

An overview of the history of planning relevant to the Project is summarised in Figure 3-2. Further discussion regarding JSC inquiry outcomes for the Project in relation to the crossing of Lake Burley Griffin and the alignment for light rail through the Parliamentary Zone is provided in Section 3.3 below.

Various strategic planning documents and the Parliamentary processes described above identify light rail as the preferred transport solution to address future network congestion between Woden and the city. Notwithstanding, identified strategic alternatives to the Project include:

- Do nothing
- Do minimum – rapid bus augmentation

- Rapid bus – major intervention
- Project case (integrated public transport network with light rail between Woden and the city).

Consideration of strategic alternatives to the Project is discussed in Section 2.4 of Chapter 2 (Need for the Project).

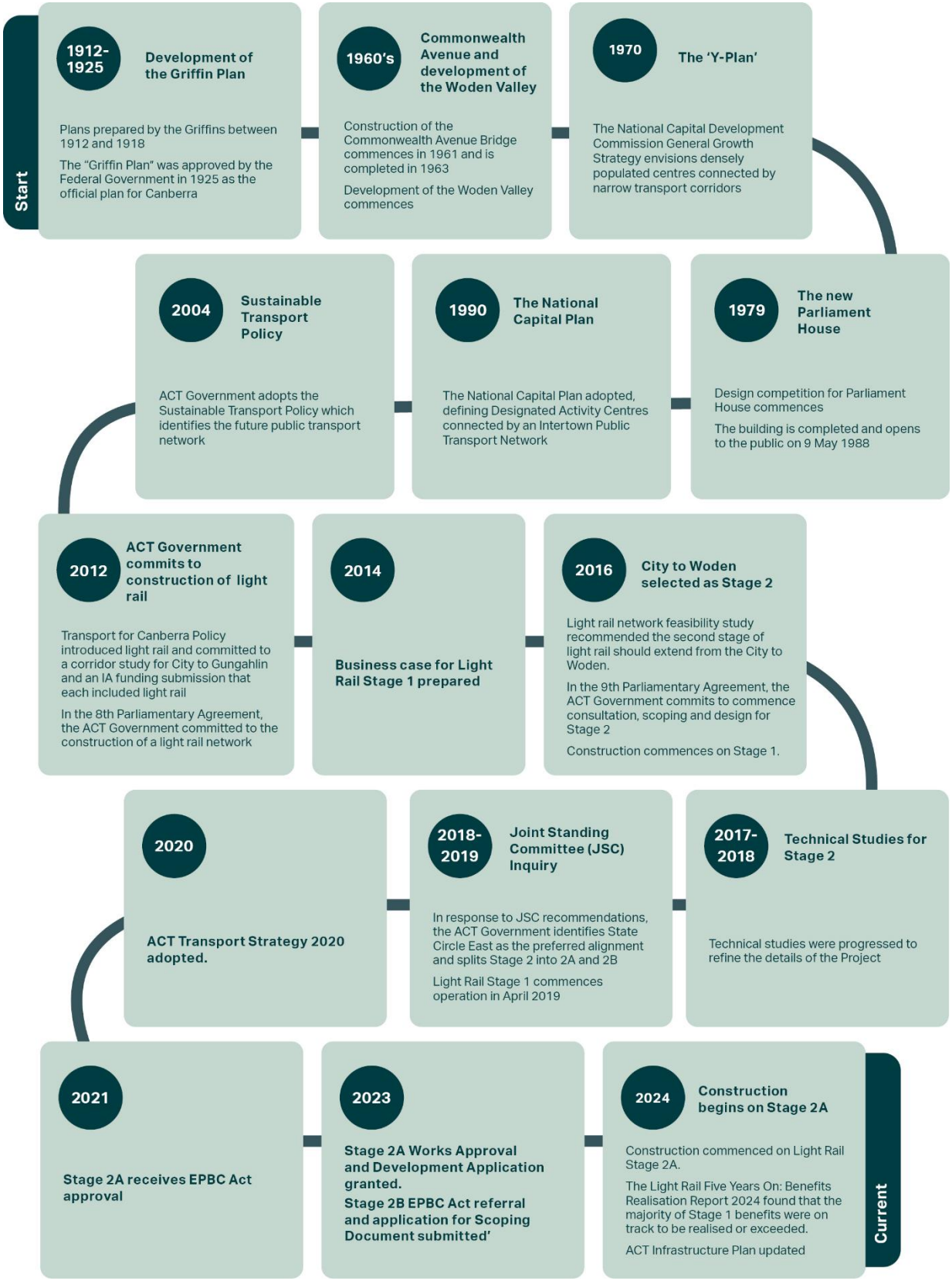


Figure 3-2 Timeline of investigations and planning for Canberra Light Rail

3.2 Route and design options considerations

3.2.1 Methodology for assessment of route and design options

An iterative process of design development, stakeholder consultation, community engagement and assessment has been carried out to refine the Project design, including route and stop locations, landscape, urban realm, and technical elements.

A key driver influencing the Project's development process has been seeking alignment with the NCP and the Inter-Town Public Transport System map contained within in the NCP. Responding to the principles of the Griffin Plan (and later plans) has also been an important factor for the design development process. Implications of this include an acknowledged and necessary interaction of the Project with Matters of National Environmental Significance (MNES) identified under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), particularly in relation to Commonwealth land and Commonwealth-listed heritage items such as Lake Burley Griffin and Adjacent Lands, the Parliament House Vista, and State Circle Cutting.

In considering the relative performance of design options, and with reference to the Project objectives (refer to Section 2.5 of Chapter 2 (Need for the Project)) the following factors have been considered as relevant:

- MNES identified under the EPBC Act, particularly National and Commonwealth heritage (including indirect heritage impacts relating to visual and landscape aspects) and biodiversity factors, as well as impacts to the environment of Commonwealth land and broader environmental impacts, including traffic, noise and vibration and flooding and hydrology
- Territory environmental considerations, such as Territory listed heritage items, items listed and considered under the *Nature Conservation Act 2014* (ACT), land on the Register of contaminated sites under the *Environment Protection Act 1997* (ACT), and broader environmental impacts to Territory Land including traffic, noise, vibration, flooding, and hydrology
- Urban design and place outcomes, including potential impacts to existing landscape, visual and urban realm including impacts to street trees, placemaking opportunities and urban design outcomes
- Land use and property, including integration with existing and planned development as well as property impacts (land acquisition, property access)
- Transport integration, movement and access, including potential for an improved and/ or more integrated transport network that focuses on customer access and interchange opportunities, impacts to existing public transport, road and active travel networks
- Deliverability and risk, including complexity of planning approvals, construction phase traffic disruption, constructability challenges including utilities and overall risks to, and impacts on, the delivery program
- Light rail operations and network safety, including operational requirements, fleet, journey time, operational safety and safety for road users and active travel movements
- Stakeholder and community feedback.

3.2.2 Light Rail network and operations principles – basis for design

The Project is an important part of delivering a wider light rail network for Canberra. LRS1 has several design and operational factors that have contributed to making it an attractive, reliable, and popular transport option. Wherever possible, these design and operational factors have and will continue to be integrated into the Project. Although new design approaches are needed for different environments along the Project corridor – particularly for grade-separated stops on Adelaide Avenue and Yarra Glen – replicating successful design and operational features presented in Table 3-1 seek to reinforce a legible, cohesive and reliable light rail network.

For overarching Project design principles, refer to Section 5.2 of Chapter 5 (Project description).

Table 3-1 Light rail network and operations principles that influence decision-making on design options

Network and operations principle	Supporting rationale
Promote light rail journey time reliability	• Provide a reliable system where light rail has exclusive right-of-way separated from other modes and priority at intersections • Five-minute peak hour headways are preferred to manage the balance between light rail journey time and other movement modes • Deliver a 30-minute city by reducing the need for longer journeys.
Light rail as part of an integrated public transport network	• Expand the network using the existing technology in use or planned for LRS1 and LRS2A • Support integration with bus and active travel networks • The Project will not preclude further light rail network expansion.
Integrate light rail into the existing road and path network	• Provide light rail as a surface-running system with stops located at signalised intersections with convenient crossings • Tie design into existing infrastructure • Provide a step-free system wherever possible.
Provide for light rail passenger safety and comfort	• Safety for passengers, pedestrians, cyclists and other road users is inherent in the design • Avoid sharp bends and steep gradients in the alignment, where possible, to provide for passenger comfort.

3.3 Options considered – initial options to support JSC inquiry

3.3.1 Initial options for the crossing of Lake Burley Griffin

As part of selection of the City to Woden corridor as the preferred corridor for expansion of the Light Rail network in 2019, and as shown in Figure 3-3, the following route options were considered for the crossing of Lake Burley Griffin:

- Commonwealth Avenue
- Acton Peninsula to Commonwealth Avenue
- Constitution Avenue and Kings Avenue
- Long tunnel from City Hill to Deakin
- Short tunnel from Flynn Drive to Deakin.

The Commonwealth Avenue route was investigated as part of the JSC inquiry. The JSC inquiry committee recommended that an independent light rail bridge be delivered on the route of Commonwealth Avenue and that this bridge would need to:

- Be of equal quality to that of the existing bridges
- Have the same column spacing as the existing bridges
- Not reduce existing clearance between the lake and the underside of the bridge
- Be slimmer than the existing bridges so as not to visually impact on the existing two bridges
- Have no impact on the structural soundness of the existing bridges.

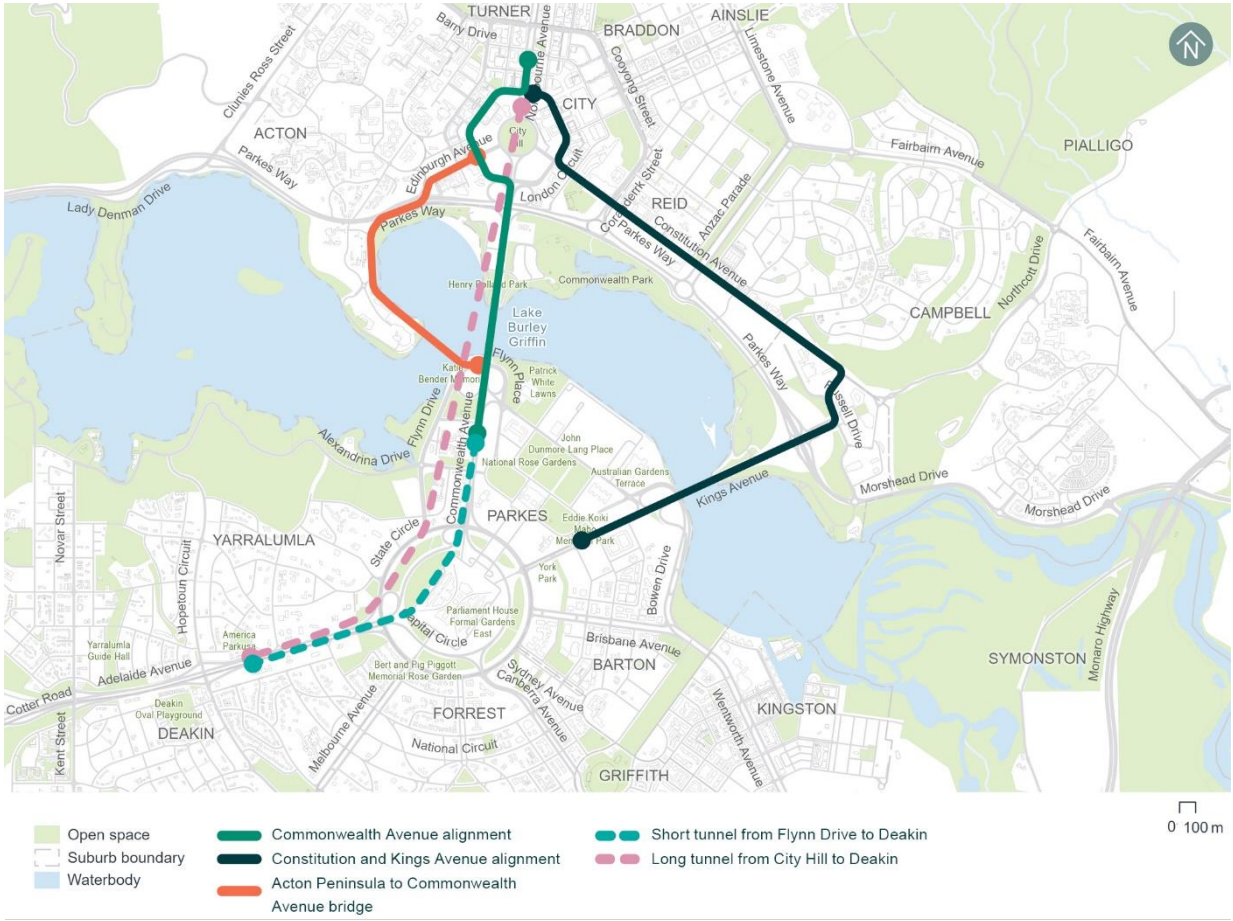


Figure 3-3 Initial route options for the crossing of Lake Burley Griffin

3.3.2 Route considerations through the Parliamentary Zone

With Commonwealth Avenue assumed as the preferred route across Lake Burley Griffin, four broad route options around the Parliamentary Zone (including within the National Triangle precinct and Parliament House precinct) were also contemplated during the initial planning phase. All four broad options were considered as part of the JSC inquiry process (noting that other options were identified in submissions to the JSC inquiry). These options are shown in Figure 3-4 and included:

- State Circle East
- State Circle West
- Capital Circle East and West
- Parkes – Barton via King George Terrace and Windsor Walk.

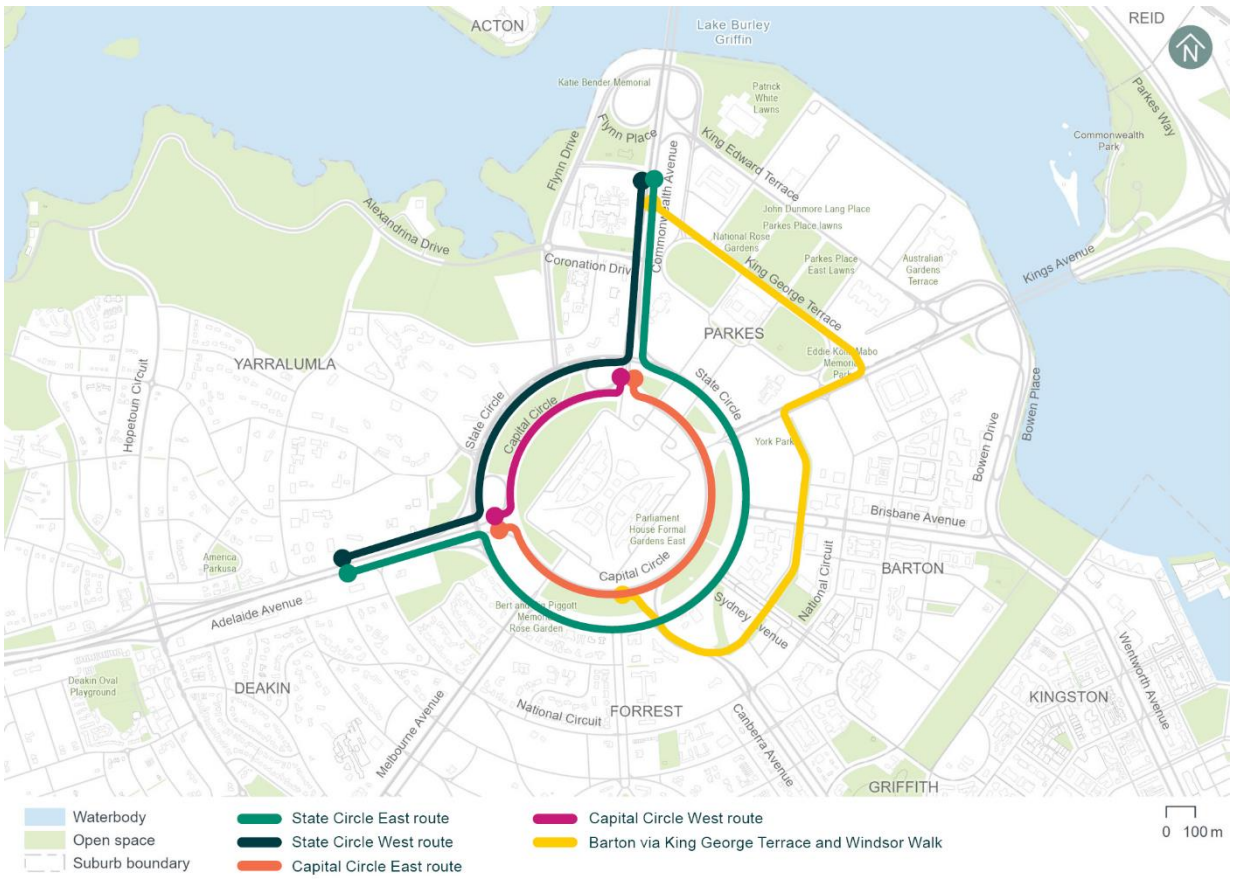


Figure 3-4 Initial route options considered for the National Triangle and Parliament House precincts

In relation to National Triangle and Parliament House route options, the JSC inquiry report noted that if the ACT Government were to pursue a route that is consistent with the NCP, it could do so with the confidence that the route has already been considered by the Commonwealth, and given its in-principle approval, in the NCP.

In response to the JSC recommendation that State Circle East had the in-principle support of the Commonwealth under the NCP, the ACT Government ultimately resolved to explore the preferred State Circle East alignment option through the EIS process, recognising that it provided a comprehensive pathway to understanding technical, environmental, and stakeholder issues. At the same time including an alternative route through the National Triangle and Barton (refer to Section 3.1.3) meant that if the preferred option was not feasible, for whatever reason, the need to recommence the EIS process again with an alternative would be avoided.

Route options utilising State Circle West, Capital Circle (east and west) and the Parkes – Barton route via King George Terrace and Windsor Walk were therefore not considered further. The National Triangle-Barton alignment option presented in Section 3.5.2 below has evolved from the Parkes-Barton route presented to the JSC inquiry based on further consultation with key stakeholders including the NCA.

3.3.3 Confirmation of Project alignment

Given the complexity of the planning approvals processes required to deliver light rail through the National Triangle, the ACT Government determined to proceed with:

- A staged delivery approach, with detailed design and construction being progressed for LRS2A between Alinga Street and Commonwealth Park (LRS2A has since received approvals and is currently under construction)

- Environmental and planning approvals for the section between Commonwealth Park and Woden (the Project) that included further consideration of both the preferred State Circle East alignment option and an alternative alignment through the Parliamentary Zone via a National Triangle and Barton corridor.

This EIS provides an assessment of both the preferred State Circle East alignment option and an alternative alignment through the Parliamentary Zone via a National Triangle and Barton corridor. This approach allows for environmental impacts of both options to be considered; community and stakeholder feedback to be sought for both options; and provides flexibility by enabling the environmental assessment and approvals process for the Project to commence while both options are under investigation.

The Project would deliver a light rail alignment across Lake Burley Griffin, through the National Triangle, along Adelaide Avenue and Yarra Glen, before terminating at Woden Town Centre. The Project, including the preferred State Circle East alignment option and the alternative National Triangle-Barton alignment option is shown in Figure 3-5.

Ongoing landscape and technical investigations and assessments, and engagement with key stakeholders has identified a number of challenges relating to both alignment options, including:

- Potential visual impacts to Parliament House for stops located on State Circle
- Heritage impacts – including geographic, built form, and vistas
- Landscape impacts between State Circle and Capital Circle at Adelaide Avenue
- Constructability challenges, including noise and vibration, and construction duration
- Interface issues between the Project and the planned National Security Office Precinct.

Options assessed in relation to route selection and stop locations consider the above challenges and are discussed in the following sections.

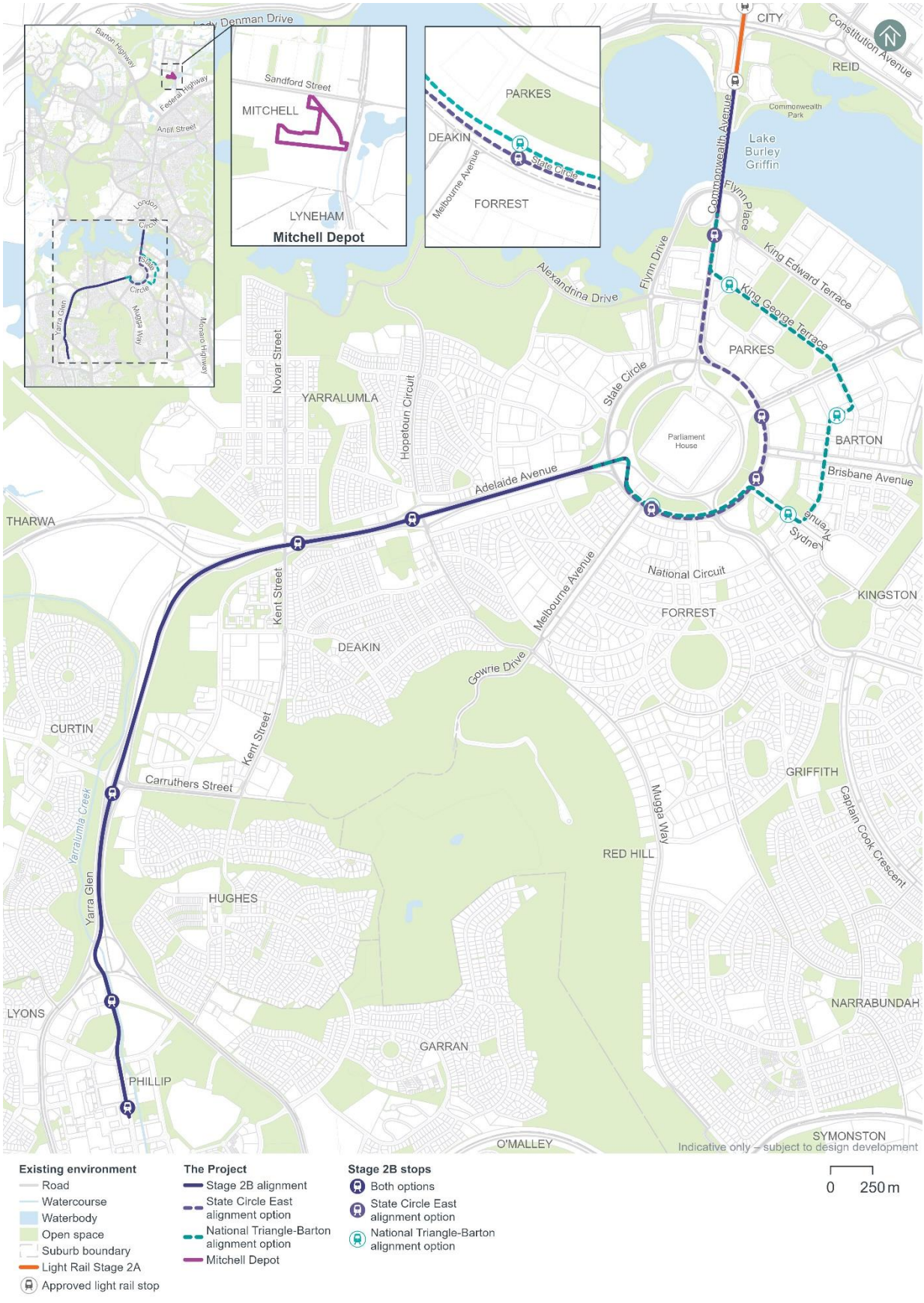


Figure 3-5 Project overview including the State Circle East and National Triangle-Barton alignment options

3.4 Options considered – Commonwealth Avenue precinct

Key options that have been considered in the Commonwealth Avenue precinct include:

- Bridge options for crossing Lake Burley Griffin (refer to Section 3.4.1)
- Alignment options along the Commonwealth Avenue corridor (refer to Section 3.4.2)
- Light rail stop locations (refer to Section 3.4.3).

3.4.1 Bridge options for crossing of Lake Burley Griffin

The design of the light rail bridge over Lake Burley Griffin has considered the heritage significance of Lake Burley Griffin and the visual values of Commonwealth Avenue.

In March 2019, the Australian Government endorsed the JSC's Recommendations, which included design criteria for a new bridge (refer to Section 3.3).

Noting that there were several sub-options considered by the Commonwealth Avenue Bridge Steering Committee (which was established by the NCA and Infrastructure Canberra (iCBR) in May 2019 to guide a jointly funded design investigation into the Commonwealth Avenue light rail bridge), the following broad options were considered for crossing Lake Burley Griffin along the Commonwealth Avenue alignment:

- A new infill light rail bridge (between the existing Commonwealth Avenue road bridges)
- Light rail using the existing Commonwealth Avenue road bridges with reconfigured traffic lanes.

Conceptual images of the two bridge options are shown in Figure 3-6.

The Commonwealth Avenue Bridge is historically significant as an important part of Lake Burley Griffin and represents a significant part of Canberra's planning history, landscape design, and development. Lake Burley Griffin and Adjacent Lands (including Commonwealth Avenue Bridge) was listed on the Commonwealth Heritage List in 2022.

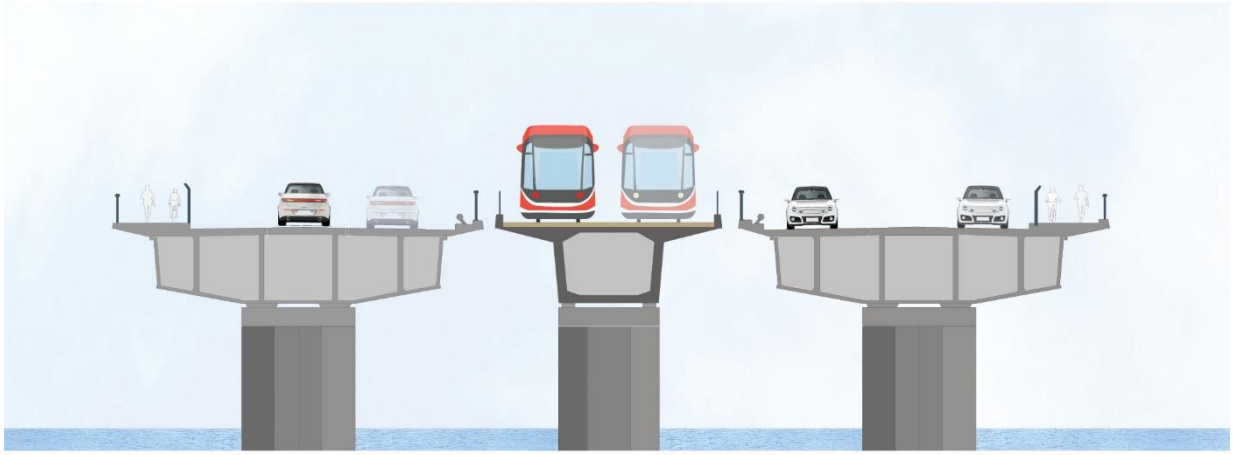
Both bridge options for crossing Lake Burley Griffin would provide attractive light rail journey times but would also result in complex approvals requirements with similar heritage impacts needing to be considered and managed.

Although the construction methodology for a new light rail bridge between the existing Commonwealth Avenue road bridges would be more complex (relative to the alternative option which would utilise existing bridges), the operational traffic impacts (reduced road capacity) that would result from the removal of a traffic lane in each direction on Commonwealth Avenue road bridges were seen as undesirable.

A new infill bridge would have impacts on Commonwealth heritage, altering large scale vistas of Lake Burley Griffin (refer further to the historic heritage assessment in Section 12.5 of Chapter 12 (Commonwealth Avenue precinct)). However, this option would occupy the space between the existing bridges as contemplated by the original bridge design for a future public transport corridor.

Considering the above as well as performance of the options against the JSC inquiry recommendations (refer to Section 3.3 above), a new single infill light rail bridge between the existing Commonwealth Avenue road bridges was identified as the preferred option for the light rail crossing of Lake Burley Griffin. The light rail bridge design would include wire-free running and would reflect the design quality and architectural character of the existing road bridges, in accordance with design guidance in the Public Domain Master Plan (Appendix I).

New light rail (infill) bridge option



Light rail using existing Commonwealth Avenue Bridge with reconfigured traffic lanes

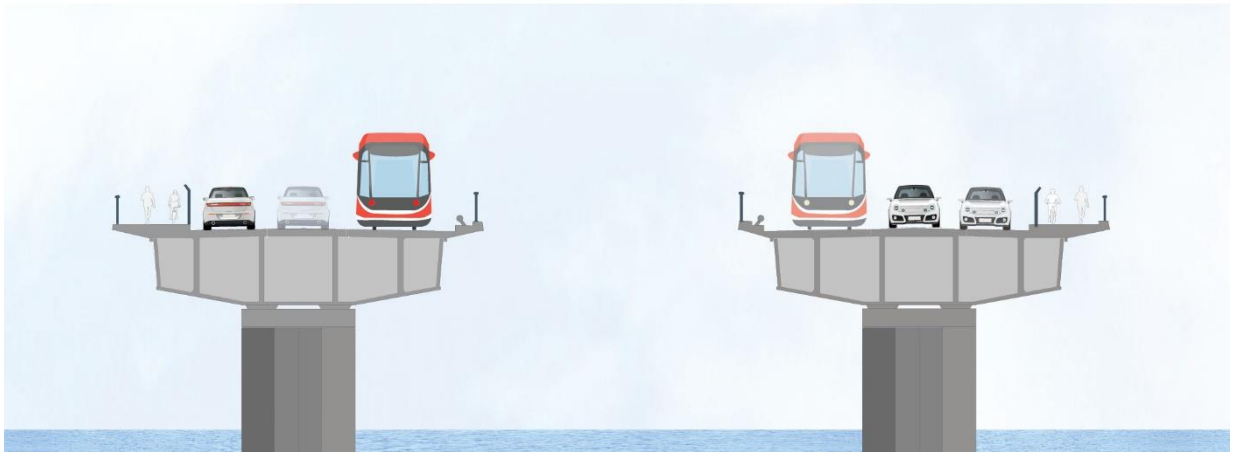


Figure 3-6 Conceptual illustrations showing the two Commonwealth Avenue bridge options considered (indicative only)

3.4.2 Commonwealth Avenue alignment considerations

The Commonwealth Avenue precinct includes two heritage-listed conservation areas: the Parliament House Vista and Lake Burley Griffin and Adjacent Lands (both listed on the Commonwealth Heritage List). The design of the light rail alignment on Commonwealth Avenue has been informed by heritage advice and a Light Rail Commonwealth Avenue Master Plan (LRCAM) (AECOM, 2022). It has considered visual impacts to the Parliament House Vista, Albert Hall, and Hotel Canberra as well as physical impacts to the heritage-listed Weston tree plantings within the median during both construction and operation.

Traffic congestion and related public transport constraints have been identified as a key challenge limiting Canberra's growth and productivity (refer to Section 2.3 of Chapter 2 (Need for the Project)). Following the urban design driver of 'design for growth' (refer to Section 5.2.1 in Chapter 5 (Project description)), the initial investigations into Light Rail Stage 2 considered the potential traffic impacts of future population growth and introducing light rail on Commonwealth Avenue as a key arterial road in Canberra's road network.

Traffic modelling for Light Rail Stage 2 has indicated that future population growth would increase demand for travel with substantial impacts to traffic performance including peak hour congestion. These impacts would be exacerbated if a travel lane from Commonwealth Avenue were to be repurposed for light rail. Potential physical and visual impacts of road widening to reduce congestion, symmetry with the approved design for LRS2A as well as recommendations from the JSC for a new light rail bridge in line with the median of Commonwealth Avenue, have influenced the decision for a light rail alignment along the Commonwealth Avenue median in this precinct.

The introduction of light rail to the median of Commonwealth Avenue would require the removal of the existing median tree plantings and a reconsideration of the tree structure, particularly the location of the Weston-planted evergreens that play a structural role in the Avenue. Project design development has considered opportunities to avoid and minimise tree impacts, and where impacts would be unavoidable, opportunities to replace trees consistent with the existing heritage landscape. To manage the impact of tree removal and replacement, the LRCAM (AECOM, 2022) was developed during the design of LRS2A. The Master Plan demonstrated the approach to introducing light rail on Commonwealth Avenue in a manner that would provide a landscape structure consistent with the Griffins' vision for a Main Avenue.

A wide light rail track configuration has been selected for the Project for its ability to accommodate a single row of trees down the centreline of the 12 m wide Commonwealth Avenue median. Light rail operational clearances require a tree form with a sympathetic branching habit able to withstand under pruning. In developing the LRCAM and in consultation with the NCA, the Commonwealth Avenue landscape cross section has been adjusted. Specifically, a deciduous oak was selected for the median as best suited to meet the historical and operational constraints while still providing a stately avenue tree and meeting the intent of the NCP. The Master Plan configuration proposes a consistent median arrangement for the entire length of Commonwealth Avenue.

Tree replacement and succession planning has been informed by multiple phases of tree survey with a number of factors influencing the design. These have included heritage considerations, ACT policy, and design guidance on species selection, health, form, Useful Life Expectancy (ULE) of the trees, biodiversity values, asset management requirements, and stakeholder inputs. The final Landscaping Plan for the Project (refer to landscape and visual mitigation measures in Chapter 21 (Environmental management and mitigation measures)) will provide for tree replacement that maintains or enhances visual, landscape, biodiversity and/or heritage values, among other relevant considerations.

Light rail along Commonwealth Avenue would be wire-free with green track to manage visual impacts to the vista and adjacent heritage sites.

Differences between the State Circle East and National Triangle-Barton alignment options are discussed in Section 3.5.

3.4.3 Stop locations

There would be one light rail stop within the Commonwealth Avenue precinct – the Albert Hall Stop. The Albert Hall Stop is relevant to the State Circle East alignment option only. On the National Triangle-Barton alignment option, a separate stop would be provided south of the Treasury Building (within the National Triangle precinct) instead of the Albert Hall Stop.

The Albert Hall Stop would be located in the median of Commonwealth Avenue adjacent to the Albert Hall. Key trip generators in the catchment include Questacon, the Treasury, the National Library of Australia, the Hyatt Hotel Canberra, the southern lake foreshore, events in the National Triangle, and several diplomatic missions.

Design considerations for the Albert Hall stop have included optimal stop spacing, physical and visual heritage impacts to Albert Hall (including driveway access), the street layout of the Griffin Plan, walking access to the stop and opportunity for light rail–bus interchange.

The Albert Hall stop location has been investigated as part of the LRCAM. The LRCAM has demonstrated the approach to introducing light rail on Commonwealth Avenue in a manner consistent with the Griffins' vision for a Main Avenue.

The Albert Hall Stop location considered both the current and a potential future intersection layout at Commonwealth Avenue-King Edward Terrace. The LRCAM envisages a potential future intersection of Commonwealth Avenue and King Edward Terrace consistent with the geometry of the Griffin Plan. Options for a stop platform to the north and south of King Edward Terrace were considered. A location south of King Edward Terrace provided the best connectivity and avoided conflicting with the current and future intersection alignment, as envisaged in the LRCAM.

A new signalised pedestrian crossing to the Albert Hall Stop would be located in line with the potential future intersection. The pedestrian crossing would provide access to existing bus stops located within the verge, facilitating transfer opportunities. The existing pedestrian underpass of Commonwealth

Avenue would be retained as part of the Project, but has not been considered for access to the stop due to personal safety, accessibility, and inclusive design challenges.

3.5 Options considered – Parliament House, National Triangle, and Barton precincts

Key options that have been considered in the Parliament House, National Triangle and Barton precincts include:

- For the State Circle East alignment option (refer to Section 3.5.1):
  - Transition of the light rail alignment from Commonwealth Avenue to State Circle
  - Light rail track running options along the State Circle corridor
  - Light rail stop locations
- For the National Triangle-Barton alignment option (refer to Section 3.5.2):
  - Connection of the light rail alignment from Commonwealth Avenue to Kings Avenue
  - The light rail crossing of Kings Avenue
  - Light rail alignment options through Barton and connection with State Circle
  - Light rail stop locations
- For both alignment options, the transition of the light rail alignment from State Circle to Adelaide Avenue (refer to Section 3.5.3).

3.5.1 Light rail alignment (State Circle East alignment option)

State Circle forms the border of Capital Hill and serves an important movement function in the road network by connecting several key transport corridors including Commonwealth Avenue, Kings Avenue, Brisbane Avenue, Canberra Avenue and Adelaide Avenue. State Circle, between Commonwealth Avenue and Kings Avenue is within the National Triangle.

Key Project design considerations for State Circle as part of the State Circle East alignment option have included:

- Minimising visual impacts along the Main Avenues and to Capital Hill, respecting the views and vistas to and from Parliament House, minimising impacts to the heritage-listed State Circle Cutting and the Presbyterian Church of St Andrew
- Maintaining the symmetry and geometry of State Circle where possible and introducing a stop typology with architectural elements sympathetic to the area (such as curved platforms responding to the shape of the road)
- Designing and implementing light rail within the Inter-Town Public Transport System, retaining road network function, avoiding the need for traffic lights or complex intersections on Main Avenues where possible
- Maintaining the amenity of the Canberra Centenary Trail, which traverses the landscaped annulus.

Commonwealth Avenue to State Circle transition

For the State Circle East alignment option, the light rail alignment needs to transition from Commonwealth Avenue to State Circle. This area is on the northern side of Capital Hill and is currently a grade-separated road intersection. The LRCAM included a median running configuration (light rail track in the road median) on Commonwealth Avenue with a transition to a median running configuration on State Circle.

Moral Rights aspects, including potential landscape and visual impacts to Parliament House during construction and operation have also been considered in the design development process at this location.

Initial design development has identified design options for transition of light rail from Commonwealth Avenue to State Circle. All design options have assumed median running within the Commonwealth

Avenue median with at-grade options and grade separated options (covered sections allowing light rail to pass beneath traffic lanes) with different arrangements considered for light rail running on State Circle. An overview of the options considered at the transition from Commonwealth Avenue to State Circle are shown in Figure 3-7.

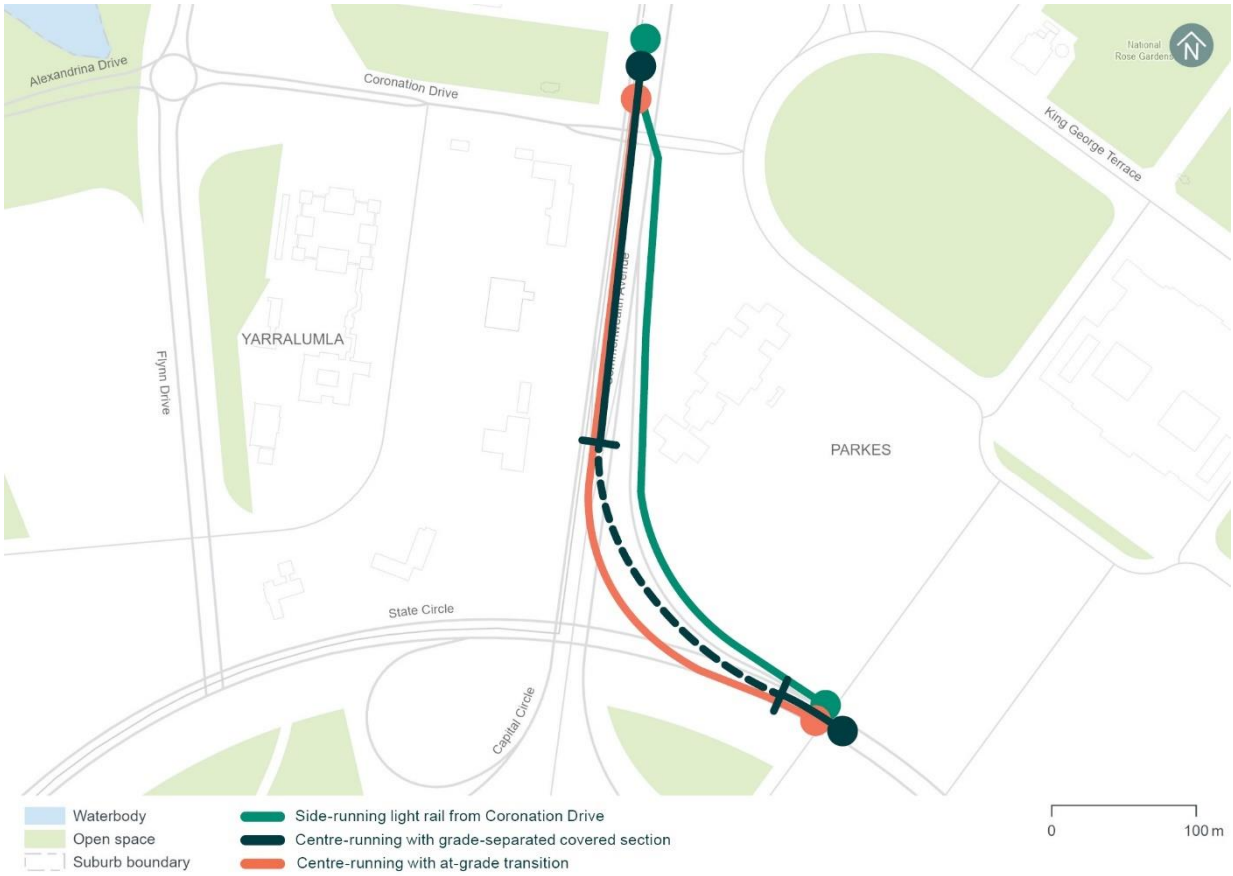


Figure 3-7 Overview of options considered for the light rail transition from Commonwealth Avenue to State Circle (State Circle East alignment option)

The design development process for the Project has confirmed the broad arrangement outlined in the LRCAM as being the most feasible. Although an at-grade option has been assessed to have fewer technical challenges, a grade-separated arrangement with a covered section would provide several benefits over an at-grade approach, including:

- As supported through consultation with the NCA, Department of Parliamentary Services, and the Giurgola Moral Rights Administrators, there would be several comparatively superior visual and heritage vista outcomes, including:
  - Preserving the symmetry of Commonwealth Avenue
  - The ability to deliver a discrete portal arrangement within the existing landscape that would connect the light rail alignment with State Circle
  - Avoiding visual clutter associated with a new set of traffic signals on Commonwealth Avenue that would be required for an at-grade approach
- Reduced potential for property impacts, including avoiding potential impacts to West Block (that would likely result with selection of an at-grade option)
- Comparatively reduced traffic and active travel safety impacts, including:
  - Avoiding the need for an additional set of traffic signals for south bound traffic on Commonwealth Avenue

- Adopting a design that would align with the ACT Active Travel Plan (Transport Canberra and City Services, 2023) and would avoid an unsafe interface between light rail and the southbound Commonwealth Avenue cycle lane. The design would also provide a safe light rail crossing arrangement for a future shared path on the outer verge of State Circle.

State Circle light rail running options

Investigations have considered three options for light rail running on State Circle, being inner running (light rail track closest to Capital Hill), median running (in the median of State Circle), and outside running (light rail track furthest away from Capital Hill). Potential visual impacts to the Parliament House Vista during construction and operation have been a primary consideration in developing design options at this location.

Constraints influencing the decision on light rail running have included:

- Retaining two traffic lanes in each direction on State Circle, in addition to turning lanes at intersections
- Protecting heritage elements including:
  - The cutting beneath Federation Mall (State Circle Cutting)
  - The Presbyterian Church of St Andrew between Canberra Avenue and Sydney Avenue
  - York Park
- Proximity to the planned National Security Office Precinct between Brisbane Avenue and York Park.

Retaining the existing number of traffic lanes on State Circle would require realignment of the State Circle outer carriageways to provide sufficient space for light rail. The need for road realignment combined with the localised heritage constraints listed above made it apparent that outer running would not be a feasible option.

The following two arrangements for light rail running have been investigated further as shown in Figure 3-8:

- A median running option within the median of State Circle. This would require the realignment of State Circle into Capital Hill to accommodate the light rail corridor
- An inner running option that would generally, when compared to the median running option, avoid road realignment and comparatively reduce the need for intersection adjustments.

Figure 3-8 Typical cross section adjacent to Melbourne Avenue showing median running and inner running options for light rail on State Circle

As part of the State Circle East alignment option, median running has been identified as the preferred option because it would:

- Provide stops at locations to balance connections to employment and other key destinations
- Avoid physical impacts to heritage items during both construction and operation including the State Circle Cutting, Federation Mall, and the Presbyterian Church of St Andrew
- Maintain the general operational function for road vehicles on State Circle and minimise potential impacts to access and circulation
- Maintain the outer verge width of State Circle and avoid the need for property acquisitions
- Avoid impacts to the circular form and geometry of State Circle (relative to other options).

Notwithstanding, an inner running option on State Circle would support similar outcomes as those described above (refer further to Section 3.5.2).

Within the median running option, four sub-options have been considered to reduce cross-section width and impacts to the inner verge of State Circle. These have included curved island stop platforms with wide track centres, side platforms with both continuous and varying track centres and offset platforms.

The curved island platform stops with wide track centres have been selected on the basis that wide track centres would be required to pass beneath the Federation Mall bridges and their existing piers without impacting on the existing heritage cutting. The encroachment into the inner verge of State Circle would be greatest at stop locations (curved island stops provide a narrower footprint when compared to side platforms). Island stops would also avoid duplication of platform infrastructure such as canopies, ticketing machines and cabinets. This would be beneficial because the island stop design would result in less visual clutter in this highly visually sensitive landscape. For the State Circle East alignment option, and considering median running, offset platforms and side platforms with varying track centres have been determined to be less desirable for light rail operations, customer comfort and ease of use.

Discussion regarding arrangements for light rail running on State Circle for the National Triangle-Barton alignment option is included in Section 3.5.2.

Stop locations

For the State Circle East alignment option, stops would be located at Albert Hall (in the Commonwealth Avenue precinct), Kings Avenue, Sydney Avenue and Melbourne Avenue (in the Parliament House precinct). Light rail stop spacing has been determined based on the need to balance connectivity, patronage, and journey time.

The stops on the State Circle East alignment option would be located at existing road junctions on State Circle to maximise patronage within the Barton precinct, an NCP Defined Activity Centre. Spacing between light rail stops would be subject to patronage and placemaking opportunities as well as traffic and safety risks. City centre stops are normally closer together to better connect people to places of work, education, and leisure.

The Kings Avenue Stop would be located in the median of State Circle on the southern side of the intersection with Kings Avenue. The nearest light rail stops would be Albert Hall Stop, located around 1.2 km to the north-west, and Sydney Avenue Stop, located around 400 m to the south. Key trip generators in the catchment would include Parliament House, Old Parliament House, the Australian Federal Police, the Office of National Intelligence, the National Security Office Precinct, Centenary Trail, and events in the National Triangle.

The Sydney Avenue Stop would be located in the median of State Circle on the northern side of the intersection with Sydney Avenue. The nearest light rail stops would be Kings Avenue Stop, located around 400 m to the north, and Melbourne Avenue Stop, located around 700 m to the south-west. Key trip generators in the catchment would include Telopea Park School, the Department of Foreign Affairs and Trade, and the new Australian Tax Office.

The Melbourne Avenue Stop on the State Circle East alignment option would be located in the median of State Circle, east of the intersection with Melbourne Avenue and State Circle. The nearest light rail stop would be the Sydney Avenue Stop, located about 700 m to the north-east. Key trip generators in the catchment would include Parliament House and embassies.

A Melbourne Avenue Stop is also proposed for the National Triangle Barton alignment option, in the inner verge of State Circle, east of the intersection with Melbourne Avenue and State Circle.

3.5.2 Light rail alignment (National Triangle-Barton alignment option)

The National Triangle is a place with substantial heritage values containing cultural institutions and significant employment hubs. The National Triangle is formed by Commonwealth, Kings, and Constitution Avenues.

Notwithstanding the alignment option chosen through this area, an appropriate design would be required given the significant contribution of this area to the Parliament House Vista and National Triangle landscape, including views to and from Old Parliament House along the Land Axis.

The Project design for this alignment option has considered specific stop locations outside sensitive vistas, appropriate use of green track and landscaping, prioritising tree retention in some locations over road traffic impacts. The design has also included clutter free public plaza spaces that reinforce the main vista and improves active travel spaces.

Within the National Triangle, the Project would provide light rail infrastructure and accessible and convenient stop locations while effectively managing heritage, visual, tree, and property impacts. Impacts to local traffic, property access, and movement have also been key considerations in design development for this alignment option.

Connection from Commonwealth Avenue to Kings Avenue

As shown in Figure 3-9, options considered for connecting light rail from Commonwealth Avenue to Kings Avenue have included King Edward Terrace, King George Terrace, and Queen Victoria Terrace. Each of these connection options would introduce light rail to relatively narrow tree-lined streets with heritage values. Given the relatively narrow width of the streets in this area, introducing light rail would generally either require changes to local traffic circulation (to avoid mixing of light rail and vehicles) or widening of the streets to accommodate light rail and vehicles with associated impacts to the road verge, including removal of street trees.

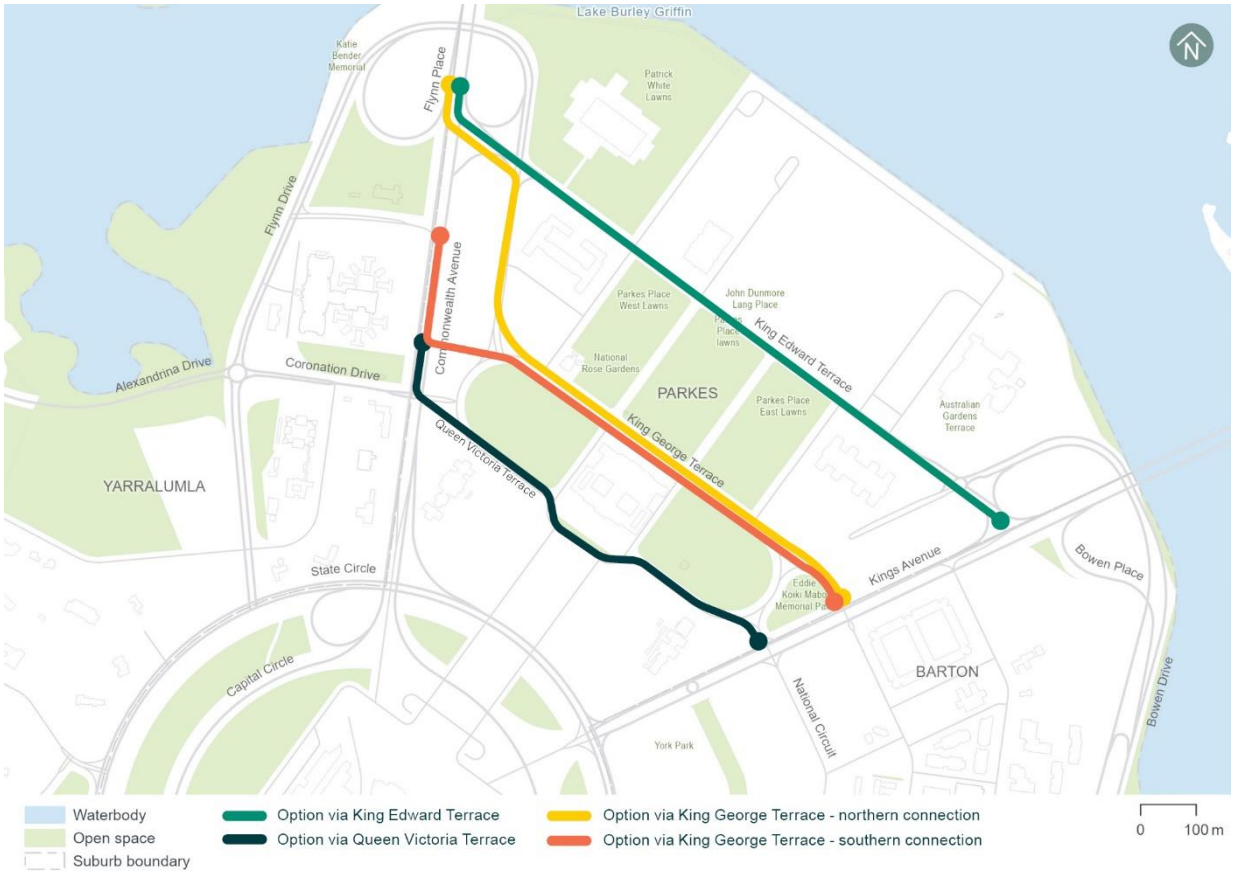


Figure 3-9 Light rail connection options considered from Commonwealth Avenue to King George Terrace

A connection option via Queen Victoria Terrace was discounted early in the design development process based on a number of factors including impacts on the view from Parliament House, street trees, and local traffic and property access impacts. This connection option would also be further away from key destinations including national institutions within the National Triangle and therefore overall journey time would be greater for those seeking to access these destinations.

King Edward Terrace is currently the main traffic route across the National Triangle. The King Edward Terrace connection option would result in traffic impacts and property access constraints (such as challenges for access to carparks, institutions, and offices). Ongoing development within and adjacent to the National Triangle would mean that a connection from King Edward Terrace to State Circle would not be feasible.

King George Terrace has been selected as the most appropriate connection option across the National Triangle because it would be more direct (shorter light rail journey time) and centrally located to employment and cultural institutions.

As shown in Figure 3-9, two sub-options for the connection between Commonwealth Avenue and King George Terrace have been investigated:

- A ‘northern’ connection option via King Edward Terrace and Langton Crescent
- A ‘southern’ connection option directly from Commonwealth Avenue to King George Terrace on the northern side of Coronation Drive.

The ‘southern’ connection option from Commonwealth Avenue to King George Terrace has been identified as preferred because the connection option would have fewer tight turns and would therefore minimise potential associated noise and vibration impacts. It would also include fewer areas where light rail vehicles (LRVs) would be required to travel at lower speeds (and would therefore result in a comparatively better journey time). This option would also avoid direct impacts to breeding habitat for the Gang-gang Cockatoo, which is endangered under the EPBC Act.

Crossing of Kings Avenue

Following the selection of King George Terrace as the preferred route through the National Triangle, two sub-options have been considered to cross Kings Avenue into Barton. The first would cross Kings Avenue to connect with Macquarie Street. The second option would use Walpole Crescent and Queen Victoria Terrace to cross Kings Avenue into National Circuit. The option crossing Kings Avenue to connect with Macquarie Street has been identified as the preferred option because it would:

- Better maintain the symmetry of the National Triangle (and would therefore reduce visual impacts to heritage items)
- Provide greater opportunity for a more centrally located light rail stop within Barton
- Be consistent with the NCP development plan for the National Triangle
- Have comparatively lower environmental impacts, including impacts to street trees that also have local landscape character sensitivities
- Avoid interactions with sensitive communication assets expected in the vicinity of the intersection of National Circuit and Kings Avenue.

Light rail through Barton and connection with State Circle

Light rail through Barton would improve transport connectivity and would provide opportunities to further activate the area through careful design and placemaking considerations. The precinct is typically busy during working hours with limited evening and weekend activity despite the concentration of residences, hotels, and accommodation.

With an aim to better connect employment hubs in the area with other parts of the Light Rail network, consideration has been given to minimising impacts while also optimising journey time for passengers. Key design considerations through Barton have included:

- The ability to retain vehicular access to properties
- Minimising local traffic impacts (during both construction and operation) and on-street parking loss
- Limiting impacts to commercial premises, hotel guests and events
- Minimising landscape character impacts including tree removal and impacts to canopy cover
- Minimising other environmental impacts including heritage, noise, and vibration considerations.

Starting on Macquarie Street at Kings Avenue the assessment considered several possible routes for connection through Barton and then back up and onto State Circle.

As shown in Figure 3-10, three options have been considered through Barton between Kings Avenue and Brisbane Avenue:

- Option 1: Median running on Macquarie Street through to Brisbane Avenue, with one traffic lane in each direction
- Option 2: Median running on Macquarie Street, turning onto Blackall Street and then onto National Circuit through to Brisbane Avenue, with one lane of traffic in each direction
- Option 3: Median running on Macquarie Street, turning onto Bligh Street and then onto National Circuit through to Brisbane Avenue, with one lane of traffic in each direction.

Running on National Circuit between Bligh Street and Kings Avenue was not considered due to the constraints discussed in the National Triangle (refer Section 3.2.2).

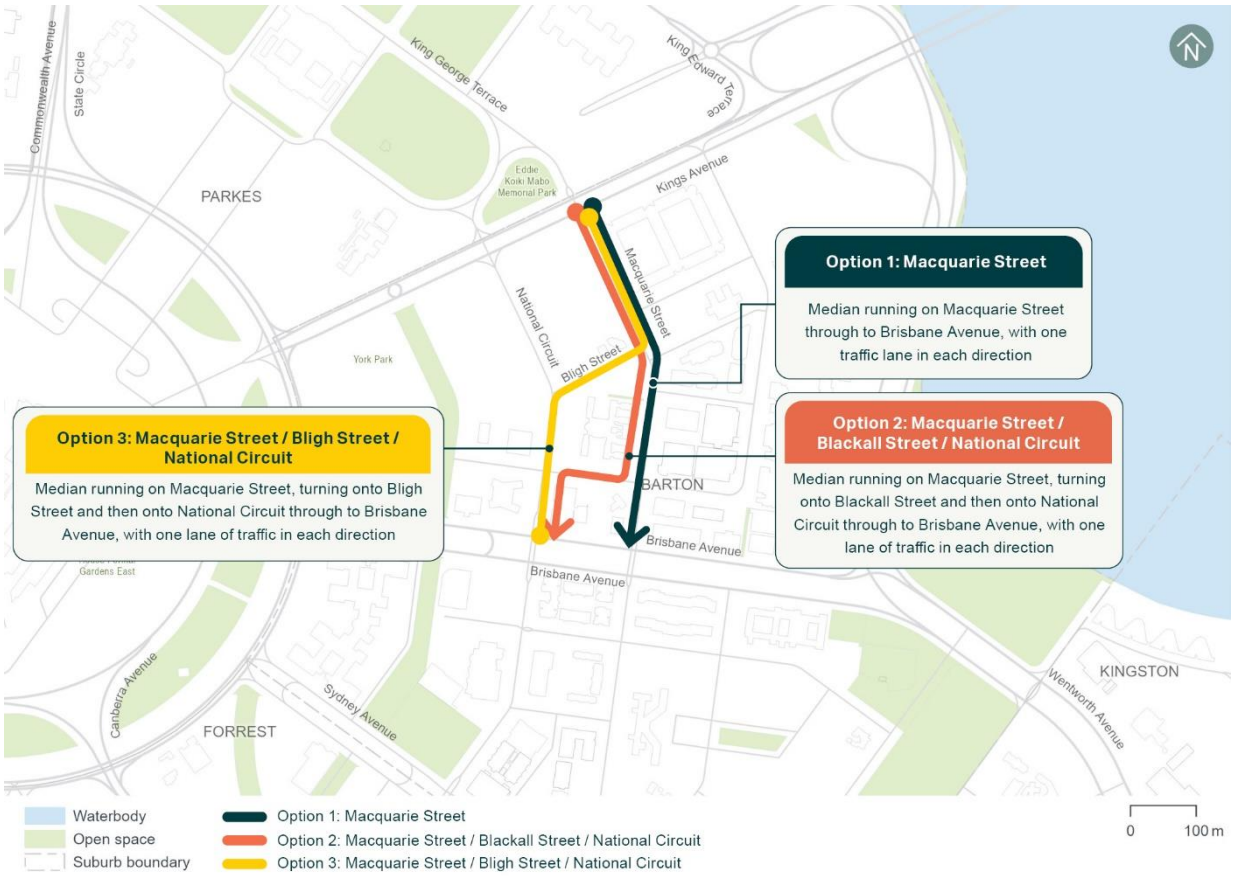


Figure 3-10 Light rail connection options considered through Barton

In relation to Option 1, the vertical grade of Macquarie Street between Blackall Street and Brisbane Avenue is steep and considered a poor outcome for light rail running. Locating a stop on Macquarie Street would also be constrained by grades, driveway access and its local road network function role, making location of a stop challenging. Further south along the alignment, this option would also interact with heritage places and precincts (such as the Barton Housing precinct).In relation to Option 2, the grades of Blackall Street between Macquarie Street and National Circuit are also steep and therefore would be present design challenges and interface with several property accesses. Blackall Street is an important connection between Kings Avenue and the planned National Security Office Precinct and would require maintaining through vehicle traffic on Blackall Street, therefore substantially limiting the ability to include a light rail stop at this location.

In relation to Option 3, the grades on Bligh Street are generally flat and suitable for light rail. The local traffic function provides the opportunity to place a stop here with limited impacts to local traffic functionality while still maintaining access to properties on Bligh Street.

For all options the existing road carriageway widths would need to be widened to allow for dedicated light rail track and a single lane of traffic in each direction. This would result in the need to remove existing street trees, and would require 'left-in, left-out' arrangements for vehicles entering and exiting properties along these streets (for safety reasons vehicles would be restricted from crossing the light rail track).

In response to these issues, several design options have been considered to reduce overall width requirements and minimise impacts to street trees. These options have included shared running (private motor vehicles sharing the trackform with LRVs, with no exclusive right of way for light rail) and asymmetric running (offsetting the light rail track from the centre of the existing roadway).

Shared-running has been determined to be unsuitable because it would not meet the Light Rail network and operations principles (refer to Section 3.2.2) relating to journey time reliability, particularly along a busy road such as National Circuit and in a central point of the Light Rail network.

Asymmetric running has been determined to be unsuitable as this arrangement only provides space for a traffic lane to access properties on one side of the street. However, access would be required along both sides of the street, and asymmetric running would therefore result in a loss of property access along one side of the street. Asymmetric running would still result in impacts to trees on at least one side of the road during construction. Asymmetric running has been adopted for small section of Macquarie Street to allow light rail to safely turn onto Bligh Street from Macquarie Street, and to avoid direct property impacts and land acquisition.

A configuration with single track running using the corridors of Macquarie Street and National Circuit was also considered in response to key challenges, as shown in Figure 3-11.

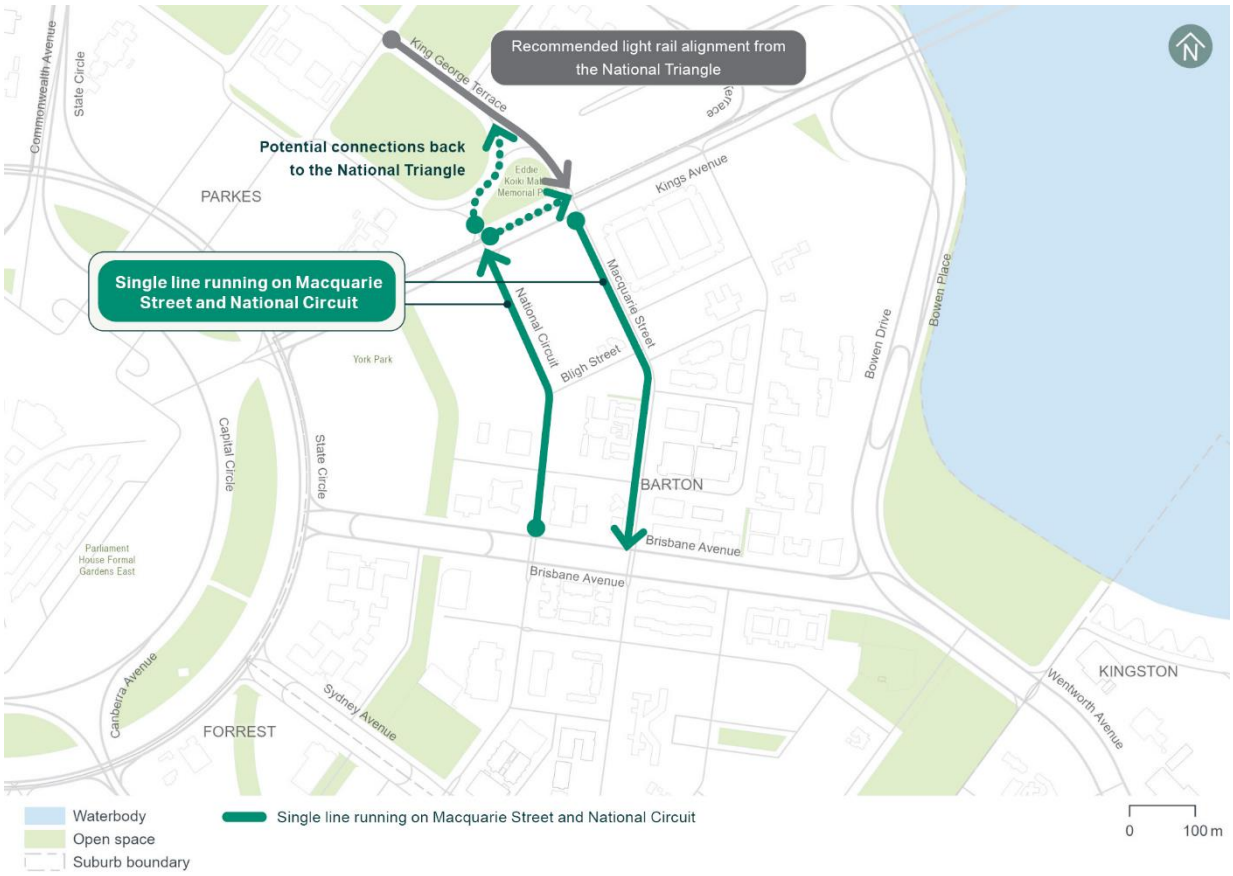


Figure 3-11 Alternative light rail connection option considered through Barton

Notwithstanding, a single track running arrangement would:

- Require additional works on Kings Avenue and or Walpole Crescent (in the National Triangle) to 're-connect' the single track arrangement
- Be less intuitive for passengers (a confusing design arrangement that would not be as easy to use, especially for infrequent users)
- Effectively duplicate the expected property interface impacts (including for driveway access), and the potential for conflicts with pedestrian movements
- Have the vertical alignment grade challenges on Macquarie Street between Blackall Street and Brisbane Avenue
- Likely have a greater level of disruption, resulting in construction traffic impacts, noise impacts, impacts on utilities and broader amenity impacts along both Macquarie Street and the National Circuit.

Given these constraints and challenges, Option 3 has been identified as the preferred option given that it:

- Works best with the existing street gradients
- Allows for a stop to be located on Bligh Street while maintaining local access and minimising impacts to the broader local traffic network
- Provides for a stop in an optimum catchment location with ability for interchange
- Allows for the continuation of the current rapid bus routes on National Circuit.

As part of design development for this option, potential heritage impacts associated with Hotel Kurrajong's landscape setting and street tree plantings have been considered and minimised to the extent possible. Track design, stop design, and landscape design measures have all sought to minimise tree removal. Tree replacement would respond to the surrounding landscape character, with the Bligh Street Stop designed to allow for the reinstatement of trees in generally the same location and position as those to be removed. Wire-free running through this area would also be adopted to minimise visual impacts.

Brisbane Avenue to State Circle

Brisbane Avenue, Sydney Avenue, and Canberra Avenue have all been considered as options to connect the National Triangle-Barton alignment option with State Circle. Considerations for this connection have included potential heritage and environmental constraints, gradients, traffic impacts during construction and operation, stop spacing and customer catchments around stops, as well as ease of access to a light rail stop in this area. Sydney Avenue has been selected as the preferred option because it would provide the opportunity for a centrally located stop within the Barton catchment, with safe and convenient walking connections. A light rail route on Sydney Avenue would also have fewer traffic impacts compared to Brisbane or Canberra Avenues.

Stop locations

The National Triangle-Barton alignment option would include three stop locations at Treasury (in the National Triangle precinct), Bligh Street, and Sydney Avenue (in the Barton precinct). The stop locations have been selected to balance coverage with light rail journey time, to provide regular stop spacing, to locate stops centrally within catchments and to provide opportunities for urban realm upgrades and/or redevelopment adjacent to the stops. In addition to potential impacts to heritage values in a highly sensitive area, constraints such as gradient, motor vehicle access to properties and locating stops where safe pedestrian crossings could be provided have been important decision-making factors.

The Treasury Stop would be located at the intersection of King George Terrace and Langton Crescent. The nearest light rail stop would be Bligh Street Stop, located around 1 km to the south-east. The

Treasury Stop has been identified as the preferred stop location in the National Triangle because it would be consistent with the long-term development plan in the NCP and would:

- Be located within a convenient walk of employment and cultural institutions
- Minimise visual heritage impacts on Old Parliament House and would be located on the periphery of the Parliament House Vista
- Avoid impacts to trees on King George Terrace with heritage value
- Provide the opportunity for the design of a high amenity stop in a campus landscape setting, consistent with NCP aspirations.

A stop location around the eastern end of Bligh Street has been preferred due to its central location within the Barton catchment, the opportunity to provide regular stop spacing coverage along the light rail alignment and the opportunity to provide convenient transfer opportunities to rapid bus services at the Barton Interchange. Further, the width of National Circuit and Macquarie Street would also limit the ability to include a light rail stop, which would require space for trackform, stop platforms, formal tree plantings, and a traffic lane in each direction to maintain property access. A stop located on a local access street such as Bligh Street would also enable safer walking access for the volume of expected patronage by effectively creating a plaza environment rather than an island stop platform in the middle of a busy road such as National Circuit.

The nearest light rail stops to Bligh Street Stop would be Treasury Stop, located around 1 km to the north-west, and Sydney Avenue Stop, located around 700 m to the south-west.

The stop location on Sydney Avenue between National Circuit and Windsor Walk / Game Court has been selected to provide regular stop spacing coverage along the light rail alignment, and to provide access to major trip generators such as the new Australian Tax Office building. In addition to paths on Sydney Avenue, the stop location would also tie into existing direct walking connections via Windsor Walk, Game Court, and John McEwen Crescent. The nearest light rail stops to Sydney Avenue Stop would be Bligh Street Stop, located around 700 m to the north-east, and Melbourne Avenue Stop, located around 900 m to the west.

Light rail running on State Circle for the National Triangle-Barton alignment option

Section 3.5.1 discusses options considered for light rail running on State Circle for the State Circle East alignment option as well as the significance of Capital Hill and design drivers to reduce potential impacts.

As with the State Circle East alignment option, the National Triangle-Barton alignment option would need to transition onto State Circle. The National Triangle-Barton alignment option would transition across the Sydney Avenue and State Circle intersection and be aligned within the inside verge of State Circle. The Melbourne Avenue Stop would therefore be located on the inner verge east of the intersection of State Circle and Melbourne Avenue for the National Triangle-Barton alignment option (refer to Figure 3-5).

While the landscape character related to the topography and vegetation of Capital Hill would be moderately impacted, inner running has been identified as the most suitable option because it would:

- Provide a safe angle of approach for cyclists
- Reduces the extent of regrading required for the light rail alignment
- Reflect the heritage values of the strong circular form of State Circle by embedding the track into the landscape setting of Capital Hill with landscape planting.

3.5.3 State Circle to Adelaide Avenue transition

A common challenge for both alignment options would be the Project's transition to Adelaide Avenue from State Circle. The light rail alignment would need to transition from State Circle to Adelaide Avenue on the south-western side of Capital Hill. Capital Hill is a highly sensitive area due to the location of Parliament House and is an area of Aboriginal cultural significance. Prior to the arrival of Europeans in Australia, this region had a range of important ceremonial sites for local Aboriginal peoples.

A two-stage design competition for Parliament House was held beginning in 1979. Criteria against which the entries were judged included that the design must respond in a sensitive manner to both the natural environment including those qualities of environment that are uniquely Australian (climate, landscape, vegetation, and quality of light), and the Griffins' concept of the most significant national building being at the apex of the National Triangle. The design was to symbolise the unique national qualities, attributes, attitudes, aspirations, and achievements of Australia. The criteria also encouraged public access and involvement in the design. Parliament House was not intended to appear remote and inaccessible; access to both the site and the building was meant to be facilitated. The annulus between Capital Circle and State Circle was planted and expected to remain as open space.

The two principal constraints that have been considered in developing design options for the transition of the light rail alignment from State Circle to Adelaide are:

- The need to minimise visual impacts to the Parliament House Vista during construction and operation
- The grade change between State Circle and Adelaide Avenue. The vertical alignment of State Circle dips as it approaches Adelaide Avenue to allow it to pass beneath.

Following review of a long list of options, six options have been evaluated for the transition from State Circle to Adelaide Avenue, as shown on Figure 3-12. All options have assumed median running on Adelaide Avenue due to the existing median providing space for light rail trackform, island stop platforms, access from existing road interchanges and a symmetrical urban design without impacts associated with realigning the existing road. The options included:

- Option 1: Connection between State Circle (median or inner running options) and Adelaide Avenue, passing through the landscape area to an at grade signalised crossing of the Capital Circle transition to Adelaide Avenue (westbound carriageways), and a new light rail bridge over State Circle connecting with the Adelaide Avenue median
- Option 2: State Circle median running passing under the westbound road bridge that connects Capital Circle to Adelaide Avenue, connecting to the median of Adelaide Avenue via a long slot structure starting between the two bridge structures
- Option 3: Crossing State Circle at new traffic signals and entering a short underpass of the westbound carriageway of Adelaide Avenue, then following a long slot up onto the Adelaide Avenue median
- Option 4: A viaduct for light rail starting west of the intersection of Melbourne Avenue, passing over State Circle, transitioning to the Adelaide Avenue median via an at-grade signalised crossing of the westbound carriageway of Adelaide Avenue
- Option 5: Removal of the existing bridges over State Circle and replacement with a land bridge that maintains existing road traffic movements. Light rail would access the Adelaide Avenue median via this land bridge. The State Circle vehicle lanes would be arranged to maintain existing vehicle movements
- Option 6: Connection to the Adelaide Avenue median at-grade via the westbound on-ramp from State Circle to Adelaide Avenue with a signalised crossing of the Adelaide Avenue westbound carriageway adjacent to the entrance to The Lodge.

