Prepared for

ACT Government
Major Projects Canberra

AECOM COX

RAISING LONDON CIRCUIT

ENVIRONMENTAL ASSESSMENT

Environmental Assessment

Client: Major Projects Canberra

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Prepared by

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06-Oct-2021

Job No.: 60656949

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Acronyms and Abbreviations

Acronym	Definition
ABS	Australian Bureau of Statistics
ACM	Asbestos containing materials
ACT	Australian Capital Territory
AEP	Annual exceedance probability
AHD	Australian height datum
ANU	Australian National University
ARR2019	Australian Rainfall Runoff 2019 methodology
ASGS	Australian Statistical Geography Standard
AWS	Automatic weather monitoring stations
BGL	Below ground level
BoM	Bureau of Meteorology
BRU	Beneficial reuse
CALMET	Computer Aided Learning in Meteorology
CBD	Central business district
CEMP	Construction Environmental Management Plan
CHL	Commonwealth Heritage List
CMTEDD	ACT Chief Minister, Treasury and Economic Development Directorate
CNHA	Climate and Natural Hazards Assessment
CoPC	Contaminants of potential concern
CPTED	Crime Prevention Through Environmental Design
CRA	ACT City Renewal Authority
CRG	Community Reference Group
Cth	Commonwealth
CTMP	Construction Transport Management Plan
DAWE	Australian Government Department of Agriculture, Water and the Environment
DITRDC	Australian Government Department of Infrastructure, Transport, Regional Development and Communications
EMP	Environmental Management Plan
EP Act	*Environment Protection Act 1997* (ACT)
EPA	Environment Protection Authority
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EPSDD	ACT Environment, Planning and Sustainable Development Directorate
ERM	Environmental Resources Management Pty Ltd
ESD	Ecologically sustainable development
GSM	Golden Sun Moth
HIA	Heritage Impact Assessment

Acronym	Definition
HMP	Heritage Management Plan
IAQM	UK Institute of Air Quality Management
IFD	Rainfall Intensity-Frequency-Duration Data
IPCC	Intergovernmental Panel on Climate Change
IRE	Industrial Relations and Employment
IS Rating Scheme	Infrastructure Sustainability Rating Scheme
ISC	Infrastructure Sustainability Council (formerly referred to as the Infrastructure Sustainability Council of Australia)
ISCA	Former name of the Infrastructure Sustainability Council (ISC)
JACS	ACT Justice and Community Services
LAA	Licensed Asbestos Assessor
LCZ	Landscape Character Zones
LVIA	Landscape Character and Visual Impact Assessment
MNES	Matters of National Environmental Significance
MPC	Major Projects Canberra
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
NCA	National Capital Authority
NCP	National Capital Plan
NEPM	National Environment Protection (Ambient Air Quality) Measure
NGA	National Greenhouse Accounts
NGER	National Greenhouse and Energy Reporting Scheme
NHL	National Heritage List
NPI	National Pollutant Inventory
NSW	New South Wales
PALM Act	*Australian Capital Territory (Planning and Land Management) Act 1988*
PBS	Performance Based Standards
PCE	Perchloroethene
PFAS	Per- and polyfluoroalkyl substances
RCIP	Department of Defence Regional Contamination Investigation Program
RWMP	Resource and Waste Management Plan
SAQP	Sampling Analysis Quality Plan
SDS	Safety Data Sheet
SEIA	Social and Economic Impact Assessment
TCCS	Transport Canberra and City Services
TCE	Trichloroethene
TSP	Total suspended particulates
TTLG	Traffic and Transport Liaison Group

Acronym	Definition
TTM	Temporary Traffic Management (
TTIA	Traffic and Transport Impact Assessment
VENM	Virgin Excavated Natural Material
WBNM	Watershed Bounded Network Model
WHS	Work Health and Safety
WSUD	Water Sensitive Urban Design

Executive Summary

Overview

Major Projects Canberra (MPC) proposes to raise London Circuit between Edinburgh Avenue and Constitution Avenue to provide a new at-grade, signalised intersection with Commonwealth Avenue (the Project). London Circuit currently passes under Commonwealth Avenue in a grade separated interchange with ramp connections between Commonwealth Avenue, London Circuit and Parkes Way.

The principal strategic planning and development context for the Project is set by the National Capital Plan (NCP) and the four Designated Area Precincts relevant to the Project: Main Avenues and Approach Routes, City Hill, West Basin, and Constitution Avenue and Anzac Parade. The Project has been designed with consideration of the NCP and ACT Planning and Infrastructure Policies. The Project is consistent with the key strategic plans, policies and guidelines of relevance to strategic transport planning, including integration with land use planning, urban planning and placemaking, and sustainability planning.

The Project is needed as part of coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for the city presented in the NCP. It would facilitate other major projects, most notably the extension of the Canberra Light Rail network to Woden, development of Section 63, and through well-timed delivery support orderly, economic and efficient development of land within Canberra City. The Project would also provide an important opportunity to future proof the city's transport network to accommodate future growth, and to provide high quality urban design and amenity outcomes consistent with the NCP.

This Environmental Assessment has been prepared to provide the community and other stakeholders with complete and consolidated details of the Project, its anticipated environmental impacts, and the mitigation and management measures proposed. The raising of London Circuit forms part of the City to Commonwealth Park Light Rail Project, or Stage 2A, as works required to facilitate the future stage, and this Environmental Assessment should be read in the context of the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act Approval (2019/8582) for the City to Commonwealth Light Rail Project. The EPBC Act approval was based on a Preliminary Documentation impact assessment which separated the project into individual components of which raising London Circuit was a key element.

The raising London Circuit portion of the works has been separated and is the subject of this Environmental Assessment and associated Works Approval application. This separation allows it to be considered by the NCA as a standalone project, important to the strategic development of Canberra, with the resultant works able to be delivered by local industry. To allow the NCA to determine the Project separate from the City to Commonwealth Light Rail Project, a complete design has been provided as part of the Works Approval Application and this Environmental Assessment. The proposal to undertake the extension of Light Rail from the City to Commonwealth Park would be the subject of a separate Works Approval and Environmental Assessment process.

This Environmental Assessment also serves to inform an application for works approval from the National Capital Authority for relevant parts of the Project under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth).

The Project

The Project would involve raising London Circuit between Edinburgh Avenue and Constitution Avenue on a gradual filled embankment to meet the current height of Commonwealth Avenue, and provision of a new signalised intersection between London Circuit and Commonwealth Avenue. The completed Project, including its main features and elements, is shown in **Figure 1**.

Key features of The Project would involve:

- Temporary closure of London Circuit between Edinburgh Avenue and Constitution Avenue
- Infilling the London Circuit road reserve between Edinburgh Avenue and Constitution Avenue, to form embankments from the intersections with those roads to around the existing height of Commonwealth Avenue
- Removal of the existing ramps (cloverleaves) to the north west and south west of the London Circuit-Commonwealth Avenue interchange and modification of the existing ramp to the south east to remove connection with London Circuit and retain connection between Parkes Way and Commonwealth Avenue
- Staged closure and demolition of the northbound and southbound Commonwealth Avenue bridges over London Circuit, including infilling the London Circuit road reserve below
- Rebuilding London Circuit between Edinburgh Avenue and Commonwealth Avenue
- Rebuilding London Circuit between Commonwealth Avenue and Constitution Avenue
- Building a new signalised London Circuit-Commonwealth Avenue intersection, including capacity to accommodate proposed and potential future light rail infrastructure
- Provision of active transport infrastructure, utility connections, lighting, street furniture, landscaping and drainage
- Ancillary activities include construction compound sites, traffic diversions and traffic management measures.

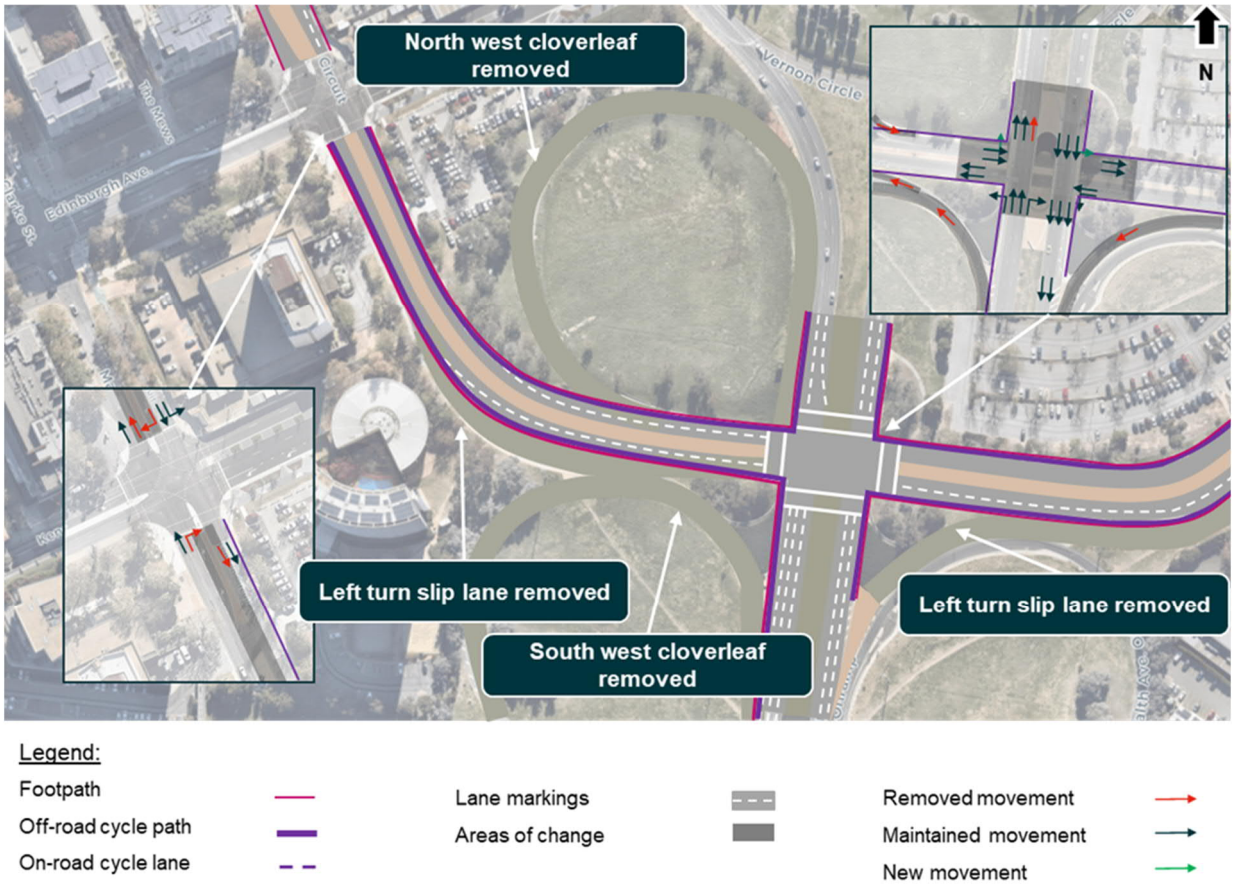


Figure 1 Main features of the completed Project

Subject to securing and complying with the conditions of environmental and planning approvals, construction of the Project would commence around April 2022 and would take approximately two years to complete. Construction of the Project would be preceded by a series of early works required to allow construction works to commence.

A separate Works Approval (WA102408) for the relocation of utilities from within the Project construction footprint includes authorisation of two construction compound sites for those works:

- Construction compound site A – occupying part of the carpark currently in City Block 1, Section 116
- Construction compound site B – occupying the carpark currently in City Block 2 and City Block 3, Section 20

It is proposed that these two construction compound sites would be repurposed and would continue to be used as construction compound sites for the Project. A third construction compound (construction compound site C) is proposed to occupy the carpark currently in Acton Block 24 Section 33.

The location of the three construction compound sites, and the construction footprint for the Project is shown in **Figure 2**.

A temporary sidetrack would be constructed on part of the permanent embankment works to the east of the existing Commonwealth Avenue, to provide for continued traffic movements northbound and southbound for the duration of construction activities. The sidetrack and parts of the Commonwealth Avenue median would be temporarily paved to provide two traffic lanes, with connections to allow cross-over of traffic between the northbound and southbound traffic lanes and the sidetrack. The sidetrack would include temporary bicycle and pedestrian paths to allow for safe diversion of pedestrians and cyclists during the works.

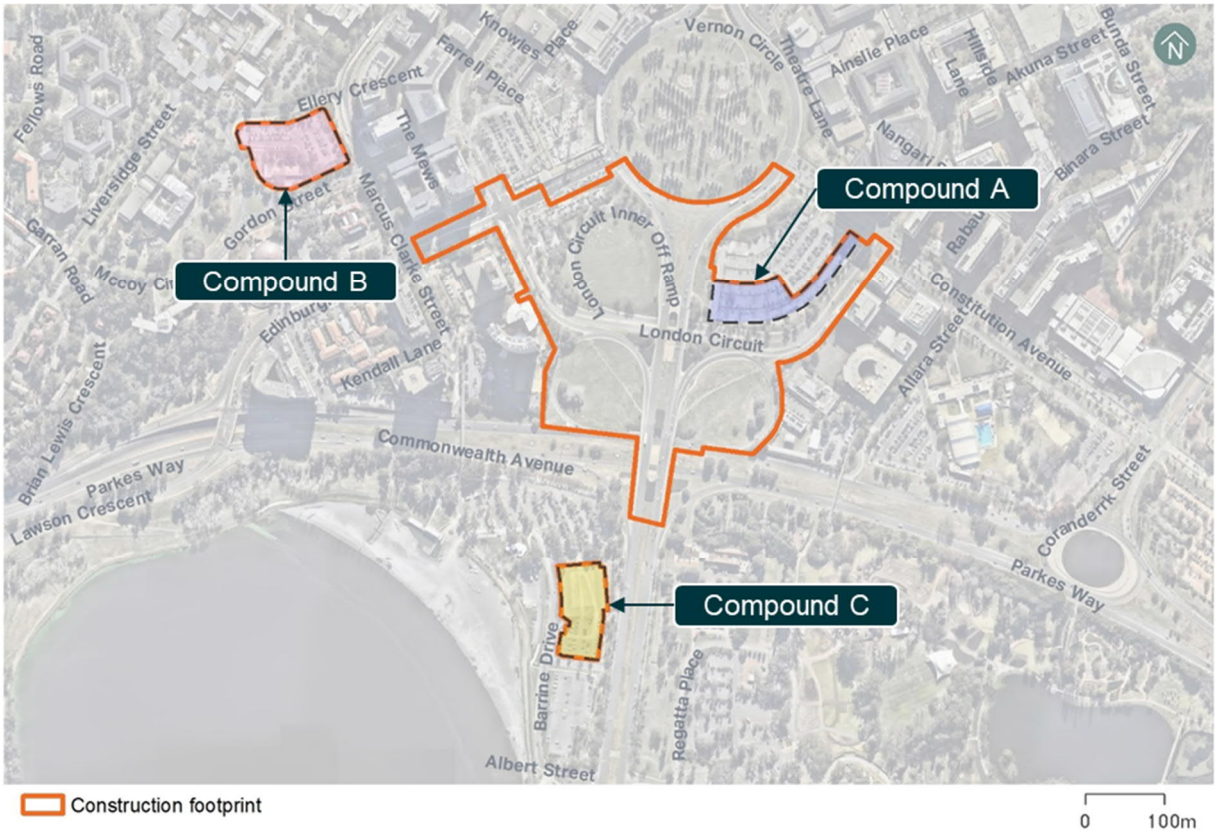


Figure 2 Project construction footprint

Project need and objectives

The Project is proposed as one of a series of major projects being planned and delivered in a coordinated and holistic way to give effect to the strategic planning and development vision in the NCP for Canberra City and its surrounds. The need for the Project is underpinned by several significant strategic roles:

- Directly facilitate other major projects (such as the extension of the Canberra Light Rail network and development of Section 63), and indirectly facilitate others through improved transport network capacity and efficiency
- Contribute to future proofing the transport network of Canberra City by providing infrastructure that responds to current needs and also provides strategic capacity for future growth development
- Be well-timed and coordinated with the delivery of other major projects, to allow orderly, economic and efficient development of land in Canberra City
- Provide for improved urban design and amenity outcomes, supporting the NCP vision for Canberra City.

The vision and objectives for the Project have been developed, taking into account the Project's role in responding to the planning and development vision in the NCP, and other strategies and plans.

The design, development and delivery of the Project would be guided by the following five objectives described in **Figure 3** below.

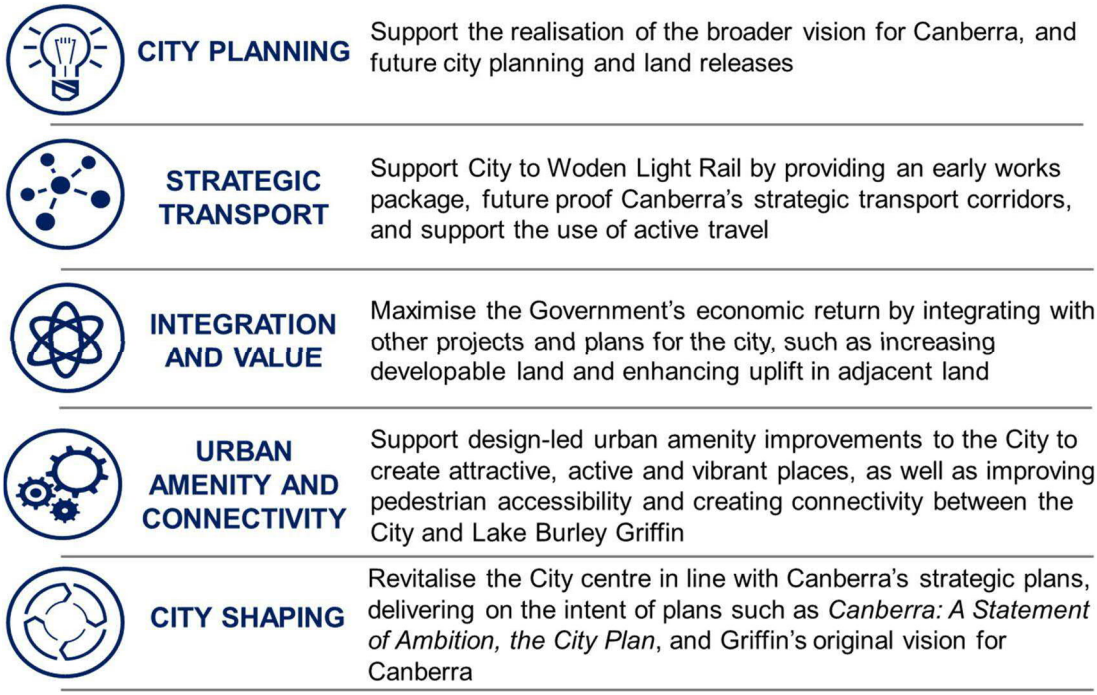


Figure 3 Project objectives

Statutory and planning framework

The Project will require or rely on the following statutory environmental and planning approvals:

- Various 'Works Approvals' from the National Capital Authority under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) to carry out certain works in a Designated Area under the National Capital Plan. A Works Approval for the Project has yet to be sought and obtained, and will be supported by information presented in this Environmental Assessment. Notwithstanding, Works Approvals have been obtained for several early works activities required to allow construction of the Project to commence around April 2022

- Approval from the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) to carry out the Project has already been sought and obtained, subject to conditions (EPBC 2019 / 8582) ('EPBC Approval'). This Environmental Assessment is not a statutory requirement for the Project but has been prepared to provide a complete and consolidated assessment of its potential environmental impacts.

Community and stakeholder consultation

Consultation and engagement for the Project has been integrated with complementary consultation activities that have been undertaken for the City to Commonwealth Park (Stage 2A) component of the Light Rail to Woden project since 2019.

The key community and stakeholder engagement activities and associated metrics that have been achieved for the Project to date include:

- In-person engagement opportunities, including stakeholder meetings, pop-up stalls, community information sessions attendance at community events
- Virtual and in person door knocking
- Light Rail to Woden website: visualisations, videos, flythroughs, virtual engagement room and interactive map
- Communication collateral
- E-newsletters
- Fact sheets
- Social media
- YourSay Website
- 1800 enquiry line
- Project inbox
- Media mentions.

The Environmental Assessment would be placed on public exhibition as part of the Works Approval Application for the Project. MPC would continue to engage with the community and stakeholders on the Project throughout the approvals and construction period. Future engagement would continue to be integrated with Light Rail to Woden, including the City to Commonwealth Park project, in an aim to manage consultation fatigue and deliver engagement activities in a coordinated manner.

Sustainability

For the purposes of meeting best practice, the Project has sought to align with ecologically sustainable development (ESD) principles as detailed in the ACT *Planning and Development Act 2007* (PD Act), as the PALM Act does not specify design or assessment requirements relevant to ESD principles. The Project has sought to implement the following principles of ESD, as defined by the PD Act:

- The precautionary principle
- The intergenerational equity principle
- Conservation of biological diversity and ecological integrity
- Appropriate valuation and pricing of environmental resources.

The Project is consistent with the principles for sustainable development in the Statement of Strategic Direction, outlined in the Territory Plan (the statutory document that guides planning and development in the ACT). An overarching Sustainability Policy has been developed for the Project and Light Rail to Woden, given the co-location of the two proposals. This policy sets the theme and key objectives for sustainability and resilience for development and operation of Light Rail to Woden, and consequently, the Project.

The Project is undertaking a rating under the Infrastructure Sustainability (IS) Rating Scheme. The IS Rating Scheme is a comprehensive rating system for evaluating sustainability across planning, design, construction and operation phases of infrastructure projects. This rating is sought in accordance with the ACT Climate Change Strategy 2019-2025, which outlines the ACT Government's response to climate change.

Environmental impacts

As the Project would generally be within the existing road easement which is a highly modified environment, it largely avoids impacts on environmental values and land use. Despite best efforts to avoid impacts, there are some adverse environmental effects, most temporary in nature, which are likely to occur. Adverse environmental impacts would be minimised by implementing mitigation measures outlined in this Environmental Assessment, and would include preparing and implementing a Construction Environmental Management Plan. This Environmental Assessment found that, with suitable mitigation measures in place, the environmental and social risks generated through the construction and operation of the Project can be managed to a general overall residual risk rating level of Low. There remains a high residual risk associated with construction noise (based on a worst-case scenario) and temporary loss of parking, with all remaining potential impacts for construction and operation reduced to a medium risk or below. Operation of the Project is anticipated to result in beneficial impacts to traffic and transport, landscape and visual realm, socioeconomic conditions, surface water and hydrology, and land use.

A summary of the environmental impact assessment is provided below.

Traffic

A Traffic and Transport Impact Assessment was undertaken to assess the potential impacts of the Project on traffic, public transport, active transport, parking, and road safety.

The construction of the Project would require the closure of London Circuit between Edinburgh Avenue and Constitution Avenue; and the removal of the existing ramps (cloverleaves) to the north west and south west of the London Circuit-Commonwealth Avenue interchange and modification of the existing ramp to the south east to remove connection with London Circuit and retain connection between Parkes Way and Commonwealth Avenue (**Figure 1**). The construction traffic management phases indicate that two northbound lanes and two southbound lanes could be maintained on Commonwealth Avenue. The Commonwealth Avenue footpaths and on-road cycle paths could also be maintained during construction. Notwithstanding the above, a worst-case construction scenario that considers the loss of a northbound lane on Commonwealth Avenue has been modelled and assessed to understand the potential impact of this scenario on the surrounding traffic and transport network.

The construction assessment indicated that the local road network would experience some minor-moderate increases to congestion, delays and travel times. Buses could experience moderate-major travel time increases due to increased congestion on London Circuit and lower speed limits along Commonwealth Avenue. The closure of London Circle and the removal of the cloverleaf ramps would require pedestrians and cyclists to use alternative routes. While most of the impacts to pedestrians and cyclists are considered minor, there are limited convenient alternatives to replace the pedestrian and cyclist desire lines along London Circuit between Constitution Avenue and Edinburgh Avenue.

Overall, the assessment demonstrated that the Project could provide an at-grade intersection for Commonwealth Avenue and London Circuit with minor local area and wider network traffic and transport impacts. The Project would offer benefits including the opportunity to: improve public transport priority, as an enabling project for the future potential Light Rail to Woden; reduce the dominance of cars through London Circuit east by allocating more space to walking, cycling and the future public transport; and provide safer and more direct pedestrian and cyclist crossing opportunities.

Measures to mitigate the impacts of the Project on traffic would be implemented.

Heritage

A Heritage Impact Assessment was undertaken to assess the potential heritage impacts associated with the Project.

Places of non-Aboriginal heritage significance within the construction footprint include Canberra the Planned National Capital, Parliament House Vista, National Land Roads and City Hill. During construction and operation, the Project would have an overall minor adverse impact on items of heritage value with the exception to the value of Parliament House Vista, the impact on which would be insignificant.

The Project area has been previously assessed as having low potential for the likely existence of Aboriginal archaeological sites. Although the area is within a landscape of culture, significant to the local Aboriginal community, the Project would not affect such values any more than the existing development of Canberra.

Measures to mitigate the potential impacts of the Project on heritage would be implemented.

Biodiversity

The assessment of potential biodiversity impacts has been based on the EPBC Act Preliminary Documentation prepared to inform the assessment of the City to Commonwealth Park component of the Light Rail to Woden project. Direct and indirect impacts to Golden Sun Moth (*Synemon plana*) GSM, and their associated mitigation measures, have been approved under the EPBC Act (2019 / 8582), and subsequently through the approved GSM Plan. For the purpose of the assessment, areas in the south east cloverleaf are taken to continue to be GSM habitat (and subject to the ongoing requirements of the EPBC Approval).

Other biodiversity impacts include the removal of vegetation, including about 100 mature trees within the construction footprint, to facilitate the proposed works and site access. Following construction, more than 130 trees would be planted within the construction footprint.

The Project aims to have a net positive impact on GSM habitat value. This would be achieved through a combination of habitat rehabilitation and enhancement (within the construction footprint) and biodiversity offsets (outside the construction footprint) to achieve no net loss of biodiversity. Offsets have been secured for GSM impacts associated with all activities approved under EPBC2019 / 8582, which includes the future City to Commonwealth Park component of the Light Rail to Woden project. The offsets package was delivered through the NSW Biodiversity Offsets Scheme.

Contamination and soils

A Contamination Assessment was undertaken to assess the potential contamination and soil impacts associated with the Project. The construction of the Project involves risks associated with contamination and soil management. The potential impact on soil from construction activities would be primarily associated with soil loss from the erosion of exposed soils and stockpiles at the compound site. Erosion and sediment controls would be established to capture any sediment runoff travelling towards Lake Burley Griffin. Other construction activities with the potential to expose soils and lead to erosion include vehicle movements, stockpiling, excavation and service relocation, importation of fill materials, vegetation removal and landscaping.

Construction works may increase the risk of contamination to soil if poor site management practices and inadequate waste disposal management occurs. Other general contamination risks are associated with the handling and processing of products where liquid waste and hazardous material can escape into the soil. These are associated with the transport, handling and storage of such materials and the potential threat of releases and spills onto the ground.

The demolition of the existing Commonwealth Avenue bridge poses the risk of encountering asbestos. A licenced asbestos assessor and, if required, removalist would be available onsite to clear the existing conduits of asbestos and to safely remove asbestos conduits and mitigate any risks. Risks associated with forms of contamination can be adequately managed through the adoption of the proposed mitigation measures.

The potential for contamination as a result of operation, including any general roadway maintenance, is considered to be low and does not differ from the current contamination risks from the road corridor.

Noise and vibration

A Noise and Vibration Impact Assessment was undertaken to assess the potential impacts associated with the Project.

Construction works would be generally undertaken between 7am – 6pm for weekdays and 7am – 1pm Saturdays. Any works outside of these hours would be the subject of a specific application to the Territory, detailing the need for such works and any additional or work specific noise mitigation measures.

A qualitative construction noise assessment, based on a worst-case scenario, identified that highly intrusive noise impacts (>30 decibels (dB) above background levels) are occasionally expected during standard work hours, associated with high noise generating equipment, typically required during excavation, surface preparation, piling, earthworks, backfilling, profiling, levelling and grading. Other activities, associated with structural work and finishing works, may be moderately intrusive (>20-30 dB above background levels). These impacts may be extensive for the nearest sensitive receivers to the noise generating activity. It is important to note that the construction scenarios consider sound power levels based on a worst-case 15-minute period and would likely not represent the ongoing day-to-day noise impact at sensitive receivers for an extended period of time. Construction impacts would be managed through a Noise and Vibration Management Plan.

The operational road traffic noise assessment criteria used in the assessment is from the Roads ACT Noise Management Guideline (NMG) (2018). Future road traffic noise levels have been modelled for the 'no build' (without the Project) and 'build' scenarios for 2026 and 2036. Road traffic noise levels are predicted to exceed the NMG criteria at a total of two co-located noise sensitive receivers, however these do not reflect an actual increase in road traffic noise levels due to the Project. The exceedance of noise criterion at these receivers is predominantly caused by existing road traffic on Parkes Way. As a result, no operational road traffic noise mitigation is proposed.

Air quality

An Air Quality Impact Assessment was undertaken to assess the potential impacts associated with the Project. The construction phase of the Project would have risks associated with dust emissions, generated from activities involving demolition, land clearing and earth moving. The pre-mitigation risk rating for dust soiling for receptors is considered to be medium-high, however the overall sensitivity to human health effects for annual average PM_{10} is considered to be medium-low. The risks associated with construction of infrastructure is well known and generally well managed using standard mitigation measures and safeguards. With the implementation of mitigation measures, the risks associated with construction dust emissions are expected to produce a residual effect which is not significant.