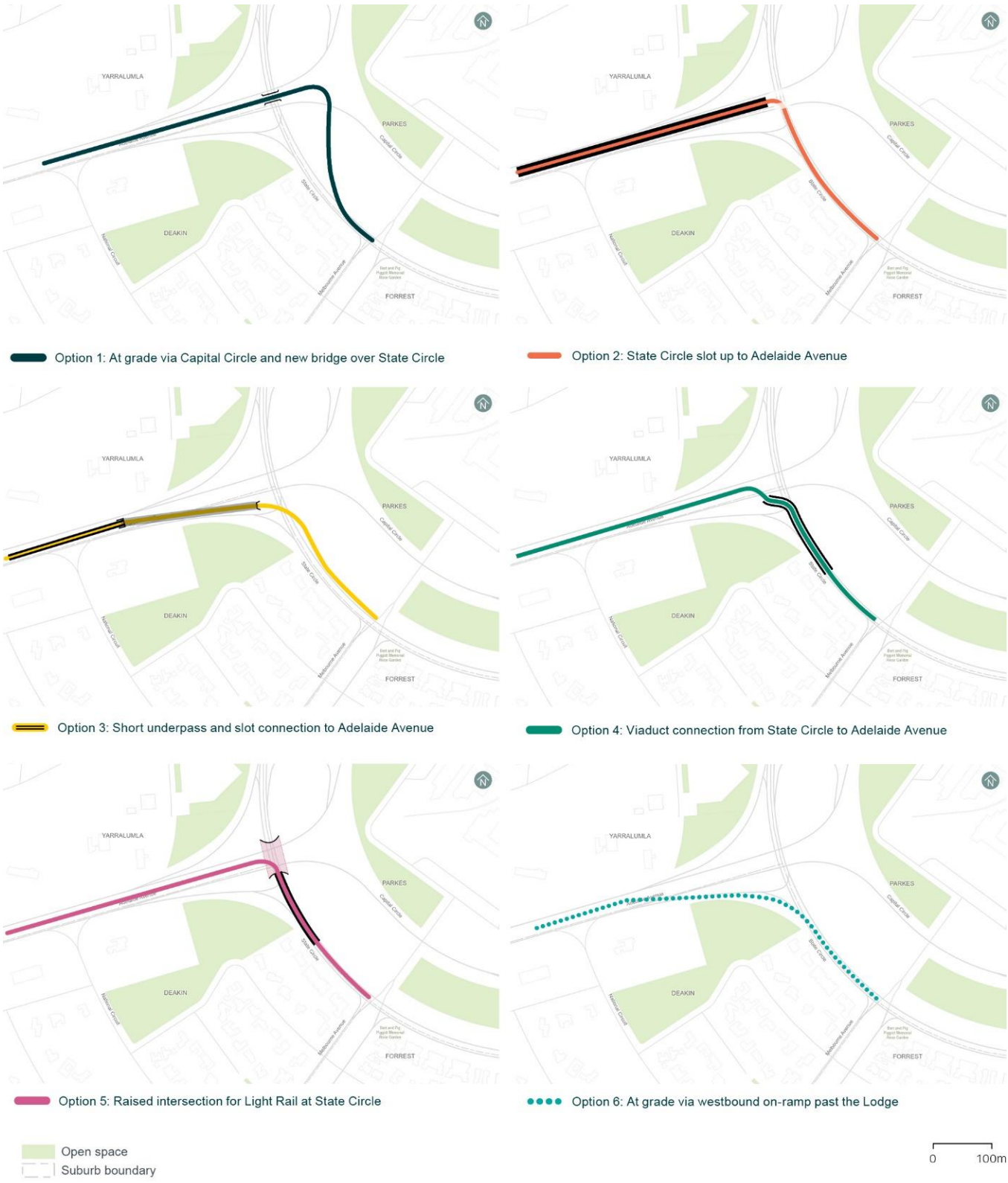


Figure 3-12 Options considered for transition of light rail between State Circle and Adelaide Avenue

An evaluation of the six options shown in Figure 3-12 has concluded that none of the options would perform better or worse if the State Circle East alignment option or the National Triangle-Barton alignment option were to be adopted. The initial evaluation has also discounted four of the options (Option 3, Option 4, Option 5 and Option 6) for the following reasons:

- Option 3 has been discounted because it is similar to Option 2, with Option 3 having relatively greater engineering, constructability, and traffic impacts as well as resulting in more substantial potential landscape and visual impacts than Option 2
- Option 4 and Option 5 have not been progressed due to the potential visual clutter and permanent visual impacts to the Parliament House Vista related to the substantial change in landscape character as a result of either a substantial new bridge infrastructure (Option 4) or the extensive earthworks requirements associated with Option 5
- Option 6 has not been progressed due to steeper than desirable gradients for the light rail track on the westbound on-ramp and potential security concerns for, and permanent visual impacts to, The Lodge. This option would also have similar visual impacts as Option 5 in relation to the introduction of traffic signal infrastructure on Adelaide Avenue.

The remaining two options (Option 1 and Option 2) have been subject to more detailed investigation, including further design development and stakeholder engagement. The criteria used to further assess Option 1 and Option 2 have included consideration of landscape and visual amenity, heritage, and biodiversity impacts as well as constructability and safety.

The key outcomes of the more detailed investigations into Option 1 and Option 2 have included:

- In relation to Option 1:
    - Option 1 would result in the removal of vegetation within the landscaped annulus between State Circle and Capital Circle, and would alter the landscape character of this area through the introduction of new traffic signals on Capital Circle and a new light rail bridge between the existing Adelaide Avenue road bridges over State Circle
    - The Parliament House design competition documentation and submissions from the Giurgola Moral Rights Administrator and the Department of Parliamentary Services have been reviewed to understand the design intent of the landscape setting of Capital Hill and Parliament House. This review and feedback from stakeholders has identified key design objectives for further development of Option 1 to address stakeholder concerns associated with physical and visual impacts to the landscape and visual setting of Parliament House
    - The alignment of Option 1 within the landscaped annulus between State Circle and Capital Circle would remain within the ‘road’ zoning. It would therefore be generally consistent with mapping presented in the NCP Parliamentary Zone policy. While transport uses are permissible in the zone, the policy protects the setting of Parliament House by not permitting urban development. The traffic signals on Capital Circle required as part of the Option 1 design would not be centrally located within the Parliament House Vista from Adelaide Avenue and the design would retain public access and use of the open space within the landscaped annulus
- In relation to Option 2:
    - Given the topography of Adelaide Avenue rising away from State Circle, the long slot structure associated with Option 2 would need to extend for around 450 m before reaching the surface level of Adelaide Avenue
    - The length of the slot structure would result in visual impacts to The Lodge and the view to Capital Hill from Adelaide Avenue
    - There would be complexities associating with siting the light rail alignment between the existing foundations of the ageing Adelaide Avenue bridges over State Circle.

Further assessment of Option 1 and Option 2, including consultation with NCA and other key stakeholders, has resulted in the Project adopting Option 1. Noting the potential impacts associated with Option 1, design development for the Project will continue to engage with key stakeholders in order to optimise the design response in relation to these constraints.

3.6 Options considered – Inner South precinct

Key options that have been considered in the Inner South precinct include:

- Light rail route within the Adelaide Avenue corridor (refer to Section 3.6.1)
- Adelaide Avenue design considerations (refer to Section 3.6.2)
- Stop locations (refer to Section 3.6.3).

3.6.1 Light rail route (Adelaide Avenue corridor)

All options considered for transition of light rail from the Parliament House precinct (refer to Section 3.5.3) include a light rail alignment within the Adelaide Avenue corridor. Light rail route options within the Inner South precinct have therefore focused on the Adelaide Avenue corridor.

Based on the preferred option for the transition of light rail to Adelaide Avenue from State Circle via a central median arrangement as well as property constraints associated with The Lodge to the south and several embassies to the north, central median running along Adelaide Avenue has been progressed.

3.6.2 Adelaide Avenue design considerations

Notwithstanding the progression of the light rail alignment with central median running within the Adelaide Avenue corridor, there have been several considerations that have influenced the Project design within the Inner South precinct. These considerations relate to opportunities to enhance Adelaide Avenue as a Main Avenue consistent with the NCP Main Avenues and Approach Routes Precinct Code, and to enhance the landscape and visual setting on approach to Parliament House from the south.

The form and function of Adelaide Avenue has deviated substantially from the 1918 Griffin Plan. While other approach routes have been designed as boulevards, Adelaide Avenue was developed in the 1960s as an urban motorway without formal landscaping, footpaths, or at-grade intersections. It also follows the pre-existing undulating topography with Parliament House not entering the view for those approaching Capital Hill until a point just west of Hopetoun Circuit. From Hopetoun Circuit to State Circle, Adelaide Avenue follows the geometry of the 1918 Griffin Plan, has views of Parliament House uninterrupted by topography, and includes The Lodge.

The introduction of light rail provides an opportunity to create a formal avenue befitting its status in the Griffins' plan for Canberra. Currently, the landscape of Adelaide Avenue is limited to informal tree plantings within the verges, which is inconsistent with its classification under the NCP as a Main Avenue. The NCP Main Avenues and Approach Routes Precinct Code requires Main Avenues to be developed and maintained as high quality landscaped corridors where the landscape design increases in formality on approach to the Central National Area.

The Project has adopted design measures for this area that are consistent with a Main Avenue. Design measures would include green track (from the northern extent of the Inner South precinct to Hopetoun Circuit), wire-free running (transitioning to over-head wiring at the Hopetoun Circuit Stop), and narrow track centres with twin rows of formal tree plantings along the outside of the tracks. These would create an identifiable approach to the Central National Area, establish formal Avenue plantings, enhance the significant view of Parliament House, and reinforce the Griffins' landscape structure.

Wire-free running in these areas would reduce visual impacts associated with overhead wires and would therefore also minimise impacts to the heritage values of Parliament House and The Lodge.

3.6.3 Stop locations

There would be two stops in the Inner South precinct – the Hopetoun Circuit Stop and the Kent Street Stop.

Hopetoun Circuit Stop

The Hopetoun Circuit Stop would be a grade-separated stop located in the median of Adelaide Avenue, immediately to the west of Hopetoun Circuit. The nearest light rail stops would be the Melbourne Avenue Stop, located around 1.5 kilometres to the north-east, and the Kent Street Stop, located around 700 m to the south-west. Major trip generators in the catchment would include the Deakin Group Centre to the south-west of the stop as well as nearby schools.

Based on operational parameters for wire-free running, the light rail would transition at the Hopetoun Circuit Stop from wire-free running to use of overhead wiring. Overhead wiring would be adopted from this location through to the Woden Interchange in the south. Technical considerations that have determined the viability of a wire-free route have included the distance between stops where an LRV can travel wire-free using existing battery technologies taking gradients and operating speed into account. Additionally, the transition to over-head wires would need to occur at a stop with a traction power substation located nearby.

Four options for the location of the Hopetoun Circuit Stop platform have been considered

- Three options within the median of Adelaide Avenue (one to the east, one to the west, and one directly over Hopetoun Circuit on a new bridge structure)
- A slot-dive option where the rail alignment would descend from the median of Adelaide Avenue through a slot structure to a stop on Hopetoun Circuit.

The stop platform within the slot-dive arrangement introduced several concerns relating to a lack of passive surveillance and potential conflicts between LRVs, road vehicles and pedestrian movements on Hopetoun Circuit. Local traffic circulation would also be impacted with the introduction of another crossing and set of signals on Hopetoun Circuit. This option was therefore discounted.

Of the Adelaide Avenue median options, the western side has been identified as the preferred due to the location providing more direct and convenient walking access to the Deakin Group Centre (a main attractor for the stop) as well as the stop platform and overhead wires having less visual impact on the Parliament House Vista.

Kent Street Stop

The Kent Street Stop would be located near where the light rail alignment transitions from the Inner South precinct to the Yarra Glen precincts. For this reason, options for locating a light rail stop in this area have been considered in both the Inner South and Yarra Glen precincts. Three potential stop locations have been investigated to serve the Yarralumla, West Deakin, and North Curtin area:

- At the Kent Street overpass
- Adjacent to the Cotter Road overpass
- Near the Royal Australian Mint.

Initial investigations have determined that all three stop locations would be feasible, with the stop near Cotter Road presenting greater delivery constraints. Further investigations into a Cotter Road stop have resulted in this location being discounted because:

- The arrangement of the existing Cotter Road piers would result in:
    - A sub-optimal ‘narrow track centre configuration’ in order for the light rail to pass between the piers
    - A light rail track arrangement that would require a side platform rather than a central platform configuration. This would subsequently require double the vertical transport infrastructure requirements for lifts and stairs
    - A sub-optimal design outcome with the light rail alignment being on a curve once it had passed through the Cotter Road bridge piers as it transitioned onto Yarra Glen
- Limited catchment and challenges creating a meaningful place outcome, with poor connections into the broader road network and limited opportunity for interchange connectivity.

A Kent Street Stop has been identified as preferred due to the ability to tie into existing infrastructure and connections to existing communities. The Kent Street Stop would facilitate greater access to light rail via a number of modes, including active travel (walking and cycling) and via existing bus networks. The nearest light rail stops would Hopetoun Circuit Stop, located around 700 m to the north-east, and Carruthers Street Stop, located around 2 km south-west.

A light rail stop at a location near the Royal Australian Mint (the Mint) has also been considered. While a stop at this location would support future growth in North Curtin and the Molonglo Valley, the current

catchment area is limited based on existing land uses. The infrastructure to support accessibility to the area, such as provision for bus and active travel, is also currently limited.

Planning for future growth and development in Woden is outlined in the Woden District Strategy (ACT Government, 2023), which identifies areas for change along the light rail corridor. Further planning and investigations into potential opportunities in Woden are being addressed through the development of the Southern Gateway Planning and Design Framework, as well as planning for the North Curtin Residential Area which is noted on the Indicative Land Release Program as being slated for initial release in 2028-29. The Southern Gateway Planning and Design Framework will further outline the strategic directions for growth and development in the Inner South and Woden Districts, including an integrated land-use and transport plan in and around Yarra Glen and North Woden.

Given this, and to provide flexibility for future land-use and transport plans, the Project design has been developed to not preclude the placement of a stop in the Yarra Glen median near the Mint, i.e. the light rail tracks would be sited with sufficient space for a stop platform.

While the Southern Gateway Planning and Design Framework does not form part of this EIS or this EPBC Act process, consideration of an alternative to the Kent Street Stop near the Mint, and other corridor development options, is ongoing. Implementation of the final Southern Gateway Planning and Design Framework would be subject to a separate assessment and approvals process.

3.7 Options considered – Yarra Glen precinct

Key options that have been considered in the Yarra Glen precinct include:

- Light rail route options (refer to Section 3.7.1)
- Stop locations (refer to Section 3.7.2)
- Yarra Glen, Yamba Drive, and Melrose Drive road configuration (refer to Section 3.7.3).

3.7.1 Light rail route

Three potential light rail route options have been considered through the Yarra Glen precinct (refer to Figure 3-13):

- Along Yarra Glen
- Along Denison Street connecting with Yarra Glen via Carruthers Street
- Along Kent Street connecting with Yarra Glen via Carruthers Street.

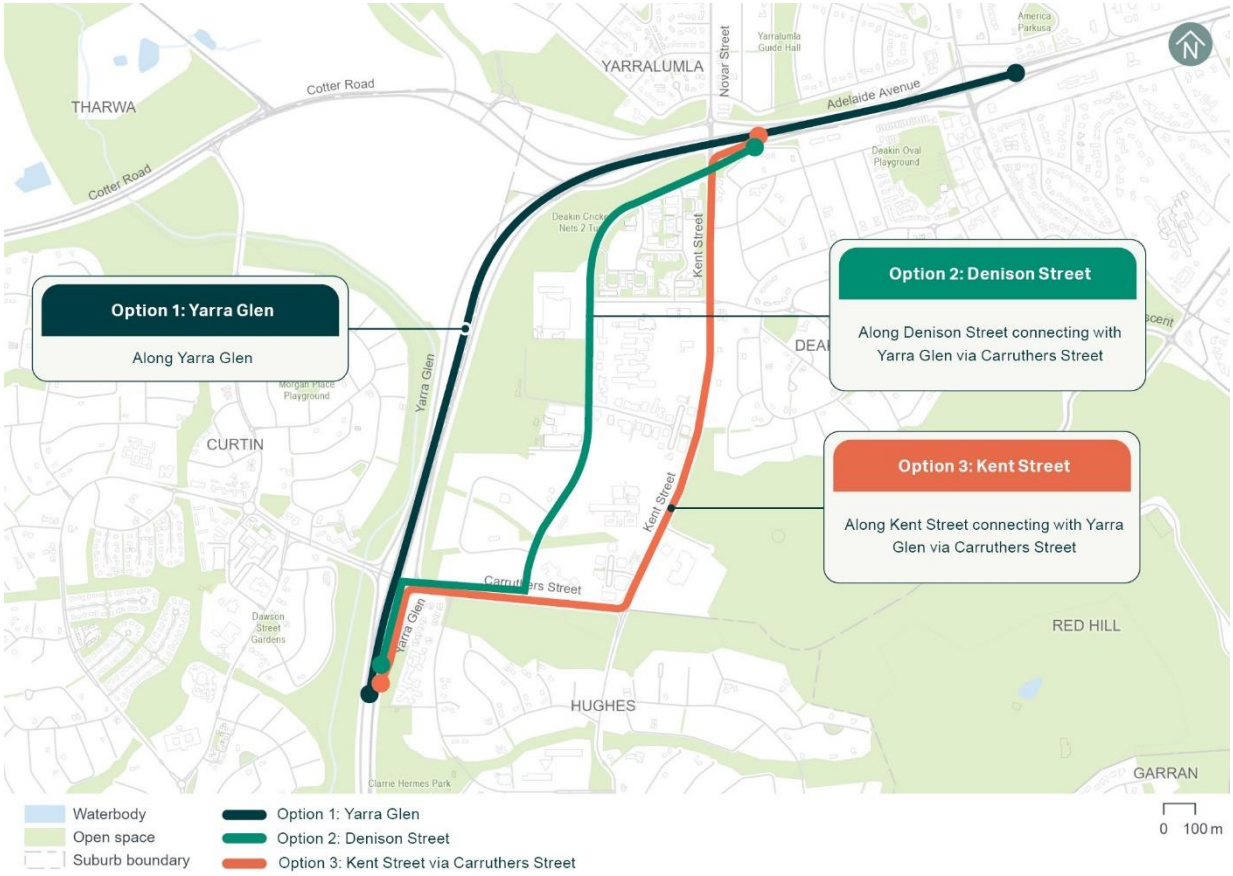


Figure 3-13 Light rail options considered through the Yarra Glen precinct

Of these three options, a light rail route along Yarra Glen has been identified as the preferred option for the following reasons:

- The ability to accommodate the light rail alignment within the Yarra Glen central median, which would result in fewer technical challenges than those associated with a light rail route on both Kent and Denison Streets. Routes along Kent and Denison Streets would result in:
  - Greater constructability challenges (likely need for road widening)
  - Higher potential for utilities constraints
  - More substantial construction and operation phase traffic impacts
  - More challenging grades (including at Adelaide Avenue and the area around the Denison Street/ Carruthers Street intersection)
- It would provide the fastest journey time, which would best support the objective of achieving a 30-minute journey time between the city and Woden
- It would best support access to light rail from both the Deakin and Curtin catchments, whereas neither of the Kent Street and Denison Street route options would provide access for those in Curtin
- The Yarra Glen route option would have greater potential to support urban renewal in the North Curtin area
- It would be consistent with the Inter-Town Public Transport System shown in the NCP.

3.7.2 Stop locations

There would be one stop in the Yarra Glen precinct – the Carruthers Street Stop. The location of the Kent Street Stop has considered options in both the Inner South and Yarra Glen precincts, as discussed in Section 3.6.2.

Carruthers Street Stop

Two options for the location of the Carruthers Street Stop have been considered, one north and one south of the Carruthers Street overpass. Both options would include wide track centres, and a wide island platform stop accessed by a new pedestrian and cyclist bridge. The nearest light rail stops would be Kent Street Stop, located around 2 km north-east, and Phillip Oval Stop, located around 1.3 km south.

Based on stakeholder feedback as well as a review of access to the stop, the cycling network plan in the ACT Active Travel Plan (Transport Canberra and City Services, 2023) and technical considerations, the southern location has been identified as preferred. The southern location has been selected because:

- It would provide greater stop access amenity
- The catchment would be greater, with the stop being on the same side as Curtin Group Centre and providing opportunity for a future park and ride facility
- It would provide greater opportunity for integration with the city-Tuggeranong via Woden cycle route.

3.7.3 Yarra Glen, Yamba Drive, and Melrose Drive configuration

As described in Section 5.6 of Chapter 5 (Project description), the Melrose Drive and Yamba Drive roundabout would be removed and replaced with a new signalised high capacity intersection. The new intersection would allow for light rail movement, and would include the following infrastructure:

- A new light rail bridge (short viaduct) over Yarralumla Creek
- Modification of the existing Melrose Drive road bridge over Yarralumla Creek to accommodate the southbound carriageway comprising two through traffic lanes
- Removal of the existing road connection from Yamba Drive to Melrose Drive, including the removal of the existing road bridge
- Removal of existing pedestrian and cyclist bridge over Yarralumla Creek, and construction of new pedestrian and cyclist bridge further south
- Relocation of existing active travel link to the eastern side of Yarralumla Creek.

Two options for a light rail bridge (viaduct) across Yarralumla Creek and an associated active travel route have been considered as part of the design development for Yarra Glen, Yamba Drive and Melrose Drive configuration. These options are shown in Figure 3-14.

Figure 3-14 Options for light rail and active travel arrangement at Yamba Drive, Yarra Glen, Melrose Drive intersection

Consideration of the two options has taken into account several factors, including:

- Development of design that maintains safety and limits transport and traffic impacts for the transition of light rail running from the Yarra Glen median to the western side of Yarralumla Creek
- Minimising traffic noise impacts to existing residential buildings on Irving Street, Phillip
- Minimising impacts to key sites and change areas identified in the ACT District Strategies and being developed by the Southern Gateway Planning and Design Framework
- Maintaining and enhancing walking and cycling network connections between Woden Town Centre, existing and planned residential development, open space and destinations to the north (Curtin and Deakin Group Centres, West Deakin, National Triangle, Barton, and the city)
- Avoiding worsening of potential flooding risk from Yarralumla Creek.

Both options would include a direct connection to Woden Town Centre via a light rail route that generally follows Yarralumla Creek, consistent with the Inter-town Public Transport System (Indicative Route) as set out in the NCP, with public transport as an allowable use under the Territory Plan. This approach would minimise journey time for the Project and potential future light rail extension(s) to the south.

Of these two options for light rail and active transport routes, Option 2 has been identified as the preferred arrangement because it would:

- Improve movement outcomes and safety of the Yamba Drive, Yarra Glen, Melrose Drive intersection and would minimise transport and traffic impacts

- Be consistent with light rail design criteria for horizontal and vertical alignment and would minimise the length of the bridge crossing of Yarralumla Creek to a single span, running parallel to Melrose Drive
- Provide an arrangement that limits encroachment into potential future development sites envisaged in the ACT District Strategies
- Consolidate the main north-south active travel route to the eastern side of Yarralumla Creek that would:
  - Enable a safer, more legible active travel network through to Woden Town Centre, including separation of the active travel route from the Phillip Oval Stop location
  - Maintain an active travel on the eastern side of Yarralumla Creek that responds to space constraints within the corridor
  - Best integrate the active travel route with planned future residential development
  - Maximise urban design and biodiversity outcomes by minimising tree removal and allowing for comparatively better landscaping opportunities within the light rail corridor.

Ongoing consultation with relevant stakeholders would continue in relation to integration of the Project with outcomes of investigations as part of the Southern Gateway Planning and Design Framework.

3.8 Options considered – Woden precinct

Key options that have been considered in the Woden precinct include:

- Light rail route options (refer to Section 3.8.1)
- Stop locations (refer to Section 3.8.2).

3.8.1 Light rail route

Flooding is a constraint in this precinct and the Project design has considered potential flooding impacts related to the introduction of the trackform, stops, and grade separated pedestrian bridges. Other factors considered in developing the preferred light rail route have included known or potential future development sites and opportunities, and existing infrastructure and developments immediately adjacent to the corridor including Ivy Apartments and Canberra College.

In the Woden precinct, the light rail alignment would be located on the western side of the Yarralumla Creek adjacent to Ivy Apartments, Phillip Oval and the bus layover, before crossing Launceston Street and following a median alignment on Callam Street to the Woden Interchange. The alignment would include a Phillip Oval stop near Irving Street.

The light rail would follow the Inter-Town Public Transport System (Identified Route) identified in the NCP (public transport is an allowable use within blocks along the alignment under the Territory Plan).

Potential alternative routes following the road network have been discounted because these options would result in a less direct route with longer journey time between Woden and defined activity centres, including those located to the south along a potential future Light Rail network extension.

3.8.2 Stop locations

There would be two stops in the Woden precinct – the Phillip Oval Stop and the terminus stop (Woden Interchange).

Phillip Oval Stop

The Phillip Oval Stop would serve the catchment north of Launceston Street. The catchment includes existing and proposed medium to high density residential development, Phillip Oval, and Canberra College. The nearest light rail stops would be Carruthers Street Stop, located around 1.3 km north, and Woden Interchange, located around 600 m south-east.

Factors considered in the location and design of the stop as well as the rail route and access arrangements have included:

- Potential flooding risk from Yarralumla Creek
- Potential physical and noise impacts to adjacent residential development from construction and operation, as well as potential impacts to motor vehicle access
- Physical impact to mature trees and habitat
- Access to the stop and broader walking and cycling network connections.
- Vertical and horizontal alignments of the walking and cycling path, stop location, bridge over Yarralumla Creek and the connecting watercourse and length of elevated to provide a Disability Standard Accessible Public Transport (DSAPT) compliant connection back to grade along the creek.

A review of a range of options against these factors has resulted in the following configuration for the Phillip Oval Stop:

- A stop location south (upstream) of the Yarralumla Creek main and side channels to reduce flood storage at the confluence
- A horizontal light rail alignment on the western edge of the Yarralumla Creek corridor to reduce flood storage impacts
- Lowering the vertical light rail alignment north of the stop to match the existing ground level to reduce flood storage impacts
- Relocating the existing active travel corridor on the eastern side of Yarralumla Creek with a north-south bridge over the side channel and use of an elevated path on piers to reduce flow impedance
- Provision of an east-west stop access bridge over Yarralumla Creek, north of the stop with DSAPT compliance for ramps and walkways
- Earthworks refinements, including localised benching above the formal channel on the western side of the creek and south of the stop to increase flood storage.

Terminus stop (Woden Interchange)

Two locations have been considered for a terminus stop for the Project (refer to Figure 3-15):

- Woden Town Centre
- Canberra Hospital.

A stop at Canberra Hospital would extend the light rail alignment beyond the Woden Town Centre.

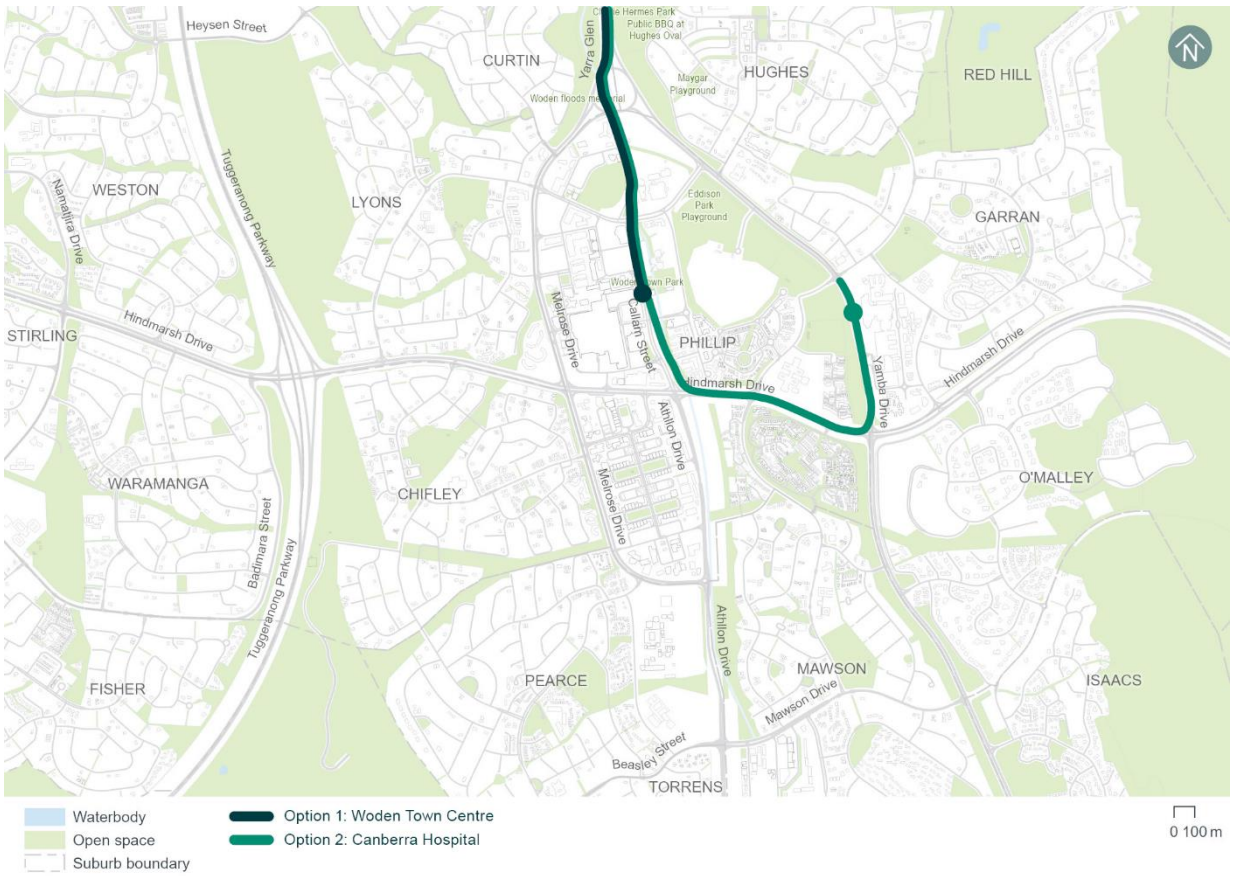


Figure 3-15 Options considered for a light rail terminus stop

Key constraints considered in evaluating the options for a light rail terminus stop have included relative length, ability to integrate with future Light Rail network extensions, bus interchange opportunities, utilities and transport network outcomes.

Community consultation undertaken in 2017 indicated a good level of support for a terminus at Canberra Hospital, however, respondents raised concerns regarding the amenity of the proposed hospital terminus to the hospital itself, and to future extensions of the network from a hospital terminus.

The Canberra Hospital terminus stop option would result in a 1.4 km extension to a terminus stop near Canberra Hospital at the intersection of Hindmarsh Drive and Yamba Drive. The additional distance would increase journey time for a potential future network extension to the south. Although there has been some community support for a stop near Canberra Hospital, there are various technical issues including substantial utilities relocation work, including for a high-pressure gas main on Hindmarsh Drive.

Woden Town Centre has been identified as the preferred terminus stop location because it would:

- Integrate with the renewed Woden Public Transport Interchange, providing access to safe, reliable and inclusive transport options incorporating cycling, walking, bus, and light rail
- Provide the most direct light rail route with the shortest journey time to Woden Town Centre, with minimal impact to journey time for a potential future extension to the south
- Follow the NCP Inter-Town Public Transport System (Indicative Route) where public transport is an allowable use under the Territory Plan.

The nearest light rail stop to Woden Interchange is Phillip Oval Stop, located around 600 m to the north-west.

3.9 Options considered – Project operations and stabling

Key options that have been considered in relation to Project operations and stabling:

- Stage operation (refer to Section 3.9.1)
- Service stopping patterns (refer to Section 3.9.2)
- Stabling and maintenance (refer to Section 3.9.3).

3.9.1 Staged operation

As part of the Project development process, investigations are ongoing into potential options to stage operation of the Project. Factors being considered that would influence options for staged operation include:

- Construction program and opportunities for staged construction completion, including in relation to longer duration construction areas such as Commonwealth Avenue light rail bridge
- Project power supply, including extent of wire-free running and the need for supporting infrastructure including traction power substation requirements
- Suitable space for a terminus design at an appropriate location, including requirements for turnback infrastructure
- Light rail operational considerations, including LRV fleet requirements
- Considerations for integration with broader public transport network (and drivers for the terminus location to perform an interchange function).

3.9.2 Service stopping patterns

Investigation into the viability and benefits of different stopping patterns, including the introduction of express light rail services in peak periods have been considered and presented in the report *Express Light Rail Services to Woden* (Transport Canberra and City Services, 2024). The investigation included review of timetable aspects as well as infrastructure design changes, and found that the introduction of express services would not provide substantive benefits when compared to the current all stopping services arrangement. It found that the reduction in journey times for express services would be minimal and would negatively impact customer experience.

3.9.3 Stabling and maintenance

Consideration has been given to stabling arrangements for LRVs to support light rail operations and service frequencies. Options considered have included:

- Catering for stabling of the full LRV fleet at the existing Mitchell Depot site
- Stabling of a majority of LRVs at the existing Mitchell Depot site with a smaller (‘satellite’) stabling facility introduced at the southern end of the Project for stabling of a small number of LRVs.

At this stage of design development, the existing Mitchell Depot has been identified as the preferred option for stabling of all LRVs for the Project. Reconfiguration of the Mitchell Depot site is feasible and would co-locate operations and maintenance activities. As part of ongoing design development, investigations into a potential satellite stabling facility location would continue.

4.0 Stakeholder and community consultation

This chapter provides an overview of the consultation undertaken for the Project. It summarises the outcomes of consultation completed during the preparation of the draft EIS with the community, government agencies, and other stakeholders, and where feedback has been addressed in this EIS.

Further detail of the consultation process and outcomes for the Project is in Appendix H (Consultation).

4.1 Engagement objectives and approach

4.1.1 Consultation and engagement objectives and approach

Stakeholder and community consultation is an important requirement in producing an EIS, as it allows for the identification and, where possible, the resolution of issues during project development and the approvals process.

The EIS has adopted a precinct-based approach which responds to the linear nature of the Project, and the unique character, environmental, and stakeholder context of areas along the Project alignment. This precinct-based approach also guided the consultation effort and has supported the collation of feedback from stakeholders. For some community and stakeholder engagement activities, the National Triangle, Barton, and Parliament House precincts were combined into a single precinct (referred to as 'the combined Parliament House precinct').

The consultation approach involved engaging with stakeholders in each precinct, through a variety of online and face to face methods.

The Project has established the following consultation and engagement objectives:

- Build enduring stakeholder and community relationships through authentic engagement
- Accurately identify stakeholders and communities and analyse their issues and interests
- Provide a range of opportunities for the community and stakeholders to raise issues relevant to the EIS
- Ensure the community and stakeholders have access to Project information that empowers them to provide feedback and input
- Collaborate with stakeholders and the community to influence design and the development of mitigation measures
- Inform the community and stakeholders about Project changes and decisions, including how their input has been considered and addressed
- Support EIS studies and investigations by gathering details on community views on the existing environment, potential impacts, and management and mitigation strategies
- Use inputs and feedback to inform ongoing engagement and involvement during the draft EIS public notification period (exhibition) and ongoing approvals processes.

4.2 Summary of consultation stages to date

Infrastructure Canberra (iCBR) has engaged with stakeholders and the community in relation to planning and delivering Canberra's Light Rail network since 2014. Consultation on Light Rail Stage 1 (LRS1) commenced in 2014 and consultation on Light Rail Stage 2A (LRS2A) and the Project commenced in 2017.

The consultation program for the draft EIS for the Project was planned and conducted in stages over a 13-month period from September 2023 to November 2024 and involved a range of stakeholders and the community.

The consultation and engagement stages are summarised in Table 4-1. Future consultation stages are discussed in Section 4.5.

Table 4-1 Summary of consultation and engagement undertaken to date

Consultation stages	Summary
Stakeholder mapping and identification	Between September 2023 and January 2024, a stakeholder mapping exercise was undertaken to identify all communities and stakeholders located in each precinct and with an interest in the Project. The list of stakeholders was refined and categorised based on proximity to the Project alignment, potential impacts during construction or operation, and levels of potential interest. Further details about stakeholder groups and the community are included in Section 4.3.
Communications and engagement planning	Between September 2023 and January 2024, a communications and engagement plan was prepared to guide engagement during the Project stages and included a comprehensive program of activities. The plan was updated regularly to reflect Project stages, participation levels and additional stakeholders.
Early stakeholder engagement	In September 2023, early engagement was undertaken to brief key stakeholders including Australian Government departments. The purpose of these meetings was to provide a preliminary overview of the approvals process and proposed engagement.
Engagement during preparation of the draft EIS	Engagement with key stakeholders was conducted over a seven-month period from February 2024 to the end of August 2024, with broader community engagement between early May and June 2024. Engagement during this time increased awareness of the Project and provided opportunities for the community and stakeholders to raise issues and concerns, and to identify community values and potential impacts, to inform the EIS and Project design. The consultation activities are described further in Section 4.4 and included: • Stakeholder meetings • Consultation with the Community Reference Group (CRG) • Community information sessions and pop-up events • Aboriginal stakeholder consultation • A community survey • Business doorknocks • Project email inbox and 1800 number • Distribution of printed and digital collateral.
Report back	The ‘What We Heard’ report was published on the YourSay Conversations and Light Rail to Woden webpages in early September 2024 (ACT Government, 2024). The report provides a summary of the community engagement that occurred between May 2024 and June 2024. The report outlines key activities undertaken and feedback received as part of the consultation.
Targeted follow up engagement	Targeted follow up meetings with stakeholders are planned to continue throughout the EIS process, and moving forward, to provide further updates and specific responses to design issues or impacts raised.

4.3 Community and stakeholder identification

A comprehensive community and stakeholder mapping process was undertaken that included desktop and on the ground research. The community, residents, businesses, and other stakeholder groups within 500 m of the Project alignment, as well as stakeholders with a holistic interest in the Project, were identified in the mapping process, which included but was not limited to:

- Aboriginal and Torres Strait Islander groups
- ACT Government
- Australian Government

- Businesses, medical services, and commercial groups
- Education and childcare
- Embassies and high commissions
- Emergency services
- Cultural institutions
- Peak bodies, special interest groups, and sporting groups
- Places of worship and religious groups
- Clubs and representative groups
- Residents, community councils, and resident associations.

A summary of stakeholder groups in each precinct is outlined in Table 4-2. For all precincts, other stakeholders consulted (that are not individually named in Table 4-2) included residents, businesses, medical services, developers and commercial groups.

Table 4-2 Stakeholder groups by precinct

Precinct	Stakeholders
Project-wide stakeholders (with an interest in the Project as a whole rather than specific precincts)	*Government stakeholders* • City Renewal Authority • Department of Climate Change, Energy, the Environment and Water (DCCEEW) • Department of Foreign Affairs and Trade Protocol and Events Branch • Diplomatic Corps* • Environment, Planning and Sustainable Development Directorate (EPSDD) (ACT Government) (including the Territory Planning Authority (TPA), ACT Heritage Office, and Parks and Conservation Services) • Events ACT • National Capital Authority • Office of International Engagement (ACT Government) • Canberra and Region Visitors Centre *Aboriginal stakeholders – Representative Aboriginal Organisations* • Buru Ngunawal Aboriginal Corporation • Mirrabee • King Brown Tribal Group *Aboriginal stakeholders – Designing with Country process* • Buru Ngunawal Aboriginal Corporation • Dhawura Ngunnawal Caring for Country Committee • Traditional Owners Aboriginal Corporation • Nagrigu Currawong Clan Registered Aboriginal Organisation • Other individual knowledge holders *Peak bodies, community, business and industry stakeholders* • Australian Chamber of Commerce and Industry • Conservation Council ACT Region • National Trust of Australia *Special Interest Groups* • Pedal Power • Public Transport Association of Canberra • Tourism Leaders Forum

Precinct	Stakeholders
	CRG members • A Gender Agenda • ACT Deafness Resource Centre • Capital Hill Apartments Executive Committee • Carers ACT • CIT Students Association • Conservation Council ACT • Council of the Ageing • Greater Canberra • Guide Dogs NSW/ACT • Living Streets Canberra • Ministerial Advisory Council on Ageing • Weston Creek Community Council • Woden Valley Community Council • Yarralumla Residents Association *Note: Diplomatic Corps meeting included the Department of Foreign Affairs and Trade Protocol and Events Branch, Office of International Engagement (ACT Government), Embassy of the Republic of Cuba, Embassy of the Republic of Estonia, Embassy of France, Embassy of Guatemala, High Commission of the Republic of Kenya, Embassy of Laos, Embassy of Mexico, Embassy of Switzerland, Embassy of Sweden, New Zealand High Commission, and High Commission of Malaysia.
Commonwealth Avenue	*Other stakeholders* • Archbishop's House (Catholic Archdiocese of Canberra and Goulburn) • British High Commission • Canberra Croquet Club • Friends of Albert Hall • High Commission of Canada • Lake Burley Griffin Guardians • New Zealand High Commission • Lake User Group
Parliament House	*Government stakeholders* • Australian Federal Police • Australian Parliament House • Department of Foreign Affairs and Trade • Department of Parliamentary Services • Department of the House of Representatives • Department of the Prime Minister and Cabinet • Department of the Senate • National Security Office Precinct stakeholders • The Lodge *Other stakeholders* • Giurgola Moral Rights Administrators • Presbyterian Church of St Andrew
National Triangle	*Government stakeholders* • Australian Electoral Commission (National Electoral Education Centre) • Australian Public Service Commission • Department of Climate Change, Energy, the Environment and Water (DCCEEW) (consulted as an adjacent stakeholder) • High Court of Australia • Museum of Australian Democracy (MoAD) • National Archives of Australia • National Gallery of Australia

Precinct	Stakeholders
	• National Library of Australia • National Portrait Gallery of Australia • Old Parliament House • Questacon • Treasury *Other stakeholders* • National Capital Education Tourism Project
Barton	*Government stakeholders* • Attorney-General's Department • Australian Federal Police • Australian National Audit Office • Australian Taxation Office • Department of Defence • Department of Finance • Department of the Prime Minister and Cabinet • Office of National Intelligence *Other stakeholders* • Embassy of Argentina • Embassy of Columbia • High Commission of the Republic of Zambia • First Church of Christ, Scientist • Housing Industry Association • Telopea Park School
Inner South	*Other stakeholders* • Canberra Deakin Football Club • Canberra Girls Grammar School and Junior School Early Learning Centre • Canberra House of Prayer • Embassy of Italy • Embassy of Japan in Australia • Friends of Grasslands • High Commission of Sri Lanka • Nigeria High Commission • Royal Embassy of Saudi Arabia
Yarra Glen	*Government stakeholders* • Community Services Directorate - Housing • Office of the Official Secretary to the Governor General • Royal Australian Mint
Woden	*Government stakeholders* • Transport Canberra City Services – Sport and Recreation *Other stakeholders* • Canberra College • Phillip Oval Management Group • Weston Creek Community Council • Woden Valley Community Council

Note: Consultation will be undertaken at a later stage for the Mitchell Depot site with nearby stakeholders and relevant surrounding ACT Government Departments, community and businesses.

4.4 Consultation during preparation of the EIS

4.4.1 Tools and activities

A range of consultation and engagement tools were used to provide information about the Project, including potential impacts, and opportunities for feedback. These tools would continue to be used in subsequent stages of the Project, and include the following:

- Meetings and emails to elected officials, Government departments, agencies and authorities (described further in Section 4.4.2)
- Meetings with Project-wide and precinct-specific stakeholders (described further in Section 4.4.3)
- Regular CRG meetings to invite feedback on their needs and priorities for the Project (described further in Section 4.4.4)
- Pop-up events and community information sessions held at local venues or scheduled community events to provide community members with Project information, and opportunities to give feedback in person (described further in Section 4.4.5)
- Aboriginal stakeholder consultation via the Designing with Country process and Representative Aboriginal Organisation (RAO) consultation for the First Nations heritage assessment (discussed further in Section 4.4.6)
- The ACT Government's online engagement platform, YourSay Conversations, including surveys for feedback (described further in Section 4.4.7)
- A Project information 1800 number and Project email inbox (described further in Section 4.4.8):
  - Email: lightrailtowoden@act.gov.au
  - Phone: 1800 956 409
- A dedicated Project website (www.act.gov.au/lightrailtowoden), which included information on the Project and an interactive map to help the community visualise the Project design and plans and provide feedback (described further in Section 4.4.8)
- Doorknocking businesses potentially impacted by or adjacent to the Project to inform them about the Project, and to encourage business owners and organisations to provide responses to a questionnaire about their operations and potential impacts during construction and operation (described further in Section 4.4.9)
- Printed collateral including Project updates, fact sheets and postcards. Printed collateral was distributed in-person at engagement activities and via letterbox drops, as well as via electronic direct mail to a distribution list of over 6,000 subscribers
- Social media including ACT Government and Transport Canberra social media accounts, including Facebook and X (formerly known as Twitter)
- A four-week media campaign that included digital advertising on social media, search and display advertising, print, and LRV and bus interior advertisements, which contained a QR code to the YourSay survey webpage.

The following sections describe these activities, and provide a summary of responses received from the community and stakeholders.

4.4.2 Government agency engagement

Throughout the engagement program regular meetings were held with the NCA, ACT Government departments, and DCCEEW. These meetings discussed a range of items including:

- Project progress briefings including the *Environment Protection and Biodiversity Conservation Act 1999* (Cth, EPBC Act) referral, design development, and stakeholder engagement updates
- Key technical matters
- EIS development and assessment
- Future approval processes.

Further details regarding issues and items discussed are provided in Table 4-3.

Table 4-3 Agency and department engagement discussion points

Entity	Date(s) of consultation	Issues raised/items discussed
National Capital Authority (NCA)	A number of consultation sessions were held from November 2023 and throughout 2024	A series of monthly design meetings and presentations were held between iCBR and NCA which discussed a range of items: • Project progress briefings, including EPBC Act Referral, design development and stakeholder engagement updates • Key technical matters in Designated Areas, and the broader corridor • Draft concept design development • Draft EIS development • Future approval processes. Project update briefings to the NCA board were also made to present: • Stakeholder engagement overview and a pre-lodgement of EPBC Act Referral briefing • Draft concept design Additional consultation with NCA included Works Approval applications and notifications of investigation activities in Designated Areas.
ACT Government Agencies including: Transport Canberra and City Services (TCCS), EPSDD, Suburban Land Agency, City Renewal Authority	June 2023 to November 2024	Multiple engagements and collaboration during the development and review of the various design phases, to support the environmental approvals. Other matters included: • Regular design and technical meetings, including in relation to traffic and flood modelling • Proposed alignment configurations • Light rail operations and safety • Bus network • Active travel • Tree assessments • Collaboration on strategic land use planning, including Southern Gateway Planning and Design Framework, and North Curtin Residential Area.

Entity	Date(s) of consultation	Issues raised/items discussed
ACT Heritage	October 2023, March 2024, October 2024	• Meetings were held to discuss advances in the design in proximity to ACT Heritage listed sites
EPSDD (Parks and Conservation) and Conservator of Flora and Fauna	Ongoing discussions following conclusion of the biodiversity field work in May 2024	• Approach to biodiversity assessments and offsets, including collaboration on the undertaking of hollow bearing tree surveys across the alignment • Relevant matters under the *Nature Conservation Act 2014* (ACT).
Territory Planning Authority	A number of consultation sessions held from December 2023 and throughout 2024	• EIS Scoping document • Environmental assessment approach • Draft EIS Public notification requirements.
Department of Climate Change, Energy, Environment and Water	A number of consultation sessions held from December 2023 and throughout 2024	• EPBC Referral preparation and lodgement • EPBC Act EIS Guideline development • Environmental assessment approach • Draft EIS Public notification requirements.

4.4.3 Stakeholder meetings

Meetings were held with Project-wide and precinct-specific stakeholders which included peak bodies and interest groups as listed in Table 4-2. The key items raised relating to the EIS are summarised in Section 4.4.10. Detailed responses from stakeholders are available in Section 5 of Appendix H (Consultation).

4.4.4 Community Reference Group

A CRG was established in 2020 to provide opportunities for stakeholders and community representatives to have a say in planning and delivery of LRS2A and the Project. The CRG format and membership was refreshed in early 2023, following an independent review of the group in August 2022. CRG members are identified in Appendix H (Consultation).

Between April 2023 and August 2024, a series of CRG meetings were held where the Project was discussed. Agenda items relating to the Project during these meetings included:

- Communications and engagement approach for the Project
- Considerations for each Project precinct
- Project sustainability priorities
- EIS and environmental assessment process
- Review of community and stakeholder engagement outcomes
- Planning and design sessions to gather feedback on the movement and access, safety and landscaping for individual stops, including Hopetoun Circuit, Kent Street, and Carruthers Street Stops
- Review of YourSay survey outcomes for several precincts and comparing the CRG's impressions with the broader community view
- Opportunities for feedback on the design of Albert Hall and Kings Avenue Stops.

Feedback from the CRG meetings focused on the following key themes:

- Urban design, including improvements for pedestrians and cyclists
- Bus and active travel integration, including bike storage at stops

- Environmental considerations and potential impacts, including sustainability and climate change adaption, landscape preservation and rehabilitation, and flooding
- Stop design including weather protection, safety, and security features
- Traffic and road safety including speed limits, cycling lanes, and traffic light sequencing
- Heritage, including the sensitive integration of light rail into areas of national significance
- Community engagement and communication, including how light rail benefits are communicated and supporting improvements to engagement
- Urban renewal, including opportunities for placemaking around stops.

Further detail on agendas and feedback received from the CRG is included in Appendix H (Consultation).

4.4.5 Pop-up and drop-in sessions

During May and June 2024, a program of public engagement was carried out involving pop-up and drop-in sessions.

To notify the community, a schedule of planned sessions was published on the Project and YourSay website. Postcards promoting the engagement in each precinct was issued to around 14,300 local businesses and communities in proximity to the Project area.

Community pop-ups were held at local venues and scheduled community events, such as markets, to inform the broader community about the Project.

During the same period, a drop-in information session was held in each precinct (excluding National Triangle and Barton). These were similar to pop-up sessions but provided the opportunity for the broader community to view more detailed maps of the Project alignment as well as having a one-to-one discussion with Project team members.

Each information session's location, date, and number of attendees is outlined in Table 4-4.

Table 4-4 Community information sessions

Location	Date	Attendees
Commonwealth Avenue precinct		
The Jetty at Lake Burley Griffin pop-up	8 June 2024	49
Albert Hall drop-in	20 June 2024	5
Parliament House precinct (combined with Barton precinct)		
Presbyterian Church of St Andrew pop-up	16 June 2024	40
Presbyterian Church of St Andrew drop-in	12 June 2024	11
National Triangle precinct		
Rosa's pop-up	13 June 2024	23
Inner South precinct		
Doubleshot cafe Deakin pop-up	18 May 2024	13
Yarralumla pop-up	16 May 2024	39
Deakin Football Club drop-in	23 May 2024	27

Location	Date	Attendees
Yarra Glen precinct		
EQ Café Deakin pop-up	20 May 2024	7
Two Blind Mice Curtin pop-up	21 May 2024	31
Hughes drop-in	5 June 2024	5
Woden precinct		
Woden Westfield pop-up (three sessions)	13-15 May 2024	118
Winter WOVAland pop-up	1 June 2024	75
Bus interchange pop-up	25 June 2024	25
Bus interchange pop-up	27 June 2024	12
Hellenic Club drop-in	6 June 2024	21

These sessions enabled the community to provide feedback on key issues and potential impacts of the Project in each precinct. Common topics were raised by community members throughout the Project precincts. Community members expressed support for:

- Potential for traffic congestion relief to be enabled by the Project
- Opportunities to improve access to amenities, tourism, and employment
- Socioeconomic benefits such as improved access to community facilities
- Opportunities for active travel (walking, cycling, micromobility) to be enabled and promoted by the Project.

Community members raised questions and concerns regarding:

- Route selection and stop location
- Bus network integration
- Preference for alternatives to the Project including electric buses
- Landscape and visual amenity impacts, including tree removal
- Construction traffic and timeline
- Design, such as parking, accessibility, and increasing wire-free running
- Active travel infrastructure design
- Safety features such as lighting
- Cost.

Precinct-specific questions and concerns included:

- Noise and vibration (combined Parliament House precinct)
- Improvements to the communication and engagement activities (combined Parliament House and Inner South precincts)
- Densification due to the Project (Inner South precinct).

4.4.6 Aboriginal stakeholder consultation

During development of the Project, targeted consultation was undertaken with the local Aboriginal community and knowledge holders, including traditional custodians, RAOs, and key organisations and broader community members about the Designing with Country framework and the Project's First Nations heritage values. Individual knowledge holders as well as members of the following

organisations were consulted as part of the Designing with Country process: Buru Ngunawal Aboriginal Corporation, Dhawura Ngunnawal Caring for Country Committee, Traditional Owners Aboriginal Corporation, and Nagrigu Currawong Clan Registered Aboriginal Organisation.

The Designing with Country process included:

- Identifying traditional custodians, key organisations and broader community members, prioritising them according to seniority, cultural knowledge, and professional experience
- Conducting a Walk on Country and inviting representative stakeholders to a one-on-one interview
- Gathering feedback and insights defining a site-specific Designing with Country Framework inclusive of key design principles.

Designing with Country initiatives would continue to be developed and implemented during design development, construction planning and operations, in consultation with Aboriginal stakeholders. The Public Domain Master Plan (Appendix I) includes a summary of the Designing with Country framework.

An assessment of impacts of the Project on First Nations heritage is provided in Section 11.4 of Chapter 11 (Project-wide issues) and Technical Report 3 – Heritage. Three of Canberra's four RAOs have been consulted to inform this assessment (including knowledge holders from the Buru Ngunawal Aboriginal Corporation, Mirrabee, and King Brown Tribal Group, as noted in Table 4-2). One RAO declined the invitation for consultation. The consultation involved discussions regarding the proposed Project alignment and noting feedback from the representatives from each RAO.

Through consultation with RAOs, the Project area was not found to hold any specific Aboriginal cultural significance in and of itself because it has been subject to historical disturbance through ongoing urban development within Canberra. However, it was noted that the Project area sits within an important Aboriginal landscape. RAOs have identified the following elements of significance:

- The Molonglo River is of high cultural significance due to its association with a creation story
- The geology of the State Circle Cutting for its representation of local stone and mineral resources
- Kurrajong (Capital) Hill (including its connection to Stirling Ridge) is of high cultural significance as a former ceremonial area.

During the development of the Draft EIS, the Project has also sought to engage with representatives of the Aboriginal Tent Embassy on a number of occasions. The Aboriginal Tent Embassy remains a priority stakeholder for the Project. The Project is committed to ongoing engagement with the Aboriginal Tent Embassy to discuss the Project and understand the values of the site. As identified in Appendix L (Environmental Management Plan outline), a Community Engagement and Social Management Plan would be developed for the Project to guide the ongoing engagement process. The Aboriginal Tent Embassy and RAOs have been identified as key stakeholders.

Further information on the RAO consultation process and outcomes can be found in Section 4 of Technical Report 3 – Heritage.

4.4.7 YourSay community survey

Community members and stakeholders were invited to participate in a YourSay survey from 7 May 2024 to 30 June 2024 to provide comments on the Project alignment (Project-wide) or individual precincts. The survey combined the Parliament House, National Triangle, and Barton precincts into one combined Parliament House precinct. The YourSay survey included a series of questions, and responses to select from, relating to participant backgrounds, the benefits of light rail, what light rail can be used for, important Project design principles and potential impacts during construction and operation.

A summary of the most reoccurring issues raised is provided in Table 4-5, and detailed survey responses are available in Appendix H (Consultation).

Table 4-5 Your Say survey responses summary

Precinct	Key findings
Project-wide (all precincts)	A total 318 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Noise and vibration • Landscape character and visual amenity. The most frequently identified issues during Project operation included: • Traffic and transport • Socioeconomic • Landscape character and visual amenity.
Commonwealth Avenue	A total 434 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Landscape character and visual amenity • Noise and vibration. The most frequently identified issues during Project operation included: • Traffic and transport • Landscape character and visual amenity • Land use and property.
Combined Parliament House (Parliament House, National Triangle, and Barton precincts)	A total 257 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Noise and vibration • Landscape character and visual amenity. The most frequently identified issues during Project operation included: • Traffic and transport • Landscape character and visual amenity • Land use and property.
Inner South	A total 157 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Noise and vibration • Landscape character and visual amenity. The most frequently identified issues during Project operation included: • Traffic and transport • Landscape character and visual amenity • Land use and property.
Yarra Glen	A total 114 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Landscape character and visual amenity • Noise and vibration. The most frequently identified impacts during Project operation included: • Traffic and transport • Landscape character and visual amenity • Land use and property.

Precinct	Key findings
Woden	A total 197 responses were received. The most frequently identified issues during Project construction included: • Traffic and transport • Noise and vibration • Landscape character and visual amenity. The most frequently identified issues during Project operation included: • Traffic and transport • Landscape character and visual amenity • Land use and property.

4.4.8 Written responses, emails and phone calls

During the EIS engagement, peak bodies, interest groups, other key stakeholders, and individuals provided written responses and called the Project information line regarding Project-wide issues, impacts, benefits, and opportunities.

Written feedback, which took the form of reports, letters, and detailed emails, generally related to the Project as a whole. The feedback received is further detailed in Section 5 of Appendix H (Consultation).

Stakeholders who called the Project hotline or provided written feedback raised the following issues:

- Accessibility
- Bus network integration
- Cost
- Heritage
- Landscape and visual impacts
- Noise and vibration impacts
- Route selection
- Socioeconomic impacts
- Project timeline
- Traffic and transport congestion.

4.4.9 Business engagement

Overall, 110 businesses participated in the business engagement process, with input received from most business types and precincts, except Yarra Glen and Commonwealth Avenue precincts. Of the 110 participants, 61 completed a questionnaire and 10 businesses participated in targeted interviews. A further 39 business representatives had short discussions with the Project team during the business doorknock.

Light rail operations were seen as a benefit for a wide range of businesses. Participants cited benefits such as providing an alternative to driving and parking for staff or an accessible transport option for visitors and clients.

Business participants indicated access, noise and vibration, and traffic and transport as key considerations for during construction for staff, clients, deliveries, and visitors.

4.4.10 Summary of feedback and where this is addressed

Stakeholder feedback was analysed and considered during the preparation of the EIS. This section provides a summary of the key feedback received from stakeholder and community engagement undertaken for the Project and identifies where in the EIS the key issues raised are addressed.

Mitigation measures to manage environmental and social impacts raised below are included in Chapter 21 (Environmental management and mitigation measures). Appendix L (Environmental Management Plan outline) also includes an overview of the proposed environmental management plans to address these impacts.

Project alignment

Community feedback showed support for both the State Circle East and National Triangle-Barton alignment options, with suggestions to modify each alignment to minimise impacts, especially around Commonwealth Avenue. Suggestions included moving the Project alignment to King Edward Terrace to avoid the Weston-planted evergreens and exploring alternatives along Langton Crescent and National Circuit.

The ACT Government's preferred route is the State Circle East alignment option, while the National Triangle Barton alignment option was assessed to provide flexibility in planning. The selection of an alignment option for the Project (i.e. the National Triangle-Barton alignment option or the State Circle East alignment option) will consider factors including:

- Place outcomes
- Community and stakeholder feedback on the draft EIS
- Potential environmental and social benefits and impacts.

The revised, final EIS will describe only one alignment option, and will identify potential environmental impacts and benefits of that option.

Further information regarding Project alignment is discussed in Chapter 3 (Project development).

Route selection into Woden

Community feedback requested more justification for the Project route selection into Woden, with interest in alternative routes.

iCBR determined the selected route along Yarralumla Creek to Woden Town Centre aligns with Project objectives and planning. This Project alignment integrates with the approved Woden Interchange, supporting safe, multimodal access. It offers a direct path to Woden with travel time benefits, reflects the Intertown Public Transport System map included in the NCP, and would enable options for future extensions. The City to Woden route, prioritised in the 2015 Light Rail Network Plan (Transport Canberra and City Services, 2015a), strategically links key areas, fostering a cohesive, accessible public transport network across Canberra.

Further information regarding route selection is discussed in Chapter 3 (Project development).

Access

Community concerns focused on maintaining access for residents, organisations, and event visitors along the Project alignment during construction and operation. Key issues included impacts on driveways, parking, and pedestrian paths, especially around National Circuit, State Circle, Irving Street, and local schools. Participants highlighted the importance of preserving access for major events such as Floriade and active travel connections near stops, to provide safe access for school children.

To address these issues, construction would be phased where possible and planned to minimise disruptions, with temporary access provided if needed. During operation, existing property access would be preserved where feasible, although some areas may require left-in, left-out arrangements for safety reasons. Parking would largely be retained, though some spaces may be repurposed. Tailored access plans would be developed for major events, and active travel routes would be supported, including a grade-separated Hopetoun Circuit Stop with lifts and stairs, as well as a signalised pedestrian-friendly intersection. VIP and dignitary access, particularly to Parliament House and Government House, would also be maintained.

Further information regarding access arrangements are discussed in Chapter 5 (Project description), Chapter 6 (Construction), Chapter 11 (Project-wide issues), Traffic and transport sections in precinct Chapters 12 to 19, Chapter 21 (Environmental management and mitigation measures), and Chapter 23 (Justification and conclusion).

Light rail stops

Feedback on light rail stops focused on the potential inclusion of additional stops to service current and future residential areas, with concerns raised about access, convenience, and safety for pedestrians, cyclists, and individuals with disabilities. Community members supported stops at Hopetoun Circuit and Carruthers Street, recognising benefits for nearby amenity aspects, businesses, and residential areas, including retirement communities and the Deakin medical precinct. Requests were made for park ‘n’ ride facilities, particularly on Cotter Road, to improve access for residents from areas like Molonglo, and for a potential adjustment of the Kent Street Stop to better serve North Curtin.

iCBR is adhering to Project design principles for light rail stops to be optimally placed to serve key population hubs, with consideration for safety, accessibility, and projected housing and employment growth. Light rail stop designs would integrate features like pedestrian crossings, secure bike parking, bus interchanges, and a wide plaza area at Hopetoun Circuit. Future transport planning may include park ‘n’ ride options, and provisions to allow for a possible stop near the Royal Australian Mint as part of the Southern Gateway Planning and Design Framework.

Further information regarding light rail stops is discussed in Appendix I (Public Domain Master Plan), Chapter 3 (Project development), and Chapter 5 (Project description).

Traffic

Concerns about traffic and parking during Project construction and operation highlighted potential issues with congestion, especially during peak hours and local events, with specific emphasis on the Barton precinct, Hopetoun Circuit, and Irving Street near Phillip Oval. Additional concerns included cumulative traffic impacts from allied developments, such as the Southern Gateway Planning and Design Framework and North Curtin Residential Area.

In response, iCBR would conduct event impact assessments, working with event organisers to establish transport and parking management plans, including temporary alternatives if required. Signalised intersections would control traffic at light rail crossings, with speed limit reductions in various locations to maintain safety. Forecasting indicates that congestion is expected to increase on north-south corridors even without the Project. Parking and pedestrian access adjustments have been planned, along with close collaboration with TPA for cohesive land use and transit planning.

Further information regarding traffic is discussed in Chapter 6 (Construction), Chapter 11 (Project-wide issues), Traffic and transport sections in precinct Chapters 12 to 19, and Technical Report 1 –Traffic and transport.

Parking

Concerns about reduced parking due to the Project focused on temporary and permanent losses, especially along the National Triangle-Barton alignment option and at King George Terrace. Stakeholders raised issues about limited parking for staff and visitors in Barton and the National Triangle, suggesting the light rail could ease local parking strain. Additional concerns included increased congestion and noise if nearby side streets are used for parking.

In response, temporary reductions would primarily affect construction zones, with limited permanent losses. A traffic demand management strategy would contribute to managing weekday parking demand by promoting public transport options for employees and visitors. Accessibility parking spaces would also be preserved, and construction planning would also explore shuttle services for workers to manage potential parking impacts. Future park ‘n’ ride options are under consideration by the Territory, aligned with broader transport planning, to support commuter access to light rail and local facilities.

Further information regarding parking is discussed in Chapter 5 (Project Description), Chapter 6 (Construction), Chapter 11 (Project-wide issues), Traffic and transport sections in precinct Chapters 12 to 19, Chapter 21 (Environmental management and mitigation measures), and Technical Report 1 – Traffic and transport.

Design

Concerns were raised about retaining open space along the Project alignment where possible; the design of the Melrose Drive and Yamba Drive intersection; and design constrains around areas such as

the National Circuit and Yarralumla Creek. Support was expressed for both inner-running and median-running track design on State Circle and suggestions were made for updating the Design Principles.

The Project design prioritises preserving open space along the alignment, though some areas within road reserves, such as the inner verge of State Circle and parts of the Yarra Glen roundabout, may be affected by construction or operational design features.

Design principles, shaped by community input, emphasise aligning with Canberra's historic urban plan, respecting the Griffin Vision near Parliament House, and enhancing the local landscape and precinct character. The designs include inner or median running on State Circle and discounts outer running (placement of the light rail alignment on the outer road verge), thereby avoiding several heritage, property and security impacts. A new high-capacity intersection would replace the Yarra Glen roundabout to support light rail integration. The alignment adjacent to Yarralumla Creek (which reflects the Intertown Public Transport System map included in the NCP), would include a new pedestrian and cyclist bridge and relocated active travel links. Ongoing community consultation would continue to inform design.

Further information regarding Project design is discussed in Chapter 5 (Project description) and Public Domain Master Plan (Appendix I).

Landscape and visual amenity

Feedback on landscape and visual amenity included preserving vistas and lighting designs of key landmarks, improving pedestrian urban spaces, incorporating green track, wire-free running, tree succession planting, and native vegetation.

The Project's landscape-led approach and broader landscape strategy aims to integrate the Project with the various landscapes it crosses, minimising impacts on the existing landscape character and prominent views, such as Parliament House and Commonwealth Avenue vistas, while celebrating the unique characteristics of each precinct. Design strategies include alignment of the light rail, the use of green track, wire-free running from Commonwealth Park to Hopetoun Circuit, and new street tree planting to frame these views. The Project would follow the NCA Outdoor Lighting Policy (NCA, 2012) and respect the current lighting hierarchy in the Project area, particularly in the Parliament House area. Key considerations for active travel arrangements for the Project, such as along Commonwealth Avenue, include access to stops and integration with the existing and planned network to support long-term transport network planning. The Project has also sought to minimise impact to native vegetation where possible.

Further information regarding landscape and visual amenity is discussed in Chapter 5 (Project description), Appendix I (Public Domain Master Plan), and Technical Report 10 – Landscape character and visual amenity.

Noise and vibration

Residents along State Circle, as well as organisations on Bligh Street and National Circuit, raised concerns about noise and vibration impacts during construction and operation, especially around the National Circuit and Sydney Avenue intersection. Businesses with outdoor or after-hours operations also highlighted potential noise disturbances.

Construction of the Project would result in noise impacts at times. Noise and vibration impacts would be managed under a Construction Noise and Vibration Management Plan as part of the broader Construction Environmental Management Plan(s). Measures would also be applied to manage vibration around heritage buildings, including the Presbyterian Church of St Andrew and heritage sites in the National Triangle.

Construction would primarily occur between 7am and 6pm, Monday to Saturday, but some work may be required outside these hours to reduce disruptions on major roads. Any out-of-hours work would be carefully managed with individual assessment and approval via a process which would be documented in the Construction Noise and Vibration Management Plan.

Further information regarding noise and vibration is discussed in noise and vibration sections in Part B (Environmental impact assessment), Chapter 21 (Environmental management and mitigation measures), and Technical Report 9 – Noise and vibration.

Investment decision

Concerns were raised about the Project's costs and funding allocation.

A detailed business case would be developed following completion of necessary planning approvals outlined in Chapter 8 (Legislation and policy). This approach enables the scope and alignment to be well defined prior to government considering an investment decision. The process would be undertaken in accordance with the Capital Framework and include consideration of technical studies, options analysis, delivery model assessment, economic analysis (including cost-benefit assessment and Wellbeing Impact Assessment) to support an investment decision.

Further considerations relating to an investment decision is discussed in Chapter 2 (Need for the Project) and Chapter 23 (Justification and conclusion).

Bus network integration

Feedback showed strong support for integrating light rail into the public transport network, in order to meet the challenges of a growing city. Some suggested bus alternatives in lieu of light rail could meet this challenge. Concerns were also raised about potential disruption to existing bus services, particularly to and from Woden.

Consistent with the introduction of LRS1, Transport Canberra would oversee future network planning to optimise bus and light rail integration, potentially revising routes and timetables. Preliminary work is underway to explore how the existing bus fleet could be redeployed to enhance network reach and frequency. Further information regarding bus network integration is discussed in Chapter 5 (Project description).

The merits of strategic transport alternatives including, for example rapid bus interventions are discussed in Chapter 2 (Need for the Project).

Potential construction phase impacts have been identified and assessed in Technical Report 1 – Traffic and transport, with mitigation measures outlined in Chapter 21 (Environmental management and mitigation measures). This includes the ongoing use of the Traffic and Transport Liaison Group and specific measures to optimise the performance of the road network.

Communication and engagement

Feedback requested clear communication and signage for altered traffic conditions during construction, continuous engagement to help businesses adapt, and plain English materials for accessibility.

iCBR would prioritise community consultation, maintaining open relationships with stakeholders as the Project design evolves. A comprehensive communication strategy will be developed, providing timely, area-specific updates on traffic and transport arrangements, including information on local road changes. Communication would include plain English resources, online updates, and engagement through the Community Reference Group and business partnerships, to provide all community members accessible information throughout the Project’s construction and operation.

Further information regarding engagement is discussed throughout this chapter and in Appendix H (Consultation).

Accessibility

Feedback highlighted the need to consider accessibility for people with disabilities in the Project design.

The Project would comply with Disability Standards for Accessible Public Transport, ensuring all stops meet Australian accessibility standards. Infrastructure at each stop would support accessibility, and ongoing engagement with the Community Reference Group and relevant groups would inform further design to improve outcomes for those with accessibility needs.

Further information regarding accessibility is discussed in Chapter 5 (Project description) and Appendix H (Consultation).

Project timing

Community members inquired about the Project timeline.

Major construction is expected to start in 2029, subject to Commonwealth and Territory approvals, and would take approximately four to five years, with passenger services planned to commence in 2034. Early works may begin sooner, pending detailed design and planning.

Further information regarding timeline is discussed in Chapter 6 (Construction).

Tree removal

Participants expressed concerns about the removal of established trees along Commonwealth Avenue, King George Terrace, and National Circuit, with suggestions to plant new trees that align with the existing environment. Specific concern was raised for preserving the Yarra Glen Homestead Conifer.

While the majority of trees in the National Triangle precinct would be unaffected, a Tree Replacement Strategy has been prepared to outline considerations for the replacement of trees slated for removal, including on National Circuit.

The Homestead Conifer would be removed due to operational constraints on the light rail and road network.

Further information regarding tree removal is discussed in Section 3 and 11, and Appendix B of Appendix I (Public Domain Master Plan).

Safety and security

Issues were raised in relation to safety and security, given the proximity of the Project to high security buildings particularly within the National Triangle, Barton, Parliament House and Inner South precincts. Pedestrian safety in high-traffic zones was also raised as an issue, particularly during construction.

Engagement with high-security sites would give consideration to access and specific security needs throughout ongoing design and construction activities. From an operational perspective, the design includes reduced speeds, landscaping, and clear pedestrian pathways to enhance safety, with further refinements planned as the Project progresses, consistent with the strategic policy context outlined in Chapter 2 (Need for the Project).

Further information regarding safety and security are discussed in Section 11.1 and 11.13 of Chapter 11 (Project-wide issues), Traffic and transport sections in precinct Chapters 12 to 19, and Technical Report 1 – Traffic and transport.

Heritage

Issues were raised in regard to heritage considerations including First Nations heritage impacts, and impacts to other listed heritage items. The Project's cultural heritage impact assessment (Technical Report 3 – Heritage) has assessed First Nations heritage, and included consultation with RAOs. The assessment found that generally the Project area does not hold any specific Aboriginal cultural significance in and of itself, because it is a modern and developed landscape. However, the Project area and the features of the developed city of Canberra, such as the city layout, roads and buildings, sit in an important Aboriginal landscape. In addition to the cultural heritage assessment, further consultation was undertaken with the broader Aboriginal community members to develop a Designing with Country framework (which is provided as Appendix A of Appendix I (Public Domain Master Plan)).

Technical Report 3 – Heritage also assesses impacts on historic heritage, including listed items like Old Parliament House and Curtilage, the Parliament House Vista, and the Old Parliament House Gardens. The State Circle rock cutting, and surrounding natural features were also raised.

Guided by a landscape-led approach, the design has integrated architecture and urban planning to protect heritage sites and visual amenity. Mitigation measures would be implemented to manage impacts during construction and operation, with management and consideration for unexpected heritage finds.

Further information regarding heritage is discussed in Chapter 11 (Project-wide issues), historic heritage sections in precinct Chapters 11 to 19, Appendix I (Public Domain Master Plan), and Technical Report 3 – Heritage.

Other

Other issues raised by the community and stakeholders included the location of Traction Power Substations (TPSs), active travel integration, journey time, dust impacts during construction, and construction work hours.

Design development has sought to locate TPSs to minimise impacts, where possible, and would include design features such as screening and landscaping to reduce potential visual impacts. For active travel, stops would feature secure bike and scooter parking, with mapped access routes to encourage walking and cycling.

The light rail journey time between Woden and the city (LRS2A and the Project combined) would meet the 30-minute city aspiration. Early investigations have indicated that journey time on the National Triangle-Barton alignment option would be 3-5 minutes longer than the State Circle East alignment option.

A Dust Management Plan would be developed, to manage construction dust impacts.

Standard work hours would be maintained where possible and any out-of-hours work would be carefully managed with individual assessment and approval.

Further information regarding the various issues raised are noted below:

- TPS locations: Chapter 5 (Project description)
- Active travel: Chapter 5 (Project description), Chapter 11 (Project-wide issues), and Appendix I (Public Domain Master Plan)
- Journey time: Chapter 5 (Project description)
- Dust: Section 11.9 of Chapter 11 (Project-wide issues)
- Work hours: Chapter 6 (Construction) and Chapter 21 (Environmental Management and mitigation measures).

4.5 Future consultation and engagement

iCBR would continue to engage with the community and stakeholders on the Project during the assessment and approvals process, and during the design development and construction periods.

This draft EIS is subject to a public notification period (exhibition). During the public notification period, the public will have an opportunity to review this EIS and make a submission or representation on the document.

iCBR will undertake consultation during the public notification period to inform and provide information on how submissions and representations can be made about the Project.

At the conclusion of the public notification period, iCBR will review submissions and representations made by stakeholders and the community on the draft EIS. Key issues will be addressed and the EIS will be updated where relevant to address the matters raised. In the event that Project refinements are required in response to comments, these would be assessed as part of the revised, final EIS.

Various methods and tools would be used in the next stages of the Project, including online tools, continued engagement with the CRG, tailored precinct and demographic engagement plans, business partnership plans, and embedding Designing with Country/Aboriginal stakeholder engagement in Project planning.

5.0 Project description

This chapter provides a description of the Project, how it would operate and the urban design vision. The Project design presented in this chapter would be subject to ongoing development and the final design may vary from that presented in this chapter. A description of how the Project would be constructed is provided in Chapter 6 (Construction).

5.1 Overview

The Project would include the construction and operation (including maintenance) of the next stage of the Light Rail network, from the approved Light Rail Stage 2A (LRS2A) Commonwealth Park stop on Commonwealth Avenue, to a new terminus on Callam Street at Woden Town Centre (the Woden Interchange). The Project would be an extension of the existing Light Rail Stage 1 Gungahlin to City (LRS1) and the approved LRS2A.

A Commonwealth Joint Standing Committee (JSC) on the National Capital and External Territories inquiry into Commonwealth and Parliamentary approvals for Stage 2 of Canberra Light Rail was held in 2018 and 2019. The JSC Inquiry Report recommendations were agreed to, or agreed to in principle by the Australian Government. In response to the JSC recommendation that State Circle East had the in-principle support of the Commonwealth under the NCP, the ACT Government ultimately resolved to explore the preferred State Circle East alignment option through the EIS process, recognising that it provided a comprehensive pathway to understanding technical, environmental, and stakeholder issues. At the same time including an alternative alignment through the National Triangle and Barton meant that if the preferred option was not feasible, for whatever reason, the need to recommence the EIS process again with an alternative alignment would be avoided.

The following two alignment options are therefore being considered through the National Triangle and around Parliament House and are shown on Figure 5-1:

- The State Circle East alignment option: from Commonwealth Avenue along State Circle to Adelaide Avenue
- The National Triangle-Barton alignment option: from Commonwealth Avenue along King George Terrace, Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue, before connecting with State Circle to Adelaide Avenue.

Only one of the two alignment options would be constructed. The selection of an alignment option for the Project (i.e. the National Triangle-Barton alignment option or the State Circle East alignment option) will consider factors including:

- Place outcomes
- Community and stakeholder feedback on the draft EIS
- Potential environmental and social benefits and impacts.

The revised, final EIS will describe only one alignment option, and will identify potential environmental impacts and benefits of that option.

The Project would provide light rail on Commonwealth Avenue, State Circle or King George Terrace towards Sydney Avenue (depending on the alignment option selected) then along Adelaide Avenue, Yarra Glen, and Callam Street as shown on Figure 5-1.

Both alignment options would connect at the Commonwealth Park Stop (approved as part of LRS2A) and would include nine new light rail stops. These new light rail stops are described in Section 5.4.

The Project would also include adjustments to the existing stabling and maintenance depot in Mitchell (the Mitchell Depot site) to increase storage and maintenance space for additional light rail vehicles (LRVs). Ancillary infrastructure and equipment required to operate the light rail would also form part of the Project, such as three new traction power substations (TPSs) (described in 5.10.3) and signalling equipment.

The Project would be subject to ongoing design development, as is typical of major infrastructure projects. This EIS includes a reasonable level of conservatism in its approach to assessing environmental impacts to accommodate anticipated design evolution. Potential refinements to the Project design are discussed in Section 5.14.

5.1.1 Precincts

This EIS has adopted a precinct-based approach for the environmental assessment of construction and operational impacts. The precinct-based approach responds to the linear nature of the Project, and the unique character, environmental and stakeholder context of areas along the Project alignment. The Project has been divided into seven precincts, as well as the Mitchell Depot site.

The State Circle East alignment option would be located within the Commonwealth Avenue, Parliament House, Inner South, Yarra Glen, and Woden precincts. The National Triangle-Barton alignment option would also be located within these precincts, as well as the National Triangle and Barton precincts.

Each precinct is shown on Figure 5-1.

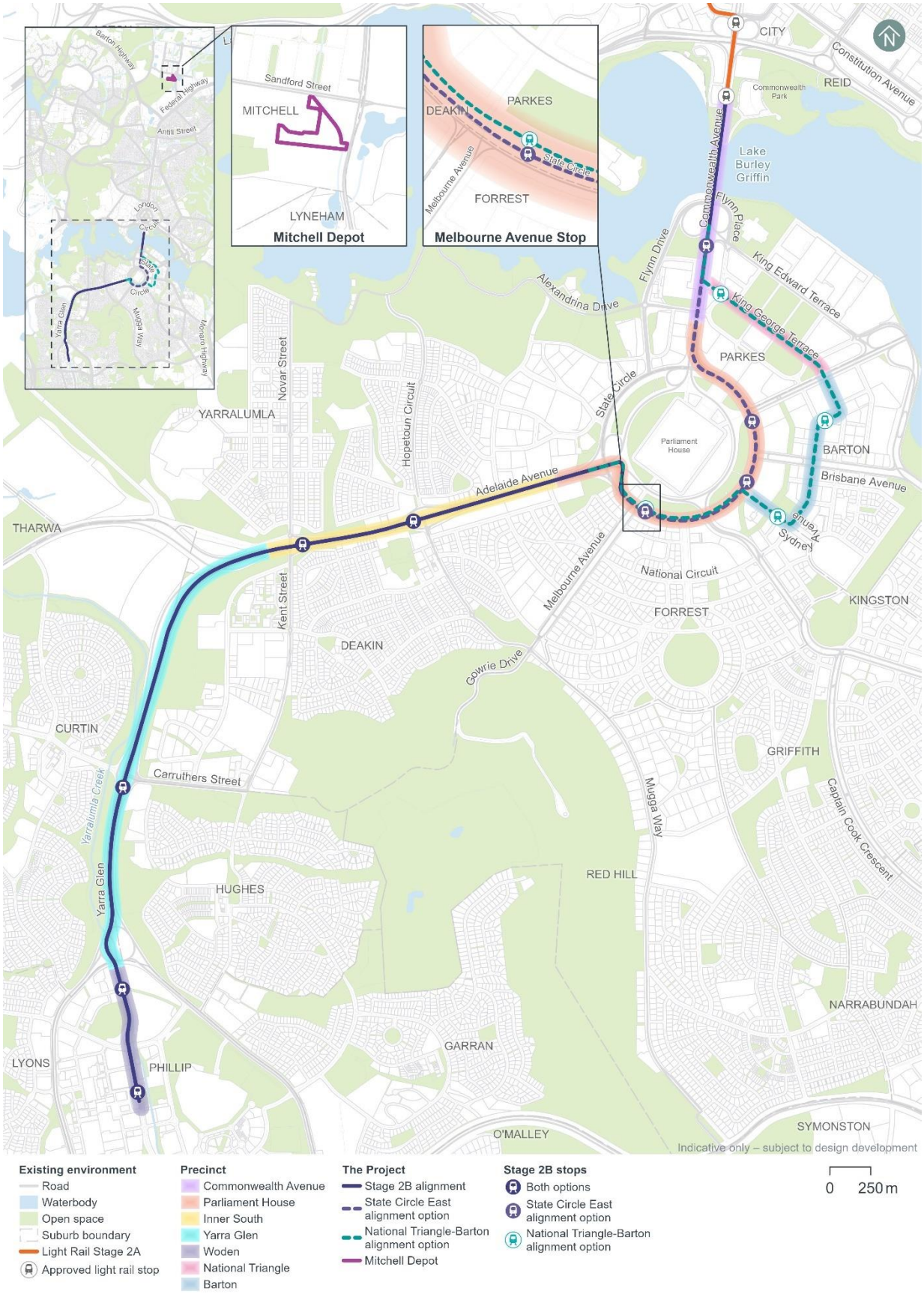


Figure 5-1 Project overview

A summary of the key features of the Project within each precinct is provided in Table 5-1, and shown on Figure 5-2 to Figure 5-17. Proposed road network changes to accommodate the Project are also shown in further detail on Figure 5-38 to Figure 5-52 (refer to Section 5.9).

Table 5-1 Overview of Project features within each precinct

Description	Figure reference
Commonwealth Avenue precinct	
The Commonwealth Avenue precinct comprises Commonwealth Avenue, extending from the Archbishop's House/Parkes Way in the north and ending just south of Coronation Drive in the south. For both alignment options the light rail would extend south from the approved LRS2A Commonwealth Park Stop, across Lake Burley Griffin and Flynn Drive via new light rail bridges. Within the Commonwealth Avenue precinct, light rail would be wire-free. **State Circle East alignment option** The light rail alignment would be located within the Commonwealth Avenue median within this precinct. It would include one light rail stop near Albert Hall, where a signalised pedestrian crossing would provide access to the stop from the verges. **National Triangle-Barton alignment option** The light rail alignment would transition from the median of Commonwealth Avenue to King George Terrace near the entrance to Hyatt Hotel Canberra. There would be no light rail stops within the Commonwealth Avenue Precinct for the National Triangle-Barton alignment option.	Key features of the Project within this precinct are shown on Figure 5-2 (features common to both alignment options); Figure 5-3 (State Circle East alignment option) and Figure 5-6 (National Triangle-Barton alignment option).
Parliament House precinct	
The Parliament House precinct sits generally within the National Triangle. The northern extent of the precinct begins on Commonwealth Avenue, immediately south of the intersection with Coronation Drive and extends around Parliament House to a point on Adelaide Avenue near its intersection with National Circuit. Within the Parliament House precinct, the light rail would be wire-free. **State Circle East alignment option** On Commonwealth Avenue, the light rail would transition from the road corridor into a dedicated covered section about 125 m long. This covered section would allow the light rail to pass underneath southbound Commonwealth Avenue traffic lanes through to State Circle (refer to Section 5.7). The light rail alignment would transition from the covered section onto the median of State Circle and pass around the eastern side of Capital Hill and Parliament House. To the west of Melbourne Avenue it would transition at-grade from median running on State Circle to transition onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle and a new light rail bridge over State Circle (refer to Section 5.5.2). For the State Circle East alignment option there would be three stops located within the median of State Circle: the Kings Avenue Stop, located immediately to the south of Kings Avenue; the Sydney Avenue Stop, located immediately to the north of Sydney Avenue and the Melbourne Avenue Stop, located immediately to the east of Melbourne Avenue.	Key features of the Project within this precinct are shown on Figure 5-3 Figure 5-4, and Figure 5-5 for the State Circle East alignment option Figure 5-8, Figure 5-9, and Figure 5-10 for the National Triangle-Barton alignment option.

Description	Figure reference
National Triangle-Barton alignment option Within the Parliament House precinct the National Triangle-Barton alignment option would transition onto State Circle at its intersection with Sydney Avenue. Until its transition onto Adelaide Avenue, this alignment option would run within the road verge (referred to as inner running) of State Circle. As with the State Circle East alignment option, this option would transition onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle and a new light rail bridge over State Circle. The National Triangle-Barton alignment option would include one stop within this precinct, the Melbourne Avenue Stop, located on the inner verge of State Circle immediately east of its intersection with Melbourne Avenue.	
National Triangle precinct	
This precinct is relevant to the National Triangle-Barton alignment option only. The National Triangle precinct encompasses the area generally between Commonwealth Avenue and Kings Avenue. Within the National Triangle precinct, the National Triangle–Barton alignment option would be located on King George Terrace and would be wire-free. There would be one light rail stop within this precinct (Treasury Stop), located at the intersection of King George Terrace and Langton Crescent.	Key features of the Project within this precinct are shown on Figure 5-6 and Figure 5-7.
Barton precinct	
This precinct is relevant to the National Triangle-Barton alignment option only. As shown on Figure 5-1 and Figure 5-8, the Barton precinct encompasses the area generally between Kings Avenue and Sydney Avenue, extending along Sydney Avenue from National Circuit to its intersection with State Circle. The light rail alignment would follow Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue before connecting with State Circle. The National Triangle–Barton alignment option would include two stops in this precinct: the Bligh Street Stop located at the eastern end of Bligh Street and the Sydney Avenue Stop located at the south-eastern end of Sydney Avenue. Within the Barton precinct, the light rail would be wire-free.	Key features of the Project within this precinct are shown on Figure 5-7 and Figure 5-8.
Inner South precinct	
The Project design within this precinct would be consistent for both alignment options. The Inner South precinct comprises the extent of Adelaide Avenue generally between the intersection of Adelaide Avenue and National Circuit and the Adelaide Avenue/Cotter Road on- and off-ramps just south of Kent Street. The precinct would include a new light rail bridge between the existing Adelaide Avenue eastbound and westbound carriageways over Hopetoun Circuit. The precinct would also include two grade separated stops located in the median of Adelaide Avenue. The Hopetoun Circuit Stop would be located	Key features of the Project within this precinct are shown on Figure 5-10, Figure 5-11, and Figure 5-12.

Description	Figure reference
immediately to the west of Hopetoun Circuit, and the Kent Street Stop would be located immediately to the east of the Kent Street overbridge. At the Hopetoun Circuit Stop, the light rail would transition from wire-free running to use of over-head wiring. Over-head wiring would be adopted from this location through to the Woden Interchange. The precinct would also include a TPS (TPS 8), located off Guilfoyle Street within an existing grassed area.	
Yarra Glen precinct	
The Project design within this precinct would be consistent for both alignment options. The Yarra Glen precinct comprises the Yarra Glen road corridor from south of Kent Street to the southern side of the Yarra Glen roundabout. The light rail alignment would predominately be located within the Yarra Glen median. The Project would include the reconfiguration of the Yarra Glen roundabout into a new at-grade intersection of Yarra Glen with Yamba Drive and associated at-grade crossing of this new intersection by light rail. A new light rail bridge over Yarralumla Creek would be provided. The existing active travel link would be relocated to the eastern side of Yarralumla Creek, and the existing Melrose Drive road bridge over Yarralumla Creek would be removed. The precinct would include one grade separated stop, the Carruthers Street Stop, located immediately to the south of Carruthers Street. Within the Yarra Glen precinct, the light rail would include over-head wiring. The precinct would also include a TPS (TPS 9) located off Yarra Glen, adjacent to the active travel link at the south-west corner of the Deakin Ovals.	Key features of the Project within this precinct are shown on Figure 5-12, Figure 5-13, Figure 5-14, and Figure 5-15.
Woden precinct	
The Project design within this precinct would be consistent for both alignment options. The Woden precinct extends from south of the Yarra Glen roundabout to around Neptune Street in Woden. From the southern extent of the Yarra Glen roundabout, the light rail alignment would continue south along the western side of Yarralumla Creek, across Launceston Street, along Callam Street, and terminating north of Bradley Street. The precinct would include two stops, the Phillip Oval Stop near Irving Street immediately north of Phillip Oval, and the Woden Interchange located on Callam Street between Bowes Street and Bradley Street. Within the Woden precinct, the light rail would include over-head wiring. The precinct would also include a TPS (TPS 10) in an existing carpark off Spoering Street near Phillip Oval.	Key features of the Project within this precinct are shown on Figure 5-15 and Figure 5-16.

Description	Figure reference
Mitchell Depot site	
The existing Mitchell Depot site is used as a stabling, operational control and maintenance area for the existing Light Rail network and would be expanded to cater for the additional storage, operations and maintenance requirements to support the Project.	Refer to Figure 5-17.

5.1.2 Key Project infrastructure

A summary of the Project's key infrastructure features is provided in Table 5-2.

Key features of the Project are shown on Figure 5-2 to Figure 5-17. Proposed road network changes to accommodate the Project are also shown in further detail on Figure 5-38 to Figure 5-52 (refer to Section 5.9).

Table 5-2 Key features of the Project

Project feature	Description	
	State Circle East alignment option	National Triangle-Barton alignment option
Light rail track (Section 5.3)	A new light rail track around 9.5 kilometres (km) in length, connecting from the approved Commonwealth Park Stop (LRS2A), crossing over Lake Burley Griffin, travelling along the median of Commonwealth Avenue and passing on the eastern side of Parliament House in the median of State Circle.	A new light rail track around 10.5 km in length, connecting from the approved Commonwealth Park Stop (LRS2A), crossing over Lake Burley Griffin, leaving Commonwealth Avenue to travel east along King George Terrace, Macquarie Street, Bligh Street, National Circuit, Sydney Avenue and moving to inner running on State Circle.
	From State Circle, both alignment options would transition onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle before travelling along Adelaide Avenue and Yarra Glen, with a new terminus at Woden Town Centre (Woden Interchange).	
Light rail stops (Section 5.4)	A total of nine new light rail stops and ancillary infrastructure.	
Bridges (Section 5.5)	• New light rail bridge structures: - Between the existing Commonwealth Avenue road bridges over Lake Burley Griffin and separately over Flynn Drive - Between the existing Adelaide Avenue northbound and southbound carriageways over State Circle and separately over Hopetoun Circuit - Over Yarralumla Creek at the existing Melrose Drive/Yarra Glen/Yamba Drive interchange • Removal of the existing Melrose Drive road bridge over Yarralumla Creek between Yamba Drive and Melrose Drive • Removal of the existing pedestrian bridge across Yarralumla Creek north of Phillip Oval • Modification (including widening) of the existing Melrose Drive road bridge over Yarralumla Creek • New pedestrian and cyclist bridge structures over: - Adelaide Avenue at Kent Street - Yarra Glen at Carruthers Street - Yarralumla Creek, north of the Phillip Oval Stop - Yarralumla Creek main drain, to the east of Irving Street.	

Project feature	Description	
	State Circle East alignment option	National Triangle-Barton alignment option
Covered section (Section 5.7)	A covered section about 125 m long where the light rail would pass beneath the southbound lanes of Commonwealth Avenue and transition onto the median of State Circle.	There would be no covered sections in the National Triangle-Barton alignment option.
Active travel arrangements (Section 5.8)	Reconfiguration, modification and/or replacement of existing active travel (walking, cycling and micromobility) infrastructure at various locations, and connection to existing active travel infrastructure within the Project area. New active travel arrangements would include four new pedestrian and cyclist bridges, shared paths to connect with the existing and/or planned active travel network, and bike/scooter parking at stops.	
Landscaping and public domain works (Section 5.2)	Landscaping and public domain features along and around the Project alignment, as presented in the Public Domain Master Plan (refer to Appendix I).	
Road network changes (Section 5.9)	Road network changes to accommodate the Project, including modifications to existing road carriageways and intersections, new intersection arrangements, changes to line markings and traffic signal phasing.	
	• Realignment of the inner carriageway of State Circle into Capital Hill by up to around 20 metres (m) to accommodate the light rail median running arrangement, generally between Commonwealth Avenue and Adelaide Avenue • Realignment into Capital Hill would be greater at intersections along State Circle to accommodate existing turning movements (by up to around 25 m at Canberra Avenue and by up to around 28 m near Melbourne Avenue).	• Introduction of light rail infrastructure into Capital Hill by up to around 22 m to accommodate the inner running arrangement, generally between Sydney Avenue and Adelaide Avenue • This would be greater at intersections along State Circle to accommodate the light rail infrastructure (by up to around 35 m at Sydney Avenue, by up to around 27 m at Canberra Avenue and by up to around 29 m near Melbourne Avenue).
Other facilities and infrastructure (Section 5.10)	• Modified and additional drainage and stormwater management infrastructure to accommodate the Project • Upgrade of the existing stabling depot and maintenance facility in Mitchell to accommodate additional LRVs, staff and storage • Power supply, including TPSs, inground service routes, track infrastructure, signal/lighting, communications equipment and a combination of wire-free and over-head wiring • Connection of new services (power and water supply) to light rail stops • A variety of utility adjustments, subject to agreement with relevant utility authorities.	
Operation and maintenance (Section 5.12)	Operation and maintenance of the Project, including operation, storage and maintenance of up to 12 additional LRVs on the Light Rail network.	

Figure 5-2 Key features of the Project – Commonwealth Avenue precinct (both alignment options)

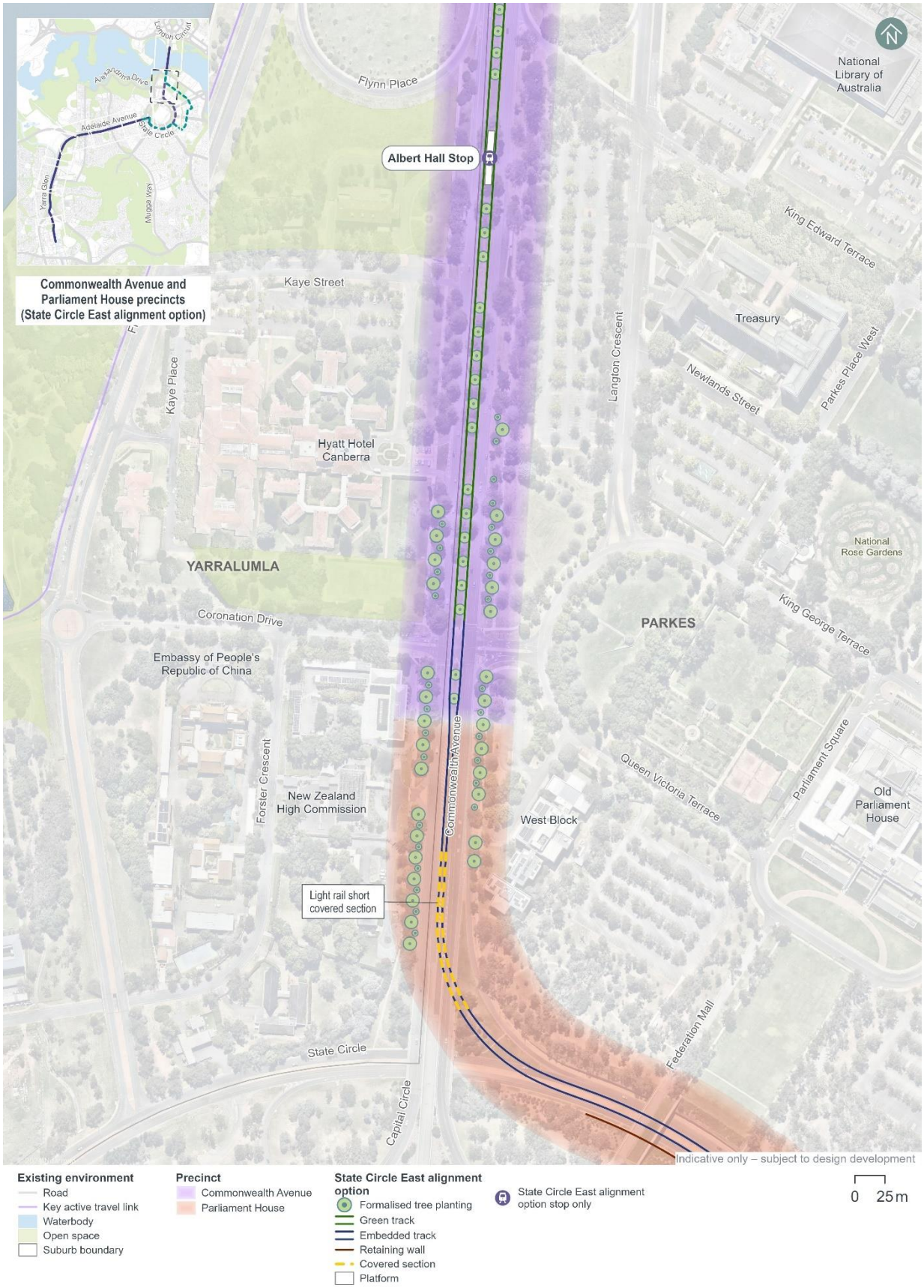


Figure 5-3 Key features of the Project – Commonwealth Avenue and Parliament House precincts (State Circle East alignment option)

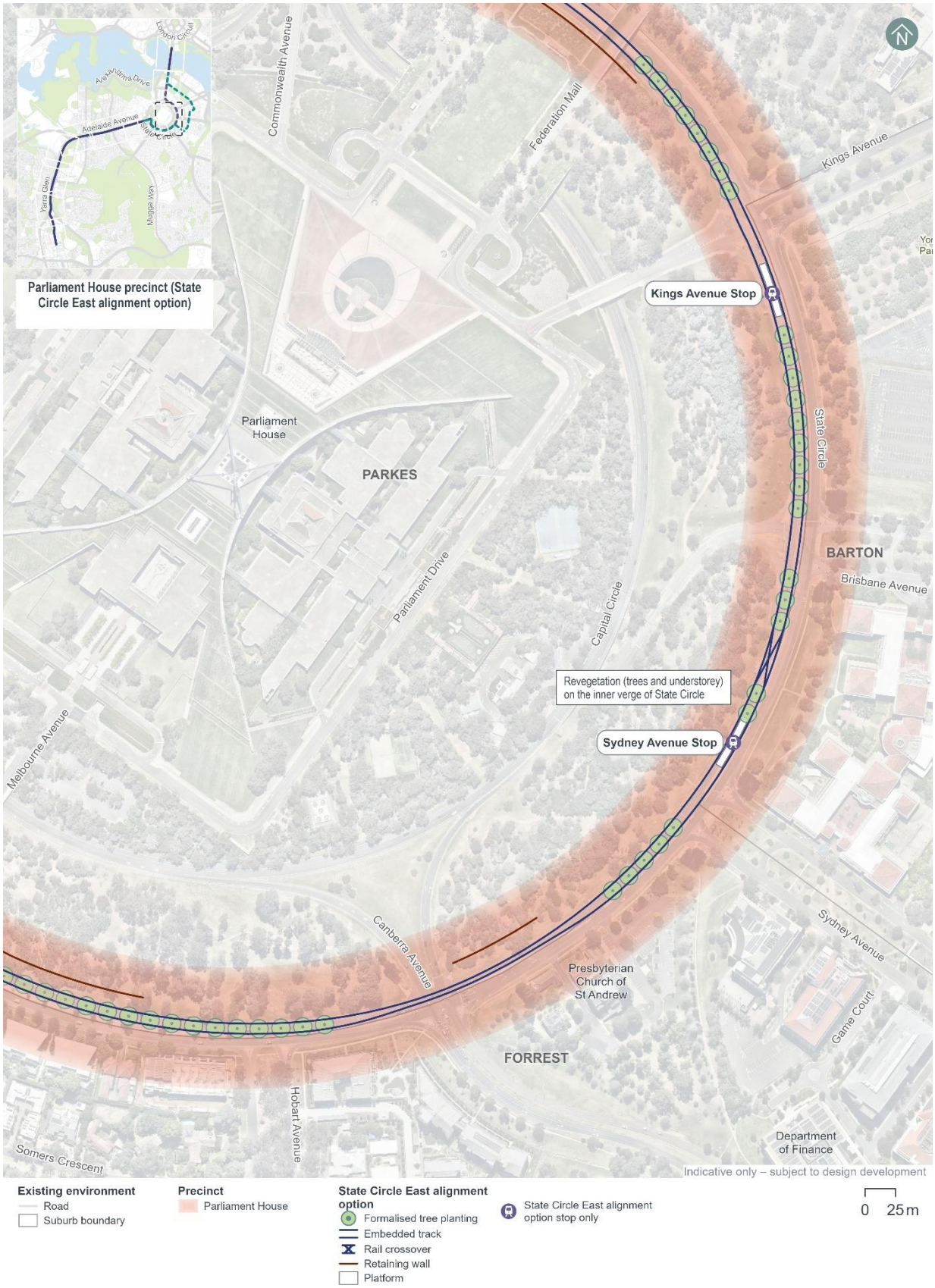


Figure 5-4 Key features of the Project – Parliament House precinct (State Circle East alignment option)

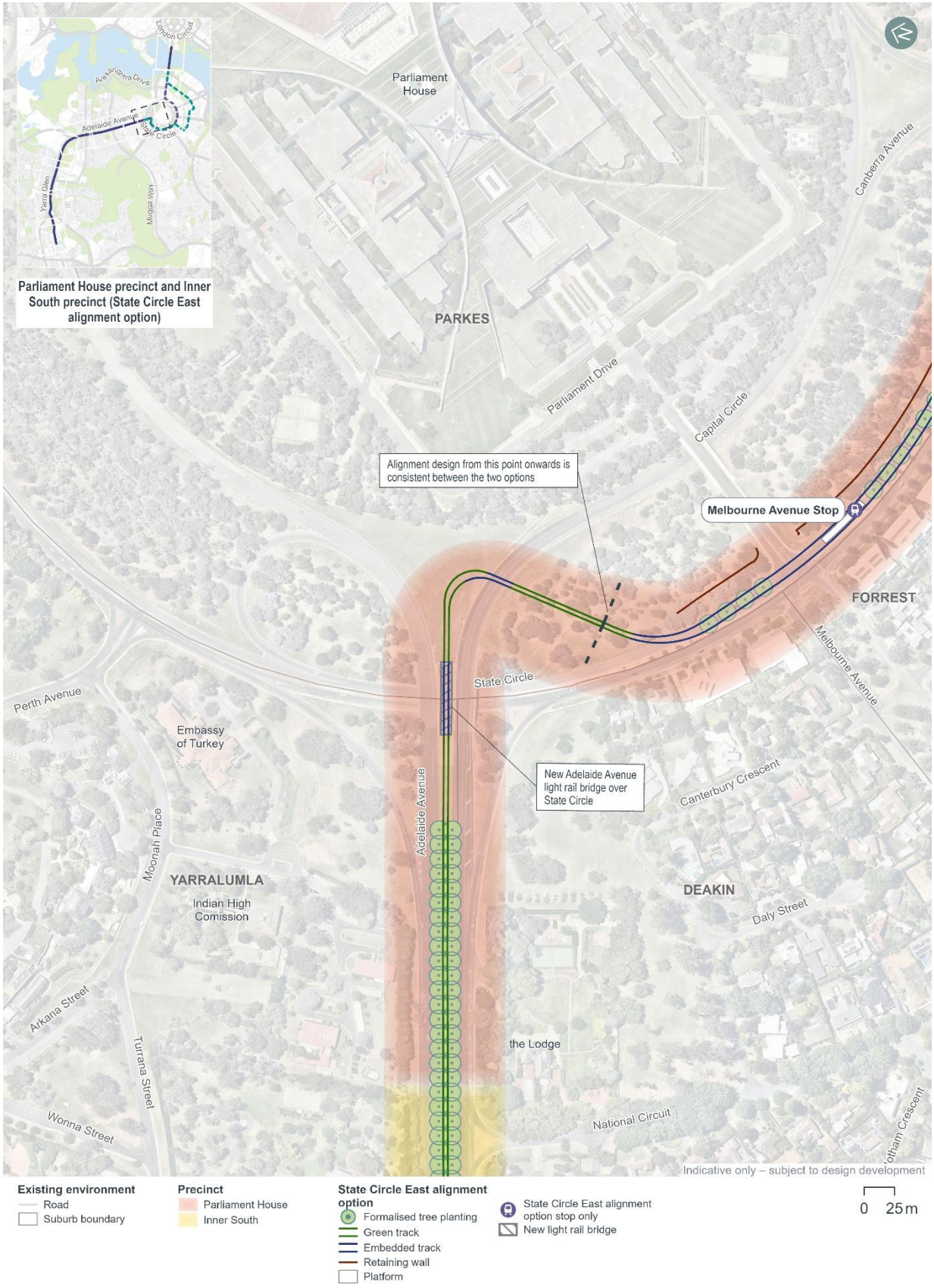


Figure 5-5 Key features of the Project – Parliament House and Inner South precincts (State Circle East alignment option)

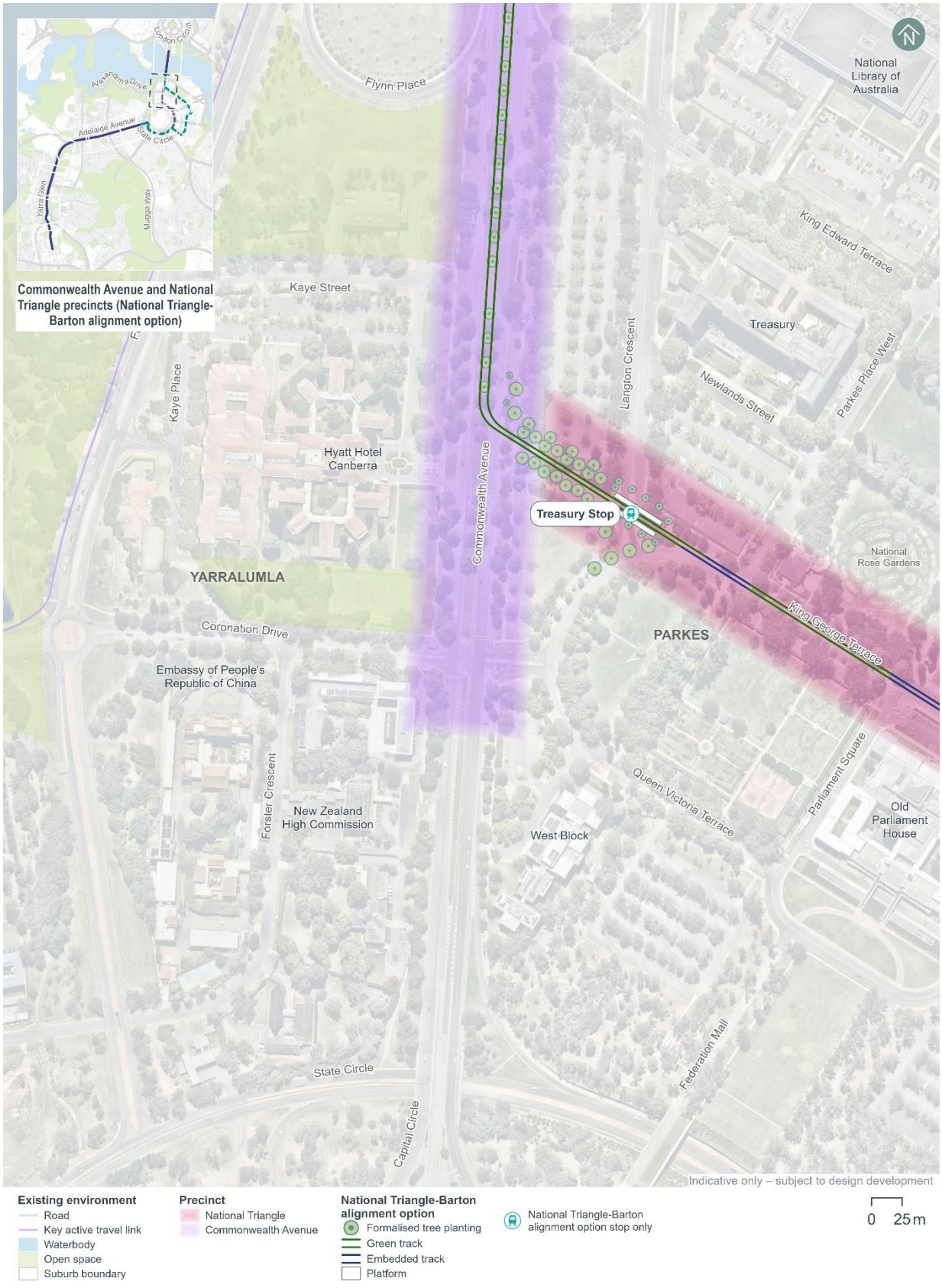


Figure 5-6 Key features of the Project – Commonwealth Avenue and National Triangle precincts (National Triangle-Barton alignment option)

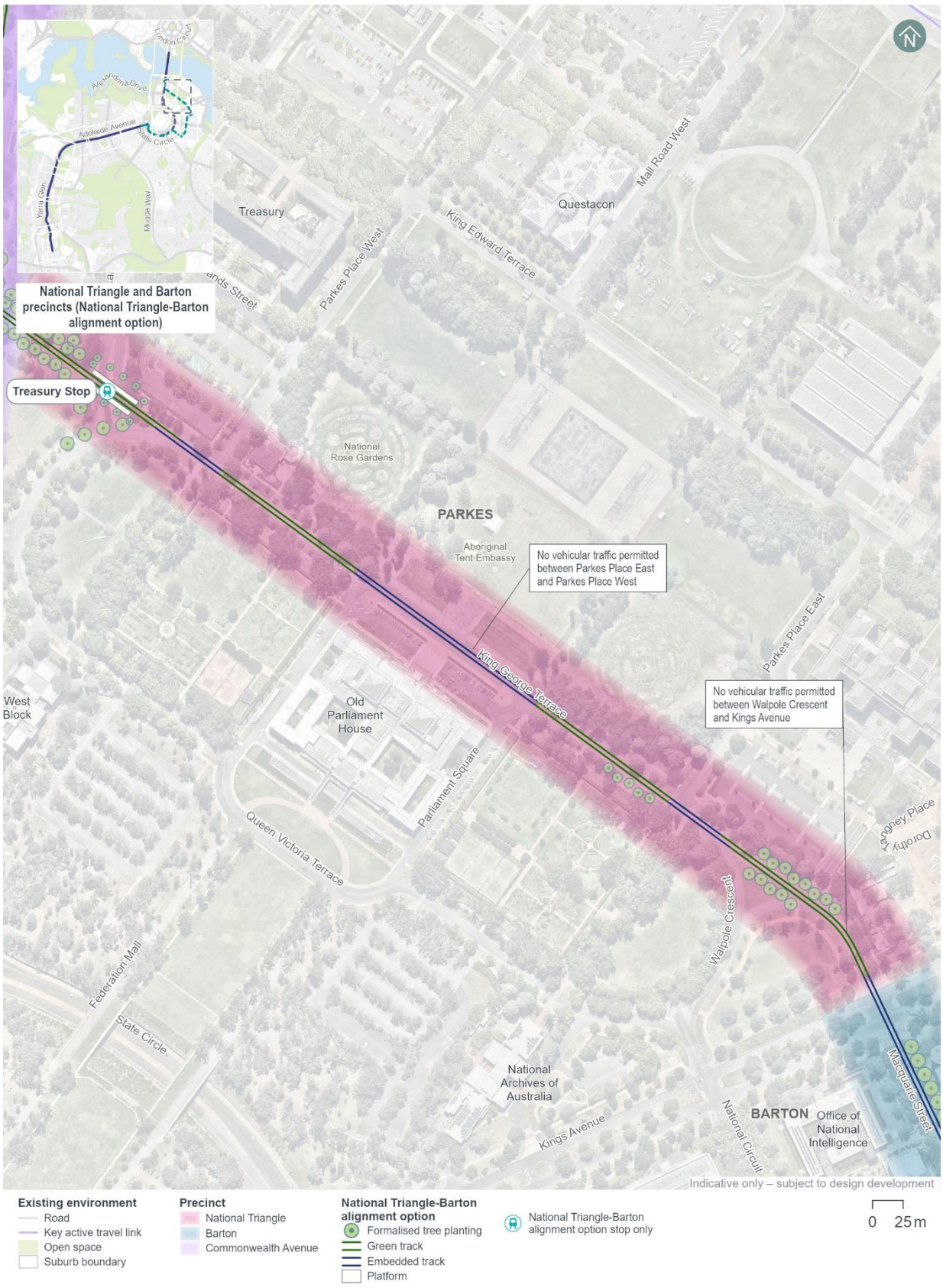


Figure 5-7 Key features of the Project – National Triangle and Barton precincts (National Triangle-Barton alignment option)

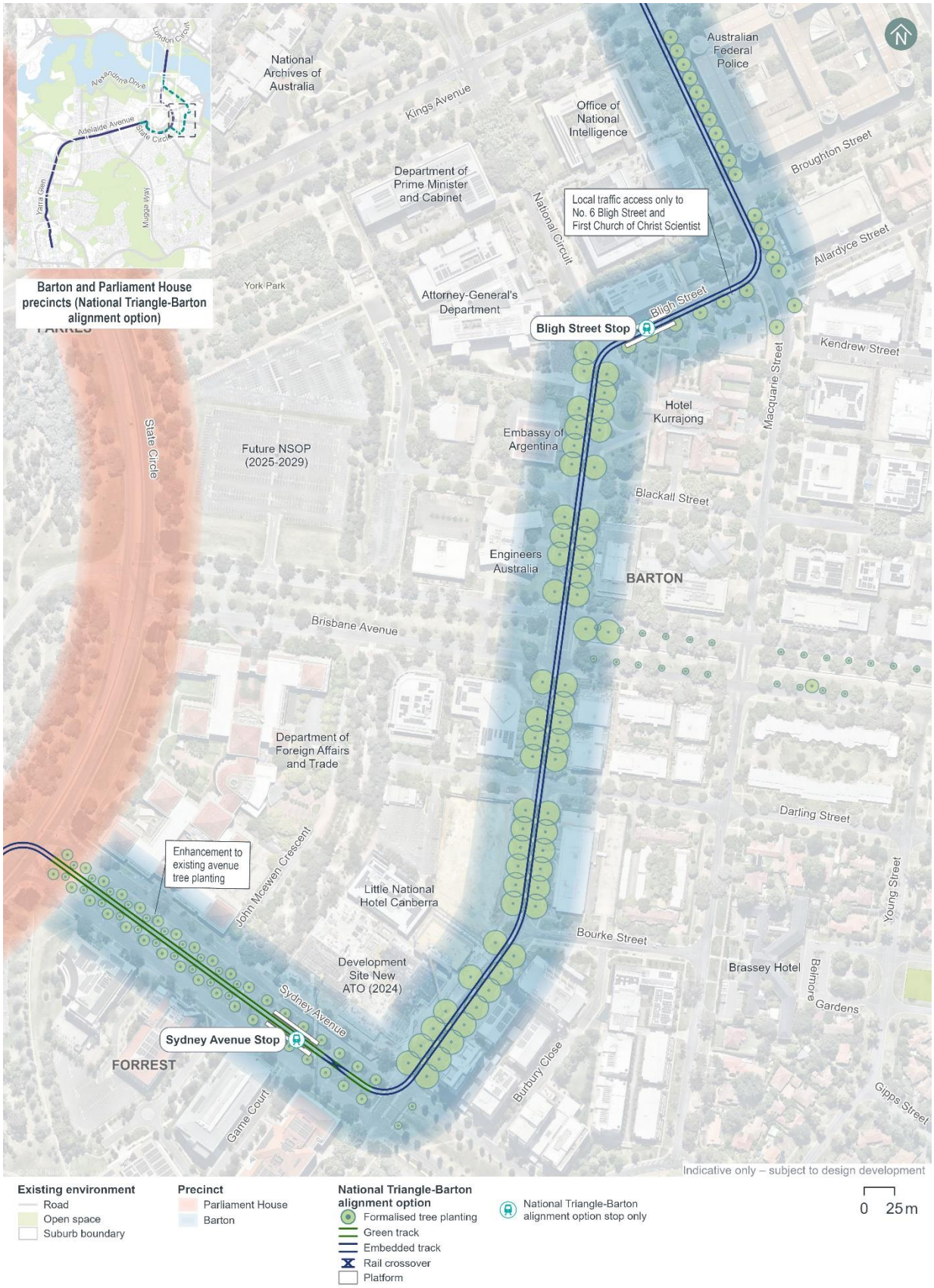


Figure 5-8 Key features of the Project – Barton and Parliament House precincts (National Triangle-Barton alignment option)

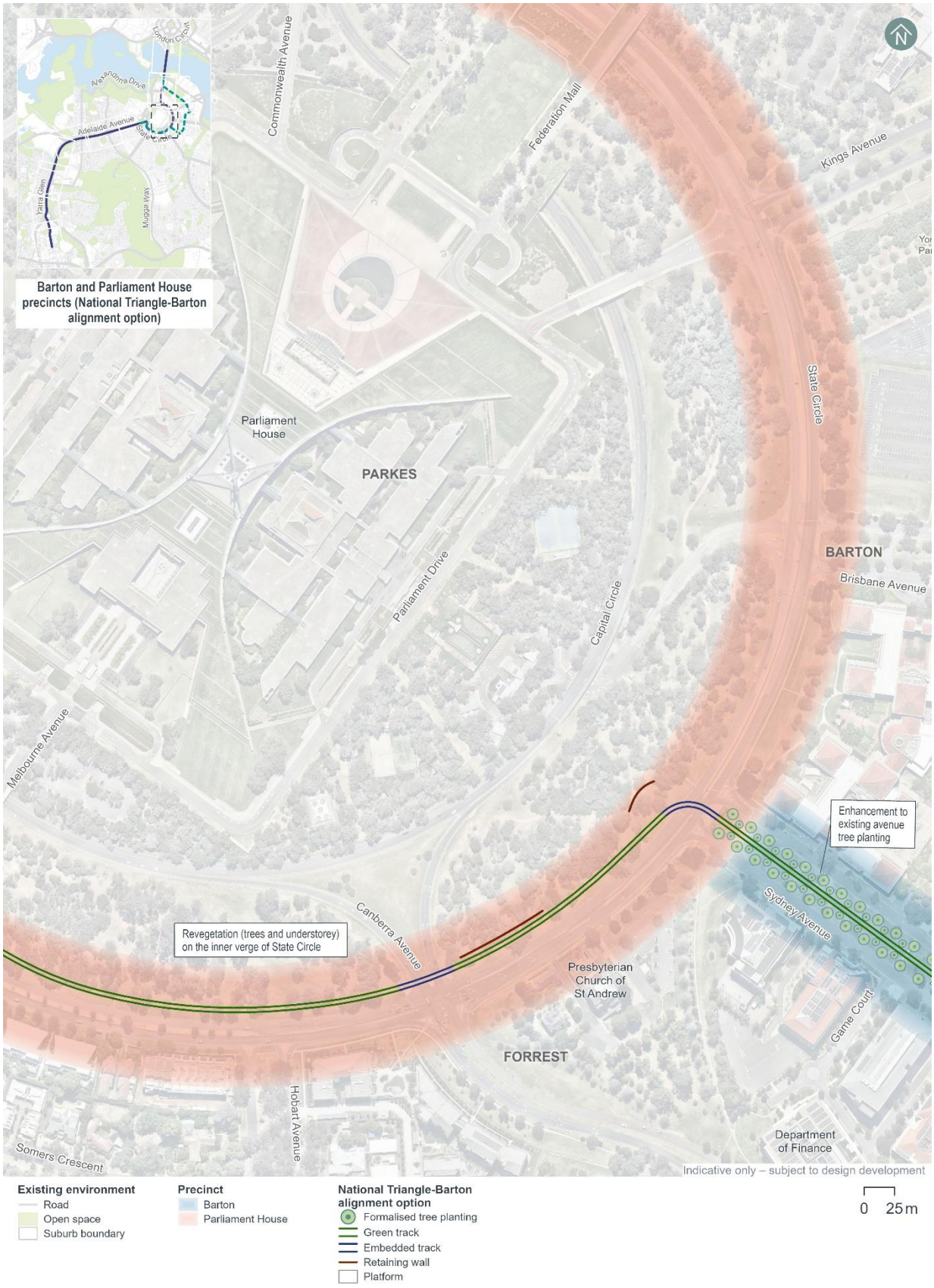


Figure 5-9 Key features of the Project – Barton and Parliament House precincts (National Triangle-Barton alignment option)

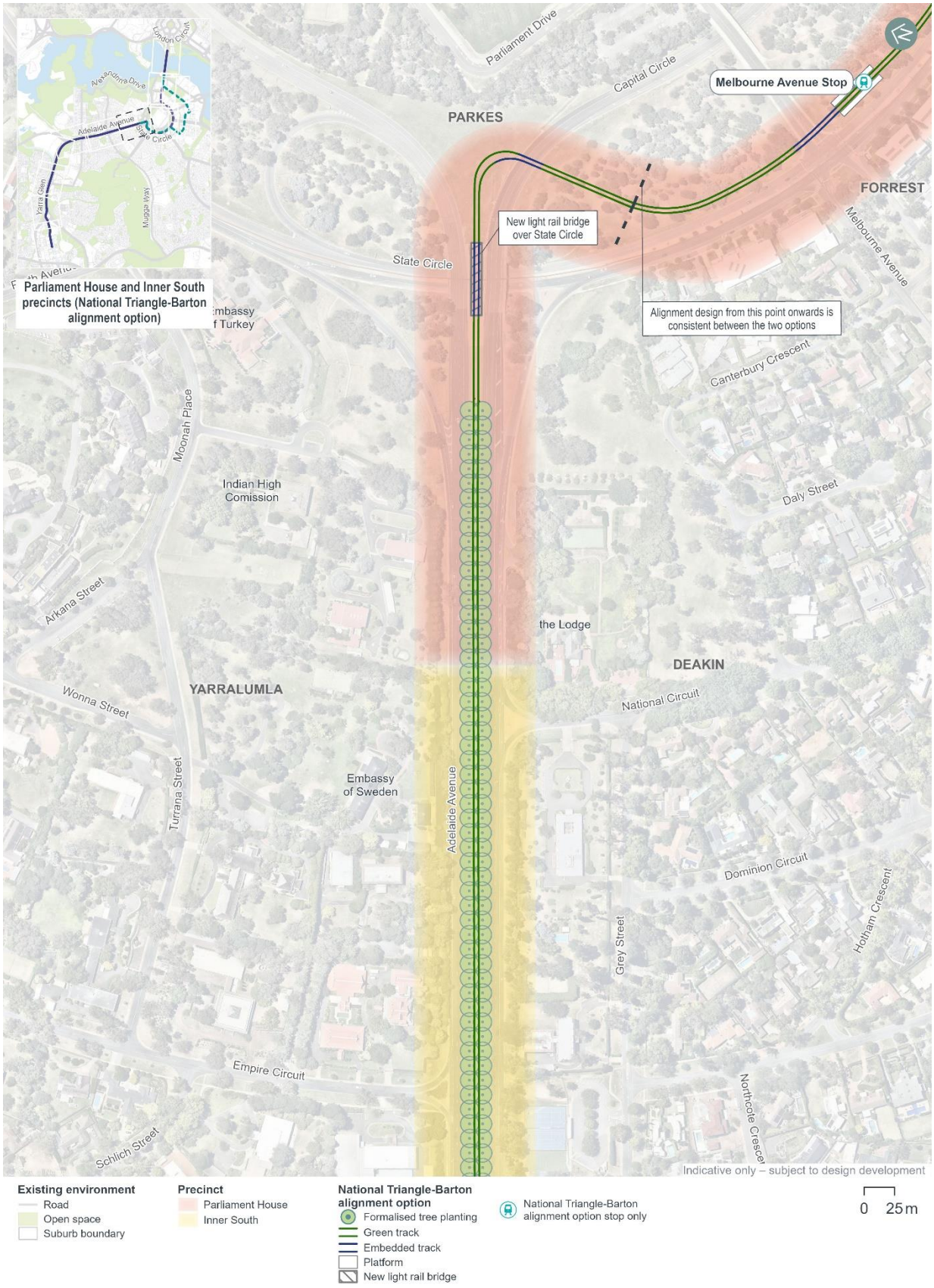


Figure 5-10 Key features of the Project – Parliament House and Inner South precincts (National Triangle-Barton alignment options)

Figure 5-11 Key features of the Project – Inner South precinct (both alignment options)

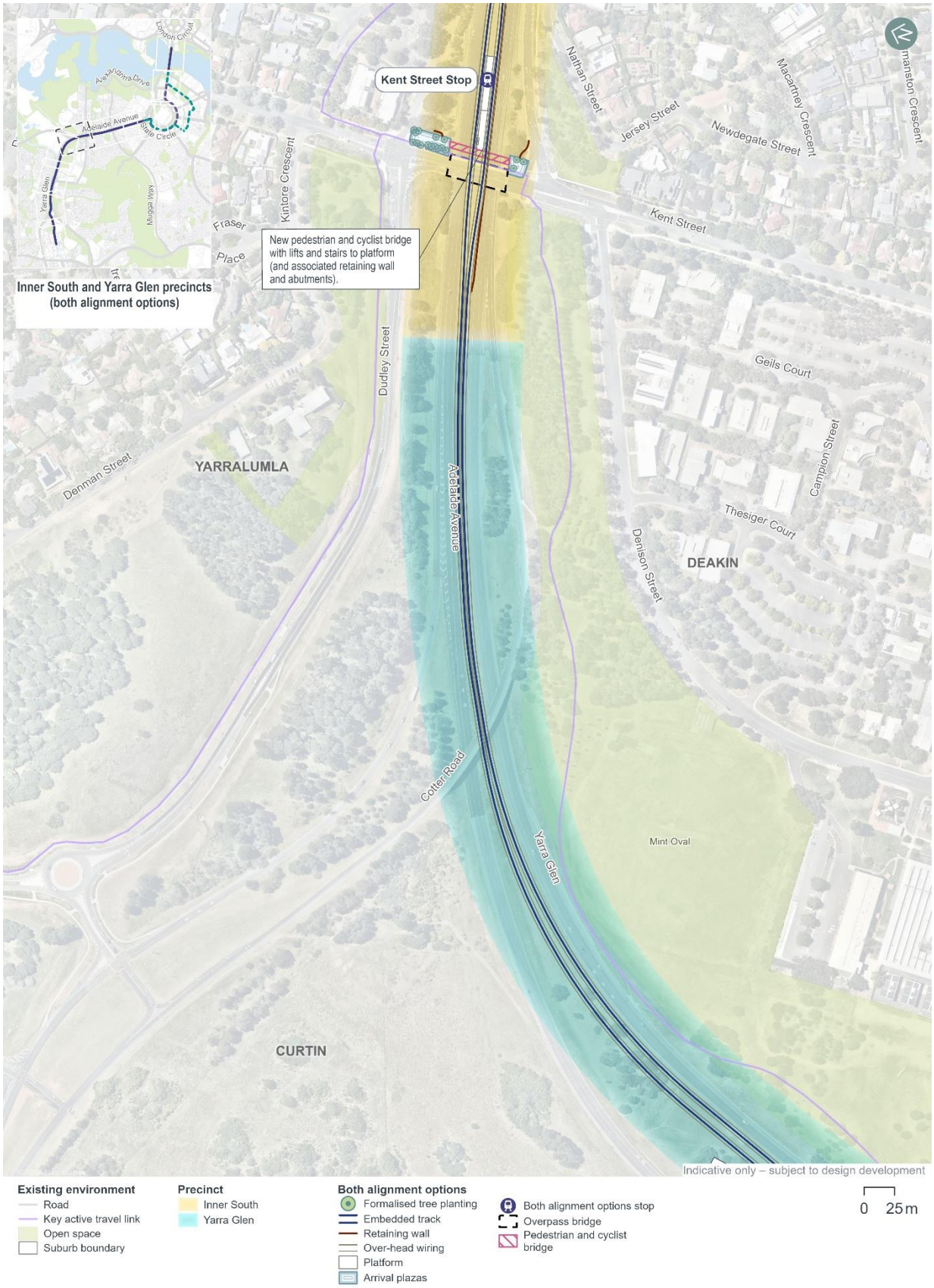


Figure 5-12 Key features of the Project – Inner South and Yarra Glen precincts (both alignment options)

Figure 5-13 Key features of the Project – Yarra Glen precinct (both alignment options)

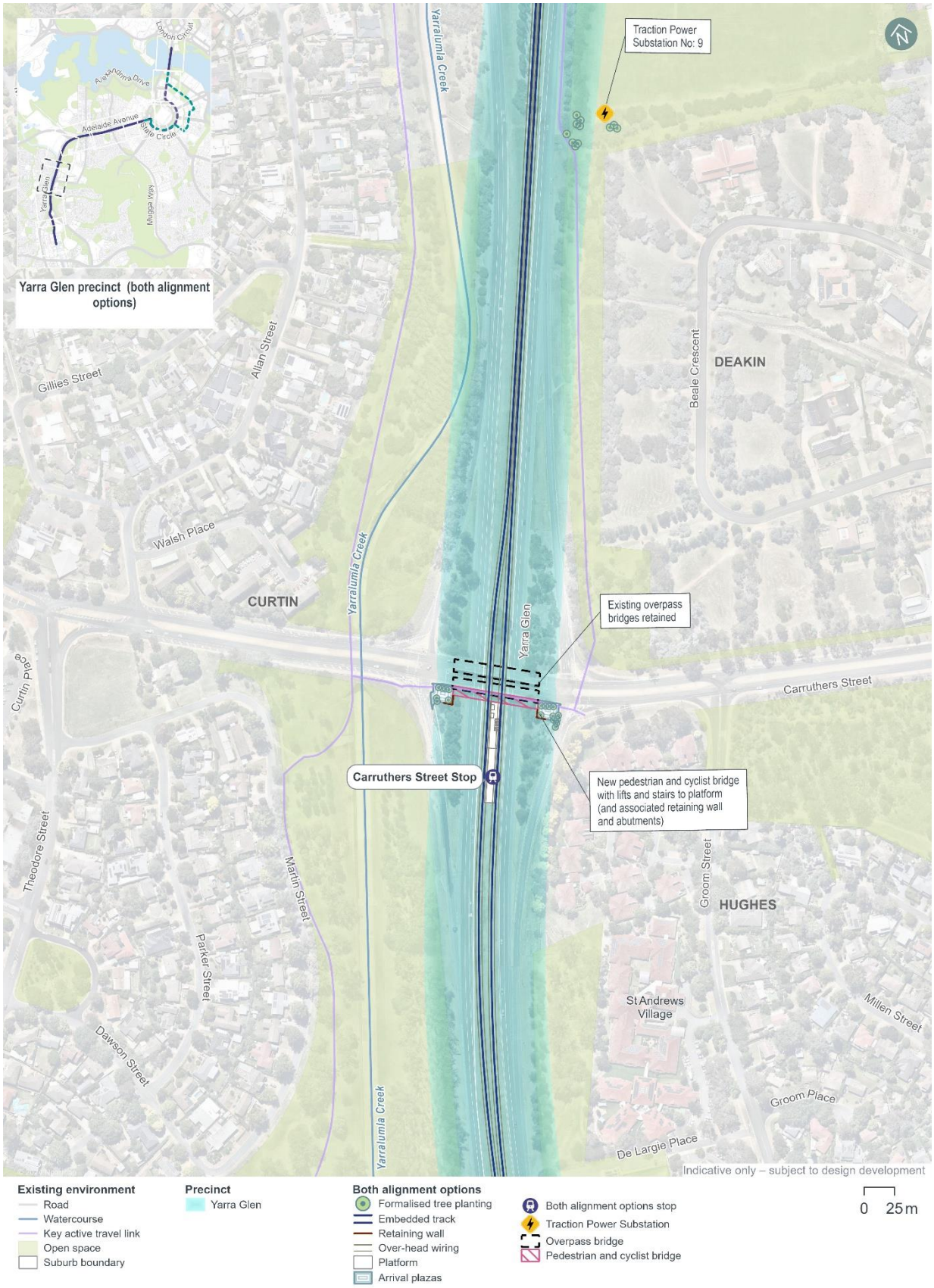


Figure 5-14 Key features of the Project – Yarra Glen precinct (both alignment options)

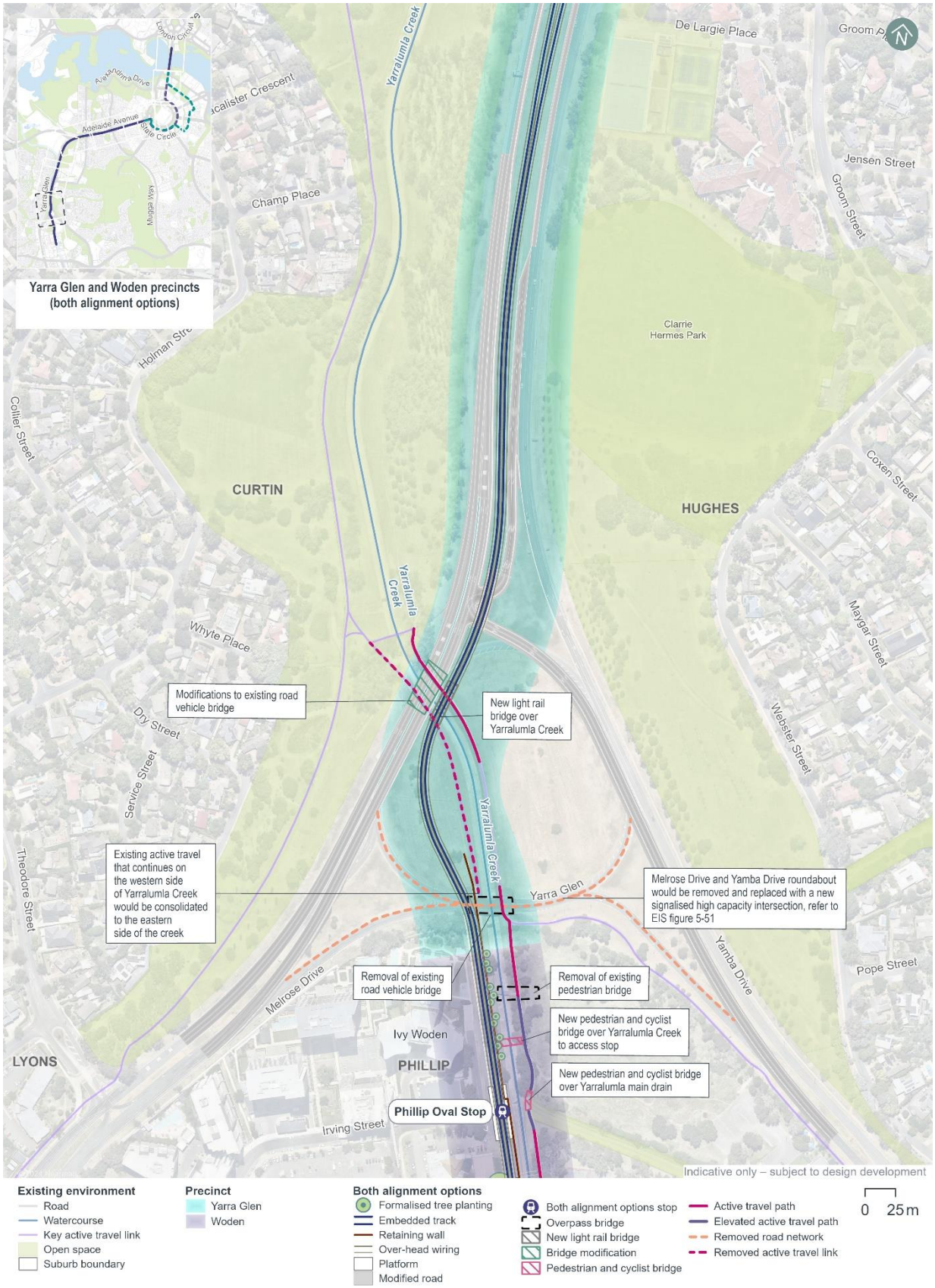


Figure 5-15 Key features of the Project – Yarra Glen and Woden precincts (both alignment options)

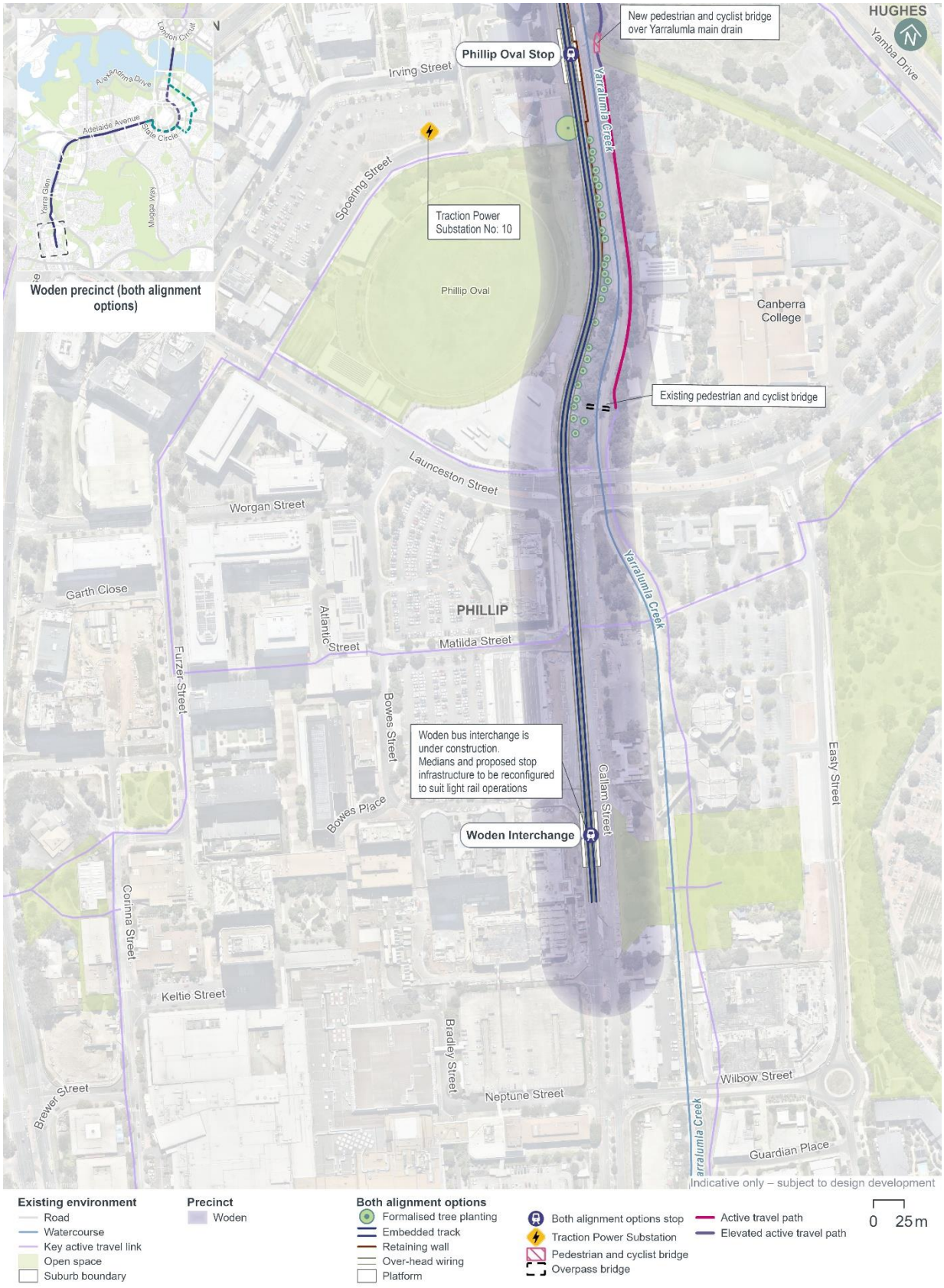


Figure 5-16 Key features of the Project – Woden precinct (both alignment options)

Figure 5-17 Key features of the Project – Mitchell Depot site (both alignment options)

5.2 Urban design approach

5.2.1 Key urban design drivers

Key urban design drivers have been identified for the Project to guide ongoing design and give effect to the Project's design vision. The key urban design drivers have been developed with reference to the Canberra: A Statement of Ambition 2016 (ACT Government, 2016) and the ACT Planning Strategy 2018 (ACT Government, 2018), with the aim to support the principles of sustainability, movement, place and landscape.

The key urban design drivers and corresponding objectives for each precinct are summarised in Table 5-3. They are described further in Appendix I (Public Domain Master Plan).

Table 5-3 Key urban design drivers

Design driver	Objective
Canberra's designed, historic urban landscape	**Complement the national significance of Canberra's historic urban plan** The design should complement the ACT's ambition to optimise main avenues for multi-modal use and integration, and: • Reinforce the geometry and symbolism of Canberra's Central National Area • Maintain the National Triangle that is formed by grand avenues leading to Capital Hill • Include focused views along avenues and open vistas to the lake and distant hills.
Sense of place	**Conserve and enhance the natural and planned landscape character of each precinct** The Project should be designed to respond sensitively to the cultural, historic, and natural character of Canberra's landscape. A landscape-led approach to the design would reinforce the character in each distinct precinct within the light rail corridor.
Design with Country	**Recognise Country and the connection Traditional Custodians have to place** The Project should be developed to celebrate the rich heritage and living culture of Canberra. It should seek to incorporate First Nation's perspectives into design through engagement with traditional custodians in ways that can result in positive outcomes for Country, the land, built environment and community.
Natural systems	**Protect and enhance natural systems** Waterways that cross the Project should be sensitively managed through integration of water sensitive urban design principles. The Project should foster opportunities for biodiversity enhancement and increased tree canopy coverage.
Connecting people to places	**Connect Canberrans to the places they live, work and play** Light rail should connect people to neighbourhoods, schools, workplaces, and tourist destinations. Patterns of movement should be transformed by providing people with efficient and convenient access to precincts along the light rail corridor.
	Accessible and integrated Promote public transport use by enabling convenient multi-modal connections including walking, cycling, bus stops and other modes. Light rail stops should be accessible to all.
	Enhance cross-city connections The north-south light rail corridor should facilitate the establishment of cross-corridor links to local communities and improved city-wide connections.

Design driver	Objective
	Connect Canberrans to the places they live, work and play Light rail should connect people to neighbourhoods, schools, workplaces, and tourist destinations. Patterns of movement should be transformed by providing people with efficient and convenient access to precincts along the corridor.
People first	**Deliver comfortable, safe, and reliable public transport** The safety and security, convenience, comfort, and passenger experience should be paramount in the planning, design and delivery of the Project. Light rail should provide public transport choice for Canberrans and a reliable passenger journey incorporating real time information and integrated ticketing systems.
Placemaking	**Enhance local communities with complementary social infrastructure** Light rail creates opportunities for urban renewal around stops and the broader corridor where appropriate. Increased patronage and activity around stops should support a mix of complementary uses and improve safety through passive surveillance and gender sensitive urban design. Public art should be included and informed by the landscape, heritage and the curated themes based on historical stories along the light rail corridor.
High quality urban design and innovation	**Build beautiful, diverse, and layered places inspired by Country and precinct character** High quality design and innovation is a key driver. The Project should consider high-quality, robust, and sustainable materials that are durable, low maintenance, and sensitively integrate into the surrounds. Well-designed stop canopies, street furniture, signage, lighting, and other urban elements define the system. These elements should guide intuitive wayfinding throughout corridor precincts and provide recognisable transport and urban infrastructure to enhance the public realm.
Economy and technology	**Design for prosperity** Light Rail to Woden should support key residential and employment hubs and provide opportunities for improved economic activity.
	Embrace technology and innovation Modernising the city's public transport system, the Project should embrace battery technology with wire-free running and green track. It should also consider emerging innovations in operations to enhance safety and improve the efficiency, sustainability, and performance of the system.
Safeguard	**Inbuilt capacity for future generations** The Project should be scalable to support the future urban densification of more homes, businesses and services along the corridor, and the expansion of light rail to other parts of the city. The Project should help maintain the city's liveability by enhancing public transport choice and access.
Legacy	**Design to benefit Canberra's future generations** Deliver a world-class integrated public transport system that benefits current and future Canberrans. The legacy of Light Rail to Woden would include improved accessibility, improved landscape, and pedestrian amenity, connected cycleways and increased tree canopy.

5.2.2 Public Domain Master Plan

A Public Domain Master Plan has been prepared to outline the urban design vision for the Project. It identifies requirements and design approaches to achieve this vision, and to guide the planning, design development and delivery of the Project. It introduces the Project's precinct-based approach for identifying and addressing the diverse urban and landscape characteristics within the Project area.

The Public Domain Master Plan describes landscaping and public domain features designed to be consistent with the outcomes detailed in the NCP, and the Territory Plan, including:

- A landscape design-led approach to the Project that prioritises Canberra's landscape heritage, provides a positive landscape legacy where impacts are unavoidable, and meets the Project requirements
- Natural, cultural and indigenous heritage values, that are protected and addressed in the public domain
- Concept urban designs for the State Circle East and National Triangle-Barton alignment options
- Project light rail alignment, stops, and their interactions with interfacing road corridors and land uses
- Design and place opportunities for light rail integration within precincts
- Movement functions around the light rail alignment and stops, considering all users (pedestrians, cyclists, transit users, and road traffic)
- Light rail infrastructure that is well integrated within the existing public domain
- Guidance for the future design development of the Project
- The environmental and aesthetic objectives of the Project.

The Public Domain Master Plan is provided as Appendix I (Public Domain Master Plan). It may be subject to further review and refinement as part of the revised, final EIS.

5.2.3 Landscape strategy

A landscape strategy has been developed for the Project. It reflects Canberra's diverse range of landscape typologies which have been shaped by natural Country, the stewardship of the local Aboriginal peoples, the Griffin Plan and its legacy, the ongoing urban growth of the city, and its climate resilience.

The landscape strategy aims to fit the Project within the landscape typologies through which it would pass, minimising impacts to landscape character and views and celebrating the unique characteristics within each precinct. The strategy includes consideration of:

- The more formal landscape typologies within the northern Project precincts of Commonwealth Avenue, National Triangle, and Barton
- The more informal, 'natural' landscapes of the southern Project precincts of Inner South, Yarra Glen, and Woden
- Parliament House precinct, which displays a more informal, 'natural' landscape than its surrounding suburbs, particularly reflected in the native woodland buffer that occupies the lower slopes of Capital Hill
- Areas of ecological sensitivity, fauna habitats, threatened species and biodiversity
- The overlay of Designing with Country, which would embed an understanding and sense of Country within the landscape design response
- The health of trees and a consideration of vulnerability of species to climate change
- The increased use of native and endemic trees and planting where appropriate.

The Project landscape strategy is further detailed in Appendix I (Public Domain Master Plan).