Air emissions during the construction of the Project that are not related to dust would be due to the combustion of diesel fuel by heavy vehicles, mobile construction equipment and stationary equipment such as diesel generators. Given the expected scale of the Project works, the typically transitory nature of construction site mobile equipment and machinery, and vehicle numbers, by construction vehicles, plant, and machinery, emissions would be minimal. For these reasons, the potential for air quality impacts as a result of the operation of vehicles, plant, and machinery during construction of the Project is considered to be negligible.

Following the completion of construction, all disturbed areas would be reinstated, and areas of exposed soil would be paved or vegetated. Further, no ongoing dust generating activities form part of the operational Project description. The Project is not expected to generate additional traffic nor significantly affect the distribution of traffic on the road network, as such, no increase in vehicle emissions are anticipated. As such, the potential air quality emissions attributed to the operation of the Project would be negligible and would be unlikely to have any significant air quality impacts.

Greenhouse gases

A Greenhouse Gas Impact Assessment was undertaken to assess the potential impacts associated with the Project on greenhouse gas emissions.

The construction and operation activities proposed for the Project were reviewed to determine likely emission sources and greenhouse pollutants. It was determined that the Project is likely to generate

both direct and indirect emissions during the construction of the Project, with the main emission sources comprising:

- Energy including fuel (ULP and diesel)
- Electricity
- Waste generated in demolition and construction.

The total emissions generated by the Project are estimated to be 1,875 t CO_2-e. The majority of the emissions generated offsite, however are directly related to the Project in terms of offsite transport or greenhouse gas generation during the manufacture of materials and supplies. Diesel fuel used in stationary machinery on site during the Project accounts for about 22% of all emissions.

In 2019 Australia's total greenhouse gas emissions were 529.3 megatonne (Mt) CO_2-e, with ACT contributing 1.28 Mt CO_2^{-e} (DISER, 2021). In comparison with this data, the Project is expected to represent approximately 0.00036% of Australia's total emissions and 0.15% of ACT's total emissions.

As such, the potential greenhouse gas emissions attributed to the construction the Project are unlikely to have any significant impacts.

Following the completion of construction, landscape plantings would be installed, and construction vehicles, plant, and machinery would be demobilised and removed from the Project construction footprint. The ongoing use of vehicles, plant and machinery would be limited to that required for routine maintenance of the Project.

The Project is not expected to generate additional traffic or to result in significant redistribution of traffic on the surrounding road network, and as such, no material increase in vehicle emissions relative to existing conditions are anticipated. As such, the potential greenhouse gas emissions attributed to the operation of the Project are considered to be minor and would be unlikely to have any significant greenhouse gas impacts.

Landscape and visual

A Landscape and Visual Impact Assessment was undertaken to assess the potential landscape character and visual impacts associated with the Project.

A landscape character assessment was undertaken to identify features and elements relevant to the Project. Landscape Character Zones (LCZ) are an area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby. The assessment of landscape effects considered the change due to the Project on the landscape as a resource in its own right. The assessment was based on the sensitivity to change and the magnitude of the change that is likely to occur. Landscape effects were assessed at the commencement of operation of the Project, and only LCZs deemed likely to be impacted by the Project were assessed. The impact on landscape character is considered to be minimal with only two LCZs having an impact greater than negligible, with impacts on both considered to be beneficial.

A series of viewpoints were selected from which to assess the visual impact of the Project. Viewpoints were chosen to assess the changes due to the Project from publicly accessible locations. The visual impact assessment considered both the sensitivity of an existing viewpoint to change and the magnitude (scale, character and distance) of the change of view. Visual impacts were assessed during construction and at the commencement of operation of the Project. Five of the 13 selected viewpoints were assessed to have a temporary, adverse qualitative rating for visual impact during construction. The remaining viewpoints are anticipated to experience a neutral impact. The viewpoints anticipated to have an adverse impact during construction are from the following locations:

- Viewpoint 1: City Hill (Moderate impact)
- Viewpoint 2: City Hill South (High impact)
- Viewpoint 3: London Circuit (Moderate to Low impact)
- Viewpoint 7: Commonwealth Avenue (High to Moderate impact)
- Viewpoint 13: Parliament House (High to Moderate impact).

One viewpoint (Viewpoint 5: London Circuit South West) is considered to have an adverse qualitative rating for visual impact during operation, with an overall moderate impact at this location. During operation the visual impact on viewpoints is anticipated to be primarily neutral or beneficial with four viewpoints anticipated to experience a beneficial impact.

Socioeconomic

Socioeconomic impacts associated with the construction of the Project may include temporary impacts to the road network, accessibility to services, active and public transport, health and wellbeing, amenity and visual landscape, and economic contributions including employment opportunities. Socioeconomic impacts would be minimised through the proposed mitigation measures.

In the construction phase of the Project, there is the potential for road users to experience adverse impacts due to increased traffic congestion and traffic changes. A decline in accessibility to services and businesses in the Canberra CBD may be experienced due to a loss of parking. Impacts to traffic and access are considered to be minor as alternative routes would be provided and impacts would be temporary. There is the potential for a temporary decline in social amenity for residents and accommodation providers in proximity to the Project as a result of construction activities. Active and public transport users in the area may experience adverse impacts during the construction of the Project. Public transport users would experience temporary delays and changes to the bus schedule due to construction activities in the area. Minor health and wellbeing impacts may be felt during construction by residents and commuters, however, air quality, noise, and light pollution impacts have been assessed as being of low risk to the community.

Construction of the Project would likely provide economic benefits, through the provision of employment opportunities, and an additional income stream for local businesses through procurement and services for the workforce.

Socioeconomic impacts during operation of the Project are anticipated to be largely beneficial. The permanent changes to the road network would increase road safety for all road users, and would increase accessibility throughout the city for active and public transport users. Further, the Project would increase the aesthetic value of the area by creating an attractive and active public space close to the city. There would be a permanent loss of 50 long stay parking spaces at London Circuit East, which is anticipated to have a minor impact due to the local carpark network's capacity to absorb the increased demand.

Overall, the Project is anticipated to cause temporary negative socioeconomic impacts during the construction phase of the Project, but would have beneficial socioeconomic impacts for residents and the community in the long-term.

Surface water and hydrology

A Hydrology and Water Quality Assessment was undertaken to assess potential hydrology impacts associated with the Project.

Construction of the Project is not anticipated to directly impact waterways as the Project area is drained by a stormwater pipe network which discharges to Lake Burley Griffin. There is potential for the water quality of the lake to be impacted during construction as a result of possible increased sediment load runoff. During operation, the increase in impervious area could result in increased contaminant loads to Lake Burley Griffin, however Project design measures would reduce pollutant loads, to below existing conditions. Mitigation measures have been proposed to reduce potential water quality impacts associated with construction and operation of the Project.

Construction of the Project would increase impervious surfaces through large scale earthworks and there is potential for large quantities of sediment to be directed into the network of temporary drainage as it is progressively constructed. This could potentially result in on-site flooding or flooding downstream. These impacts would be appropriately managed during construction, including through erosion and sediment control measures.

The Project involves upgrading the existing stormwater network to cater for flow characteristic changes and mitigate any potential adverse drainage impacts during operation of the Project. This upgrade is designed to cater for up to 1% Annual Exceedance Probability (AEP) events (a flood with a one in a 100 chance of being exceeded in any year). The results indicate that the performance of the drainage

system is significantly improved under the proposed conditions, with the upgraded drainage system in place.

Resource management and waste minimisation

The Project would generate construction and demolition waste during the construction of the Project. The Project would seek to minimise the requirement for new materials as far as practical, through reuse and recycling of materials on-site. Where this is not possible, recyclable materials would be sent to local recycling centres, and waste would be managed appropriately in accordance with the Project CEMP.

Resource consumption and waste generation during the operational phase of the Project are anticipated to be minimal and limited to maintenance activities.

Measures to mitigate the resource use and waste generation of the Project would be implemented.

Land use

During construction the Project has the potential to impact on surrounding land uses including residential, commercial, businesses and public open spaces. The Project would require temporary and permanent loss of carparking spaces. During operation, the Project would have beneficial impacts by contributing to the achievement of the general land use outcomes specified in the National Capital Plan (NCP) and the Griffin Legacy to realise the broader vision for Canberra and future city planning and land releases. It is therefore considered that the land uses proposed for the Project are consistent with surrounding areas and minimal impact to the current or future use of surrounding land is expected.

Cumulative impact

Cumulative environmental impacts are the combined effect of individual impacts from multiple proposals occurring in proximity or concurrently at a given time. There are a number of proposals identified within the vicinity of the Project that have the potential to contribute to a potential cumulative impact with the Project. Considering the potential overlaps in construction (timing and proximity), key potential cumulative impacts include traffic, heritage, biodiversity, noise and vibration, air quality and GHGs, landscape and visual, and social and economic. MPC would continue to liaise with relevant internal and external stakeholders and proponents to manage the coordination of the projects in construction.

During operation, it is anticipated there would be a negligible cumulative impact from several environmental factors. The Project would meet the objectives of the NCP and may have a beneficial operational cumulative impact with other proposals.

Management and mitigation of impacts

Management and mitigation measures are proposed to be implemented to reduce the potential impacts of the Project. These measures would be incorporated into the construction environmental management plan (CEMP) and operational management plans and systems.

With the implementation of the measures specified in this Environmental Assessment during construction and operation of the Project, the identified environmental impacts and risks are considered to be acceptable and manageable.

Summary

The Works Approval Planning Report (Canberra Town Planning, 2021) concludes that the Project is consistent with the *Australian Capital Territory (Planning and Land Management) Act 1998* (Cth) and NCP, does not create adverse planning impacts, and is aligned with the strategic planning and development objectives for the various Designated Area precincts under the NCP affected by the Project.

The Project is needed as part of coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for the city presented in the NCP. It would facilitate other major projects, most notably the extension of the Canberra Light Rail network, development of Section 63, and through well-timed delivery would support orderly, economic and efficient development of land within Canberra City. The Project would also provide an important opportunity to future proof the city's transport network to accommodate future growth, and to provide high quality urban design and amenity outcomes consistent with the National Capital Plan.

1.0 Introduction

Major Projects Canberra (MPC) proposes to raise London Circuit between Edinburgh Avenue and Constitution Avenue to provide a new at-grade, signalised intersection with Commonwealth Avenue (the Project). London Circuit currently passes under Commonwealth Avenue in a grade separated interchange with ramp connections between Commonwealth Avenue, London Circuit and Parkes Way.

The Project is needed as part of coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for the city presented in the National Capital Plan. It would facilitate other major projects, most notably the extension of the Canberra Light Rail network to Woden, development of Section 63, and through well-timed delivery support orderly, economic and efficient development of land within Canberra City. The Project would also provide an important opportunity to future proof the city's transport network to accommodate future growth, and to provide high quality urban design and amenity outcomes consistent with the National Capital Plan.

This Environmental Assessment has been prepared to provide the community and other stakeholders with complete and consolidated details of the Project, its anticipated environmental impacts, and the mitigation and management measures proposed. The raising of London Circuit forms part of the City to Commonwealth Park Light Rail Project, or Stage 2A, as works required to facilitate the future stage, and this Environmental Assessment should be read in the context of the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act Approval (2019/8582) for the City to Commonwealth Light Rail Project. The EPBC Act approval was based on a Preliminary Documentation impact assessment which separated the project into individual components of which raising London Circuit was a key element.

The raising London Circuit portion of the works has been separated and is the subject of this Environmental Assessment and associated Works Approval application. This separation allows it to be considered by the NCA as a standalone project, important to the strategic development of Canberra, with the resultant works able to be delivered by local industry. To allow the NCA to determine the Project separate from the City to Commonwealth Light Rail Project, a complete design has been provided as part of the Works Approval Application and this Environmental Assessment. The proposal to undertake the extension of Light Rail from the City to Commonwealth Park would be the subject of a separate Works Approval and Environmental Assessment process.

This Environmental Assessment also serves to inform an application for works approval from the National Capital Authority for relevant parts of the Project under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth).

1.1 Background

The National Capital Plan (NCP) is the strategy and blueprint giving effect to the Commonwealth Government's interests and intentions for planning, designing and developing Canberra and the Australian Capital Territory. It is prepared and delivered by the National Capital Authority (NCA) under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth), and is focused on planning and development matters of national significance.

One of the key matters of national significance that underpins the NCP is respect for the key elements of Walter Burley Griffin's formally adopted plan for Canberra. His plan centred around the National Triangle, formed by Commonwealth Avenue, Constitution Avenue and Kings Avenue, with Parliament House, the Defence Headquarters at Russell and City Hill in Canberra City at the three corners of the triangle. Among other matters of national significance covered by the NCP, the National Triangle and its three corners are subject to careful planning and management under the NCP. Canberra City is centred on City Hill at one corner of the National Triangle, and the NCP presents a strategic planning and development vision for the city that reflects its national significance.

Several major projects in and around Canberra City are currently in various stages of planning and delivery to give effect to the strategic planning and development vision presented in the NCP. Some of the key major projects include:

- Extension of the Canberra Light Rail network from its current terminus on Northbourne Avenue at Alinga Street, via London Circuit and Commonwealth Avenue and southward to Woden
- Development of Section 63 (bounded by Edinburgh Avenue, London Circuit, Commonwealth Avenue and Vernon Circle) for land uses permitted under the NCP
- Development of Section 100 (bounded London Circuit, Edinburgh Avenue, Vernon Circle and Knowles Place) for land uses permitted under the NCP
- Development of the Acton Waterfront (generally to the south west of the Commonwealth Avenue and London Circuit intersection) as part of the West Basin precinct, including the potential future West Road connection between London Circuit and the new development
- Upgrade of Parkes Way to improve accessibility and connectivity, and safety for all road users
- Upgrade of the Commonwealth Avenue bridges over Lake Burley Griffin to extend their life and provide improved amenity for pedestrians and cyclists
- The recently completed extension of Edinburgh Avenue from London Circuit through to Vernon Circle
- Upgrades to the stormwater network across the West Basin precinct to support the Acton Waterfront development and upgrade of Parkes Way.

Planning and delivery of these and other projects is being coordinated in a holistic way to ensure the timely, orderly and economic development of land consistent with the strategic planning and development vision presented in the NCP. An important aspect of this coordination is integration of land use and transport planning, to ensure that transport infrastructure, including roads, public transport and active transport infrastructure, is delivered at the right time to meet current needs and to accommodate future growth and development across Canberra.

Raising London Circuit (the Project) is proposed as an important transport project within the mix of major projects being progressed to give effect to strategic outcomes spelled out in the NCP. As part of a coordinated and holistic approach to planning and development of Canberra City and surrounds, the Project would:

- Directly facilitate other major projects (such as the extension of the Canberra Light Rail network and development of Section 63), and indirectly facilitate others through improved transport network capacity and efficiency
- Contribute to future proofing the transport network of Canberra City by providing infrastructure that responds to current needs and also provides strategic capacity for future growth development
- Be well-timed and coordinated with the delivery of other major projects, to allow orderly, economic and efficient development of land in Canberra City
- Provide for improved urban design and amenity outcomes, supporting the NCP vision for Canberra City.

Further details of the Project are provided in **Section 1.2** and **Chapter 3.0** (Project description). The NCP and other strategic planning documents are discussed in **Chapter 2.0** (Strategic need and context).

1.2 The Project

Raising London Circuit (the Project) would involve raising the height of London Circuit between Edinburgh Avenue and Constitution Avenue and providing a new at-grade, signalised intersection with Commonwealth Avenue. This would be achieved by filling the existing London Circuit road reserve to form gradual inclines from the intersections of Edinburgh Avenue and Constitution Avenue to around the existing height of Commonwealth Avenue. London Circuit would be

reconstructed on these infilled areas, to connect with the new signalised intersection to be constructed with Commonwealth Avenue. The Project, including its key features, is shown in **Figure 1-4**.

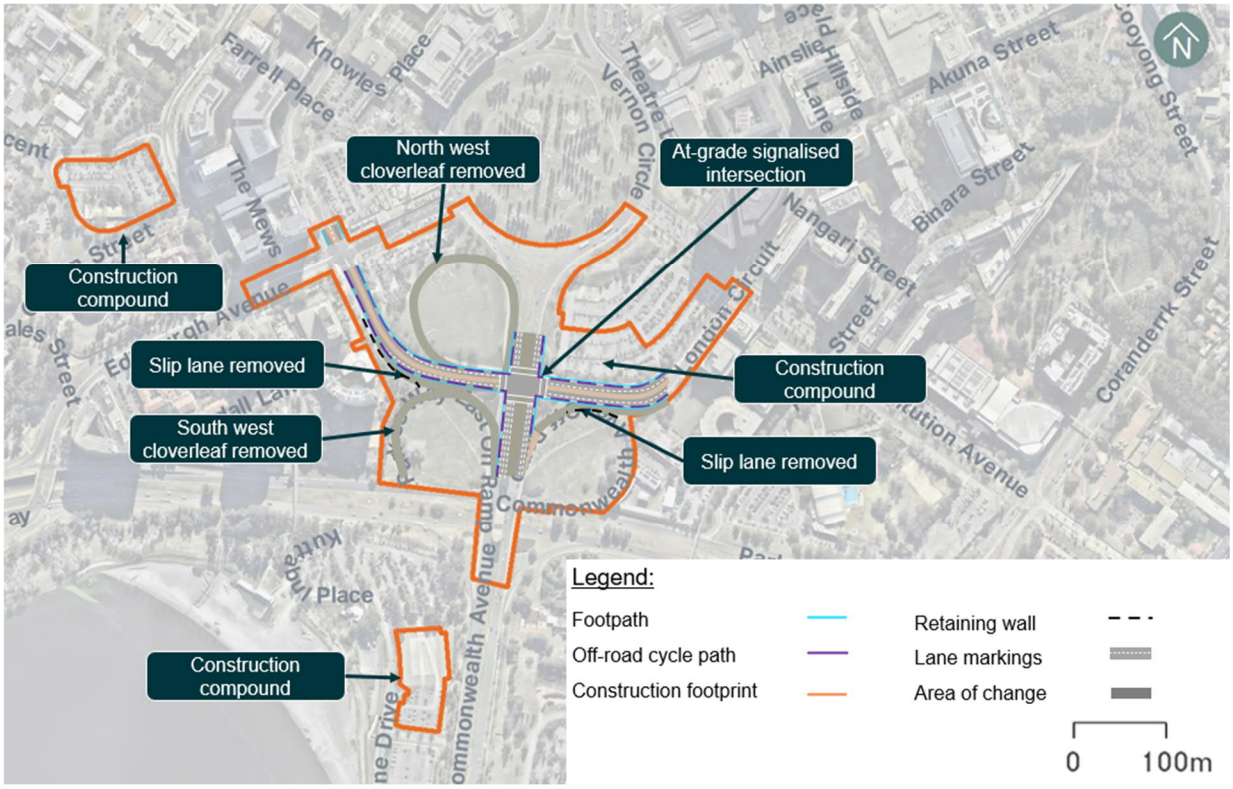


Figure 1-4 The Project and its key features

The Project would involve:

- Temporary closure of London Circuit between Edinburgh Avenue and Constitution Avenue
- Infilling the London Circuit road reserve between Edinburgh Avenue and Constitution Avenue, to form embankments from the intersections with those roads to around the existing height of Commonwealth Avenue
- Staged closure and demolition of the northbound and southbound Commonwealth Avenue bridges over London Circuit, including infilling the London Circuit road reserve below
- Rebuilding London Circuit between Edinburgh Avenue and Commonwealth Avenue, with sufficient space in the road median to accommodate the proposed extension of the Canberra Light Rail network
- Rebuilding London Circuit between Commonwealth Avenue and Constitution Avenue, with sufficient space in the road median to accommodate potential future expansion of the Canberra Light Rail network
- Building a new signalised London Circuit - Commonwealth Avenue intersection, including capacity to accommodate proposed and potential future light rail infrastructure
- Modification of the existing London Circuit - Edinburgh Avenue intersection to reflect changes to accommodate proposed future light rail infrastructure
- Removal of the existing ramps (cloverleaves) to the north west and south west of the London Circuit - Commonwealth Avenue interchange and modification of the existing ramp to the south east to remove connection with London Circuit and retain connection between Parkes Way and Commonwealth Avenue

- Provision of active transport infrastructure, utility connections, lighting, street furniture, landscaping and drainage
- Ancillary activities include construction compound sites, traffic diversions and traffic management measures.

Further details of the Project are provided in **Chapter 3.0** (Project description). Construction works required for the Project are detailed in **Chapter 4.0** (Construction works).

1.3 The Proponent

The Proponent for the Project is Major Projects Canberra (MPC). MPC was formed as a directorate in July 2019 to lead the procurement and delivery of infrastructure projects in the ACT. Its main responsibilities are:

- Procurement and delivery of infrastructure projects designed by the ACT Government as major projects
- Delivery of other whole-of-Government infrastructure projects in partnership with other directorates.

Other functions performed by MPC include contractor prequalification and industrial relations and employment (IRE) certification, project management and reporting, superintendency of works and work health and safety (WHS) active certification.

MPC has had no legal proceedings taken against it under ACT or Commonwealth law in relation to the protection of the environment, or the conservation and sustainable use of natural resources.

1.4 Structure of this Environmental Assessment

This Environmental Assessment is structure in three main parts, as summarised in **Table 1-1** below.

Table 1-1 Structure of this Environmental Assessment

Part / chapter	Description
Part A – Introduction, project description and context	
Chapter 1 (Introduction)	This chapter provides the introduction and background to the Project, details of the Project and the proponent, and structure of the Environmental Assessment.
Chapter 2 (Strategic need and context)	This chapter outlines the strategic need and context for the Project, including details of how the Project responds to key policies and plans.
Chapter 3 (Project description)	This chapter provides details of the Project and its design.
Chapter 4 (Construction works)	This chapter provides details of how the Project would be constructed.
Chapter 5 (Project development and alternatives)	This chapter outlines how the design of the Project has been developed, including alternatives to the Project and design options.
Chapter 6 (Statutory approvals context)	This chapter provides details of environmental and planning approvals that would be required to carry out the Project.
Chapter 7 (Consultation)	This chapter outlines engagement activities that have been carried out with the community and other stakeholders in relation to the Project, key issues that have been raised, and how these issues have been addressed.

Part / chapter	Description
Part B – Assessment of environmental impacts	
Chapter 8 (Environmental risk analysis methodology)	This chapter presents an environmental risk analysis methodology for the Project, and how the environmental risk analysis has been used to identify mitigation and management measures for potential impacts.
Chapter 9 (Assessment of environmental issues)	This chapter presents an assessment of environmental issues, including summaries of technical specialist studies (attached as appendices to the Environmental Assessment).
Part C – Mitigation, management and justification	
Chapter 10 (Environmental mitigation and management measures)	This chapter presents a consolidated list of environmental mitigation and management measures that would be applied in carrying out the Project, and describes the approach to environmental management of the Project.
Chapter 11 (Justification and conclusions)	This chapter presents the conclusions of the Environmental Assessment and a justification for carrying out the Project.

2.0 Strategic need and context

This chapter details the strategic need and objectives for the Project and outlines how the Project responds to key strategic plans and policies.

2.1 Strategic need and Project objectives

2.1.1 Strategic need

The Project is proposed as one of a series of major projects being planned and delivered in a coordinated and holistic way to give effect to the strategic planning and development vision in the National Capital Plan (NCP) for Canberra City and its surrounds. In addition to the Project, and as detailed in **Section 1.1**, major projects in various stages of planning and delivery include:

- Light Rail to Woden
- Development of Section 63
- Development of Section 100
- Development of the Acton Waterfront
- Upgrade of Parkes Way
- Upgrade of the Commonwealth Avenue bridges over Lake Burley Griffin
- Edinburgh Avenue extension
- Stormwater network upgrades across the West Basin precinct.

In the context of coordinated and holistic planning and delivery of these projects in an orderly and efficient way, the need for the Project is underpinned by several significant strategic roles:

1. **Direct facilitation of other major projects**, most notably:

   The Project would directly facilitate the delivery of the Canberra Light Rail network extension from its current terminus on Northbourne Avenue, near Alinga Street, along London Circuit and Commonwealth Avenue and southward to Woden. The Project would facilitate and provide an opportunity for the light rail network extension to connect onto Commonwealth Avenue without occupying surrounding developable land

   The Project would directly facilitate the proposed development of Section 63 through timely release of land around the existing London Circuit - Commonwealth Avenue interchange, including within and around the cloverleaf ramp connections

2. **Indirect facilitation of other major projects** by delivering road infrastructure and facilitating public transport infrastructure, through integration of land use and transport planning and delivery, to meet Canberra's current and future needs

3. **Future-proofing the transport network** by providing infrastructure that responds to current needs and also provides strategic capacity for future growth development continues.

4. **Well-timed and coordinated delivery of major project** to allow orderly, economic and efficient development of land in Canberra City. Delivery of the Project in the short term would provide the combined benefits of freeing up land, particularly in and around the existing cloverleaf ramps connecting London Circuit, Commonwealth Avenue and Parkes Way for development in line with the NCP vision for Canberra City, as well as ensuring that such development doesn't preclude the cost-efficient and orderly implementation of the Project in the future

5. **Improved urban design and amenity outcomes**, consistent with the strategic planning and development vision presented in the NCP. The urban design and amenity outcomes of the existing London Circuit - Commonwealth Avenue interchange are suboptimal. The Project offers an opportunity to address this through improved urban design, a more connected and accessible contribution to the city's infrastructure, a more desirable appearance and local amenity, and inclusion of modern, well-design active transport infrastructure.

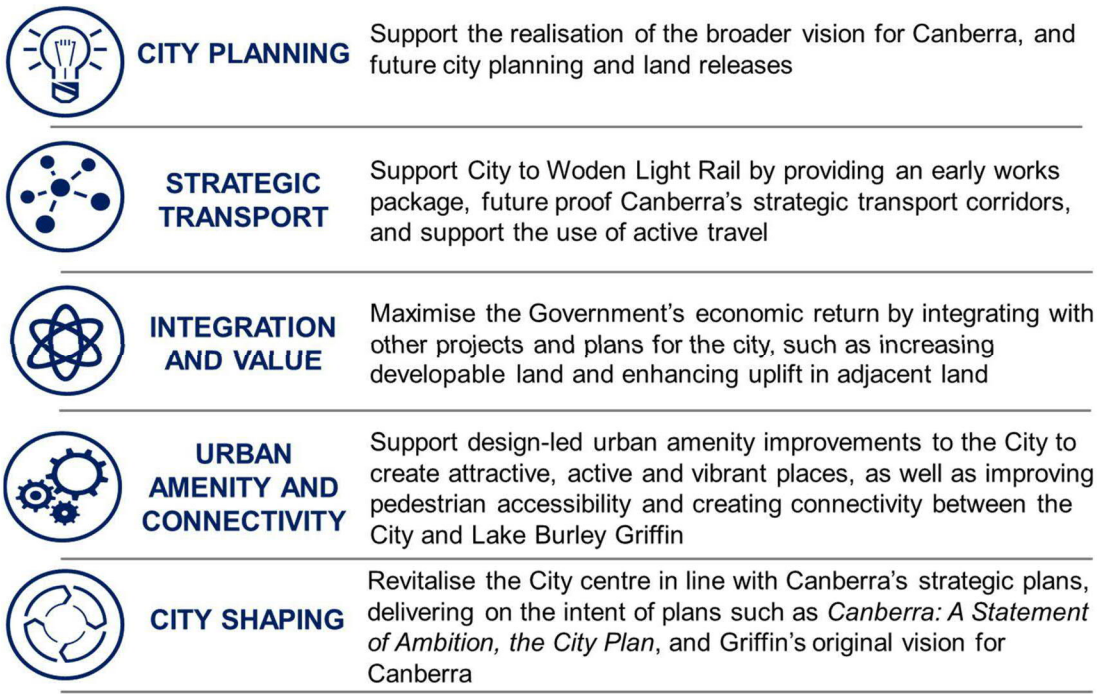
2.1.2 Project vision and objectives

The vision and objectives have been developed for the Project, taking into account the Project's role in responding to the planning and development vision in the National Capital Plan, and the other strategies and plans discussed in **Section 2.2**.

The vision for the Project reflects the ACT Government's ambitions for Canberra:

> ***To improve connectivity and support city planning by integrating strategic transport and land use initiatives to shape future development and create attractive, design-led, people focused places.***

In pursuit of this vision, the design, development and delivery of the Project would be guided by the following five objectives.



2.2 Strategic planning and policy context

The principal strategic planning and development context for the Project is set by the National Capital Plan (NCP) and the four Designated Area Precincts relevant to the Project: Main Avenues and Approach Routes, City Hill, West Basin, and Constitution Avenue and Anzac Parade. Consistency of the Project with the NCP is discussed the Works Approval Planning Report, and summarised in **Section 2.2.1**.

2.2.1 National Capital Plan

The National Capital Plan includes provisions in three key areas that are relevant to the Project:

- The Statement of Planning Principles that aim to give effect to the object of the NCP to ensure that Canberra and the Territory are planned and developed in accordance with their national significance
- Land use plans and general land use controls
- Requirements applicable to Designated Areas, particularly the City Hill, West Basin, and Constitution Avenue and Anzac Parade Designated Area Precincts.

The Project would span several Designated Areas regulated under the National Capital Plan (NCP) and is subject to planning principles, policies and requirements under relevant precincts of the NCP.

The Works Approval Planning Report (Canberra Town Planning, 2021) concludes that the Project is consistent with the *Australian Capital Territory (Planning and Land Management) Act 1998* (Cth) and NCP, and does not create adverse planning impacts. As discussed above, the Project would provide positive planning outcomes through the removal of existing cloverleaf ramps, which would facilitate future development of that land for permitted uses, consistent with the NCP. It would also facilitate the Light Rail to Woden project, consistent with the NCP vision of London Circuit operating as a major public transport corridor through Canberra City.