5.2.4 Biodiversity Sensitive Urban Design

Biodiversity Sensitive Urban Design (BSUD) is an approach that integrates biodiversity into urban planning and development, viewing biodiversity as an opportunity rather than a limitation. It aims to mitigate the negative impacts of urbanisation, such as habitat loss and fragmentation, while promoting positive human-nature interactions.

BSUD considerations for the Project have included:

- Design development taking into account the need to protect the habitat for threatened fauna species, including the Golden Sun Moth (*Synemon plana*), Gang-gang Cockatoo (*Callocephalon fimbriatum*), and Superb Parrot (*Polytelis swainsonii*)
- Revegetation on the inner verge of State Circle to support habitat and biodiversity
- Increased tree density, creating a vegetated border adjacent the light rail corridor along Yarra Glen to reduce the risk of bird strike from low flying birds
- New trees and planting at all light rail stops to connect people to nature
- Increased tree and shrub planting from Yarra Glen, along Yarralumla Creek to Launceston Street to extend and connect natural areas
- Consideration of native tree planting across the Project to increase habitat for biodiversity, including the threatened Gang-gang Cockatoo and Superb Parrot.

5.2.5 Designing with Country

The land upon which the Project would sit is Ngunnawal Country. Canberra, derived from the local Aboriginal word for ‘meeting place’, has been home to the first peoples, the Ngunnawal, Ngambri and Ngambri-Guumaal for around 20,000 years. Ngunnawal, Ngambri, and Ngambri-Guumaal people continue to live and travel through the Canberra region, preserving their culture by maintaining connections to land and through artistic expression.

Aboriginal community members have been engaged to identify ways to incorporate Country and culture into the Project and Designing with Country. The Designing with Country stakeholder engagement process has included:

- Identifying traditional custodians, Representative Aboriginal Organisations (RAOs), and key organisations and broader community members, prioritising them according to seniority, cultural knowledge, and professional experience
- Conducting a Walk on Country and inviting priority stakeholders to a one-on-one interview process
- Gathering feedback and insights defining a site-specific Designing with Country Framework inclusive of key design principles.

Design themes and recommendations developed through this process are reflected in Appendix I (Public Domain Master Plan). The key design themes include:

- Reflect Country through landscaping – designing landscapes with a deep respect for the natural, cultural and spiritual dimensions of Country
- Journey through story telling – to use the Project as an opportunity for sharing stories as passengers are transported across Country
- Evoking the senses – Creating a multi-sensory experience to connect to Country, fostering a sense of belonging, identity and cultural heritage
- Incorporating language – opportunities include stop names, quick-response (QR) codes and signage to celebrate language in design.

Implementation of Designing with Country would occur over the next phase of design development, with continued community engagement and engagement of an Aboriginal design consultant to meaningfully consider key themes, an art strategy and socioeconomic recommendations within the design.

5.2.6 Gender sensitive urban design

To support the Project objective to enhance local communities with complementary social infrastructure, the Project has and would continue to consider gender sensitivity in design as a factor of overall customer experience, including safety and equitable access.

Gender sensitive urban design (GSUD) in the Project is guided by the *GSUD Implementation Toolkit* (ACT Government, 2021) and the *Gender Sensitive Urban Design Framework* (ACT Government, 2023) as well as a Project-specific design strategy.

GSUD recognises that people experience public spaces differently based on gender. GSUD seeks to empower the participation of everyone, particularly women, girls, and gender diverse people, in the use of public spaces, including public transport spaces. The application of design strategies which engage with the gendered experience of public space address themes including the enhancement of perceived safety and the promotion of inclusiveness, ensuring that public spaces are welcoming and accessible for all individuals.

While not all the experiences that contribute to how a person feels in a public space can be solved by design, a gender sensitive approach would seek to understand and embrace diversity and re-address inequalities in the design of the public realm to create more inclusive and equitable environments for everyone.

The Project has and would continue to include consideration of key GSUD elements within the context of public transport, including:

- Lighting – associated with stops
- Stop access – multiple points of access and good integration within their environs, including, where possible, catchment footpath upgrades
- Service information displays – good navigation, regardless of available personal technology, good communications with passengers
- Targeted consultation to inform the design approach, further supported by a women's safety audit.

Appendix I (Public Domain Master Plan) establishes the GSUD considerations to be applied across all precincts and to actively contribute to a more equitable and inclusive urban environment.

5.2.7 Connecting people to places

Connecting people to places by facilitating easy and effective transfer between different modes of transport, is a key driver for the Project. The Project would be designed to integrate with the broader transport network (including active travel networks and bus services) and would likely include the following features to allow passengers to change between transport modes:

- Wayfinding signage to direct passengers between public transport services
- Direct pathways to other public transport services and active travel routes
- Free-standing passenger information displays
- Bike/scooter parking at stops
- Kiss and ride.

An interchange facility with bus services on Callam Street (Woden Interchange) is currently under construction and will include future proofing for a light rail terminus as part of those works. The Project would include modification to the Woden Interchange to facilitate light rail operations and the ability for passenger interchange to/from bus services.

5.3 Light rail trackform and corridor

This section describes the different types of trackform and corridor arrangements along the light rail alignment. Trackform for the State Circle East alignment option would be around 9.5 km long, and around 10.5 km long for the National Triangle-Barton alignment option.

5.3.1 Trackform

Trackforms and their indicative locations are described in the following sections. The location of different types of trackform along the light rail alignment would be subject to further design development, taking into account community and stakeholder feedback, value for money, support for heritage outcomes and environmental, sustainability and landscaping outcomes.

At road intersections and on bridges, trackform would be an embedded track design to meet requirements for vehicles moving across the tracks.

Embedded track

Embedded track is typically used in street environments where the light rail track is trafficable by both LRVs and road vehicles. The embedded tracks would be encapsulated within a concrete base with the surface finish integrated to complement the surrounding context, function, and use. Different types of surface finishes are being considered for embedded track sections of the Project, such as concrete, paving, asphalt (generally at road intersections), stabilised decomposed granite gravel or (non-permeable) bonded gravel, and stone unit pavers. The Project would likely implement a mix of different surface finish types taking into account maintenance requirements, cost, local landscape context, urban design outcomes, and safety.

Figure 5-2 to Figure 5-16 show the embedded track locations for each alignment option. An example of embedded tracks installed as part of LRS1 is shown on Figure 5-18.

Figure 5-18 Image showing embedded tracks installed as part of LRS1

Green track

Green track is a light rail feature that includes grass or vegetation between and along tracks. Green track generally involves placement of the track on a plinth or base with a suitable fastening system.

As part of LRS2A, green track has been approved on Commonwealth Avenue on the northern side of Lake Burley Griffin (refer to Figure 5-19).

Figure 5-19 Indicative visualisation of green track at approved Commonwealth Park Stop for LRS2A

For the Project, the locations of green track are shown on Figure 5-2 to Figure 5-16 and summarised in Table 5-4. Different types of green track are being investigated for the Project and would be confirmed through ongoing design development. The Project would consider use of a combination of the following types of green track:

- Turf grass – which would comprise a monoculture turf grass with higher maintenance requirements compared to other green track options. An example of turf grass green track is shown on Figure 5-20
- Mass planted – which would comprise a mix of low ground cover species and gravel mulch, with medium to high maintenance requirements. An example of mass planted green track is shown on Figure 5-21.

The final design, type, and extent of green track would be subject to ongoing design development in consultation with stakeholders and may vary from the example images shown (including due to grass species selection). Green track design would consider factors including cost and maintenance requirements, the local landscape context, water use and sustainability. As part of ongoing design development, it may be appropriate, based on further consultation and consideration of the sustainability, whole of life considerations and landscape context, for some areas of green track to be treated with a permeable gravel material (refer to discussion on other potential trackforms in the following sections).

Figure 5-20 **Example of green track – turf grass, from the light rail green track prototype at the National Arboretum Canberra (September 2024)**

Figure 5-21 **Example of green track - planted, from the light rail green track prototype at the National Arboretum Canberra (May 2024)**

Other potential trackform types

Other potential trackform types would be considered along sections of Adelaide Avenue and Yarra Glen to the intersection at Melrose and Yamba Drive. These alternative trackform types could consist of concrete sleepers sitting on ballast and a suitable capping layer, and would be used only in areas where light rail is in a median with sufficient separation from the road, and with no intersections.

The Project may also include limited sections of permeable (gravel) track. This would comprise non-irrigated gravel mulch that would cover the rail sleepers and would have low to medium maintenance requirements.

The use of alternative trackform types would be subject to further investigation and would consider factors such as urban design and place integration, value for money (considering both construction and operational maintenance costs), drainage, and sustainability outcomes.

5.3.2 Light rail corridor

The light rail corridor refers to the land and physical structures (e.g. track and light rail stops) on which LRVs would operate. For the majority of the Project, the light rail corridor would be located within existing road reserves, and separated from other vehicles by a kerb or other physical barrier. In this configuration, the tracks could be located either:

- Within a median (referred to as 'median running'). An example of this is shown on Figure 5-22
- Within the road verge (referred to as 'inner running'). An example of this is shown on Figure 5-23.

In both median and inner running arrangements, LRVs would generally not use the same road space as road vehicles, except at intersections where LRVs would cross the road carriageway via controlled traffic signals. Key exceptions to this are noted in Table 5-4. Pedestrians would be able to cross the tracks and road carriageway via traffic signals or other designated crossing points.

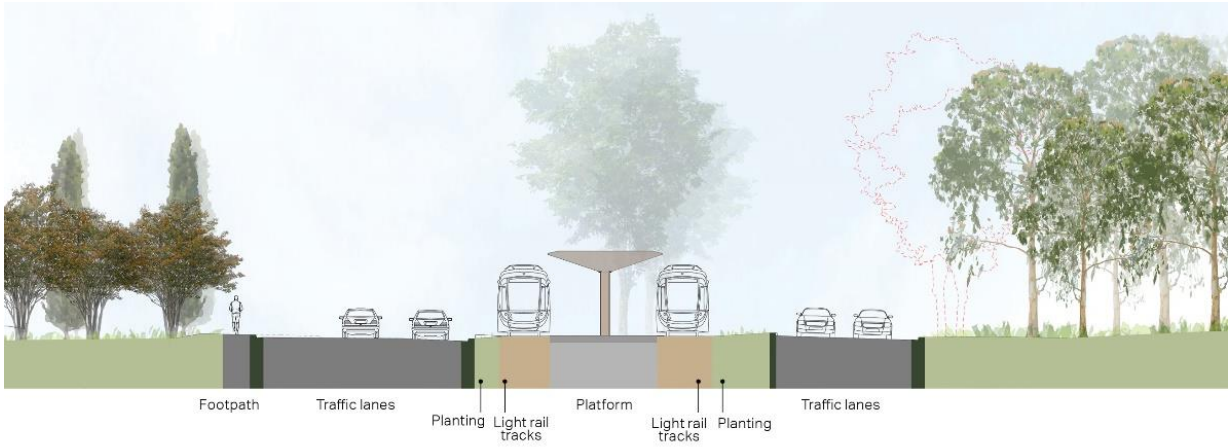


Figure 5-22 Indicative cross section of a median running arrangement, with an island platform (in the Parliament House precinct at the Sydney Avenue Stop)

Figure 5-23 Indicative cross section of an inner running arrangement (in the Parliament House precinct on State Circle near Melbourne Avenue)

There are some instances where the light rail corridor would be located outside of a road reserve:

- In respect of both alignment options:
  - A section of the light rail alignment between State Circle and Capital Circle, within the Parliament House precinct (refer to Figure 5-10 and Figure 5-24). This section of the light rail alignment is within land designated for roads, however is located physically away from road carriageways
  - A section of the light rail alignment south of the Yarra Glen/Melrose Drive/Yamba Drive intersection to Launceston Street in the Woden precinct. This section is on Territory land where light rail is permissible in the Territory Plan (refer to Figure 5-15, Figure 5-16 and Figure 5-25).
- For the National Triangle-Barton alignment option: A section of the light rail alignment between Commonwealth Avenue and Langton Crescent, connecting to the Treasury Stop (refer to Figure 5-6). This section would traverse the Commonwealth Avenue and National Triangle precincts.

Figure 5-24 Indicative cross section of the light rail alignment between State Circle and Capital Circle in the Parliament House precinct

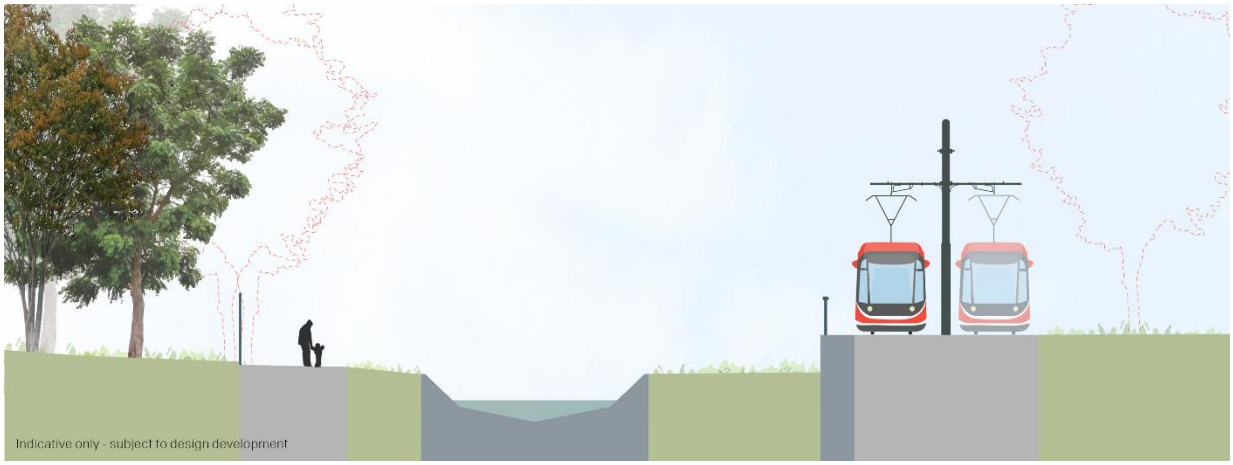


Figure 5-25 Indicative cross section of the light rail alignment south of Melrose Drive to Launceston Street in the Woden precinct

5.3.3 Light rail trackform and corridor across precincts

A summary of the indicative light rail trackform types within each precinct, including the light rail corridor type is provided in Table 5-4 and shown on Figure 5-2 to Figure 5-16.

Table 5-4 Light rail track proposed within each precinct

Trackform	Light rail corridor type
Commonwealth Avenue precinct	
• Embedded track – on the new light rail bridges over Lake Burley Griffin and Flynn Drive • Green track – all other sections of the light rail alignment in the precinct, north and south of Lake Burley Griffin.	Median running.
Parliament House precinct	
State Circle East alignment option • Embedded track – for the majority of the light rail alignment in the precinct, including Capital Hill • Green track – a section of the light rail alignment between State Circle and Capital Circle, and on Adelaide Avenue within the precinct.	**State Circle East alignment option** Median running, with the exception of an inner running section where the light rail transitions from State Circle onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle.
National Triangle-Barton alignment option Green track – road verge along State Circle, just west of the Sydney Avenue Stop, to Adelaide Avenue, and Capital Hill.	**National Triangle-Barton alignment option** Inner running.
National Triangle precinct (National Triangle-Barton alignment option only)	
• Green track – on King George Terrace, between Commonwealth Avenue and Parkes Place West; Parkes Place West and Parliament Square (west); Parliament Square (east) and Parkes Place East; and Walpole Crescent to Kings Avenue • Embedded track – all other sections of the light rail alignment in the precinct.	Median running, with the exception of a section of the alignment between Commonwealth Avenue and Langton Crescent where the alignment is located away from the road reserve.
Barton precinct (National Triangle-Barton alignment option only)	
• Green track – on Sydney Avenue • Embedded track – all other areas of the light rail alignment in the precinct.	Median running, with the exception of a controlled section of the alignment on Bligh Street between Macquarie Street and the Bligh Street Stop, where the alignment would also be used by road vehicles accessing No 6 National Circuit and No 4 Bligh Street.
Inner South precinct	
• Green track – from the northern extent of the precinct to Hopetoun Circuit • Embedded track – south of Hopetoun Circuit • Embedded track – light rail bridges over Hopetoun Circuit.	Median running.
Yarra Glen precinct	
Embedded track.	Median running.

Trackform	Light rail corridor type
Woden precinct	
Embedded track.	Median running, with the exception of the light rail alignment between the Yarra Glen/Melrose Drive/Yamba Drive intersection and Launceston Street which would be outside of the road reserve

5.4 Light rail stops

5.4.1 Stop locations and platform arrangements

Both alignment options would include nine new stops. Light rail stop locations are shown on Figure 5-2 to Figure 5-16. Stop platforms may either be a side platform arrangement (two platforms located either side of narrow tracks, refer to Figure 5-26), or an island platform arrangement (a single central platform between tracks, refer to Figure 5-27).

Further investigations into potential urban renewal opportunities are being carried out by others as part of development of the Southern Gateway Planning and Design Framework. This framework outlines the strategic directions for growth and development in the Inner South and Woden districts, including integrated land-use and transport outcomes in and around Yarra Glen and North Woden. To support planned land-use outcomes, the Project design does not preclude the introduction of a potential future stop within the Yarra Glen median near the Royal Australian Mint.

Figure 5-26 Example of a side platform arrangement at the existing Alinga Street Stop

Figure 5-27 Example of an island platform arrangement, at the existing Gungahlin Place Stop

Platform dimensions for light rail stops have been informed by anticipated customer requirements, existing infrastructure and space constraints, platform typology and integration with other Project infrastructure (e.g. bridges). Stop platforms would generally range from 33 to 45 m long, with space proofing at shorter platforms (33 m) to allow for potential future expansion to 45 m if required in the future. Table 5-5 summarises the indicative stop platform arrangements and dimensions for the Project.

Table 5-5 Stop locations and platform arrangements

Stop name	Alignment option	Location	Indicative platform arrangements (at commencement of operation)		
			Type	Length (m)	Width (m)
Commonwealth Avenue precinct					
Albert Hall	State Circle East alignment option only	In the median of Commonwealth Avenue, just north of Albert Hall.	Island platform	45	5.5
Parliament House precinct					
Kings Avenue	State Circle East alignment option only	In the median of State Circle, south of the intersection with Kings Avenue, opposite to York Park.	Island platform	45	5.5
Sydney Avenue	State Circle East alignment option only	In the median of State Circle, north-east of the intersection with Sydney Avenue and State Circle.	Island platform	45	5.5

Stop name	Alignment option	Location	Indicative platform arrangements (at commencement of operation)		
			Type	Length (m)	Width (m)
Melbourne Avenue	State Circle East alignment option only	In the median of State Circle, east of the intersection with Melbourne Avenue and State Circle (in the median).	Island platform	45	5.5
Melbourne Avenue	National Triangle-Barton alignment option only	In the inner verge of State Circle, east of the intersection with Melbourne Avenue and State Circle (in the inner verge).	Side platforms	45	4.5
National Triangle precinct					
Treasury	National Triangle-Barton alignment option only	On King George Terrace at the intersection with Langton Crescent.	Side platforms	45	4.0
Barton precinct					
Bligh Street	National Triangle-Barton alignment option only	On the western end of Bligh Street, close to the intersection with National Circuit.	Side platforms	45	3.5
Sydney Avenue	National Triangle-Barton alignment option only	In the median of Sydney Avenue, between Windsor Walk and National Circuit.	Side platforms	45	4.0
Inner South precinct					
Hopetoun Circuit	Both alignment options	In the median of Adelaide Avenue, immediately west of Hopetoun Circuit.	Island platform (grade-separated)	33	6.0
Kent Street	Both alignment options	In the median of Adelaide Avenue, east of Kent Street overpass bridge.	Island platform (grade-separated)	33	8.0
Yarra Glen precinct					
Carruthers Street	Both alignment options	In the median of Yarra Glen, south of the Carruthers Street overpass bridge.	Island platform (grade-separated)	33	8.0

Stop name	Alignment option	Location	Indicative platform arrangements (at commencement of operation)		
			Type	Length (m)	Width (m)
Woden precinct					
Phillip Oval	Both alignment options	North of Phillip Oval, near Irving Street on western side of Yarralumla Creek.	Side platforms	45	4.0
Woden Interchange	Both alignment options	On Callam Street, north of the intersection with Bradley Street.	Side platforms	45	4.0

The Hopetoun Circuit Stop and Kent Street Stop on Adelaide Avenue, and Carruthers Street Stop on Yarra Glen would be grade-separated due to the difference in level between the light rail alignment and the parallel road network. Indicative visualisations of these grade-separated stops at Kent Street and at Hopetoun Circuit are provided on Figure 5-28 and Figure 5-29, respectively.

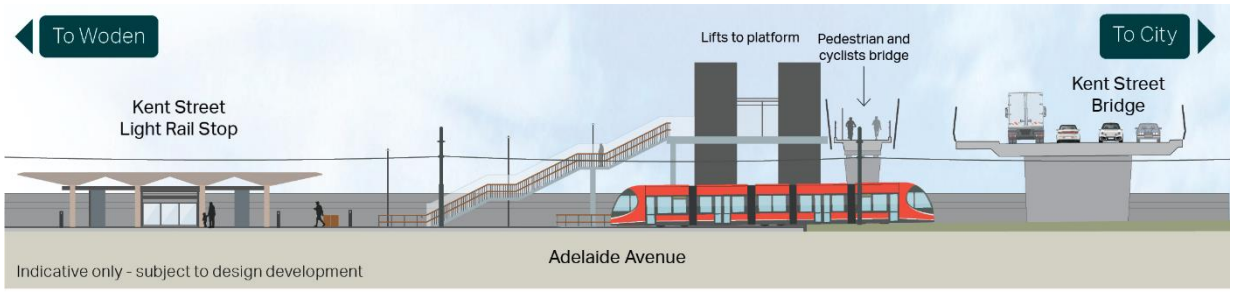


Figure 5-28 Visualisation of the grade-separated stop below Kent Street in the Inner South precinct

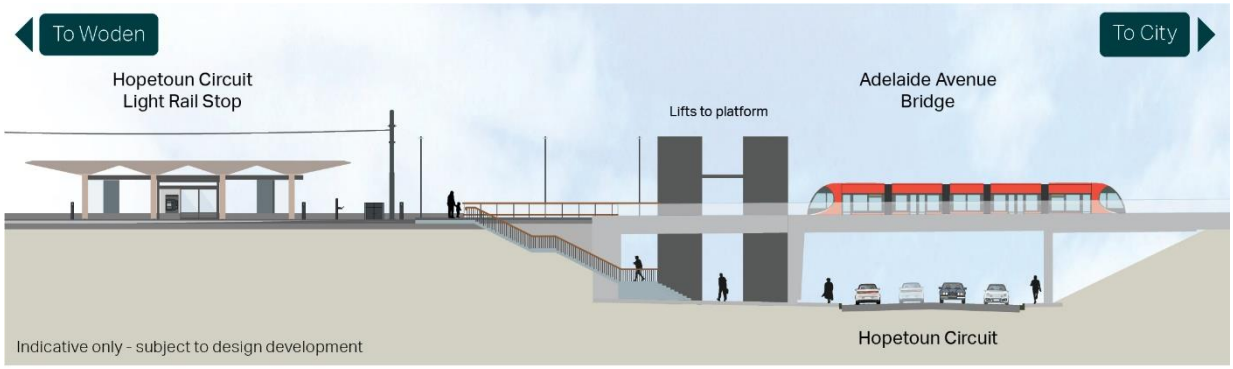


Figure 5-29 Visualisation of the grade-separated stop at Hopetoun Circuit in the Inner South precinct

Consultation with key stakeholders and the community, including the established Community Reference Group for the Project, would continue as part of ongoing optimisation of stop design. This process would include consideration of designs that provide attractive, safe and efficient stops and best meet the urban design drivers for the Project (refer to Section 5.2).

The design of the Phillip Oval Stop would be subject to further investigation to improve resilience to potential flooding along Yarralumla Creek. This may include adjustments in the location and height of infrastructure at or near this stop.

5.4.2 Stop architecture

To maintain legibility and consistency with LRS1 and LRS2A, and to assist with intuitive wayfinding, the architectural design of the stops across all precincts would be generally consistent with the existing LRS1 stops, and approved LRS2A stops. In particular, the Albert Hall Stop (State Circle East alignment option) would be designed to maintain visual consistency with other approved LRS2A stops along Commonwealth Avenue. The Public Domain Master Plan (refer to Section 5.2.2 and Appendix I (Public Domain Master Plan)) identifies requirements and design principles for stop architecture which acknowledge the heritage landscape and values around stop locations.

5.4.3 Accessibility

Stops would be designed to meet Australian Standard *AS1428: Design for access and mobility*, and the requirements of Disability Standard Accessible Public Transport (DSAPT) issued under the *Disability Discrimination Act 1992* (Cth) (DDA). Stops would include infrastructure for accessibility, including:

- Passenger ramps and handrails
- Seating at stops, including space provisions for wheelchairs in some areas
- Facilities at grade-separated stops to assist with access to the platform such as lifts and stairs
- Braille lettering and raised pictograms at stops, on information totem poles, and on every LRV door button
- Pre-recorded public announcement messaging to assist hearing impaired passengers with information about the stop facilities
- Hearing loops at each stop and on-board LRVs to assist those with hearing impairments
- Accessibility symbols and tactile ground surface indicators on the ground of stop platforms for mobility aid users to assist with boarding.

Stops would be designed to be accessible from a suitable access point. Access to at-grade platforms would be from signalised crossings and ramps where necessary. Grade-separated stops would have lifts and stairs to allow access to the platform. Signalised pedestrian crossings would also be provided at stops with a side platform arrangement, to allow passengers to cross the tracks safely.

At some stops such as the Phillip Oval Stop and the Bligh Street Stop, platforms would be integrated into the surrounding footpath (i.e. designed at a similar level with visually similar materials to the surrounding footpath) to allow seamless access. This arrangement would be similar to the existing Gungahlin terminus, as shown on Figure 5-30.

Figure 5-30 Existing Gungahlin Place Stop where access has been integrated with the surrounding pedestrian zone

5.4.4 Safety and security

The Project design would incorporate measures to promote the safety of light rail passengers and staff. Crime prevention through environmental design (CPTED) principles and Gender Sensitive Urban Design (GSUD) initiatives (refer to Section 5.2) have been integrated into the design.

The Project would be designed, constructed and operated in accordance with the Rail Safety National Law. Safety features incorporated into the design would include:

- Installation of closed-circuit television (CCTV)
- Provision of clear signage and public address system to assist in an emergency
- Designing stops with clear sight lines for passengers and staff for passive surveillance
- Installation of lighting
- Reinforcement of the light rail stop boundaries to separate the road reserve from stops where space allows using landscape design and other design features such as signalised crossings
- Emergency help points located at every LRV door and at each stop
- Potential use of bollards to delineate areas, the location and extent of which would be subject to ongoing design development
- Dual access/egress to stops where possible as well as clearly marked exits.

The Project design has also been developed to be responsive to the security and access requirements for high security buildings, particularly around the Parliament House, National Triangle and Barton precincts. The Project concept design has been, and would continue to be developed in consultation with these stakeholders to manage potential conflicts with existing security requirements, and to avoid any increase in security and access risks.

Security is discussed further in the hazard and risk assessment in Section 11.13 of Chapter 11 (Project-wide issues).

5.4.5 Stop furniture and facilities

The design of stop furniture and facilities would be generally consistent with those provided for LRS1 and approved for LRS2A. Stop furniture and facilities would include canopies, windbreak screens, emergency help points, customer information points, seating, water fountains, and rubbish bins.

Other key furniture and facilities at stops would include access points, CCTV, lighting, canopies, furniture, signage, tactile ground surface indicators (TGSIs), radio masts, cabinets for signalling, bicycle parking and other customer facilities (e.g. passenger information display systems, hearing loops, and ticket machines).

Driver facilities would also be provided at the Woden Interchange and would be similar in nature to those provided at the Alinga Street Stop as part of LRS1.

5.4.6 Signage and wayfinding

The Project would incorporate a dedicated signage system that has been implemented as part of LRS1 and approved for LRS2A. Signage at stops would generally include stop names, wayfinding, warning signs, timetable information, and customer information points.

Signage and wayfinding would be designed to be intuitive, clear, and consistent to enhance customer journeys. Urban design elements such as stop canopies, street furniture and lighting would support intuitive wayfinding for customers within all precincts.

Operational signage would also be in use by the light rail operator and drivers, such as light rail speed limit signage.

5.5 Bridges

The Project would require the construction of new light rail and pedestrian and cyclist bridges, and the removal and modification of existing road vehicle and pedestrian and cyclist bridges.

New light rail bridges would facilitate grade separated travel along the light rail alignment and would allow connection to each light rail stop. New pedestrian and cyclist bridges would be required to connect to existing and new active travel arrangements. Active travel arrangements for the Project are described further in Section 5.8.

The following existing bridges would be removed as part of the Project:

- Road bridge over Yarralumla Creek between Yamba Drive and Melrose Drive
- Pedestrian bridge across Yarralumla Creek north of Phillip Oval.

New and modified bridges (including light rail, pedestrian and cyclist, and road vehicle bridges) required as part of the Project are summarised in Table 5-6. Each bridge identified in Table 5-6 would be required for both alignment options.

Table 5-6 New and modified bridges

Location / details of bridge	Approximate length (metres)
Commonwealth Avenue precinct	
New light rail bridge over Lake Burley Griffin between the existing Commonwealth Avenue northbound and southbound road bridges. The light rail bridge would allow for northbound and southbound direction travel.	330
New light rail bridge over Flynn Drive between the existing Commonwealth Avenue road bridges.	65
Parliament House precinct	
New light rail bridge over State Circle between the existing Adelaide Avenue northbound and southbound carriageways. The light rail bridge would allow for northbound and southbound direction travel.	65
Inner South precinct	
New light rail bridges over Hopetoun Circuit between the existing Adelaide Avenue road bridges.	55
New pedestrian and cyclist bridge parallel to the existing Kent Street bridge over Adelaide Avenue.	60
Yarra Glen precinct	
New pedestrian and cyclist bridge parallel to the existing Carruthers Street bridges over Yarra Glen.	70
Modification (including widening) of the existing Melrose Drive road bridge over Yarralumla Creek.	20
New light rail bridge over Yarralumla Creek, immediately south of the new intersection at the Yarra Glen/Melrose Drive/Yamba Drive interchange. To the south of the intersection, a new light rail (only) bridge would be provided to allow the light rail alignment to pass from the eastern to the western side of Yarralumla Creek. The light rail bridge would allow for northbound and southbound direction travel.	50
Woden precinct	
New pedestrian and cyclist bridge over Yarralumla Creek to the east of Ivy Apartments to connect the new active travel link (on the eastern side of Yarralumla Creek) with the Phillip Oval Stop	20
New pedestrian and cyclist bridge on the eastern side of Yarralumla Creek crossing over the Yarralumla Creek Main Drain to connect the active travel link through to Canberra College and Launceston Street	20

5.5.1 Commonwealth Avenue light rail bridges

Two light rail bridges would be provided between the existing Commonwealth Avenue road bridges over Lake Burley Griffin, and Flynn Drive. These two bridges have been and would continue to be designed in line with the following principles:

- Be of equal quality to that of the existing road bridges
- Have the same column spacing as the existing road bridges
- Not reduce existing lake to underside of bridge clearance distances

- Be slimmer than the existing bridges so as not to visually impact the existing road bridges
- Have no impact on the structural soundness of the existing road bridges.

Figure 5-31 and Figure 5-32 provide indicative visualisations showing the light rail bridges over Lake Burley Griffin and Flynn Drive, respectively. The location of the bridges is shown on Figure 5-2.

Figure 5-31 Indicative visualisation of light rail bridge between the existing Commonwealth Avenue road bridges over Lake Burley Griffin in the Commonwealth Avenue precinct

Figure 5-32 Indicative visualisation of light rail bridge between the existing Commonwealth Avenue road bridges over Flynn Drive in the Commonwealth Avenue precinct

5.5.2 Adelaide Avenue light rail bridge over State Circle

The light rail alignment would transition from State Circle onto Adelaide Avenue via the landscaped annulus between State Circle and Capital Circle, an at-grade intersection with Capital Circle, and a light rail bridge over State Circle between the existing Adelaide Avenue road bridges. An indicative visualisation is provided on Figure 5-33, and the location of the light rail bridge is shown on Figure 5-5 and Figure 5-10.

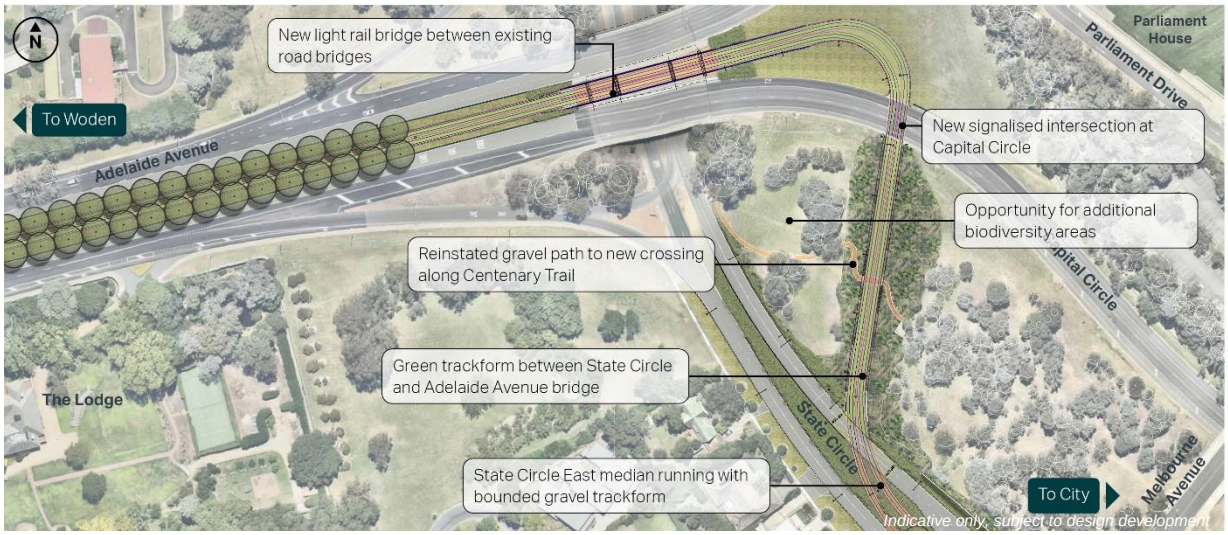


Figure 5-33 Indicative visualisation of the light rail bridge over State Circle – Parliament House and Inner South precincts

5.5.3 Twin light rail bridges over Hopetoun Circuit

Twin bridges would be provided over Hopetoun Circuit for the northbound and southbound light rail tracks. The location of these bridges is shown on Figure 5-11, with an indicative visualisation of the bridges provided on Figure 5-34.

Figure 5-34 Indicative visualisation of the light rail bridges over Hopetoun Circuit – Inner South precinct

5.6 Melrose Drive and Yamba Drive intersection and light rail bridge

The Melrose Drive and Yamba Drive roundabout would be removed and replaced with a new signalised high capacity intersection. The new intersection would allow for light rail movement, improved traffic flow, and would include the following key infrastructure:

- A new light rail bridge over Yarralumla Creek
- Modification to the existing Melrose Drive road bridge over Yarralumla Creek to accommodate the southbound carriageway comprising two through traffic lanes
- Removal of the existing road connection from Yamba Drive to Melrose Drive, including the removal of the existing road bridge
- Removal of existing pedestrian and cyclist bridge over Yarralumla Creek, and construction of new pedestrian and cyclist bridge further south
- Relocation of the existing active travel link to the eastern side of Yarralumla Creek.

Melrose Drive and Yamba Drive intersection locality is identified as a ‘change area’ in the District Strategies and is the subject of ongoing strategic planning investigations as part of the Southern Gateway Planning and Design Framework. Noting the ongoing planning work, an indicative visualisation of the intersection and light rail bridge is provided on Figure 5-35. Its location is shown on Figure 5-15.

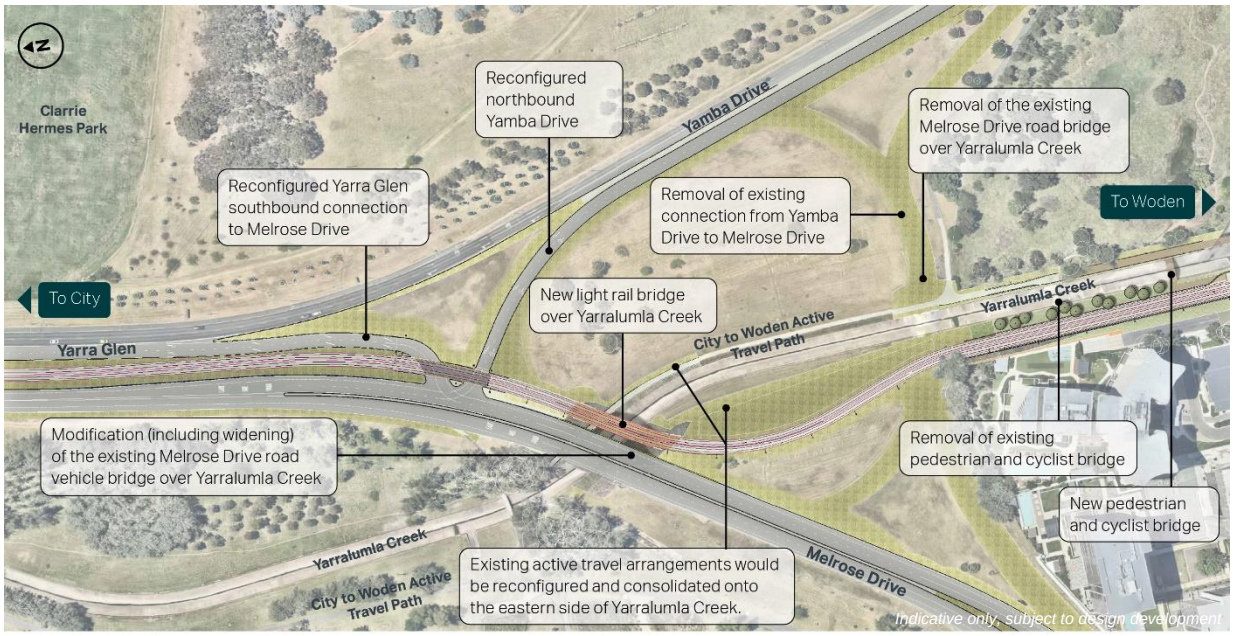


Figure 5-35 Indicative visualisation of the new Melrose/Yamba Drive intersection and light rail bridge over Yarralumla Creek – Yarra Glen and Woden precincts

5.7 Covered section between Commonwealth Avenue and State Circle

For the State Circle East alignment option, the light rail alignment would travel along the Commonwealth Avenue median and transition under the southbound carriageway of Commonwealth Avenue to emerge on State Circle via a covered section around 125 m long. The covered section would not be accessible to road vehicles, pedestrians or other active travel users.

This covered section would allow the light rail alignment to transition from Commonwealth Avenue to State Circle without disrupting traffic. It would also minimise visual impacts relative to at-grade or overpass alternatives. Indicative visualisations of this covered section are provided on Figure 5-36 and Figure 5-37. The location of the covered section is shown on Figure 5-3.

LRVs would enter and exit the covered section from an opening in the median of Commonwealth Avenue, south of the Coronation Drive and Queen Victoria Terrace intersection with Commonwealth

Avenue (shown on Figure 5-36), and an opening on the north side of State Circle, east of Commonwealth Avenue (shown on Figure 5-37).

Services such as fire and life safety equipment, lighting, cables, CCTV, signage and infrastructure to support light rail operations would be provided for the covered section.

To manage potential surface water and groundwater entry, the covered section may include drainage and water management infrastructure such as a wet well, in-built subsoil drainage, recessed pumps, a valve pit and rising main, and water treatment equipment.

Opportunities to minimise the complexity of the design of the covered section, including potential at-grade options, would be subject to further investigations and consultation with key stakeholders. Any alternative solution would balance factors including traffic and road network performance, urban design and visual impacts, and heritage considerations.

Figure 5-36 Indicative visualisation of covered section looking south from Commonwealth Avenue toward State Circle - Parliament House precinct

Figure 5-37 Indicative visualisation of covered section merging onto State Circle – Parliament House precinct

5.8 Active travel arrangements

Active travel arrangements for the Project, such as access to light rail stops and long-term transport and land use integration, have been considered in relation to the existing cycling and pedestrian network and the Active Travel Plan 2024-2030 (ACT Government, 2024).

For much of the Project, the existing active travel arrangements would be retained. However, to promote more continuous active travel links through the area, new active travel infrastructure as part of the Project would include:

- Four new pedestrian and cyclist bridges (as discussed in Table 5-6)
- Shared paths to connect with the existing and/or planned active travel network
- Bike/scooter parking at stops
- Modifications to existing active travel pathways (such as on-road cycleways, off-road shared pathways and dedicated off-road cycleways) to integrate with the Project.

The National Triangle-Barton alignment option would include active travel links through the National Triangle and Barton precincts, enhancing access to national cultural institutions, commercial areas, hotels and government offices.

A summary of active travel arrangements provided by the Project in each precinct is provided in Table 5-7. There would be no change to active travel arrangements around the Mitchell Depot site.

Table 5-7 Active travel arrangements

Active travel arrangements
Commonwealth Avenue precinct
State Circle East alignment option only Other than adjustments to kerb lines at the Coronation Drive intersection area, existing active travel arrangements on Commonwealth Avenue (on road cycleways) would be retained and would remain unchanged. **National Triangle-Barton alignment option only** The existing Commonwealth Avenue southbound on-road cycle lane would be diverted to allow safe crossing of the track as it crosses from the Commonwealth Avenue median across the verge through the landscaped area and onto King George Terrace.
Parliament House precinct
State Circle East alignment option only There are no dedicated cycleways or on-street cycle markings on State Circle. These existing active travel arrangements on State Circle would remain unchanged, however a minor adjustment would be required to allow for safe crossing of the light rail alignment as it enters State Circle from the covered connection from Commonwealth Avenue. **National Triangle-Barton alignment option only** Existing active travel arrangements would remain unchanged.
National Triangle precinct
National Triangle-Barton alignment option only A shared path would be provided on the northern side of the light rail alignment between Commonwealth Avenue and Parkes Place West running parallel to the new Treasury Stop
Barton precinct
National Triangle-Barton alignment option only A shared path would be provided between Kings Avenue and Bligh Street on the eastern verge of Macquarie Street. Existing on-road dedicated cycle lanes on National Circuit would be replaced with a shared path between Bligh Street and Sydney Avenue on the western verge of National Circuit. Active travel arrangements would be provided to connect to and around the Bligh Street Stop and Sydney Avenue Stop and would include facilities for cyclist/scooter parking.
Inner South precinct
Both alignment options Existing on-road cycleways on Adelaide Avenue would be retained. Minor modifications to these cycleways would be required at the upgraded intersections located at the on- and off-ramps with Adelaide Avenue and Hopetoun Circuit. Bicycle parking and storage would be provided at the new public plaza on Hopetoun Circuit (proposed as part of the Project). A new pedestrian and cyclist bridge would provide pedestrian and cyclist connections at the Kent Street Stop (refer to Section 5.5). Stop access plazas would be provided at each end of the new bridge and would include bicycle parking and storage.
Yarra Glen precinct
Both alignment options Existing on road and off-road cycle paths would be retained. A new pedestrian and cyclist bridge would provide pedestrian and cyclist connections at the Carruthers Street Stop (refer to Section 5.5). Stop access plazas would be provided at each end of the new bridge and would include bicycle parking and storage. Existing active travel arrangements would be reconfigured and consolidated onto the eastern side of Yarralumla Creek.

Active travel arrangements

Woden precinct

Both alignment options

The light rail alignment and Phillip Oval Stop would be located on the western side of Yarralumla Creek. The existing active travel arrangements (shared path) on the western side of Yarralumla Creek would be consolidated onto the eastern side of the creek, as shown on Figure 5-16. A section of this new active travel path would be on an elevated structure, extending north and south around the Phillip Oval Stop area. This elevated path would provide connection to the following two pedestrian and cyclist bridges:

- Over the Yarralumla Creek, north of Phillip Oval Stop, to provide north-south access along the eastern side of Yarralumla Creek
- Over Yarralumla Creek to provide east-west access between Irving Street and Block 4, Section 79 in Woden. A ramp would provide connection from the eastern landing of this bridge to the Phillip Oval Stop.

The existing pedestrian bridge across Yarralumla Creek north of Phillip Oval would be removed, and the existing pedestrian and cycle bridge over Yarralumla Creek north of Launceston Street would be retained.

The EIS considers the ACT Government's Active Travel Plan 2024-2030, which identifies a future walking and cycling network, including a more direct cycle route between the City and Woden within the Inner South precinct.

Investigations into the feasibility of an Adelaide Avenue and Yarra Glen cycleway have identified a potential alignment for a future shared path link along these road corridors. Some elements of this shared path will be progressed outside of this EIS process, as an allied or related project(s) with separate approvals. The Project has considered and would not preclude future development of cycling infrastructure along Adelaide Avenue and Yarra Glen. iCBR will continue to work with ACT Government stakeholders to coordinate active travel infrastructure along the corridor.

5.9 Road network changes

The Project would require consequential modifications to the surrounding road network, including changes to the physical configuration of the network and changes to posted speed limits.

5.9.1 Changes to the configuration of the road network

The Project would generally be delivered within existing roadways or road reserves. To facilitate this, changes to the existing road network would be necessary to accommodate the light rail tracks and stops. These road network changes would include road realignments and closures, adjustments to existing lanes, intersections and access arrangements, adjustments to property access, and some changes to speed limits. Key road network changes are summarised in Table 5-8 to Table 5-10 and shown on Figure 5-38 to Figure 5-52. There would be no road network changes around the Mitchell Depot site. Temporary changes to the road network during the construction of the Project are described in Section 6.7 of Chapter 6 (Construction).

The road network changes have been developed to safely and effectively integrate new light rail infrastructure and operations into the existing road network while also reducing impacts on existing trees, urban vistas and streetscapes. The Project design supports operational safety by including dedicated light rail running (avoiding areas where road vehicles and LRVs share road space), reduction of road vehicle speed limits on some roads, changes to intersection arrangements including changes to available turning movements, and additional pedestrian safety measures such as reduced speed limits, increased crossing times and/ or new or staged pedestrian crossings to support access to light rail stops.

For the National Triangle-Barton alignment option, road closures in the National Triangle and Barton precincts would be implemented to allow space for the light rail alignment. Closure of roads in these precincts has been adopted rather than widening or realigning roads to avoid and minimise impacts to

the highly sensitive heritage landscape and individual heritage items such as Old Parliament House and the Kurrajong Hotel. Consequential changes to some site access arrangements in these precincts (including relocations and conversion to left-in, left-out arrangements) would also be made to minimise potential interactions between road traffic and LRVs.

Notwithstanding changes to the road network required to facilitate the Project, road users would continue to be able to access destinations in much the same way as is currently allowed for by the existing road network. There would be no change in access for those travelling to or between major centres. In some instances (predominantly for local access arrangements) block closures and median islands would result in minor changes to local access routes. Impacts of changes to the road network are assessed in Technical Report 1 – Traffic and transport, and traffic assessment sections in Part B (Environmental Impact Assessment).

Where the Project would result in changes to existing traffic arrangements, adjustments to or additional road signage and line marking would be required. Except for speed limit signs, road and light rail signage would be co-located where possible on multi-use poles. The location of light rail signage would be coordinated with traffic signal locations at intersections and would be located adjacent to the light rail track. The required clearance distance would be maintained to allow LRV movements within the light rail alignment.

In addition to the road network changes summarised in Table 5-8 to Table 5-10, adjustments along State Circle into Capital Hill would be required to accommodate light rail infrastructure, as described below.

For the State Circle East alignment option:

- Realignment of the inner carriageway of State Circle into Capital Hill by up to around 20 m to accommodate the light rail median running arrangement, generally between Commonwealth Avenue and Adelaide Avenue
- Realignment into Capital Hill would be greater at intersections along State Circle to accommodate existing turning movements (by up to around 25 m at Canberra Avenue and by up to around 28 m near Melbourne Avenue).

For the National Triangle-Barton alignment option:

- Introduction of light rail infrastructure into Capital Hill by up to around 22 m to accommodate the inner running arrangement, generally between Sydney Avenue and Adelaide Avenue
- This would be greater at intersections along State Circle to accommodate the light rail infrastructure (by up to around 35 m at Sydney Avenue, by up to around 27 m at Canberra Avenue and by up to around 29 m near Melbourne Avenue).

Further design development would also include consideration of opportunities and constraints associated with light rail running arrangements on State Circle, including an inner running arrangement for the State Circle East alignment option.

Table 5-8 Road network changes in Commonwealth Avenue and Parliament House precincts for the State Circle East alignment option

Location	Existing arrangements	Proposed arrangements
Commonwealth Avenue precinct – State Circle East alignment option		
Intersection of Commonwealth Avenue and Albert Street (refer to Figure 5-38)	Existing conditions based on LRS2A design: • Unsignalised left turn in and left turn out of Albert Street at Commonwealth Avenue southbound carriageway • Unsignalised left turn into Albert Street at Commonwealth Avenue northbound carriageway • Straight signalised pedestrian crossing of Commonwealth Avenue on northern side of Albert Street intersection.	• The signalised pedestrian crossing of the northbound carriageway would be relocated south to form a staggered crossing.
Commonwealth Avenue between the approved LRS2A Commonwealth Park Stop and Coronation Drive (refer to Figure 5-38 and Figure 5-39)	• Posted speed of 70 km/h • Dual carriageway, with three traffic lanes in each direction • Kerbside cycle lane on both carriageways, except over Lake Burley Griffin • Grassed median, paved footpath on both verges and no on-street parking • Indented bus stop on both carriageways opposite Albert Hall. The kerbside lane on the northbound carriageway is a bus lane between Kaye Street and the Flynn Drive ramp, with a merge of the left two traffic lanes south of Kaye Street • All intersecting streets and driveways are priority controlled (unsignalised) left in or left out.	• Posted speed limit would decrease to 60 km/h • A signalised, staged, pedestrian crossing would be added at the northern end of the Albert Hall Stop • Light rail would be located within the existing median.
Intersection of King Edward Terrace/ Flynn Drive ramps and Commonwealth Avenue (refer to Figure 5-38 and Figure 5-39)	• Auxiliary left turn lane from the southbound carriageway onto King Edwards Terrace and Flynn Drive ramp. Stop sign controlled left turn from King Edward Terrace onto Commonwealth Avenue • Flynn Drive ramp joins Commonwealth Avenue northbound with a merge between the ramp and the Commonwealth Avenue bus lane.	• The posted speed limit would decrease to 60 km/h on Commonwealth Avenue • Light rail would be located within the existing median of Commonwealth Avenue.

Location	Existing arrangements	Proposed arrangements
Intersection of Commonwealth Avenue, Coronation Drive and Queen Victoria Terrace (refer to Figure 5-39)	• Signalised intersection, with all movements permitted • Priority controlled (unsignalised) left turn slip lanes provided from Queen Victoria Terrace and Coronation Drive onto Commonwealth Avenue. Auxiliary right turn lanes provided from Commonwealth Avenue onto Queen Victoria Terrace and Coronation Drive • Signalised pedestrian crossings on all intersection legs, with zebra crossings at the left turn slip lanes.	A signalised intersection with: • Signal phasing for light rail travel across the intersection • Removal of priority controlled (unsignalised) left turn slip lanes • Signalised pedestrian crossings on all intersection legs, with crossings of Commonwealth Avenue and the light rail alignment converted to staged and staggered crossings.
Parliament House precinct – State Circle East alignment option		
Commonwealth Avenue between Coronation Drive and State Circle (refer to Figure 5-39)	• Posted speed limit of 70 km/h • Dual carriageway with three traffic lanes in each direction • Southbound diverge to an auxiliary lane in the median to provide an access ramp to Parliament House exit ramp kerbside of the southbound carriageway to State Circle • Left two southbound traffic lanes merge south of the exit to the off ramp to State Circle • Northbound lane from ramp from Parliament House merges with right hand lane north of the ramp • Kerbside cycle lane southbound to Capital Circle and a priority cycle lane across the entry to the exit ramp to State Circle • Left in and left out access to the New Zealand High Commission, British High Commission and High Commission of Canada • Grass median with paved footpath on both verges and no on-street parking.	• The posted speed limit would decrease to 60 km/h • Left southbound lane would be a trapped exit lane onto the off ramp to State Circle. The other two southbound lanes would remain as through lanes, with no merge required • The southbound cycle lane would remain kerbside, with a ramp crossing provided at the top of the off ramp. Cyclists would give way to motorists • The light rail alignment would be located within the existing median entering the covered section, where it would pass underneath the southbound carriageway and exit onto State Circle.

Location	Existing arrangements	Proposed arrangements
Exit ramp from Commonwealth Avenue to State Circle (refer to Figure 5-39)	• Posted speed limit of 70 km/h • Single traffic lane • Paved footpath on eastern side and an uncontrolled pedestrian crossing.	• The posted speed limit would decrease to 60 km/h • The uncontrolled pedestrian crossing would be removed.
Intersection of State Circle and exit ramp from Commonwealth Avenue (refer to Figure 5-39)	• Two lanes on the outer carriageway on approach to the intersection joining with the continuous flow lane of the exit ramp from Commonwealth Avenue entering State Circle kerbside on the departure side of the intersection • Two lanes on the inner carriageway.	• The continuous flow lane of the exit ramp from Commonwealth Avenue entering State Circle kerbside on the departure side of the intersection would be removed • A signalised intersection would be provided on the outer carriageway only to allow: - LRVs to cross State Circle outer carriageway into the median - Traffic from the exit ramp from Commonwealth Avenue to enter State Circle - Crossing of pedestrians across the light rail alignment across the outer verge and the exit ramp from Commonwealth Avenue • An off-road cycle path, adjacent to the relocated footpath, would be provided to achieve acceptable rail crossing angle for cyclists. An on-road to off-road cycle transition would be provided on the outer carriageway to provide a safer crossing angle for cyclists to cross the light rail alignment.
State Circle between exit ramp from Commonwealth Avenue and Brisbane Avenue (refer to Figure 5-39 and Figure 5-40)	• Posted speed limit of 70 km/h • Dual carriageway with two traffic lanes on the inner carriageway and three traffic lanes on the outer carriageway • Federation Mall twin bridge overpass with piers in the median • Gravel median, paved footpath on the outer verge, no on-road cycle lane and no on-street parking.	• The posted speed limit would decrease to 60 km/h • The existing median would be widened to accommodate the light rail alignment, with tracks to pass either side of the Federation Mall bridge piers • Inner kerb line and verge would be adjusted to maintain two lanes on the inner carriageway. The existing outer kerb line and verge would remain, reducing the outer carriage way to two lanes • No change to footpath, cycle or parking facilities.

Location	Existing arrangements	Proposed arrangements
Intersection of State Circle and Kings Avenue (refer to Figure 5-40)	• Signalised intersection, with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection • The right turn movement from State Circle outer carriageway into Kings Avenue westbound would be removed.
Intersection of State Circle, Brisbane Avenue, and Wyman Street (refer to Figure 5-40)	• Signalised intersection, with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.
State Circle between Brisbane Avenue and Canberra Avenue (refer to Figure 5-40)	• Posted speed limit of 70 km/h • Dual carriageway with two traffic lanes in each direction • Paved footpath on the outer verge, no on-road cycle lane and no on-street parking.	• The posted speed limit would be decreased to 60 km/h • The existing median would be widened to accommodate the light rail alignment.
Intersection of State Circle and Sydney Avenue (refer to Figure 5-40)	• Signalised T-intersection with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.
Accesses to the Presbyterian Church of St Andrew from State Circle (refer to Figure 5-40)	• Unsignalised accesses with all movements permitted.	• Accesses to be modified to permit left in and left out movements only • Right turns onto State Circle would not be permitted
Intersection of State Circle and Canberra Avenue (refer to Figure 5-40)	• Signalised intersection with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.

Location	Existing arrangements	Proposed arrangements
State Circle between Canberra Avenue and Adelaide Avenue (refer to Figure 5-40 and Figure 5-41)	• Posted speed limit of 70 km/h • Dual carriageway with two traffic lanes in each direction • Gravel median with a footpath on the outer verge. No on-road cycle lane. Restricted on-street parking on the outer carriageway between Hobart Avenue and Adelaide Avenue • A bus stop on the outer carriageway just west of Melbourne Avenue.	• The posted speed limit would be decreased to 60 km/h • The existing median would be widened to accommodate the light rail alignment • On-street parking would be removed.
Intersection of State Circle and Hobart Avenue (refer to Figure 5-40)	• Priority controlled (unsignalised) intersection with all movements permitted.	• The priority controlled (unsignalised) intersection would allow left in and left out movements allowed only.
Intersection of State Circle and Melbourne Avenue (refer to Figure 5-41)	• Signalised intersection, all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.
State Circle approximately 120 m west of Melbourne Avenue (refer to Figure 5-41)	• Posted speed limit of 70 km/h • Dual carriageway with two traffic lanes in each direction • Gravel median with no on-road cycle lane.	• The posted speed limit would be decreased to 60 km/h • A new signalised intersection on the inner carriageway would allow only LRVs to cross over from the State Circle median to the verge towards Capital Circle.
Capital Circle approximately 100 m east of the Adelaide Avenue road bridges over State Circle (refer to Figure 5-41)	• Posted speed limit of 80 km/h • Single carriageway with three traffic lanes westbound • On-road cycle lane.	• A new signalised intersection would allow LRVs to cross from the verge to the median of Capital Circle.
Adelaide Avenue road bridges over State Circle (refer to Figure 5-41)	• Posted speed limit of 80 km/h • Two structures/ dual carriageway with three lanes in each direction • On-road cycle lane westbound.	• A new light rail bridge would be provided.

Location	Existing arrangements	Proposed arrangements
Adelaide Avenue between State Circle and National Circuit (refer to Figure 5-41)	• Posted speed limit of 80 km/h • Dual carriageway with three lanes in each direction. A T2 lane adjacent to the median lane in each direction • Off-ramp from Adelaide eastbound to State Circle and on-ramp from State Circle to Adelaide Avenue westbound • Grassed median, paved footpath behind both kerb lines, on-road cycling lane kerb side in each direction, no on-street parking.	• The existing median would be widened and the T2 lanes removed.

Figure 5-38 Road network changes – Commonwealth Avenue precinct (both alignment options)

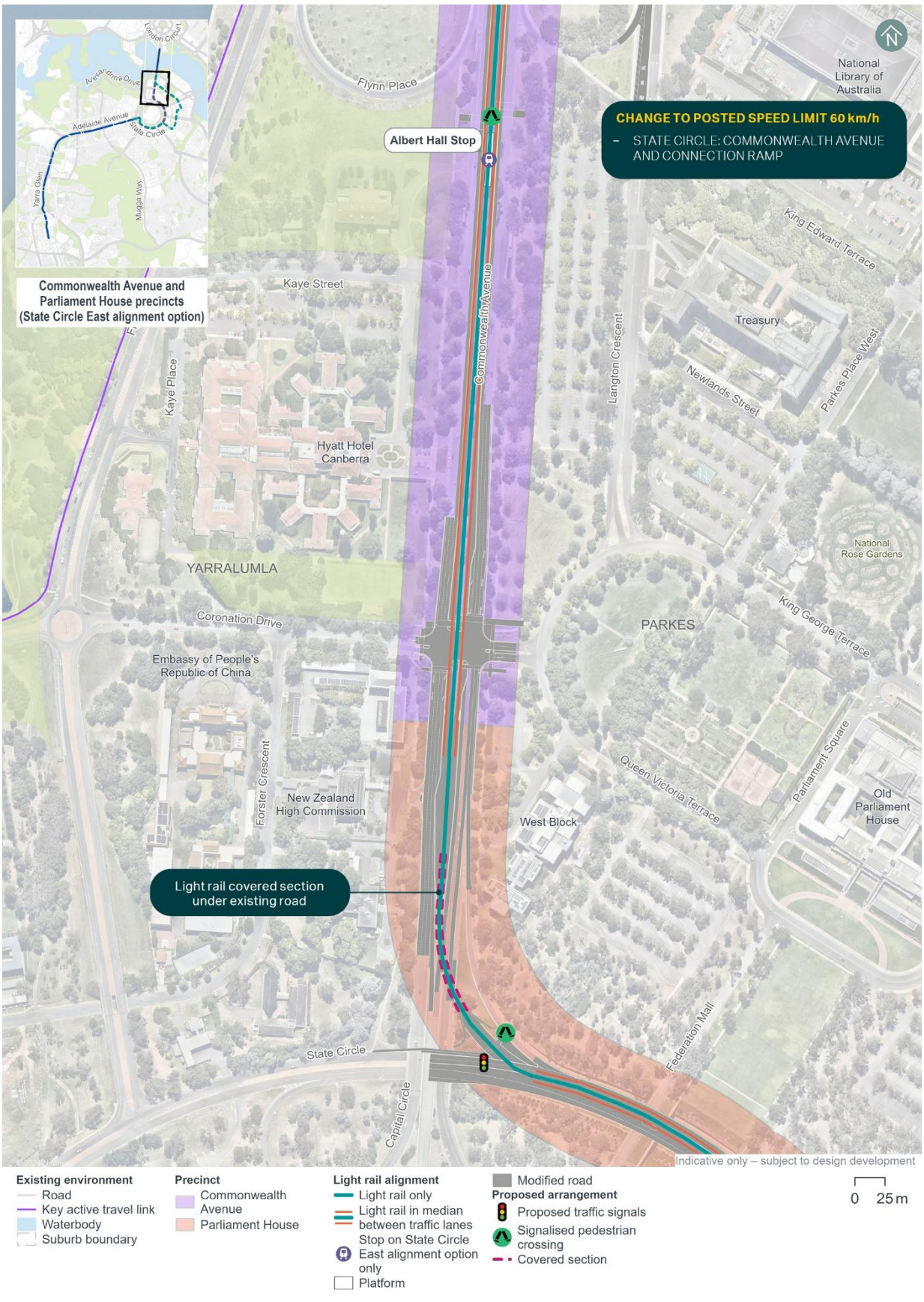


Figure 5-39 Road network changes – Commonwealth Avenue and Parliament House precincts (State Circle East alignment option)

Figure 5-40 Road network changes – Parliament House precinct (State Circle East alignment option)

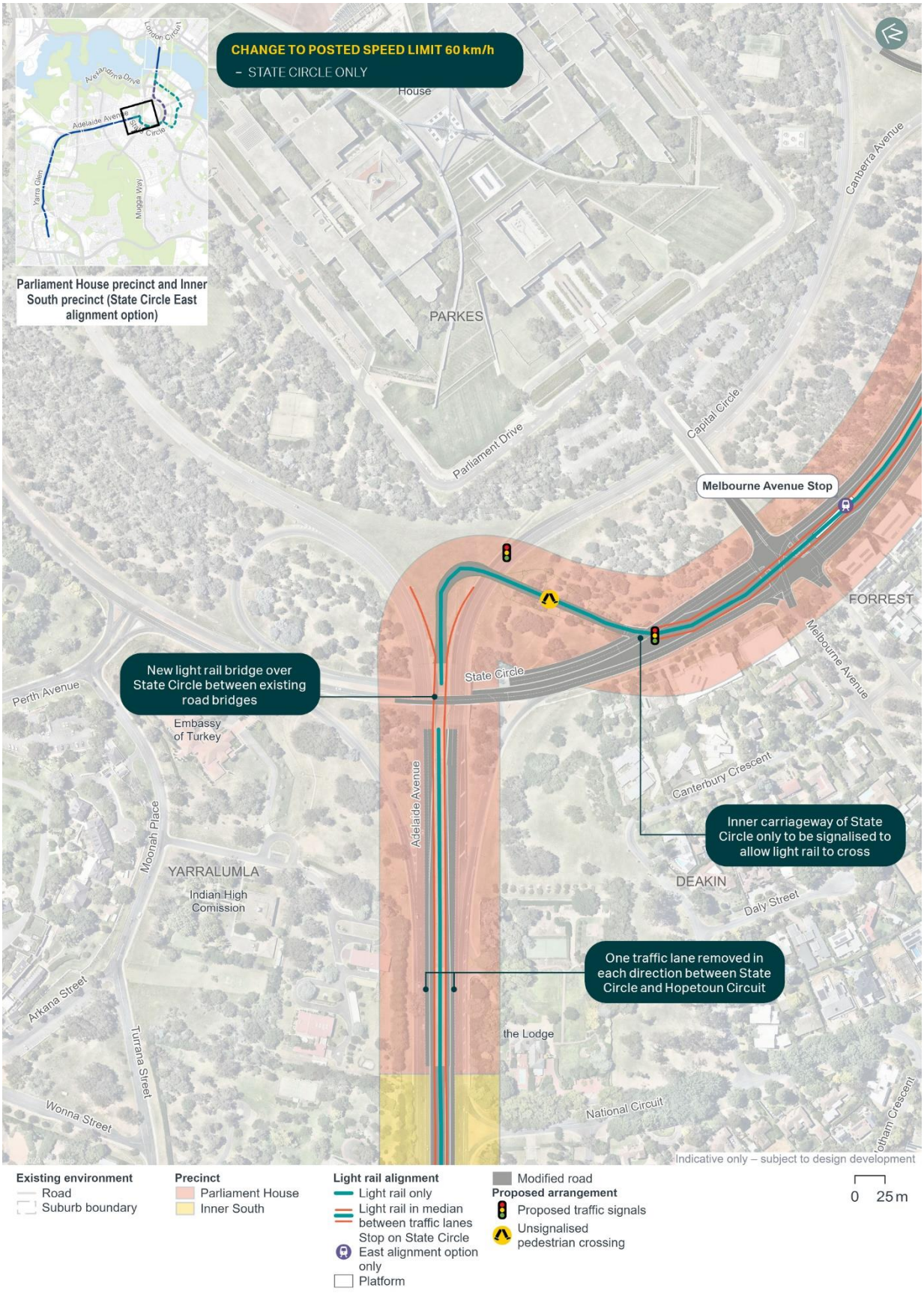


Figure 5-41 Road network changes – Parliament House and Inner South precincts (State Circle East alignment option)

Table 5-9 Road network changes in the Commonwealth Avenue, Parliament House, National Triangle, and Barton precincts for the National Triangle-Barton alignment option

Location	Existing arrangements	Proposed arrangements
Commonwealth Avenue precinct – National Triangle-Barton alignment option		
Intersection of Commonwealth Avenue and Albert Street (refer to Figure 5-38)	Existing conditions based on LRS2A design: • Unsignalised left turn in and left turn out of Albert Street at Commonwealth Avenue southbound carriageway • Unsignalised left turn into Albert Street at Commonwealth Avenue northbound carriageway • Straight signalised pedestrian crossing of Commonwealth Avenue on northern side of Albert Street intersection.	• The signalised pedestrian crossing of the northbound carriageway would be relocated south to form a staggered crossing.
Commonwealth Avenue between the approved LRS2A Commonwealth Park Stop and King George Terrace (refer to Figure 5-38 and Figure 5-42)	• Posted speed of 70 km/h • Dual carriageway, with three traffic lanes in each direction • Kerbside cycle lane on both carriageways, except over Lake Burley Griffin • Grassed median, paved footpath on both verges and no on-street parking • Indented bus stop on both carriageways opposite Albert Hall. The kerbside lane on the northbound carriageway is a bus lane between Kaye Street and the Flynn Drive ramp, with a merge of the left two traffic lanes south of Kaye Street • All intersecting streets and driveways are priority controlled (unsignalised) left in or left out.	• Posted speed limit would decrease to 60 km/h • Light rail would be located within the existing median • A signalised intersection would be provided at the intersection of the Commonwealth Avenue southbound carriageway and King George Terrace to allow light rail to cross from the median to King George Terrace.
Intersection of King Edward Terrace/ Flynn Drive ramps and Commonwealth Avenue (refer to Figure 5-42)	• Auxiliary left turn lane from the southbound carriageway onto King Edwards Terrace and Flynn Drive ramp. Stop sign controlled left turn from King Edward Terrace onto Commonwealth Avenue • Flynn Drive ramp joins Commonwealth Avenue northbound with a merge between the ramp and the Commonwealth Avenue bus lane.	• The posted speed limit would decrease to 60 km/h on Commonwealth Avenue • Light rail would be located within the existing median of Commonwealth Avenue.

Location	Existing arrangements	Proposed arrangements
Parliament House precinct – National Triangle-Barton alignment option		
State Circle between Sydney Avenue and Capital Circle (refer to Figure 5-45 and Figure 5-46)	• Posted speed limit of 70 km/h • Dual carriageway with two traffic lanes in each direction • Gravel median, paved footpath on the outer verge, no on-road cycle lane, no on- street parking.	• The inner verge would be widened to accommodate the light rail alignment.
Intersection of State Circle and Sydney Avenue (refer to Figure 5-45)	• Signalised T-intersection with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.
Intersection of State Circle and Canberra Avenue (refer to Figure 5-45)	• Signalised intersection with all movements permitted.	• Phasing would be added to allow light rail to cross the intersection • Left turn from the inner verge of State Circle to Canberra Avenue northbound would be removed.
Intersection of State Circle and Hobart Avenue (refer to Figure 5-45)	• Priority controlled (unsignalised) intersection with all movements permitted.	• Traffic signal phasing would allow LRVs to cross the intersection.
Intersection of State Circle and Melbourne Avenue (refer to Figure 5-46)	• Signalised intersection, all movements permitted.	• Right turn not permitted from State Circle inner carriageway to Melbourne Ave southbound • Traffic signal phasing would allow LRVs to cross the intersection.
Capital Circle approximately 100 m east of the Adelaide Avenue road bridges over State Circle (refer to Figure 5-46)	• Posted speed limit of 80 km/h • Single carriageway with three traffic lanes westbound • On-road cycle lane.	• A signalised intersection would be provided to allow LRVs to cross Capital Circle.

Location	Existing arrangements	Proposed arrangements
Adelaide Avenue road bridges over State Circle (refer to Figure 5-46)	• Posted speed limit of 80 km/h • Two structures/dual carriageway with three lanes in each direction • On-road cycle lane westbound.	• A new light rail bridge would be provided.
Adelaide Avenue between State Circle and National Circuit (refer to Figure 5-46)	• Posted speed limit of 80 km/h • Dual carriageway with three lanes in each direction. A T2 lane adjacent to the median lane in each direction • Off-ramp from Adelaide eastbound to State Circle and on-ramp from State Circle to Adelaide Avenue westbound • Grassed median, paved footpath behind both kerb lines, on-road cycling lane kerbside in each direction, no on street parking.	• The T2 lanes in both directions would be removed to widen the existing median to accommodate the light rail alignment.
National Triangle precinct – National Triangle-Barton alignment option		
Queen Victoria Terrace, Commonwealth Avenue to Langton Crescent (refer to Figure 5-42)	• Posted speed limit of 60 km/h • Dual carriageway with two lanes in each direction • Concrete median and concrete footpath in both verges. No parking permitted.	• The posted speed limit would decrease to 40 km/h.
Langton Crescent from Queen Victoria Crescent to King George Terrace (refer to Figure 5-42)	• Posted speed of 60 km/h • Single carriageway with one lane northbound and one lane southbound. Auxiliary right turn lane for southbound vehicle turning right into Queen Victoria Terrace • Concrete footpath in both verges. No parking permitted.	• The posted speed limit would decrease to 40 km/h.

Location	Existing arrangements	Proposed arrangements
Intersection of Langton Crescent and King George Terrace (refer to Figure 5-42)	Priority controlled (unsignalised) T-intersection with: • Through movement between the southern leg of Langton Crescent and King George Terrace • Left and right turn lanes into and out of the northern leg of Langton Crescent • An auxiliary right turn lane on King George Terrace westbound into Langton Crescent northbound.	• The movement between Langton Crescent and King George Terrace would be removed north of the Treasury Stop, and a turn head would be provided on Langton Crescent immediately south of the car park entry and exit • A new signalised intersection would be installed that connects Langton Crescent (south of the Treasury Stop) with Parkes Place West.
Parkes Place West between King George Terrace and Newlands Street (refer to Figure 5-42)	• Posted speed limit of 60 km/h • Single carriageway with one lane northbound and one lane southbound • Concrete footpath in both verges. Timed parking permitted.	• The posted speed limit would decrease to 40 km/h.
Intersection of King George Terrace and Parkes Place West (refer to Figure 5-43)	• Priority controlled (unsignalised) T-intersection with all movements permitted.	A signalised intersection with: • Phasing to allow LRVs to continue straight along King George Terrace • All vehicular access would be removed on King George Terrace east of the intersection • Vehicle movements would only be permitted between the western leg of King George Terrace and Parkes Place West • Signalised pedestrian crossings would be provided for King George Terrace, Parkes Place West and the light rail alignment at the western end of the intersection.
King George Terrace between Parkes Place West and Parkes Place East (refer to Figure 5-43)	• Posted speed limit 60 km/h • Single carriageway, with single lane two-way movement • Indented car parking lane provided on the northern side of the road opposite Old Parliament House • Indented bus parking lane provided on the southern side of the road outside Old Parliament House, and indented bus stops provided on both sides of the road between Parliament Square and Parkes Place East • Paved footpath both verges.	• All road vehicle access would be removed. Only LRV and pedestrian access would be permitted • Car parking, bus parking and bus stops would be removed.