The Project is consistent with applicable planning policies, the planning principles of the NCP and Central National Area. It is aligned with the strategic planning and development objectives for the various Designated Area precincts under the NCP affected by the Project.

2.2.2 Other key strategic plans, policies and guidelines

The Project has been designed with consideration of the NCP and ACT Planning and Infrastructure Policies. The Project is consistent with the key strategic plans, policies and guidelines listed in **Table 2-1**, of relevance to strategic transport planning, including integration with land use planning, urban planning and placemaking, and sustainability planning.

Table 2-1 Key strategic plans, policies and guidelines

Key strategic plans, policies and guidelines
Transport planning
Moving Canberra 2019-2045: Integrated Transport Strategy (Transport Canberra and City Services Directorate, 2018) *Transport for Canberra: Transport for a sustainable city 2012-2031* (Environment and Sustainable Development Directorate, 2012)
Urban planning and placemaking
• *City and Gateway – Urban Design Framework 2018* (National Capital Authority, 2018) • *The City Plan* (Environment and Sustainable Development Directorate, 2014) • *The 2025 Strategic Plan* (City Renewal Authority, 2018) • *Canberra: A Statement of Ambition* (ACT Government, 2016) • *ACT Planning Strategy 2018* (Planning and Sustainable Development Directorate, 2018) • *King and Commonwealth Avenues Draft Design Strategy* (National Capital Authority, 2017) • *City to the Lake - Strategic Urban Design Framework 2015* (Suburban Land Agency, 2015)
Sustainability planning
The *Sustainability Strategy 2021-2025* (City Renewal Authority, 2021) *ACT Climate Change Strategy 2019-25* (Environment, Planning and Sustainable Development Directorate, 2019)

3.0 Project description

The completed Project, including its main features and elements, is shown in **Figure 3-1**. Temporary works associated with construction of the Project are detailed in **Chapter 4.0**.

The Project would include the following key elements:

- A main embankment with associated retaining walls and batters between Edinburgh Avenue in the west and Constitution Avenue in the east, rising in the centre to around the current height of Commonwealth Avenue
- A modified and reconstructed London Circuit West between Edinburgh Avenue and Commonwealth Avenue
- A modified and reconstructed London Circuit East between Commonwealth Avenue and Constitution Avenue
- New and modified intersections on London Circuit, including at Edinburgh Avenue (modified) and Commonwealth Avenue (new), and provision for potential for future connection to the proposed West Road (southward from London Circuit west towards the future New Acton waterfront)
- Modification and removal of existing cloverleaf ramp connections between Commonwealth Avenue, London Circuit and Parkes Way
- Provision of active transport infrastructure, including pedestrian and bicycle facilities
- Ancillary infrastructure and works, including utility connections, lighting, street furniture, landscaping and drainage.

Further details of these key elements are provided in the following sections. **Section 3.8** outlines the key sustainability and resilience measures that have been applied to the Project.

The Project would be carried out on:

- A small triangle of privately leased land adjacent to and southwest of the connection between the south west cloverleaf ramp and London Circuit (next to Capital Tower)
- Unleased National Land within the Commonwealth Avenue road reserve, including the existing crossing of London Circuit
- Unleased Territory Land under the custodianship of Transport Canberra and City Services (TCCS), including all other parts of London Circuit (other than the land crossed by Commonwealth Avenue) between Edinburgh Avenue and Constitution Avenue
- Unleased Territory Land under the custodianship of the City Renewal Authority (CRA), including the Section 63 carpark and Action Block 23 Section 33 carpark.

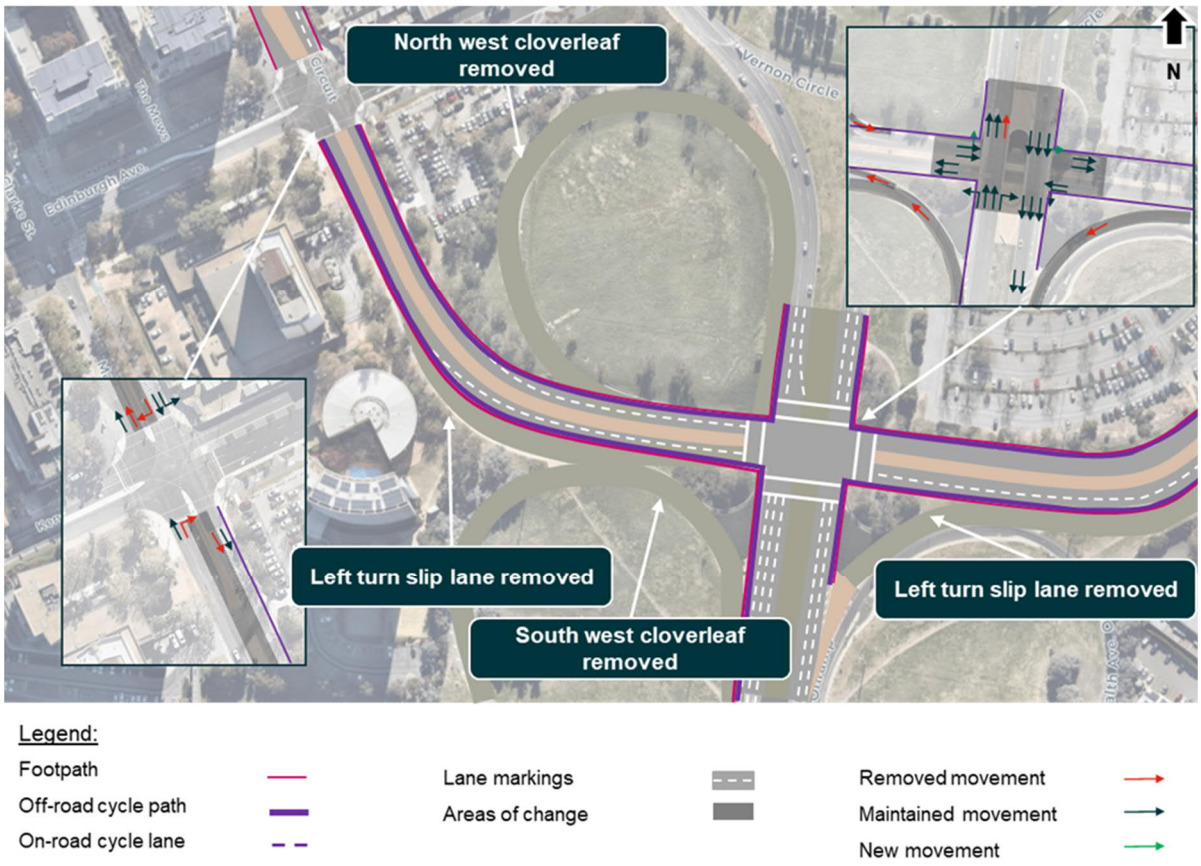


Figure 3-1 Completed Project features

3.1 Main embankment

The Project would include a filled embankment generally along the existing alignment of London Circuit between Edinburgh Avenue and Constitution Avenue. The embankment would extend from:

- London Circuit West - a point around 50 m to the south east of London Circuit - Edinburgh Avenue intersection (elevation 562 m AHD) to around the height of the existing Commonwealth Avenue (elevation 568.5 m AHD)
- London Circuit East - the existing Commonwealth Avenue (elevation 568.5 m AHD) to a point around 140 m south west of the London Circuit - Constitution Avenue intersection (elevation 563.5 m AHD).

The gradient of the embankment along the alignment of London Circuit would be up to 3.5%, tapering to around 2.0% on the approaches to Commonwealth Avenue. An indicative vertical alignment of the embankment along London Circuit is shown in **Figure 3-2**.

The embankment would be stabilised and supported using a series of retaining walls and batters. Subject to detailed design of the Project, these retaining walls and batters are anticipated to be as summarised in **Table 3-1**. At Commonwealth Avenue, batters would be integrated with the existing landform beneath the Commonwealth Avenue corridor, with additional batter fill used to support the embankment beneath the reconstructed London Circuit - Commonwealth Avenue intersection (refer to **Section 3.4**). Around 60,000 m^3 of fill material would be required for the embankment.

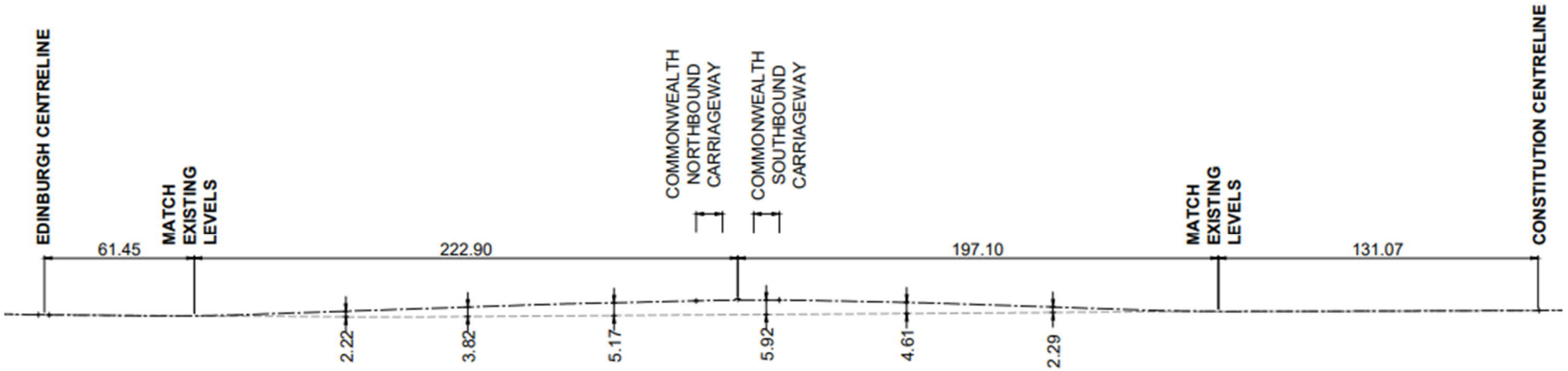


Figure 3-2 Indicative embankment vertical alignment along London Circuit

Table 3-1 Indicative retaining wall and batter arrangements

Project location	Indicative retaining wall and batter arrangements
London Circuit West (Edinburgh Avenue to Commonwealth Avenue)	Along the northern (inner) side of the embankment: • A batter along the full length of the embankment, with gradient of 25%. Along the southern (outer) side of the embankment: • A retaining wall from a point around 50 m to the south east of London Circuit - Edinburgh Avenue intersection to around the proposed future London Circuit-West Road intersection (around 150 m to the south east of London Circuit - Edinburgh Avenue intersection) • A batter for the remaining length of the embankment to Commonwealth Avenue, with gradient ranging from 20 to 25%.
London Circuit East (Commonwealth Avenue to Constitution Avenue)	Along the northern (inner) side of the embankment: • A batter along the full length of the embankment, with gradient of 25% Along the southern (outer) side of the embankment: • A batter for around 50 m from Commonwealth Avenue with gradient ranging from 25 to 33% • A retaining wall between the embankment and the modified south east cloverleaf ramp between Parkes Way and Commonwealth Avenue, for around 70 m • A batter for the remaining length of the embankment to a point around 140 m south west of the London Circuit - Constitution Avenue intersection, with gradient ranging from 25 to 33%.

3.2 London Circuit West (Edinburgh Avenue to Commonwealth Avenue)

The Project would involve modification and reconstruction of London Circuit West on the main embankment (refer to **Section 3.1**) from the modified London Circuit - Edinburgh Avenue intersection to the new London Circuit - Commonwealth Avenue intersection. Further details of new and modified intersections are provided in **Section 3.4**.

London Circuit West would provide sufficient space in the median to accommodate light rail infrastructure proposed as part of the Canberra Light Rail to Woden project.

London Circuit West would also include provision for potential future connection to the proposed West Road. West Road is proposed to connect London Circuit West southward into New Acton and towards the lake.

The traffic lane configuration of London Circuit West is shown in **Figure 3-1** and summarised in **Table 3-2**. London Circuit West would have a signposted speed limit of 40 km/h in both directions. **Figure 3-3** provides an indicative visualisation of London Circuit West from the adjacent to the QT Hotel.

Table 3-2 London Circuit West traffic lane configuration

Traffic direction	Traffic lane configuration
Eastbound (Edinburgh Avenue to Commonwealth Avenue)	• One traffic lane at the London Circuit - Edinburgh Avenue intersection • Widening from one traffic lane to two traffic lanes between around 60 m to 110 m to the east of the London Circuit - Edinburgh Avenue intersection • Two traffic lanes at the potential future intersection of the proposed West Road (around 160 m to the east of the London Circuit - Edinburgh Avenue intersection) • Two traffic lanes from the potential future intersection of the proposed West Road to the London Circuit - Commonwealth Avenue intersection • Two traffic lanes at the London Circuit - Commonwealth Avenue intersection.
Westbound (Commonwealth Avenue to Edinburgh Avenue)	• Two traffic lanes at the London Circuit - Commonwealth Avenue intersection up to the potential future intersection of the proposed West Road (around 120 m to the west of the London Circuit - Commonwealth Avenue intersection) • Narrowing from two traffic lanes to one traffic lane leading between 120 m and 190 m to the west of the London Circuit - Commonwealth Avenue intersection • One traffic lane from the potential future intersection of the proposed West Road from 190 m west of the London Circuit - Commonwealth Avenue intersection • One traffic lane at the London Circuit - Edinburgh Avenue intersection.

Figure 3-3 Visualisation south east along London Circuit from the QT Canberra hotel

3.3 London Circuit East (Commonwealth Avenue to Constitution Avenue)

The Project would involve reconstruction of London Circuit East on the main embankment (refer to **Section 3.1**) from the new London Circuit - Commonwealth Avenue intersection to the existing London Circuit - Constitution Avenue intersection. Further details of new London Circuit - Commonwealth Avenue intersection are provided in **Section 3.4**.

The traffic lane configuration of London Circuit East would be consistent with the current configuration of the road, as shown in **Figure 3-1** and summarised in **Table 3-2**. London Circuit East would have a signposted speed limit of 40 km/h in both directions. **Figure 3-4** provides an indicative visualisation of London Circuit East looking west to Commonwealth Avenue.

Table 3-3 London Circuit West traffic lane configuration

Traffic direction	Traffic lane configuration
Eastbound (Commonwealth Avenue to Constitution Avenue)	• Two traffic lanes from Commonwealth Avenue to Constitution Avenue.
Westbound (Constitution Avenue to Commonwealth Avenue)	• Two traffic lanes from Constitution Avenue to Commonwealth Avenue.

Figure 3-4 Visualisation from near the south eastern corner of London Circuit looking west to Commonwealth Avenue

3.4 New and modified intersections

The Project would involve new and modified intersections, including:

- Modification of the existing London Circuit - Edinburgh Avenue intersection
- A new London Circuit - Commonwealth Avenue intersection.

The Project would also include provision for potential connection to the proposed West Road in the future. The Project does not include any changes to the existing London Circuit - Constitution Avenue intersection.

3.4.1 Modified London Circuit - Edinburgh Avenue intersection

The Project would involve modification of the London Circuit - Edinburgh Avenue intersection to reflect the alignment and traffic lane configuration of London Circuit West (refer to **Section 3.2**), including capacity in the median to accommodate the proposed Canberra Light Rail to Woden project. The layout of the modified London Circuit - Edinburgh Avenue intersection is shown in **Figure 3-1**.

The Project would not involve changes to London Circuit to the north of the intersection, other than tie-in works immediately to the north of the intersection. The Project would not include any changes to Edinburgh Avenue outside the modified London Circuit - Edinburgh Avenue intersection, with the exception of utility works and minor civil works.

The existing lane configuration of London Circuit to the north of the Edinburgh Ave intersection would remain unchanged, however at the intersection the eastbound kerb side lane would be changed to left turn only and the right bay removed and the right turn would no longer be permitted.

The modified London Circuit - Edinburgh Avenue intersection would continue to be signalised with traffic lane configurations as shown in **Figure 3-1**.

3.4.2 New London Circuit - Commonwealth Avenue intersection

The Project would involve construction of a new at-grade signalised intersection between London Circuit and Commonwealth Avenue. The new London Circuit - Commonwealth Avenue would be at the existing elevation of the Commonwealth Avenue corridor and would be configured as shown in **Figure 3-1**.

The new intersection would include tie-in works to connect the intersection to the existing alignment and traffic lane configuration of Commonwealth Avenue for around 200 m to the north and around 200 m to the south. The general arrangement of the intersection has been designed to operate in its proposed state.

The new intersection has been designed to accommodate proposed and potential future light rail infrastructure. The proposed Canberra Light Rail to Woden project, which would travel along the median of London Circuit West (refer to **Section 3.2**), up the main embankment of the Project (refer to **Section 3.1**) before turning south within the centre of the new London Circuit - Commonwealth Avenue intersection and proceeding south along the median of Commonwealth Avenue.

3.4.3 Provision for potential future London Circuit-West Road intersection

The Project would not include an intersection with the proposed future West Road connection towards New Acton and the lake foreshore. However, the Project has been designed to accommodate such an intersection as part of or in association with delivery of West Road in the future.

A potential future London Circuit-West Road intersection is anticipated to be located on London Circuit West, around midway between Edinburgh Avenue and Commonwealth Avenue. Around this point, the Project would include:

- Two eastbound traffic lanes (Edinburgh Avenue to Commonwealth Avenue), with capacity to provide one of those lanes for a right-turn movement from London Circuit (eastbound) into the proposed West Road (southbound)
- One westbound traffic lane (Commonwealth Avenue to Edinburgh Avenue) with capacity in the corridor to allow for a left-turn movement from London Circuit (westbound) into the proposed West Road (southbound).

3.5 Modified and removed cloverleaf ramps

The Project would involve removal of redundant roads:

- The north west cloverleaf ramp that provides a connection from Commonwealth Avenue northbound onto London Circuit eastbound
- The south west cloverleaf ramp that provides a connection from Commonwealth Avenue northbound onto London Circuit westbound and Parkes Way eastbound.

Land affected by removal of these cloverleaf ramps would be stabilised and rehabilitated consistent with adjacent land.

The south east cloverleaf ramp that currently provides connection from Parkes Way eastbound and London Circuit westbound onto Commonwealth Avenue southbound would be modified to remove the connection from London Circuit. The remainder of the cloverleaf ramp would be retained and would continue to connect Parkes Way eastbound onto Commonwealth Avenue southbound. Minor modifications to the retained cloverleaf ramp along its northern extent be required to accommodate the retaining wall and batters associated with the main embankment beneath London Circuit East (refer to **Section 3.1**).

3.6 Active transport infrastructure

The Project would provide active transport infrastructure, including dedicated and separate pedestrian and bicycle paths. Active transport infrastructure that would be provided as part of the Project and its connection with existing networks is shown in **Figure 3-1**, and includes:

- A dedicated and separated bicycle path, and a separate pedestrian path, along the northern and southern sides of London Circuit between the London Circuit - Edinburgh Avenue intersection and the London Circuit - Constitution Avenue intersection
- A dedicated and separated bicycle path, and a separate pedestrian path, along the western and eastern sides of the new London Circuit - Commonwealth Avenue intersection for the length of the Commonwealth Avenue tie-in works

- Dedicated bicycle crossing points, and pedestrian crossing points over the new London Circuit - Commonwealth Avenue intersection, in both west-east and north-south directions.

3.7 Ancillary infrastructure and works

In addition to the main components of the Project, ancillary infrastructure and works would be carried out including:

- Provision of utilities (such as electricity supply for lighting) to support the Project. Adjustments and relocations to existing utilities along London Circuit would be carried out under separate approvals, as outlined in **Chapter 6.0**
- Installation of street furniture, landscaping and lighting, including both traffic and active transport lighting
- Drainage and stormwater management infrastructure connected to and integrated with existing networks.

3.8 Urban design vision

It is a policy of the ACT Government to achieve design excellence and a sustainable, liveable city. Appropriate planting design creates attractive, and durable landscapes that enhance the existing, rich diversity of the natural ACT environs. Street trees provide strong, legible structure planting that reinforces spatial connectivity with adjacent areas, enhancing environmental quality, visual continuity, identity and character.

The landscape design for the Project, shown in **Figure 3-5**, aims to provide a seamless interface with future development. The landscape design for London Circuit seeks to maximise opportunities to increase the public realm, to fill existing gaps in the street tree structure on both verges and to maximise the quantum of tree canopy cover in line with Territory policy. The proposed street trees for London Circuit are in accordance with the Canberra Central Design Manual (ACT Planning and Land Authority, 2008), City Hill Precinct requirements, and the current design is expected to exceed the urban forest target of 30 percent canopy shade cover.

Landscape treatments address Crime Prevention Through Environmental Design (CPTED) and safety-in-design. Paving finishes, street lighting and street furniture have also been designed in accordance with the requirements of the Central Canberra Design Manual.

MPC has commissioned a number of studies to further understand the heritage aspects associated with the landscape of Commonwealth Avenue, and to assist in developing a holistic landscape proposition for the Avenue. The landscape design is consistent with this proposition, and would continue to be refined in consultation with key stakeholders and Approval authorities, including the NCA and Commonwealth Department of Agriculture, Water and Environment (DAWE).

Figure 3-5 Landscape plan for the Project

3.9 Sustainability and resilience

3.9.1 Ecologically sustainable development

As discussed in detail in **Chapter 6.0**, the Project would be subject to Works Approval from the National Capital Authority under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) (PALM Act). The PALM Act does not specify design or assessment requirements relevant to ecologically sustainable development (ESD) principles. For the purposes of meeting best practice for this Environmental Assessment, the Project has sought to align with ESD principles as detailed in the ACT *Planning and Development Act 2007* (PD Act). ESD definitions and principles are also provided in a number of other relevant statutory planning documents, including in the *Protection of the Environment Administration Act 1991* (NSW) and the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) (**Section 6.0**).

The United Nations Brundtland Commission has defined sustainability as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*". In turn, ESD comprises development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. Section 9 of the PD Act defines sustainable development as the effective integration of social, economic and environmental considerations in decision-making processes, achievable through implementation of the following principles:

a. The precautionary principle

b. The intergenerational equity principle

c. Conservation of biological diversity and ecological integrity

d. Appropriate valuation and pricing of environmental resources.

Table 3-4 provides a detailed definition of each of these principles and describes their applicability to the Project. Measures to meet the ESD principles outlined in the PD Act have been embedded throughout this Environmental Assessment.

Table 3-4 ESD principles, descriptions, and applicability

Principle	Description	Applicability
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 measures to prevent environmental degradation.	The Environmental Assessment details potential impacts to the environment (if left unmanaged) as a result of the Project and throughout the asset design life. As the Environmental Assessment has been developed during Project planning, a number of ESD assumptions have been made based on current knowledge of the Project. Where information is unavailable or unclear to determine environmental impacts, conservative assumptions have been applied through modelling and other assessment tools to estimate projected outcomes within reasonable levels of certainty. This is highlighted in the climate change risk assessment (refer to **Section 3.9.4**) using historic climate trends and scientific data to predict future climatic conditions.
Intergenerational 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 Environmental Assessment has been developed to provide an assessment of key environmental issues that may be impacted by the Project and outline measures that at least 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. A summary of all the management and mitigation measures provided for the Project is provided in **Chapter 10.0** (Environmental mitigation and management measures)
Conservation of biological diversity and ecological integrity	Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The Environmental Assessment outlines where biological diversity and ecological integrity may be impacted by the Project, and outlines techniques for management and maintenance, including habitat rehabilitation and offsetting. These measures are detailed in **Section 9.3.**

Principle	Description	Applicability
Appropriate valuation and pricing of environmental resources	Environmental factors should be included in the valuation of assets and services.	The London Circuit and Commonwealth Avenue Intersection Business Case (ACT Government, n.d.) (of which the Project forms a part) details the value of environmental factors that have been taken into consideration for decision making for the Project through qualitative or quantitative means. Furthermore, design development has sought to use a decision making framework to value environmental resources in decision making for the Project.

3.9.2 Statement of Strategic Directions

The PD Act requires that the Territory Plan, which provides the policy framework for the administration of planning in the ACT, must contain a statement of strategic directions which contains broad strategic principles to guide long term planning for the ACT. The statement of strategic directions includes principles for sustainable development, as well as urban design principles. The Project is consistent with relevant parts of the Statement of Strategic Directions, including:

- The Project has been developed with a balanced approach to achieving economic vitality, community wellbeing and environmental quality. Community involvement has been recognised as an important input into Project development, as outlined in **Chapter 7.0** (Principles 1.1 and 1.3)
- The Project reflects matters of significance to the broader National Capital, as detailed in relation to the National Capital Plan (refer to **Section 2.2.1**) (Principle 1.2)
- The potential for cumulative impacts beyond those posed by the Project itself have been considered and taken into account as part of this environmental assessment (refer to **Chapter 2.0**), including in the context of the Precautionary Principle (Principle 1.4)
- The Project has been designed to ensure efficient use of all resources and reduce the consumption of non-renewable resources, and waste minimisation, reuse and recycling has been encouraged (refer to **Section 3.9.4** and **Section 9.11**) (Principle 1.5)
- The Project has responded to land capability constraints, and information on topography, soils, geotechnical factors, drainage, natural hazards, microclimate and the sensitivity of ecosystems has informed development of the Project design (Principle 1.6)
- Land and water resources have been considered, and the Project has been designed to reflect water sensitive urban design (refer to **Section 9.10**) (Principle 1.7)
- The Project has been designed to maximise the integration of land use and transport planning, and in addition to the delivery of road infrastructure includes active transport infrastructure (refer to **Section 3.6**) and provision for proposed and potential future light rail infrastructure (Principle 1.10)
- The Project would improve local amenity through the City Hill precinct by providing an alternative route for through-traffic, consistent with the National Capital Plan, and has been designed to minimise the generation of pollution and provide for the protection of health and safety (Principle 1.11)
- The Project would enhance the ease of getting around the city, has been designed to provide a safe and clean environment, and to contribute to the vibrancy of the city as a place of social, cultural and business exchange, consistent with Canberra's role as the national capital (Principle 1.13)

- The Project has been developed placing a particular emphasis on cost-effective provision and management of infrastructure, taking into account whole-of-life and whole-of-system costs (Principle 1.17)
- The Project facilitates active living through the provision of active transport infrastructure (refer to **Section 3.6**) connected to existing networks (Principle 1.18A)
- The urban design vision for the Project (refer to **Section 3.8**) has been developed taking into account the principles of crime prevention through environmental design. The Project meets applicable road design standards to provide a high standard of safety and to accommodate emergency services needs (Principle 1.22)
- The Project has been designed to recognise the needs of people with disabilities, both related to the Project and to its proposed future interface with the Canberra Light Rail to Woden (Principle 1.23)
- The Project would include segregated network facilities for pedestrians and cyclists, has made provision for future connection with the Canberra Light Rail to Woden and would provide a legible and permanent hierarchy of roads consistent with the road hierarchy for the City Hill Designated Area Precinct presented in the National Capital Plan (Principle 1.24)
- The Project would avoid significant impacts on identified places of heritage significance. Notably, the Project has been designed to sympathetically integrate with the Commonwealth Avenue corridor which provides the historically, culturally and visually significant connection between the City Hill-Parliament House side of the National Triangle (Principle 1.26).

3.9.3 Sustainability framework

3.9.3.1 Sustainability policy

Given the co-location of the Project with sections of Light Rail to Woden, an overarching Sustainability Policy has been developed for the Project and light rail. This policy sets the theme and key objectives for sustainability and resilience for development and operation of Light Rail to Woden, and consequently, the Project.

This Sustainability Policy aims to capture themes from ACT policies and best practice guidelines to underpin planning and design decision making. The Sustainability Policy has been endorsed by the Project Director and has been made available via the Project website at https://www.act.gov.au/__data/assets/pdf_file/0005/1844114/Light-Rail-Sustainability-Policy-1.pdf.

The Sustainability 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.

3.9.3.2 ACT Climate Change Strategy 2019-2025

The *ACT Climate Change Strategy 2019-2025* outlines the ACT Government's response to climate change and identifies the necessary steps to meet both interim targets, and also defines long-term aspirations to achieve the end goal of net zero by 2045. As part of the strategy, actions have been developed that are focused on a number of climate adaptation and mitigation options, most notably, building resilience to physical climate change impacts.

The Strategy outlines several key priorities, several of which the Project helps support. Of relevance to this sustainability and resilience assessment, action 5.6 provides that '*all new Government capital works with a budget of more than $10 million either seek or are consistent with an independent sustainability rating such as an Infrastructure Sustainability rating from the Infrastructure Sustainability Council of Australia (ISCA), or a Greenstar rating from the Green Building Council of Australia or equivalent, and review ratings at least every five years'*.

As discussed in more detail below, the Project is undertaking an IS Rating under the ISCA Rating Scheme.

3.9.3.3 Infrastructure Sustainability Council

The Infrastructure Sustainability (IS) Rating Scheme (ISCA, 2018) was developed and is administered by Infrastructure Sustainability Council (ISC) (formerly referred to as Infrastructure Sustainability Council of Australia (ISCA)). ISC is a member-based, not-for-profit peak body operating in Australia and New Zealand with the purpose of enabling sustainability outcomes in infrastructure.

ISC seeks to promote infrastructure sustainability through the IS Rating Scheme. The ACT Government is a member of ISC.

Infrastructure Sustainability is defined by ISC as:

Infrastructure that is designed, constructed and operated to optimise environmental, social and economic outcomes over the long term.

The IS Rating Scheme facilitates the ratings of infrastructure projects and assets. The IS Rating Scheme is a comprehensive rating system for evaluating sustainability across planning, design, construction and operation phases of infrastructure projects.