Location	Existing arrangements	Proposed arrangements
Parkes Place East to Kings Avenue (refer to Figure 5-43)	• Posted speed limit 60 km/h • Single carriageway, with single lane two-way movement (two lanes on approach to Kings Avenue)	• All road vehicle access would be removed. Only LRV and pedestrian access would be permitted
Intersections of King George Terrace and Parliament Square (refer to Figure 5-43)	• Priority controlled (unsignalised) intersections, all movements permitted.	• Vehicular access to and from King George Terrace would be removed.
Parkes Place East between King George Terrace and entry driveway to existing carpark (refer to Figure 5-43)	• Posted speed limit of 60 km/h • Single carriageway with one lane northbound and one lane southbound • Concrete footpath in both verges. Timed parking permitted.	• The posted speed limit would decrease to 40 km/h.
Intersection of King George Terrace, Parkes Place East and Walpole Crescent (refer to Figure 5-43)	• Priority controlled (unsignalised) intersection, all movements permitted • Pedestrian (zebra) crossing on King George Terrace between Parkes Place East and King George Terrace.	A signalised intersection with: • Traffic signal phasing to allow LRVs to continue straight along King George Terrace • All vehicular access removed from King George Terrace. Vehicle movements would only be permitted from Walpole Crescent to and from Parkes Place East • Signalised pedestrian crossings for King George Terrace (both sides of the intersection) and of Parkes Place East • Walpole Crescent leg towards eastbound direction would be removed.
Walpole Crescent between Queen Victoria Terrace and King George Terrace (refer to Figure 5-43)	• Posted speed limit of 60 km/h • Single carriageway from Queen Victoria Terrace to 50 m south of King George Terrace. Dual carriageway from King George Terrace to a point 50 m south. One lane northbound and one lane southbound • Concrete footpath in both verges. No parking permitted.	• The posted speed limit would decrease to 40 km/h • The eastern carriageway would be removed.

Location	Existing arrangements	Proposed arrangements
Intersection of King George Terrace and eastern carriageway of Walpole Terrace (refer to Figure 5-43)	• Priority controlled (unsignalised) intersection, all movement permitted.	• The intersection would be removed.
Queen Victoria Terrace from Kings Avenue to Walpole Crescent (refer to Figure 5-43)	• Posted speed of 60 km/h • Single carriageway with two lanes northbound and one lane southbound • Concrete footpath in both verges. No parking permitted.	• The posted speed limit would decrease to 40 km/h.
Barton precinct – National Triangle-Barton alignment option		
Intersection of King George Terrace, Macquarie Street and Kings Avenue (refer to Figure 5-43)	• Signalised intersection with all movements permitted.	A signalised intersection with: • Traffic signal phasing to allow LRV access • All vehicular access would be removed to and from King George Terrace.
Macquarie Street, between Kings Avenue and Bligh Street (refer to Figure 5-44)	• Posted speed limit of 50 km/h • Single carriageway with single lane two-way movement • Mid-block pedestrian (zebra) crossing 45 m north of Broughton Street, paved footpath both verges, restricted on street parking.	• The posted speed limit would decrease to 40 km/h • Dual carriageway, single lane two-way movement separated by a raised median carrying the light rail alignment • Driveway entry and exits would be restricted to left in left out • The mid-block pedestrian (zebra) crossing removed and on-street parking would be removed • An active travel (shared) path added in the eastern verge.
Intersection of Broughton Street and Macquarie Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A priority controlled (unsignalised) intersection with: • The vehicular right turn access from Macquarie Street to Broughton would be removed • The vehicular right turn access from Broughton Street to Macquarie Street would be removed.

Location	Existing arrangements	Proposed arrangements
Intersection of Macquarie Street, and Bligh Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A signalised intersection with: • The vehicular right turn from Macquarie Street southbound to Bligh Street westbound would be removed • The vehicular left turn from Macquarie Street northbound to Bligh Street westbound would be removed for general traffic • Local access to 4 Bligh Street and 6 National Circuit would be restricted to a left turn from Macquarie Street northbound to Bligh Street westbound • The vehicular right turn from Bligh Street eastbound to Macquarie Street southbound would be removed • Signalised pedestrian crossings would be provided on all three sides • Traffic signal phasing would allow LRV access.
Macquarie Street, from Bligh Street to Kendrew Street (refer to Figure 5-44)	• Posted speed limit of 50 km/h • Single carriageway, with single lane two-way movement • Mid-Block pedestrian (zebra) crossing 25 m south of Bligh Street. Paved footpath on both verges. No street parking permitted.	• The posted speed limit would reduce to 40 km/h • The mid-block pedestrian (zebra) crossing would be removed.
Intersection of Allardyce Street and Macquarie Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, all movements permitted.	A priority controlled (unsignalised) intersection with: • The vehicular right turn from Macquarie Street northbound to Allardyce Street eastbound would be removed • The vehicular right turn from Allardyce street westbound to Macquarie Street northbound would be removed.

Location	Existing arrangements	Proposed arrangements
Bligh Street from Macquarie Street to National Circuit (refer to Figure 5-44)	• Posted speed limit of 50 km/h • Single carriageway with single lane two-way movement • Paved footpath both verges. Restricted on street parking.	• The posted speed limit would reduce to 40 km/h • Westbound vehicles and LRVs would travel in a shared running environment. Eastbound vehicles would travel in a separated traffic lane • Vehicular access would be limited to and from 4 Bligh Street and 6 National Circuit only • Access to and from National Circuit would be removed for all vehicles • Vehicular access to the carpark and northern courtyard of 8 National Circuit (Kurrajong Hotel) would be removed and relocated to Macquarie Street • On-street parking would be removed • An active travel path would be provided in the southern verge.
Intersection of Bligh Street and National Circuit (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A signalised intersection with: • All vehicular access would be removed to and from Bligh Street. All other movements would be retained for vehicles • Traffic signal phasing would allow LRV access • Pedestrian crossings would be provided on all legs of the intersection.
National Circuit from Bligh Street to Brisbane Avenue (refer to Figure 5-44)	• Posted speed limit of 60 km/h • Single carriageway with single lane two-way movement • Paved footpath both verges. Bus routes in both directions. Restricted on-street parking.	• The posted speed limit would reduce to 40 km/h • Dual carriageway with single lane two-way movement separated by a raised median carrying the light rail alignment • Driveway entry and exits would be restricted to left in left out • On-street parking would be removed • An active travel (shared) path would be provided on the western verge.

Location	Existing arrangements	Proposed arrangements
Intersection of National Circuit and Blackall Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A signalised intersection with: • The right turn access from National Circuit to Blackall Street would be removed for all vehicles • Traffic signal phasing would allow LRV access • Pedestrian crossings would be provided on all legs of the intersection.
Intersection of National Circuit and Brisbane Avenue (refer to Figure 5-44)	• Signalised intersection, with all movements permitted.	A signalised intersection with: • The right turn access from National Circuit to Brisbane Avenue would be removed for all vehicles • Traffic signal phasing would allow LRV access • Pedestrian crossings would be provided on all legs of the intersection.
National Circuit from Bligh Street to Sydney Avenue (refer to Figure 5-44)	• Posted speed limit of 60 km/h • Single carriageway with single lane two-way movement • Paved footpath both verges and a pedestrian refuge island 20 m south of Bourke Street. Bus routes in both directions. Restricted on street parking.	• The posted speed limit would reduce to 40 km/h • Dual carriageway with single lane two-way movement separated by a raised median carrying the light rail alignment • Driveway entry and exits would be restricted to left in left out • On-street parking and the pedestrian refuge would be removed • An active travel (shared) path would be provided on the western verge.
Intersection of National Circuit and Darling Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A signalised intersection with: • The right turn access from National Circuit to Darling Street would be removed for all vehicles • Traffic signal phasing would allow LRV access • Pedestrian crossings would be provided on all legs of the intersection.

Location	Existing arrangements	Proposed arrangements
Intersection of National Circuit and Bourke Street (refer to Figure 5-44)	• Priority controlled (unsignalised) intersection, with all movements permitted.	A priority controlled (unsignalised) intersection with: • The vehicular right turn from National Circuit northbound to Bourke Street eastbound would be removed • The vehicular right turn from Bourke Street westbound to National Circuit northbound would be removed.
Intersection of National Circuit and Sydney Avenue (refer to Figure 5-44)	• Signalised intersection, with all movements permitted.	A signalised intersection with: • Traffic signal phasing would allow LRV access • Pedestrian crossings would be provided on all legs of the intersection.
Sydney Avenue from National Circuit to State Circle (refer to Figure 5-44 and Figure 5-45)	• Posted speed limit of 60 km/h • Dual carriageway with dual lane two-way movement • Eastbound and westbound u-turn bays through the landscaped median • Restricted on street parking • Paved footpath both verges and in the landscaped median. Uncontrolled pedestrian crossing points through the landscaped median opposite Windsor Walk • Bus routes in both direction. Restricted on-street parking.	• Both u-turn bays would be removed • All uncontrolled pedestrian crossing points would be removed and a marked pedestrian (zebra) crossing would be provided on both carriageways opposite Windsor Walk. An informal crossing point across the light rail alignment would be provided for pedestrians opposite Windsor Walk • Restrict traffic would be restricted to one lane on approach and through zebra crossings.

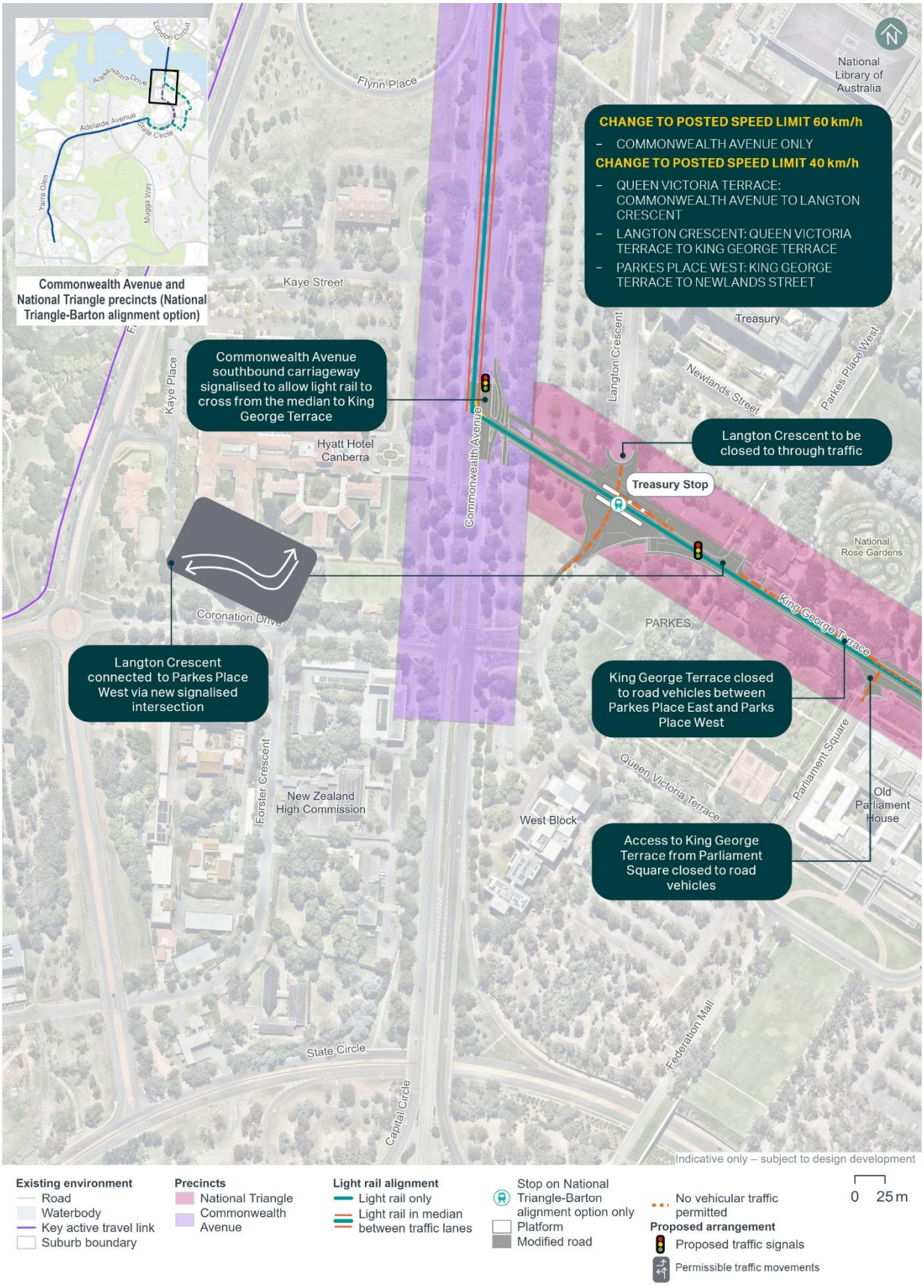


Figure 5-42 Road network changes – Commonwealth Avenue and National Triangle precincts (National Triangle-Barton alignment option)

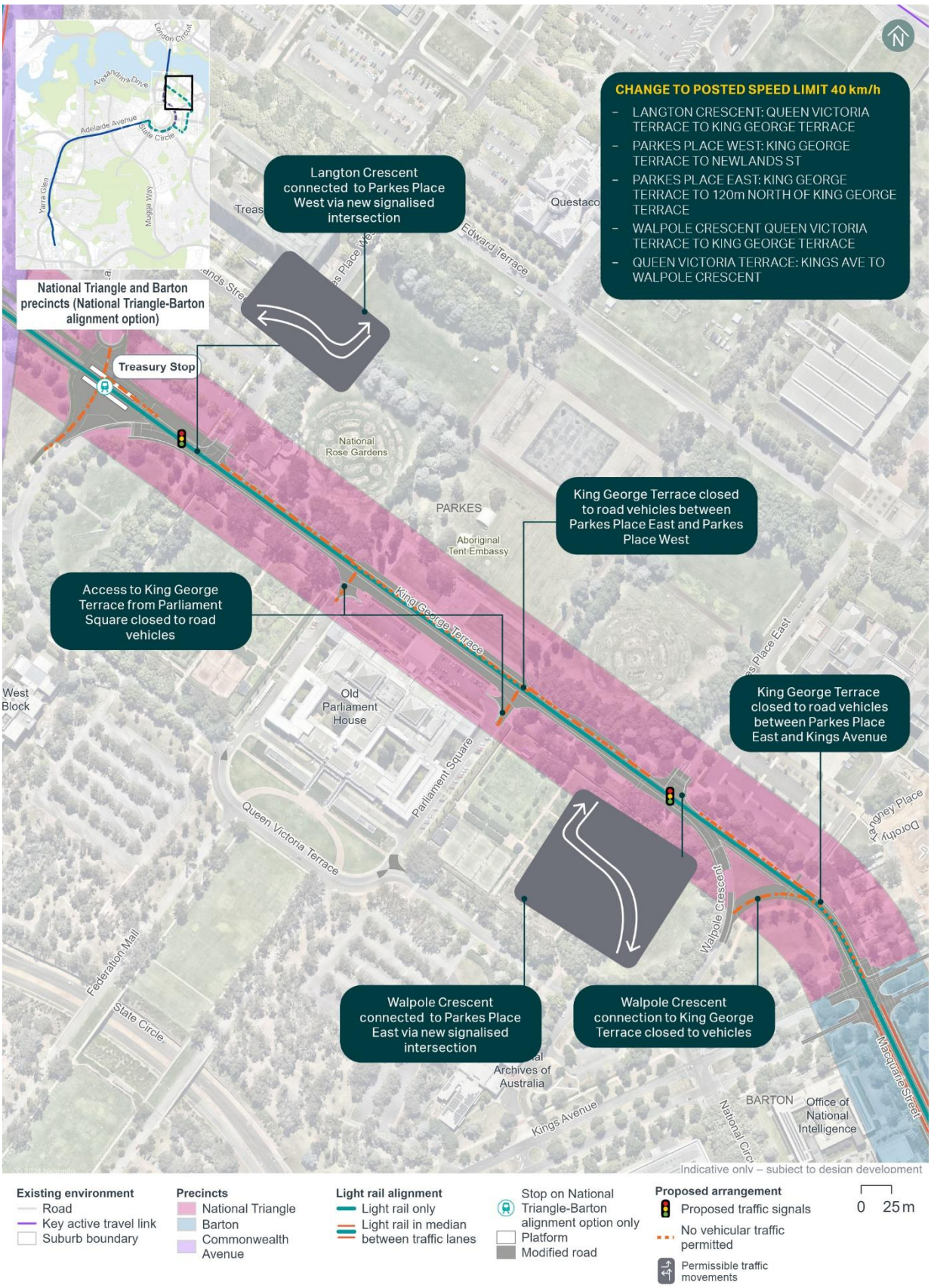


Figure 5-43 Road network changes – National Triangle and Barton precincts (National Triangle-Barton alignment option)

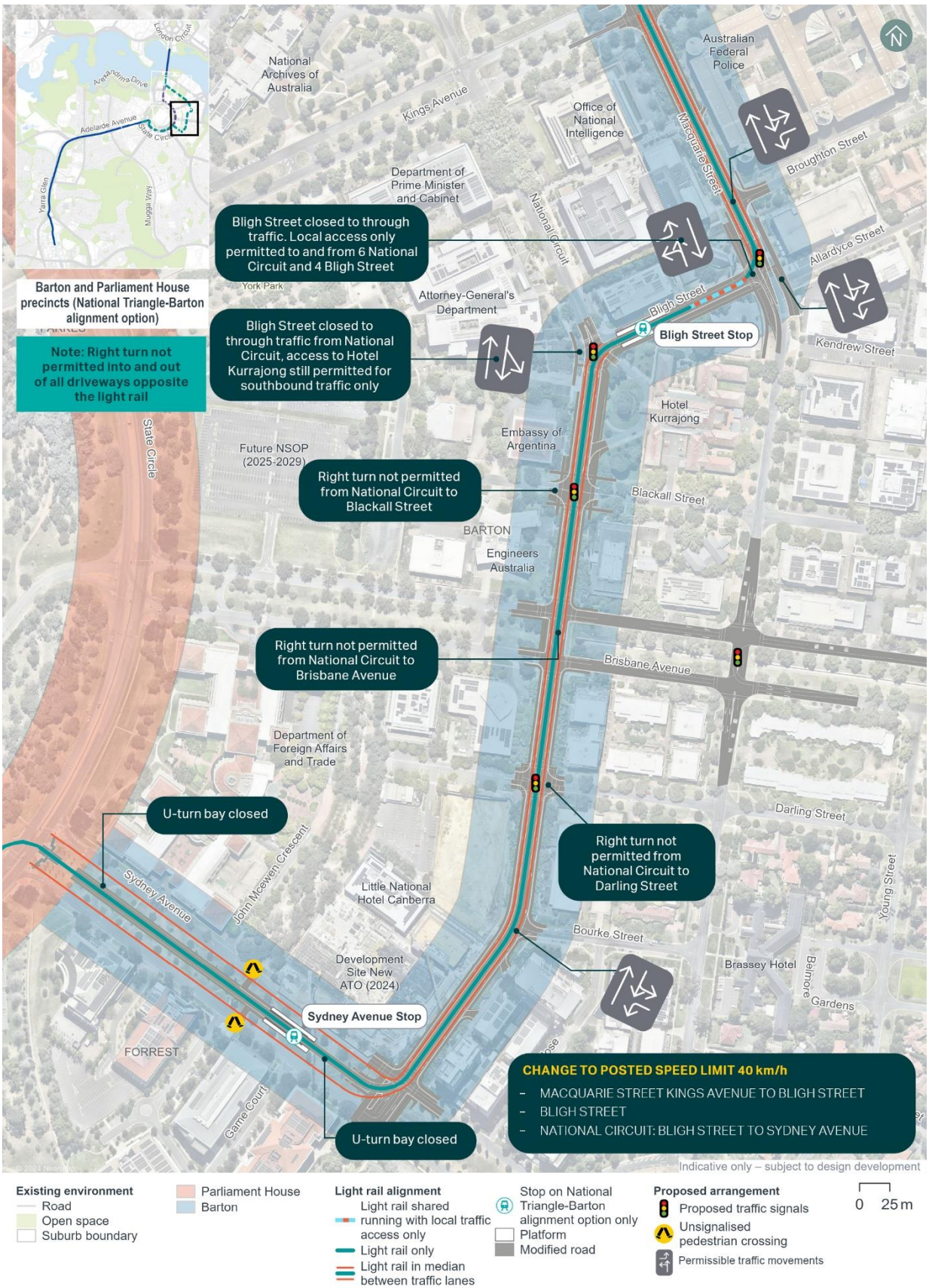


Figure 5-44 Road network changes – Barton and Parliament House precincts (National Triangle-Barton alignment option)

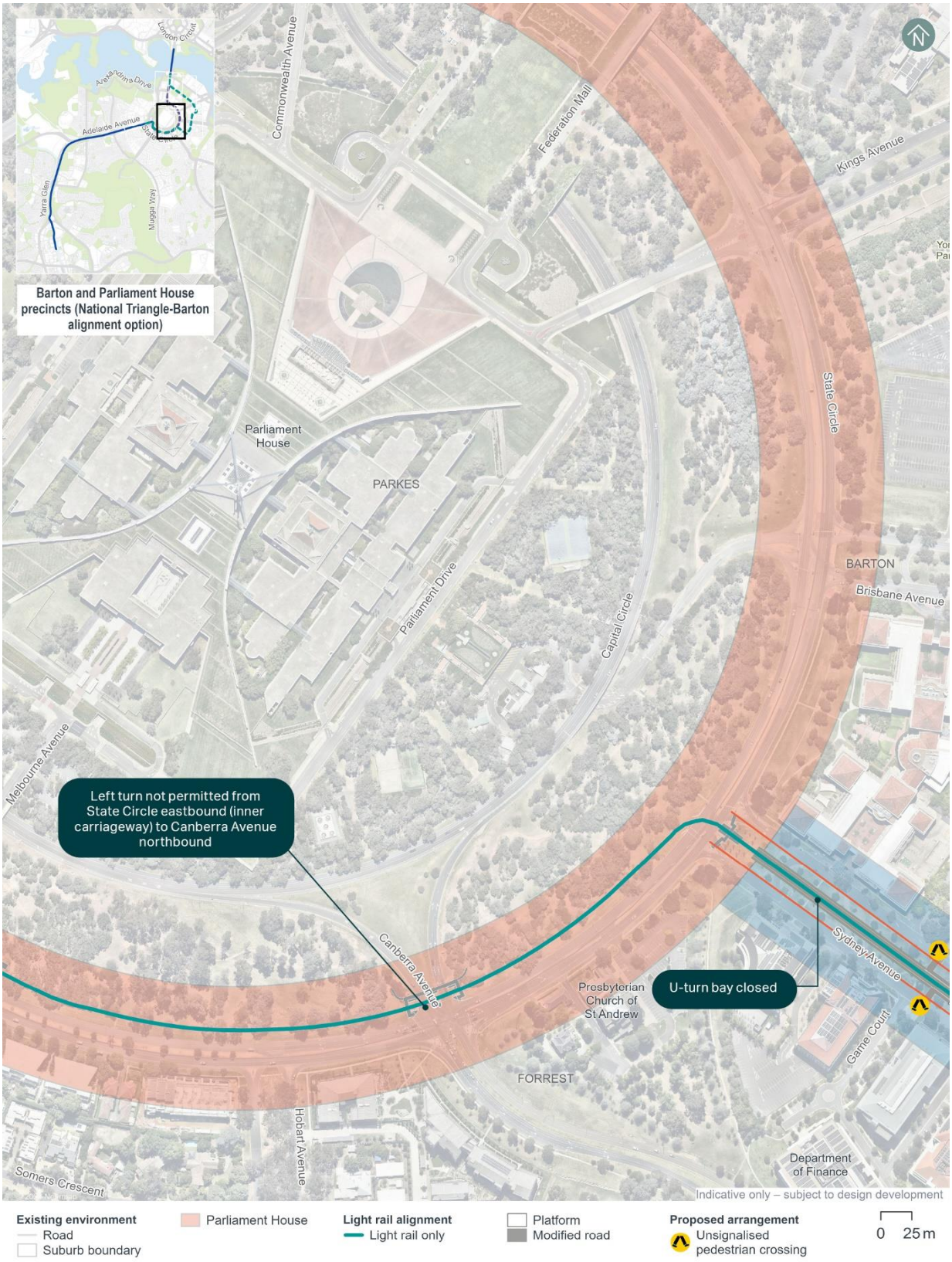


Figure 5-45 Road network changes – Barton and Parliament House precincts (National Triangle-Barton alignment option)

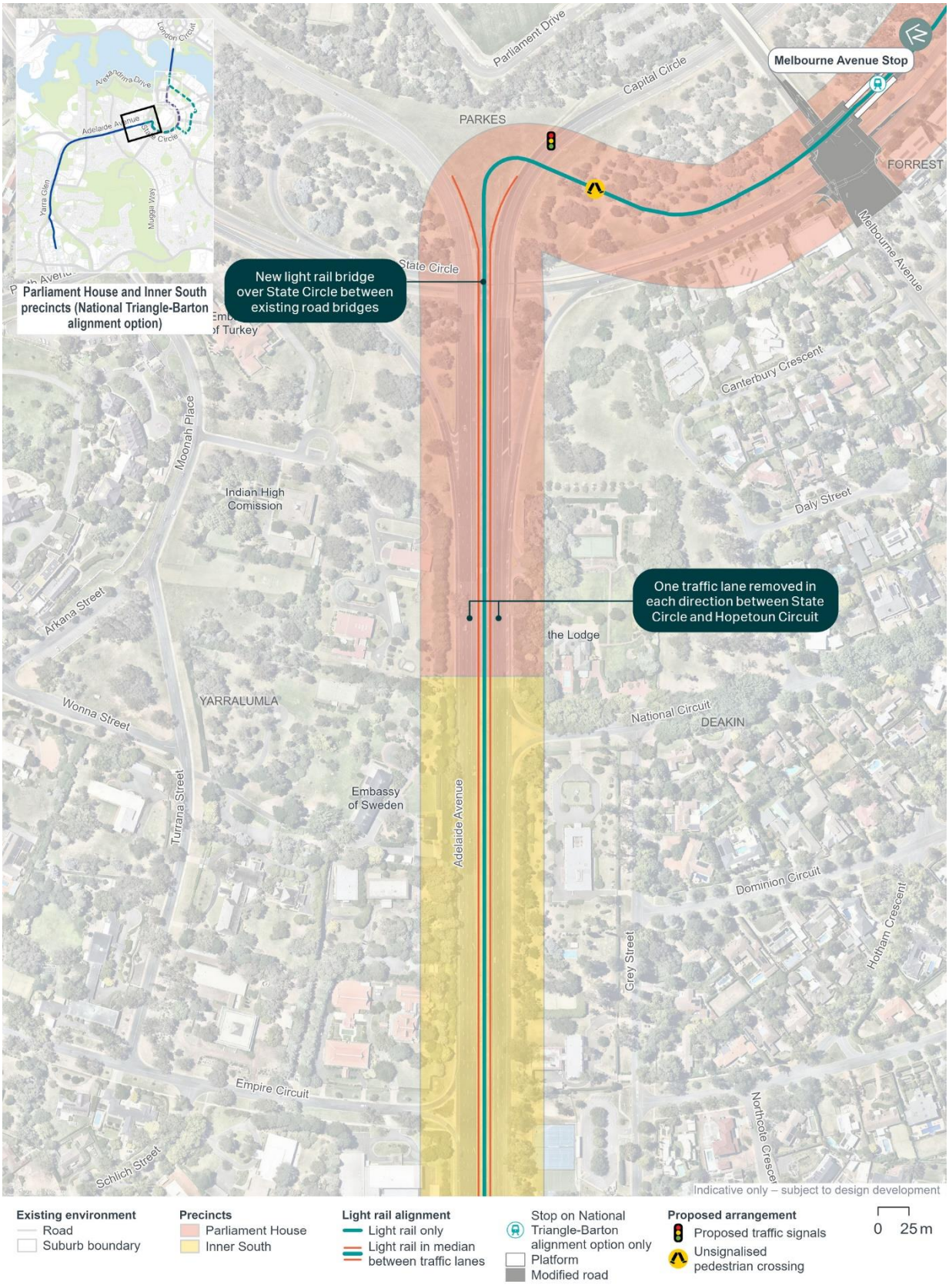


Figure 5-46 Road network changes – Parliament House and Inner South precincts (National Triangle-Barton alignment options)

Table 5-10 Inner South, Yarra Glen, and Woden precincts road network changes for both alignment options

Location	Existing arrangements	Proposed arrangements
Inner South precinct – both alignment options		
Adelaide Avenue between National Circuit and Hopetoun Circuit (refer to Figure 5-46 and Figure 5-47)	• Posted speed limit of 80 km/h • Dual carriageway with three traffic lanes eastbound and two traffic lanes westbound. One T2 lane is provided adjacent to the median westbound • Grassed median. On-road cycling lane kerbside in each direction. No on street parking.	• One traffic lane in each direction would be removed to accommodate the light rail alignment within a widened median.
Intersection of Adelaide Avenue and National Circuit (refer to Figure 5-46)	• Priority controlled (unsignalised) intersection with westbound carriageway only • Left turn from Adelaide Avenue westbound to National Circuit southbound permitted. Left turn from National Circuit northbound to Adelaide Avenue westbound permitted. No other movements permitted.	• No changes proposed.
Intersection of Adelaide Avenue and Empire Circuit (refer to Figure 5-46)	• Priority controlled (unsignalised) intersection with eastbound carriageway only • Left turn from Adelaide Avenue eastbound to Empire Circuit northbound permitted. Left turn from Empire Circuit southbound to Adelaide Avenue eastbound permitted. No other movements permitted.	• No changes proposed.
Adelaide Avenue and Hopetoun Circuit interchange (refer to Figure 5-47)	• Posted speed limit of 80 km/h • Adelaide Avenue passes over Hopetoun Circuit • Two structures/dual carriageway with three traffic lanes eastbound and two traffic lanes westbound. One T2 lane is provided adjacent to the median westbound • Off-ramps from Adelaide Avenue to Hopetoun Circuit in both directions. On-ramps from Hopetoun Circuit to Adelaide Avenue in both directions • On-road cycle lane on both sides of the interchange.	• Two new light rail bridges would be provided over Hopetoun Circuit • A new light rail stop would be provided in the median of Adelaide Avenue.

Location	Existing arrangements	Proposed arrangements
Hopetoun Circuit between Hampton Circuit and Grose Street (refer to Figure 5-47)	• Posted speed limit of 60 km/h • Single carriageway with a single lane in each direction • A combination of painted and concrete medians form right turn lanes • Restricted indented on-street parking and an indented bus bay on the northbound side between Grouse Street and the Adelaide Avenue on ramp. An indented bus stop on the southbound side between the Adelaide Avenue off ramp and Grey Street. A disused indented bus stop on both sides between the Adelaide Avenue ramps and Hampton Circuit • A paved footpath behind both kerb lines. No on-road cycle lane.	• The posted speed limit would decrease to 40 km/h • An indented bus stop would be provided in both directions on the departure sides of the southern intersection • Indented kiss and ride parking would be provided in the northbound direction between the Adelaide Avenue off ramp and Hampton Circuit • A northbound on-road cycle lane would be provided between Adelaide Avenue off ramp and Hampton Circuit • A paved footpath would be provided behind both kerb lines with a wide plaza area on the western side of Hopetoun Circuit between the ramps.
Northern intersection of Hopetoun Circuit and Adelaide Avenue ramps (refer to Figure 5-47)	• Priority controlled (unsignalised) intersection with all movements permitted. Ramps are single direction roads.	• A signalised intersection would be provided with all movements permitted and pedestrian crossings on all legs of the intersection except the southern approach.
Southern intersection of Hopetoun Circuit and Adelaide Avenue ramps (refer to Figure 5-47)	• Priority controlled (unsignalised) intersection with all movements permitted. Ramps are single direction roads.	• A signalised intersection would be provided with all movements permitted and pedestrian crossing on all legs of the intersection except the northern approach.
Adelaide Avenue between Hopetoun Circuit and Kent Street (refer to Figure 5-47 and Figure 5-48)	• Posted speed limit of 80 km/h • Dual carriageway with three traffic lanes eastbound and two traffic lanes westbound. A T2 lane is provided adjacent to the median westbound • Grassed median. An on-road cycling lane kerbside in each direction.	• The light rail alignment would be located within the median.

Location	Existing arrangements	Proposed arrangements
Adelaide Avenue and Kent Street (refer to Figure 5-48)	• Posted speed limit of 80 km/h • Kent Street passes over Adelaide Avenue • Dual carriageway with three general traffic lanes eastbound and two traffic lanes westbound. A T2 lane is provided adjacent to the median westbound • One off-ramp from Adelaide Avenue westbound to Kent Street. One on-ramp from Kent Street Circuit to Adelaide Avenue eastbound • Grassed median. An on-road cycling lane kerb side in each direction.	• A new light rail stop would be provided in the median of Adelaide Avenue, west of the Kent Street bridge • A new pedestrian and cyclist bridge would be provided over Adelaide Ave west of the existing Kent Street bridge to provide access to the light rail stop.
Yarra Glen precinct – both alignment options		
Yarra Glen and Cotter Road interchange (refer to Figure 5-48)	• Posted speed limit of 80 km/h • Cotter Road passes over Yarra Glen • Dual carriageway with three traffic lanes northbound and two traffic lanes southbound. One bus/T2 lane is provided southbound • One on-ramp from Cotter Road to Yarra Glen eastbound. One off-ramp Yarra Glen southbound to Cotter Road • Grass median. On-road cycling lane within the left shoulder on both carriageways. No on-street parking.	• The light rail alignment would be located within the median.
Yarra Glen from Cotter Road interchange to Carruthers Street interchange (refer to Figure 5-48, Figure 5-49, and Figure 5-50)	• Posted speed limit of 80 km/h • Dual carriageway with two traffic lanes in each direction • A southbound T2 lane is provided between Cotter Road and 150 m south of Cotter Road. A northbound T2 lane is also provided • Grass median. On-road cycling lane within the left shoulder on both carriageways. No on-street parking.	• The light rail alignment would be located within the median.

Location	Existing arrangements	Proposed arrangements
Yarra Glen and Carruthers Street interchange (refer to Figure 5-50)	• Posted speed limit of 80 km/h • Carruthers Street passes over Yarra Glen • Dual carriageway with two traffic lanes in each direction. A northbound T2 lane is provided • Off-ramps from Yarra Glen Avenue to Carruthers Street in both directions. On-ramps from Carruthers Street to Yarra Glen in both directions • Grass median. On road cycling lane within the left shoulder on both carriageways. No on-street parking.	• A new light rail stop would be provided in the median of Yarra Glen, south of the Carruthers Street bridge • A new pedestrian and cyclist bridge would be provided over Yarra Glen south of the existing Carruthers Street bridge to provide access to the light rail stop.
Carruthers Street between the Yarra Glen ramps (refer to Figure 5-50)	• Posted speed limit of 60 km/h • Dual carriageway with two traffic lanes in each direction • Kerbed median with a gap between carriageway bridges. Concrete footpath located behind the kerb on both carriageways. No on-road cycle lane. No on-street parking.	• No changes proposed.
Western intersection of Carruthers Street and the Yarra Glen ramps (refer to Figure 5-50)	• Signalised intersection with all movements permitted. Ramps are single direction roads.	• The signalised pedestrian crossing would be adjusted to allow pedestrian crossing on all legs of the intersection except the eastern approach on Carruthers Street.
Eastern intersection of Carruthers Street and the Yarra Glen ramps (refer to Figure 5-50)	• Signalised intersection with all movements permitted. Ramps are single direction roads.	• The signalised pedestrian crossing would be adjusted to allow pedestrian crossing on all legs of the intersection except the western approach on Carruthers Street.

Location	Existing arrangements	Proposed arrangements
Yarra Glen between Carruthers Street interchange and intersection of Yarra Glen, Yamba Drive and Melrose Drive (refer to Figure 5-50 and Figure 5-51)	• Posted speed limit of 80 km/h • Dual carriageway with two traffic lanes in each direction. • Grass median. On-road cycling lane within the left shoulder on both carriageways • No on-street parking.	• The light rail alignment would be located within the median.
Intersection of Yarra Glen, Yamba Drive and Melrose Drive (refer to Figure 5-51)	• Large roundabout providing connection between Yarra Glen, Yamba Drive, and Melrose Drive in all directions.	• The existing roundabout would be removed • A new signalised intersection would be provided with: - LRV access across the intersection - Traffic connection between Yarra Glen southbound to Melrose Drive southbound - Traffic connection between Yamba Drive northbound and Yarra Glen northbound/Melrose Drive southbound.
Woden precinct – both alignment options		
Irving Street, between Spoering Street and Yarralumla Creek (refer to Figure 5-52)	• Single carriageway with a two-way connection to 15 Irving Street and Phillip Oval car park.	• The car park between Phillip Oval and Yarralumla Creek would be closed • The southern section of the Irving Street adjacent to Yarralumla Creek would be closed • Access to the Phillip Oval maintenance facility, the approved Woden Interchange drainage facilities, and other utilities adjacent to Yarralumla Creek would be accessed via a new maintenance access track off Spoering Street.
Intersection of Launceston Street and Callam Street (refer to Figure 5-52)	• Signalised T-intersection with all movements permitted.	• A signalised intersection with traffic signal phasing to allow LRVs to cross the intersection.

Location	Existing arrangements	Proposed arrangements
Callam Street between Launceston Street and Matilda Street (refer to Figure 5-52)	• Two general traffic lanes in each direction • Kerbed median between the carriageways. Footpaths behind kerb lines on both sides of the road.	• No change to lane and footpath arrangements • The light rail alignment would be located in the central kerbed median.
Intersection of Callam Street and Matilda Street (refer to Figure 5-52)	A signalised intersection with: • Southbound approach traffic must turn left or right. Buses straight through only • Eastbound approach traffic must turn left or straight through. No right turn permitted • Westbound approach traffic must turn right or travel straight through. No right turn permitted • Northbound approach provides for bus only movement • Signalised pedestrian crossings of all intersection legs.	• A signalised intersection with traffic signal phasing to allow LRVs to cross the intersection.
Callam Street between Matilda Street and Bradley Street (refer to Figure 5-52)	• Vehicular traffic access is restricted to buses only • Two traffic lanes in each direction except at Matilda Street intersection where one lane is provided in each direction. Line marking separating the two central lanes • Kerbside bus stops are provided on both sides of the road • Kerbed median between the two northbound traffic lanes. Kerbed median between the two southbound traffic lanes • Signalised mid-block pedestrian crossings either side of the Woden Interchange. Footpaths behind kerb lines on both sides of the road.	• The inner bus lanes would be removed, and the light rail alignment would be located in the median • The median would be adjusted to allow LRV access only.

Figure 5-47 Road network changes – Inner South precinct (both alignment options)

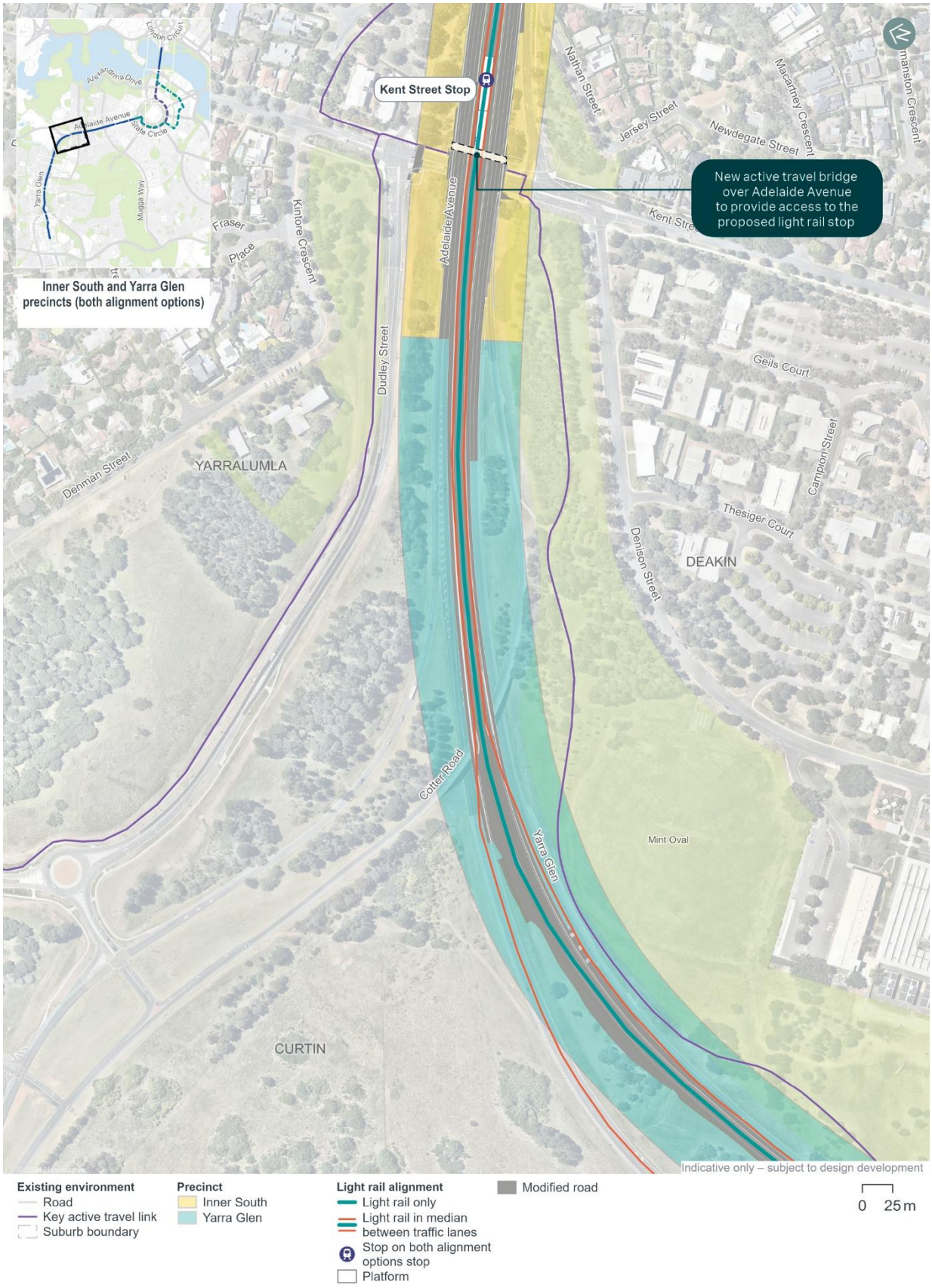


Figure 5-48 Road network changes – Inner South and Yarra Glen precincts (both alignment options)

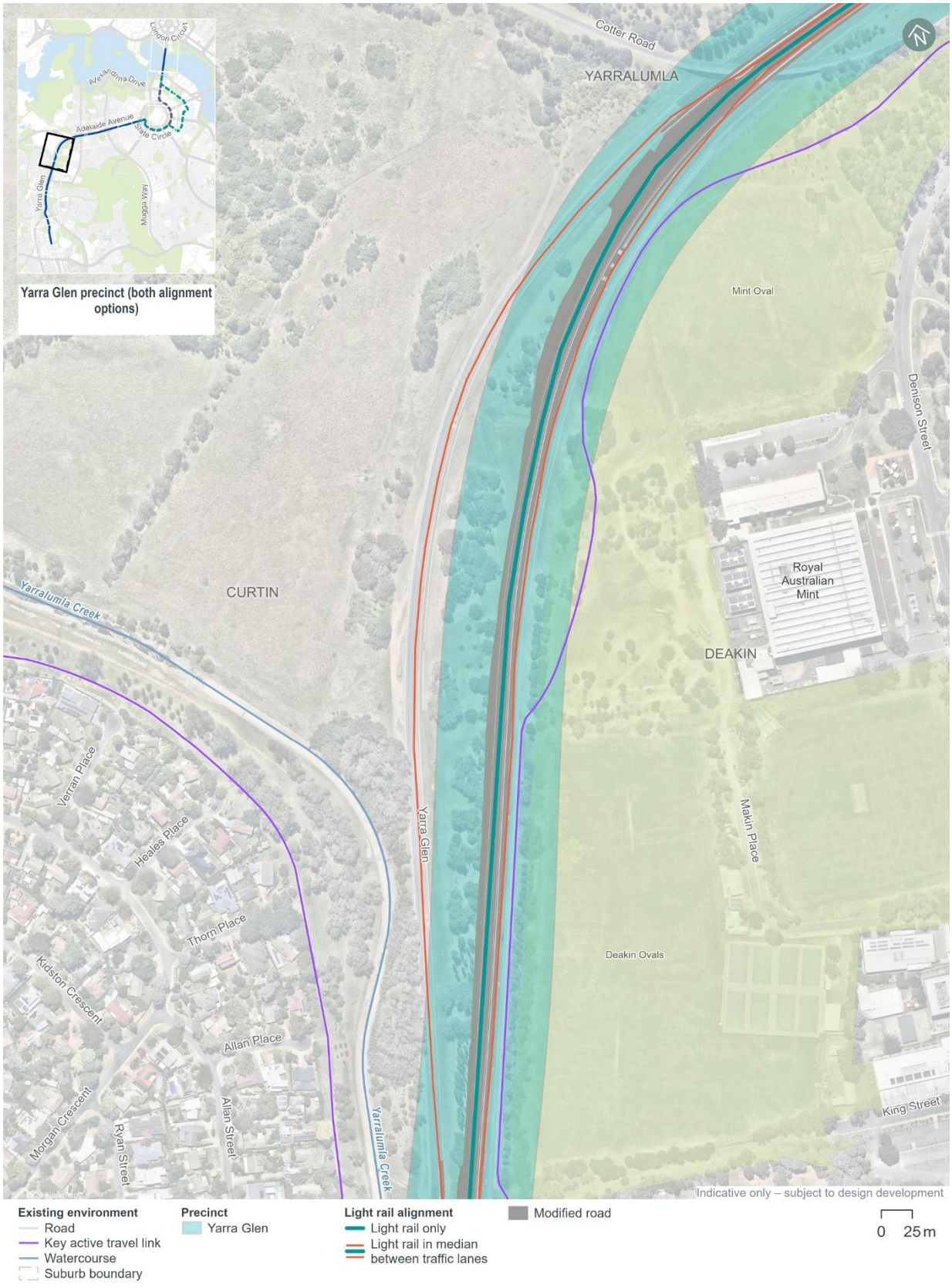


Figure 5-49 Road network changes – Yarra Glen precinct (both alignment options)

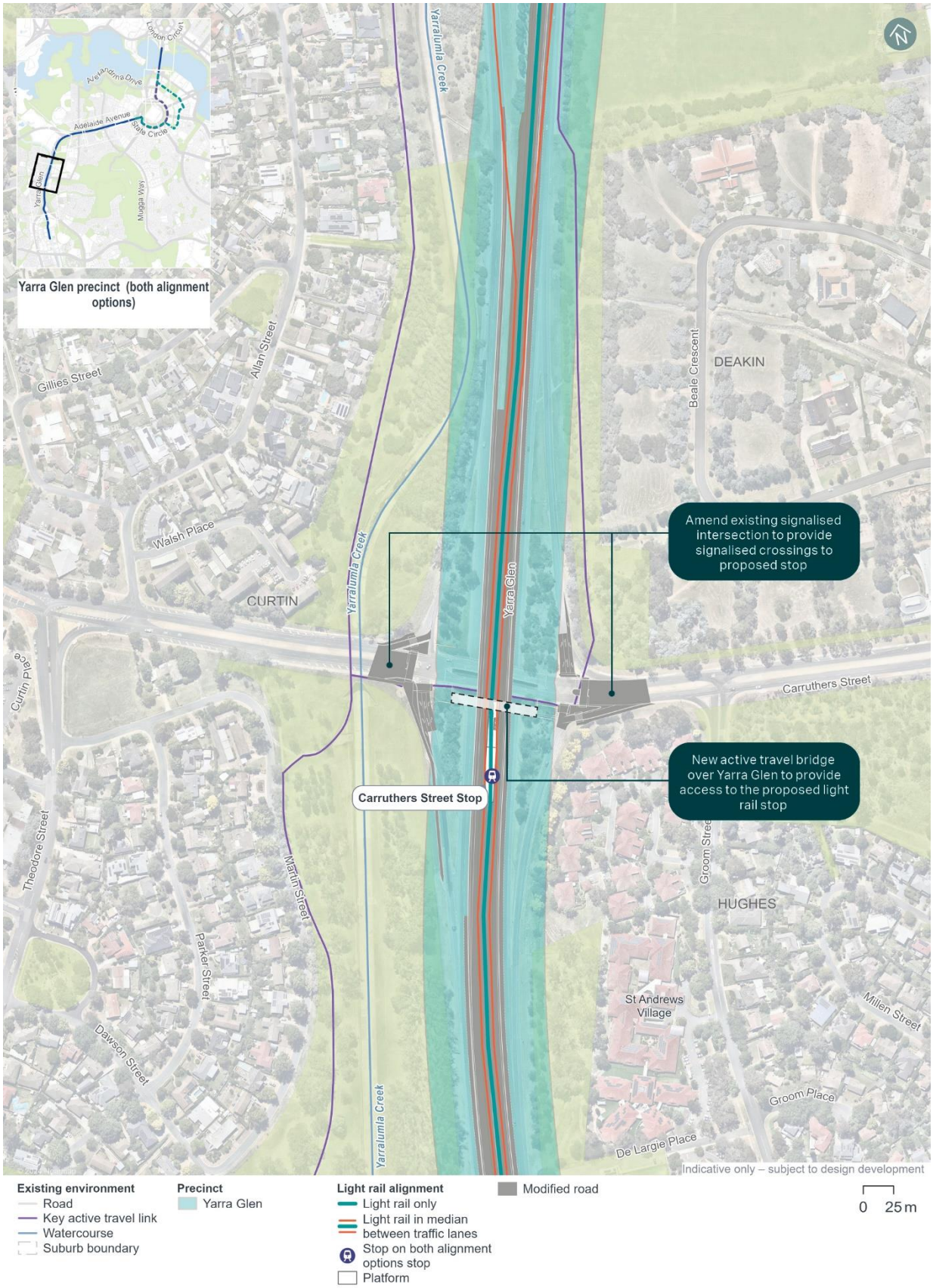


Figure 5-50 Road network changes – Yarra Glen precinct (both alignment options)

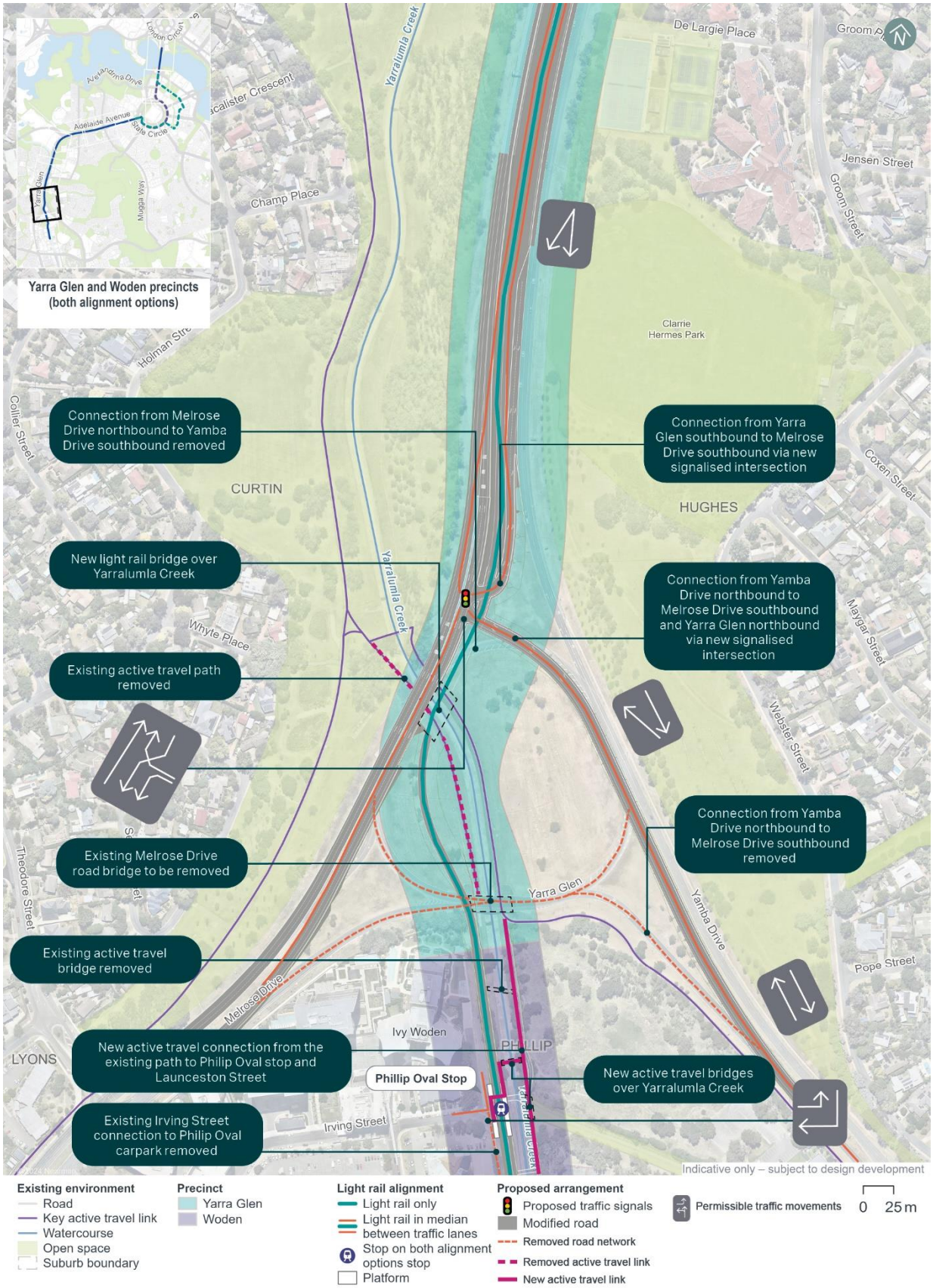


Figure 5-51 Road network changes – Yarra Glen and Woden precincts (both alignment options)

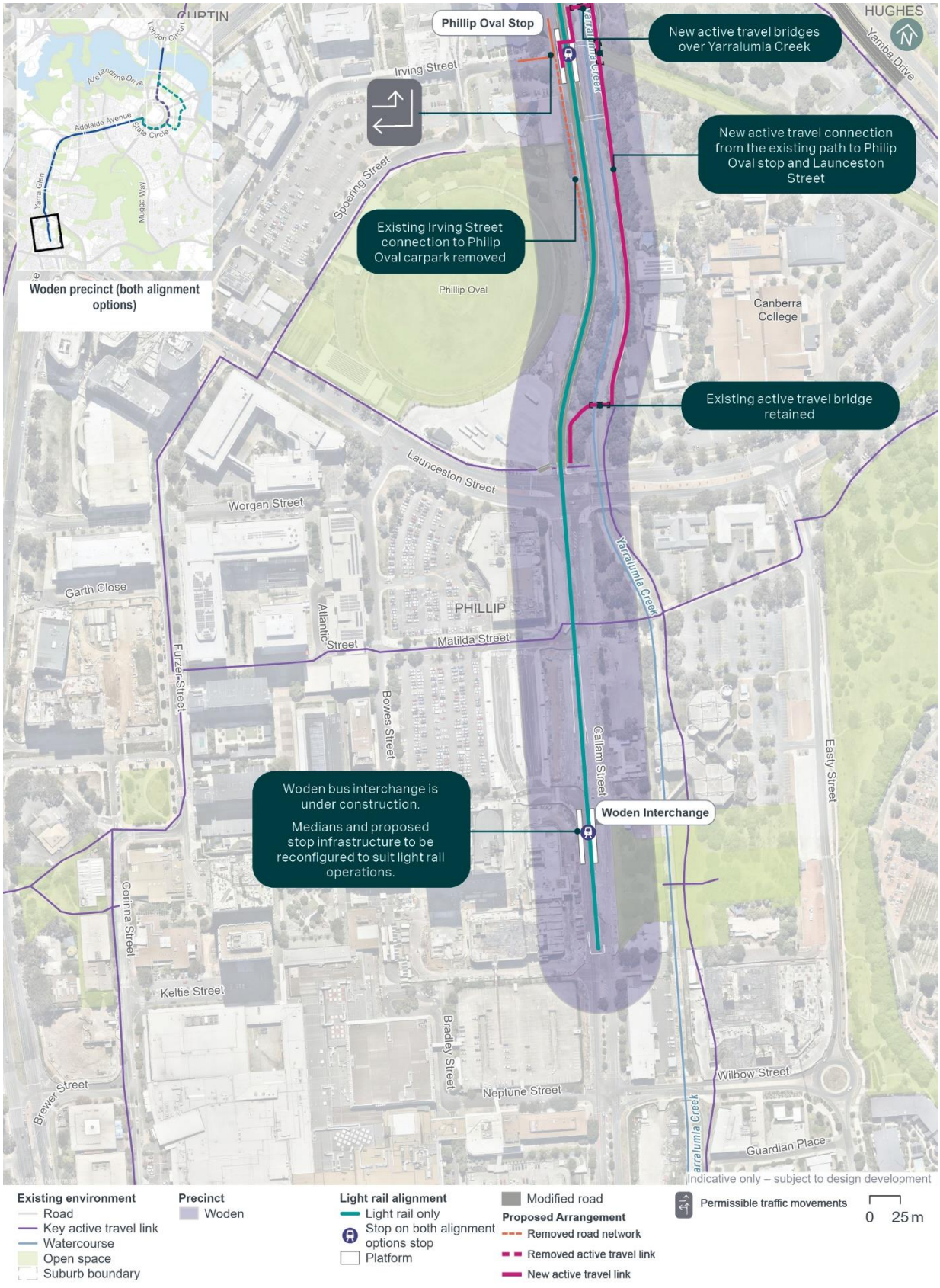


Figure 5-52 Road network changes – Woden precinct (both alignment options)

5.9.2 Changes to posted speed limits

The Project would result in changes to existing posted speed limits, as summarised in Table 5-11. Changes to posted speed limits would affect roads in the Commonwealth Avenue, Parliament House, National Triangle, Barton and Inner South precincts. No posted speed limit changes would be required in the Yarra Glen or Woden precincts, or around the Mitchell Depot site.

The need for changes to posted limits is driven by:

- Light rail customer safety around light rail stops
- Light rail customer, pedestrian, and cyclists' safety in and around stop precincts and along access routes to stops
- Motorist and light rail customer safety in shared areas and locations where there would be lower clearances between road traffic and LRVs (such as in the verges of Commonwealth Avenue and State Circle)
- Maintaining a consistent approach with posted speed limits around LRS2A
- In the case of Hopetoun Circuit (Inner South precinct), extension of the high pedestrian around the light rail stop and protection of pedestrian safety.

Table 5-11 Changes to posted speed limits

Location	Existing posted speed limit (km/h)	New posted speed limit (km/h)
Commonwealth Avenue precinct		
Commonwealth Park Stop to King George Terrace (both alignment options)	70	60
King George Terrace to State Circle (State Circle East alignment option only)	70	60
Parliament House precinct		
State Circle (State Circle East alignment option only)	70	60
National Triangle precinct		
Queen Victoria Terrace, Commonwealth Avenue to Langton Crescent (National Triangle-Barton alignment option only)	60	40
Langton Crescent, Queen Victoria Terrace to King George Terrace (National Triangle-Barton alignment option only)	60	40
Parkes Place West, King George Terrace to Newlands Street (National Triangle-Barton alignment option only)	50	40
Parkes Place East, King George Terrace to 120 m north of King George Terrace (National Triangle-Barton alignment option only)	50	40
Walpole Crescent Queen Victoria Terrace to King George Terrace (National Triangle-Barton alignment option only)	60	40
Queen Victoria Terrace, Kings Avenue to Walpole Crescent (National Triangle-Barton alignment option only)	60	40
Barton precinct		
Macquarie Street, Kings Avenue to Bligh Street (National Triangle-Barton alignment option only)	50	40
Bligh Street (National Triangle-Barton alignment option only)	50	40
National Circuit, Bligh Street to Sydney Avenue (National Triangle-Barton alignment option only)	60	40

Location	Existing posted speed limit (km/h)	New posted speed limit (km/h)
Inner South precinct		
Hopetoun Circuit Grose Street to Weston Street (both alignment options)	60	40

5.10 Other facilities and infrastructure to support light rail operation

5.10.1 Rail crossovers and turnback facilities

Crossovers between the tracks would allow LRVs to change over from one track to the other and travel in the opposite direction when required for special events or in response to light rail operational requirements.

The Project would include crossovers at:

- State Circle East alignment option: State Circle between Kings Avenue Stop and Melbourne Avenue Stop
- National Triangle-Barton alignment option: Sydney Avenue to the north-east of the Sydney Avenue Stop
- Both alignment options: Adelaide Avenue to the west of the Hopetoun Circuit Stop.

Turnback facilities using crossovers would be provided at the Woden Interchange to allow LRVs to turn around and travel in the opposite direction. Were the Project to be delivered in stages (refer to Section 5.12.8), turnback facilities would be required at that interim staging point.

5.10.2 Power supply and services

The power supply and other services for the Project would be provided with:

- Poles and over-head wiring from Hopetoun Circuit Stop to Woden Interchange in the Inner South, Yarra Glen, and Woden precincts (refer to Figure 5-53 for an example of over-head wiring). Power would be distributed from the TPSs via the over-head wiring strung on poles to the LRVs
- Three TPSs to supply power into sections of over-head wiring (described further below).

A combined services route, which would be located along the length of the light rail alignment and would support rail systems such as traction power, signalling, communications, and stop lighting. The combined services route would be located underground, generally parallel to the light rail track.

Were the Project to be delivered in stages (refer to Section 5.12.8), additional power supply infrastructure would be required in the vicinity of that interim staging point.

Figure 5-53 Example of traffic signals, signage poles and over-head wiring on LRS1

5.10.3 Traction power substations

The over-head wired section of the Project between the Hopetoun Circuit Stop and the Woden Interchange would require three TPSs to supply operational power from the existing electricity grid.

The locations of the three TPSs are shown on Figure 5-2 to Figure 5-17, and would include:

- TPS8 located off Guilfoyle Street within an existing grassed area (within the Inner South precinct)
- TPS9 located off Yarra Glen adjacent to the bicycle paths at the south-west corner of Deakin Ovals (within the Yarra Glen precinct)
- TPS10 located within the existing carpark off Spoering Street (within the Woden precinct).

The TPSs would be similar in size, layout and design to TPSs provided as part of previous light rail stages (for example, as shown on Figure 5-54 for LRS1), and would include design features such as screens and landscaping to minimise visual impact. Further detail on TPS design principles can be found in the Public Domain Master Plan (Appendix I).

Each TPS site (including the TPS, surrounding site compound and fencing) would have an area of around 270 m^2. The TPSs would generally include a demountable building with an air-conditioned switchgear room, a separate ventilated room for the power systems equipment, a separate room for Evoenergy equipment if required, and access for maintenance vehicles. iCBR would consult with relevant energy providers to secure required connection arrangements between the TPSs and the existing electricity grid. The final location, design and integration of TPSs within the landscape may change in response to community or stakeholder feedback or to better integrate with surrounding development.

Figure 5-54 Example of a traction power substation on Light Rail Stage 1

5.10.4 Retaining walls

Retaining walls would be adjusted or installed in specific areas due to variations in elevation between the current ground level and the light rail alignment, or to provide sufficient space along existing road corridors to accommodate light rail infrastructure. The design and materials of retaining walls would be informed by the existing and desired landscape character of the precinct, and design guidance documented in the Public Domain Master Plan (Appendix I).

Adjustments or installation of retaining walls for the Project are summarised in Table 5-12 and shown on Figure 5-2 to Figure 5-17.

Table 5-12 Retaining walls and embankments

Retaining walls
Commonwealth Avenue precinct
State Circle East alignment option only Replacement and relocation of the existing State Circle inner retaining wall between Commonwealth Avenue and Kings Avenue, to widen the road corridor and provide sufficient space for light rail operation.
Parliament House precinct
Both alignment options New retaining walls on the inner verge of State Circle between Sydney Avenue and Adelaide Avenue. The extent of the retaining walls would vary between the State Circle East alignment option and National Triangle-Barton alignment option.

Retaining walls
Inner South precinct
Both alignment options New retaining walls to increase the concourse space at Hopetoun Circuit Stop.
A new retaining wall in the median at Kent Street Stop running parallel to the stop to cater for the level change between the existing carriageways on Adelaide Avenue.
Modification of the existing stone embankment on the outside of Adelaide Avenue adjacent to and under Kent Street bridge, including cutting into the embankment to widen the road corridor and provide sufficient space for light rail operation.
Yarra Glen precinct
Both alignment options New retaining walls to the Yarra Glen median between Cotter Road and Carruthers Street to enable the Project to fit into the existing embankments and swales along the median without adversely impacting on existing stormwater and flood management.
New retaining walls to the on and off ramps at their intersection with Carruthers Street as a result of adjusted kerb lines to suit the new intersection arrangements.
New retaining walls and abutments for pedestrian and cyclist access bridges proposed at the Kent Street Stop and the Carruthers Street Stop.
Woden precinct
Both alignment options New linear retaining walls or a box culvert structure in Yarralumla Creek between Melrose Drive and Phillip Oval to widen the existing channel form and reduce potential flood impacts to adjacent property and provide flood protection to Project infrastructure.
Mitchell Depot site
Both alignment options New retaining walls to stabilise the modified embankments or built-up areas surrounding the newly formed stabling area.

5.10.5 Communications systems

Communications systems would be required to provide timely and reliable transmission of voice, data and video signals from key operational locations across the light rail system. The systems would be an extension of those provided for LRS1 and approved for LRS2A, and would include additional radio system poles, antennas, Wi-Fi access points, cabling, and associated wayside cabinets.

Central communications systems equipment would be located at the Mitchell Depot. Signalling infrastructure would be monitored from the operations control centre.

5.10.6 Mitchell Depot adjustments

The Mitchell Depot has recently been adjusted to support an additional five LRVs for the approved LRS2A. To meet the Project's operational targets, further adjustments to the Mitchell Depot would be required to support up to an additional 12 LRVs. Adjustments would also be required to cater for additional staff, as well as additional maintenance equipment storage.

Work required at the Mitchell Depot site to facilitate stabling and maintenance activities for the Project would be subject to ongoing design development in consultation with key stakeholders, and would include:

- Extension of the Mitchell Depot to include an additional land parcel to the north (adjoining Sandford Street) to accommodate additional staff, contractor and visitor parking, and covered storage
- Two new stabling roads, as well as extension of the existing stabling roads to the west
- New retaining walls to stabilise the modified embankments or built-up areas surrounding the newly formed stabling area

- Additional drainage to capture and detain water run-off from new hardstand areas and direct to the existing detention basin
- Landscaping work, including embankment stabilisation and earthworks to manage changes associated with the increase in hardstand areas
- Additional office accommodation and storage facilities, such as sheds.

An overview of the adjustments to the Mitchell Depot are shown on Figure 5-17.

5.11 Land requirements

Most of the Project's operational infrastructure would be located on land within existing road reserves and land owned by the ACT Government. Land licences would be required for the areas of National Land as the ACT Government is not the land custodian. Further details on land requirements are provided in Section 11.8 in Chapter 11 (Project-wide issues). The Project would also require some temporary leasing of land for construction. Temporary land requirements are described in Section 6.6.1 in Chapter 6 (Construction).

A complete list of properties that would be affected by temporary or permanent works for the Project is included in Appendix K (Property and land use planning).

5.12 Operation

5.12.1 Service frequency and journey time

The Project would be an extension of the existing Light Rail network (including the approved LRS2A) and would allow for peak operational headway frequency of every five minutes. A summary of the Project's indicative planned service frequency is shown on Figure 5-55.

The light rail journey time between Woden and the city (LRS2A and the Project combined) would meet the 30-minute city aspiration. Early investigations have indicated that journey time on the National Triangle-Barton alignment option would be 3 to 5 minutes longer than the State Circle East alignment option.

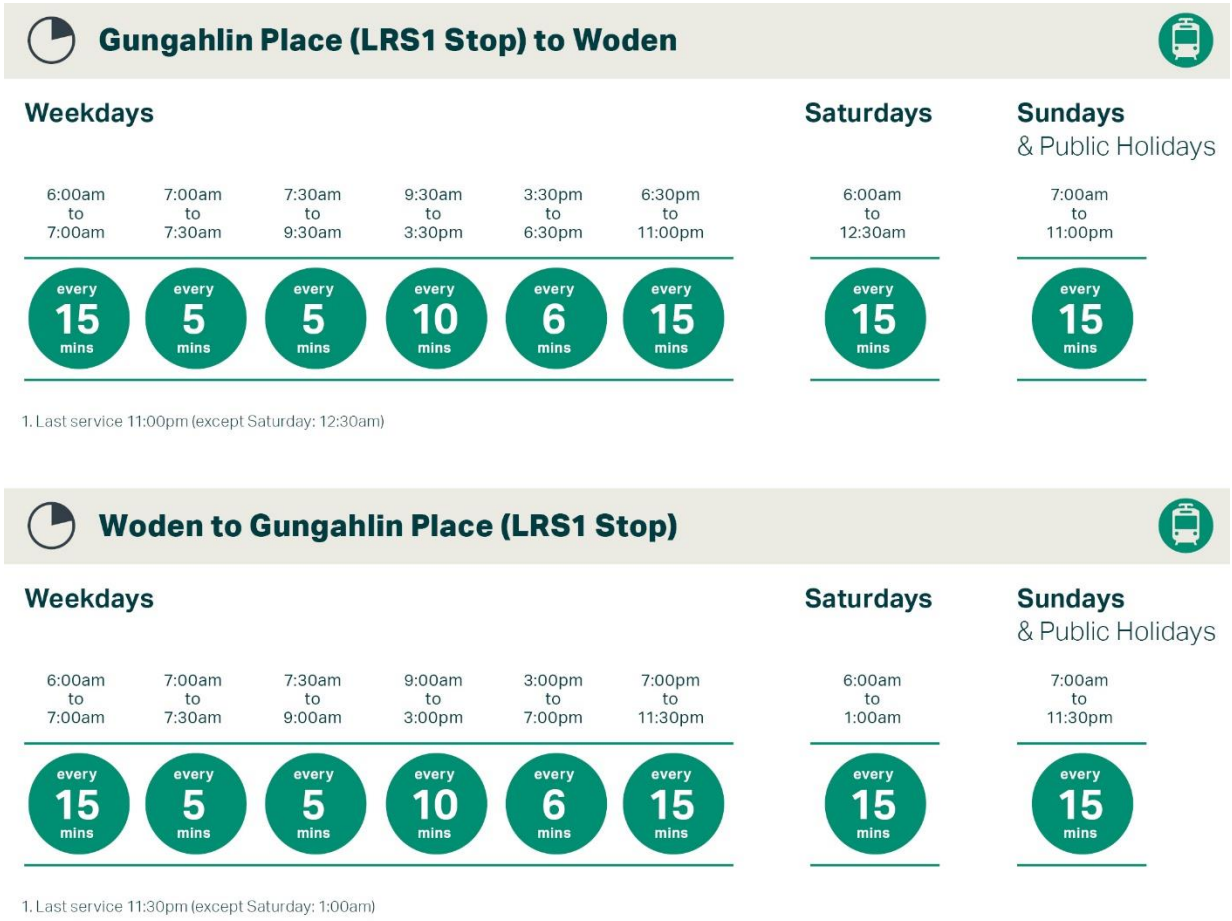


Figure 5-55 Indicative hours of operation and service frequency for the Light Rail network (LRS1, LRS2A and the Project)

5.12.2 Special event operations

Several special events occur within the city centre and the Woden Valley region during the year which may require amended light rail operation scenarios. Special events occur predominantly in the city centre, Commonwealth Park, Lake Burley Griffin, and Manuka Oval. Events at Commonwealth Park would generate the largest demand for special event services, especially for New Year's Eve and Skyfire, where the event conclusion is likely to create a short duration peak public transport demand period.

Operations would be tailored to cater for planned special events, in collaboration with Events ACT and the light rail operator, with detailed requirements for special event operations determined during the design development process.

5.12.3 Light rail vehicles

The Project would require up to 12 LRVs to be added to the Light Rail network. The additional LRVs would be similar in appearance, size, and performance to those that operate as part of LRS1 and planned for LRS2A. As with LRS2A, the LRVs would include battery technology to allow for wire-free operation.

Key LRV features are shown on Figure 5-56.

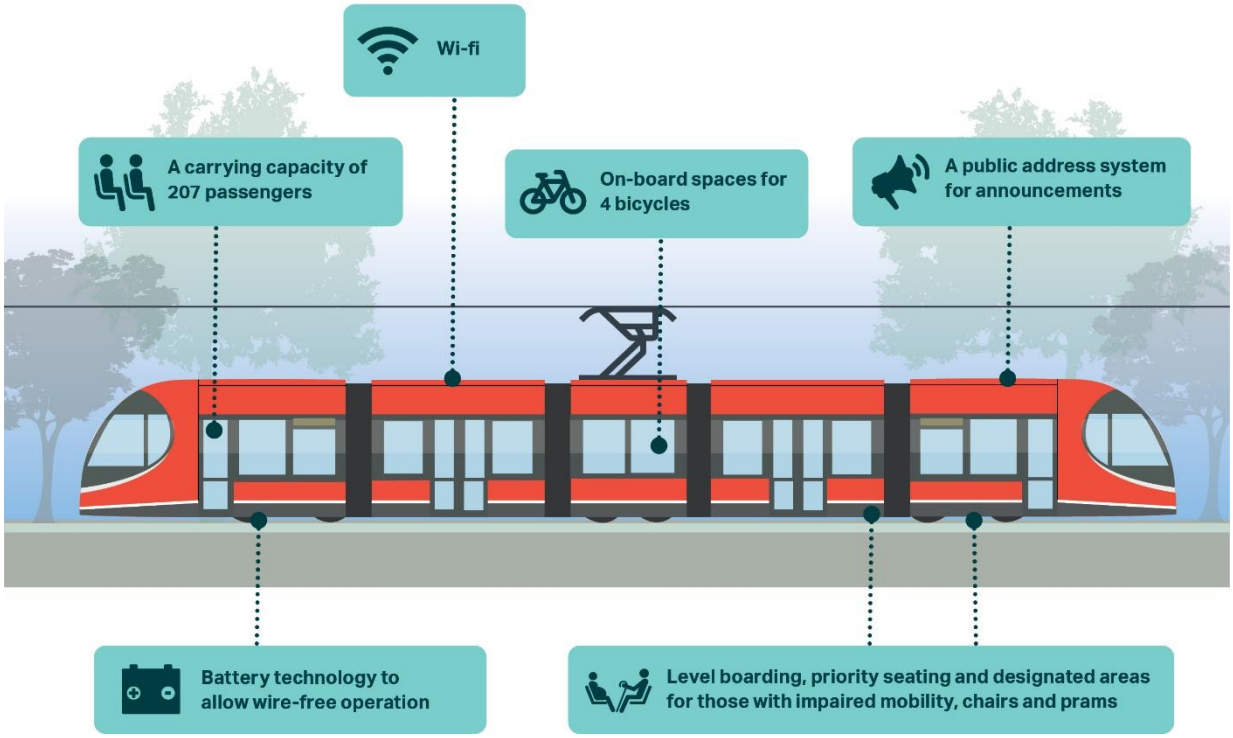


Figure 5-56 Key LRV features

5.12.4 Ticketing system and passenger information

Ticketing

MyWay+ is the ticketing system used for Canberra's public transport network. Ticket readers would be located at each stop, with passengers required to tap on before boarding, and tap off after alighting. Ticket vending machines would also be available at each stop. The machines can be used to top-up MyWay+ cards, check their balance, and/or purchase a single or daily ticket. Ticket vending machines would be accessible in English, Arabic, Chinese, and Italian.

Passenger information

Passenger information displays would be provided at each stop. They would detail current service information for the specific stop, general information, and updates during service disruptions.

A public address system would be provided at each stop. Use of the system would be limited to emergency-related events and would be designed to minimise disturbance to the surrounding community. The system would not be used to announce regular service information.

As identified in Section 5.4.3, hearing loops would be provided at each stop and on-board LRVs to provide customer information and assist those with hearing impairments.

5.12.5 Operational control and safety

Operational control

Operation of the light rail system would be managed through the existing Operation Control Centre (OCC) within the Mitchell Depot. The OCC currently manages and has oversight of all communications with the drivers, LRVs, traffic and rail signals, other operational staff and interfaces and would be updated to meet the needs of the Project.

Road and LRV safety

The operator of the Light Rail network would have responsibility for the safe and efficient operation of the Project. At intersections road vehicles and LRVs would be directed by traffic light signals with traffic signal priority generally given to LRVs. Light rail would be designed as a line-of-sight system that would give light rail drivers sufficient visibility to respond to potential hazards. Drivers would be trained to operate LRVs and to take into account aspects including traffic and pedestrian factors, LRV speeds and braking requirements in responding to potential hazards.

Speed restrictions for LRVs would be determined based on factors such as the current traffic and pedestrian levels, engineering specifications, and safety considerations. Generally, the speed of LRVs would match the speed limit of surrounding vehicle traffic and would be slower around intersections, light rail stops, areas of high pedestrian activity, and as a result of track geometry.

The Project has been designed to manage LRV safety and potential interaction between LRVs and other road users to meet the requirements of Rail Safety National Law. This is discussed further in Section 11.13 (Hazards and risk) of this EIS.

Disruption to light rail services and incident management

While in operation, various incidents may occur that disrupt light rail services, leading to the unavailability of certain parts of the network. The Project design and network planning for the Project has considered the potential for disruptions to light rail services, and how this would be managed through design and operational service planning to maximise network resilience.

The Light Rail network operator would be responsible for developing and implementing procedures to reduce both the frequency and consequence of disruptions and incidents. Potential incidents could include:

- Road traffic accidents (including a collision involving a LRV)
- Major fault or failure of a LRV
- Infrastructure faults (such as track, over-head wiring or signals)
- Unruly or ill passenger(s)
- Environmental events (such as flooding or bush fire).

All emergency or incident responses would be subject to safe management processes including risk assessments, staff training and agreements with emergency services and utilities agencies.

Customer safety

The Light Rail network operator would be accredited by the Office for the National Rail Safety Regulator and would have the responsibility for ensuring the safety of customers, staff, and the public in areas where they encounter the Light Rail network so far as is reasonably practicable. This would include outlining how customers would be informed about safety risks associated with proximity to LRVs.

Security and safety features that would be provided for the Project are described in Section 5.4.4. The operator would actively manage a number of these security features such as responding to emergency help point activations and monitoring CCTV.

Customer Service Officers would provide information and assistance to customers for the Project and communicate with the operations control centre as required, including to request attendance of emergency service officers as necessary.

5.12.6 Maintenance

The Mitchell Depot would be used to stable and maintain current and additional LRVs (refer to Section 5.10.6 and 5.12.3). Maintenance works would be required from time to time along the light rail track, at bridges, stops, TPSs, signalling, signage, other ancillary facilities, and would include landscaping.

5.12.7 Public transport network changes

The ACT Government continues to seek opportunities to expand and improve public transport. This includes integration of light rail and bus services with the intention to increase reach and frequency of public transport across Canberra. Prior to commencement of operations, Transport Canberra would re-evaluate the bus network design to optimise opportunities for interchange with the Light Rail network.

Some bus stops and routes may require adjustments to accommodate the Project. Transport Canberra will assess these impacts and adjust services accordingly for construction and operation phases. Potential impacts to public transport are addressed in Technical Report 1 – Traffic and transport.

5.12.8 Staging

Investigations are ongoing into potential options to stage operation of the Project. Factors being considered that would influence options for staged operation include, construction program, the power supply solution required at terminus locations, space for terminus infrastructure (e.g. driver facilities), operational implications and public realm outcomes. Refer further to Section 3.9.1 in Chapter 3 (Project development).

5.13 Utilities and services

There are utilities and services currently within the Project area that may be affected to varying degrees by the Project. Depending on the type and nature of the utility, its location and extent of impact during construction, and the outcomes of consultation with the relevant utility providers, each utility may be subject to the following treatments:

- Do nothing/ leave in situ (subject to individual assessments)
- Protection in place
- Minor modification or realignment
- Relocation and/or lowering
- Abandonment or disconnection, and if required, replacement with an alternative.

Some utility services in Canberra are highly classified, with limited publicly available information, particularly in the National Triangle and Barton precincts.

Consultation has been ongoing with utility providers and other relevant stakeholders as part of design development, including the potential requirement for connection with utility infrastructure located outside the Project area. Further utility investigations and consultation with key stakeholders would occur as part of ongoing design development and construction planning to confirm utilities potentially affected by the Project. Suitable treatments would be verified by conducting utility investigations, through discussions with utility authorities, and construction preparation in collaboration with the utility provider/asset owner.

Utilities investigations carried out to support the design process categorised utilities based on their size and/or capacity as either major or minor utilities types. Major utilities for the different utilities types have been defined as follows:

- Communications (NBN, Telstra, TPG, Optus and other asset owners): a six-way conduit bank or greater, and any size of Department of Finance optic fibre cables
- Water and sewerage (Icon Water): water or sewerage pipeline with a diameter of 300 millimetres or greater
- Gas (Jemena): high pressure gas main (pressure of 1050 kilopascals)
- Electricity (Evo Energy): high voltage (HV) power infrastructure only.

Table 5-13 provides an overview of the utilities potentially impacted by the Project (inclusive of both the State Circle East alignment option and the National Triangle-Barton alignment option).

No major utilities are likely to be affected as part of works at the Mitchell Depot site, however some internal depot services and minor utilities may be impacted by proposed works. Most potentially impacted utilities are underground, however, over-head high voltage electrical cables may also be affected by the Project. This, and any related treatments, would be confirmed as part of ongoing design development.

Table 5-13 Indicative number of major and minor utilities that potentially affected by the Project

Precinct	Major utilities affected	Minor utilities affected
Commonwealth Avenue precinct	11	12
Parliament House precinct	51	49
National Triangle precinct	10	26
Barton precinct	34	81
Inner South precinct	11	20
Yarra Glen precinct	45	43
Woden precinct	16	12

5.14 Ongoing design refinement

The Project design presented in this chapter, as well as the indicative construction method presented in Chapter 6 (Construction), defines the Project.

As part of the design development process, further refinements to the Project design to minimise environmental impacts, respond to community and stakeholder feedback, improve Project outcomes and enhance Project value may be required. As a result, there may be some variations from the design presented in this EIS.

For example, the final location of light rail platforms, stop access, road network infrastructure (e.g. traffic signals/lighting and communications equipment) and ancillary infrastructure (such as TPSs) may change in response to community or stakeholder feedback or to better integrate with surrounding development. Design refinements would not be substantial and generally are not anticipated to result in changes to the Project area, the identified route alignments, or the fundamental nature of the Project.

6.0 Construction

This chapter outlines a preliminary construction approach, based on Project design development carried out to date. The preliminary construction approach would continue to be refined through ongoing design work, in response to conditions of environmental and planning approvals, and the outcomes of stakeholder engagement activities. The construction contractor(s) would finalise construction planning considering these factors in addition to timing, delivery strategy (contract packaging), and work sequencing.

A Construction Environmental Management Plan(s) (CEMP) would be prepared for the construction phase of the Project (refer to Chapter 21 (Environmental management and mitigation measures)). The CEMP would be prepared and implemented by the construction contractor(s), and would specify the environmental requirements to be implemented during the construction phase of the Project. An outline of the CEMP is provided in Section 2 of Appendix L (Environmental Management Plan outline).

6.1 Project area

Construction activities associated with the Project would occur within the 'Project area', as shown on Figure 6-1 to Figure 6-4. The Project area would allow sufficient area for both permanent and temporary works required to deliver the Project. Temporary occupation of land would be subject to a licence or lease over the land, where required. Permanent works would include new and altered infrastructure to support operation of the Light Rail extension to Woden, such as the track, stop infrastructure, bridges, landscaping, and traction power substations (TPSs). Permanent Project elements are described in Chapter 5 (Project description).

Temporary works would include areas for short-term storage of construction plant and equipment, construction compound areas, traffic management, and temporary alterations required to deliver the permanent Project elements. Land required for temporary works would be used at different times depending on the stage of construction, and construction requirements at a particular location. Temporary works would vary over time during the construction period, and would proceed along the Project alignment. Construction planning would aim to minimise and manage potential construction phase environmental impacts through careful selection of locations and scheduling of temporary works across the Project area. The extent and location of temporary works would depend on which alignment option is selected for the Project.

Indicative construction compound locations are shown in Figure 6-1 to Figure 6-4 and described further in Section 6.6.1. All indicative construction compound locations would be required regardless of which alignment option is selected. Some temporary work areas may also be required in each precinct for each alignment option. For example, temporary work areas along Sydney Avenue in the Barton precinct may be used to facilitate construction of the State Circle East alignment option.

Further information about the Project's land requirements, and the potential property impacts of these requirements is provided in the property and land use assessments in Section 11.8.

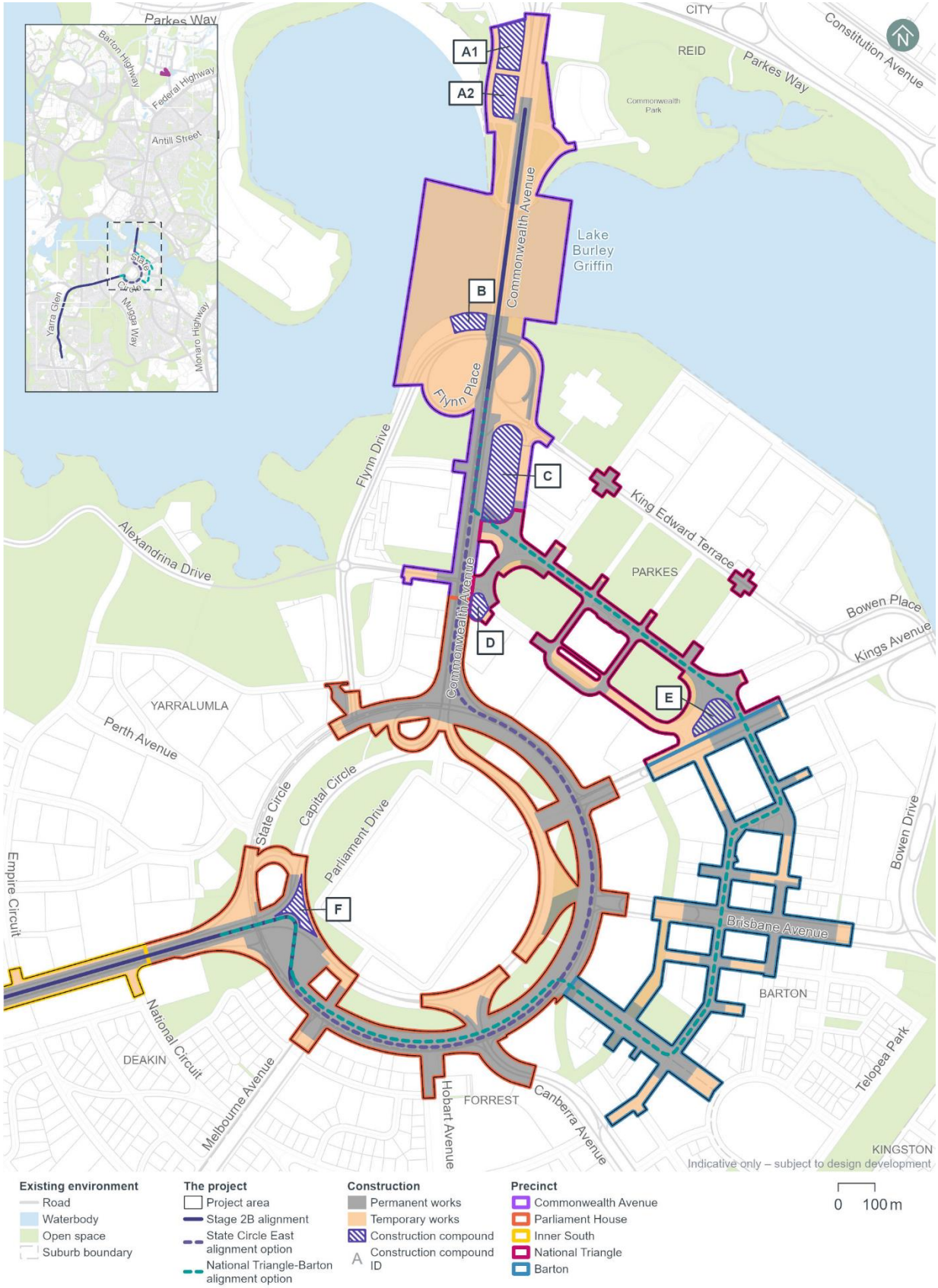


Figure 6-1 Project area (1/4)

Figure 6-2 Project area (2/4)

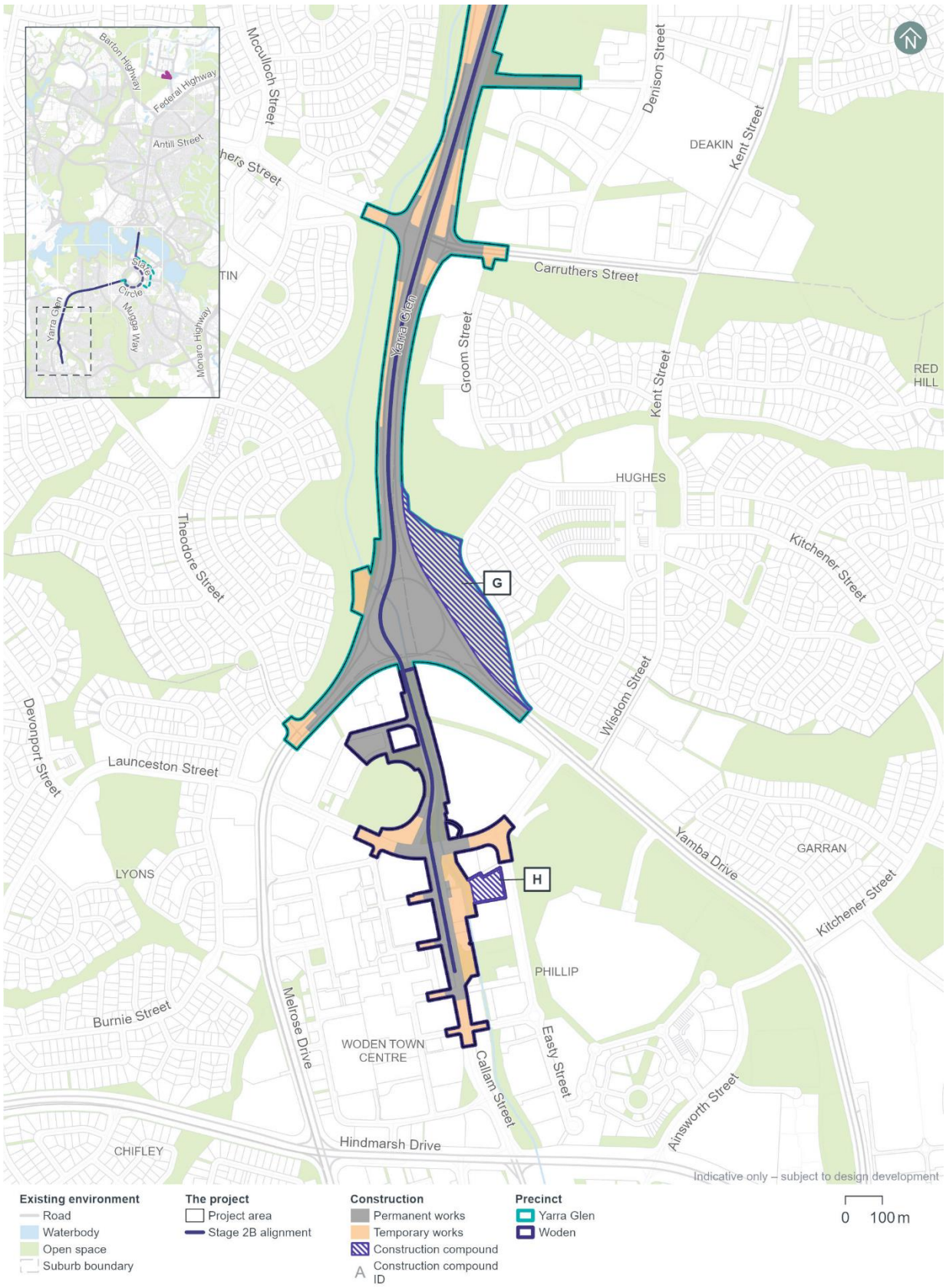


Figure 6-3 Project area (3/4)

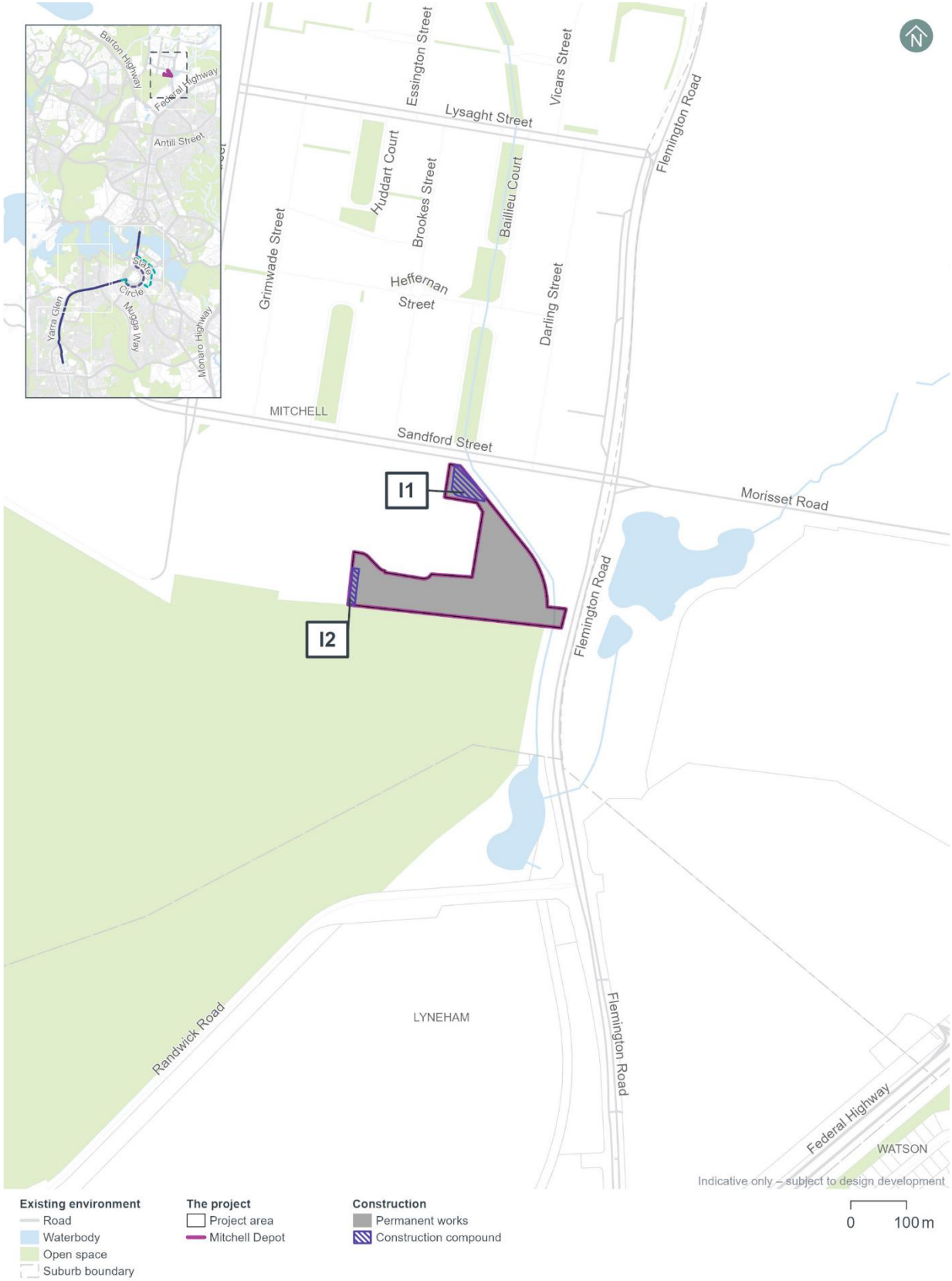


Figure 6-4 Project area (4/4)

6.1.1 Program

Design and approvals

Design development and construction planning for the Project is ongoing and would continue up until anticipated commencement of construction.

Subject to statutory requirements and the timing of decisions to be made by environmental and planning regulatory agencies with respect to the Project and this EIS, it is anticipated that necessary environmental approvals associated with this EIS would be secured in 2026.

Construction and early and enabling works

Subject to approvals and the Project's procurement strategy, major construction work is anticipated to commence in 2029 and would take about four to five years to complete. The construction duration would depend on further design development, investigations (including geotechnical and utilities), and detailed construction planning, including the construction contractor's final delivery methodology. Early and enabling works may be required prior to 2029, subject to detailed design and construction planning. A decision on how the construction works would be packaged would be made as part of ongoing planning for Project delivery.

Construction is anticipated to occur concurrently across each precinct from 2029.

The construction of Light Rail Stage 2A (LRS2A) is anticipated to be completed in 2027 followed by a period of testing and commissioning, and would begin operation prior to the main construction works of the Project.

Testing, commissioning and operation

The testing and commissioning phase would begin towards the end of completion of the main construction works and would take around 12 months. The first passenger services are proposed to start in 2034.

Design life and potential decommissioning

The design life (the period of time over which the Project is designed to meet specified requirements) of Project elements varies depending on their nature. For example bridges, the covered section, and retaining walls have a design life of 100 years. Other elements such as light rail stop structures, trackform structures, drainage structures, and pedestrian footpaths have a lower design life ranging between 75 and 40 years. As the Project elements approach those timeframes, their operational performance would be reviewed and decisions made at that time regarding further investment in prolonging the life of the infrastructure or whether decommissioning and replacement of elements would be required.

6.2 Early and enabling works

Early and enabling works would be carried out before the start of major construction work. These works would reduce the duration of the major civil construction works and associated disruptions to traffic and surrounding sensitive land uses. The scope of early and enabling works would be subject to the delivery strategy and a specific CEMP (refer to Section 2.2 of Appendix L (Environmental Management Plan outline). Early and enabling works may include:

- Surveys and investigations, such as land surveys, geotechnical investigations, utility investigations, bridge foundation assessments, archaeological surveys, property condition surveys, soil sampling and monitoring work
- Installing site environment management controls, including site fencing, environment protection zones, sediment and erosion controls and screening
- Relocating bus stops and diversions of bus routes
- Removing redundant structures (as required)
- Temporary fencing of works areas

- Establishing construction compounds, ancillary facilities and work areas for early and enabling works, including but not limited to providing access, erecting demountable buildings, and solid hoarding or temporary fencing. Construction compound locations are shown in Figure 6-1 to Figure 6-4 and described further in Section 6.6.1
- Supplying power, water, and other utilities to construction compounds, ancillary facilities, and work areas
- Vegetation removal, trimming, mulching, and tree removal/relocation where required
- Establishing temporary roads and access tracks, drainage measures, pedestrian, and cyclist diversions
- Preparing work areas for main construction works, including property adjustments (such as temporary driveways and access points)
- Relocation, protection and the potential replacement or removal of utilities
- Any other work that may be required to support the commencement of major construction works.

Temporary connection to the water, telecommunications, and power supply networks may also be required during establishment of compounds and ancillary facilities. Engagement with relevant utility providers would be carried out with respect to timing and location of temporary connections to ensure sufficient capacity is available. Connections to existing power supply networks would be prioritised where feasible.

6.3 Main construction works

Main construction works would include elements directly related to light rail (refer to Section 6.3.1 and 6.3.6) as well as civil works required to install light rail infrastructure such as bridges (Section 6.3.4) and the covered section (Section 6.3.5). Main construction works may also include ancillary activities such as establishing active travel links (Section 6.3.7) and roadworks (Section 6.3.8).

6.3.1 Light rail infrastructure

Light rail infrastructure would include trackform, stops, over-head wiring, street lighting, signalling, drainage and services. The construction of the light rail infrastructure would include:

- Civil works (including excavation and earthworks, installation of track drainage, the combined services route, and concrete). This would form the base of the trackform
- Track installation (including installation of reinforcing steel, installation of electrical stray current and bonding elements, and welding of the track)
- Installation of over-head wiring and poles
- Installation of street lighting, closed circuit television (CCTV), communications and signalling equipment.

Works typically required to construct the light rail infrastructure are described in the following sections.

Civil works

Civil works required to install light rail infrastructure are expected to involve:

- Removing existing surface infrastructure (such as roads, medians, and asphalt), and other elements such as kerb and gutter
- Earthworks (refer to Section 6.3.2), including subgrade works for the track slab foundation and compaction of fill material, construction of retaining walls (refer to Section 6.3.8) and backfilling areas of excavation
- Installing service conduits
- Relocation, protection and the potential replacement or removal of utilities
- Constructing stormwater drainage
- Concrete work, including placing steel reinforcement and concrete formwork and pouring concrete in-situ or installing pre-cast concrete slabs
- Installing pavement for track slab and kerbs for the turnback facilities at the light rail terminus at the Woden Interchange
- Reinstating affected areas including roads, paths, and grassed areas
- Public domain works (refer to Section 5.2).

Track installation

Track installation is expected to involve:

- Installing track into concrete formwork (for embedded and green track options), including track laying, welding, and grinding
- Installing concrete sleepers, track, and infilling ballast or permeable gravel between tracks (if required, subject to detailed design development)
- Installing rail crossovers at Sydney Avenue Stop and Hopetoun Circuit Stop for emergency access use
- Installing the end of line infrastructure including turnback facilities at Woden Interchange
- Installing embedded and cast-in rail systems infrastructure, such as conduits, cabling, and pole foundations

- Surface finishing, depending on the trackform to be applied at each location (refer to Section 5.3.1)
- Installing irrigation and turfing for green track (if required)
- Reinstating affected areas
- Line marking on roads.

Figure 6-5 shows a simplified and indicative construction process for installation of the light rail tracks.

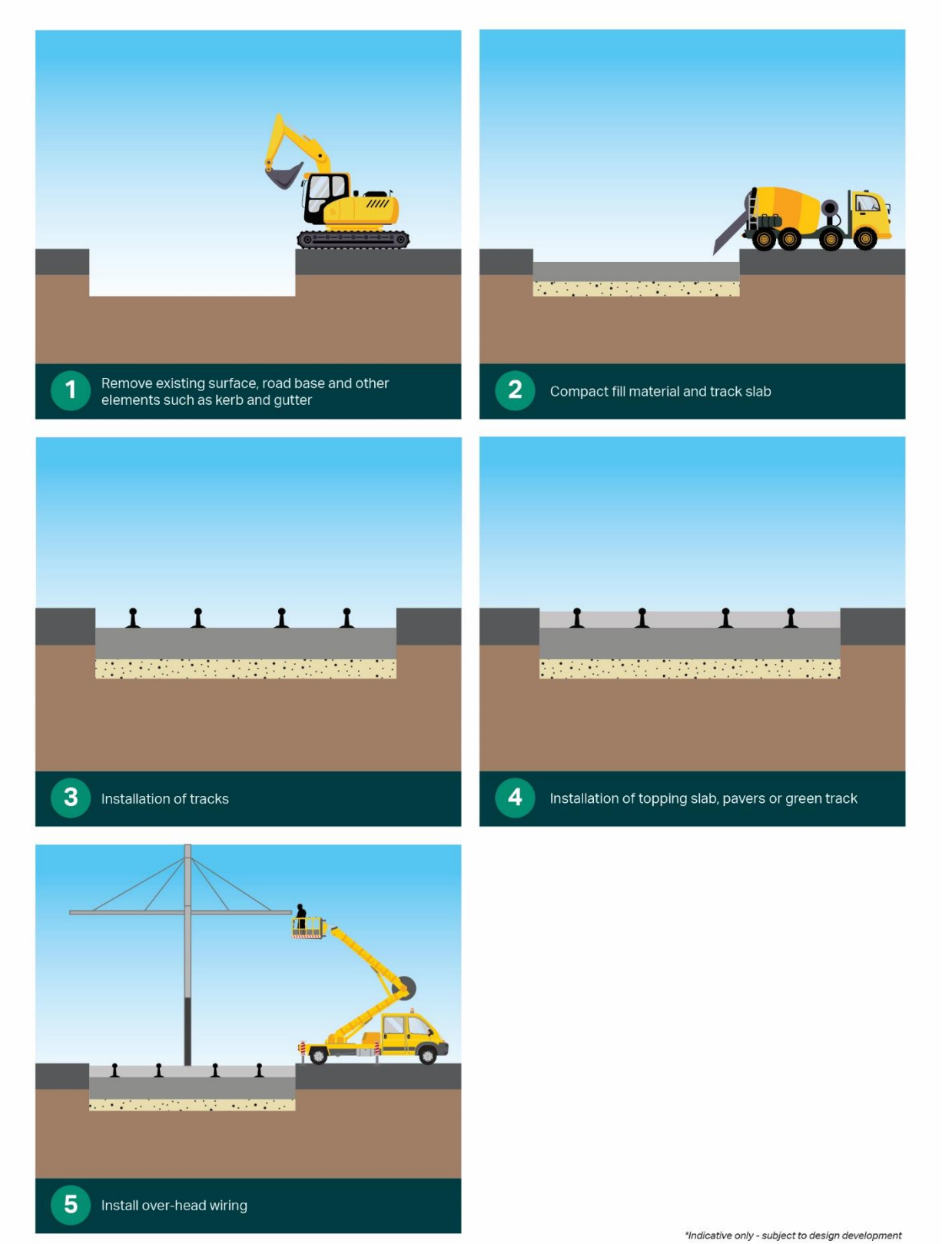


Figure 6-5 Simplified light rail track construction process – embedded and green track

Over-head wiring and poles

As discussed in Chapter 5 (Project description), the Project would transition between wire-free running and over-head power supply at the Hopetoun Circuit Stop. Installation of over-head wiring and poles (from Hopetoun Circuit Stop to Woden Interchange) is expected to involve:

- Removing existing pavement and excavating footings
- Placing prefabricated reinforcement cage, base plate, and other sub-structure elements
- Concrete pouring
- Erecting poles
- Stringing of over-head wires, utility connection, installing droppers, and wiring terminations.

Street lighting, CCTV and signalling

Installation of street lighting, CCTV and signalling is expected to involve:

- Installing underground conduits and access pits from the points of supply for both communications and electrical power to each of the traffic signal posts and associated electrical cabinets
- Constructing pole footings
- Erecting the signal and streetlight posts
- Installing cabling
- Connecting and commissioning the traffic lights (and integrating them with the light rail signals system where required).

For the National Triangle-Barton alignment option, some adjustments to traffic signals would be required on King Edward Terrace at its intersection with Parkes Place East and Parkes Place West. These areas are shown on Figure 6-1.

6.3.2 Earthworks

Earthworks would be required to construct light rail infrastructure, bridges, traction power substations (TPSs), to undertake road and utility works, and to remove existing concrete in some locations. Fill material would be required for sub-grade works and retaining wall construction, and to backfill excavations.

The management of excavated materials would be as per the following hierarchy:

- Reuse material that has appropriate engineering properties and meets soil quality standards within the Project area, where possible
- Reuse or recycle surplus usable material on other projects within or nearby the ACT
- Transport excess material, including any contaminated material, that cannot be reused within the Project area or other projects, off-site for treatment and/or disposal at a licensed facility as determined by its waste classification.

Management of contaminated materials would be as outlined in Section 11.6.

The estimated quantities of materials associated with earthworks cut and fill are provided in Table 6-1. Where fill material is not available from earthworks, suitable material would be sourced from other projects, where possible, to divert waste from landfill.

Further information on waste management is provided in Section 11.12.

Table 6-1 Estimated volume of cut and fill material

Precinct	Volumes of spoil (m^3)					
	State Circle East alignment option			National Triangle–Barton alignment option		
	Fill material	Excavated material	Excess spoil	Fill material	Excavated material	Excess spoil
Commonwealth Avenue	500	20,000	19,500	500	15,000	14,500
Parliament House	10,000	84,000	74,000	3,000	43,000	40,000
Inner South	10,000	36,000	26,000	10,000	36,000	26,000
Yarra Glen	38,000	55,000	17,000	38,000	55,000	17,000
Woden	5,000	11,000	6,000	5,000	11,000	6,000
National Triangle	-	-	-	2,000	20,000	18,000
Barton	-	-	-	2,000	31,000	29,000
Mitchell Depot	-	21,000	21,000	-	21,000	21,000
Total	**63,500**	**227,000**	**163,500**	**60,500**	**232,000**	**171,500**

6.3.3 Road works

Road works would be required for the Project to deliver the road network changes described in Section 5.9. This would include construction of new kerbing, drainage, asphalt and concrete pavements, installation of associated road furniture, such as barriers, and installation of signage and pavement markings.

Construction of roads would involve:

- Demolishing existing kerbs and pavements
- Ground excavation to required formation levels
- Installation of road, pavement, and subsoil drainage
- Preparing the ground sub-grade
- Installing and compacting road base material
- Constructing kerbs and gutters
- Placing asphalt (or concrete)
- Installing road furniture
- Line marking and placing pavement markers.

The State Circle East alignment option would require realignment of the road carriageway on the inside edge of State Circle, into Capital Hill, as described in Section 5.9.

Works would generally involve relocation of utilities; reconstruction of drainage; and reconstruction of the inner verge including retaining walls. Widening of the existing median would be carried out (for the State Circle East alignment option only). Following these works, excavation for light rail stops and trackform; intersection reconfiguration and construction; and trackform and stop construction would be carried out.

6.3.4 Bridges

Construction of new bridges, and modification, removal, or protection of existing bridge structures would include (refer further to Section 5.5):

- Construction of new light rail bridges (four land based structures and one structure over Lake Burley Griffin)
- Construction of four new pedestrian and cyclist bridges
- Removal of the existing Melrose Drive road bridge over Yarralumla Creek between Yamba Drive and Melrose Drive and construction of a new light rail bridge over Yarralumla Creek
- Removal of one existing pedestrian bridge across Yarralumla Creek north of Phillip Oval.

Typical land bridge construction

The land bridges (light rail and pedestrian) are expected to be constructed in the following sequence:

- Ground preparations including installation of ground retaining structures (if required)
- Construction of the bridge substructure including piles, pile caps, and footings
- Construction of the bridge superstructure including bridge piers, abutments, headstocks, bridge beams/ girders, bridge deck, wing walls, and approach slabs
- Installation of the bridge barriers
- Construction of the trackform and rails (for light rail bridges) (refer to Section 6.3.1)
- Installation of the bridge finishings including handrails and lighting.

Light rail bridge over Lake Burley Griffin

Construction of the light rail bridge over Lake Burley Griffin would occur between the existing Commonwealth Avenue road bridges. Lake Burley Griffin is an important landscape feature and is an environmentally sensitive area. As such, the construction methodology adopted would reflect best practice, considering relevant environmental sensitivities and recreational users of the lake and its foreshore areas. Appropriate approvals and licences would be secured prior to commencement of construction. Chapter 21 (Environmental management and mitigation measures) includes commitments to specific and detailed measures to manage hydrology and water quality during construction works within Lake Burley Griffin that would be included in a Surface Water and Groundwater sub-plan(s) for the Project. There will be ongoing consultation with key stakeholders including the NCA in developing the methodology for construction of the light rail bridge over Lake Burley Griffin.

Temporary structures would be required within Lake Burley Griffin to allow access to the bridge construction area. A service jetty would be installed on the southern side of Lake Burley Griffin, to the west of Commonwealth Avenue to service two barges (a boat that transports heavy goods – refer to Figure 6-6 for an example of a barge). Cranes would be secured on the barges to transport materials to and from the barge.

Figure 6-6 Example of a barge with a crane used in bridge construction works (Sundale Bridge Queensland, 2012-2014)

Piling works would use the barges and would include driving or vibrating either pre-cast concrete piles, or steel casings into the rock bed of Lake Burley Griffin. Once installed, the steel casings would be augured and cleaned out, a reinforcing cage would be installed, and concrete would be poured to the required height. Temporary piers may also be required, depending on the selected bridge construction methodology (refer to Table 6-2). The temporary piers would likely be constructed using steel casings to allow removal of the temporary piers once bridge construction is complete.

Cofferdams[1] would be required around each pier to allow safe and dry access to the bridge construction area. An example of a cofferdam structure is shown on Figure 6-7. The cofferdams would be constructed by installing temporary piles, pumping water out, and installing access platforms. Piling works would then be undertaken, involving driving or vibrating steel casings or interlocking sheet piles, as per the methodology outlined above.

[1] Watertight enclosures from which water is pumped to expose the bed of a body of water to permit the construction of a pier. Source: Britannica, 2023 https://www.britannica.com/technology/cofferdam

Figure 6-7 Example of a cofferdam structure (ED Corporation, 2024)

After the piling, coffer dam installations and pier works are completed, the bridge structure would be built, using either the incremental launch method or the balanced cantilever method. The two methods are described and shown in Figure 6-8 and Figure 6-9.

Bridge construction is highly specialised and is likely to be undertaken using one of these two methodologies. Factors to be considered in any decision on a preferred bridge construction method would include construction program and related efficiencies including cast-in-situ or pre-cast concrete construction requirements, construction footprint (including access for recreational lake users) and environmental impact avoidance/ management. The selected construction methodology would be subject to ongoing design development and detailed construction planning in consultation with relevant stakeholders.

Table 6-2 Commonwealth Avenue light rail bridge – potential construction methods

Bridge construction method	Description of method
Incremental launch method (refer to Figure 6-8)	The incremental launch method would involve staged construction of the bridge deck between each abutment, including: • Casting each bridge section on-site • Attaching each bridge section to the 'launching nose' to extend in a southward direction across Lake Burley Griffin • Guiding and attaching to the preceding bridge section across the abutments in a north to south direction across Lake Burley Griffin. An excavation area would be required within the Commonwealth Avenue median to allow space for launching the bridge construction, and for on-site casting of each bridge segment. A temporary retaining structure (e.g. sheet piles) would also be required along both sides of the Commonwealth Avenue median
Balanced cantilever method (refer to Figure 6-9)	The balanced cantilever method would involve progressively joining bridge segments from each pier. This method could be undertaken using the cast-in-situ, or precast concrete options, as described below: • Cast -in-situ: - Progressive casting in-situ of each bridge segment to the opposite side of each pier, balancing the weight of bridge sections until the span between piers joins. The segments would be cast in place using suspended formwork • Precast: - Construction of bridge sections at an off-site precast facility and delivery to site via trucks and barges - Installation of the bridge segments using a crane to lift them into place, working from the piers towards the centre of the span, alternating each side of the pier. The bridge segments would be supported by a bridge deck and pier brackets.

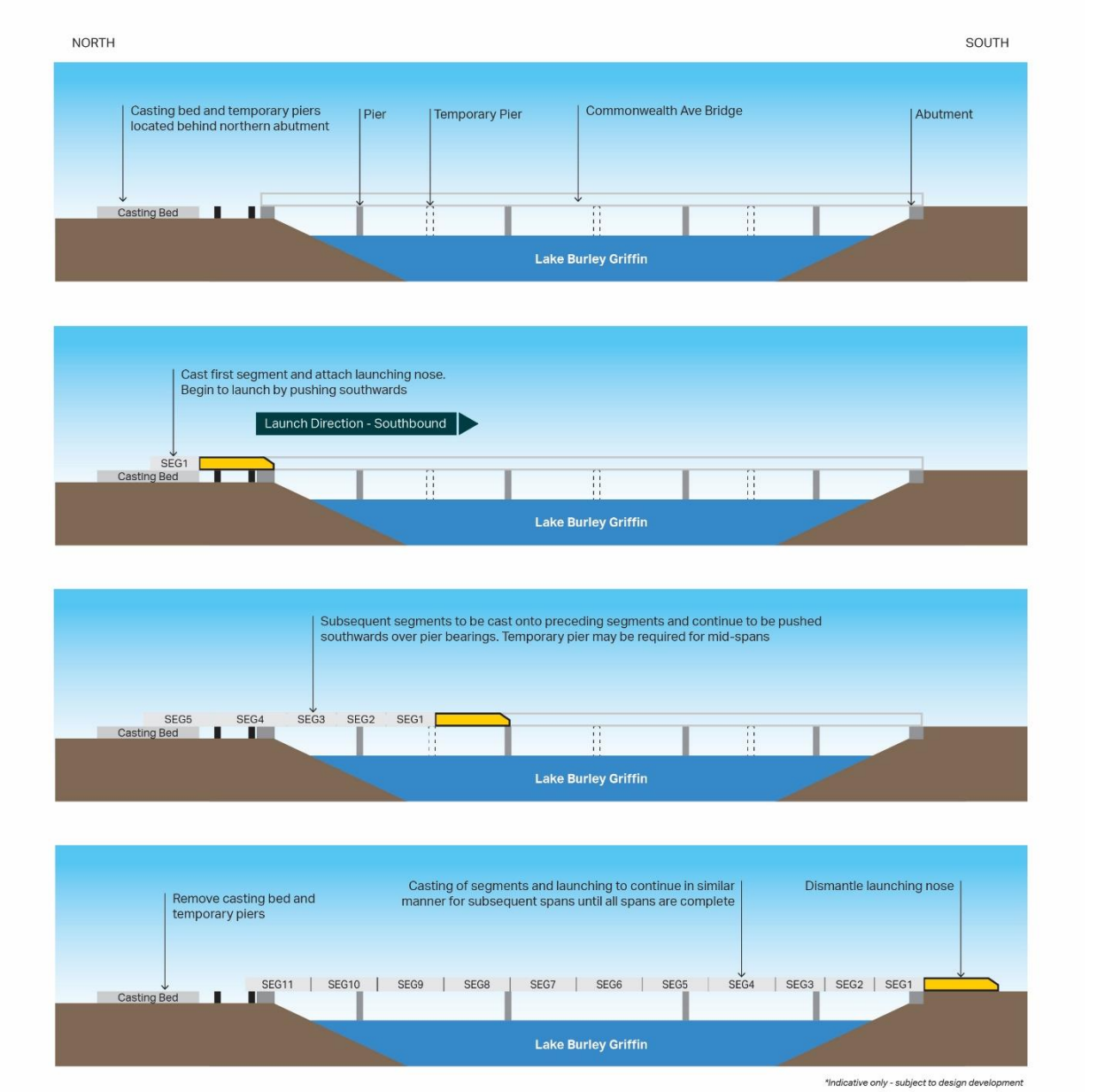


Figure 6-8 Commonwealth Avenue light rail bridge – incremental launch method

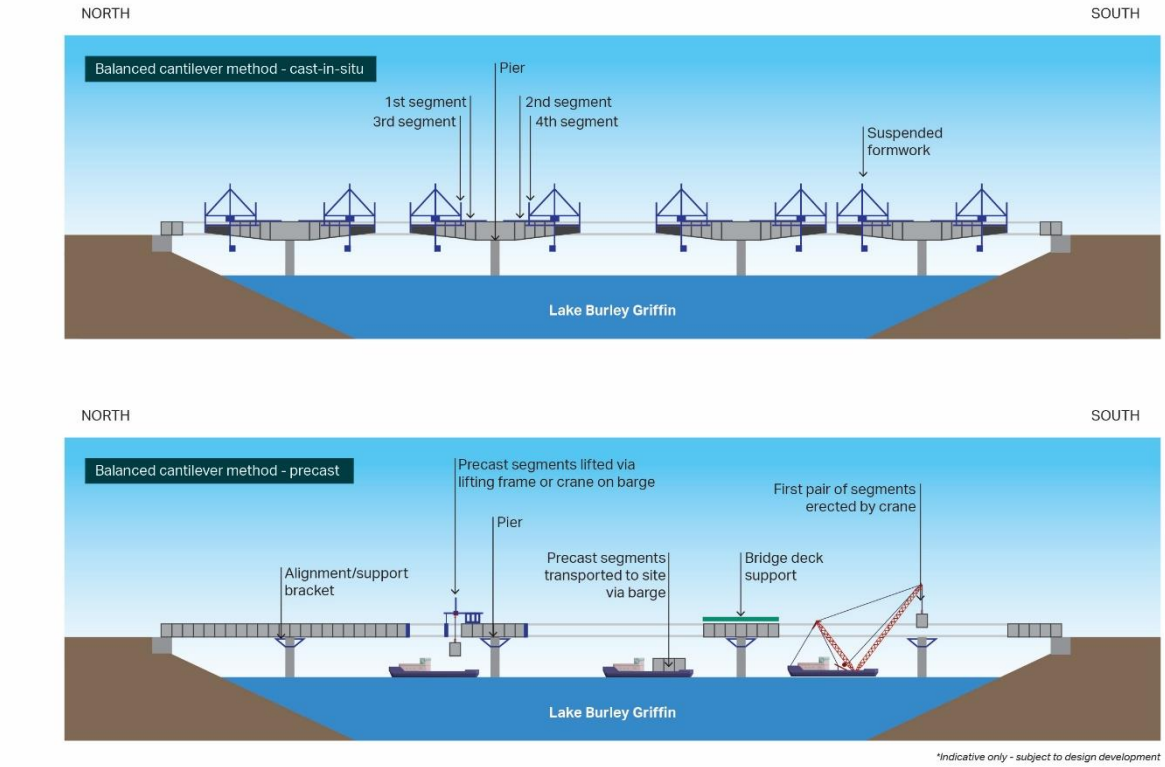


Figure 6-9 Commonwealth Avenue light rail bridge – balanced cantilever method

6.3.5 Covered section between Commonwealth Avenue and State Circle (State Circle East option only)

For the State Circle East alignment option, the light rail alignment would travel along the Commonwealth Avenue median and transition under the southbound carriageway through a covered section towards State Circle. A 'cut and cover' construction method is proposed for construction of this covered section, which could involve one of two construction methods: bottom-up; or top-down. Both methods are described further in Table 6-3 and shown in Figure 6-10 and Figure 6-11. The selection of a construction method would be subject to ongoing design development and detailed construction planning, with consideration given to ground conditions and traffic management.

Table 6-3 Covered section between Commonwealth Avenue and State Circle – proposed construction methods

Construction method type	Description of method
Bottom-up construction method	The following stages would apply in the bottom-up construction method for the covered section: • Construction of soil retaining structure (e.g. piles, walls, and supports) • Excavation works and installation of wall and track • Installation of drainage, combined services route and roof • Installation of fit-out and finishes, backfill, and reinstatement of the road. The bottom-up construction method would be used if ground conditions are found to be less stable during detailed design and construction planning. For this option, reopening State Circle to traffic would only be possible once construction of the covered section is complete.

Construction method type	Description of method
Top-down construction method	The following stages would apply in the top-down construction method for the covered section: • Construction of soil retaining structures (e.g. piles, walls, and supports) • Excavation works (top half) and installation of the roof • Backfill and reinstatement of the road • Excavation works (bottom half) and installation of walls, track, drainage, combined services route, fit-out and finishes. The top-down construction method would be used if ground conditions are found to be more stable during detailed design and construction planning. For this option, reopening State Circle to traffic would be possible once the roof of the covered section is installed and backfilled.

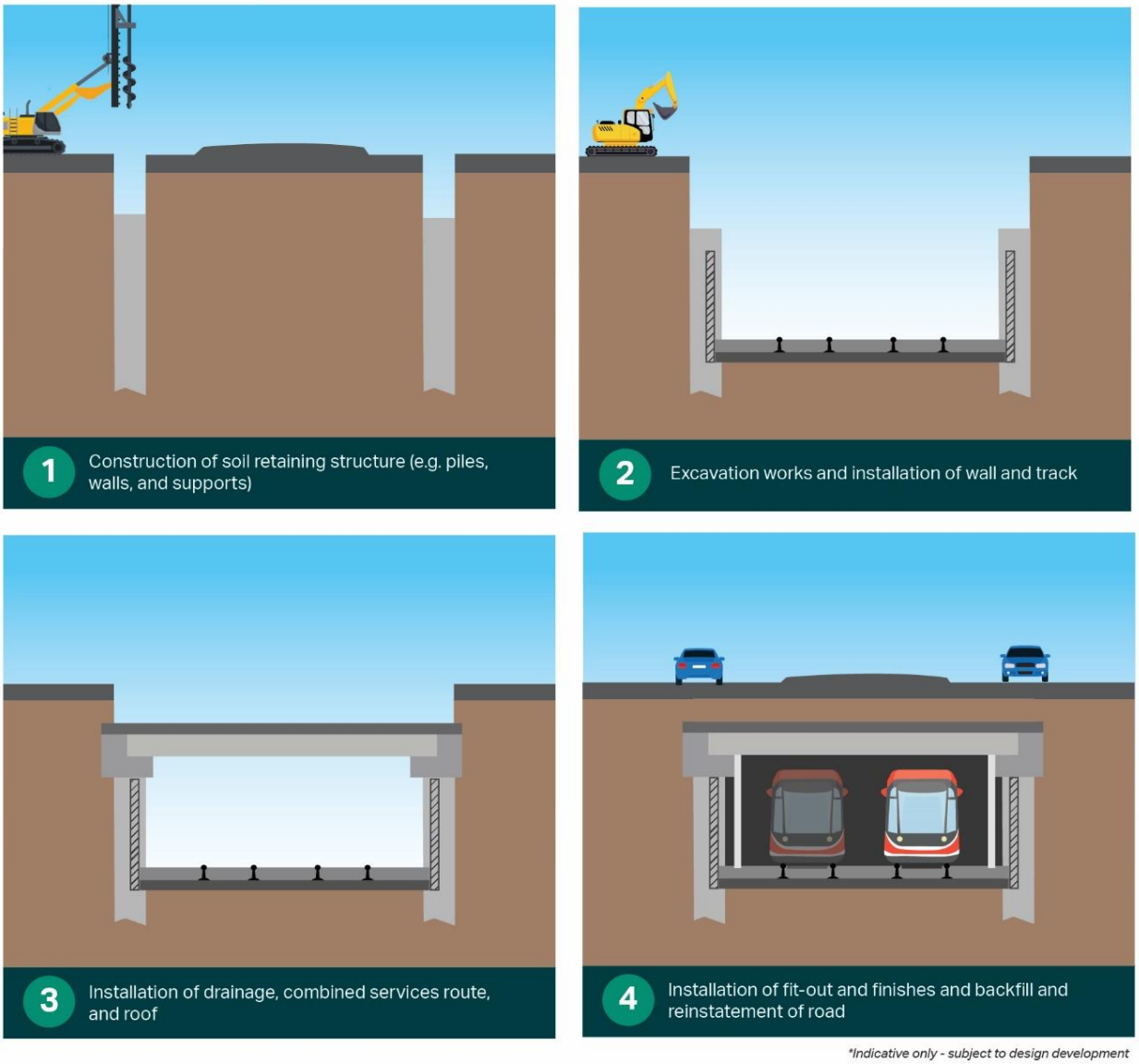


Figure 6-10 Indicative sequence of activities required for bottom-up construction method for covered section

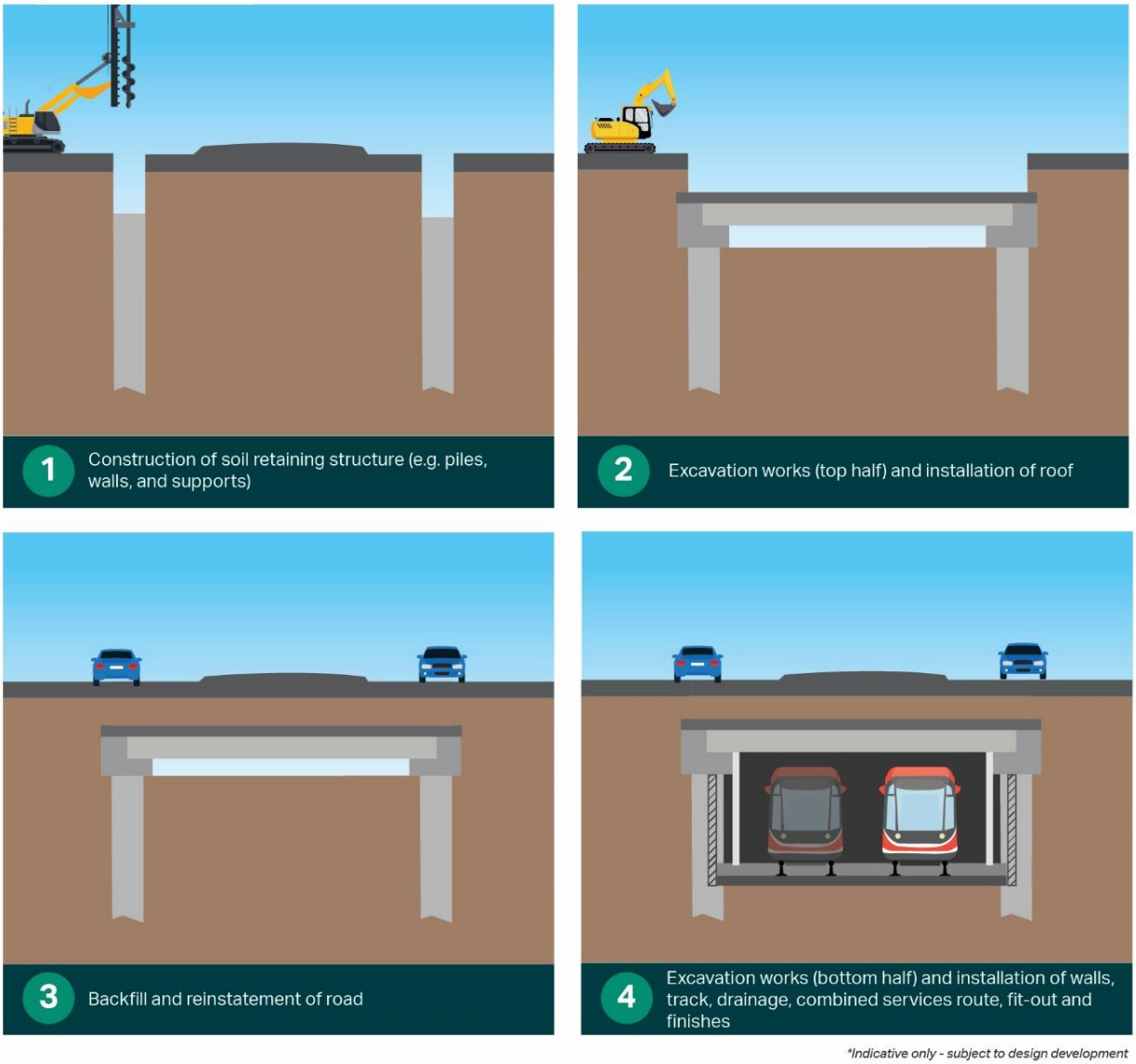


Figure 6-11 Indicative sequence of activities required for top-down construction method for covered section

6.3.6 Stops

Construction of each light rail stop would involve:

- Ground preparations including demolition of existing pavements within the stop footprint
- Excavation and earthworks
- Installation of stormwater drainage
- Construction of the stop platforms including installation of footings and ramps
- Installation of the roof and canopy structure
- Installation of systems equipment
- Installation of lifts, and stairs as required
- Construction of cyclist parking facilities and driver facilities if required
- Installation of stop services and systems including electrical and lighting, communications, closed circuit television (CCTV), and water

- Installation of the stop furniture such as seats, bins, bollards, handrails, signage (e.g. wayfinding signage), and pavement markings.

6.3.7 Active travel links

Where existing active travel (walking, cycling, and micromobility) networks are affected by construction works, the active travel links would be reinstated or reconfigured to integrate into the wider active travel network. For the new pedestrian and cyclist bridge structures to be provided as part of the Project, active travel links would be constructed as part of the bridge deck structure. In other areas, the active travel links would be constructed as part of other Project elements, such as modified roads or areas adjacent to modified roads and stops.

Generally, where excavation for the active travel links is required, it would be completed as part of the overall Project earthworks (refer to Section 6.3.2). This would typically be followed by:

- Installing formwork
- Pouring concrete
- Installing drainage and services (as required)
- Finishing the surface (including painting and line marking)
- Installing wayfinding and customer information signage (as required).

In addition, construction of sections of elevated structures would be required for the shared path to be provided on the eastern side of Yarralumla Creek in Woden (refer further to Section 5.8). Works to construct this shared path would include:

- Ground preparations including installation of ground retaining structures (if required)
- Piling works, including construction of pile caps, and footings
- Construction of the elevated structure including piers and abutments
- Installation of safety barriers
- Installation of finishings including handrails and lighting.

The approach to construction of active travel bridges is detailed in Section 6.3.4.

6.3.8 Other infrastructure

Adjustments to the existing Mitchell Depot

As described in Section 5.10.7, adjustments to the existing Mitchell Depot would be required to meet the Project's operational needs. This would include support for up to an additional 12 light rail vehicles (LRVs) for the Project.

Construction work at the Mitchell Depot would involve:

- Earthworks and constructing soil retaining structures
- Installing new drainage and services including a combined services route, and over-head wiring and poles
- Installing new stabling track, turnouts and buffer stops
- Constructing facilities to support stabling and maintenance activities including storage facilities, a workshop, office space and carpark
- Installing new signage and linemarking
- Installing light rail systems and operational infrastructure.

Traction power substations (TPSs)

Construction of TPSs would involve:

- Installing underground services and pits
- Constructing foundations, footings, and base slabs
- Constructing and/ or delivery and installation of substation structures and electrical equipment, including wiring fit-out
- Installing earthing and lighting systems
- Installing high voltage cables between substations and light rail stops, and to the existing electricity supply network
- Installing the substation units
- Installing access paths and service parking bays as required
- Ground finishing with concrete, pavers, or other materials
- Installing the façade.

Retaining walls

Retaining walls would vary in structure and construction methodology, depending on location. Construction activities are expected to involve:

- Excavating below the existing ground surface to prepare the foundation for the retaining wall
- Installing reinforcing steel and formwork, and concrete pouring (for cast in-situ bases and walls)
- Installing precast segments and retaining straps (for reinforced earth walls)
- Installing subsurface drainage systems, including free draining aggregate and geotextile materials
- Progressive backfilling and compaction
- Installing any surface drainage at the top or bottom of the retaining wall
- Installing retaining wall finishes.

Stormwater drainage

Stormwater drainage systems (including subsoil drainage) would include installation of drainage pipes, gullies and pits, culverts, manholes, and chambers.

Drainage installation would involve one of two construction methods depending on the location. One method would involve micro-tunnelling, a trenchless method that would install the drainage system without excavating the surface. The second method would involve trenching, and would include:

- Excavation
- Placing bedding material
- Installing pipes/ pits
- Backfilling
- Compacting the trenches.

Utilities

Existing utilities within the Project area which may be affected to various degrees by the Project. In consultation with the relevant utility provider, each utility may be subject to:

- Temporary protection during construction
- Permanent protection
- Relocation

- Provision of spare conduits or sleeving.

The Project would also include new utilities, such as electricity supply to LRVs and lighting, as well as light rail systems such as power and communications.

The protection, decommissioning and/ or removal of utilities would be completed early in the Project construction period but may also be staged during the main works depending on construction planning requirements.

6.4 Finishing, testing, and commissioning

6.4.1 Finishing works

Construction related equipment and infrastructure would be removed at the end of construction work in each work area. Finishing works would be completed progressively (as far as practicable) and would generally include:

- Demobilising construction compounds and works areas, removing all equipment, and temporary infrastructure
- Removing materials, waste, and redundant structures from the Project area
- Removing temporary fencing
- Rehabilitating disturbed areas
- Landscaping, including tree replacement
- Erecting signage, and roadside furniture such as street lighting
- Rectifying defects.

6.4.2 Testing and commissioning

Testing and commissioning would involve trial running of light rail infrastructure, including LRV movement, driver familiarisation, and integration of new and existing power, communications and signalling systems.

Testing and commissioning of stops would include lighting, help points, passenger information displays, ticket vending machines and validation scanners, CCTV, public address systems, precise clock, and audio frequency induction loops.

6.5 Construction working hours

Standard construction hours would be Monday to Saturday, 7am to 6pm. Where possible works would be conducted during standard construction hours. However, as the Project would be carried out predominantly within live road corridors, some construction works would be required outside of standard construction hours to:

- Minimise disruptions to traffic
- Minimise disturbance to surrounding landowners and businesses
- Maintain safe and efficient operation of key roads and public transport facilities.

Works that would be required outside of standard construction hours may include:

- Delivery of oversized plant, equipment, and structures that the police or other authorities determine require special arrangements to transport along public roads
- Constructing track infrastructure and undertaking road works at busy intersections or where temporary road closures are required during periods of lower traffic volumes
- Installation of large elements such as bridge beams/girders

- Certain utility adjustments depending on the location and requirements of the utility provider, particularly where disruption to essential services, required system conditions (such as low-flow conditions for sewers), and/ or worker safety considerations do not allow work during standard construction hours
- Road closures and traffic switches during night works, to be reopened the following day.

High noise and vibration intensive works would be limited to standard construction hours as far as practicable. Mitigation measures identified in Chapter 21 (Environmental management and mitigation measures) would be implemented to manage potential noise and vibration impacts during works outside standard construction hours.

6.6 Construction resources and ancillary facilities

6.6.1 Construction compounds and ancillary facilities

Construction compounds would be required to support and service construction activities and would likely be required for the duration of the construction program. Information on the land custodianship and relevant land use policy applying to land affected by construction compounds is included in Appendix H (Consultation). Indicative construction compound locations are shown in Figure 6-1 to Figure 6-4 and summarised in Table 6-4.

Construction compounds would support staff and worker accommodation (such as temporary office buildings and amenities) and storage of plant, equipment, and construction materials. Solid hoarding or temporary fencing would be installed around each of the construction compounds. Following construction works, land occupied by the construction compounds would be rehabilitated.

Table 6-4 Indicative construction compounds

Precinct/site	Compound	Location	Block details
Commonwealth Avenue	A1	Acton Waterfront car park at Corkhill Street (consistent with the compound location used for LRS2A)	Block: 24 Section: 33 Division: Acton
	A2	Acton Waterfront car park at Albert Street (consistent with the compound location used for LRS2A)	Block: 1 Section: 95 Division: Acton
	B	Yarralumla Parkland, Commonwealth Avenue south-west cloverleaf on the southern side of Lake Burley Griffin and adjacent to the existing bridges	Block: 12 Section: 42 Division: Yarralumla
	C	Langton car park opposite Treasury building, Parkes	Block: 1 Section: 25 Division: Parkes
National Triangle	D	21 Queen Victoria Terrace Parking	Block: 3 and 4 Section: 23 Division: Parkes
	E	King George Terrace and Kings Avenue	Block: 1 Section: 22 Division: Parkes
Parliament House	F	Capital Hill West	Between Adelaide Avenue and Capital Circle
Yarra Glen	G	Parkland east of Yarra Glen/Yamba Drive roundabout, Hughes	Block: 5, 6, and 9 Section: 28 Division: Hughes
Woden	H	Easty Street car park in Woden	Block: 30 and 31 Section: 80 Division: Phillip

Precinct/site	Compound	Location	Block details
Mitchell Depot	I1	Sandford Street	Block: 2 Section: 16 Division: Mitchell
	I2	Within the existing Mitchell Depot site	Block: 3 Section: 16 Division: Mitchell

As part of the early and enabling works (refer to Section 6.2), construction compounds would require connections to utilities such as electricity, telecommunications, water and sewer. Construction compounds would include:

- Offices and meeting rooms
- Amenities and ablution blocks
- All-weather protected cribbing areas
- Access ramps, stairs, and outdoor decking areas
- Worker crib sheds
- Parking and storage of plant, equipment, and vehicles
- Storage of construction materials
- Storage of bulk materials and stockpiles
- Storage containers
- Separated waste skips.

In addition to the construction compounds, smaller short term ‘satellite’ ancillary facilities would also be required. These ancillary facilities would include temporary toilet facilities for workers and small stockpiles of materials and/ or equipment. The ancillary facilities would be short term and would be relocated as the works/ crews move to different precincts and construction zones.

6.6.2 Estimated workforce

The construction workforce would fluctuate during the construction period in response to the scale and intensity of construction activities. It is estimated that the peak construction workforce including construction works and support staff would be around 900 to 1,000 people.

It is anticipated that there would be sufficient available workforce to support the Project construction, and workers would be sourced locally where appropriate skill sets are available. This would be confirmed during detailed construction planning.

6.6.3 Plant and equipment

Plant and equipment used during construction would include machinery such as cranes, piling rigs, ballast tampers, excavators, milling/paving machines, semitrailers/dump trucks, compactors, vacuum excavation trucks, and road sweepers. On a smaller scale, construction would require generators, welding equipment, concrete saws, elevated working platforms, bobcats, line marking machines, jackhammers, and personal tools.

Figure 6-12 provides an indicative list of plant and equipment expected to be required during construction. Some plant and equipment that has been identified for the Commonwealth Avenue precinct only is specific to construction activities over Lake Burley Griffin.

Plant and equipment	All precincts and the Mitchell Depot site	All precincts excluding the Mitchell Depot site	Commonwealth Avenue only
Excavator	●		
Ground grader		●	
Asphalt paving machine		●	
Pavement profiler		●	
Compaction roller	●		
Kerbing machine / former	●		
Line marking machine	●		
Concrete crusher	●		
Concrete cutting saw	●		
Concrete pump	●		
Concrete truck	●		
Portable concrete mixer	●		
Concrete vibrator	●		
Fuel truck	●		
Material transportation truck	●		
Waste management truck	●		
Transportation vessel			●
Water truck	●		
Water pump	●		
Tree grinder	●		
Crane truck	●		
Crawler crane			●
Elevated work platform	●		
Bobcat / Possitrack	●		
Power tool	●		
Welding equipment	●		
Air compressor	●		
Generator	●		
LED lighting towers	●		

Figure 6-12 Indicative construction plant and equipment

6.6.4 Construction materials

Raw materials

Materials required during construction would include raw materials such as aggregates and asphalt, concrete, metals (such as steel rails, structural steel, steel reinforcement, over-head wiring, prefabricated steel furniture and signage), diesel, and oils. Other materials required would be confirmed during design development and construction planning.

Further details of the materials expected to be used, including an indicative estimate of required quantities, is provided in Section 11.12.

Water use

The use of water during construction would be required for activities such as:

- Dust suppression
- Road pavement works, including compaction of pavement
- Site office and amenities
- Concrete construction
- Cutting equipment, such as concrete cutters
- Landscaping.

It is expected that the construction of the Project would involve connection to potable water supply sources (subject to agreement with the relevant authority), with the potential to deliver water to the Project area from a licensed source, if required.

Further information on materials and resources to be used are provided in Section 11.12.

6.7 Transport and access

This section provides an overview of the intended transport and access arrangements during the construction phase. The potential impacts of construction on transport, traffic, and access are described in the Traffic and transport sections in Part B (Environmental impact assessment), and the management and mitigation measures that would be implemented to manage these impacts are described in Chapter 21 (Environmental management and mitigation measures).

6.7.1 Heavy vehicle routes

Anticipated heavy vehicle haulage routes during construction are shown in Figure 6-13 to Figure 6-18. Heavy vehicle movements would be generally for deliveries of construction plant and equipment, supplies and infrastructure, and to transport spoil and waste materials.

The scheduling of construction heavy vehicle movements, including the transportation of oversized loads, would occur outside peak AM and PM traffic periods whenever feasible.