The IS Rating Scheme encompasses the IS Rating Tool, a comprehensive evaluation of sustainability performance designed to help infrastructure meet its full sustainability potential across all project stages. Points are gained through the achievement of IS credits, which cover numerous aspects of sustainability including governance and procurement, stakeholder engagement and community wellbeing, urban design, resource use, climate change, heritage and ecology

3.9.4 Climate change

In 2016, for the first time, global temperatures were confirmed to have risen by one degree Celsius (1^{o}C) since pre-industrial levels. The *State of the Climate 2020* (BoM, 2020) confirms the long term warming trend over Australia's land and oceans, showing that Australia's climate has warmed by 0.9^{o}C since 1910. Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (IPCC, 2021) states with high confidence that Australia is already experiencing impacts from recent climate change, including a greater frequency and severity of extreme weather events. Other observed trends include an increase in record hot days, a decrease in record cold days and increases in global GHG concentrations.

A Climate and Natural Hazards Assessment (CNHA) assessment has been undertaken with the aim to identify measures to increase the Project's resilience to climate change. This assessment is provided in **Appendix J (Climate and Natural Hazards Assessment)**. This involves the understanding and identification of potential effects and physical risks associated with climate change as well as the identification of treatment options and mitigation measures to be incorporated throughout the design, construction and operation phases of the Project. Multidisciplinary stakeholders were consulted during the assessment process to validate and assist in identifying further climate risks.

Climate change is anticipated to alter the future climate of Canberra beyond a point of natural variability. Effects of climate change are already experienced, with recent events, such as the 2019/2020 bushfires, maximum temperature records set in 2020, extreme storms and 2021 extreme rainfall event,

demonstrating the current vulnerability of critical infrastructure in and around Canberra and the Project. As such, climate change has the potential to impact each of the ESD principles described in **Table 3-4**.

Various elements of the Project may be impacted by climate change. These impacts may be realised both during construction and during the on-going operation and maintenance of the Project. As such, climate change projections for 2030 and 2070 were considered applicable to determine the short term and long term impacts, respectively.

Events experienced between 2019 and 2021 described above, previous observed events, and projected trends indicate that construction risks to the Project may be associated with construction delays, impacts to the availability of workers and supplies, and potential risks to human health and safety. Previous trends have also highlighted the increased likelihood of physical damage, increased water discharge and the accelerated deterioration of assets.

Extreme rainfall, flooding and extreme heat are expected to pose the greatest risk to the operation of the Project in both the near future and far future. Risks associated with these events may include):

- Impacts from extreme rainfall impacting on drainage infrastructure and surrounding areas resulting in nuisance or destructive flooding
- Increased load on stormwater treatment and erosion and sediment control devices, affecting water quality treatment levels
- Reduced access to the Project and surrounding areas impacting on emergency response during extreme events (e.g., storms, wind events, bushfire)
- Bushfire smoke affecting visibility and air quality for construction workers
- The consideration of drought, extreme heat and changes to rainfall increasing damage and accelerated degradation of materials and equipment (e.g., concrete, electrical equipment, paved areas), and associated increases in maintenance costs
- Decreased availability of water during periods of drought negatively impacting on landscaped areas (particularly green infrastructure).

Whilst the extent of climate change beyond 2030 is uncertain, adaptation actions identified within the CNHA may assist in reducing the residual risk across future scenarios. Adaptation actions were developed around key climate variables, with adaptations in **Table 3-5** included in the Project design and in **Table 3-6** planned for future action.

Table 3-5 Adaptation actions incorporated into design

Climate variable	Adaptation action
Extreme rainfall and flooding	Bridges, culverts, Water Sensitive Urban Design (WSUD) infrastructure and drainage infrastructure designed to accommodate increased runoff that could be caused by changes in rainfall, including increased short duration runoff events where the Project is not constrained by existing downstream drainage infrastructure (i.e., design drainage structures to accommodate a 20 per cent increase in peak rainfall and stormwater).
	Pits and pipes within the Project area to be sized to allow for the 20 per cent increase in rainfall intensities, consistent with relevant TCCS Standards (MIS08).
	Water sensitive urban design (WSUD) features such as irrigated tree pits to collect and clean stormwater.
	Blockage factors of drainage have been included in the design for the one per cent Annual Exceedance Probability (AEP) event that range from 10 per cent to 50 per cent to reduce the risk of debris and other materials blocking the drainage.
	Stormwater load, drainage and performance on WSUD devices have been designed with consideration of a 20 per cent increase in rainfall volume where reasonable and feasible.

Climate variable	Adaptation action
Extreme rainfall and flooding / extreme heat	Design pavements and base layers to accommodate impacts caused by variability in rainfall (e.g., wetting and drying) and increases in temperature.
Drought / extreme heat	Landscape features and plantings have been selected to resist drought and hotter conditions in accordance with the ANU Urban Forest Tree Species Research program. This would include the use of mulch in planting areas to encourage infiltration and reduce evaporation.
Extreme heat	Health and safety plans would be required to include extreme heat response (e.g., staffing plans, tools down, scheduling work to not coincide with the hottest part of the day etc., PPE for construction and transit staff and rest areas and first aid points.
Bushfire	Maintain landscaped areas to minimise potential bushfire origin point and fuel loads.
General	Asset management plans have been developed to account for both seasonal variation and in response to climate variables (e.g., inspection after a bushfire or storm event, regular maintenance – dry limb removal).
General	Relevant specifications have been checked against climate change factors (e.g., projected increases / decreases in climate variables) including planting schedules.

Table 3-6 Planned climate adaptation measures

Climate variable	Adaptation action
Extreme rainfall and flooding	Maximise the use of permeable surfaces int the public realm or verge areas through the use of permeable pavement materials, green infrastructure and other mechanisms.
	Flood levels that have been identified in the flood study (which account for worst case scenarios) would be taken into consideration when deciding RLs across the Project alignment.
Extreme Heat	Materials (e.g., electrical box coverings, lighting) would be selected that can withstand / be more resistant to increased extreme and prolonged temperature events to slow / prevent accelerated degradation of infrastructure – in accordance with the ACT Climate Change Adaptation Strategy.

An assessment was undertaken to estimate greenhouse gas emissions associated with the Project, this has been provided and is summarised in **Section 9.7**. The results of this assessment determine that the Project is expected to result in the generation of approximately 1,875 tonnes of carbon dioxide equivalent over the duration of the Project construction, the majority of which are emissions from embodied energy within key construction materials and disposal of waste generated by the Project, and the transport of construction materials (such as concrete, steel, asphalt, aggregate and sand), These emissions are referred to as ‘scope 3’ under the National Greenhouse and Energy Reporting Scheme.

Scope 3 emissions comprise indirect greenhouse gas emissions that occur as a consequence of the activities of a facility or project, that is; they are the result of activities from assets not owned or controlled by the reporting proponent. This may include transport, distribution and use of sold products and services, or leased assets.

This generation of direct and indirect greenhouse gas emissions as a result of the Project would be relatively minor, equivalent to approximately 0.15% of ACT’s total emissions and 0.00036% of Australia’s total emissions in 2019.

Despite the low emissions generation, the Project aims to achieve net zero emissions, in alignment with the ACT Climate Change Strategy 2019-2025.

The Project also seeks to minimise the requirement for new materials as far as practical, through reuse and recycling of materials from demolition, clearing and grubbing activities. Works, including earthworks, have been programmed in a way to minimise double handing of materials. In addition, MPC would seek to prioritise local procurement of materials where practicable to reduce transport emissions.

Examples of proposed reuse and recycling measures are provided in **Table 9-61**, and the Project would continue to explore opportunities to reuse materials onsite, where practicable. Resource and waste management associated with the Project are discussed further in **Section 9.11**.

Table 3-7 Proposed materials reuse and recycling

Activity	General measures
Demolition of bridges and retaining walls	Minimise demolition efforts i.e., leaving in place foundations, and not impacting permanent works where practical The following materials would be recycled either onsite or taken to a facility that is capable of recycling that material Concrete Steel (including steel rails, and reinforcement separated from concrete).
General demolition	Gravel pavements would be reused onsite in service trench backfill, and select material would be reused in new pavements Excavated material from services would be incorporated into earthworks to minimise the export of material and import of additional materials The following materials would be recycled either onsite on taken to a facility that is capable of recycling that material Concrete Steel and copper Asphalt Steel streetlights Concrete pipes.
Clearing and grubbing	Vegetation material would be mulched and stockpiled for reuse onsite or at other locations. Where this is not feasible, it would be transported for use at alternative sites. In the instance that significant environmental weeds or pathogens are identified in any vegetation material, this would be removed from site to undergo any required treatment prior to being directed to reuse or waste, as appropriate.

4.0 Construction works

Subject to securing and complying with the conditions of environmental and planning approvals (refer to **Chapter 6.0**), construction of the Project would commence around April 2022 and would take approximately two years to complete. Construction of the Project would be preceded by a series of early works, including:

- Relocation of utilities currently located within the Project construction footprint
- Translocation of Golden Sun Moth (*Synemon plana*) larvae from areas affected by utility relocations
- Traffic management works at the London Circuit - Edinburgh Avenue intersection to allow closure of London Circuit during construction of the Project
- Traffic management works at the Northbourne Avenue-Vernon Circle intersection, including signalisation, and at the London Circuit - Constitution Avenue intersection to allow closure of London Circuit and traffic management along Commonwealth Avenue during construction of the Project.

These early works are described in more detail in **Section 4.1**. The construction footprint for the Project is shown in **Figure 4-1**.

Key construction activities that would be carried out for the Project include:

- Site establishment and preparatory works
- Closure and raising of London Circuit, and construction of retaining walls
- Demolition and infilling of the Commonwealth Avenue bridges over London Circuit
- Construction of permanent roadworks
- Construction of ancillary infrastructure, including traffic signals and streetlighting, and finishing works.

Each of these key construction activities is described in more detail in the following sections.

Construction of the Project would be carried out under a Construction Environmental Management Plan (CEMP). The CEMP would be prepared prior to construction to outline the construction conditions and temporary environmental protection measures to manage the impact of construction activities. The CEMP would be consistent with the environmental management measures documented in this Environmental Assessment and identified in the Works Approval, planning approval conditions from the NCA Works Approval, and any other requirements or conditions within any licences or permits as issued by Government Authorities.

Figure 4-1 The Project construction footprint

4.1 Early works

Early works would be carried out to enable construction of the Project to commence, subject to securing and complying with approvals for the Project. works are subject to separate assessment and approvals processes from the Project, with key activities outlined here for completeness. These early works are separate from the site establishment and preparation activities carried out at the beginning of the construction program for the Project (refer to **Section 4.2**).

The early works to be carried out prior to commencement of construction of the Project, and the approvals under which they would be carried out, are summarised in **Table 4-1** and detailed further in the following sections. Further information relating to approvals is provided in **Chapter 6.0**.

Table 4-1 Package 1 early works and related approvals

Early works	Relationship to the Project
Utilities relocations and adjustments, including construction support sites	Relocation of utilities currently within the London Circuit corridor to an alternative location via Constitution Avenue, Edinburgh Avenue, and Vernon Circle to allow commencement of construction in the London Circuit corridor. The construction compound sites for the utilities relocations would continue to be used as construction support sites for the Project. This Environmental Assessment considers the continued use of the construction support sites for the Project (refer to **Section 4.2.1**).
Golden Sun Moth translocation	Translocation of Golden Sun Moth (*Synemon plana*) larvae from within areas affected by utility relocation early works and the construction footprint. This Environmental Assessment assumes translocation of larvae to the south east cloverleaf is complete.

Early works	Relationship to the Project
Edinburgh Avenue traffic controls	Traffic controls would be implemented at and around the London Circuit - Edinburgh Avenue intersection to allow closure of London Circuit as part of the Project (refer to **Section 4.3**). The traffic controls would remain in place for the duration of construction of the Project. This Environmental Assessment assumes that the Edinburgh Avenue traffic controls are in place prior to the commencement of construction of the Project.
Vernon Circle and Constitution Avenue traffic controls	Traffic controls would be implemented at and around the London Circuit - Constitution Avenue intersection, and at the Northbourne Avenue-Vernon Circle intersection (including signalisation) to allow closure of London Circuit and north west cloverleaf (refer to **Section 4.3**) and management of traffic on Commonwealth Avenue (refer to **Section 4.4**) as part of the Project. The traffic controls would remain in place for the duration of construction of the Project. This Environmental Assessment assumes that the Constitution Avenue and Vernon Circle traffic controls are in place prior to the commencement of construction of the Project.

4.2 Site establishment and preparatory works

Site establishment and preparatory works would involve:

- Mobilisation and establishment of construction compound sites. Construction compound sites approved for use as part of the utility relocation early works (refer to **Section 4.2.1**) would continue to be used for construction of the Project
- Implementation of temporary surface water and drainage management infrastructure, including temporary grass swales, along around areas of London Circuit to be filled and raised with bulk earthworks
- Decommissioning and removal of utilities from within the Project construction footprint. Some decommissioning and removal works may also be carried out as part of construction works along London Circuit and around the new London Circuit - Commonwealth Avenue intersection
- Implementation of traffic management measures, including reliance on early works carried out at the London Circuit - Edinburgh Avenue, Commonwealth Avenue-Vernon Circle and London Circuit - Constitution Avenue intersections, closure of London Circuit to traffic between Edinburgh Avenue and Constitution Avenue, and north west and south west cloverleaf ramp connections between Commonwealth Avenue, London Circuit and Parkes Way.

4.2.1 Mobilisation and establishment of construction compound sites

Works Approval WA102408 for the relocation of utilities from within the Project construction footprint includes authorisation of two construction compound sites for those works:

- Construction compound site A – occupying part of the carpark currently in City Block 1, Section 116
- Construction compound site B – occupying the carpark currently in City Block 2 and City Block 3, Section 20

It is proposed that these two construction compound sites would be repurposed and would continue to be used as construction compound sites for the Project.

A third construction compound (construction compound site C) is proposed to occupy the carpark currently in Acton Block 24 Section 33.

The location of the three construction compound sites are shown in **Figure 4-2**, with key site details summarised in **Table 4-2**.

Table 4-2 Key details of construction compound sites

Construction compound site	Key activities	Site access routes
Construction compound site A	• Construction carparking • Employee amenities.	Direct access to / from Constitution Avenue
Construction compound site B	• Construction laydown and storage • Construction carparking • Employee amenities.	Vehicle access via Gordon Street
Construction compound site C	• Light vehicles only • Construction carparking • Employee amenities.	Vehicle access via Albert Street and Corkhill Street

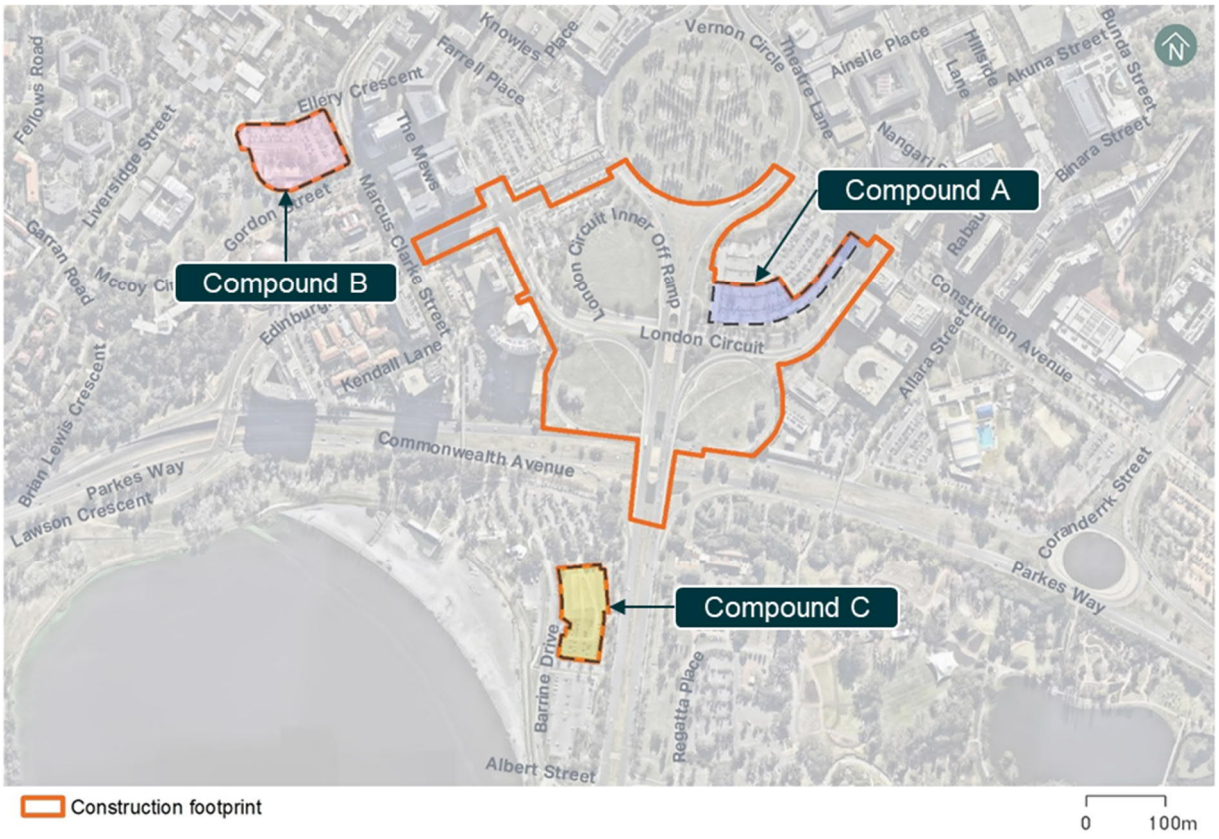


Figure 4-2 Location of construction compound sites

4.2.2 Temporary surface water and drainage management infrastructure

Temporary surface water and drainage management infrastructure would be constructed along the Project construction footprint, around areas that would be subject to bulk earthworks. The measures would be maintained, as required, until construction of the Project is complete.

Surface water management works would be carried out across construction disturbance areas, as required depending on the construction area, construction works being carried out and stage of construction activities. Surface water management works may include a series of:

- Earth berms to contain and direct surface water runoff
- Drainage channels and sedimentation basins

- Connections with existing drainage infrastructure
- Application of geotextile fabric or similar to minimise erosion and scouring
- Use of silt rocks or similar around drainage pits.

Further details of surface water management techniques would be included in the CEMP for the Project.

4.2.3 Decommissioning and removal of utilities

Utilities within the Project construction footprint that may be affected by construction works would be relocated prior to the commencement of construction as an early works activity (refer to **Section 4.1**). Utilities infrastructure that remains within and around the Project construction footprint would be subject to one or more of the following, depending on agreement with the relevant utility owner / operator:

- Protected for the duration of construction works
- Disconnected, decommissioned and removed
- Disconnected, decommissioned and left in-situ.

Most protection, decommissioning and removal of utilities would be completed early in the Project construction period, but may also be staged during the construction period depending on construction planning requirements.

4.2.4 Traffic management measures

Early works would include installation of additional traffic controls or signalisation works at Edinburgh Avenue, and at Vernon Circle and Constitution Avenue (refer to **Section 4.2.4**). These early works would be relied on during construction of the Project to:

- Facilitate closure of London Circuit
- Support management of traffic, particularly for buses, along Commonwealth Avenue during construction.

These early works may be supplemented with additional traffic management measures to be implemented as part of the Project, including changes to:

- Traffic line markings, particularly around the London Circuit - Edinburgh Avenue, London Circuit - Constitution Avenue and Commonwealth Avenue-Vernon Circle intersections
- Traffic signal phasing at these intersections
- Traffic signage at these intersections, and elsewhere, including in relation to the cloverleaf ramp connections between London Circuit, Commonwealth Avenue and Parkes Way
- Active transport infrastructure, including temporary diversions and associated signage
- Public transport infrastructure and services, including temporary diversions and associated signage.

4.3 Closure and raising of London Circuit

Closure and raising of London Circuit would involve:

- Removal of existing street furniture, road pavement and vegetation along London Circuit and within the Project construction footprint
- Removal of existing street furniture and road pavement along the north west and south west cloverleaf ramp connections between Commonwealth Avenue, London Circuit and Parkes Way, and stabilisation and rehabilitation of land in those areas
- Removal of existing street furniture and road pavement for the connection between London Circuit East and the south east cloverleaf ramp connection between London Circuit, Commonwealth Avenue and Parkes Way. Only the connection with London Circuit would be affected, with the remainder of the ramp connection retained with potential minor modification to accommodate the

embankment batter for London Circuit East. Land affected by removal of the London Circuit connection would be stabilised and rehabilitated

- Construction of retaining walls and batters, and staged filling of the London Circuit road corridor between Edinburgh Avenue and Constitution Avenue. The infilling around Commonwealth Avenue would continue concurrently and in coordination with demolition and infilling beneath the Commonwealth Avenue northbound and southbound bridges (refer to **Section 4.4**).

4.3.1 Removal of existing street furniture, road pavement and vegetation

Following closure of London Circuit to traffic, existing street furniture, road pavement and vegetation would be removed along the London Circuit corridor between Edinburgh Avenue and Constitution Avenue. This would include removal of kerb and gutter, pedestrian paths, hard landscaping, signage, street lighting and handrails.

Areas of vegetation to be cleared would be delineated before removal, including protection of Golden Sun Moth habitat. Vegetation would be mulched for reuse as part of the Project or directed for reuse or disposal offsite. Topsoil would be stripped and managed in accordance with the EPBC Act Approval (2019 / 8582).

4.3.2 Removal and rehabilitation of cloverleaf ramp connections

The existing cloverleaf ramp connections between London Circuit, Commonwealth Avenue and Parkes Way would be removed or modified as follows:

- The north west cloverleaf ramp currently connecting Commonwealth Avenue northbound to London Circuit eastbound would be removed
- The south west cloverleaf ramp currently connecting Commonwealth Avenue northbound to London Circuit westbound and Parkes Way eastbound would be removed
- The south east cloverleaf ramp currently connecting London Circuit westbound to Commonwealth Avenue southbound and Parkes Way eastbound would be retained and modified to remove the connection from London Circuit westbound and the cloverleaf ramp.

Existing street furniture, road pavement and vegetation would be removed along the north west and south west cloverleaf connections and along that part of the south east cloverleaf ramp connection to be removed, as outlined in **Section 4.3.2**. Mulched vegetation would be used, subject to quality requirements, to stabilise and rehabilitate disturbed land.

4.3.3 Retaining walls, batters and staged raising of London Circuit

London Circuit would be progressively raised in a series of stages to form the final main embankment, providing a slope of up to 3.5% from the intersections with Edinburgh Avenue and Constitution Avenue to the new London Circuit - Commonwealth Avenue intersection (around 5.5 to 6 m above the current alignment of London Circuit). The embankment slope would reduce to around 2.0% on approach to the new intersection. The indicative final vertical alignment of the embankment is shown in **Figure 3-2**.

The main embankment would require the importation of around 60,000 m^3 of fill material, including:

- Around 54,000 m^3 of bulk general fill to form the majority of the main embankment
- Around 6,000 m^3 of other materials, including controlled road base (roads), controlled fill (verges), pavers and asphalt, and topsoil (landscaped areas).

It is estimated that up to around 5,200 24-tonne truck-and-dog deliveries of material would be required during construction of the main embankment. Imported materials are anticipated to be delivered to, stockpiled and managed within the closed London Circuit corridor during construction works, such as within the north west and south west cloverleaves. Some minor quantities of material may also be managed at construction compound site B (refer to **Section 4.2.1**). Imported materials would be subject to testing to ensure appropriate quality and would be managed on-site to minimise the generation of dust. This may include the use of water sprays and interim stabilisation of infilled areas.

Imported fill material would be managed and placed using a combination of graders, vibrating rollers, excavators and compactors. Road sweepers would be used to maintain clean roads and access points,

and vacuum trucks for detailed excavation or removal of water from trenches. Dust control and suppression measures would be implemented.

Infilling of London Circuit would be carried out in stages as required to coordinate with demolition and infilling of the Commonwealth Avenue bridges (refer to **Section 4.4**), and construction and stabilisation of retaining walls and embankment batters. Finished retaining walls and batters are summarised in **Table 3-1** and would include two retaining wall structures:

- As part of London Circuit West – a retaining wall from around a point around 50 m to the south east of London Circuit - Edinburgh Avenue intersection to around the potential future London Circuit-West Road intersection (around 150 m to the south east of London Circuit - Edinburgh Avenue intersection)
- As part of London Circuit East – a retaining wall between the embankment and the modified south east cloverleaf ramp between Parkes Way and Commonwealth Avenue, for around 50 m.

The retaining walls would have a high quality finish consistent with the urban design vision for the Project.

At tie-in points with the existing Commonwealth Avenue embankment, existing retaining walls would be fully or partially demolished, and replaced with integrated embankments with the London Circuit main embankment works.

4.4 Demolition and infilling of Commonwealth Avenue bridges

Commonwealth Avenue is an important major road providing access to the Canberra City centre and across Lake Burley Griffin to the south. It is vital that it continues to operate during construction of the Project, and therefore construction works affecting Commonwealth Avenue would be staged with implementation of appropriate traffic management measures to ensure that Commonwealth Avenue continues to operate until the new London Circuit - Commonwealth Avenue intersection is completed.

Key to allowing Commonwealth Avenue to continue to operate would be the construction and use of a temporary sidetrack to the east of the existing Commonwealth Avenue bridges. The sidetrack would allow switching of traffic along Commonwealth Avenue while each of the northbound and southbound bridges are demolished and infilled. Further details of the temporary sidetrack and demolition and infilling of the Commonwealth Avenue bridges is provided below.

4.4.1 Temporary sidetrack

A temporary sidetrack would be constructed on part of the permanent embankment works to the east of the existing Commonwealth Avenue. The sidetrack and parts of the Commonwealth Avenue median would be temporarily paved to provide two traffic lanes, with connections to allow cross-over of traffic between the northbound and southbound traffic lanes and the sidetrack (as shown in **Figure 4-3** for the operation of the sidetrack during demolition of the Commonwealth Avenue southbound bridge). The sidetrack would include temporary bicycle and pedestrian paths to allow for safe diversion of pedestrians and cyclists during the works.

Construction of the sidetrack embankment would form part of the permanent main embankment works to minimise rework as much as possible (refer to **Section 4.3.3**).

Operation of the sidetrack during staged demolition and infilling of the Commonwealth Avenue bridges is summarised in **Table 4-3**. An indicative cross section through the temporary sidetrack and existing Commonwealth Avenue southbound carriageway showing their configuration and operation during demolition of the Commonwealth Avenue northbound bridge is shown in **Figure 4-6**.

Table 4-3 Staged operation of the temporary sidetrack during Commonwealth Avenue bridge demolition and infilling

Commonwealth Avenue works	Commonwealth Avenue northbound traffic	Commonwealth Avenue southbound traffic	Status of the temporary sidetrack
Stage 1 – Construction of temporary sidetrack (refer to **Figure 4-3**)	Northbound traffic stays on the existing carriageway	Southbound traffic stays on the existing carriageway	Under construction
Stage 2- Demolition and infilling southbound bridge (refer to **Figure 4-4**)	Northbound traffic stays on the existing carriageway	Southbound traffic is diverted onto the temporary sidetrack	Carrying southbound traffic
Stage 3 – Demolition and infilling northbound bridge (refer to **Figure 4-5**)	Northbound traffic switched onto the newly constructed southbound carriageway using temporary median pavement	Southbound traffic is still diverted onto the temporary sidetrack	Carrying southbound traffic
Stage 4 – Demolition complete (refer to **Figure 4-7**)	Northbound traffic switched back to the newly constructed northbound carriageway	Southbound traffic switched back to the newly constructed southbound carriageway	Incorporated into the permanent eastern embankment works

Figure 4-3 Stage 1 Commonwealth Avenue works

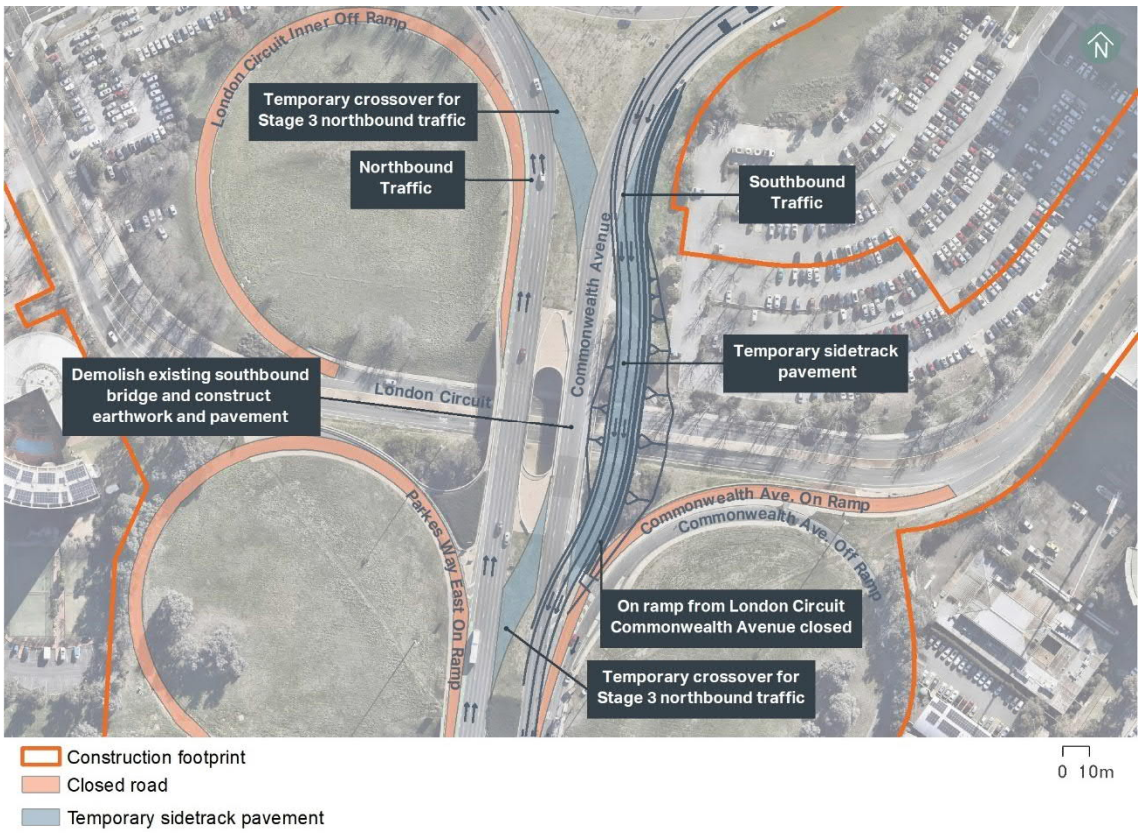


Figure 4-4 Stage 2 Commonwealth Avenue works

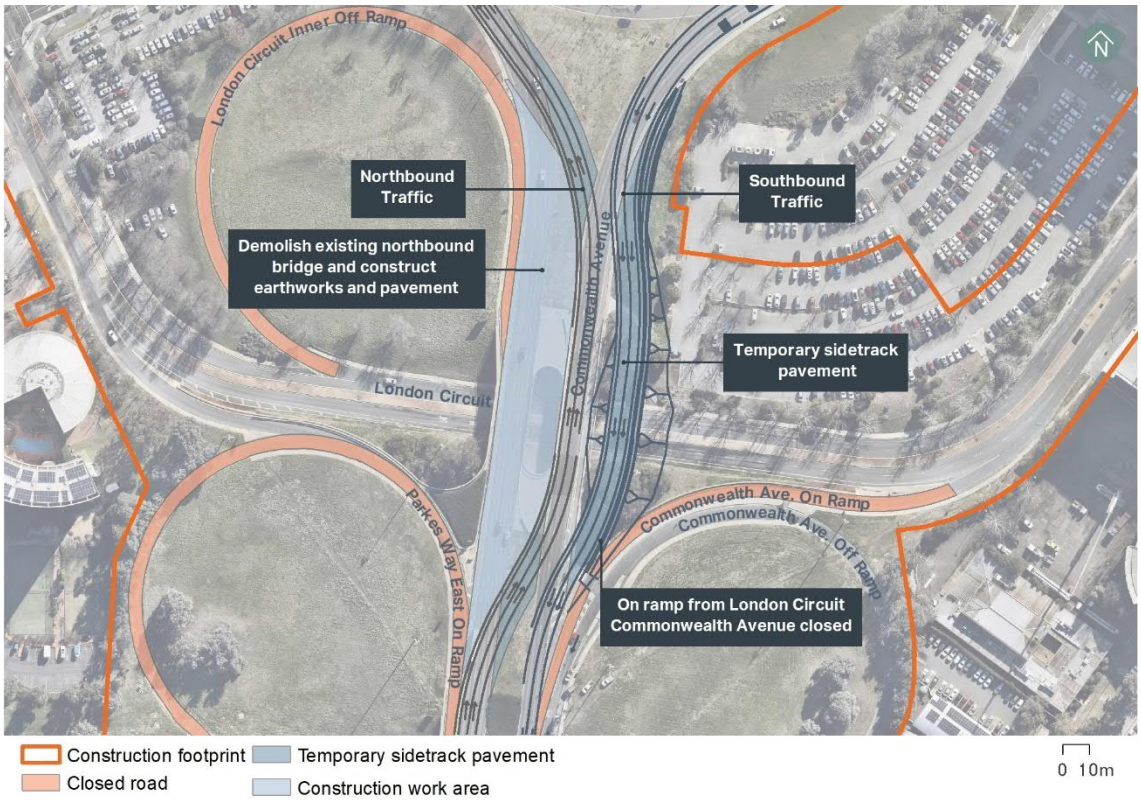


Figure 4-5 Stage 3 Commonwealth Avenue works

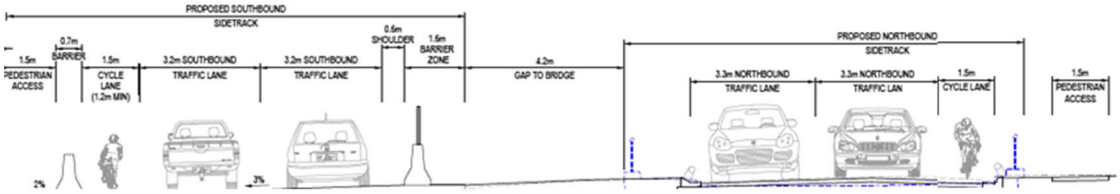


Figure 4-6 Indicative cross section through the temporary sidetrack and Commonwealth Avenue southbound carriageway during demolition of the Commonwealth Avenue northbound bridge

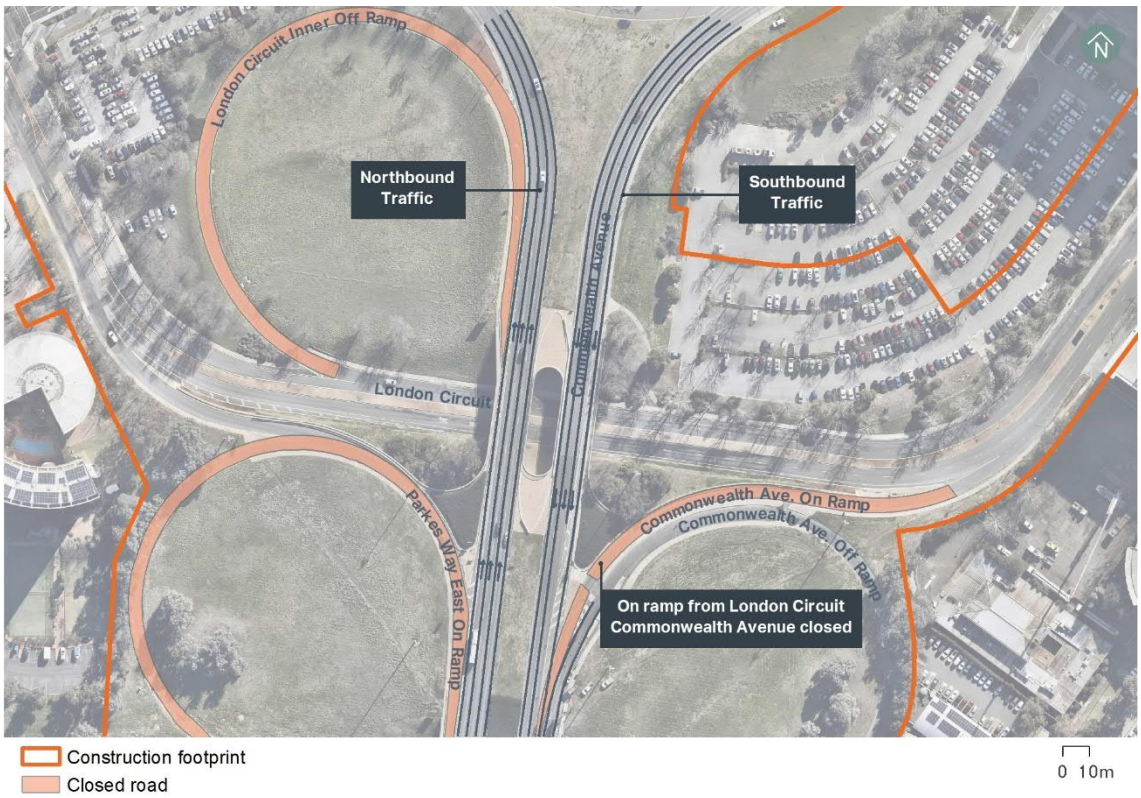


Figure 4-7 Stage 4 Commonwealth Avenue works

4.4.2 Bridge demolition and infilling

As outlined in **Section 4.4.1**, demolition and infilling of the Commonwealth Avenue Bridge and associated construction of the new London Circuit - Commonwealth Avenue intersection would be carried out in stages, with switching of Commonwealth Avenue between the temporary sidetrack, and existing and new Commonwealth Avenue carriageways.

Demolition and infilling of each Commonwealth Avenue bridge would follow a broadly similar sequence of events:

- Installation of safety and environmental management measures, including exclusion zone delineation and public safety signage, anti-gawk and debris screens, and dust mitigation measures
- Inspection for and removal of any asbestos containing material in the existing bridge structure
- Removal of bridge barrier rails
- Temporary works as required to stabilise adjacent roadways prior to commencement of major demolition works
- Demolition of bridge wing walls behind abutments and cloverleaf ramp connection retaining walls
- Demolition of bridge centre wing walls

- Demolition of the bridge deck and precast planks
- Full or partial removal of remaining abutment structures
- Infilling of the void beneath and round the demolished bridge in coordination with the infilling of London Circuit to form part of the final main embankment (refer to **Section 4.3.3**)
- Construction of the relevant part of the new London Circuit - Commonwealth Avenue intersection to allow continued flow of traffic on Commonwealth Avenue during completion of the Project (refer to staged traffic switching and operation of the temporary sidetrack in **Section 4.4.1**).

Demolition works would use a combination of excavators with concrete pulverisers and rock hammers, with fill materials suitable for reuse as part of the Project retained and incorporated into the works.

The sidetrack would be incorporated into the permanent eastbound embankment works and removal of the temporary paving of the Commonwealth Avenue median would be carried out as part of the demolition and infilling of the Commonwealth Avenue southbound bridge.

4.5 Permanent road works

Permanent road pavement, median works and kerb and guttering would be constructed in coordination with the completion of infilling London Circuit to provide the permanent reconstructed London Circuit. Road works would include intersection works at Edinburgh Avenue and Commonwealth Avenue, and tie-in works at Constitution Avenue and around the modified and new intersections with Edinburgh and Commonwealth Avenues.

Road pavements would be laid following completion of bulk earthworks and would include:

- Placement and compaction of preconditioned manufactured roadbase material using rollers
- Spray application of a bituminous coating with small aggregates
- Application of overlying asphalt layers to form the final road pavement.

Verge pavements, including for active transport infrastructure (refer to **Section 3.6**) would also be installed in coordination with road pavement works and would include a combination of hardscaped and softscape areas. Hardscaped pavements would comprise road base overlaid with either concrete and stone paving, or asphalt. Softscape areas would be formed through fill and topsoil consistent with the urban design and landscaping vision for the Project.

Kerb and gutter would be installed along the outer edges of new road pavement areas to capture road surface runoff and divert into the new stormwater network.

4.6 Ancillary infrastructure and finishing works

Ancillary infrastructure and finishing works would be completed, and road safety audit conducted, prior to commissioning and opening London Circuit to traffic, including:

- Completion of active transport infrastructure, permanent drainage and utilities works
- Installation of traffic signals, lighting and street furniture, and road line marking
- Landscaping
- Demobilisation, and stabilisation and rehabilitation of disturbed areas, including construction compound sites.

5.0 Project development and alternatives

The Project has been developed taking into account:

- The planning and development vision presented in the National Capital Plan for Canberra City and its surrounds (refer to **Section 2.2.1**)
- The identified strategic need to deliver major projects in pursuance of the vision presented in the National Capital Plan in a coordinated and holistic way, ensuring integrated land use and transport planning and the orderly, economic and efficient development of land (refer to **Section 2.1**)
- The Project vision and objectives (refer to **Section 2.1.2**).

Two strategic level alternatives have been identified and evaluated in response to the strategic need outlined in **Section 2.1.1** (ACT Government, n.d.):

- **Strategic alternative A** (do nothing / business as usual) – continue with the grade separate London Circuit - Commonwealth Avenue interchange as it currently exists
- **Strategic alternative B** (at-grade intersection now) – implement an at-grade intersection between London Circuit and Commonwealth Avenue in the short term (the Project).

With respect to strategic alternative B, implementation of an at-grade intersection was established as involving the raising of London Circuit to meet the current elevation of Commonwealth Avenue. The alternative, a lowering of Commonwealth Avenue to the level of London Circuit, was discounted up front as being unacceptable in terms of environmental and planning impacts (including inconsistency with the historical, planning and visual significance of the Commonwealth Avenue corridor) and engineering complexity.

Table 5-1 presents a summary of the evaluation of the two strategic alternatives against the strategic vision presented in the National Capital Plan, the vision for the Project and the Project objectives. Based on this evaluation, strategic alternative B (at-grade intersection now) has been identified as the preferred alternative because:

- Strategic alternative B best responds to the vision presented in the National Capital Plan as part of a coordinated and holistic approach to a suite of major developments in planning and delivery across Canberra City and surrounds. Strategic alternative A does not respond to the National Capital Plan vision
- Strategic alternative B would address both the short term and longer traffic network performance and capacity requirements of a growing city in a timely way, to reduce congestion, improve local amenity and support safe and efficient transport. It would contribute to future-proofing the Canberra City transport network by delivering road infrastructure and facilitating public transport infrastructure by integrating land use and transport planning and delivery to meet Canberra's current and future needs. Strategic alternative A does not address the short term or longer term transport requirements of the city
- Strategic alternative B provides an opportunity to deliver improved urban design, connectivity, accessibility and sustainability outcomes. Strategic alternative A would not deliver improved urban design, connectivity, accessibility and sustainability outcomes.

Table 5-1 Evaluation of the strategic alternatives

Evaluation focus	Evaluation
National Capital Plan vision	
Consistency with the National Capital Plan vision for Canberra City and its surrounds	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) is not fully consistent with the National Capital Plan vision for Canberra City and its surrounds, and raises several key impediments to achieving that vision: While it would not preclude the delivery of the Canberra Light Rail to Woden project (consistent with the strategic aim of relying on London Circuit as the principal public transport corridor around City Hill), a viable design and alignment for the light rail extension based on a grade separated London Circuit - Commonwealth Avenue interchange would likely require additional land take to accommodate the transition from the elevation of London Circuit to the elevation of Commonwealth Avenue. This land take would affect areas around the existing interchange, reducing the area of land available for orderly and economic development of land uses permitted under the National Capital Plan Full functioning of the grade separated London Circuit - Commonwealth Avenue interchange relies on the existing cloverleaf ramp connections between London Circuit, Commonwealth Avenue and Parkes Way. These cloverleaf ramp connections occupy land intended for future development, generating a conflict between development of that land and ongoing effective functioning of the interchange. If the cloverleaf ramp connections are retained, a significant loss of developable land would result. Conversely, if the cloverleaf ramp connections are removed to facilitate development, the loss of connectivity through the grade separation of London Circuit and Commonwealth Avenue would further exacerbate congestion and suboptimal distribution of traffic (refer below) Traffic modelling has identified increasing levels of congestion in the road network around City Hill and Canberra City and a need for improved traffic distribution across the network by as early as 2026. This situation is forecast to worsen with continued city growth and development leading to some parts of the road network, including Vernon Circle and Knowles Place exceeding traffic capacity by around 2031. Retention of the grade separated London Circuit - Commonwealth Avenue interchange would perpetuate this suboptimal distribution of traffic and levels of congestion that are inconsistent with the development vision in the National Capital Plan. Local amenity and safety impacts of traffic congestion would be inconsistent with the local amenity, safety and traffic efficiency aims of the National Capital Plan The existing configuration of London Circuit does not include provision for improved connectivity from the City Hill precinct to the West Basin precinct, particularly through improved road connections to / from the New Acton waterfront area The existing grade separated London Circuit - Commonwealth Avenue interchange and associated London Circuit corridor presents poor urban design and land use planning outcomes, particularly in relation to the

Evaluation focus	Evaluation
	quality of design, reduced opportunities for active street frontages, and barriers to connectivity and accessibility across and around the interchange, particularly for pedestrians and cyclists. **Strategic alternative B (Project now)** The Project has been developed as part of coordinated and holistic delivery of a series of major projects aimed at achieving the vision presented in the National Capital Plan. Strategic alternative B (the Project) therefore positively responds to key parts of the National Capital Plan as follows: It would directly facilitate the delivery of the Canberra Light Rail network extension from its current terminus on Northbourne Avenue, near Alinga Street, along London Circuit and Commonwealth Avenue and southward to Woden. This is consistent with the National Capital Plan aim of providing London Circuit as the main public transport corridor around City Hill. Importantly, strategic alternative B (Project now) would facilitate the light rail extension within the delivery program for that project, avoiding the additional land take requirements that would arise with a light rail extension limited by the existing configuration of the London Circuit - Commonwealth Avenue interchange It would also facilitate the timely release and development of land around the existing London Circuit - Commonwealth Avenue interchange, including within and around the cloverleaf ramp connections. It would specifically allow the timely release and development of Section 63, and would avoid the potential conflict that would arise if land around the existing interchange were to be developed prior to upgrade of the London Circuit - Commonwealth Avenue interchange. As noted above, this would occur if the cloverleaf ramps were removed and land developed in the short term, with additional pressure added to the surrounding road network, including increased congestion, in the absence of an adequate alternative connection between London Circuit and Commonwealth Avenue It would allow improved traffic network performance outcomes and would more effectively distribute traffic to address existing short term and longer term traffic capacity requirements. Traffic modelling has identified that additional traffic network capacity and redistribution would be beneficial in the short term (i.e., as early as around 2026) It would provide an opportunity through design to plan for and deliver improved connectivity from London Circuit through the West Basin precinct towards Lake Burley Griffin It would provide an opportunity through design for improved urban design, connectivity, accessibility and sustainability outcomes.

Evaluation focus	Evaluation
Project vision	
To improve connectivity and support city planning by integrating strategic transport and land use initiatives to shape future development and create attractive, design-led, people focused places.	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would make no contribution to improving connectivity and supporting city planning nor would it create attractive, design-led, people focused places. **Strategic alternative B (Project now)** As discussed above in relation to the National Capital Plan, strategic alternative B (Project now) would improve connectivity and would support city planning by integrating strategic transport and land use initiatives. In particular, short term delivery of strategic alternative B is consistent with the delivery programs for other major projects in and around Canberra City, and would directly facilitate developments such as the Canberra Light Rail to Woden project, and release and development of Section 63 in a timely, orderly and economic way. Through appropriate design of strategic alternative B (Project now), an attractive, design-led and people focused place could be created.
Project objectives	
City planning – *support the realisation of the broader vision for Canberra, and future city planning and land releases*	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would not support the realisation of the broader vision for Canberra, and future city planning and land releases as discussed above in relation to the National Capital Plan. **Strategic alternative B (Project now)** Strategic alternative B (Project now) would support the realisation of the broader vision for Canberra, and future city planning and land releases as discussed above in relation to the National Capital Plan.
Strategic transport – *support City to Woden light rail by providing an early works package, future proof Canberra's strategic transport corridors, and support the use of active travel*	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would not support the Light Rail to Woden project by providing an early works package, future proofing Canberra's strategic transport corridors or support the use of active transport. **Strategic alternative B (Project now)** Strategic alternative A (do nothing) would support the Light Rail to Woden project by providing an early works package, future proofing Canberra's strategic transport corridors and supporting the use of active transport.

Evaluation focus	Evaluation
Integration and value – *maximise the Government's economic return by integrating with other projects and plans for the city, such as increasing developable land and enhancing uplift in adjacent land*	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would not integrate with other projects and plans for the city. The full function of the existing London Circuit - Commonwealth Avenue interchange relies on several cloverleaf ramp connections that occupy developable land, which is inconsistent with the timely, orderly and economic development of that land. **Strategic alternative B (Project now)** Strategic alternative B (Project now) would facilitate the release and development of surrounding land in a timely, orderly and economic way. Anticipated improvements to the capacity and efficiency of the road network, reductions in congestion and improvements in local amenity are likely to contribute to the increased desirability and value of land as a result of strategic alternative B (Project now).
Urban amenity and connectivity – *support design-led urban amenity improvements to the City to create attractive, active and vibrant places, as well as improving pedestrian accessibility and creating connectivity between the City and Lake Burley Griffin*	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would not support design-led amenity improvements to the City and would not create attractive, active and vibrant places, as well as improving pedestrian accessibility. It would not create connectivity between the City and Lake Burley Griffin. **Strategic alternative B (Project now)** Strategic alternative B (Project now) would support design-led amenity improvements to the City and would create attractive, active and vibrant places, as well as improving pedestrian accessibility in the short term. It would provide the opportunity to design for connectivity between the City and Lake Burley Griffin.
City shaping – *revitalise the City centre in line with Canberra's strategic plans, delivering on the intent of plans such as* Canberra: A Statement of Ambition*,* The City Plan*, and Griffin's original vision for Canberra*	**Strategic alternative A (do nothing)** Strategic alternative A (do nothing) would not contribute to revitalising the City centre in line with Canberra's strategic plans. **Strategic alternative B (Project now)** Strategic alternative B (Project now) would contribute to revitalise the City centre in line with Canberra's strategic plans in the short term.

6.0 Statutory approvals context

The Project will require or rely on the following statutory environmental and planning approvals:

- Various 'Works Approvals' from the National Capital Authority under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) to carry out certain works in a Designated Area under the National Capital Plan. A Works Approval for the Project has yet to be sought and obtained and will be supported by information presented in this Environmental Assessment. Notwithstanding, Works Approvals have been obtained for several early works activities (refer to **Section 4.1**) required to allow construction of the Project to commence around April 2022
- Approval from the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) to carry out the Project has already been sought and obtained, subject to conditions (EPBC 2019 / 8582) ('EPBC Approval').

Each of these approvals is discussed in further detail in the following sections. Other legislative requirements are outlined in **Section 6.3**.

This Environmental Assessment is not a statutory requirement for the Project but has been prepared to provide a complete and consolidated assessment of its potential environmental impacts. It is intended to:

- Provide complete details of the Project to allow the community and other stakeholders to appreciate the Project and its impacts in a holistic way
- Support applications for statutory approvals, particularly the Works Approval for the Project required from the National Capital Authority under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth)
- Complement the future statutory and non-statutory environmental assessments completed for other related projects, most notably the City to Commonwealth Park component of the Light Rail to Woden project.

6.1 Australian Capital Territory (Planning and Land Management) Act 1988

The *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth) establishes the National Capital Authority and assigns it various functions and responsibilities relating to the Commonwealth Government's interest in the planning and development of the nation's capital. One of the National Capital Authority's key roles is the preparation and administration of the National Capital Plan, which aims to ensure that Canberra and the Australian Capital Territory are planned and developed in accordance with their national significance.

The National Capital Plan identifies a series of Designated Areas deemed to 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 *Australian Capital Territory (Planning and Land Management) Act 1988* the approval of the National Capital Authority (a 'Works Approval') is required to carry out works within a Designated Area. Works include:

- Construction, alteration, extension or demolition of buildings or structures
- Landscaping
- Tree felling
- Excavations.

The Project would involve carrying out works in several Designated Area Precincts, as summarised in **Table 4-3**.

Table 6-1 NCP Designated Area Precincts affected by key components of the Project

NCP Designated Area Precinct	Key components of the Project
Main Avenues and Approach Routes	All works within the London Circuit and Commonwealth Avenue road corridors, and works affecting the north west, south west and south east cloverleaf ramp connections between London Circuit, Commonwealth Avenue and Parkes Way.
City Hill	Works within the Commonwealth Avenue road corridor north of London Circuit, works affecting the north west cloverleaf ramp, and construction compound site A.
West Basin	Works within the London Circuit road corridor west of Commonwealth Avenue, works affecting the south west cloverleaf ramp, and construction compound site C.
Constitution Avenue and Anzac Parade	Works within the Commonwealth Avenue road corridor including above and to the south of London Circuit, works with the London Circuit road corridor including beneath and to the west of Commonwealth Avenue, and works affecting the south west cloverleaf ramp.

This Environmental Assessment is not a statutory requirement for, but has been prepared to support, an application for a Works Approval for the Project in Designated Areas under the NCP. Further information on the National Capital Plan and other strategic planning policies is provided in **Section 2.2**.

Several Works Approvals have been obtained to permit early works required to allow commencement of construction of the Project around April 2022. These early works are detailed further in **Section 4.1**.

6.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) establishes a framework for the protection of the environment, particular those aspects of the environment that are matters of national environmental significance. Assessment and approval is required under the Act for actions that have or will have a significant impact on a matter of national environmental significance. Matter of national environmental significance include:

- World heritage properties
- National heritage places
- Wetlands of international importance (Ramsar wetlands)
- Listed threatened species and communities
- Listed migratory species
- Nuclear actions
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Water resources affected by coal seam gas development or large coal mining development.

The City to Commonwealth Park component of the Light Rail to Woden project was referred to the Commonwealth Department of Agriculture, Water and Environment (DAWE) under the EPBC Act for potential impacts to Matters of National Environmental Significance (MNES).

On 10 January 2020, the Project was determined to be a controlled action which would be assessed through Preliminary Documentation due the potential for significant impacts to listed threatened species, specifically Golden Sun Moth (*Synemon plana*), and Commonwealth Land.

MPC received a Conditional Approval from DAWE on the 2 February 2020. The approval was based on a Preliminary Documentation impact assessment which separated the project into individual components of which Raising London Circuit was a key element.

Further discussion of potential impacts from the Project on biodiversity, including the Golden Sun Moth and its habitat, is provided in **Section 9.3**.

6.3 Other legislation

Other legislation that has been considered in the development of the Project design and the assessment of its environmental impacts is summarised in **Table 6-2**.

Table 6-2 Other legislation considered in the design and environmental assessment of the Project

Legislation	Broad legislative focus	Relevance to the Project
Disability Discrimination Act 1992 (Cth)	Protects people with disabilities and defines the mechanisms to ensure public places can be made fully accessible.	The Project has been designed with consideration of the Act, including the provision of continuous accessible path, lighting and wayfinding.
Environment Protection Act 1997 (ACT) and Environment Protection Regulation 2005	Legislates with respect to all forms of pollution and waste. The Act sets out notification processes in the event of encountering or causing pollution. It includes associated provisions for: clean air; water quality control; noise control; contaminated land; and hazardous chemical and waste management. Key is the need to secure an agreement or authorisation for carrying out certain potentially polluting activities. The Act does not apply to operational noise and air pollutants from light rail and motor vehicles unless it is causing environmental harm as defined in the Act. The Act also includes the principles of ecologically sustainable development (ESD).	This Environmental Assessment has been prepared to understand the potential environmental impacts associated with the Project, and to identify mitigation and management measures to minimise these impacts. The Project would be required to comply with General Environmental Duty under the Act; that is 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 Aboriginal and non-Aboriginal places and objects through their listing on a register. The Act makes it an offense to harm any heritage value without permission, while involving Aboriginal peoples in planning decisions that affect objects and places.	The Act only considers impacts to the heritage significance, and intrinsic features, of a listed place within the place boundary. As the actions of the Project would not occur within the place boundary of Heritage Act listed places, the Act does not apply to the Project.
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. The Act provides for the protection of threatened species, communities and associated habitat. It defines the key threatening processes to ecological values in the ACT and various	The Golden Sun Moth is listed as Endangered under the Act. The ACT Conservator of Flora and Fauna was consulted during the EPBC Act approval processes, and further action under the Nature Conservation Act is not required.

Legislation	Broad legislative focus	Relevance to the Project
	licencing and management plan requirements. It also includes the mechanisms to ecologically offset impacts.	
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 Act. Where temporary traffic management is required for Project activities, traffic management plans would be developed and approved by Roads ACT prior to works.
Tree Protection Act 2005 (ACT)	Serves to protect certain trees and urban forests that hold exceptional amenity, natural or cultural value. The Act aims to value and protect trees in the design and planning of proposed developments. It defines the mechanisms for protecting and registering trees, while accounting for regulations and management measures in key areas, and the adoption of tree protection zones. It also defines the requirements for tree management plans and tree management precincts, and the means for creating specific tree protection directions.	There are no protected (regulated or registered) trees within the Project construction footprint. However, a tree management plan has been prepared for the Project.
Waste Management and Resource Recovery Act 2016 (ACT)	Defines the waste hierarchy of avoidance, recovery and recycling over disposal while the supporting guidelines set out waste classification in the ACT.	The waste hierarchy would be applied to the management and disposal of waste associated with the Project, as outlined in **Section 9.11**.

7.0 Consultation

This chapter provides an overview of the consultation approach for the Project. It also summarises the outcomes of consultation undertaken to date with the community, stakeholders, and agencies, and discusses feedback that has been received.

7.1 Background

Consultation and engagement for the Project has been integrated with complementary consultation activities that have been undertaken for the City to Commonwealth Park component of the Light Rail to Woden project since 2019.

Given the proximity of the Project to the City to Commonwealth Park component of the Light Rail to Woden project, it was anticipated that many of the stakeholders who are likely to be interested in the Project would be the same as those who would be interested in the Light Rail to Woden project. This would include both registered and non-registered parties. As such, the consultation and engagement activities for the Project and the City to Commonwealth Park component of the Light Rail to Woden project have occurred concurrently. Consultation and engagement activities undertaken for the Light Rail to Woden project are described in the context of also having been undertaken for the Project.

7.2 Consultation objectives

The communication and engagement objectives for the Project include:

- Identify and engage with key stakeholders and community members
- Identify and develop a high level of understanding of expected impacts, risks, opportunities and areas of interest – particularly with stakeholders within the area of impact
- Provide information about the design, planning, approvals and stages of implementation
- Seek community input and feedback to inform design development, reduce impacts and risks.

7.2.1 Engagement overview

The key consultation and engagement activities that have occurred since 2019 that are relevant to the Project are summarised in **Table 7-1**.