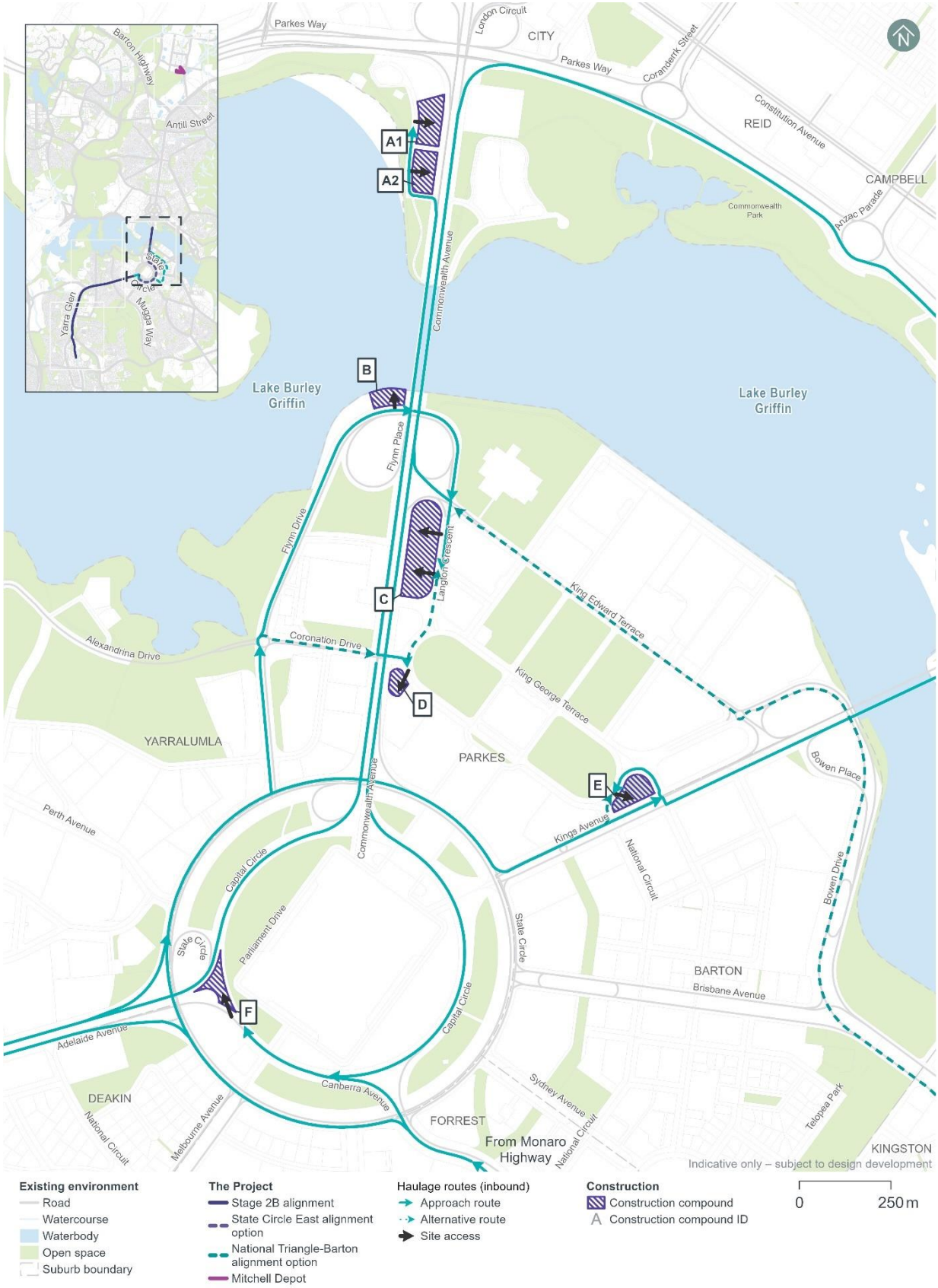


Figure 6-13 Heavy vehicle haulage routes to construction compounds (1/3)

Figure 6-14 Heavy vehicle haulage routes to construction compounds (2/3)

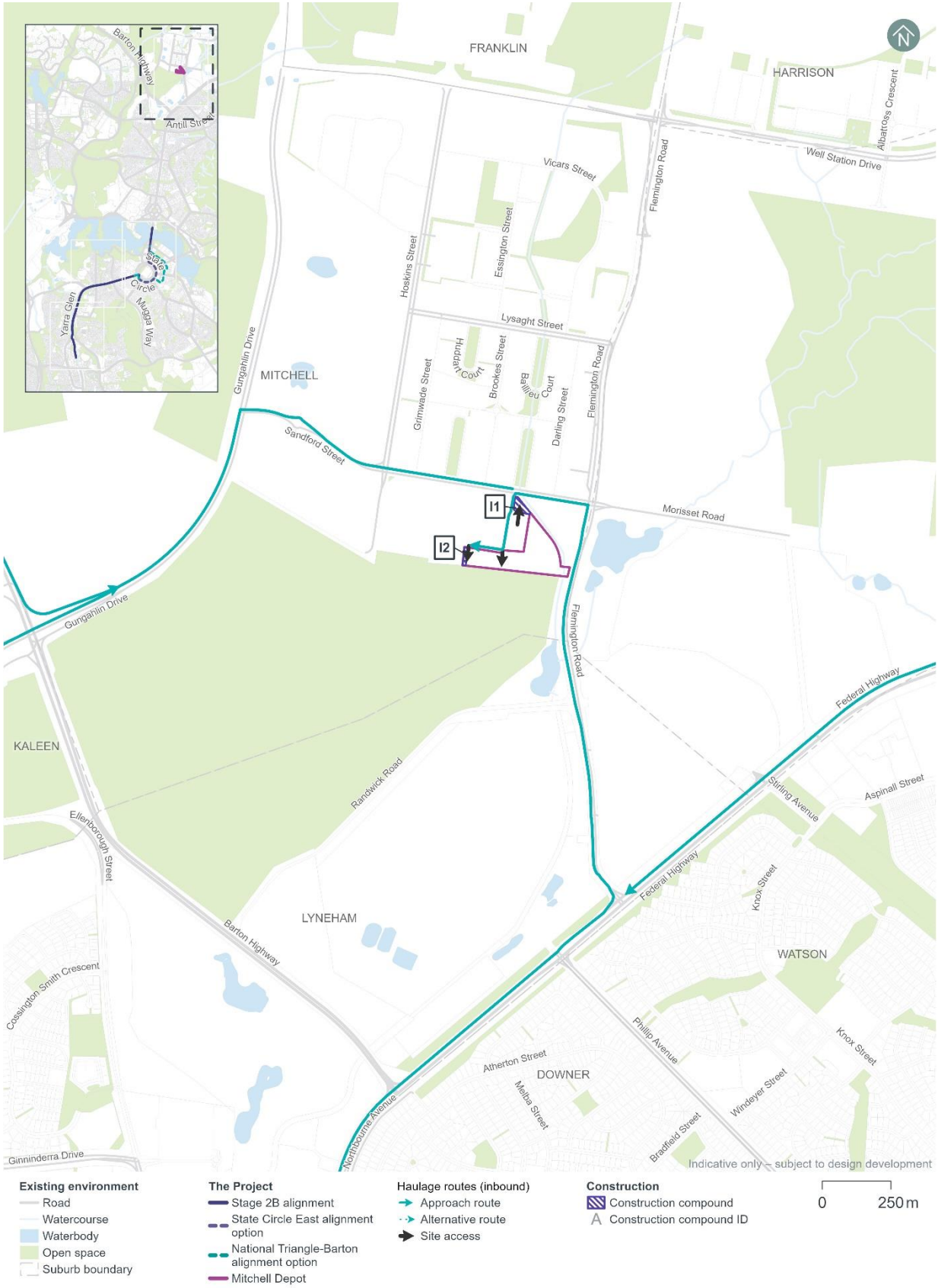


Figure 6-15 Heavy vehicle haulage routes to construction compounds (3/3)

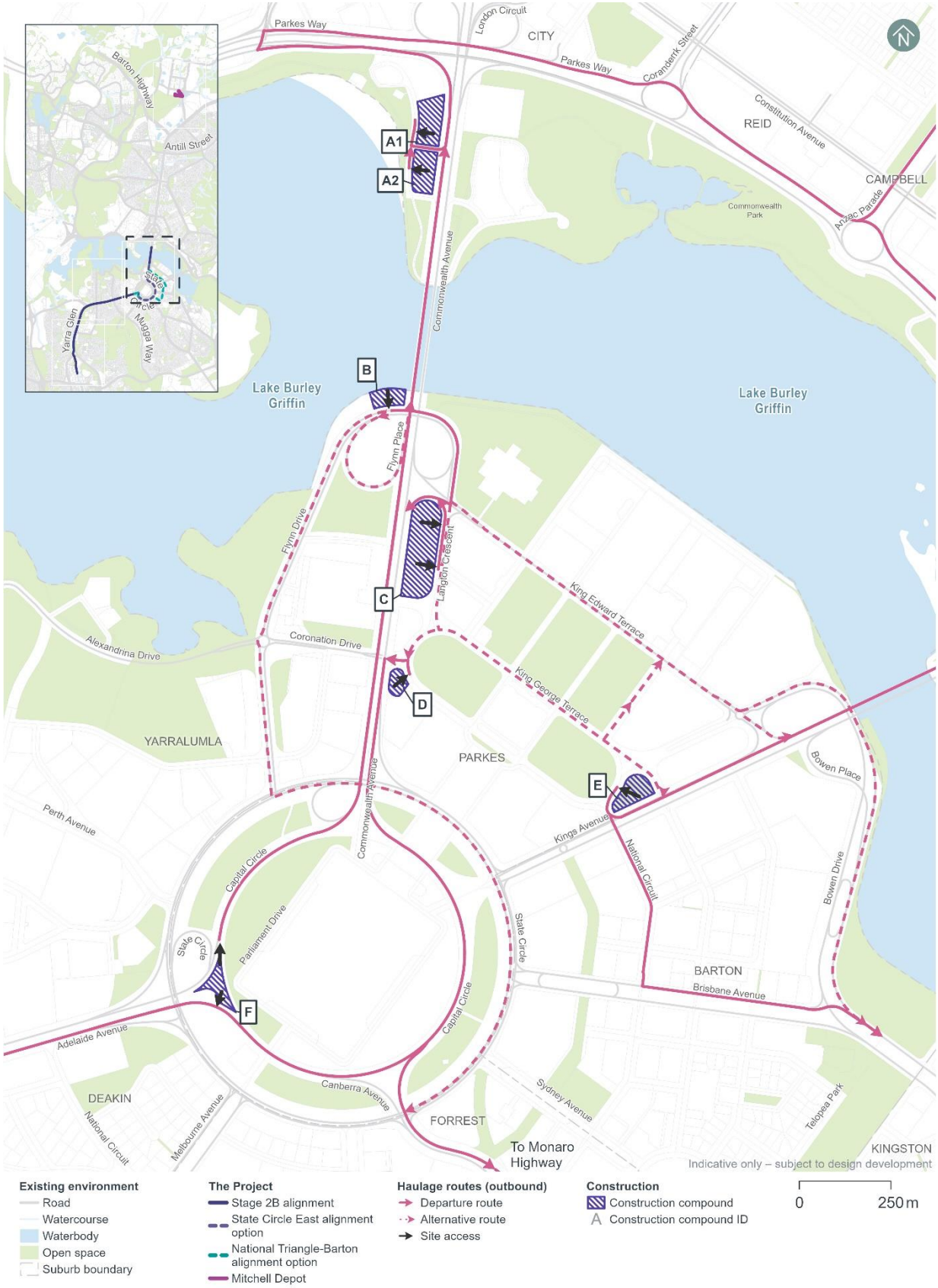


Figure 6-16 Heavy vehicle haulage routes from construction compounds (1/3)

Figure 6-17 Heavy vehicle haulage routes from construction compounds (2/3)

Figure 6-18 Heavy vehicle haulage routes from construction compounds (3/3)

6.7.2 Construction traffic volumes

Estimated construction traffic volumes are summarised in Table 6-5 and Table 6-6 for day shifts and night shifts, respectively.

Table 6-5 Estimated construction traffic volumes – day shifts

	Heavy vehicle movements		Light vehicle movements (construction activities)		Light vehicle movements (workforce)		Total vehicle movements	
Precinct/site	Day shift[1]	Peak[2]	Day shift[1]	Peak[2]	Day shift[1]	Peak[2]	Day shift[1]	Peak[2]
Commonwealth Avenue	25	5	30	5	235	0	290	9
Parliament House	135	25	20	5	145	0	295	25
National Triangle	25	5	20	5	170	0	215	10
Barton	15	5	20	5	125	0	160	5
Inner South	65	15	20	5	330	0	410	15
Yarra Glen	70	15	20	5	130	0	215	15
Woden	30	5	20	5	150	0	195	10
Mitchell Depot	20	5	10	5	160	0	190	5

Notes:

1. Daily vehicle movements represent maximum inbound and outbound movements across the day shift for the peak construction period. Movement refers to a one-way movement. A vehicle entering and then leaving a construction compound represents two movements.
2. Peak vehicle movements represent the maximum number of vehicle movements during the morning and afternoon road network peak periods (8:00 am to 9:00 am and 5:00 pm to 6:00 pm) for the peak construction period.

Table 6-6 Estimated construction traffic volumes – night shifts

	Heavy vehicle movements		Light vehicle movements (construction activities)		Light vehicle movements (workforce)		Total vehicle movements	
Precinct/site	Night shift[1]	Hourly[2]	Night shift[1]	Hourly[2]	Night shift[1]	Hourly[2]	Night shift[1]	Hourly[2]
Commonwealth Avenue	15	5	15	5	105	30	130	30
Parliament House	60	10	10	5	65	20	135	30
National Triangle	15	5	10	5	80	20	95	25
Barton	10	5	10	5	60	15	70	20
Inner South	30	5	10	5	150	40	185	45
Yarra Glen	35	5	10	5	60	15	100	25
Woden	15	5	10	5	70	20	90	20
Mitchell Depot	10	5	5	5	75	20	85	20

Notes:

1. Daily vehicle movements represent maximum inbound and outbound movements across the night shift for the peak construction period. Movement refers to a one-way movement. A vehicle entering and then leaving a construction compound represents two movements.
2. Represents the maximum number of vehicle movements per hour for the night peak periods (6:00 pm to 7:00 am) for the peak construction period.

6.7.3 Construction workforce parking

Construction workforce parking would involve:

- For most construction compounds and construction sites, parking requirements would be satisfied with a combination of parking spaces within construction compounds as well as public parking
- At construction compounds A1 and A2, workforce parking within the construction compounds would not be available and staff would instead utilise public parking
- At the Mitchell Depot site, most parking would be provided within the site where feasible.

Construction workers would be encouraged to use public transport to access the Project during construction. Consideration would be given to providing shuttle services to transport construction workers. If shuttle services are not provided as part of the Project, parking restrictions around work areas would be considered to reduce the impact on public parking facilities.

6.7.4 Temporary changes to transport networks and facilities

Transport network

The construction of the Project would apply traffic management measures to maintain the operational capacity of nearby roads and ensure the safety of the public, motorists, and construction workers. Some modifications to the road network would be necessary during construction, such as:

- Installation of temporary traffic signals to allow for the safe movement of construction traffic
- Temporary road, access, or lane closures (for example, closure of one lane in each direction on the existing Commonwealth Avenue road bridges to support construction of a new light rail bridge over Lake Burley Griffin)
- Temporary intersection adjustments or closures.

For the State Circle East alignment option, one lane in each direction of travel would remain open to traffic during construction. For the National Triangle-Barton alignment option, progressive road closures along sections of the alignment would be required due to road width restrictions within the National Triangle and Barton precincts. Local traffic access would be maintained.

Temporary road closures would be limited to the duration of works requiring the closure. Alternative access arrangements and detour routes would be provided, including to private properties and businesses. Further information in relation to construction traffic and transport is provided in Technical Report 1 – Traffic and transport.

Parking

In certain areas, on-street and off-street parking may be removed to allow enough space for construction activities, to ensure ongoing access along the road network, and to facilitate use of construction compounds (refer to Section 6.6.1). The temporary loss of parking could vary in duration, lasting from less than a day to more extended periods (e.g. up to the construction phase duration), depending on the necessary works in individual areas.

Potential temporary and permanent on-street and off-street parking impacts are detailed further in Technical Report 1 – Traffic and transport.

Public transport

Bus stop relocations would not be required for the State Circle East alignment option as no full road closures would be required.

For the National Triangle-Barton alignment option, several bus stops would require relocation due to full road closures during construction. Bus services would need to be rerouted through the National Triangle and Barton precincts, including routes R2, R6, 56, 59, and 182.

Affected services would be diverted and bus stops would be relocated along their existing routes during construction, where practical. Rerouting of bus services would be required where bus stops are not able to be relocated along the existing routes. The details of any changes to bus stops and/ or routes would

be determined in consultation with relevant stakeholders, including Transport Canberra City Services (TCCS).

There would also be temporary impacts to the Commonwealth Park Stop when connecting the Project to the stop. Works would be scheduled to minimise disruption to light rail services.

Further information on potential impacts to public transport is provided in Section 11.1.

Pedestrian and cyclist facilities

Modifications to the road network and access limitations in work zones would affect pedestrian walkways and cycling paths. Alternative access arrangements (such as detours) would be provided.

All pedestrian and cycle facility adjustments would be consistent with *AS 1428 DDA and Disability Standards Accessible Public Transport.*

6.7.5 Changes to maritime infrastructure and navigation

Construction works associated with the light rail bridge between the Commonwealth Avenue road bridges over Lake Burley Griffin would require access to boat ramps and jetties. The public thoroughfare/ open navigation channel beneath the bridges would also be affected (moved locations for public access under the bridge depending on where construction barges are positioned) however access would be maintained throughout the construction period. These activities would likely result in temporary restrictions to public access in these areas for safety reasons, with access maintained as far as practicable.

These restrictions would be temporary, and access reinstated once the relevant construction activities are completed.

6.7.6 Special events

Known special events that would fall within the construction schedule (for example Floriade and Skyfire) would be managed and suitable measures implemented to manage and mitigate the anticipated impacts of construction. This may include temporary pauses in construction, traffic management and contingency plans. The traffic management necessities for special events may involve modifications to the construction schedule and routes utilised by heavy vehicles.

7.0 Sustainability

7.1 Introduction

Sustainability, defined as “meeting the needs of the present without compromising the ability of future generations to meet their own needs,” (Brundtland Commission, 1987) is a crucial consideration when designing, building, and operating public infrastructure. The Project embodies this principle by aiming to deliver long-term benefits while minimising its environmental footprint.

Investing in a light rail system in Canberra is a significant infrastructure commitment. Therefore, it is crucial to ensure the Project is executed sustainably to contribute positively to environmental, social, and governance outcomes. By integrating sustainable practices, the Project would not only enhance the city's public transport system but also deliver sustainability benefits associated with the circular economy, energy and carbon reduction, resilience and climate change adaptation, environmental discharge management, First Nations engagement, urban design and social improvement, land use, and water management.

The need to consider sustainability in the Project is underscored by the applicable legislative and policy context. Firstly, the Project must adhere to the principles of ecologically sustainable development (ESD) as outlined in both Commonwealth and Territory legislation. These principles guide the planning, design, and implementation processes, ensuring that environmental impacts are avoided and minimised, and resources are used efficiently. Furthermore, the ACT has established additional policies and guidelines that emphasise a sustainable strategic direction for the Territory. These policies advocate for developments that support ecological health, reduce carbon emissions, and foster social well-being.

By aligning with these legislative requirements and strategic guidelines, the Project can serve as a model for sustainable infrastructure. This chapter outlines how sustainability has and would be managed on the Project, in alignment with these requirements.

7.1.1 Overview

This chapter describes how sustainability principles have been applied to the Project, including:

- Legislation, policies, and guidelines relevant to sustainably managing the Project
- The sustainability governance framework developed to achieve the Project’s sustainability targets
- How the sustainability governance framework has been implemented on the Project to date
- How the principles of ecologically sustainable development (ESD) have been applied to the Project, including:
  - The ESD principles as defined by Section 3A of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cth)
  - The ESD principles as defined by Section 9 of the *Planning Act 2023* (Planning Act) (ACT)
- Sustainability mitigation measures.

7.2 Key legislation, policies, and guidelines

The sustainability approach for the Project has been guided by Commonwealth and ACT Government legislation, policies, and guidelines, which each set sustainability principles, visions, and targets. Although not all of these commitments are directly relevant to the Project, the Project has actively sought to support the sustainability vision for the ACT wherever possible. This is expanded on in Section 7.4.1.

Key legislation, policies, and guidelines that have underpinned the development of sustainability targets and supporting initiatives for the Project include the policy documents summarised in Table 7-1 (refer to Section 7.4.2 for more detail on these sustainability targets). Additional legislation, policies and guidelines relevant to the Project are discussed in Chapter 8 (Legislation and policy) and Chapter 2 (Need for the Project).

In addition to these key legislation, policies, and guidelines, the Project has also specifically addressed each of the principles of ESD (refer to Section 7.5).

Table 7-1 Key sustainability related legislation, policies, and guidelines and their relevance to the Project

Sustainability policy documents	Relevance to the Project's sustainability approach
Climate Change and Greenhouse Gas Reduction Act 2010 (ACT) (ESDD, 2010)	The ACT Government established an ambitious greenhouse gas reduction target through the *Climate Change and Greenhouse Gas Reduction Act 2010* of zero net emissions by 30 June 2060. The Project would contribute to achieving this target by providing a transport alternative with lower greenhouse intensity than road vehicle use. The Project's contributions to greenhouse gas emissions are considered further in Section 11.11 of Chapter 11 (Project-wide issues).
ACT Planning Strategy 2018 (EPSDD, 2018)	The ACT Planning Strategy 2018 and its relevance to the Project are discussed in Section 2.2 of Chapter 2 (Need for the Project). Specific commitments relevant to the Project's sustainability approach include: • Implementing best-practice water sensitive urban design principles, including the new Water Sensitive Urban Design Code and ACT Practice Guidelines • Delivering well-designed, safe, and sustainable streets and public spaces to create walkable neighbourhoods that are inclusive and equitable • Reducing vulnerability to natural hazard events and adapting to climate change • Continuing to reduce grid electricity demand through increased efficiency and deploying small-scale solar with batteries to maintain the target of achieving 100% renewable energy.
The National Capital Plan 1990 (NCP) (NCA, 1990) and the *Territory Plan 2023* (ACT) (Territory Plan) (ACT Government, 2023a)	The NCP and Territory Plan, and their applicability to the Project are discussed in Section 8.2 of Chapter 8 (Legislation and policy). Specific commitments relevant to the Project's sustainability approach include: • Providing accessible movement systems for pedestrians, cyclists, public transport, and private transport modes, ensuring good connections between different modes of transport • Ensuring at least 40% of the Project area is soft planting, covered by trees, grass, and shrubs, excluding buildings and impermeable surfaces. Retaining mature trees where possible and compensating for tree removal by re-planting and landscaping.
ACT Circular Economy Strategy, 2023 (TCCS, 2023c)	The ACT Circular Economy Strategy 2023 focuses on creating a circular economy by addressing infrastructure lifecycles from design to maintenance. Key focus areas include procurement and the built environment and the waste hierarchy: reduce, reuse, recycle, and recover. The Project design has been developed with circular economy principles in mind, and has applied the waste hierarchy through design, construction planning and early materials selection for the Project.

Sustainability policy documents	Relevance to the Project's sustainability approach
ACT Climate Change Strategy 2019-2025 (EPSDD, 2019b)	Specific commitments relevant to the Project include: • Integrating climate change projections and risk vulnerabilities in disaster and emergency management, focusing on extreme heat, bushfire, and flash flooding • Implementing Canberra's Living Infrastructure Plan to achieve 30% urban canopy cover and surface permeability, value living infrastructure, and manage heat • Collaborating with Traditional Custodians and the Aboriginal and Torres Strait Islander community to integrate traditional knowledge into landscape management • Developing a plan to achieve zero emissions from gas use by 2045, with timelines for phasing out gas connections • Implementing the Zero Emissions Vehicles Action Plan 2018–21, investing in public charging infrastructure, and supporting zero emissions vehicle adoption from 2021 onwards.
City Renewal Authority Sustainability Strategy 2021-2025 (City Renewal Authority, 2021)	Specific commitments relevant to the Project include: • Ensuring places are accessible for all, achieving an age-friendly and child-friendly city • Exceeding targets to filter the majority of pollutants from stormwater, including suspended solids and gross pollutants • Establishing priority cycle and pedestrian routes with a goal of achieving 50% tree canopy shade.
Canberra's Living Infrastructure Plan: Cooling the City 2019 (EPSDD, 2019c)	Canberra's Living Infrastructure Plan: Cooling the City 2019 outlines actions by the ACT Government to design, construct, and manage Canberra City to promote a climate-wise, prosperous, and healthy environment integrating nature into the built environment. A key goal is to achieve 30% tree canopy cover and permeable surfaces in Canberra's urban footprint by 2045.
Biodiversity Sensitive Urban Design (BSUD) Guide (EPSDD, 2023f)	Specific commitments relevant to the Project include: • Ensuring development aligns with Territory Plan assessment outcomes, particularly guided by the BSUD Guide • Avoiding or minimising loss of native habitat and biodiversity • Maintaining biodiversity connectivity across the landscape • Minimising threats to biodiversity such as noise, light pollution, invasive species, chemical pollution, or site disturbance through effective design and planning.
Water Sensitive Urban Design (WSUD) (EPSDD, 2017)	Specific commitments relevant to the Project include: • Directing runoff from hard surfaces directed to small wetlands and bio-retention basins to help filter water • Use of permeable surfaces to reduce the urban runoff generated from the Project • Consideration of plant species which are climate resistant and drought tolerant.

Sustainability policy documents	Relevance to the Project's sustainability approach
Gender Sensitive Urban Design (GSUD) Framework (TCCS, 2023b)	Specific commitments relevant to the Project include: • Lighting associated with stops • Stop access including multiple points of access and good integration within their environs, including, where possible, catchment footpath upgrades • Passenger information displays supporting easy navigation, and effective communications with passengers regardless of available personal technology • Targeted consultation to inform the design approach, further supported by a women's safety audit.

7.2.1 Light Rail Sustainability Policy and vision

Within the broader policy context, the Project has its own guiding policy tailored specifically to its scope. The Light Rail Sustainability Policy (MPC, 2021) articulates the Project's sustainability vision: to *"deliver the inherent sustainability benefits of light rail and seek opportunities to enhance the social, economic and environmental outcomes for the community, through all stages of the Project lifecycle"*.

The Light Rail Sustainability Policy identifies specific themes through which the Project can work towards its vision and deliver sustainable outcomes. These themes include energy and carbon, resilience and climate change adaptation, social impacts, urban design, materials and waste management, environmental discharge, land use and biodiversity, water, and heritage.

The following sections outline the governance and implementation of the Project's sustainability vision.

7.3 Sustainability governance

Informed by the legislative context described in Section 7.2, Canberra's Light Rail network has a legacy of exemplary sustainability performance, and the Project aims to meet or exceed this standard. 'Leading' Infrastructure Sustainability (IS) Ratings were achieved for Light Rail Stage 1 Gungahlin to City (LRS1) and the Raising London Circuit (RLC) project Design Rating, which is the highest category awarded by the IS Council.

Achieving sustainability goals in infrastructure projects relies heavily on proactive planning from the outset. This entails having a clear vision and defining sustainability targets early to guide the planning, design, development, and delivery of the infrastructure.

The sustainability governance framework establishes how the sustainability policy for the Project would be implemented. The vision and policy reflect and align with Commonwealth and ACT Government strategic sustainability policies (refer to Section 7.2).

Several sustainability governance options have been considered to manage sustainability for the current phase of the Project. To meet the requirements of the ACT Government's Climate Change Action Strategy (EPSDD, 2019b) Action 5.6, the Project must "seek or be consistent with an Infrastructure Sustainability (IS) Rating from the Infrastructure Sustainability Council (ISC), or equivalent".

The viable systems of sustainability governance (including IS Ratings or equivalent systems) for potential application to the Project have been identified to be:

- IS Rating (ISC)
  - Detailed Planning Rating
  - Design or As-Built Rating
- Greenroads (Sustainable Transport Council)
- Environmental, Social and Governance (ESG) integration approach

- Targets mapped to UN Sustainable Development Goals (SDGs) and ACT Government policy commitments.

The factors considered in assessing which of these would be the best sustainability governance system for the Project are:

- Governance – how the system follows the intent of the Climate Change Action Strategy
- Commercial – including consideration of potential contract delivery models
- Economic – taking into account value for money, including the cost of the rating
- Reputational – noting the Project is intended to set the standard for sustainability in the ACT and continue the 'Leading' sustainability outcomes achieved on preceding Light Rail projects
- Practical – logistical considerations such as the location of the rating agency, working across different time zones, and the time taken to become familiar with a new rating system.

Based on these metrics, the preferred sustainability governance option for the initial stages of the Project has been identified as the ESG integration approach including development of specific sustainability targets. The benefits of this approach include:

- It aligns with specific sustainability goals and policies of the Project and the ACT (as these could form the basis for Project targets)
- Value for money due to reduced costs compared with undertaking a formal rating and similar sustainability outcomes possible at this stage of the Project
- Reduced risk of duplication of work for future design and construction procurement options.

While the ESG integration system of governance has been deemed the most suitable for the initial phase of the Project—covering planning, approvals, and preliminary design—the governance framework's appropriateness would be reassessed as the Project advances through detailed design, construction, and operation stages. This would ensure that the Project remains well-managed and successful through its lifecycle.

7.3.1 ESG integration framework

ESG integration employs a systematic approach for embedding sustainability considerations into Project delivery. Based on the ISO14001 environmental management system standard, this approach entails a cyclical approach to planning, execution, assessment, and continuous improvement to foster exceptional sustainability outcomes. These stages are summarised in Figure 7-1.

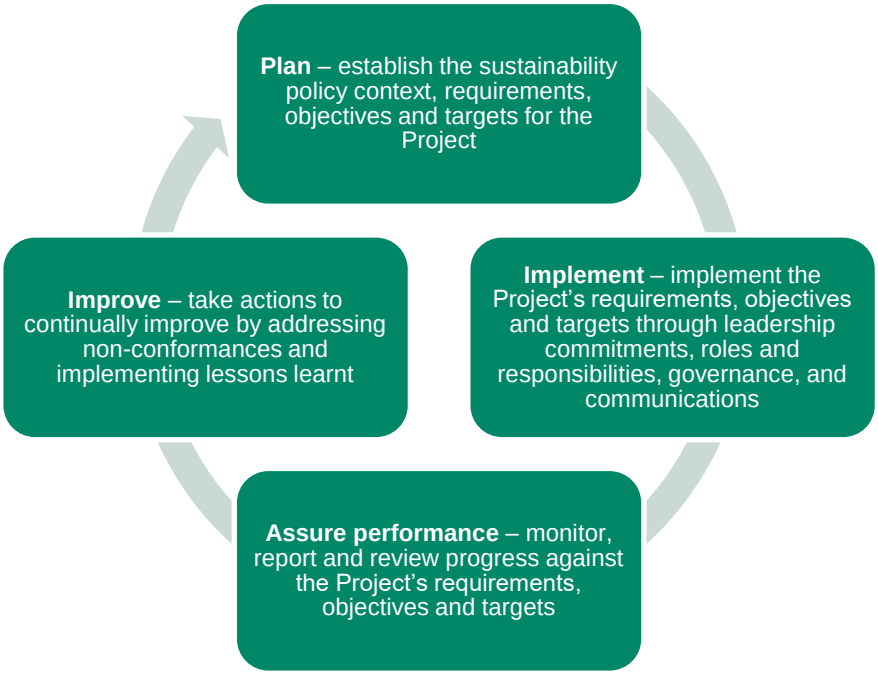


Figure 7-1 The four stages of an ESG-integration approach to sustainability based on ISO14001

7.4 Implementation of sustainability

7.4.1 Determining sustainability priorities

Research has been undertaken to review sustainability best practice globally and nationally, to understand the sustainability policy landscape for the ACT, and to consolidate lessons learned on how to effectively implement sustainability from the delivery of previous stages of the Light Rail network.

From this background research, sustainability themes have been developed for the Project to guide the focus and development of sustainability targets and outcomes, and to work towards the strategic direction for the ACT. These themes cover a range of areas, from circular economy, to using recycled materials, and reducing water consumption.

Four themes have been selected to be Project priorities. The themes have been prioritised taking into account ongoing Project design development, to ensure the feasibility of design and future delivery. The Project community reference group has also provided feedback on which of the themes are perceived to be priority areas by the community, and this has been considered in the prioritisation.

The sustainability priorities for the Project have been determined to be:

Circular Economy
Using sustainable and recycled materials and design to promote a circular economy

Energy and Carbon
Reducing greenhouse gas emissions and increasing energy efficiency

Urban Design and Social
Creating liveable, resilient, and accessible spaces for all

Land Use and Biodiversity
Facilitating urban biodiversity habitat and connectivity

While these priority areas provide a focus for sustainability efforts on the Project, all themes have been considered in the development of the targets and initiatives discussed below.

7.4.2 Sustainability targets and initiatives

In accordance with the ESG integration approach, baseline sustainability targets have been identified for the Project to evaluate its sustainability performance for this early stage of its development. The targets align to sustainability themes and aim to measure and influence strategic decisions to create a lasting sustainability legacy. The targets have been informed by the legislation, policies, and guidelines outlined in Section 7.2. Examples of targets are provided in Table 7-2.

Design strategies to help meet these sustainability targets would continue to be refined during design development. These voluntary targets have been designed to align with the ACT's sustainability objectives and offer added value beyond regulatory compliance.

The example targets listed below are specific to the current phase of the Project. During subsequent Project stages (such as detailed design, procurement and construction), the targets would be reviewed to ensure they remain appropriate to the Project stage and current sustainability innovations.

Table 7-2 Example targets and related sustainability policies and themes

Example target	Theme	Relevant policies
Participate in knowledge sharing events to share Project insights into circular economy knowledge.	Circular economy	ACT Circular Economy Strategy, 2023-2030
Reduce materials use and minimise embodied carbon and lifecycle environmental impacts through implementing the circular economy hierarchy (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle) in design and selection of materials.		Light Rail Sustainability Policy (2021)
Facilities built (including depot and driver facilities) would be gas free.	Energy and carbon	ACT Climate Change Strategy 2019-2025
Targets for carbon emissions (either a carbon budget or a percentage reduction from a base case) would be set for construction and operation at a future stage of design.		ACT Climate Change Strategy 2019-2025
Target zero pollution incidents and identify and implement initiatives to mitigate environmental discharges (including light, noise, vibration, water and airborne emissions).	Environmental discharge	Light Rail Sustainability Policy (2021)
As part of Designing with Country, engage an Indigenous owned and led organisation to engage First Nations communities and develop design principles. These design principles would be included in the Public Domain Master Plan (Appendix I), and would support future design initiatives	First Nations	ACT Climate Change Strategy 2019-2025
Identify opportunities for the operational corridor to be comprised of green areas where practical and feasible.	Land use and biodiversity	National Capital Plan
Identify opportunities to improve canopy cover within the operational corridor, prioritising canopy cover where people spend time (e.g. paths and waiting areas)		ACT Climate Change Strategy 2019-2025

Example target	Theme	Relevant policies
Conduct a climate change risk assessment (refer to Technical Report 7 – Climate change risk) which proposes adaptation measures to respond to impacts from relevant climate hazards (such as extreme heat, bushfire and flooding).	Resilience and climate change adaptation	ACT Planning Strategy 2018
Adopt adaptation measures to mitigate high and very high climate change risks.		ACT Climate Change Strategy 2019-2025
Conduct a Gender Sensitive Urban Design (GSUD) audit, to consider safety of vulnerable demographics in design, and implement measures into the Project design.	Social and urban design	ACT Planning Strategy 2018
Review the Design with Dignity guidelines for opportunities to include accessibility initiatives in the Project design where possible.		Sustainability Strategy 2021-2025
Implement the Water Sensitive Urban Design Code and ACT Practice Guidelines for Water Sensitive Design in the Project design.	Water	ACT Planning Strategy 2018

7.4.3 Initiatives

The targets described above are a measurable aspiration of what the Project aims to achieve, while initiatives are the tangible processes which enable their achievement. For instance, to achieve a target of gas free facilities, initiatives such as installing electrical equivalent equipment or infrastructure would be considered during Project design development.

Multi-disciplinary “blue sky” workshops have been conducted for the Project and have been used to inspire incorporation of sustainability in Project planning and design. Prompted by the sustainability themes identified in the research phase (refer to Section 7.3.1), the workshops have been used to encourage brainstorming of ideas on what sustainability initiatives could be possible on the Project. Workshop outcomes have been used to establish a sustainability initiatives register for the Project, with implementation of sustainability initiatives tracked as Project design progresses.

Not all identified sustainability initiatives may be implemented due to the multiple constraints that must be considered during the design, construction and operational phases of the Project. However, these initiatives would be considered carefully during design and their feasibility tracked, so that the achievement of goals can be measured.

7.5 Ecologically sustainable development

In addition to the systems of governance and sustainability implementation on the Project described above, the Project has also considered and responded to the principles of ESD at both a Commonwealth and Territory level.

ESD definitions and principles are provided in relevant statutory planning documents, including in Section 3A of the EPBC Act, and Section 9 of the Planning Act. Table 7-3 provides definitions of the ESD principles as defined under each Act and describes their applicability to the Project. ESD principles have been embedded in the Project design development process, consistent with the ESG-integration approach (refer to Section 7.4.2). These principles have been considered in the impact assessments presented in this EIS and used to guide the development of Project mitigation measures (refer to Chapter 21 (Environmental management and mitigation measures)).

Table 7-3 ESD principles, descriptions and applicability

Principle	Planning Act description	EPBC Act description	Applicability
Protection and enhancement of ecological processes and natural systems at local, territory and broader landscape levels	*(a) conserving, enhancing or restoring the life-supporting capacities of air, ecosystems, soil and water for present and future generations* *(b) conserving biological diversity and ecological integrity* *(c) appropriately valuing and pricing environmental resources.*	*(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making*	The EIS outlines where biological diversity and ecological integrity may be impacted by the Project (refer to Section 11.2 (Biodiversity)), and details measures for management and mitigation, including habitat rehabilitation and offsetting. Additionally, the Project design development has considered the BSUD Guide (EPSDD, 2023f), to help ensure there is a focus on urban biodiversity conservation as a priority in the development process. A biodiversity assessment has been conducted and relevant mitigation measures will be implemented to address this principle (refer to Chapter 21 (Environmental management and mitigation measures)). All other chapters of this EIS detail assessments and minimisation of impacts to the environment which are also relevant to the protection of ecological processes and natural systems.
Achievement of economic prosperity	*Achieving a diverse, efficient, resilient and strong Territory economy that allows communities to meet their needs without compromising the ability of future generations to meet their needs.*	*(e) improved valuation, pricing and incentive mechanisms should be promoted.*	Through the ESG-integration framework, and particularly the integration of social sustainability initiatives (such as the application of GSUD frameworks for designing safe and inclusive places), the Project would not only enhance economic opportunities but would also strive for the long-term well-being of communities through mitigating environmental impacts while delivering a Project to improve the ACT's transport network. This approach would promote intergenerational equity and sustainable prosperity.

Principle	Planning Act description	EPBC Act description	Applicability
			Economic viability and value-for-money considerations have been accounted for in the objectives of the Project. These objectives would continue to inform the ongoing development of the Project. Both alignment option corridors are expected to be positively impacted by the Project (refer to Section 11.7 of Chapter 11 (Project-wide issues).
Maintenance and enhancement of cultural, physical and social wellbeing of people and communities	*(a) creating and maintaining well-serviced, healthy, prosperous, liveable and resilient communities with affordable, efficient, safe and sustainable development* *(b) conserving or enhancing places of special aesthetic, architectural, cultural, heritage, historic, scientific, social or spiritual significance* *(c) providing for integrated networks of pleasant and safe public areas for aesthetic enjoyment and cultural, recreational or social interaction* *(d) accounting for the potential adverse impacts of development on climate change and seeking to address the impacts through sustainable development and design.*	Not applicable	This EIS considers cultural, physical, and social wellbeing of people and communities, how these factors may be impacted by the Project, and how these impacts may be avoided or mitigated. This has been demonstrated in the Project design through consideration of: • First Nations heritage through a 'Designing with Country' process • Heritage values directly or indirectly impacted by the Project. Refer to Sections 11.3 (First Nations Heritage) and 11.4 (Historic heritage) of Chapter 11 (Project-wide issues), and Technical Report 3 – Heritage • Resilient and climate-responsive design through alignment with the Living Infrastructure Plan (ACT Government, 2019a) • Safety through both Crime Prevention Through Environmental Design (CPTED) and GSUD (TCCS, 2023b) • Project design development responding to the Rail Safety National Law • Movement and Place Framework (TCCS, 2020a)

Principle	Planning Act description	EPBC Act description	Applicability
			• Social wellbeing of people directly or indirectly impacted by the Project. Refer to Section 11.7 of Chapter 11 (Project-wide issues) and Technical Report 6 – Socioeconomic. • Several other design considerations and sustainability initiatives related to social sustainability. These would continue to be developed during detailed design. A greenhouse gas assessment (refer to Section 11.11 of Chapter 11 (Project-wide issues) and Technical Report 8 – Greenhouse gas) has been prepared to assess the potential GHG emissions for the construction and operation of the Project. Design development for the Project would explore initiatives to reduce emissions, such as sustainable materials use and the incorporation of renewable energy generation. A climate change risk assessment (refer to Section 11.10 of Chapter 11 (Project-wide issues) Technical Report 7 – Climate change risk) has also been conducted to understand and manage potential climate change risks for the Project.
Precautionary principle	*If there is a threat of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing management and mitigation measures to prevent environmental degradation.*		This EIS details potential impacts to the environment during construction and operation of the Project. Where information has been unavailable or insufficient to determine environmental impacts, modelling and best practice environmental assessment methodologies have been used to determine projected outcomes, to implement appropriate management and mitigation measures. The methodologies applied for the EIS are outlined in Chapter 10 (Assessment methodologies).

Principle	Planning Act description	EPBC Act description	Applicability
			Mitigation measures will be implemented in a timely matter such that environmental impacts are appropriately managed. Proposed timing for implementation of each mitigation measure is identified in Chapter 21 (Environmental management and mitigation measures).
Inter-generational equity principle	*The present generation should ensure that the health, diversity, and productivity of the environment is maintained or enhanced for the benefit of future generations.*		This EIS has been developed to provide an assessment of key environmental issues that may be impacted by the Project. Chapter 21 (Environmental management and mitigation measures) outlines management and mitigation measures that aim to maintain, if not enhance the social, economic, and environmental outcomes for the community, through all stages of the Project-lifecycle, for the long-term benefit of future generations. The Project is expected to enhance the provision of public transport opportunities and provide an alternative and more sustainable mode of travel which supports a reduction in private vehicles on the road network. Intergenerational equity involves ensuring that each generation inherits similar or improved access to natural, cultural, health, and economic resources as previous generations. This concept extends to the equitable access and benefits provided by infrastructure projects.
Short and long term benefits should be considered for environmental, economic, and social decisions	Not applicable	*(a) decision making processes should effectively integrate both long - term and short - term economic, environmental, social and equitable considerations*	

7.6 Management and mitigation measures

In addition to the methods of governance and implementation outlined above, the following mitigation measures have been identified to ensure that processes to embed sustainability into the Project continue through future Project phases.

The Project design presented in the EIS would be further refined during the design development process. As the design progresses, opportunities would arise to identify and explore additional adaptation options to add value and improve the Project's approach to sustainability.

Table 7-4 Mitigation measures – Climate change

Mitigation measure ID	Objective	Mitigation measure	Timing
SU1	Support the achievement of sustainability objectives through design, construction and operation	A Sustainability Management Plan will be prepared as part of the CEMP(s) for the Project in accordance with the requirements outlined in Section 2.12 of Appendix L (Environmental Management Plan outline). In accordance with the requirements outlined in Section 3.7 of Appendix L (Environmental Management Plan outline) a Sustainability Management Plan will be prepared as part of the OEMP.	Design, prior to construction, prior to operation

8.0 Legislation and policy

8.1 Overview

This chapter outlines the various statutory environmental and planning approvals required for the Project. The Project will require or rely on the following statutory environmental and planning approvals:

- Approval for controlled actions under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) from the Commonwealth Minister for the Environment and Water through the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW). Approval is required for the Project because of potential significant impacts on Commonwealth Heritage and/or National Heritage places, listed threatened species and ecological communities and Commonwealth land (refer to Section 8.2.1)
- A Development Approval under the *Planning Act 2023* (ACT) (Planning Act). Approval is required for development applications on Territory Land subject to the *Territory Plan 2023* (Territory Plan) (refer to Section 8.3.1). As the Project requires an EIS, it is also considered to be a Significant Development under the Planning Act. This means that further public notification of the development application (including the finalised EIS accompanying the development application) will be required after the initial notification period as part of the Development Approval process
- A Works Approval under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) (PALM Act) from the National Capital Authority (NCA). Approval is required to carry out certain works in Designated Areas under the *National Capital Plan 1990* (NCP) (refer to Section 8.3.1)
- Approval from both Houses of the Commonwealth Parliament for works within the Parliamentary Zone, as defined in the *Parliament Act 1974* (Cth) (Parliament Act) (refer to Section 8.2.3).

An overview of the overarching statutory environmental and planning approvals process for the Project is shown in Figure 8-1.

This Environmental Impact Statement (EIS) has been prepared to satisfy legislative requirements under both the EPBC Act and the Planning Act. There is currently no statutory or administrative mechanism to formally coordinate the assessment and approvals processes under these two Acts. Given this, the Project has sought to rely on the cooperative assessment process developed (refer to Figure 8-2) to coordinate and satisfy the requirements of both Acts. The EIS process will involve revising or otherwise finalising the EIS in response to any comments received during public notification of this EIS under both the Planning Act and the EPBC Act.

The EIS will also inform other approvals, including Commonwealth approvals required under the PALM Act and the Parliament Act, and Territory development approval under the Planning Act. These subsequent Territory and Commonwealth planning approval requirements will respond in further detail to matters contemplated in this EIS. Given this, in preparing this EIS consistently with the Territory Scoping Document (Appendix B) and Commonwealth EIS Guidelines (Appendix C), Infrastructure Canberra (iCBR) has from time to time referred to future planning and approval processes, as a method of providing requested information or otherwise ensuring that all relevant detail is considered in a planning context. For example, some matters may be managed through:

- Conditions imposed:
  - By the Commonwealth Minister for the Environment and Water on an approval issued under the EPBC Act
  - On the Development Approval under the Planning Act
  - On Works Approval under the PALM Act
- The environmental management plans for the Project.

Figure 8-3 to Figure 8-6 indicate the applicable Commonwealth and ACT legislation throughout the Project area. Note that where Project works extend spatially beyond the alignment, applicable legislative provisions may vary, particularly near the boundaries of jurisdictions.

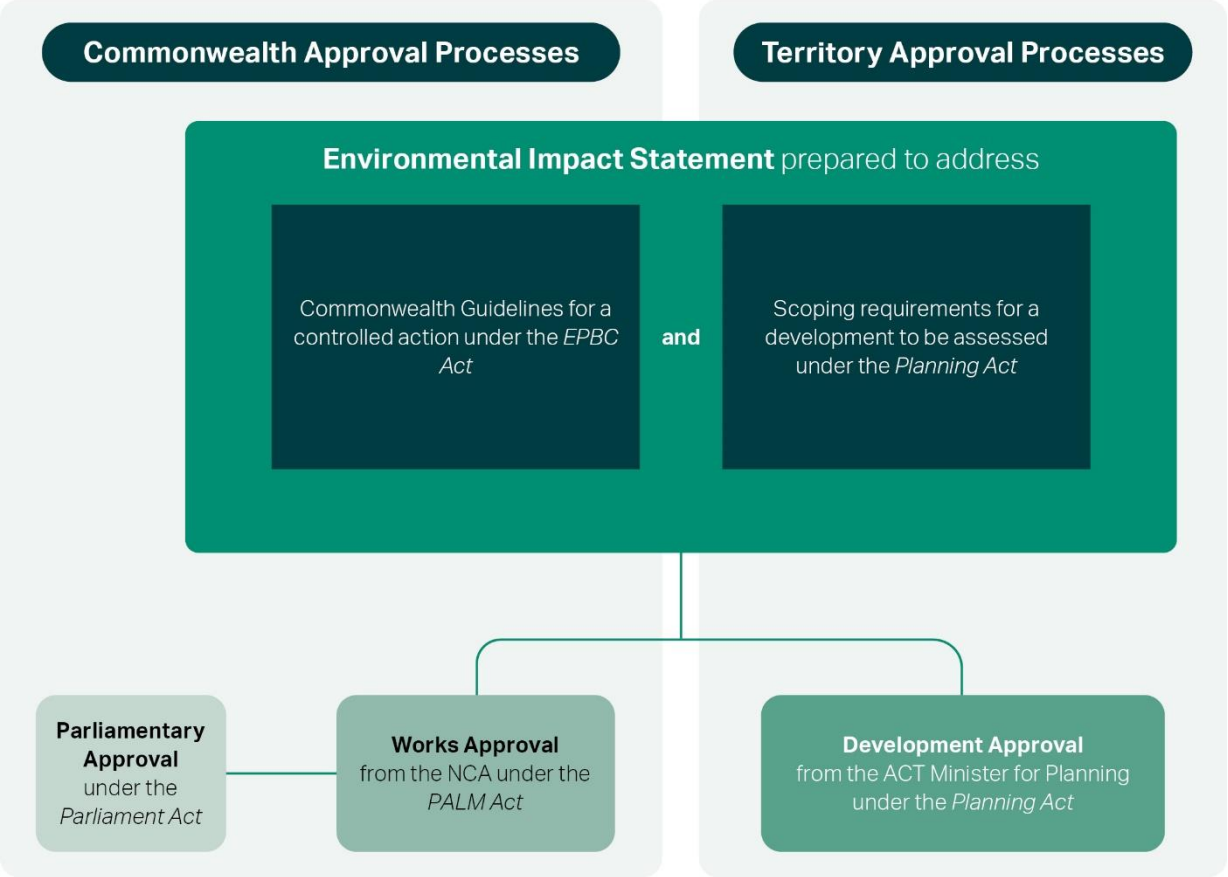


Figure 8-1 Relationship of the approval processes under Commonwealth and Territory legislation

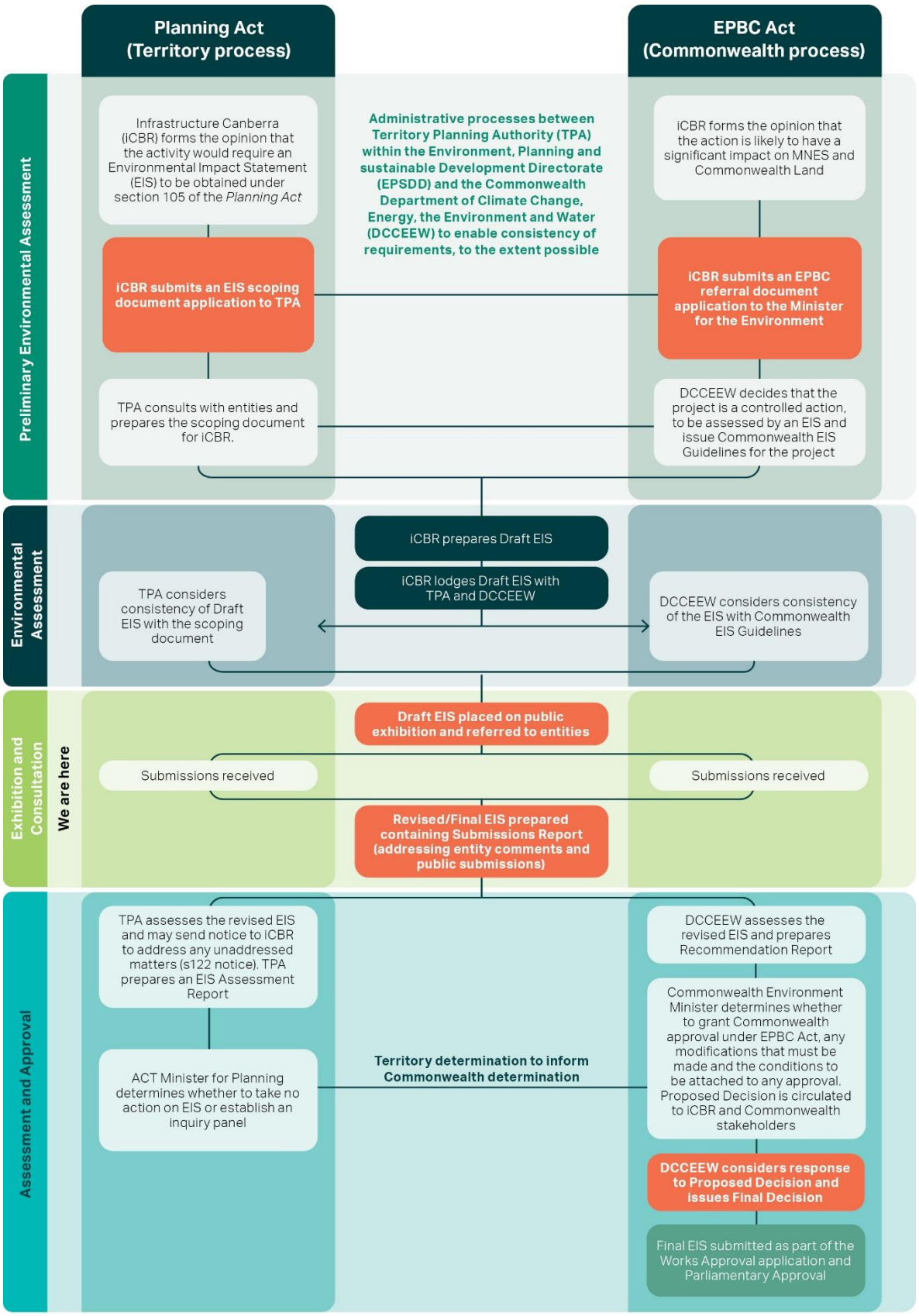


Figure 8-2 Expected environmental assessment processes under the EPBC Act and Planning Act

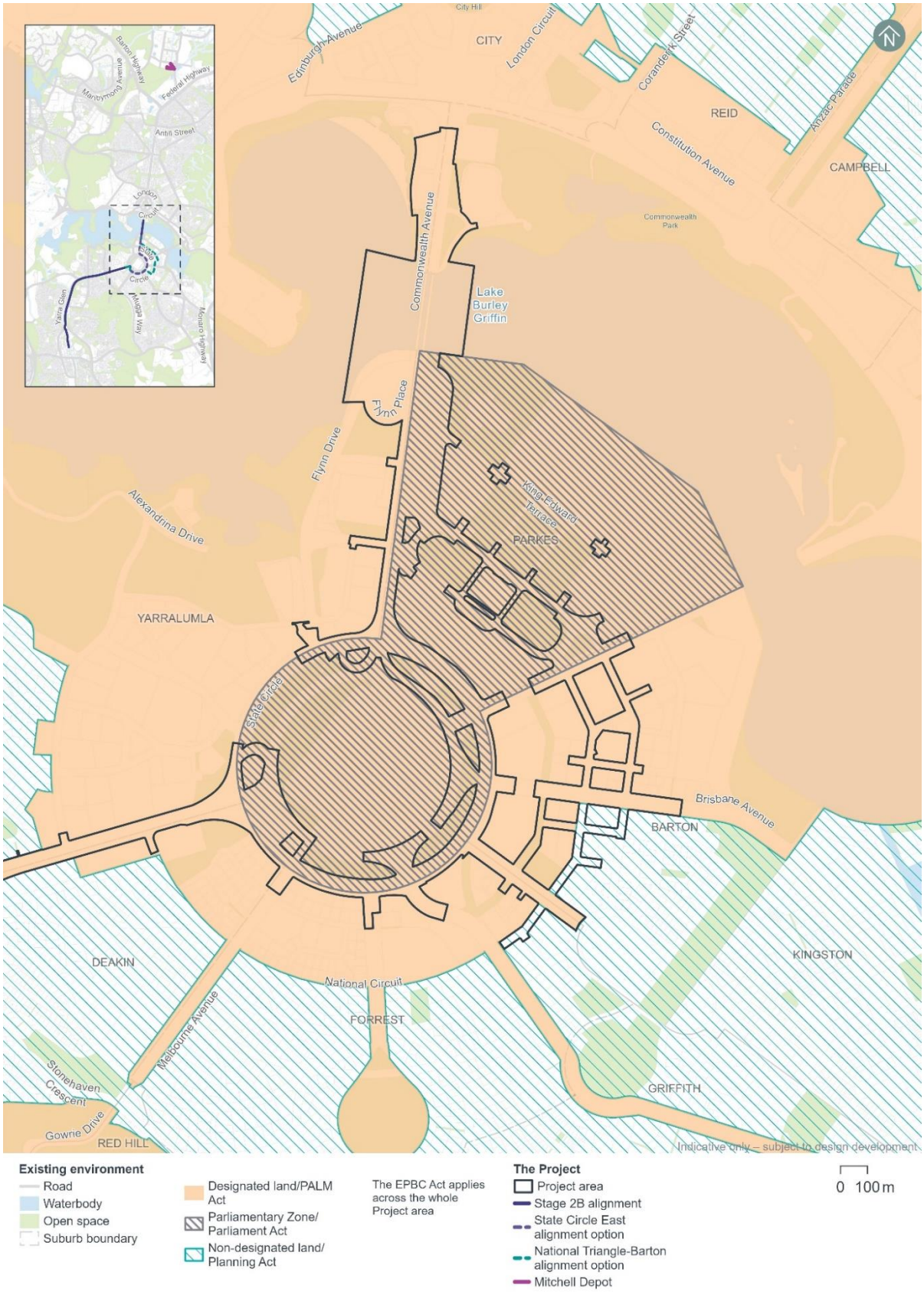


Figure 8-3 Applicable jurisdictions for the Project (1/4)

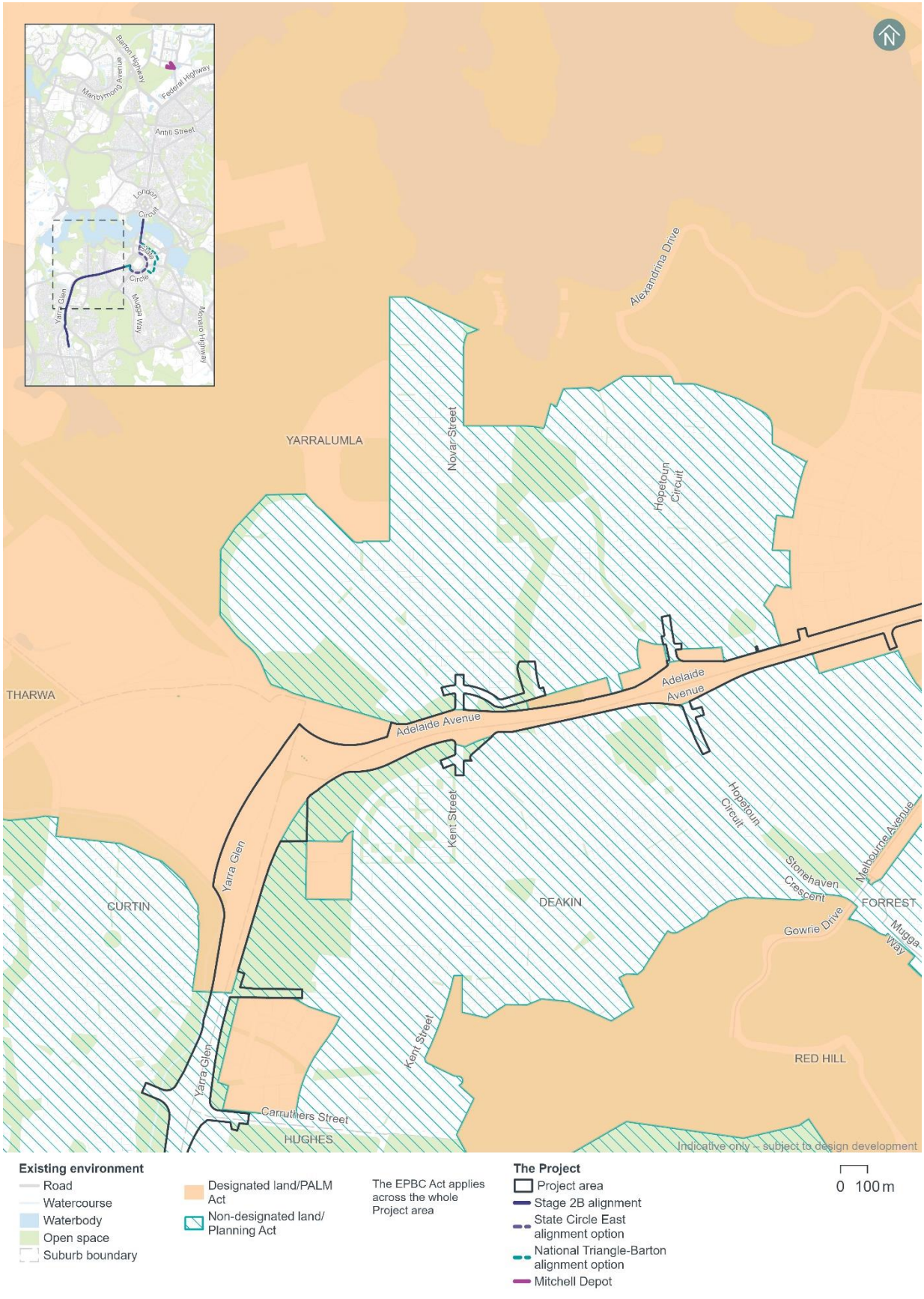


Figure 8-4 Applicable jurisdictions for the Project (2/4)

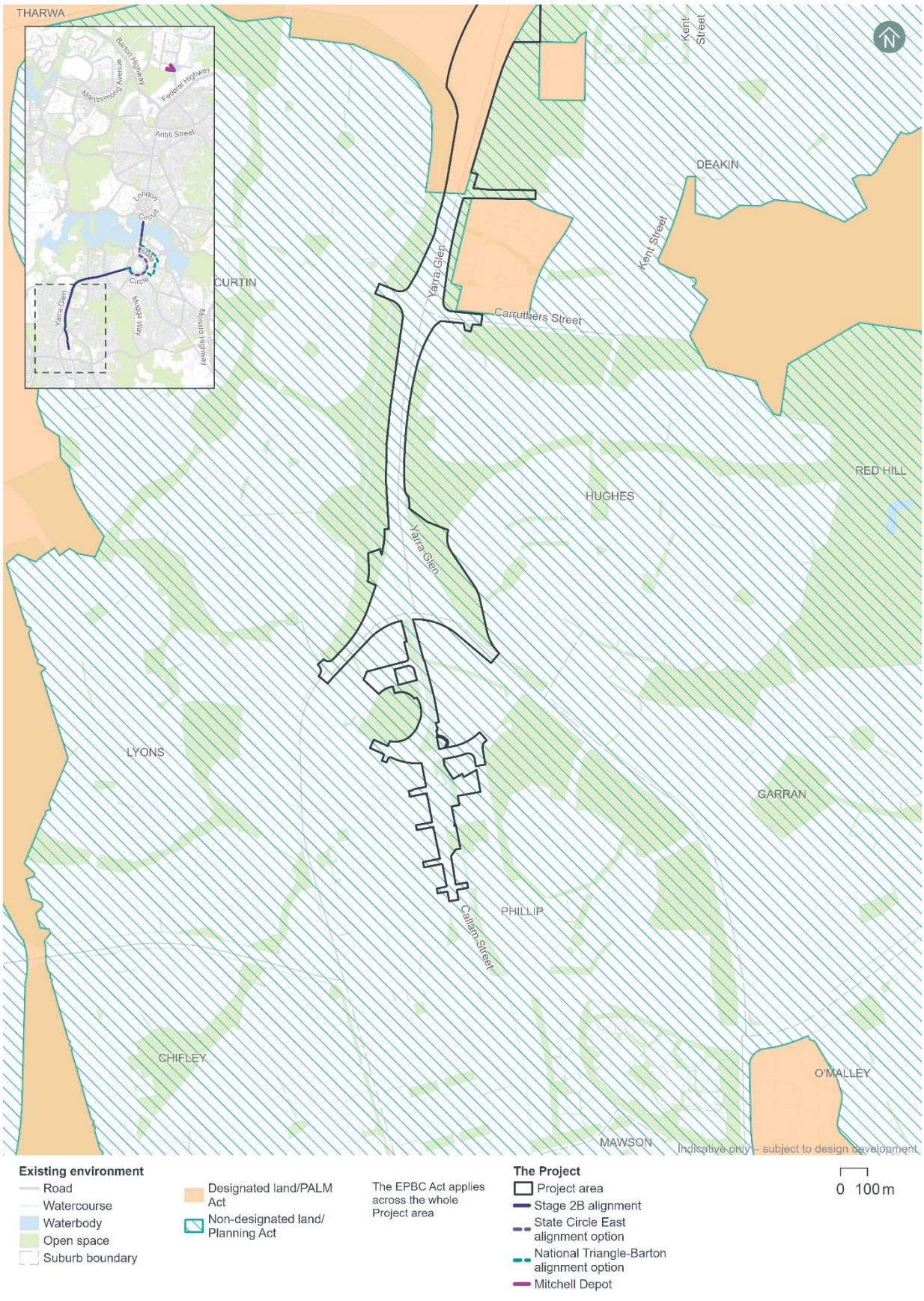


Figure 8-5 Applicable jurisdictions for the Project (3/4)

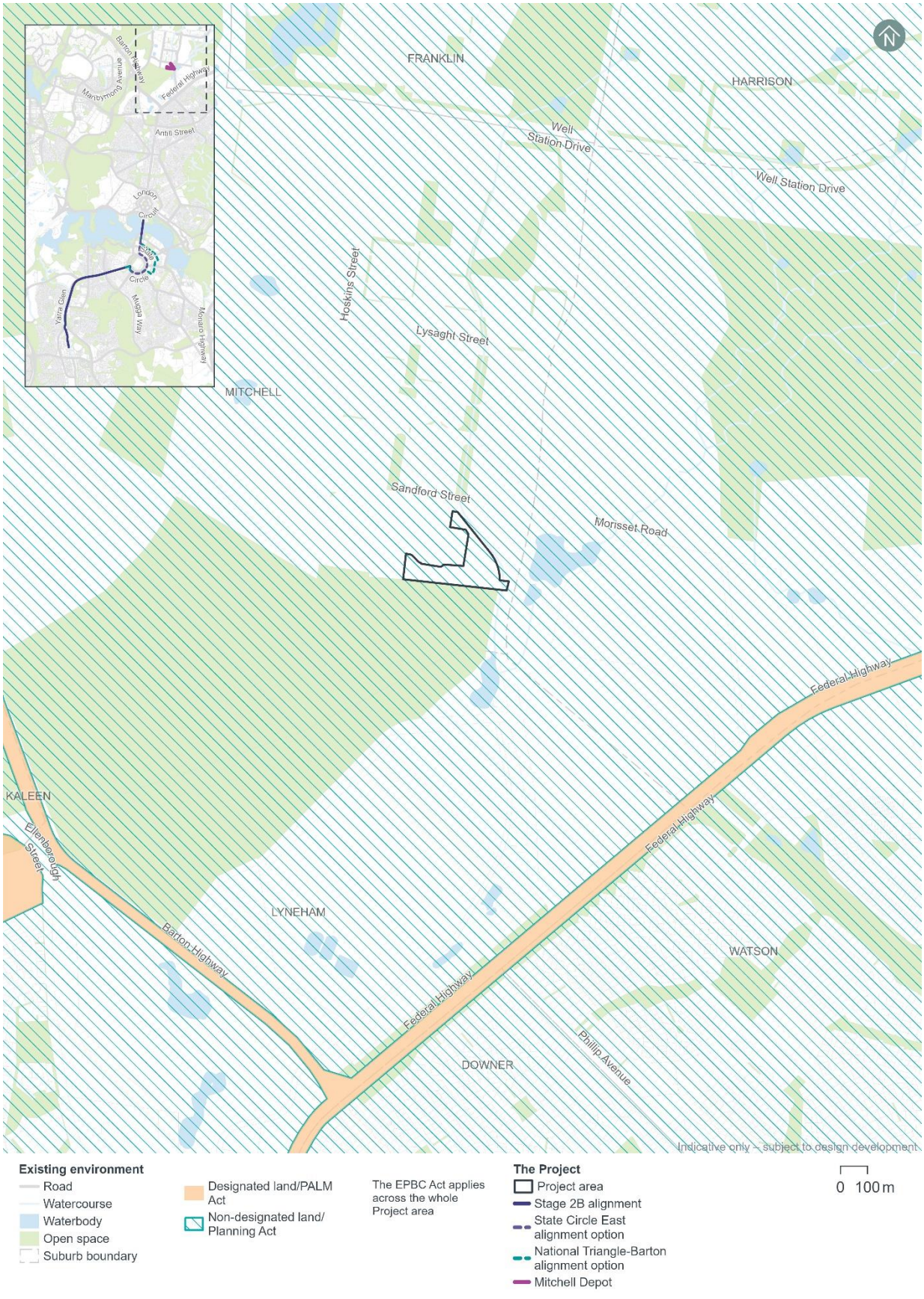


Figure 8-6 Applicable jurisdictions for the Project (4/4)

8.2 Commonwealth requirements

8.2.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims, among other things, to protect the environment, particularly Matters of National Environmental Significance (MNES) and the environment of Commonwealth land. Assessment and approval are required under the EPBC Act where an action has, will have or is likely to have a significant impact on:

- World heritage properties
- National heritage places
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed)
- Listed threatened species and ecological communities
- Listed migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mining)
- A water resource, in relation to coal seam gas development and large coal mining development
- The environment, where actions proposed are on, or will affect Commonwealth land
- The environment, where Commonwealth agencies are proposing to take an action.

An EPBC referral (EPBC 2023/09753) was made to the Commonwealth Minister for the Environment and Water. The view of the Territory was that the Project would need assessment and approval under the EPBC Act and this was confirmed on 3 April 2024 when the delegate of the Minister determined that the Project is a 'controlled action' (i.e. that the Project is likely to have a significant impact on MNES) and required assessment by EIS. The relevant controlling provisions are:

- National heritage places
- Listed threatened species and ecological communities
- The environment of Commonwealth land.

Areas that are National land (and treated as Commonwealth land under the EPBC Act) are shown on Figure 8-7 to Figure 8-8. Actions that are proposed on or will significantly affect Commonwealth land require assessment under the EPBC Act. There is no National land within or immediately surrounding the Mitchell Depot site. Areas that are not identified as 'National land' are Territory land in accordance with the PALM Act.

DCCEEW issued guidelines for the content of the EIS, which are provided in Appendix C (EIS Guidelines). This EIS responds to those environmental assessment requirements, as described in Appendix D (EIS cross references).

The EIS has also been prepared to address relevant requirements of the Environment Protection and Biodiversity Conservation Regulations 2000 (EPBC Regulations), including the matters identified in Schedule 4 of those regulations.

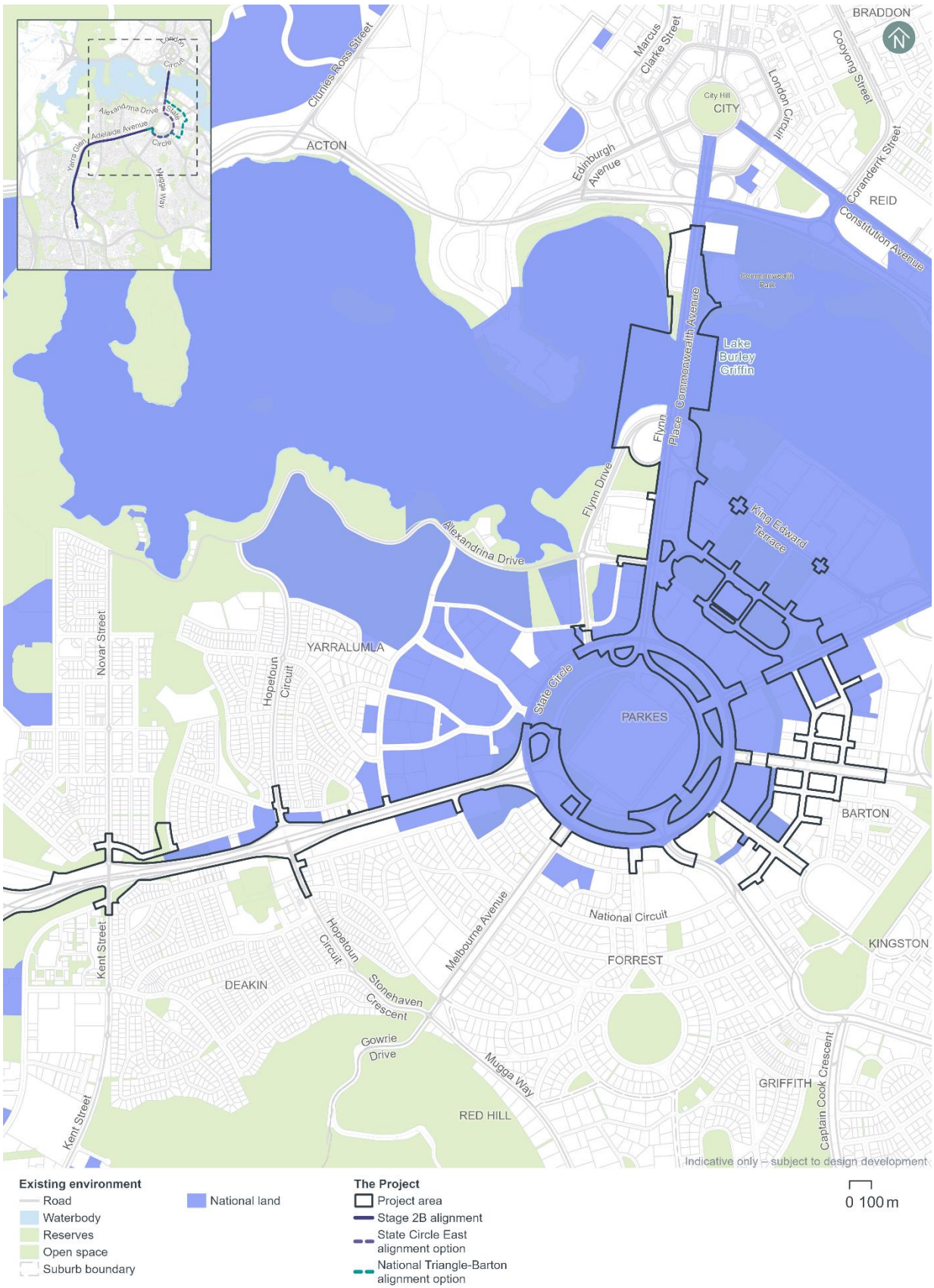


Figure 8-7 National land (1/2)

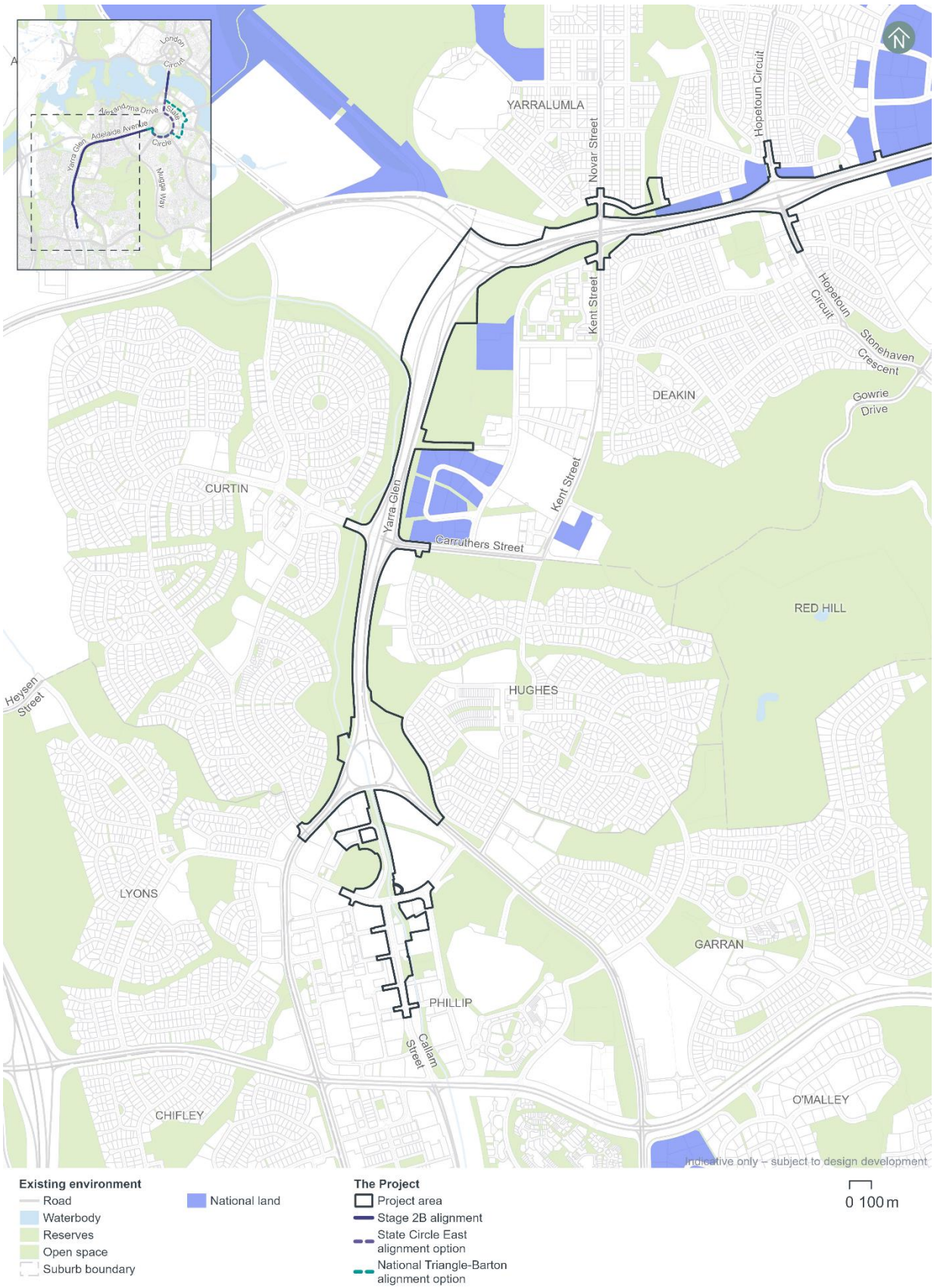


Figure 8-8 National land (2/2)

Related EPBC Act approvals

Previous stages of the Light Rail network have been subject to EPBC Act referrals and approvals, as described in the following sections.