Table 7-1 Summary of consultation undertaken

Year	Purpose	Summary
2019	Community and stakeholder consultation	Project awareness building and engagement activities were undertaken for Light Rail to Woden, including discussing the Project, potential impacts and benefits. Consultation methods used included: • Face-to-face meetings • Information pop ups • Key stakeholder briefings • Phone calls • Letterbox drops • Project updates • E-newsletters.
2020	Consultation with the community and stakeholders under the EPBC Act	The Preliminary Documentation prepared to support the EPBC Act referral was prepared in accordance with section 95A(3) of the EPBC Act (2019/8582). This documentation discussed the potential impacts of City to Commonwealth Park component of the Light Rail to Woden project on the Golden Sun Moth (*Synemon plana*)

Year	Purpose	Summary
		habitat. The referral also included information on the Project. The referral documents were placed on public exhibition from Monday 17 August to Monday 14 September 2020, with feedback sought from the community and interested stakeholders over an extended period of 20 business days. During the public exhibition and submission period, a total of 44 submissions were received from the community and stakeholders, with 10 submissions directly relevant to matters outlined in the Preliminary Documentation.
2020	Community and stakeholder consultation	Engagement in 2020 was limited due to the impacts of response to the COVID-19 pandemic. The engagement in early 2020 demonstrated: • There is a genuine interest in Light Rail to Woden and the Project • The community needed more information about the timeframes and potential impacts of the Project • The community was unsure about what the Project would involve, what the benefits would be and what it would look like when complete. Engagement and communication activities were adjusted to respond to these issues. As a result, additional information sessions, stakeholder briefings, letterbox drops, flyers, and Project updates were provided. The Community Reference Group for the Project was also revived (refer to **Section 7.4.1**), and the Light Rail to Woden project website (www.act.gov.au/lightrailtowoden) was launched.
2021	Community and stakeholder consultation regarding early works and launch of digital channels	A dedicated webpage was established at: www.act.gov.au/cityrenewal/places/city-hill/london-circuit-at-grade-intersection. The webpage provides an overview of the Project, a copy of the business case for the Project, and the justification for the Project. Digital channels were launched as part of an updated Light Rail to Woden project website. The updated website includes a virtual engagement room, updated videos, fact sheets, visualisations and maps. The website is available at: www.act.gov.au/lightrailtowoden. Engagement to support the early works (Golden Sun Moth translocation and utility relocations related to the Project) started in mid-2021 and involved face-to-face meetings, information pop ups, key stakeholder briefings, phone calls, letterbox drops, Project updates and e-newsletters. This engagement focused on sharing information with the community and stakeholders about the upcoming early works and to seek feedback.

7.3 Consultation design

The following section outlines how the communication and stakeholder engagement approach for the Project was developed.

7.3.1 Stakeholder identification

As a first step in developing the consultation plan, stakeholders who may be impacted by the Project, or who may be interested in the Project were identified.

In addition to the general community, specific stakeholder categories that have been identified include:

- Elected representatives – ACT Government and Commonwealth Government
- ACT Government agencies (TCCS, CRA, ACT Legislative Assembly, ACT Environment, Planning and Sustainable Development Directorate (EPSDD), ACT Chief Minister, Treasury and Economic Development Directorate (CMTEDD), ACT Justice and Community Services (JACS))
- Commonwealth Government agencies (DAWE, NCA, Australian Government Department of Infrastructure, Transport, Regional Development and Communications (DITRDC))
- Emergency services including the Australian Federal Police (ACT Policing) and ACT Fire and Rescue
- Directly affected and adjacent landowners, lessees, developers, and business owners
- Road users
- Public transport and active travel users
- Peak bodies / representative groups
- Utility providers
- Transportation providers (taxi, Uber, e-scooters)
- Schools and other educational institutions
- Sporting clubs, recreation groups and lake users
- Places of worship
- Tourism businesses and organisations including hotels, cultural institutions (such as museums and galleries) and other local attractions
- Traditional owners and Indigenous groups
- Culturally and linguistically diverse communities
- Canberra Light Rail Community Reference Group.

7.3.2 Communication tools

A range of communication tools have been developed to provide information about the Project and provide opportunities for feedback. The tools used most commonly included:

- A dedicated hotline and email inbox
- A dedicated Project website which includes information about the Project
- Information about the Project provided on the ACT Government's YourSay website (www.yoursay.act.gov.au) and the Light Rail to Woden project website (www.act.gov.au/lightrailtowoden)
- Digital platforms and tools, including a virtual engagement room, interactive map, virtual flythrough, and the distribution of information on the Project through electronic direct mail
- Printed collateral, including information signage and fact sheets

- In-person engagement opportunities, including pop-up engagement stalls, community information sessions, one-on-one briefings and door knocking
- Virtual 'door knocking' one-on-one information sessions.

7.3.3 Stakeholder management tools

The following tools have been used to record, manage and action community and stakeholder feedback for the Project:

- **Consultation Manager** - to record all interactions and engagements with key stakeholders
- **Communication and Engagement Action Plan** - developed by MPC as a means of providing strategic guidance for engagement events, including identifying the needs of stakeholder groups
- **Focused market research** – market research was undertaken to inform the team's communication and engagement approach. As part of this exercise, 2,496 community surveys were completed in 2019 (Stollznow, 2019) and 1,347 surveys were completed in March 2021 (Stollznow, 2021)
- "**What we heard" reports** – these reports were compiled by MPC at regular intervals to summarise anecdotal information, feedback, and issues raised in response to in-person and online engagement activities.

7.4 Consultation implementation and results

The following section outlines how communication and stakeholder engagement plans for the Project have been implemented to date. It also describes the responses received from the community and stakeholders as a result of consultation activities.

7.4.1 Community Reference Group

An advertisement seeking expressions of interest from members of the community interested in forming a Community Reference Group (CRG) was placed on the ACT Government's YourSay webpage (www.yoursay.act.gov.au) in mid to late 2019. Subsequently, in late 2019 a Community Reference Group (CRG) was established for Light Rail to Woden and the Project with the aims of:

- Independently advocating for the needs of the community
- Requesting information from MPC to inform local residents, businesses, employees and visitors
- Providing ongoing feedback (two-way dialogue).

A list of the CRG meetings that have been held to date is provided in **Table 7-2**. At each of these meetings, information regarding the Project was presented for discussion. Feedback provided by the CRG was recorded.

Table 7-2 Summary of CRG meetings held to date

Date	Location	Number of attendees
25 June 2020	Online, via WebEx	13
22 April 2021	Mercure Hotel	13
29 July 2021	220 London Circuit	16

7.4.2 Business engagement

In August 2019, detailed consultation was undertaken with businesses within City West to inform future planning for the City to Commonwealth Park component of the Light Rail to Woden project, including the Project. This consultation included face-to-face discussions, pop-up engagement events, electronic newsletters, an online survey, virtual (over the phone) meetings and in person door knocking.

The primary purpose of the business-focused engagement was to raise awareness of the next stages of the broader Light Rail to Woden project, and to seek feedback on:

- General operational information including trading hours, logistics, staffing, and access

- Opportunities and challenges for construction planning
- Preferences and interest levels for future communication
- Existing awareness levels of the current and future stages.

The outcomes of this business-focused engagement are summarised in **Table 7-3**. The online survey captured a mix of qualitative and quantitative information to inform the planning of future Light Rail to Woden works including the Project.

Table 7-3 Feedback results from business-focused engagement

Category	Feedback / Query
General Project Information	In general, there was enthusiasm and support for the next stages of Light Rail to Woden, but with low awareness levels of the proposed route and future stages, including the Project.
Construction	Stakeholders did not have a good understanding, or no experience of, construction within a built-up environment, so had a lack of urgency to 'engage' with MPC on the works.
Traffic and Transport	Major issues that arose focused on: • Future parking provision for business staff and clients • Current changes to bus routes, which has negatively impacted businesses • Pedestrian access to City East and in particular the Magistrate law courts is critical for many of the service sector including both financial and legal businesses.

7.4.3 Community and stakeholder engagement

The key community and stakeholder engagement activities and issues that have been raised for the Project to date are summarised in **Table 7-4**.

Table 7-4 Stakeholder and community engagement results

Type	Description	Categories of issues raised	Description of issues raised
In-person engagement opportunities, including: stakeholder meetings, pop-up stalls, community information sessions attendance at community events	More than 25 meetings have been held that were attended by the Project representatives. One-on-one meetings were held with a mix of 58 businesses, industry groups, the Community Representative Group and emergency services throughout 2020 and 2021. Stakeholders were provided information specific to the Project and were provided responses to queries regarding access to London Circuit during construction and planned urban design treatments. Pop-up stalls and community information sessions that provided information about the Project were held at multiple venues between October 2019 and August 2021.	• Environmental impacts • Timing • Design • Traffic and transport • Approvals • Utilities • Surrounding developments • Alternative or supplementary design options	• The environmental impact from the construction phase of the Project such as noise, dust and vibration • The timing of the Project • The configuration of the Project and how it connects with Commonwealth Avenue and crossing of Lake Burley Griffin • The footpath heights as a result of the Project, with some concerns the height would be an issue for accessibility • Urban design elements including: - Design of the structures - Final landscaping - Overall visual amenity of London Circuit • Potential future traffic impacts and access as a result of raising London Circuit • The approvals required and the timing of such approvals for the Project • Accessibility to existing utilities following the proposed construction of the Project • The future development opportunities as a result of the Project.

Type	Description	Categories of issues raised	Description of issues raised
Virtual and in-person door knocking	Due to COVID-19 restrictions, a 'virtual' door knock was held during the last week of July 2021 to make direct contact with businesses along London Circuit. During these door knocks, Project representatives spoke with 160+ stakeholders in person and 80+ stakeholders virtually. The purpose of the 'door knock' phone call was to confirm contact details for project updates, invite businesses to information sessions about the early works and the Project, and advise of upcoming early works.	Requests to be kept informed of Project updates	MPC spoke to more than 80 stakeholders via the phone who provided contact details for further updates to be sent.
Light Rail to Woden website: visualisations, videos, flythroughs, virtual engagement room and interactive map.	The Light Rail to Woden website provides a readily accessible portal for stakeholders to access information about the Project. This includes a range of visualisations, maps, videos and flythroughs containing information relating to the Project. It also includes a Virtual Engagement Room and map for stakeholders to share any feedback or ask any questions they may have in relation to the Project. Since May 2021 the virtual engagement room has had 2,018 unique visits, and 27 comments have been received on the virtual engagement room map.	Out of scope	Of the 27 comments left on the interactive map, none are relevant to the scope of the Project.

Type	Description	Categories of issues raised	Description of issues raised
Communication collateral	MPC developed five Project updates in October 2019, February 2020, September 2020, March 2021 and June 2021. A collective 45,500 Project updates were printed and distributed. General information was provided about Light Rail to Woden, including information relating to the Project.	N/A	This consultation activity is passive and for the sole purpose of providing information. As such, no direct feedback has been recorded.
E-newsletters	MPC developed and distributed 12 e-newsletters to a database of 5,153 stakeholders since 2019. The e-newsletters shared a range of general information, including benefits, impacts and timing of the Project and Light Rail to Woden. A newsletter specifically referencing the Project was sent to members of the mailing list on 23 July 2021.	N/A	This consultation activity is passive and for the sole purpose of providing information. As such, no direct feedback has been recorded.
Fact sheets	Fact sheets titled 'Project Status', 'Next Steps Timeline' and 'Stage 2A – City to Commonwealth Park' with information relevant to the Project were created and published on the website and virtual engagement room.	N/A	This consultation activity is passive and for the sole purpose of providing information. As such, no direct feedback has been recorded.
Social media	MPC shares social media content across various ACT Government and Transport Canberra platforms including, Facebook, Twitter, LinkedIn and Instagram. Since 2020, the Project has been referenced in four social media posts via the Whole	N/A	N/A

Type	Description	Categories of issues raised	Description of issues raised
	of Government and Transport Canberra social channels.		
YourSay Website	The flythrough for the City to Commonwealth Park component of Light Rail to Woden was published on the ACT Government's YourSay website, which included visualisations relevant to the Project.	N/A	N/A
1800 enquiry line	A dedicated 1800 enquiry line has been made available to the community, through which queries and concerns can be raised.	Construction	There was interest in the location of construction compound sites, footpath accessibility, parking access and impacts from early utility works for the Project.
Project inbox	A dedicated Project email address has been made available to the community through which they can raise queries and concerns.	• Design • Approvals • Traffic and Transport	• The volume of fill required for the Project was of interest to stakeholders • Environmental approvals required for the Project were of interest to stakeholders • A small number enquiries related to future bus routes along London Circuit
Other – constituent enquiries	In addition to the above consultation activities that have been undertaken specifically for the Project, enquires relating to the Project have also been received and responded to via the Minister's Office	• Timing • Traffic and Transport • Construction • Approvals	• Queries were raised regarding the construction timeframe, with some opposition to the anticipated length of the construction period • Traffic was frequently raised as a concern, including changed traffic conditions, delays and potential road closures. Many stakeholders specifically mentioned loss of carparking as

Type	Description	Categories of issues raised	Description of issues raised
			a key area of interest and concern • Concerns about reduced access to businesses, places of work, services and facilities during the construction period • Construction impacts relating to haulage routes and construction hours were raised by some stakeholders • There were a number of questions related to approvals (including project, work and environmental approvals), primarily regarding the timing and approval process.
Media mentions	Between August 2020 and August 2021 there were 99 mentions about light rail, including the Project, with a cumulative potential reach of 770,754 people. 92.9% of the coverage was neutral and 7.1% was negative.	• Construction • Timing • Cost • Design • Project Justification • Traffic and Transport • Heritage impacts • Socio-economic (impacts to businesses) • Approvals • Surrounding Development • Alternative or supplementary design options	• There was interest in impacts local roads during construction and carpark removal for construction compound sites • Timeframe and length of disruptions relating to construction of the Project • The cost of the Project • Fill requirements for the Project • The benefits of the Project • Traffic and transport, including: - The future alignment at Edinburgh Avenue and London Circuit, traffic management and loss of carparks relating to the Project.

Type	Description	Categories of issues raised	Description of issues raised
			- Future traffic impacts and disruptions - Reduced traffic capacity along Commonwealth Avenue, lane closures and traffic diversions on Commonwealth Avenue • The heritage impacts of the Project • The impacts to businesses as a result of the Project • Environmental and planning approvals for the Project • Opportunities to rejuvenate Civic as a result of the Project • Future developments and renovations relating to the Project.

7.4.4 Socioeconomic Impact Assessment

A Socioeconomic Impact Assessment (SEIA) has been undertaken to inform this Environmental Assessment. The SEIA is summarised in **Section 9.9** of this document and provided in full in **Appendix H (Socioeconomic Impact Assessment)**.

The socio-economic impact assessment for the Project is based on a review of data and information, including targeted surveys of the surrounding community and semi-structured interviews with nearby stakeholders. This consultation with nearby residents, businesses and key stakeholders was undertaken to better understand perceptions relating to the Project and to provide insights into community identity, values, priority issues and goals.

The consultation for the SEIA specifically included the distribution of an online survey to stakeholders as both a link and a QR code. The link to the survey was emailed by MPC to the target audience, published on the YourSay website, the Light Rail to Woden website and in an e-newsletter. The survey closed on 21 August 2021. The results of the survey are discussed in more detail in **Section 9.9.**

The outcomes of the SEIA would be used to inform a Social Impacts Management Plan for the Project.

7.4.5 Where feedback has been addressed

The following table provides a summary of the categories of feedback received as a result of consultation undertaken to date (as described in the section above), and where this feedback has been addressed in this Environmental Assessment.

Table 7-5 Matrix of where feedback has been addressed

Feedback category	Where this has been addressed
Project justification	Chapter 2
General Project information	Chapter 3
Design	Chapter 3
Utilities	Chapter 3
Surrounding developments	Chapter 3
Construction	Chapter 4
Timing	Chapter 4
Alternative or supplementary design options	Chapter 5
Approvals	Chapter 6
Environmental impacts	Chapter 9
Traffic and transport	Section 9.1
Heritage impacts	Section 9.2
Socio-economic (impacts to businesses)	Section 9.8
Cost	As contractual arrangements for the delivery of the Project are yet to finalised, it would be premature to release the commercial aspects of the redacted business case for the project, as this could prejudice value for money outcomes the Territory is seeking to achieve.

7.5 Ongoing approach

This Environmental Assessment will be placed on public exhibition in coordination with the application made for Works Approval for the Project.

MPC will continue to engage with the community and stakeholders on the Project during the assessment and approvals process, and during the construction period. Future engagement will continue to be integrated with Light Rail to Woden, including the City to Commonwealth Park component, to ensure consultation is timely and targeted, and to deliver engagement activities in a coordinated manner.

Engagement will build on what has been completed so far and use feedback received to inform the construction approach and methodology.

Tools to engage the community throughout the next phases of the Project will include:

- Project website
- 1800 hotline
- Email
- Phone calls
- Virtual engagement room
- Briefings (virtual and face-to-face)
- Project updates (letterbox drops)
- Community reference group
- Technical working groups
- Work notifications
- Social media
- Media
- Fact sheets
- Information sessions
- Presentations
- Attending community events
- Signage
- Visualisations, including videos, maps, animations and photography.

8.0 Environmental Risk Analysis Approach

This Environmental Assessment is not a statutory requirement for the Project but has been prepared to provide a complete and consolidated assessment of its potential environmental impacts, its anticipated environmental impacts and the mitigation measures proposed to manage those impacts. This chapter introduces the approach taken to gathering baseline data, assessing impacts and determining the mitigation presented in this document. The impact assessment for environmental issues is provided in **Chapter 9.0**.

8.1 Approach

This Environmental Assessment has been approached using best-practice methodology, despite such an assessment not being required, to provide the community and other stakeholders with complete and consolidated details of the Project. The general approach is provided below:

- Describe the impacting processes during construction and operation of the Project (**Chapters 3.0** and **4.0**)
- Describe existing environmental conditions. This provides the baseline conditions of the study area, including anthropogenic, physical and biological elements, against which potential impacts of the Project can be assessed
- Identify and describe potential impacts, with reference to the baseline environment
- Assess the significance of the potential impacts (**Section 8.2**)
- Apply mitigation to reduce significance of impacts. Mitigation measures are proposed to lower the significance, frequency or risk of an impact occurring
- Assess residual environmental risks (**Section 8.2**).

8.2 Environmental risk assessment

The environmental risk assessment has been performed in accordance with the principles of AS/NZS/ISO31000:2018 Risk Management – Principles and Guidelines. Classifying the consequences of impacts and the likelihood of occurrence allows the ranking of potential impacts into one of seven risk levels. The probable effectiveness of proposed mitigation measures is then considered to determine the residual risk of each impact. This risk assessment process is outlined in **Figure 8-1** below.

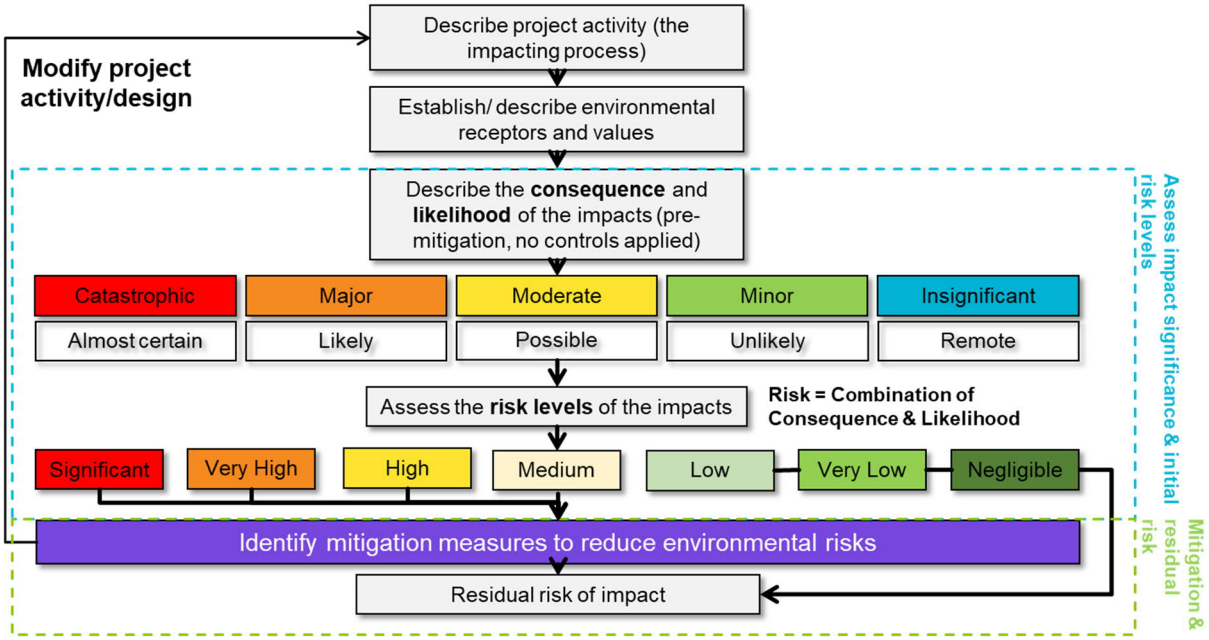


Figure 8-1 Risk assessment approach

8.2.1 Likelihood

The likelihood of an impact occurring is best described in terms of its associated probability. Typically, the probability of a particular outcome occurring is determined through qualitative assessment by experienced practitioners. However, in all qualitative assessments there is a degree of uncertainty associated with the ability for an accurate assessment to be made (i.e., reflecting the availability of knowledge, human error, etc.). Consequently, it is considered best practice to interpret potential risks assuming a reasonable worst-case scenario (i.e., overestimate the probability of impact occurrence) to account for the underlying uncertainty. **Table 8-1** illustrates the criteria used to determine the likelihood of an impact.

Table 8-1 Evaluating likelihood

Likelihood	Description
Remote	Extremely rare / unprecedented
Unlikely	Not expected to occur in most circumstances
Possible	Could occur
Likely	Probably would occur
Almost Certain	Expected to occur

8.2.2 Consequence

Assessing the consequences of an impact requires a degree of subjective assessment as the likely consequences of an impact may consist of several elements (i.e., environmental, economic, social). The consequence of an impact addressed in the risk assessment are assessed as being a reasonably foreseeable consequence. If there is a large amount of uncertainty, then the consequence may be assumed to be worse. For the purpose of an inherent risk assessment (i.e., before the efficacy of mitigation measures is assessed), elements that could be considered are illustrated in **Table 8-2**. Environmental, economic, and social elements are usually interrelated and therefore, the consequence would be considered major (or higher) if any one of the associated elements has a predicted major impact.

Table 8-2 Evaluating consequence

Consequence	Environment	Economic	Social
Insignificant	No environmental damage	Minimal losses	No noticeable change experienced by people in the locality
Minor	Minor instances of environmental damage that could be reversed. I.e., negative impact on a specific species	Several thousand dollars lost revenue or remediation costs	Mild deterioration, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable
Moderate	Isolated but significant instances of environmental damage that might be reversed with intense efforts	Half million dollars lost revenue or remediation costs	Noticeable deterioration to something that people value highly, either lasting for an extensive time, or affecting a group of people
Major	Severe loss of environmental amenities and a danger of continuing	One million dollars lost revenue or remediation costs	Substantial deterioration to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area
Catastrophic	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Several million dollars in lost revenue or remediation costs	Substantial change experienced in community wellbeing, livelihood, amenity, infrastructure, services, health, and / or heritage values; permanent displacement or addition of at least 20% of a community

8.2.3 Risk assessment

The risks associated with the potential impacts are analysed as a function of the likelihood of the risk occurring, the consequences associated with this risk occurring, and the effectiveness of the control systems in place to address the risk. The risks and impacts identified are assigned likelihood and consequence ratings generally based on the definitions set out in *Proponent's Guide to Environmental Impact Statements* (published by ACTPLA). These combine to identify the risk rating as set out in the matrix presented in **Table 8-3**.

Table 8-3 Risk rating matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	**Medium**	**High**	**Very High**	**Significant**	**Significant**
Likely	**Low**	**Medium**	**High**	**Very High**	**Significant**
Possible	**Very Low**	**Low**	**Medium**	**High**	**Very High**
Unlikely	**Negligible**	**Very Low**	**Low**	**Medium**	**High**
Rare	**Negligible**	**Negligible**	**Very Low**	**Low**	**Medium**

The inherent environmental risks of a project are any potential environmental impacts that could arise without any mitigation measures in place. The residual environmental risks of a project are any potential environmental impacts that could arise despite mitigation measures being in place. Both risk types are assessed using an evaluation of the likelihood and the consequence of each impact as outlined in **Table 8-1** and **Table 8-2**.

9.0 Environmental issues assessment

The assessment of potential environmental issues associated with the Project is documented in **Chapter 9.0**, as outlined in **Table 9-1**. A number of these assessments are supported by technical reports which are appended to this Environmental Assessment. Each section provides a summary of the existing environment, potential impacts, management and mitigation measures and an assessment of residual impacts.

Table 9-1 Environmental Issues

Issue	Section	Technical report
Traffic and transport	**9.1**	**Appendix A**
Heritage	**9.2**	**Appendix B**
Biodiversity	**9.3**	N/A
Contamination and soil	**9.4**	**Appendix C**
Noise and vibration	**9.5**	**Appendix D**
Air quality	**9.6**	**Appendix E**
Greenhouse gases	**9.7**	**Appendix F**
Landscape and visual realm	**9.8**	**Appendix G**
Socioeconomic	**9.9**	**Appendix H**
Surface water and hydrology	**9.10**	**Appendix I**
Resource management and waste minimisation	**9.11**	N/A
Land use	**9.12**	N/A
Cumulative impacts	**9.13**	N/A

9.1 Traffic and transport

A detailed Traffic and Transport Impact Assessment (TTIA) has been prepared for the Project and is included in **Appendix A (Traffic and Transport Impact Assessment)**. The TTIA addresses key traffic and transport impacts and benefits that may be associated with the construction and operation of the Project.

This section provides a summary of the traffic and transport assessment detailed in the TTIA.

9.1.1 Approach

The TTIA was undertaken to identify the existing traffic, transport and access conditions in and around the Project, and to identify potential impacts and benefits of the construction and operation of the Project (relative to traffic, transport and access). The TTIA applied a multi-modal approach, meaning the assessment considered multiple means of transport that may operate within the study area, including private vehicle, public transport and active transport (including cycling and pedestrian) movements.

The methodology for this assessment included:

- Identifying of multi-modal assessment requirements and relevant assessment criteria
- Determining the existing environment conditions applicable to traffic and transport
- Identifying the assessment criteria
- Predicting the potential future traffic and transport conditions for a series of scenarios relating to the construction and operation of the Project

- Assessment of the potential traffic and transport impacts of the Project during construction and operation, including a public transport assessment
- Provision of mitigation measures to manage and minimise the risk of the identified impacts
- Assessment of the residual risk.

9.1.1.1 Road network assessment

Construction

The construction traffic assessment was undertaken using the Aimsun mesoscopic modelling package. The following scenarios were assessed to determine the construction impacts of the Project on the surrounding road network (derived from the Canberra Strategic Transport Model):

- 2021 without the Project
- 2021 with the Project.

Operational

Three traffic modelling tools have been used to determine the Project's operational impact on the road network as follows:

- The Zenith Strategic Transport Model was used to generate traffic demand based upon employment, and population distribution and determine mode choice
- An Aimsun mesoscopic model was used to determine traffic assignment, network performance and turning movements
- SIDRA Intersection traffic model (a micro-analytical software package) was used to assess intersection Level of Service.

The following modelling scenarios were assessed:

- 2017, as a base year
- 2026 with the Project, and without the Project
- 2036 with the Project, and without the Project.

The growth in trip numbers from 2017 to 2026 and 2036 was modelled in the Aimsun model, and is summarised in **Table 9-2**. The 2036 trip numbers takes into consideration traffic predictions associate with Light Rail to Woden. The growth in the AM and PM peaks in each forecast year is similar, with growth from 2017 to 2026 between 23 per cent and 26 per cent and 2017 to 2036 is 34 per cent to 35 per cent.

Table 9-2 Modelled AM and PM growth percentage

Year	AM peak (0800-0900)	PM peak (1700-1800)
	Growth from 2017	Growth from 2017
2026	23%	26%
2036	34%	35%

Note: There are land use changes for Section 63 and Section 100 (which are discussed in section 3.4 of the TTIA) and a number of road network changes which were assumed in the Aimsun modelling.

Assessment criteria

The following metrics were considered to assess the construction and operational impacts associated with the Project:

- Travel times – time taken to travel between two defined locations
- Density – how many vehicles are occupying a length of road
- Intersection Level of Service – average total vehicle delay of all movements through an intersection

- Network statistics – including total demand, total kilometres travelled and total travel time through network, and average network speed.

9.1.1.2 Public transport assessment

As the Project would not intersect the existing light rail network to the north of the study area, it has not been considered further as part of this assessment. However, it is noted that the Project would directly facilitate the delivery of the Canberra Light Rail network extension from its current terminus on Northbourne Avenue, near Alinga Street, along London Circuit and Commonwealth Avenue and southward to Woden.

Bus transit was the primary public transport mode identified for this assessment. The public transport assessment has considered:

- Temporary changes to current services and frequency during construction
- Relocation or closure of bus stops and the associated changes to bus stop accessibility, walking distances
- Changes in travel times along bus service routes during operations and construction.

9.1.1.3 Active transport assessment

The active transport (including pedestrians and cyclists) impact assessment undertaken for the construction and operation of the Project has considered:

- Relocation or closure of existing footpaths or cycle paths and associated changes in walking and cycling distances
- Provision of new facilities and associated changes to accessibility and connectivity of the pedestrian and cycling network and changes in walking and cycling distances
- Quality, suitability and legibility of proposed pedestrian and cycling infrastructure
- Opportunities to improve current safety issues.

9.1.1.4 Parking and access assessment

The impact assessment undertaken for the construction and operation of the Project with regards to carparking, local area access and property has considered:

- Changes to current parking including permanent and temporary changes
- Identification of any parking shortfall due to parking changes, with consideration for the available parking supply in the area
- Suitability of proposed construction worker parking and associated impacts on surrounding residents and businesses during construction
- Changes to any existing property access points, including identifying alternative routes and associated changes in travel time or distance
- Changes to any existing local area access arrangements, including identifying alternative routes and associated changes in travel time or distance.

9.1.1.5 Movement and place assessment

The ACT Transport Strategy states that transport projects should consider the needs of all transport users, both on their journey and as they complete it by adopting the movement and place concept. This concept considers balancing the dual function of streets: moving people and goods; and enhancing the places they connect and pass through.

A movement and place assessment has been undertaken for the Project as follows:

- Definition of movement and place area of assessment into four relatively homogenous sections as shown on **Figure 9-1**

- Establishment of criteria for assessment using NSW and Auckland Transport Movement and Place frameworks as examples. Using these examples, the following criteria have been selected for assessment:
  - Movement and reliability
  - Economic and cultural
  - Public realm
  - Safety
  - Access and connectivity.
- Detailed description of the existing environment (relevant to the criteria above)
- Classification of the assessment area's street network into functional classes based on their respective movement and place functions, using the framework shown on **Figure 9-2**.
- Assessment of the Projects potential to impact on the criteria above.

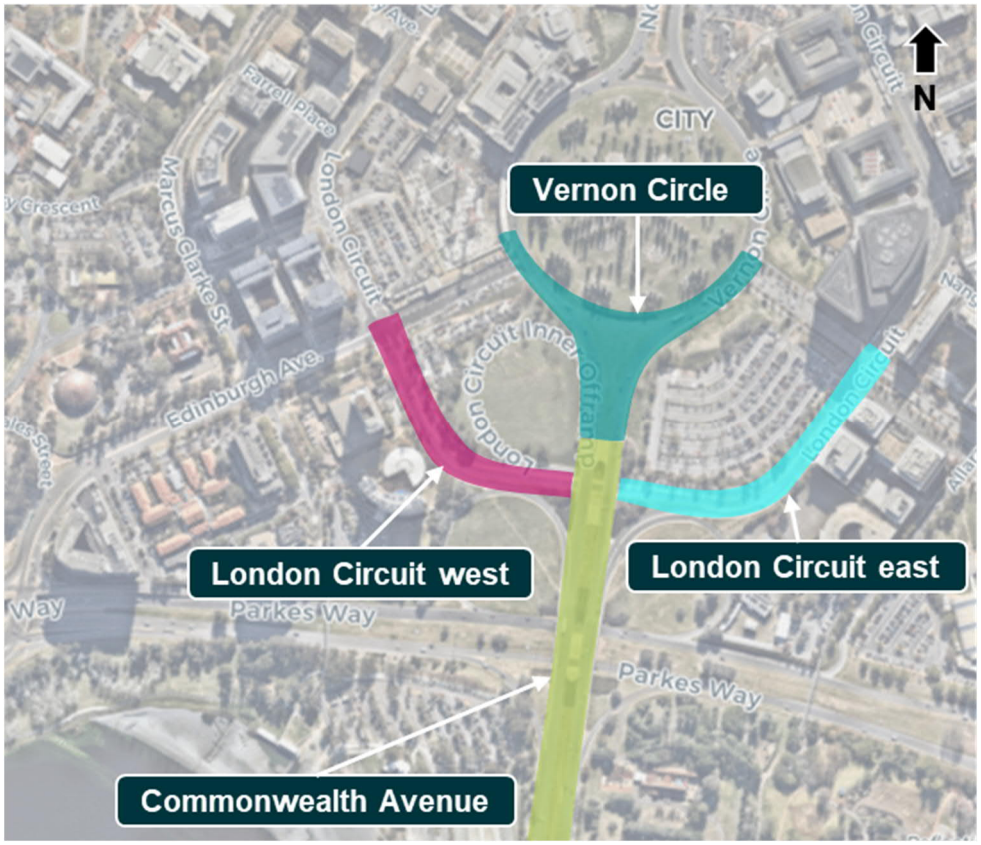


Figure 9-1 Movement and place assessment areas

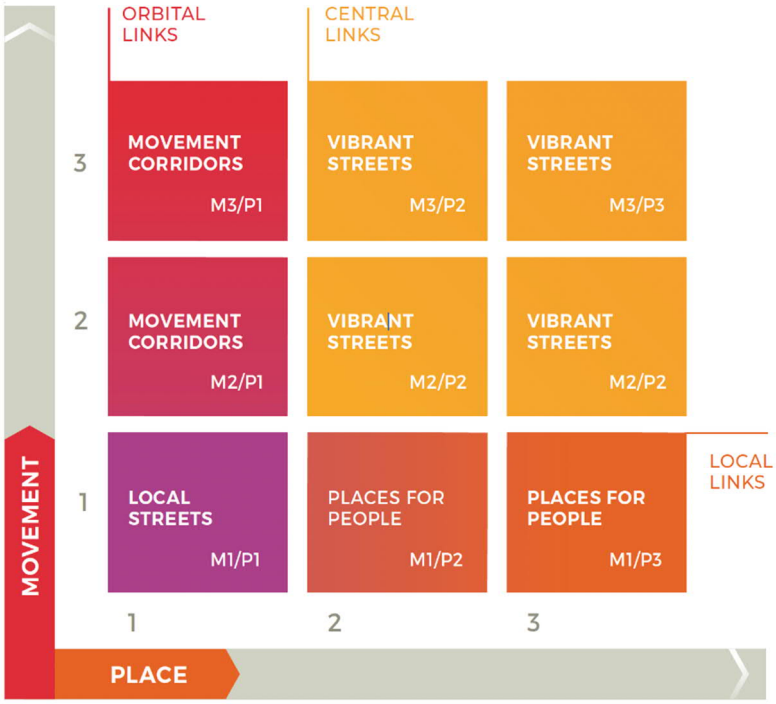


Figure 9-2 Movement and place framework for the classification of streets

9.1.1.6 Road safety assessment

The following data were analysed to identify existing road safety issues, as well as future impacts and benefits of the Project:

- Five years of historical crash data by crash type, location, and severity
- Current traffic volumes
- Forecast change in traffic volumes due to construction
- Forecast change in traffic volumes with and without the Project
- Construction staging plans
- The road and intersection design of the Project.

By reviewing the above, a qualitative assessment of the Project's impacts and benefits was undertaken for the following:

- Change in number of crashes
- Change in crash severity
- Change in crash type.

9.1.2 Existing environment

9.1.2.1 Overview

The construction footprint includes:

- London Circuit between Edinburgh Avenue and Constitution Avenue
- Commonwealth Avenue between Vernon Circle and Parkes Way.
- The southern section of Vernon Circle where it transitions to/from Commonwealth Avenue
- Construction compounds on Marcus Clarke Street, Acton Park, and Section 116 (the at-grade carpark northeast of the London Circuit and Commonwealth Avenue Intersection)

- Section 63, between the north east cloverleaf and Edinburgh Avenue.

The road network currently includes three cloverleaf ramps that facilitate vehicle access between Commonwealth Avenue and London Circuit and Parkes Way. These ramps are a significant barrier for pedestrian and cyclist accessibility between Commonwealth Avenue and London Circuit.

The construction footprint and surrounds host a wide variety of significant residential, commercial, recreation and education facilities, making it a central hub of the city with high volumes of traffic entering and exiting each day. The area already serves as a primary travel route for a wide variety of existing transport methods, including road vehicles, pedestrians and cyclists, as shown in **Figure 9-3**.

9.1.2.2 Road network

Key features of the existing road network, shown on **Figure 9-3**, include the following:

- Commonwealth Avenue, considered the gateway to the CBD from the south is a 70 km/h road which becomes 60 km/h at City Hill and then subsequently 40 km/h as it enters the commercial district around the Alinga Street light rail stop before becoming Northbourne Avenue north of this point
- Northbourne Avenue, Vernon Circle, and Commonwealth Avenue form part of a north-south arterial traffic route that runs through the centre of Canberra CBD and provides a link between north and south Canberra
- Parkes Way, which is an east-west arterial traffic route that traverses the northern side of Lake Burley Griffin
- London Circuit, which is a radial major collector road providing access between adjoining properties in Civic with the following surrounding arterial corridors:
    - Northbourne Avenue and Commonwealth Avenue to/from the north and south
    - Edinburgh Avenue and Parkes Way corridor to/from the south-west
    - Constitution Avenue, Parkes Way and Kings Avenue corridor to/from the south-east
    - Constitution Avenue, Coranderrk Street and Ainslie Avenue or Barry Drive to/from the north-east and north-west respectively
- London Circuit and Commonwealth Avenue, as well as Commonwealth Avenue and Parkes Way are currently grade separated, with three cloverleaf ramps facilitating some vehicle movements between the separated corridors
- Northbourne Avenue and Vernon Circle are approved B-double routes and approved Performance Based Standards (PBS) Level 1 vehicle routes, meaning they can be used by truck-and-dogs. London Circuit, Constitution Avenue and Edinburgh Avenue are also PBS Level 1 vehicle routes
- A combination of signalised intersections, unsignalised intersections and high-speed merge points are present within the construction footprint and surrounds.

Traffic volumes

2017 traffic volumes at key locations were sourced from the Aimsun model for a weekday AM and PM peak hour. The traffic volumes highlight the high demand for Commonwealth Avenue, with nearly 5,000 vehicles using it in the AM peak hour, and nearly 4,000 vehicles in the PM peak per hour. More than 1,000 vehicles use London Circuit west, during the AM peak hour and 900 vehicles during the PM peak hour. A large proportion of the London Circuit traffic volumes uses Edinburgh Avenue and Commonwealth Avenue to access London Circuit.

Road network performance

The existing operation of the Edinburgh Avenue and London Circuit intersection has been assessed by adopting 2017 traffic volumes extracted from the Aimsun model. The 2017 operational performance of this intersection, as well as the London Circuit and Commonwealth Avenue intersection, was determined to be satisfactory.

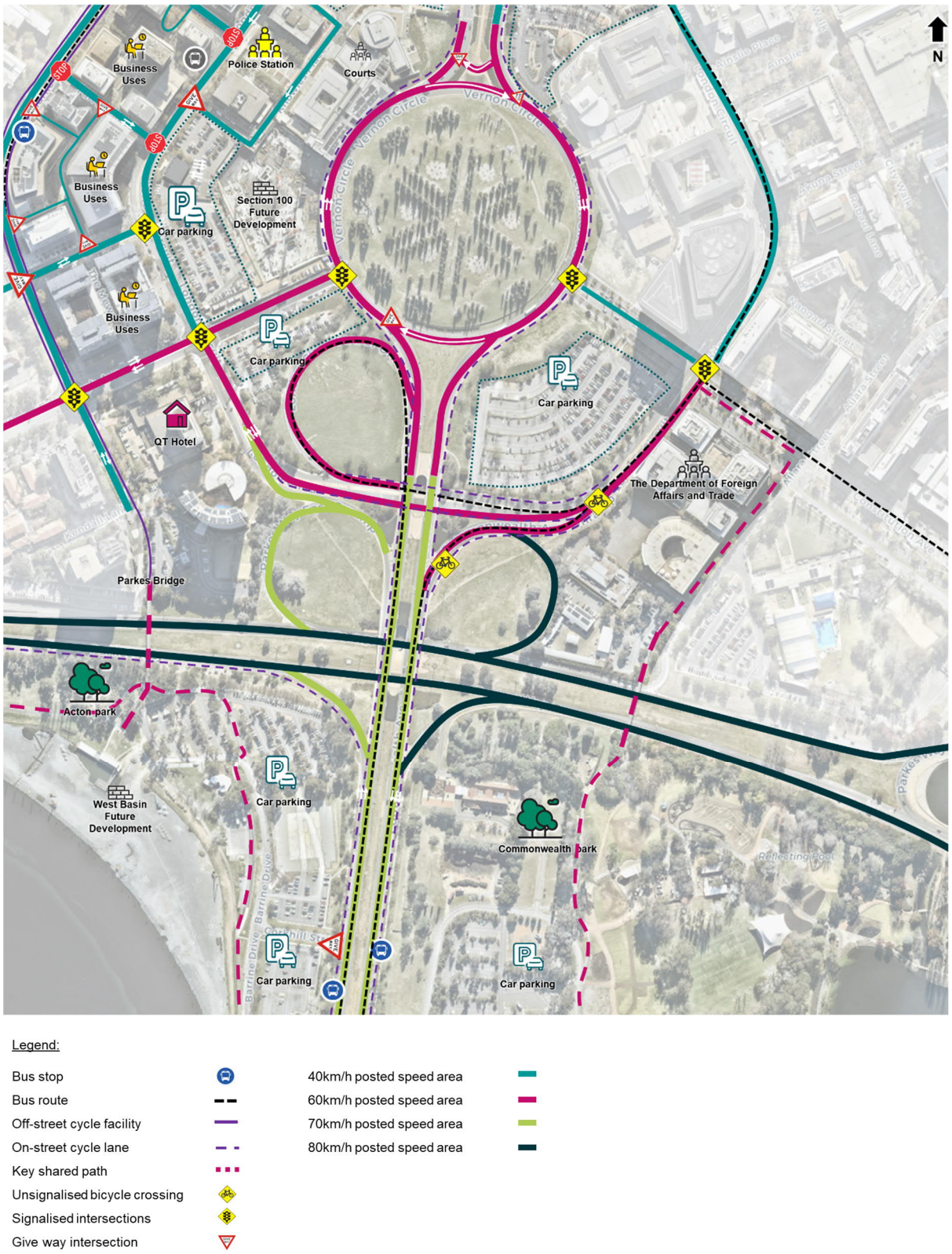


Figure 9-3 Existing transport conditions for the study area

9.1.2.3 Public transport

The City Interchange is located to the north of the study area and caters for most of the CBD's public transport activity. The interchange includes the Alinga Street light rail station and bus stops.

Transport Canberra bus services travelling to/from the south generally use Commonwealth Avenue (12 routes) or Constitution Avenue (six routes) and London Circuit east to access the City Interchange, as shown on **Figure 9-4**. The Commonwealth Avenue bus routes currently use the north-west cloverleaf to access London Circuit east from Commonwealth Avenue south.

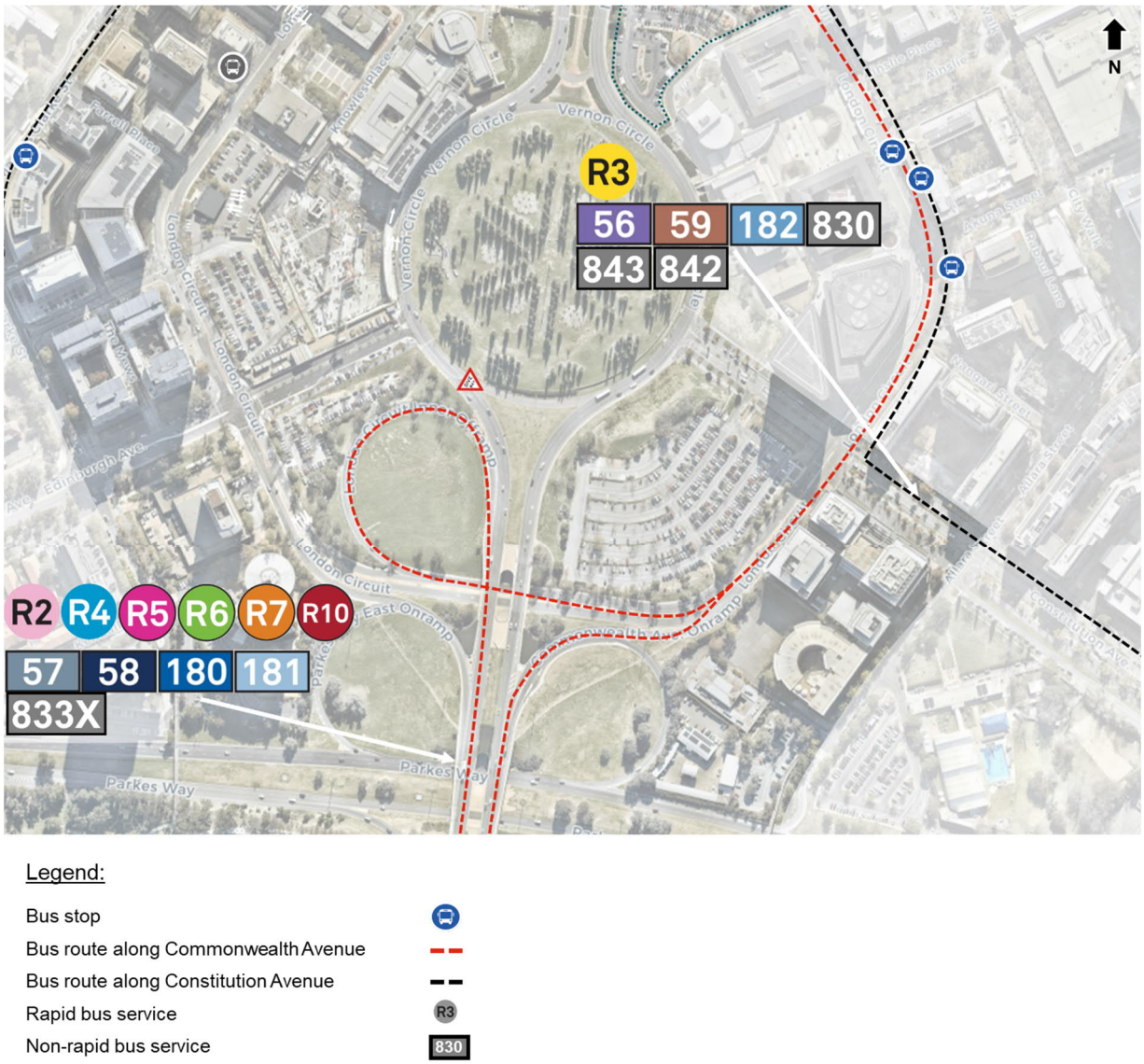


Figure 9-4 Bus services in the study area

9.1.2.4 Active transport

Data released by the ABS Census 2016 showed that active transport represented 45% and 13% of the journey to work in the Civic area, for local residents and non-residents respectively.

The existing active transport provisions within the study area include:

- North-south on-road cycle lanes provided on Vernon Circle and Commonwealth Avenue and connecting to facilities in the north on Northbourne Avenue. These cycle lanes facilitate the key north-south Principal cycle route to/from and through Canberra CBD

- An eastbound on-road cycle lane is provided along London Circuit between the north-west clover leaf merge with London Circuit about 80m south of Constitution Avenue. London Circuit is endorsed as a local cycle route, providing for short trips within the local area and offering a lower order alternative to the more heavily used Principal cycle routes
- A westbound on-road cycle lane is provided along London Circuit between the London Circuit westbound to Commonwealth Avenue southbound left turn slip lane diverge and the Commonwealth Avenue northbound to London Circuit westbound left turn slip lane merge.
- Signalised pedestrian crossings on all legs of the intersections of London Circuit and Edinburgh Avenue and London Circuit and Constitution Avenue.

In addition to the above, the C8 City Loop is a key cycle route that surrounds the study area, as shown on **Figure 9-5**. It connects key employment areas and also links the CBD with other surrounding cycle routes.

No footpath is provided along the south side of London Circuit beneath Commonwealth Avenue. The cloverleaf ramps are a significant barrier for pedestrian and cyclist accessibility between Commonwealth Avenue and London Circuit. Pedestrians and cyclists need to cross the cloverleaf ramps and slip lanes at designated points (dedicated ramps). A more direct pedestrian desire line through the cloverleaf ramps is evident by the dirt tracks that have been formed.

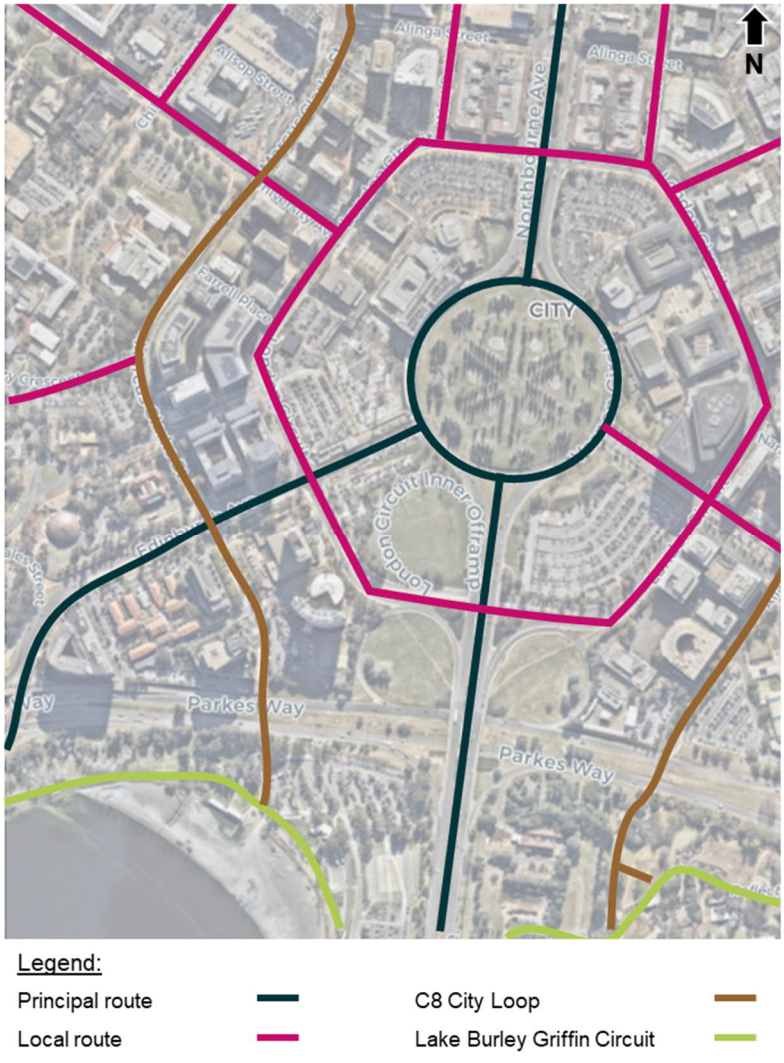


Figure 9-5 Strategic active travel routes

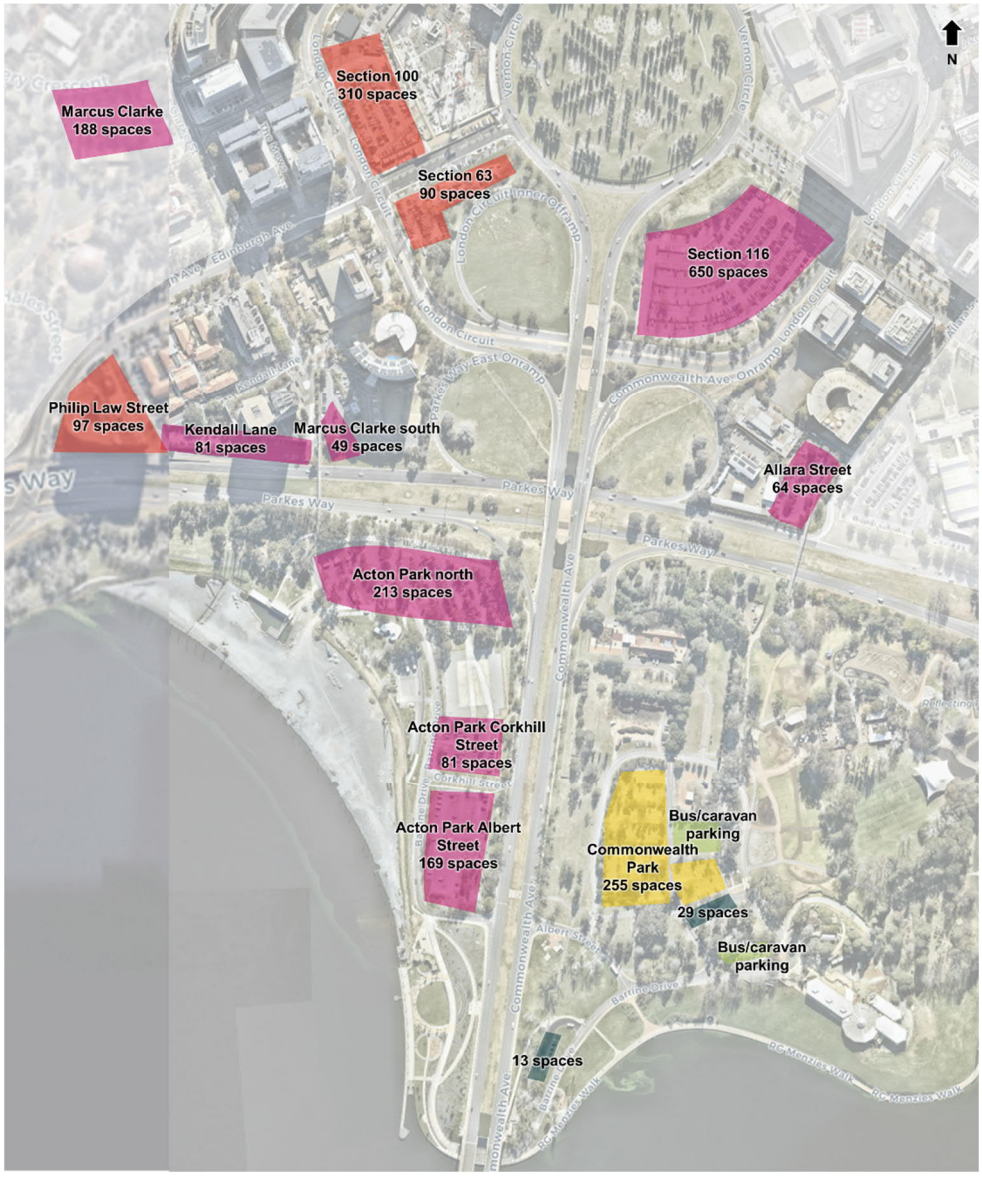
9.1.2.5 Parking and access

Parking

One on-street parking space is located on the eastern side of London Circuit outside the Department of Foreign Affairs and Trade building. This space is the only kerbside parking space within the study area, and it is typically used by priority visitors to the adjacent building.

Outside of the study area, on-street parking is generally available on adjacent streets including Edinburgh Avenue and Constitution Avenue, as well as London Circuit to the north of study area.

Some buildings surrounding the study area have dedicated basement carparking. In addition, there are several publicly available carparks located within the study area, catering for a mix of short-term and all-day parking options and a total supply of 2,290 spaces, as shown on **Figure 9-6**.



Legend:

Territory long stay parking		NCA short stay parking	
NCA long stay car parking		NCA long stay parking	
NCA bus/caravan parking			

Figure 9-6 Off-street carparking locations and approximate parking supply

Based on parking count data from 2019 and provided by TCCS, many of the carparks within the study area typically reach capacity on weekdays. Some spare capacity is typically experienced on a weekday in the Section 116 carpark, the Allara Street carpark and the Acton Park south carpark. Based on aerial imagery, also it appears that the nearby Commonwealth Park carparks also typically have some spare capacity on a weekday.

The Section 116 carpark is also frequently used by visitors to the adjacent Canberra Theatre, typically on weekends and weekday evenings.

Access

The following two properties have a vehicle access off London Circuit within the construction footprint:

- QT Hotel porte-cochère access on the south-west corner of London Circuit and Edinburgh Avenue
- The carpark located on the Section 63 site, adjacent to Edinburgh Avenue.

The closest emergency service facilities that service Canberra CBD and their likely access routes to/from the study area are summarised in **Table 9-3**.

Table 9-3 Emergency Service and access routes

Emergency Service facility	Location	Main access route	Typical travel time (minutes)[1]
Ambulance	Morphett Street, Dickson	Northbourne Avenue to / from the north	8
SES	ACT SES Majura Unit-Holtze Close	Northbourne Avenue to / from the north	12
Fire Services	Ainslie Fire station-Wakefield Avenue	Northbourne Avenue to / from the north	7
Police Station	London Circuit	London Circuit in the study area	0

[1] Derived from online wayfinding platforms to identify a typical travel time based on possible routes, and historical and predicted traffic patterns

9.1.2.6 Movement and place

The streets within study area currently have high movement functions and relatively low place value. They generally facilitate movement between places but have limited dwellable area available.

The construction footprint lies across several 'Designated Areas' under the NCP and the predominant land uses currently are commercial business and government related activities. The construction footprint is also adjacent to significant tourist land uses such, as Lake Burley Griffin and Foreshores, Commonwealth Park and Acton Park, and forms a key link between these as well as between them and the City.

There is no well refined information available to understand how many residents live in the study area, however, the Project is wholly contained within the Civic Statistical Area, which houses 4,276 residents (approximately one per cent of the total Canberra population). The labour force participation (15-85 years), representative of employment, for the Civic Statistical Area is 53.9%.

The study area streets have been classified in terms of their existing movement and place functions. The classifications for the study area streets include:

- M2 and P2 (vibrant streets): London Circuit east and west
- M3 and P1 (places for people): Commonwealth Avenue and Vernon Circle.

9.1.3 Assessment of potential impacts

9.1.3.1 Construction impact assessment

A summary of the Project's construction related traffic and transport impacts, without mitigation measures applied, is provided in **Table 9-4**. Refer to section 6.0 of the TTIA **(Appendix A)** for detailed assessment and description of the construction impacts.