LRS2A

The Project area partially overlaps with the 'delivery phase area' (construction and operational footprint) for LRS2A.

LRS2A has been subject to referral and assessment under the EPBC Act (as a controlled action). LRS2A received approval with conditions in February 2021. Two subsequent variations to the approval have been sought, with the most recent being approved on 13 April 2022.

The Project would not preclude LRS2A from meeting requirements set out in the EPBC Act conditions of approval for LRS2A.

The conditions of the approval for LRS2A place a strong focus on limiting, managing and offsetting impacts to habitat for the Golden Sun Moth (*Synemon plana*). At the time of granting the LRS2A approval, the Golden Sun Moth was listed as critically endangered under the EPBC Act. The species listing has since been revised to vulnerable (as of 7 December 2021).

Opportunities to avoid and minimise impacts on native biodiversity, including habitat for the Golden Sun Moth, have been carefully considered through the design and construction planning for the Project. This has included targeting disturbed and developed sites, such as existing car parking areas, for Project construction compounds and material laydown areas.

Depending on the alignment option selected, the Project would result in direct impact to 9.60 to 9.88 ha of potential Golden Sun Moth habitat. The majority of habitat across the two alignment options is either Chilean needlegrass dominated or low quality Chilean needlegrass habitat. Measures to manage impacts to the Golden Sun Moth have been identified in Chapter 21 (Environmental management and mitigation measures).

Potential impacts on other biodiversity values have also been considered in developing the design for the Project. Where possible, mature native trees and particularly hollow bearing trees would be retained and would be protected during construction and operation of the Project. Indirect impacts, through noise, vibration, surface water runoff and lighting have also been specifically considered to minimise the Project's overall impact on biodiversity.

A Biodiversity Offset Strategy has been developed for the Project, and will be updated to reflect any further avoidance or minimisation of biodiversity impacts achieved through ongoing design development. Impacts to biodiversity, and proposed mitigation and offsetting approaches are discussed further in Technical Report 2 – Biodiversity.

Commonwealth Avenue utility relocation

The Commonwealth Avenue utility relocation would involve the relocation of sensitive fibre optic cables to allow continued access to those cables following construction of LRS2A and the Project. Parts of the fibre optic cables to be relocated are currently within the Project area, broadly from around Albert Street on the northern side of Lake Burley Griffin, under the lake to Flynn Drive, and along King Edward Terrace to around Mall Road West and is independent and separate from LRS2A and the Project. An EPBC Act referral for the Commonwealth Avenue utility relocation was submitted to DCCEEW in August 2023 (reference 2023/9567). The Department determined that the Commonwealth Avenue utility relocation was not a controlled action and assessment and approval under section 75 of the EPBC Act was not required.

LRS1

The Project area includes the Mitchell Depot, constructed as part of LRS1. An EPBC Act referral for LRS1 was submitted to the Department of the Environment (now DCCEEW) in November 2014 (reference 2014/7379). The Department determined that LRS1 was not a controlled action and assessment and approval under section 75 of the EPBC Act was not required.

8.2.2 Australian Capital Territory (Planning and Land Management) Act 1988

The PALM Act establishes the NCA and assigns it various functions and responsibilities relating to the Australian Government's interest in the planning and development of the nation's capital. One of the NCA's key roles is to prepare and administer the NCP, which aims for Canberra and the ACT to be planned and developed in accordance with their national significance.

The NCP identifies a series of Designated Areas that have special characteristics of the national capital, and sets out priorities and detailed conditions of planning, design, and development for those areas. Under Section 12 of the PALM Act, approval from the NCA (granted through a Works Approval) is required to carry out works within a Designated Area.

Figure 8-3 to Figure 8-6 show Designated Areas and those parts of the Project within Designated Areas that would require Works Approval under the PALM Act. Designated Areas include Lake Burley Griffin and its Foreshores, the National Triangle and adjacent sites, and the Main Avenues and Approach Routes between the ACT border and the Central National Area.

The National Capital Plan 1990

Section 3.1.4 of the NCP sets out the general location of Inter-town Public Transport System (including public transport corridors) within the Territory. These corridors are identified on Figure 2 'General Policy Plan – Metropolitan Canberra' of the NCP. This section of the NCP provides for a public transport corridor along Commonwealth Avenue, State Circle and Adelaide Avenue. The State Circle East alignment option for the Project would be consistent with this public transport corridor.

The NCP does not provide for a similar public transport corridor through Barton, and therefore the National Triangle-Barton alignment option may be inconsistent with the NCP. If the National Triangle-Barton alignment option is adopted for the Project, further engagement with the NCA would be required to discuss options for progressing the Project, including potentially amending the NCP.

The NCP contains Precinct Codes, General Codes, policies, and guidelines for development in Designated Areas. NCP Precinct Codes applicable to the Project include:

- West Basin Precinct Code
- Parliamentary Zone Precinct Code
- Lake Burley Griffin and Foreshores Precinct Code
- Diplomatic Precinct (Yarralumla, Deakin, O'Malley, and Curtin) Precinct Code
- Main Avenues and Approach Routes Precinct Code.

NCP policies and guidelines would also apply to the parts of the Project in Designated Areas or other areas of interest to the National Capital.

8.2.3 Parliament Act 1974

Under Section 5(1) of the Parliament Act, '*no building or other work is to be erected on land within the Parliamentary zone unless […] the Minister has; caused a proposal for the erection of the building or work to be laid before each House of the Parliament and the proposal has been approved by resolution of each House*'. Under the Act, the Parliamentary zone includes the area within the inner boundary of State Circle, and the area bounded within the eastern boundary of Commonwealth Avenue, western boundary of Kings Avenue, and the southern shore of Lake Burley Griffin.

The general approach to coordination of the Parliamentary approval process with the Works Approval application for the Project, and the relationship of those processes with this EIS are shown in Figure 8-9.

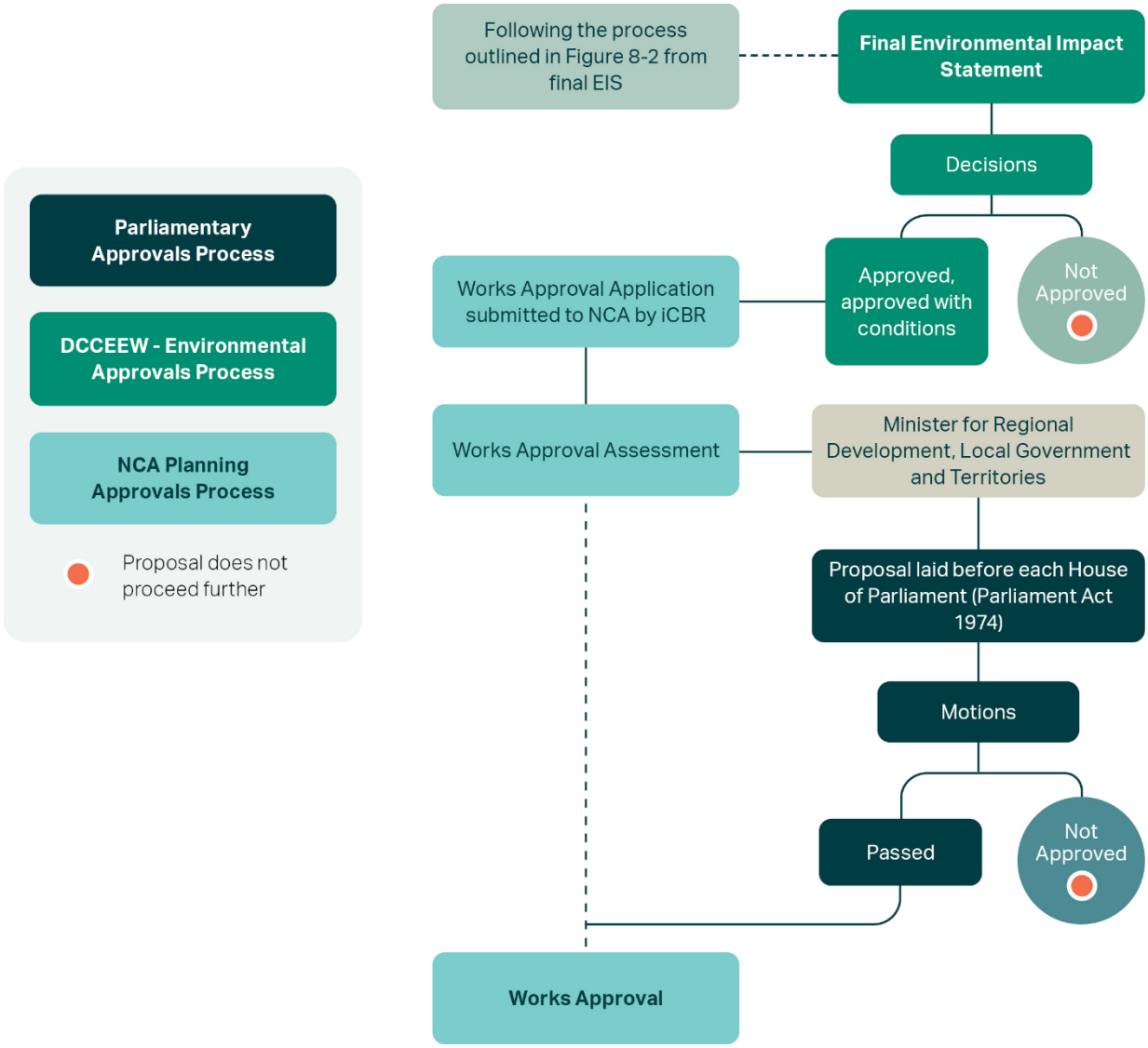


Figure 8-9 The Project's Commonwealth planning and environmental approvals process

Joint Standing Committee on the National Capital and External Territories

In May 2018, the Joint Standing Committee on the National Capital and External Territories (JSCNCET) agreed to inquire into and report on the Commonwealth and Parliamentary planning approvals process for Stage 2 of the Light Rail project. The *Commonwealth approvals for ACT light rail: Commonwealth and Parliamentary approvals for the proposed Stage 2 of the Australian Capital Territory light rail project* (JSCNCET Inquiry Report) sets out the findings of the inquiry.

The Australian Government's response to the JSCNCET Inquiry Report was published in March 2019, including agreement or agreement-in-principle to each of the JSCNCET's six recommendations. Generally, the recommendations related to approval processes, the Commonwealth Avenue bridge design, the location of wire free running and the protection of heritage.

The Project has been designed and developed to date in line with the JSCNCET recommendations and the Government's response. Further discussion of the JSCNET recommendations and how the Project responds to those recommendations is provided in Chapter 3 (Project development).

8.3 ACT requirements

8.3.1 Planning Act 2023

The objects of the Planning Act (Part 2.1) are to 'support and enhance the Territory's liveability and prosperity, protect its natural environmental, and promote the well-being of residents by creating an effective, efficient, accessible, and enabling planning system'. Key elements that are integral to achieving the objects of the Planning Act include:

- Protecting the ACT's biodiversity values and integrating natural, built, cultural and heritage elements
- People focused and design-led built outcomes
- The knowledge, culture and tradition of Traditional Custodians
- Planning for population growth while making the ACT an attractive place to live
- A sustainable and climate resilient environment.

A Territory Priority Project (TPP) is defined in Section 216 of the Planning Act as a development proposal that is declared to be a TPP, or that relates to light rail. Given that the Project is for the construction and operation of light rail, it must necessarily be a TPP.

Development Approval is required for those sections of the Project on zoned Territory Land (land that is a Designated Area under the PALM Act is subject to a separate approval given by the NCA under that Act).

Under the Planning Act, an EIS is required to be prepared to inform assessment of a Development Application for the Project.

On 4 March 2024, the TPA issued an EIS Scoping Document which identifies the matters that are to be addressed by the EIS. The EIS Scoping Document is provided in Appendix B (Scoping Document). This EIS addresses the matters identified in the EIS Scoping Document.

Based on the Scoping Document and the environmental impact assessment carried out in this EIS, several environmental impact assessment triggers in Schedule 1 of the Planning (General) Regulation 2023 have been identified as potentially relevant to the Project. A summary of these triggers is included in Table 8-1.

Table 8-1 Environmental Impact Assessment Trigger; *Planning (General) Regulation 2023*, Schedule 1, Part 1.2

Item	Provision	Comment
Part 1.2 Development proposals requiring environmental impact assessment		
16	Proposal that is likely to have a significant adverse environmental impact on 1 or more of the following: a. A critically endangered species b. An endangered species c. A vulnerable species d. A conservation dependent species e. A regionally threatened species f. A regionally conservation dependent species g. A provisionally listed threatened species h. A listed migratory species i. A threatened ecological community j. A protected native species k. A Ramsar wetland l. Any other protected matter.	The Project would impact several protected matters under the EPBC Act and *Nature Conservation Act 2014* (ACT) (Nature Conservation Act). The Project has the potential to have significant adverse impacts on one or more threatened species. These potential impacts have been assessed in Technical Report 2 – Biodiversity, which also identifies measures to manage and offset these impacts.

Item	Provision	Comment
17	Proposal involving— a. The clearing of more than 0.5ha of native vegetation in a native vegetation area, other than on land in a future urban area b. The clearing of more than 5.0ha of native vegetation in a native vegetation area on land in a future urban area	The Project is likely to impact relevant native vegetation areas (as defined by the Nature Conservation Act) for the State Circle East and National Triangle - Barton alignment options. More than 0.5 ha of this native vegetation would be cleared from Territory Land.
21	Proposal that is likely to have a significant adverse environmental impact on the heritage significance of a place or object registered under the *Heritage Act 2004* (ACT), unless the proposal is the demolition of a building that is affected residential premises, and the heritage council has approved a statement of heritage effect in relation to the proposal	Several heritage places or objects registered on the ACT Heritage Register under the *Heritage Act 2004* (ACT) have the potential to be affected by the Project. These potential impacts have been assessed in Technical Report 3 – Heritage and heritage assessment sections in Part B (Environmental impact assessment). Potentially significant impacts have been identified at the following ACT Heritage Register-listed or nominated places. For the State Circle East alignment option it is: • Albert Hall (during construction and operation) For the National Triangle-Barton alignment option it is: • Albert Hall (during construction) • Hotel Kurrajong (during construction and operation) Further opportunities to avoid and minimise impacts on heritage values would be considered during ongoing design development, in consultation with relevant stakeholders.
23	Proposal involving land included on the register of contaminated sites under the *Environment Protection Act 1997* (ACT)	There are registered contaminated sites under the *Environment Protection Act 1997* (ACT) within or adjacent to the Project area. Impacts to contaminated land have been assessed in Section 11.6 of Chapter 11 (Project-wide issues) and Technical Report 5 – Contamination.
25	Proposal that is likely to result in a key threatening process under the *Nature Conservation Act 2014* (ACT)	The potential for the Project to result in a key threatening process is assessed in Technical Report 2 – Biodiversity. The assessment has identified that the Project would increase the level of threats to the ecological function of the local landscape as described in the *Loss of Mature Native Trees Key Threatening Process Action Plan* (EPSDD, 2023).

8.4 Other legislation and policy

Other legislation and policy that has been considered in the development of the Project (including international conventions relating to biodiversity) and the assessment of its environmental impacts is summarised in Table 8-2.

Table 8-2 Other legislation considered for the Project

Legislation / policy	Broad legislative focus	Relevance to the Project
Commonwealth legislation		
Native Title Act 1993 (Cth)	An objective of the *Native Title Act 1993* is to recognise and protect native title.	Searches of the registers maintained by the National Native Title Tribunal indicate there are no native title claims or any Indigenous Land Use Agreements that apply to land covered by the Project.
Disability Discrimination Act 1992 (Cth), and *Disability Standards for Accessible Public Transport 2002* (Cth)	Section 33.1 of the *Disability Standards for Accessible Public Transport 2002* (Cth) requires all new public transport premises, infrastructure and conveyances to be compliant with the requirements of the standard and referenced to the Australian Standards (AS) and Design Rules therein, unless unjustifiable hardship is incurred by implementation. The *Disability Discrimination Act 1992* protects people against discrimination based on disability and defines the mechanisms so that public places can be made fully accessible.	The Project would be designed to be compliant with the requirements of the *Disability Standards for Accessible Public Transport 2002* (Cth) and the *Disability Discrimination Act 1992* (Cth). In particular, the Project would provide continuous accessible paths, lighting, wayfinding, and designated waiting and seating areas at platforms and within light rail vehicles (LRVs) (refer to Section 5.4.3).
ACT legislation		
Climate Change and Greenhouse Gas Reduction Act 2010 (ACT)	ACT Government established an ambitious greenhouse gas reduction target of zero net emissions by 30 June 2060.	This EIS includes an estimate of the greenhouse gases that would be generated during construction and operation of the Project, and identifies management and mitigation measures to minimise these impacts. The greenhouse gas impact assessment for the Project is provided in Technical Report 8 – Greenhouse gas and summarised in Section 11.11 of Chapter 11 (Project-wide issues).

Legislation / policy	Broad legislative focus	Relevance to the Project
Environment Protection Act 1997 (ACT) and *Environment Protection Regulation 2005* (ACT)	Legislates with respect to all forms of pollution and waste and includes associated provisions for: clean air; water quality control; noise control; contaminated land; and hazardous chemical and waste management.	This EIS has been prepared to understand the potential environmental impacts associated with the Project, and to identify management and mitigation measures to minimise these impacts. The Project will comply with the General Environmental Duty under the Act; that is, to take steps that are practicable and reasonable to prevent or minimise environmental harm or environmental nuisance caused, or likely to be caused, by the activity.
Heritage Act 2004 (ACT)	Provides for the protection and conservation of First Nations and historic places and objects through their listing on a register. The *Heritage Act 2004* makes it an offence to diminish the heritage significance of any listed place or object of heritage value or damage an First Nations place or object unless an exception applies.	The Act considers impacts to the heritage significance, and intrinsic features, of a listed place within the listed place boundary. There are several places listed on the ACT Heritage Register within or adjacent to the Project area, which are detailed in Sections 11.3 and 11.4 of Chapter 11 (Project-wide issues). The heritage assessment undertaken for the Project is provided in Technical Report 3 – Heritage and summarised in Sections 11.3 and 11.4 of Chapter 11 (Project-wide issues).
Nature Conservation Act 2014 (ACT)	Provides for ecological protection, conservation, enhancement, restoration and improvement of native species, ecological communities, biological diversity, ecological connectivity, and important habitat in the ACT.	This EIS has been prepared to understand the potential ecological and biodiversity impacts associated with the Project, and to identify management and mitigation measures to minimise these impacts. The biodiversity assessment for the Project is provided in Technical Report 2 – Biodiversity and summarised in Section 11.2 of Chapter 11 (Project-wide issues).

Legislation / policy	Broad legislative focus	Relevance to the Project
Road Transport (Safety and Traffic Management) Act 1999 (ACT)	Describes the requirements for traffic management and control in Canberra when carrying out works. It defines the need to operate under approved traffic management plans.	The Project has been designed with consideration of the *Road Transport (Safety and* Traffic *Management) Act 1999*. Where temporary traffic management would be required for Project construction activities, traffic management plans would be developed and approved by TCCS prior to works. The traffic and transport assessment undertaken for the Project is provided in Technical Report 1 – Traffic and transport and summarised in Section 11.1 of Chapter 11 (Project-wide issues).
Urban Forest Act 2023 (ACT)	Serves to protect certain trees (including regulated trees and registered trees) within urban forests.	The Project would not impact any registered trees listed under the *Urban Forest Act 2023*. The Project would require removal of protected trees under the *Urban Forest Act 2023*, including in the Barton, Inner South, Yarra Glen and Woden precincts. Further details of protected trees that would be affected by the Project are provided in the tree assessment included in Appendix B to the Public Domain Master Plan (refer to Appendix I of this EIS).
Waste Management and Resource Recovery Act 2016 (ACT)	Defines the waste hierarchy of avoidance, recovery, and recycling over disposal and the supporting guidelines set out waste classification in the ACT.	The waste management hierarchy defined in the Act would be applied to the management and disposal of waste associated with the Project. The waste assessment undertaken for the Project is summarised in Section 11.12 of Chapter 11 (Project-wide issues).
Rail Safety National Law Act 2014 (ACT)	Serves to provide safe railway operations through the Office of the National Rail Safety Regulator.	The Light Rail network operator would need to be accredited by the Office for the National Rail Safety Regulator and would have the responsibility for ensuring the safety of customers, staff, and the public in areas where they encounter the Light Rail network so far as is reasonably practicable.

Legislation / policy	Broad legislative focus	Relevance to the Project
Work Health and Safety Act 2011 (ACT)	Provides a framework to protect workers health, safety, and welfare through the elimination or minimisation of risks arising from work.	Worker health and safety hazards could arise during construction where inadequate hazard/risk identification, reporting and monitoring systems are not implemented and maintained. The hazard and risk assessment undertaken for the Project is summarised in Section 11.13 of Chapter 11 (Project-wide issues).
International conventions		
Convention on Biological Diversity	Provides goals and targets that relate to the delivery of biodiversity management policies aimed at implementing the Convention objectives.	The avoidance and mitigation measures outlined in Technical Report 2 – Biodiversity demonstrate that the Project has been planned to minimise impacts to biodiversity as far as practicable, and would continue to be developed to minimise impacts to biodiversity during detailed design. Section 9 of Technical Report 2 – Biodiversity provides further detail on how the Project would respond to the goals of the convention.
Convention on the Conservation of Nature in the South Pacific (Apia Convention)	Commits to act for the conservation, utilisation, and development of the natural resources of the South Pacific region through careful planning and management for the benefit of present and future generations.	Residual impacts from the Project would be offset in accordance with a Biodiversity Offset Strategy, with the offset strategy targeting permanent protection and management of conservation values in the reserve system. Section 9 of Technical Report 2 – Biodiversity provides further detail on how the Project would respond to the objectives of the convention.
Convention on International Trade in Endangered Species of Wild Fauna and Flora	Ensures that international trade in specimens of wild animals and plants does not threaten the survival of the species.	The Project would not be undertaken in a manner that is inconsistent with the objectives and principles of the convention. Any approved impacts on occupied habitat would be undertaken following strict pre-clearance conditions, which would be documented in the Construction Environmental Management Plan (CEMP) for the Project. Section 9 of Technical Report 2 – Biodiversity provides further detail on how the Project relates to this convention.

9.0 Approach to the environmental assessment

This chapter describes the overarching approach to the environmental impact assessment of the Project, including the precinct and Project-wide approaches adopted in this Environmental Impact Statement (EIS) for different environmental issues. The chapter also provides a summary of where each environmental issue is addressed in the EIS, including impacts on Matters of National Environmental Significance (MNES) and impacts on the whole of the environment. Assessment methodologies for each environmental issue are included in Chapter 10 (Assessment methodologies).

9.1 Overview

This EIS has adopted a precinct-based approach to the environmental assessment of the construction and operational impacts of the Project. The precinct-based approach responds to the linear nature of the Project, and the unique environmental and stakeholder contexts of areas along the Project alignment.

The environmental assessment for each precinct allows focused consideration of key issues relevant to the precinct and provides a holistic view of those impacts in one place for affected and interested stakeholders. Potential impacts with broader environmental implications, or that would be generally applicable to the whole Project, have been assessed on a Project-wide basis.

9.1.1 Project-wide impacts

Due to the nature and size of the Project, there is the potential for Project-wide impacts on the environment. There are some environmental impacts (such as in relation to biodiversity, contamination, and air quality) that are best described on a Project-wide basis, rather than specific to individual precincts.

Operational and construction impacts that would generally be applicable for the whole Project have been considered on a Project-wide basis in Chapter 11 (Project-wide issues).

9.1.2 Alignment options

Two potential alignments for the Project are being considered through the National Triangle and around Parliament House and have been assessed in this EIS. These alignment options include:

- The State Circle East alignment option: from Commonwealth Avenue along State Circle to Adelaide Avenue
- The National Triangle-Barton alignment option: from Commonwealth Avenue along King George Terrace, Macquarie Street, Bligh Street, National Circuit, and Sydney Avenue, before connecting with State Circle to Adelaide Avenue.

This approach allows for environmental impacts of both options to be considered; community and stakeholder feedback to be sought for both options; and provides flexibility by enabling the environmental assessment and approvals process for the Project to commence while both options are under investigation.

However, only one of the two alignment options above would be constructed. The selection of an alignment option for the Project (i.e. the National Triangle-Barton alignment option or the State Circle East alignment option) will consider factors including:

- Place outcomes
- Community and stakeholder feedback on the draft EIS
- Potential environmental and social benefits and impacts.

The revised, final EIS will describe only one alignment option and will identify potential environmental impacts and benefits of that option.

The State Circle East and National Triangle-Barton alignment options are shown on Figure 9-1.

9.1.3 Precinct-based approach

Specifically, the precinct-based approach has been adopted to:

- Identify and respond to the diverse urban and landscape characteristics along the Project alignment
- Present potential local environmental impacts for each precinct together in one place, to make it clearer and easier for local communities and other stakeholders along the alignment to determine how they might be affected by the Project
- Group similar land uses, such as residential, commercial, or government areas, and major transport routes
- Respond to the diverse visions and planning outcomes detailed in the National Capital Plan and various district strategies under the *Territory Plan 2023* that are applicable to the Project.

The Project has been separated into seven precincts (across both Project alignment options) based on common environmental and stakeholder contexts. The Mitchell Depot site has also been considered in addition to the precincts along the Project alignment.

The seven precincts and the Mitchell Depot site are described further in individual chapters in Part B (Environmental Assessment) of this EIS. The National Triangle and Barton precincts are generally only relevant to the National Triangle-Barton alignment option.

The seven precincts are shown in Figure 9-1 and include:

- Commonwealth Avenue precinct
- Parliament House precinct
- National Triangle precinct
- Barton precinct
- Inner South precinct
- Yarra Glen precinct
- Woden precinct.

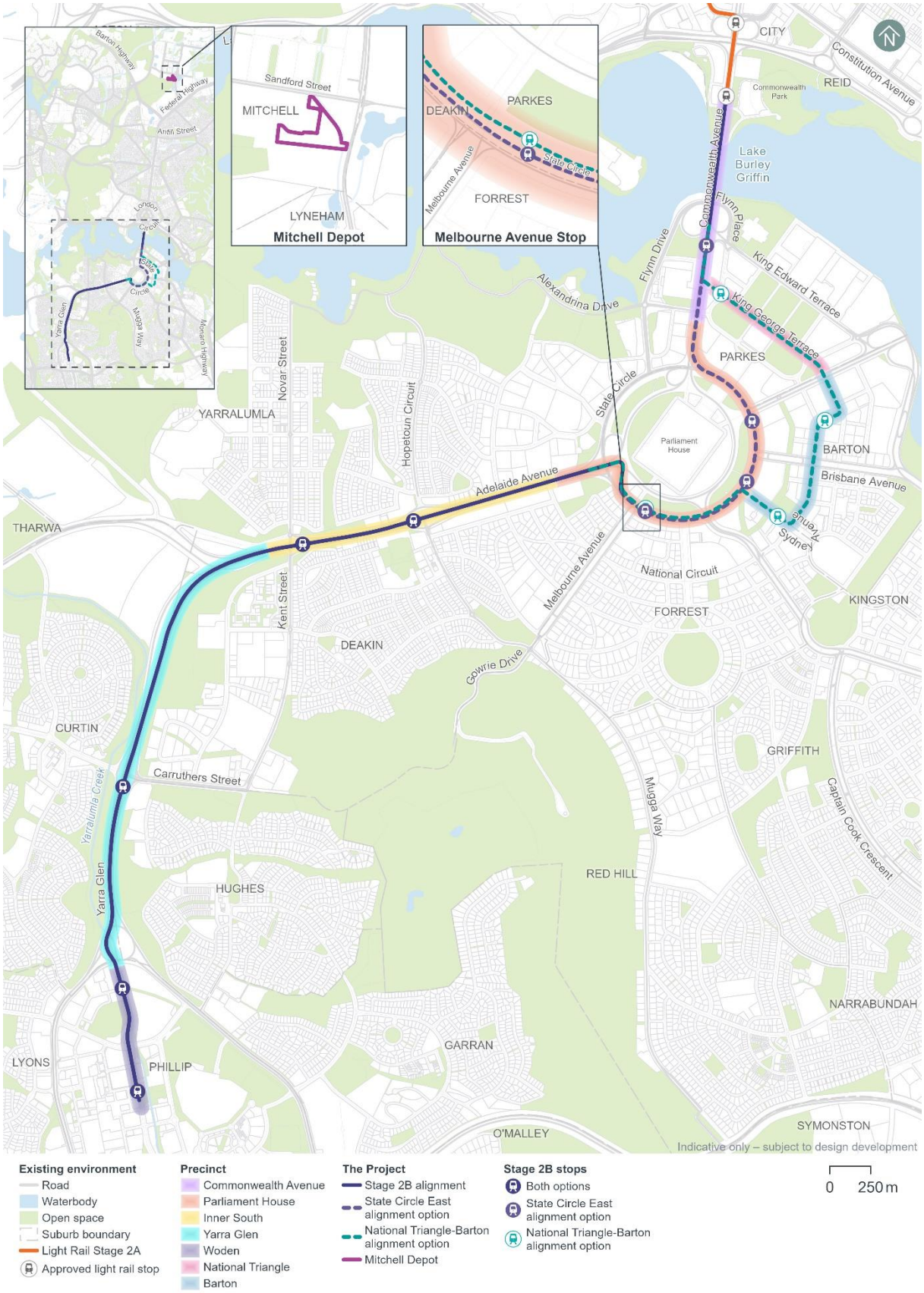


Figure 9-1 Overview of Project precincts and two alignment options

9.1.4 General approach to impact assessment

The general approach to this environmental impact assessment has included:

- Describing the Project
- Undertaking a preliminary environmental risk assessment (ERA) based on early design to identify likely key issues for further assessment and appropriate level of assessment
- Describing the baseline environmental conditions within and around the Project area, against which the potential impacts of the Project can be assessed
- Identifying and assessing potential impacts, with reference to existing environmental conditions
- Assessing the significance of the potential construction and operational impacts
- Identifying measures to mitigate, manage, avoid, and/or offset these impacts
- Assessing residual environment risks.

Environmental issues have been reported at a precinct level, where reasonable, to make it clearer and easier for local communities and other stakeholders along the alignment to determine how they might be affected by the Project. In some instances, environmental issues and specific impacts have been considered for the Project as a whole in Chapter 11 (Project-wide issues). This includes:

- Environmental impacts that would generally be applicable for the whole Project, are very similar, or are unable to be reported at a precinct level with specified precinct boundaries. For example, impacts associated with materials, waste and resource use; hazards and risks to the project; and the potential impacts of climate change on the Project relate to construction and operation of the Project as a whole, rather than being relevant to an individual precinct
- Environmental impacts that would occur at a regional level and/or at a broader geographic scale than the precincts. For example, air quality impacts that could occur across the ACT as a whole, and a whole of Project conclusion summarising the total impact to biodiversity, have been included in Chapter 11 (Project-wide issues).

Some environmental impacts have been considered at both a Project-wide and precinct level. For example, traffic and transport impacts that could occur regionally, such as changes to travel time, have been included in Chapter 11 (Project-wide issues). Traffic and transport impacts that could occur within a precinct locally, such as changes to intersection performance, have been included in precinct specific chapters. A summary of issues assessed in this EIS and whether these have been considered on a precinct or Project-wide basis is outlined in Table 9-1.

Table 9-1 Summary of how environmental issues have been considered in this Environmental Impact Statement

Issue	Project-wide	Precinct
Traffic and transport	●	●
Biodiversity	●	●
Historic heritage	●	●
First Nations heritage	●	
Hydrology, flooding, water quality and groundwater	●	
Soils and contamination	●	
Socioeconomic	●	●
Land use and property	●	

Issue	Project-wide	Precinct
Air quality	●	
Climate change risk	●	
Greenhouse gas generation	●	
Materials, waste and resources	●	
Hazards and risk	●	
Noise and vibration		●
Landscape character and visual amenity		●

The Scoping Document issued by the TPA identifies environmental themes for assessment. Some of these themes have been grouped together for assessment in this EIS where they are similar in nature. These include the following:

- Assessment of Scoping Document requirements relating to 'trees' have been incorporated into both biodiversity and landscape character and visual amenity assessments (refer to Technical Report 5 – Biodiversity, Technical Report 10 – Landscape character and visual amenity, and the Public Domain Master Plan (Appendix I)). This is due to the interrelated nature of trees to biodiversity and landscape character
- Scoping Document requirements relating to 'lighting' have been assessed in Technical Report 10 – Landscape character and visual amenity due to their relevance to this assessment, which considers visual amenity at night time
- Scoping Document requirements relating to 'utilities and services' and 'bushfire' have been incorporated into the assessment of hazards and risk in Chapter 11 (Project-wide issues). Each of these issues present a hazard or risk to the Project and would have similarities in their proposed management approaches.

Appendix D (EIS cross references) includes details of where each Scoping Document requirement has been addressed in the EIS.

9.1.5 EPBC Act protected matters

As described in Chapter 8, the relevant controlling provisions identified for assessment in the EIS under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are:

- The following MNES
  - National heritage places
  - Listed threatened species and ecological communities
  - The environment of Commonwealth land (whole of the environment).

The following section summarises where impacts to these matters are assessed in the EIS, with reference to relevant Department of Climate Change, Energy, the Environment and Water (DCCEEW) guidelines.

Chapter 22 (Summary of assessment and residual impacts) also provides a summary of the assessment outcomes of this EIS with respect to these matters.

Significant impact guidelines 1.1 (Department of Environment, 2013a) provide a definition of 'significant impact' and identify a set of criteria for each MNES and other relevant protected matters to determine whether the project is likely to have such an impact. A checklist of the nine MNES and other relevant

protected matters, and corresponding chapters of this EIS that provide relevant assessment information is provided in Table 9-2, noting that not all MNES are relevant to the Project as outlined below.

Table 9-2 EPBC Protected Matters checklist

EPBC ACT controlling provision	Relevant EIS Chapters/Sections
MNES	
World Heritage properties	This MNES is not applicable as there are no World Heritage properties within the vicinity or with the potential to be impacted by the Project.
National Heritage Places	Section 14.5 (Historic heritage) in Chapter 14 (National Triangle precinct) Technical Report 3 – Heritage
Wetlands of International importance	This MNES is not applicable as there are no Wetlands of International importance within the vicinity or with the potential to be impacted by the Project.
Listed threatened ecological communities	Section 11.2 (Biodiversity) in Chapter 11 (Project-wide issues), and precinct-specific biodiversity sections in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 2 – Biodiversity
Listed threatened species	
Listed migratory species	
Great Barrier Reef Marine Park	This MNES is not applicable as the Project is located over 1,100km from the Great Barrier Reef Marine Park.
Nuclear action (including uranium mining)	This MNES is not applicable as the Project does not propose any nuclear actions.
Commonwealth marine areas	This MNES is not applicable as the Project is located over 130km from the nearest Commonwealth marine area.
A water resource, in relation to coal seam gas development and large coal mining development	This MNES is not applicable as the Project does not include coal seam gas development or large coal mining development.
Other relevant protected matters	
The environment of Commonwealth land	Refer to Table 9-3 below
Commonwealth action	This protected matter is not applicable as the action is not being undertaken by a Commonwealth agency.
Commonwealth Heritage Places	Section 11.3 (Historic heritage) and Section 11.4 (First Nations heritage) in Chapter 11 (Project-wide issues), and precinct-specific historic heritage sections in Chapter 12 (Commonwealth Avenue precinct) to Chapter 17 (Yarra Glen precinct) Technical Report 3 – Heritage
Listed marine species; Critical habitats; Commonwealth reserves – terrestrials; and Nationally important wetlands	This protected matter is not applicable as the Project does not impact any listed marine species, critical habitats, Commonwealth reserves – terrestrial; or Nationally important wetlands.

9.1.6 Impacts on the whole of the environment

Significant impact guidelines 1.2 (Department of Environment, 2013b) consider the whole of the environment impacts to be the "total adverse impact of the action in the entire context of the environment which will be impacted by the project, particularly those elements of the environment which are sensitive or valuable."

These guidelines are relevant to the Project as they apply to "an action taken by any person on Commonwealth land that is likely to have a significant impact on the environment" under subsection 26(1) of the EPBC Act.

The guidelines identify a set of criteria against the following aspects to determine whether the Project is likely to have a 'significant' impact on the environment:

- Landscapes and soils
- Coastal landscapes and processes
- Ocean forms, ocean processes and ocean life
- Water resources
- Pollutants, chemicals and toxic substances
- Plants
- Animals
- People and communities
- Heritage.

A checklist of the specific significance criteria, and corresponding chapters of this EIS that provide relevant assessment information is provided in Table 9-3.

Table 9-3 Whole of environment checklist

Environmental element	Relevant EIS chapters
Impacts on landscapes and soils	
Is there a real chance or possibility that the action will:	
• Substantially alter natural landscape features	Precinct-specific landscape and visual impact assessment sections in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 10 – Landscape character and visual amenity
• Cause subsidence, instability or substantial erosion, or	The project is unlikely to involve excavation of a scale that would result in subsidence, instability or substantial erosion.
• Involve medium or large-scale excavation of soil or minerals	Some excavation would be required to carry out the Project. The impact of this on soils and landscapes is considered in Section 11.6 (Soils and contamination) and Section 11.5 (Hydrology, flooding, water quality and groundwater).
Impacts on coastal landscapes and processes	
Is there a real chance or possibility that the action will:	
• Alter coastal processes, including wave action, sediment movement or accretion, or water circulation patterns • Permanently alter tidal patterns, water flows or water quality in estuaries	Not applicable as the Project is located over 100 km from the coast.

Environmental element	Relevant EIS chapters
• Reduce biological diversity or change species composition in estuaries, or • Extract large volumes of sand or substantially destabilise sand dunes.	
Impacts on ocean forms, ocean processes and ocean life	
Is there a real chance or possibility that the action will:	
• Reduce biological diversity or change species composition on reefs, seamounts or in other sensitive marine environments • Alter water circulation patterns by modification of existing landforms or the addition of artificial reefs or other large structures • Substantially damage or modify large areas of the seafloor or ocean habitat, such as sea grass • Release oil, fuel or other toxic substances into the marine environment in sufficient quantity to kill larger marine animals or alter ecosystem processes, or • Release large quantities of sewage or other waste into the marine environment.	Not applicable as the Project is located over 100 km from the ocean.
Impacts on water resources	
Is there a real chance or possibility that the action will:	
• Measurably reduce the quantity, quality or availability of surface or ground water • Channelise, divert or impound rivers or creeks or substantially alter drainage patterns, or • Measurably alter water table levels	Section 11.5 (Hydrology, flooding, water quality and groundwater)
Pollutants, chemicals, and toxic substances	
Is there a real chance or possibility that the action will:	
• Generate smoke, fumes, chemicals, nutrients, or other pollutants which will substantially reduce local air quality or water quality	Section 11.9 (Air quality)
• Result in the release, leakage, spillage, or explosion of flammable, explosive, toxic, radioactive, carcinogenic, or mutagenic substances, through use, storage, transport, or disposal	Section 11.6 (Soils and contamination), Section 11.12 (Materials, waste and resources), and Section 11.13 (Hazards and risk)
• Increase atmospheric concentrations of gases which will contribute to the greenhouse effect or ozone damage, or	Section 11.11 (Greenhouse gas generation)
• Substantially disturb contaminated or acid-sulphate soils	Section 11.6 (Soils and contamination)

Environmental element	Relevant EIS chapters
Impacts on plants	
Is there a real chance or possibility that the action will:	
• Involve medium or large-scale native vegetation clearance • Involve any clearance of any vegetation containing a listed threatened species which is likely to result in a long-term decline in a population or which threatens the viability of the species • Introduce potentially invasive species • involve the use of chemicals which substantially stunt the growth of native vegetation, or	Section 11.2 (Biodiversity) and precinct-specific biodiversity sections in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 2 – Biodiversity
• Involve large-scale controlled burning or any controlled burning in sensitive areas, including areas which contain listed threatened species?	Not applicable as the Project would not involve any large-scale controlled burning.
Impacts on animals	
Is there a real chance or possibility that the action will:	
• Cause a long-term decrease in, or threaten the viability of, a native animal population or populations, through death, injury or other harm to individuals • Displace or substantially limit the movement or dispersal of native animal populations • Substantially reduce or fragment available habitat for native species • Reduce or fragment available habitat for listed threatened species which is likely to displace a population, result in a long-term decline in a population, or threaten the viability of the species • Introduce exotic species which will substantially reduce habitat or resources for native species, or	Section 11.2 (Biodiversity) and precinct-specific biodiversity sections in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 Technical Report 2 – Biodiversity
• Undertake large-scale controlled burning or any controlled burning in areas containing listed threatened species?	Not applicable as the Project would not involve any large-scale controlled burning.
Impacts on people and communities	
Is there a real chance or possibility that the action will:	
• Substantially increase demand for, or reduce the availability of, community services or infrastructure which have direct or indirect impacts on the environment, including water supply, power supply, roads, waste disposal, and housing	Section 11.12 (Materials, waste and resources) Section 11.7 (Socioeconomic) and precinct specific socioeconomic assessments in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 6 – Socioeconomic Chapter 20 (Cumulative impacts) (refer to Section 20.2 which assesses facilitated impacts)

Environmental element	Relevant EIS chapters
• Affect the health, safety, welfare or quality of life of the members of a community, through factors such as noise, odours, fumes, smoke, or other pollutants	Section 11.7 (Socioeconomic) and precinct specific socioeconomic assessments in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 6 – Socioeconomic Section 11.13 (Hazards and risk)
• Cause physical dislocation of individuals or communities, or	The Project would not involve residential or private property acquisition that would physically displace individuals or communities
• Substantially change or diminish cultural identity, social organisation or community resources?	Section 11.7 (Socioeconomic) and precinct specific socioeconomic assessments in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Technical Report 6 – Socioeconomic
Impacts on heritage	
Is there a real chance or possibility that the action will:	
• Permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place • Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place • Involve the erection of buildings or other structures adjacent to, or within important sight lines of, a heritage place which are inconsistent with the heritage values of the place • Substantially diminish the heritage value of a heritage place for a community or group for which it is significant • Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place, or • Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site?	Section 11.3 (Historic heritage) and precinct specific historic heritage assessments in Chapter 12 (Commonwealth Avenue precinct) to Chapter 19 (Mitchell Depot site) Section 11.4 (First Nations heritage) Technical Report 3 – Socioeconomic

9.2 Environmental risk assessment

The environmental risk assessment carried out prior to and during the preparation of this EIS has been developed and refined in stages to identify and evaluate potential environmental risks associated with the Project:

- Firstly, a preliminary ERA was prepared to support early scoping of the environmental impact assessment for the Project and regulatory submissions under the *Environmental Planning and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) and *Planning Act 2023* (ACT) (Planning Act)
- The preliminary ERA was revised to:
  - Respond to additional risks identified by TPA in the Scoping Document issued under the Planning Act, and assessment requirements issued under the EPBC Act
  - Reflect the evolution of the Project design
  - Include information from ongoing environmental investigations.
- Finally, a residual ERA has been prepared to evaluate risks remaining after applying mitigation measures identified in the EIS.

Appendix J (Environmental risk assessment) outlines the methodologies applied to assess the likelihood and consequence of identified risk scenarios, and provides an overview of both the preliminary (pre-mitigation) and residual (post-mitigation) risks during construction and operation of the Project, demonstrating where potential risks would likely be reduced following the implementation of mitigation measures.

10.0 Assessment methodologies

10.1 General assessment methodology

This Environmental Impact Statement (EIS) presents a series of impact assessments for environmental issues of relevance to the Project. As outlined in Chapter 9 (Approach to the environmental assessment), impact assessments have been carried out for issues relevant at a Project-wide level, and within separate Project precincts. Impact assessments for each relevant issue are presented in Part B (Environmental impact assessment).

A preliminary environmental risk assessment (ERA) has been used as a tool to identify key environmental issues for the Project, to be assessed in detail in this EIS (refer to Appendix J (Environmental risk assessment)).

The ERA has been used as an input into each impact assessment, with the outcomes of the impact assessment and the application of mitigation measures used to inform the residual risk assessment (refer to Appendix J (Environmental risk assessment)). The approach to the ERA has been further outlined in Chapter 9 (Approach to the environmental assessment).

Broadly, each impact assessment has followed the multi-step process summarised on Figure 10-1.

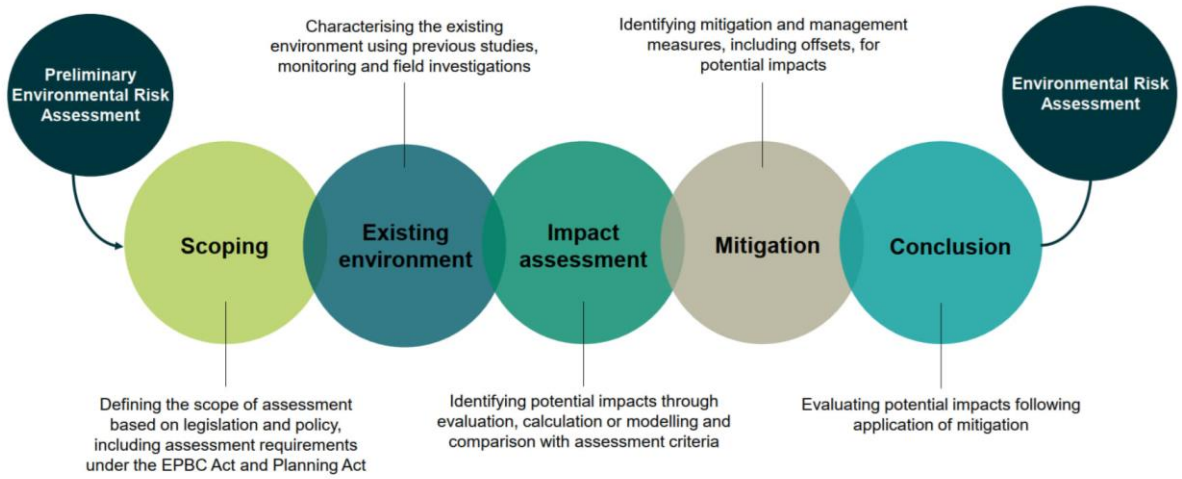


Figure 10-1 General assessment methodology

Environmental management and mitigation measures to be implemented in the detailed design, construction, and operational phases of the Project are identified in Chapter 21 (Environmental management and mitigation measures). Chapter 23 (Justification and conclusion) presents a balanced view of the Project's potential environmental impacts, considering both the positive and negative implications of the Project identified through each individual impact assessment.

10.2 Summary of methodologies

Table 10-1 summarises the methodology applied to each impact assessment included in Part B (Environmental impact assessment). Where a technical report has been prepared for an issue, the summary in Table 10-1 is supplemented with a more detailed description of the methodology in the technical report, including key assumptions. The assessments undertaken have adopted a conservative approach, incorporating higher probabilities of, and more severe impacts to the environment to account for any uncertainties in data, predictions or construction assumptions. This approach has allowed for comprehensive risk management but may result in risks appearing more significant than they are likely to be in practice.

Assessment methodologies have been developed to respond to EIS requirements issued under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Planning Act 2023* (ACT), as well as other applicable legislation and policies. Appendix B (Scoping Document) and Appendix C (EIS Guidelines) provide copies of the EIS requirements, and Appendix D (EIS cross references), details where each requirement has been addressed in this EIS.

Table 10-1 Summary of assessment methodologies

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Traffic and transport		
Section 11.1 of Chapter 11 (Project-wide issues) Precinct chapters in Part B (Environmental impact assessment) Section 3 of Technical Report 1 – Traffic and transport	• *2021 Australian Infrastructure Plan* (Infrastructure Australia, 2021) • *ACT Infrastructure Plan 2019* (ACT Government, 2019a) • *Guidelines for Traffic Impact Assessment* (TCCS, 2020b) • *ACT Transport Strategy 2020* (TCCS, 2020a) • *Active Travel Plan 2024-2030* (TCCS, 2023a) • *ACT Planning Strategy 2018-2025* (EPSDD, 2018), and relevant associated District Strategies. • *Population: Census* (ABS, 2021)	**Existing environment** • Define a study area for the assessment, based on the Project area with an additional buffer incorporated • Describe the baseline traffic and transport conditions for the study area, including road network and intersection performance, public transport network and travel times, active transport conditions, on-street and off-street parking, kerbside uses and access and road safety. This included summarising outcomes of 2017 (base year) weekday traffic modelling for the study area **Impact assessment** • Carry out traffic modelling to consider representative future traffic scenarios for 2031 and 2041 with and without the Project, including: - A Zenith strategic model to generate the future year travel demand based upon employment and population distribution - An Aimsun mesoscopic model to assign forecast traffic volumes across the broader transport network and to determine network performance at a high level - A VISSIM microsimulation model to provide a more detailed understanding of the forecast road network performance and light rail performance • For construction: - Review the likely construction methodology, program, staging and traffic arrangements, haulage routes and construction related vehicle volumes for the Project - Assess the impact of the proposed construction worker parking arrangements - Qualitatively assess the impacts of construction on property access, local area access (including for mobility impaired people), active transport, public transport, on-street and off-street parking, and road safety - Summarise the outcomes of the 2031 construction traffic modelling for the study area including: ▪ Traffic volume changes on the road network ▪ Network wide performance statistics (such as vehicle kms travelled, total vehicle travel time, average vehicle speeds and the total traffic demand) ▪ General vehicle travel times on key routes within the study area

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
		▪ Public transport travel times ▪ Mid-block metrics ▪ Intersection performance metrics • For operation: - Multi-modal assessment of the forecast traffic and transport conditions, including road network, public transport, active transport, parking, property access, and local area access - Summarise the outcomes of the 2031 and 2041 with and without Project traffic modelling scenarios for the study area including: ▪ Network wide statistics (such as vehicle kms travelled, total vehicle travel time, average vehicle speeds and the total traffic demand) ▪ General vehicle travel times on representative routes within the study area ▪ Public transport travel times ▪ Mid-block metrics ▪ Intersection performance metrics ▪ Active travel connectivity and impacts - Discuss the likely impact of the Project on road safety within the study area. **Mitigation** • Identify mitigation and management measures which can be applied to minimise traffic and transport impacts.
Biodiversity		
Section 11.2 of Chapter 11 (Project-wide issues) Precinct chapters in Part B (Environmental impact assessment)	• *Matters of National Environmental Significance, Significant Impact Assessment Guidelines 1.1* (DoE, 2013) • *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (Synemon plana) (DEWHA, 2009) • *Survey Guidelines for Australia's Threatened Reptiles: Guidelines for Detecting Reptiles Listed as Threatened under the Environment*	**Existing environment** • Carry out a desktop review to identify any known biodiversity values of relevance to the Project area. This has included searching relevant databases, species profiles for fauna species and populations, species habitat preferences, and other information relating to the Project area • Conduct an initial assessment of the likelihood of occurrence of listed threatened ecological communities, populations, species, and their habitats that may occur within or in proximity to the Project area in a manner that may be affected by construction and/or operation of the Project • Conduct field surveys (by qualified ecologists) to confirm the presence and extent of native vegetation and the ecological communities, species and species habitat that occur or have the potential to occur within the Project area

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Section 3 of Technical Report 2 – Biodiversity	*Protection and Biodiversity Conservation Act 1999* (DSEWPaC, 2011a) • *ACT Native Woodland Conservation Strategy and Action Plan* (ESPDD, 2019d) • *Loss of Mature Trees Key Threatening Process: Draft Action Plan* (EPSDD, 2023g) • *Environmental Offsets Policy* (EPD, 2015a) • *ACT Environmental Offsets Calculator Assessment Methodology* (EPD, 2015b) • *Biodiversity Sensitive Urban Design Guideline* (EPSDD, 2023f) • *Guide to providing maps and boundary data for EPBC Act projects* (DAWE, 2021a) • Conservation advice, national recovery plans and action plans for relevant species (refer further to Technical Report 2 – Biodiversity).	• Describe the ecological values within and adjacent to the Project area, including native vegetation, habitat values, local and regional habitat connectivity, listed threatened communities, species, populations, and their habitats • Identify registered, protected trees, and Mature Native Trees within the clearance footprint (as defined in Section 11.2) • Identify relevant threatened ecological communities, species, and their habitats protected under the EPBC Act and *Nature Conservation Act 2014* (ACT) that occur, or may occur, within proximity to the Project • Undertake an assessment of all hollow-bearing trees within the Project area, with the potential to be used by Gang-gang Cockatoos for breeding • Carry out targeted threatened species surveys in accordance with applicable survey guidelines for relevant listed threatened species identified through the initial assessment of likelihood of occurrence and informed by vegetation communities and habitat values/resources identified through field surveys. **Impact assessment** • Assess the potential direct and indirect impacts of the Project on biodiversity and identified ecological values during construction and operation. The assessment includes consideration of: - Vegetation removal required for the Project - Direct and indirect impacts of the Project on fauna species likely to occur within or adjacent to the Project area, including any burrowing mammals - Impacts on clearing of potential habitat for migratory species identified within the wider locality of the Project - Impact of weed spread due to soil disturbance and any key habitat that is at risk of being affected - Removal of trees, including registered and protected trees, Mature Native Trees, and hollow-bearing trees, and the implications for breeding habitat and connectivity. **Mitigation** • Document how the design process has avoided biodiversity impacts to date • Identify mitigation and management measures which can be applied to minimise biodiversity impacts • Identify residual biodiversity impacts that may require biodiversity offsets, and quantify the extent of offsets that may be required

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
		• Based on identified residual biodiversity impacts, develop a biodiversity offsets strategy.
Historic heritage		
Section 11.3 of Chapter 11 (Project-wide issues) Precinct chapters in Part B (Environmental impact assessment) Section 2 of Technical Report 3 – Heritage	• *Heritage Act 2004* (ACT) • *Planning Act 2023* (ACT) • *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) • *Environment Protection and Biodiversity Conservation Act 1999* (Cth) • Various heritage and conservation management plans for assessed heritage items/places and areas of heritage sensitivity (refer further to Technical Report 3 – Heritage).	**Existing environment** • Review relevant existing information to provide heritage context, including design documentation and previous heritage studies • Research heritage listings associated with the Project area, on heritage nominations, and in relevant databases, via primary and secondary historical research • Identify the condition, integrity, and sensitivity to change of existing heritage values within the Project area • Conduct research including: - Review of Technical Report 2 - Biodiversity - Review of Appendix I (Public Domain Master Plan) and draft concept design documentation - Examination of historical imagery and aerial photos to chart landscape change over the locations - Searches of databases of the Australian Heritage Council and ACT Government - Site visits to identify and assess the natural heritage values on or adjacent to the Project area. **Impact assessment** • Assess the potential direct and indirect impacts of the Project on identified heritage and natural heritage values during construction and operation. Consideration of potential impacts includes direct/indirect, cumulative, temporary/permanent, reversible/irreversible, visual, physical, social, and cultural impacts that may occur as a result of the Project • Determine a heritage impact statement considering degree and intensity of impacts, and the relative level of severity of the potential impacts in terms of scale, intensity, timing, duration and frequency. **Mitigation** • Identify mitigation and management measures which can be applied to minimise historic heritage and natural heritage impacts.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
First Nations heritage		
Section 11.4 of Chapter 11 (Project-wide issues) Section 1.4 of Appendix D of Technical Report 3 – Heritage, and Section 2 of Technical Report 3 – Heritage	• *Heritage Act 2004* (ACT) • *Planning Act 2023* (ACT) • *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) • *Environment Protection and Biodiversity Conservation Act 1999* (Cth)	**Existing environment** • Review relevant existing information including historical timelines, landscape information, design documentation, and previous heritage studies • Consult Representative Aboriginal Organisations (RAOs) for the cultural significance of the landscape • Research archaeological sites associated with the study area, on heritage nominations, and in relevant databases, via primary and secondary historical research. **Impact assessment** • Describe the potential direct and indirect impacts of the Project on identified First Nations heritage values during construction and operation. **Mitigation** • Identify mitigation and management measures which can be applied to minimise First Nations heritage impacts.
Hydrology, flooding, water quality, and groundwater		
Section 11.5 of Chapter 11 (Project-wide issues) Section 2.3 of Technical Report 4 – Hydrology, flooding, and water quality	• *National Water Quality Management Strategy* (Cth) • *Australian and New Zealand Guidelines for Fresh and Marine Water Quality Framework* (Australian and New Zealand Guidelines, 2018) (Cth) • *Australian Disaster Resilience Handbook* (Australian Institute of Disaster Resilience, 2017) (Cth) • *Managing Urban Stormwater: Soils and Construction – Volume 1 (Blue Book)* • *Managing Urban Stormwater: Main Roads Construction – Volume 2D*	**Existing environment** • Characterise the existing climate, topography, soils, geology, hydrology, hydrogeology, water quality, groundwater, and sensitive receiving environments • Establish land use change and development scenarios relevant to hydrology, flooding, water quality, and groundwater, and land use/development change at the commencement of construction and the commencement of operation • For hydrology and water quality: - Desktop review of publicly available information on water quality of surface waters, groundwater, existing catchment conditions, and land use - Definition of the catchments and identification of downstream environments and water users potentially impacted by the Project - Mapping of the present water bodies within or adjacent to the Project area - Definition of the area that influences the soil, surface water, and groundwater environments - Description of current water flow within and across the Project area

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
	• *Municipal Infrastructure Standards 08 (MIS08), Stormwater, Transport Canberra and City Services, April 2019* • *ACT Water Sensitive Urban Design General Code 2020* • *ACT Guidelines for Recreational Water Quality* • *ACT EPA Water Quality Environment Protection Policy.*	• For flooding: - Description of the catchments that would be impacted by the Project and identification of upstream and downstream environments potentially impacted by the Project - Review of relevant existing flood studies and description of flood behaviour for the existing conditions. **Impact assessment** • For hydrology and water quality: - Identification of potential impacts of construction activities on surface water environments - Assessment of changes to hydrology within the Project area and surrounding catchments during construction - Identification of potential impacts of operational activities on surface water environments - Identification of potential impacts of the design and operational activities on surface water environments. This includes potential impact on water quality with reference to the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality Framework* (Australian and New Zealand Guidelines, 2018) for protection of the relevant environmental values - Assessment of changes to hydrology within the Project area and surrounding catchments during operation • For flooding: - Identification of potential impacts of construction activities on existing flow paths and flooding - Identify changes to flooding conditions as a result of operational Project infrastructure, including potential changes to flood depths, extents, hazards and private property affectation. This includes assessment of 1% Annual Exceedance Probability (AEP), 5% AEP, and 1% AEP with 20% factor for climate change events • For groundwater: - Identification of potential impacts on groundwater resources, considering components of Project construction and operation that have the potential to intercept groundwater.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
		Mitigation • Identify mitigation, monitoring and management measures to manage potential hydrological, flooding, water quality, and groundwater impacts.
Soils and contamination		
Section 11.6 of Chapter 11 (Project-wide issues) Section 2.2 of Technical Report 5 – Contamination	• *Contaminated Sites Environment Protection Policy* (EPP) (ACT EPA, 2017) • *Information sheet 7 – Guidance for undertaking preliminary contamination investigations in the ACT* (ACT EPA, 2022a) • *Information sheet 11 – EPA Report Submission Requirements* (ACT EPA, 2022b) • *Per- and polyfluoroalkyl substances (PFAS) National Environmental Management Plan* (Heads of Environmental Protection Authorities, 2020) • *National Environment Protection (Assessment of Site Contamination) Measure 1999* (National Environmental Protection Council , 2013) • *Environmental Standards: Assessment and Classification of Liquid and Non-Liquid Waste* (EPSDD, 2021)	**Existing environment** • Review the relevant regulatory framework and guidelines, and publicly available data • Identify existing soil landscapes, and review of previous contamination assessments and publicly available data • Site inspection to ground truth information collected during the desktop assessment and review current land uses and condition. **Impact assessment** • Develop a conceptual site model and assessment of potential contamination risks and potential impacts to existing contamination and exposure risks to environmental and human health receptors • Identify low, medium, and high risk sites including recommendations for additional investigations and/or management based on the site risk rating, and with consideration to the intended land use/future exposure scenarios at the relevant location • Identify the potential to disturb acid sulfate and saline soils and the associated impacts during construction • Review the potential impacts associated with erosion and sedimentation during construction. **Mitigation** • Identify management and mitigation measures to address potential soils and contamination impacts.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Socioeconomic		
Section 11.7 of Chapter 11 (Project-wide issues) Precinct chapters in Part B (Environmental impact assessment) Section 4 of Technical Report 6 – Socioeconomic	• *International Association for Impact Assessment's Social Impact Assessment: Guidance for assessing and managing the social impacts of projects* (IAIA, 2015) • *NSW Department of Planning and Environment's Social Impact Assessment Guideline* (DPE, 2021) • *ACT Wellbeing Framework 2020* (EPSDD, 2019a)	**Existing environment** • Identify the area of social influence for the Project and the social and economic baseline by collating and analysing demographic data, including human, social, economic, physical, and natural capital present, as well as social infrastructure • Analyse the results of community consultation carried out for the Project • Carry out business surveys to inform the assessment of business and economic impacts. **Impact assessment** • Scope the potential socioeconomic impacts of the Project, based on review of technical studies carried out for the EIS, results of community and stakeholder consultation, literature and other comparable projects • Determine likelihood and magnitude of each impact when unmitigated, considering the likely population to be affected, impact characteristics, and the potential level of significance of the potential impact • Identify and assess socioeconomic benefits of the Project • Evaluate economic impacts to adjacent businesses, with consideration of business survey results. **Mitigation** • Identify management and mitigation measures to address potential socioeconomic impacts, and where relevant, to enhance potential benefits • Assess the residual impacts after mitigation (or enhancement) measures have been applied.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Land use and property		
Section 11.8 of Chapter 11 (Project-wide issues)	• *National Capital Plan 1990* (Cth) • *Territory Plan 2023* (ACT)	**Existing environment** • Determine the planning context, existing and future land uses, key recreational uses, and planning and development status of the Project area and surrounds. **Impact assessment** • Assessment of potential impacts to properties, recreational facilities and property amenity, and changes to land use during construction and operation stages. **Mitigation** • Identify mitigation measures to address potential land use and property impacts.
Air quality		
Section 11.9 of Chapter 11 (Project-wide issues)	• *Guidance on the assessment of dust from demolition and construction* (Application of the UK Institute of Air Quality Management (IAQM) (2024))	**Existing environment** • Review and summarise recent local meteorological data from Canberra Airport and Tuggeranong Bureau of Meteorology weather stations • Analysis of CALMET meteorological model wind speed and wind direction data for the Project area • Review and summarise background air quality from the ACT Government's network of monitoring stations. **Impact assessment** • Carry out a construction dust risk assessment to assess the potential dust risk associated with dust spoiling and human health impacts to human receptors as well as ecological receptors, using the UK Institute of Air Quality Management (IAQM) (2024) guidance. The assessment includes consideration of seasonal and meteorological variations that influence local air quality • Qualitative assessment of potential combustion emissions from mobile and plant equipment from construction activities • Qualitative assessment of potential air quality impacts from operation including: - Vehicle emissions associated with maintenance and operation of the light rail and positive changes to road network due to uptake of public transport - Fine dust emissions from operation of the light rail and operation of sandboxes fitted close to wheels on locomotives.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
		Mitigation • Identify mitigation and management measures to address potential air quality impacts during construction and operation.
Climate change risk		
Section 11.10 of Chapter 11 (Project-wide issues) Section 2.2 of Technical Report 7 – Climate change risk	• *National Climate Resilience and Adaptation Strategy 2021-2025* (DAWE, 2021) • *Climate Change Risk Assessment for the ACT* (AECOM, 2022b) • *ACT Climate Change Strategy 2019-2025* (EPSDD, 2019b) • *Canberra's Living Infrastructure Plan: Cooling the City* (EPSDD, 2019c) • *ACT Urban Forest Strategy 2021-2045* • *Territory Wide Risk Assessment 2017* (JCSD, 2017)	**Existing environment** • Desktop analysis of vulnerability and resilience for assets, people, operations, and services impacted by the Project, including a review of impacts from historical extreme weather events • Analysis of historical climate data including hazard mapping such as flood and bushfire mapping. The analysis also identifies the relevant climate projections to establish baseline and two future time horizons (near-future and far future), reflective of the climate projections available and the design life of the Project • Analysis of climate projections specific to the study area to develop understanding of the exposure and vulnerability of the study area to climate change hazards. **Impact assessment** • Develop a climate change risk register and preliminary assessment of the risk statements using a risk evaluation matrix, consequence, and likelihood criteria • Consider potential contributions from the Project to climate change, taking into account greenhouse gas emissions calculations and effects such as urban heat and changes to local microclimates. **Mitigation/adaptation** • Identify adaptation measures to address highly probable and consequential natural disaster risks through design, construction, and operation • Reassessment of climate change risks to understand the residual risk levels after adaptation actions are implemented • Identify management and mitigation measures to manage climate change risk.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Greenhouse gas generation		
Section 11.11 of Chapter 11 (Project-wide issues) Section 3.3 of Technical Report 8 – Greenhouse gas	• United National Framework Convention on Climate Change (UNFCC), Kyoto Protocol and Paris Agreement • National Greenhouse and Energy Reporting Scheme (NGERS) and *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (as amended 1 July 2021) under the *National Greenhouse and Energy Reporting Act 2007* (Cth) • *Climate Active Carbon Neutral Standard for Products and Services* (Climate Active, 2022) • Zero Emissions Government Fund (ACT Government) • *ACT Climate Change Strategy 2019-2025* (EPSDD, 2019b) • Climate Change and Greenhouse Gas Reduction Act 2010 (ESDD, 2010).	**Existing environment** • Summarise relevant legislative and strategic context including international, national, and ACT policies **Impact assessment** • Calculate greenhouse gas inventory for Scope 1, Scope 2, and Scope 3 emissions, including: - Combustion of liquid fuels from stationary and mobile plant equipment and international shipping of key construction components such as steel rails and light rail vehicles (LRVs) - Power consumption from the electricity grid (noting electricity in the ACT is 100% renewable and effective greenhouse gas emissions would be negligible) - Embodied energy of materials, construction and demolition waste, and additional LRVs and batteries - Vegetation (including tree) removal - Replanting of trees and vegetation (carbon sink). **Mitigation** • Identify management and mitigation measures to minimise greenhouse gas emissions.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Materials, waste, and resources		
Section 11.12 of Chapter 11 (Project-wide issues)	• *ACT Waste Management Strategy 2011-2025* (ESDD, 2011) • *ACT Circular Economy Strategy 2023-2025* (TCCS, 2023c) • *Assessment and Classification of Liquid and Non-Liquid wastes guideline* (EPSDD, 2021)	**Existing environment** • Identify existing waste management facilities relevant to Project waste streams • Summarise relevant legislative and strategic context including ACT policies. **Impact assessment** • Identify indicative resource use requirements of the Project during construction and operation • Identify of potential waste and material types, and preliminary waste classification in accordance with relevant legislation and guidelines. • Estimation of quantities of excess spoil from preliminary cut and fill estimates • Identification of environmental issues and consequences if demand for resources or waste generation is not managed appropriately. **Mitigation** • Identification of waste and materials management and mitigation measures • Identification of measures to avoid, reduce, and manage wastes and material use in accordance with circular economy principles.
Hazards and risk		
Section 11.13 of Chapter 11 (Project-wide issues)	• *Australian Dangerous Goods Code 2022* • Australian Standard (AS)/New Zealand Standard (NZS) 7000:2016 Overhead Line Design • *ICNIRP Guidelines* (International Commission on Non-Ionizing Radiation Protection, 2010) • *IEEE Standard for Safety Levels With Respect to Human Exposure to Electromagnetic Fields* (Institute of Electrical and Electronics Engineers, 2002)	**Existing environment** • Identify hazards and risks that may be present in the Project area and surrounds, and sensitive receivers that may be affected by Project-related hazards **Impact assessment** • Identify and assess construction and operational activities of the Project with the potential to cause impacts to receivers • Assess potential risk of the surrounding environment on the Project • Identification of key worker health and safety risks, based on the environmental context and indicative construction methodology (including planned activities and materials) for the Project • Identification of existing utilities and potential associated risks including disruption or disconnection during the construction phase • Establish high level security requirements of buildings relevant to the Project, for ongoing consideration as part of design development and construction planning.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
		Mitigation • Identify management and mitigation measures to address the identified potential hazards and risks.
Noise and vibration		
Precinct chapters in Part B (Environmental impact assessment) Section 4 of Technical Report 9 – Noise and vibration	• *Noise Measurement Manual* (NMM) (ACT EPA, 2009) • *AS 1055:2018 Acoustics – Description and measurement of environmental noise* (AS1055:2018) • *Interim Construction Noise Guidelines* (NSW ICNG) (DECC, 2009) • *Rail Infrastructure Noise Guideline* (NSW RING) (NSW EPA, 2013) • *Roads ACT Noise Management Guidelines* (RANMG) (TCCS, 2018) • *Road Noise Policy* (NSW RNP) (Transport for NSW, 2011) • *Noise Policy for Industry* (NSW NPfI) (NSW EPA, 2017) • *Assessing Vibration: A Technical Guideline* 2006 (NSW AVTG) (DEC, 2006) • *BS 6472:2008 – Guide to Evaluation of Human Exposure to Vibration in Buildings Part 1: Vibration Sources other than Blasting* (BS6472:2008) • *BS5228.2:2009 – Code of Practice for Noise and Vibration on Construction and Open Sites – Part 2: Vibration* (BS5228.2:2009) • *BS 7385-1:1990 - Evaluation and measurement for vibration in*	**Existing environment** • Identify noise and vibration sensitive receivers and suitable noise catchment areas, taking into account the Project precincts • Identify heritage structures, buildings, and values that may be affected by noise and vibration • Carry out attended and unattended measurements of existing ambient noise levels within the surrounding environment of the Project • Determine appropriate noise and vibration assessment levels for application to the Project. **Impact assessment** • For construction: - Calculate construction noise emissions using a Sound PLAN model and based on worst case construction scenarios, plant, and equipment - Assess unmitigated construction noise impacts at potentially affected receiver locations, having regard to noise assessment levels - Derive ‘safe working distances’ to achieve applicable vibration criteria at structures and vibration sensitive locations, and for human comfort, and consider potential achievement of these distances based on construction scenarios, plant, and equipment within each Project precinct. - Quantitatively assess construction traffic noise (screening of relative increases) based on construction traffic volumes and haulage routes • For operation: - Calculate operational noise emissions (LRVs) using the Nordic Rail Traffic Noise Prediction method (Nordic Kilde 130) implemented within SoundPLAN software - Assess unmitigated operational vibration, groundborne noise, and LRV noise emissions having regard to noise assessment levels derived consistent with relevant noise assessment guidelines for each Project precinct

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
	buildings. Guide for measurement of vibrations and evaluation of their effects on buildings (BS7385.1:1990) • *BS7385.2:2008 – Evaluation and Measurement for Vibration in Buildings Part 2: Guide to Damage levels from Groundborne Vibration* (BS7385.2:2008) • *DIN4150.3: 1999 – Structural Vibration – Part 3: Effects of Vibration on Structures* (DIN 4150:1999) • *AS2107: 2016: Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors* (AS2107:2016) • *AS2436:2010 – Guide to noise and vibration control on construction, demolition and maintenance sites* (AS2436:2010) • *AS/ ISO 2631.2:2014 – Mechanical Vibration and Shock – Evaluation of Human Exposure to Whole-Body Vibration – Part 2: Vibration in Buildings (1 Hz to 80 Hz)* (AS ISO2631.2:2014)	- Calculate operational road traffic noise changes (associated with changes to the road network proposed as part of the Project) using the Calculation of Road Traffic Noise (CoRTN) algorithm for any key new or realigned road - Assess unmitigated operational traffic noise emissions having regard to noise assessment levels derived consistent with relevant noise assessment guidelines for each Project precinct - Calculate operational noise emissions from fixed facilities having regard to noise assessment criteria. **Mitigation** • Identify mitigation and management measures which can be applied to minimise construction and operational noise and vibration impacts.

EIS sections	Key policies and guidelines[1]	Summary of assessment methodology
Landscape character and visual amenity		
Precinct chapters in Part B (Environmental impact assessment) Section 2.2 of Technical Report 10 – Landscape character and visual amenity	• *Environmental Impact Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA-N04* (Transport for NSW, 2023a) • *Landscape Design Guideline* (Transport for NSW, 2023b) • *Guidelines for Landscape and Visual Impact Assessment* (Third Edition) (Landscape Institute & Institute of Environmental Management and Assessment, 2013)	**Existing environment** • Analyse the regional and local context surrounding the Project, including describing the landscape character of the Project precincts, giving consideration to known heritage items and biodiversity values within the Project area • Identify representative viewpoints to assess visual impacts. Selection of these viewpoints considered their sensitivity, as well as the potential for impacts to be visible during construction and operation • Identify existing night-time visual amenity and lighting features within each precinct. **Impact assessment** • For landscape character impacts: - Evaluate landscape character impacts for each precinct, with respect to sensitivity to change and the magnitude of change that is likely to occur as a result of permanent (construction and operational) changes and infrastructure associated with the Project - Assign a rating for the quality of change to each precinct as a result of the Project • For visual impacts: - Evaluate potential visual impacts based on the sensitivity of each viewpoint (i.e. the visual receivers that it represents) to change and the magnitude of change likely to occur as a result of the Project during construction and operation • Evaluate potential night-time visual impacts during construction and operation. **Mitigation** • Identify mitigation and management measures which can be applied to minimise landscape character and visual impacts.

Note 1: This is not an exhaustive list of all relevant policies and guidelines. Only key policies and guidelines for the assessment methodology are listed here.