Table 9-4 Preliminary risk assessment for traffic and transport (construction)

Category	Construction transport impact	Likelihood	Consequence	Rating
Road network	Increased traffic delays of around 1.5 minutes and 1 minute at the Parkes Way and Edinburgh Avenue interchange during the AM and PM peak hours, respectively	Likely	Minor	**Medium**
	Increased delays of around 50 seconds on the westbound approach to the Edinburgh Avenue and Marcus Clarke Street intersection in the AM peak hour.	Likely	Minor	**Medium**
	Travel time increases of around 1 minute along Commonwealth Avenue in each direction in the AM and PM peak hours.	Likely	Minor	**Medium**
	Travel time increases of around 1.5 minutes eastbound along Parkes Way in the AM peak hour.	Likely	Minor	**Medium**
	Increased delays of around 5 minutes on the westbound approach to the Constitution Avenue and Blamey Crescent intersection in the PM peak hour.	Likely	Minor (very small number of vehicles impacted)	**Medium**
	Increased delays of almost 1 minute on the westbound approach to the Northbourne Avenue and London Circuit intersection in the PM peak hour.	Likely	Minor	**Medium**
	Additional construction related heavy vehicles using the local road network.	Likely	Minor	**Medium**
	Additional construction worker traffic using the local road network.	Likely	Minor	**Medium**
Public transport	Bus travel time increases of around 2 minutes for bus routes on Commonwealth Avenue in the AM and PM peak hours.	Likely	Moderate	**High**
	Bus travel times increases of an additional 1 minute due to delay experienced by inbound buses on London Circuit in the PM peak hour.	Likely	Moderate	**High**
Pedestrians	London Circuit footpaths closed between Edinburgh Avenue and Constitution Avenue requiring use of alternative routes with increased travel times of up to 4 minutes (from an existing walk time of approximately 8 minutes).	Likely	Minor (small number of people impacted)	**Medium**
	Removal of pedestrian facilities between London Circuit and Commonwealth Avenue requiring use of alternative routes with increased travel times of up to 2 minutes.	Likely	Minor (small number of people impacted)	**Medium**

Category	Construction transport impact	Likelihood	Consequence	Rating
Cyclists	Loss of cyclist connection between London Circuit east and Commonwealth Avenue, requiring use of alternative routes with increased travel times of up to 3 minutes.	Likely	Minor (small number of people impacted)	**Medium**
	London Circuit closure between Constitution Avenue and Edinburgh Avenue requiring use of alternative routes with increased travel times of up to 3 minutes.	Likely	Minor (small number of people impacted)	**Medium**
Kerbside uses	The on-street parking space located on the eastern part of London Circuit outside the Department of Foreign Affairs and Trade building would be temporarily lost during construction.	Likely	Minor	**Medium**
Local area traffic access	Road closures would require use of alternative local area traffic routes via Vernon Circle, Edinburgh Avenue and Constitution Avenue with limited to no increase to travel distances.	Likely	Insignificant	**Low**
Property access	Access to the QT Hotel would be maintained but only to/from the north via the London Circuit/Edinburgh Avenue intersection. Some vehicles would need to use alternative routes and/or use the main QT Hotel access via Edinburgh Avenue.	Likely	Insignificant	**Low**
Parking	Temporary loss of approximately 640 long stay parking spaces in the study area	Likely	Moderate	**High**
Road safety	Additional heavy vehicles within the area, conflicting with pedestrians and cyclists.	Possible	Moderate	**Medium**

9.1.3.2 Operational impact assessment

A summary of the Project's operational related traffic and transport impacts, without mitigation measures applied, are summarised in **Table 9-5**. Refer to section 7.0 of the TTIA **(Appendix A)** for detailed description of the operational impacts.

Table 9-5 Preliminary risk assessment for traffic and transport (operation)

Type	Operational impacts	Likelihood	Consequence	Rating
Road network	Increased travel times due to traffic growth and the Project in 2026	Possible	Minor	**Low**
	Increased weekday peak period travel times due to the cumulative impacts of the Project, other planned projects and traffic growth in 2036	Possible	Moderate	**Medium**
	Cumulative impacts of the Project, other planned projects and traffic growth on weekday peak period traffic congestion (density) in 2036	Possible	Moderate	**Medium**

Type	Operational impacts	Likelihood	Consequence	Rating
	Cumulative impacts of the Project, other planned projects and traffic growth on weekday peak period performance of the London Circuit and Commonwealth Avenue intersection in 2036	Possible	Moderate	**Medium**
Public transport	Increased weekday peak period bus travel times due to the cumulative impacts of the Project, other planned projects and traffic growth in 2036	Possible	Minor	**Low**
	Facilitation of the delivery of the Canberra Light Rail network extension to Woden.	N/A	N/A	**Beneficial**
Pedestrians and cyclists	Providing signalised pedestrian crossings for all legs at the intersection of Commonwealth Avenue and London Circuit could result in delays for pedestrians waiting at the proposed intersection of London Circuit and Commonwealth Avenue.	Possible	Insignificant	**Very low**
	The continuous footpaths proposed along London Circuit would make it easier to walk between London Circuit east and west, improving east-west connectivity for the southern CBD area and generally improving walkability in the area.	N/A	N/A	**Beneficial**
	Providing intersecting footpaths and cycleways along London Circuit and Commonwealth Avenue would improve permeability and access to/from the city south. The proposed paths are more direct and more legible than the current facilities via the cloverleaf ramps, making it easier for cyclists and pedestrians to navigate between London Circuit and the City Hill area and areas to the south such as Lake Burley Griffin or Capital Hill via Commonwealth Avenue.	N/A	N/A	**Beneficial**
Local area traffic access	Removal of the southbound right turn at the intersection of London Circuit and Edinburgh Avenue requires traffic moving between London Circuit and Edinburgh Avenue to use alternative routes.	Likely	Insignificant	**Low**
Property access	Access to the QT porte-cochère via London Circuit would be restricted to left-in and left-out instead of all movements. Vehicles approaching from the north and departing to the south would need to use alternative	Likely	Insignificant	**Low**

Type	Operational impacts	Likelihood	Consequence	Rating
	routes and/or the main QT Hotel access via Edinburgh Avenue.			
Off-street parking	Loss of approximately 50 long stay parking spaces from the Section 116 long-stay carpark on London Circuit east.	Likely	Minor	**Medium**
Road safety	Proposed signalised intersection of London Circuit and Commonwealth Avenue could create new intersection related conflicts	Possible	Moderate	**Medium**
	Providing off-road cycling facilities along Commonwealth Avenue and London Circuit, combined with wider footpaths improves safety for vulnerable users, by separating cyclists, pedestrians, and traffic.	N/A	N/A	**Beneficial**
	The removal of the south-west and north-west cloverleaf ramps and provision of signalised crossings on all legs of the intersection of Commonwealth Avenue and London Circuit would accommodate safer pedestrian and cyclist crossings, particularly for movements between London Circuit and Commonwealth Avenue and minimising safety risks and complexities associated with the current uncontrolled crossings on the cloverleaf ramps.	N/A	N/A	**Beneficial**

9.1.4 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a traffic and transport impact occurring. The relevant management measures and safeguard protocols are provided in **Table 9-35**, and have been prepared with the following objectives:

- Consider traffic implications of proposed construction activities holistically
- Adopt a whole of Government approach to citywide transport planning and management throughout construction, through the Disruption Taskforce
- Minimise the potential strain on the road network during construction
- Minimise impacts to pedestrians and cyclists during construction
- Maintain appropriate vehicular access to directly impacted neighbours
- Minimise general impacts from construction traffic movements
- Ensure that accessible parking provisions are not impacted from construction
- Minimise the impacts to parking facilities from the construction workforce
- Optimise the performance of the road traffic network.

Table 9-6 Management and mitigation measures – Traffic and transport

Ref	Management and mitigation measure	Timing	Reference
T1	A Traffic and Transport Liaison Group (TTLG) would be established to oversee and review traffic and multi modal implications of proposed construction activities and network arrangements. TTLG would include representation from: • TCCS • MPC • NCA • AFP • CRA • Emergency Services ACT (ESA).	Prior to and during construction	-
T2	Prior to implementation, Temporary Traffic Management (TTM) Plans must be endorsed by the Traffic and Transport Liaison Group and have all other necessary approvals in place.	During construction	Planning and Land Management Act 1988; AS1742 Part 3; Traffic Control at Worksites Manual (RMS 2012); Austroads Guide to Temporary Traffic Management
T3	A travel demand management strategy would be developed, to reduce the private vehicle trip generation and parking demand, particularly during weekday AM and PM peak hours, generated by local residents and employees of the broader CBD and surrounding area.	Prior to construction	ACT Transport Strategy 2020 ACT Transport Recovery Plan 2021 ACT Climate Change Strategy 2019
T4	A more direct east-west active travel connection between Edinburgh Avenue and Constitution Avenue will be investigated.	Detailed design, Prior to construction	-
T5	In consultation with relevant stakeholders, appropriate vehicular access would be maintained to 255 London Circuit and 1 London Circuit at all times during construction.	During construction	-
T6	A Construction Transport Management Plan (CTMP) would be developed to manage the impacts of the construction activities on the transport network and local parking.	Prior to construction	-
T7	As part of the CTMP, construction vehicle movement arrangements would be developed in consultation with the Traffic and Transport liaison Group (TTLG) to minimise impacts on the city generally, with specific regard to: • Bus movements, and bus priority measures • Key pedestrian movements and activity areas • Other construction projects in the locality • Local traffic movement requirements and peak traffic volumes, including long weekends and holiday periods. • Crime prevention through environmental design principles • Special events.	Prior to and during construction	Hea-2 IS ISC Rating Tool 1.2

Ref	Management and mitigation measure	Timing	Reference
T8	No net loss of accessible parking across the Project area.	During construction and operation	-
T9	To reduce the impact on public parking facilities, particularly in the Civic region, site workers parking would be provided at appropriate construction compounds to minimise the use of on-street parking. Consideration would be given to providing shuttle services to transport site workers. If shuttle buses are not provided as part of the Project, parking restrictions around work zones would be considered to prevent potential impacts due to the Project use of on- or off-street parking, this must be included in the relevant TMP and approved by TCCS.	During construction	-
T10	Continue to investigate measures to optimise the performance of key intersections (e.g., adjusted signal phasing).	Prior to operation	-

9.1.5 Residual impacts

A residual risk assessment was undertaken to assess the remaining traffic and transport issues after the proposed management and mitigation measures are applied, presented in:

- Project construction are summarised in **Table 9-7**
- Project operation are summarised in **Table 9-8**.

No significant residual impacts on traffic and transport are anticipated.

Table 9-7 Construction residual impacts – Traffic and transport

Category	Construction transport impact	Likelihood	Consequence	Residual rating
Road network	Increased traffic delays of around 1.5 minutes and 1 minute at the Parkes Way and Edinburgh Avenue interchange during the AM and PM peak hours, respectively	Possible	Minor	**Low**
	Increased delays of around 50 seconds on the westbound approach to the Edinburgh Avenue and Marcus Clarke Street intersection in the AM peak hour.	Possible	Minor	**Low**
	Travel time increases of around 1 minute along Commonwealth Avenue in each direction in the AM and PM peak hours.	Possible	Minor	**Low**
	Travel time increases of around 1.5 minutes eastbound along Parkes Way in the AM peak hour.	Possible	Minor	**Low**
	Increased delays of around 5 minutes on the westbound approach to the Constitution Avenue and Blamey Crescent intersection in the PM peak hour.	Possible	Minor (very small number of vehicles impacted)	**Low**

Category	Construction transport impact	Likelihood	Consequence	Residual rating
	Increased delays of almost 1 minute on the westbound approach to the Northbourne Avenue and London Circuit intersection in the PM peak hour.	Possible	Minor	**Low**
	Additional construction related heavy vehicles using the local road network.	Possible	Minor	**Low**
	Additional construction worker traffic using the local road network.	Possible	Minor	**Low**
Public transport	Bus travel time increases of around 2 minutes for bus routes on Commonwealth Avenue in the AM and PM peak hours.	Possible	Moderate	**Medium**
	Bus travel times increases of an additional 1 minute due to delay experienced by inbound buses on London Circuit in the PM peak hour.	Possible	Moderate	**Medium**
Pedestrians	London Circuit footpaths closed between Edinburgh Avenue and Constitution Avenue requiring use of alternative routes with increased travel times of up to 4 minutes (from an existing walk time of approximately 8 minutes).	Possible	Minor (small number of people impacted)	**Low**
	Removal of pedestrian facilities between London Circuit and Commonwealth Avenue requiring use of alternative routes with increased travel times of up to 2 minutes.	Possible	Minor (small number of people impacted)	**Low**
Cyclists	Loss of cyclist connection between London Circuit east and Commonwealth Avenue, requiring use of alternative routes with increased travel times of up to 3 minutes.	Possible	Minor (small number of people impacted)	**Low**
	London Circuit closure between Constitution Avenue and Edinburgh Avenue requiring use of alternative routes with increased travel times of up to 3 minutes.	Possible	Minor (small number of people impacted)	**Low**
Kerbside uses	The on-street parking space located on the eastern part of London Circuit outside the Department of Foreign Affairs and Trade building would be temporarily lost during construction.	Possible	Minor	**Low**
Local area traffic access	Road closures would require use of alternative local area traffic routes via Vernon Circle, Edinburgh Avenue and Constitution Avenue with limited to no increase to travel distances.	Likely	Insignificant	**Low**
Property access	Access to the QT Hotel would be maintained but only to/from the north via the London Circuit/Edinburgh Avenue intersection. Some vehicles	Likely	Insignificant	**Low**

Category	Construction transport impact	Likelihood	Consequence	Residual rating
	would need to use alternative routes and/or use the main QT Hotel access via Edinburgh Avenue.			
Parking	Temporary loss of approximately 640 long stay parking spaces in the study area	Possible	Moderate	**Medium**
Road safety	Additional heavy vehicles within the area, conflicting with pedestrians and cyclists.	Possible	Minor	**Low**

Table 9-8 Operational residual impacts – Traffic and transport

Type	Operational transport impact	Likelihood	Consequence	Residual rating
Road network	Increased travel times due to traffic growth and the Project in 2026	Possible	Minor	**Low**
	Increased weekday peak period travel times due to the cumulative impacts of the Project, other planned projects and traffic growth in 2036	Unlikely	Moderate	**Low**
	Cumulative impacts of the Project, other planned projects and traffic growth on weekday peak period traffic congestion (density) in 2036	Unlikely	Moderate	**Low**
	Cumulative impacts of the Project, other planned projects and traffic growth on weekday peak period performance of the London Circuit and Commonwealth Avenue intersection in 2036	Unlikely	Moderate	**Low**
Public transport	Increased weekday peak period bus travel times due to the cumulative impacts of the Project, other planned projects and traffic growth in 2036	Possible	Minor	**Low**
	Facilitation of the delivery of the Canberra Light Rail network extension to Woden.	N/A	N/A	**Beneficial**
Pedestrians and cyclists	Providing signalised pedestrian crossings for all legs at the intersection of Commonwealth Avenue and London Circuit could result in delays for pedestrians waiting at the proposed intersection of London Circuit and Commonwealth Avenue.	Possible	Insignificant	**Very low**
	The continuous footpaths proposed along London Circuit would make it easier to walk between London Circuit east and west, improving east-west connectivity for the southern CBD area and generally improving walkability in the area.	N/A	N/A	**Beneficial**
	Providing intersecting footpaths and cycleways along London Circuit and	N/A	N/A	**Beneficial**

Type	Operational transport impact	Likelihood	Consequence	Residual rating
	Commonwealth Avenue would improve permeability and access to/from the city south. The proposed paths are more direct and more legible than the current facilities via the cloverleaf ramps, making it easier for cyclists and pedestrians to navigate between London Circuit and the City Hill area and areas to the south such as Lake Burley Griffin or Capital Hill via Commonwealth Avenue.			
Local area traffic access	Removal of the southbound right turn at the intersection of London Circuit and Edinburgh Avenue requires traffic moving between London Circuit and Edinburgh Avenue to use alternative routes.	Likely	Insignificant	**Low**
Property access	Access to the QT porte-cochère via London Circuit would be restricted to left-in and left-out instead of all movements. Vehicles approaching from the north and departing to the south would need to use alternative routes and/or the main QT Hotel access via Edinburgh Avenue.	Likely	Insignificant	**Low**
Off-street parking	Loss of approximately 50 long stay parking spaces from the Section 116 long stay carpark on London Circuit east.	Possible	Minor	**Low**
Road safety	Proposed signalised intersection of London Circuit and Commonwealth Avenue could create new intersection related conflicts	Possible	Minor	**Low**
	Providing off-road cycling facilities along Commonwealth Avenue and London Circuit, combined with wider footpaths improves safety for vulnerable users, by separating cyclists, pedestrians, and traffic.	N/A	N/A	**Beneficial**
	The removal of the south-west and north-west cloverleaf ramps and provision of signalised crossings on all legs of the intersection of Commonwealth Avenue and London Circuit would accommodate safer pedestrian and cyclist crossings, particularly for movements between London Circuit and Commonwealth Avenue and minimising safety risks and complexities associated with the current uncontrolled crossings on the cloverleaf ramps.	N/A	N/A	**Beneficial**

9.2 Heritage

This chapter provides an overview and assessment of the potential heritage impacts and benefits associated with the construction and operation of the Project.

9.2.1 Approach

This chapter is based on information from the Heritage Impact Assessment (HIA) prepared by GML Heritage Pty Ltd in July 2021. The HIA is provided in **Appendix B (Heritage Impact Assessment)** (GML Heritage, 2021b). The HIA includes:

- Statutory heritage context relevant to the Project
- Methodology applied for assessing heritage impacts
- The existing environment and listed / known heritage (Indigenous, historic and natural) values and places within or adjacent to the Project
- An assessment of the potential impacts to heritage values and places, during construction and operation of the Project
- Recommendations and mitigation measures to reduce / avoid any potential impacts to heritage, during construction and operation of the Project.

The HIA relies on existing heritage listings and nominated heritage information. It does not contain new assessments of historic heritage values against the Commonwealth or ACT Heritage criteria for places on Commonwealth or Territory land located within or adjacent to the construction footprint. The HIA focuses on the details of existing heritage listings and nominations and does not attempt to capture broader community heritage values. Relevant Heritage Management Plans (HMP) were referred to, where appropriate, throughout the assessment.

The HIA notes that the impact severity does not necessarily indicate a significant or adverse impact on the overall heritage values of a place. The Central National Area of Canberra contains many individual heritage places which contribute to the heritage value of the location holistically. This means that localised impacts to heritage may be severe, but not significant to the overall heritage value of the place.

9.2.2 Existing environment

9.2.2.1 Historic heritage

London Circuit is part of a historically developed road network, contributing to heritage values of various listed and nominated places on the ACT Heritage Register, Commonwealth Heritage List (CHL) and the National Heritage List (NHL). **Table 9-9** outlines four historic heritage places located within or immediately adjacent to the Project (refer to **Figure 9-7**), including a summary of the key attributes and associated management policies implemented to protect the heritage values of the heritage places.

Figure 9-7 Areas of heritage significance within the construction footprint

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Table 9-9 Historic heritage places on the ACT Heritage Register, CHL and NHL and a summary of their key attributes and management policies in relation to the Project.

Place name	Register (Status)	Summary of the relevant key attributes	Summary of relevant management policies
Canberra the Planned National Capital	Nominated: National Heritage List (Nominated)	• Public parkland with their broader setting elements that form the basis for the popular presentation of the city • Views from Mount Ainslie, Black Mountain, Red Hill and Mount Pleasant along axes and across the Central National Area • Views of the Australian Parliament House as the focal point at the end of a tree-lined boulevard, as seen travelling towards Parliament House along Commonwealth Avenue • The city's layout in accordance with its two principal axes – the Land and Water axes • The use of geometry in the layout and organisation of the early city • Planned nature of the city – its design and plantings • The 1925 gazetted road layout indicates the size and layout of the early city • Central National Area, including Lake Burley Griffin and high proportion of tree planting in the public domain.	*Nil*
Parliament House Vista	Commonwealth Heritage List (Listed / 105466)	• The concentration of buildings, parklands and gardens that support Commonwealth parliamentary and governmental activity • The extensive vista along the land axis, textures of architectural massing accentuated by planned open spaces, water features and tree plantings, artworks, the terminal features plus the interplay of scale and texture in the designed landscape • The whole of the vista, including all elements and features contained within it, as well as the natural and wooded hills beyond	The Parliament House Vista Area HMP 2010 provides the following conservation policies relevant to the Project: • Protect the setting of the Parliament House Vista to the extent possible within its powers. Beyond this, the NCA will encourage such protection for those areas which fall outside its responsibilities, including the forested character of the surrounding hills and views to the hills from within the Parliament House Vista (Policy 42 – Protection of setting) • The significant views to and from the Vista would be protected including views to the surrounding hills (especially Mount Ainslie, Black Mountain and Mount

Place name	Register (Status)	Summary of the relevant key attributes	Summary of relevant management policies
		• The planned layout and the views from the top of Mount Ainslie.	Pleasant), the current Parliament House, and from Commonwealth Avenue, especially the bridge (Policy 43 Protection of views to and from the Area).
National Land Roads	Nominated: Commonwealth Heritage List (Nominated / 106324)	• Commonwealth Avenue overall wide tree-lined avenue • Formality in the design and aesthetic of Commonwealth Avenue • The siting, alignment, and width of Commonwealth Avenue. • Plantings – layout and mix of native and exotic species • Historical function as a major and active boulevard that facilitates public movement throughout Canberra • Views north and south along Commonwealth Avenue The visual and spatial relationship of Commonwealth Avenue with Kings and Constitution Avenues – the other two sides of the National Triangle • Ceremonial and symbolic importance as an entrance to the Parliamentary Zone and integral link connecting the Federal and Territory functions of Canberra.	No HMP has been prepared for the National Land Roads. In April 2020, GML developed a series of 'heritage principles' to inform and guide development of Commonwealth Avenue as part of the development of a Commonwealth Avenue Masterplan by Hassell. • Retain and enhance the formality of Commonwealth Avenue through appropriate design, aesthetic, scale and materials, the landscape character and ready public access • Retain Commonwealth Avenue as a wide tree-lined boulevard and significant views and vistas • Maintain and support Commonwealth Avenue's function as a major and active boulevard within Canberra • Any new structures along Commonwealth Avenue. should be high quality, with durable materials and finishes in sympathetic and neutral colours.
City Hill	ACT Heritage Register (Registered / 20002)	• All grassed areas • Six axial plantings of Cupressus sempervirens 'Stricta' • Eleven oval shaped groups of Cupressus sempervirens 'Stricta' • All groups of Pinus radiata between the axial plantings • Plantings of Robinia pseudocacia • The metal flagpole in its existing location.	No HMP has been prepared for City Hill. The following heritage guidelines are provided by the ACT Heritage Register citation: • The landscape qualities of City Hill are to be retained as an important element of Canberra's planning • The integrity of the plantings is to be retained by replacing all dead and damaged trees with the same species after thorough research of the original design • Access to City Hill by pedestrians is encouraged • Any proposals to alter any aspect of City Hill shall be referred to the Heritage Council of the ACT for comment prior to detailed planning and commencement work.

9.2.2.2 Indigenous heritage values

The construction footprint has been previously assessed for the combined City to Commonwealth Park component of the Light Rail to Woden project, which included the Project, and found low potential for the existence of Aboriginal archaeological sites. Although the area is within a landscape of cultural significance to the local Aboriginal community, the Project would not affect such values any more than the development of Canberra already has.

9.2.2.3 Natural heritage values

There are no vegetation communities or individual flora or fauna species with natural heritage value in or around the construction footprint, with the exception of the Golden Sun Moth (GSM), which occurs within and adjacent to parts of the construction footprint. **Section 9.3** details the Project's potential impacts on GSM and associated management measures.

9.2.3 Assessment of potential impacts

Table 9-10 provides a summary of the potential impacts on the nominated and listed Commonwealth, National and ACT Heritage places. Refer to **Appendix B (Heritage Impact Assessment)** for the full impact assessment.

The impact terminology below applies language from the EPBC Act *Significant Impact Guidelines 1.2* (Department of Sustainability, Environment, Water, Population and Communities, 2013):

- Moderate impact - Generally, has two or more of the following characteristics: medium–long term; small–medium scale; moderate intensity.
- Minor impact - Generally, has two or more of the following characteristics: short term / reversible; small-scale / localised; low intensity.

Table 9-10 Summary of heritage impacts during construction and operation

Heritage place	Heritage impact	
	Construction	Operation
Canberra the Planned National Capital	Construction works are **likely to have a minor** adverse impact on the heritage values. Temporary construction works have the potential to directly obstruct significant (heritage) views north and south along Commonwealth Avenue, views toward Lake Burley Griffin and the views across the Central National Area. The impact would be temporary.	The impact of the proposed new infrastructure and modifications to existing infrastructure are **likely to cause a moderate** adverse impact on the heritage values of Canberra the Planned National Capital. The Project would reduce the physical presence of City Hill as a topographical feature in the landscape. The works would also include the demolition of two National Capital Development Commission (NCDC) era bridges and two cloverleaves, which may diminish the understanding of the NCDC road alignment program (the NCDC interpretation of the Griffin Plan).
Parliament House Vista	Construction works are **unlikely** to have an adverse impact on the heritage values.	The proposed new infrastructure and modifications to existing infrastructure are **unlikely** to cause an adverse impact on the heritage values of the Parliament House Vista.
National Land Roads	Construction works are **likely to have a minor** adverse impact on the heritage values. The construction of the temporary sidetrack would degrade the	The proposed new infrastructure and modifications to existing infrastructure are **likely to have a moderate** adverse impact on the heritage values of National Land Roads.

Heritage place	Heritage impact	
	Construction	Operation
	formality of the road alignment by adding a curved diversion road to the side of Commonwealth Avenue.	The existing avenue is a wide boulevard with parallel alignment and no intersections interrupting the vista. The creation an intersection would permanently alter aspects of the roadways, although the works are considered a reinstatement of the road system to an earlier configuration.
City Hill	Construction works are **likely to have a minor** adverse impact on the heritage values. Construction works have the potential to obstruct or alter views from City Hill. These impacts would be temporary.	The proposed new infrastructure and modifications to existing infrastructure are **likely to have a minor** adverse impact on the heritage values of City Hill as part of the broader landscape setting[1]. The proposed works may reduce the ability to read City Hill as a special feature in the landscape, as identified by the Griffins. The proposed works would no impact on the features intrinsic as identified by ACT Heritage.

[1]Note that City Hill has heritage value both as an integral part of the heritage landscape, and intrinsic value as a heritage feature in itself. The landscape character and visual impact assessment for the Project (**Section 9.8**) identified that views from City Hill would have a beneficial visual landscape impact.

9.2.4 Preliminary risk assessment

Given no heritage provisions were determined under the EPBC Act Referral and Approval (2019 / 8582), risks to heritage have not been assigned a risk level.

9.2.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a potential heritage impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-11**, and have been prepared with the following objectives:

- Celebrate the heritage values of Canberra, the Parliament House Vista, Commonwealth Avenue and City Hill
- Document the heritage values of the Project area for future generations
- Strengthen the landscape character of Commonwealth Avenue
- Minimise potential for impacts (destruction/damage) to unexpected heritage items.

Table 9-11 Management and mitigation measures – Heritage

Ref	Management and mitigation measure	Timing	Reference
H1	Develop project strategies to identify, interpret and communicate the history and heritage values of Canberra, the Parliament House Vista, Commonwealth Avenue and City Hill, from early site establishment, throughout the construction phase and in the final completed landscape design.	Prior to and during construction	See also LV1; Her-1 ISC IS Rating Tool 1.2

Ref	Management and mitigation measure	Timing	Reference
H2	Complete a general photographic archival recording of Commonwealth Avenue from City Hill to Commonwealth Avenue Park (including offramps to the West in this area), and provision for these recordings to be made publicly available.	Prior to construction	Photographic Recording of Heritage Items Using Film or Digital Capture (NSW Heritage Office, 2006)
H3	In consultation with key stakeholders and technical specialists, develop detailed designs that are consistent with an overarching landscape masterplan for Commonwealth Avenue.	Prior to construction	Commonwealth Avenue Landscape Heritage Advice (GML Heritage, 2021a) EPBC Act Approval 2019/8582; Urb-2 ISC IS Rating Tool 1.2
H4	Implement an unexpected heritage finds protocol which includes: • Measures to enable all personnel working on site to receive awareness training relating to heritage matters • Cessation of all activity in the vicinity of the find and consultation with Representative Aboriginal Organisations and the ACT Heritage • Clear mechanisms to enable relevant clearance to be obtained and works to recommence.	During construction	**Appendix B (Heritage Impact Assessment)** (GML Heritage, 2021b)

9.2.6 Residual impacts

Given no heritage provisions were determined under the EPBC Act Referral and Approval (2019 / 8582), risks to heritage have not been assigned a risk level.

9.3 Biodiversity

This chapter provides an overview and assessment of the potential biodiversity impacts and benefits associated with the construction and operation of the Project.

9.3.1 Approach

This chapter is based on information from the EPBC Act Preliminary Documentation (MPC, 2020). The EPBC Act Preliminary Documentation was prepared to inform the assessment of the City to Commonwealth Park component of the Light Rail to Woden project. The Project was assessment as part of the City to Commonwealth Park component. The EPBC Act Preliminary Documentation focused on assessment of impacts on two controlling provisions:

- Section 18 listed threatened species and communities (Golden Sun Moth (GSM), *Synemon plana*)
- Section 26 Commonwealth land.

The Project, as part of the City to Commonwealth Park component of the Light Rail to Woden project, was approved by the Commonwealth Department of Agriculture, Water and Environment (DAWE) on 2 February 2021 (2019 / 8582) ('EPBC Approval'), subject to conditions. To meet these conditions, a GSM Management Plan (the GSM Plan) was developed and approved by the Commonwealth Environment Minister on 21 June 2021.

At the commencement of the Project, translocation of GSM larvae from the north west and south west cloverleaves and from Commonwealth Avenue median would be carried out as early works (refer to **Section 4.1**) prior to commencement of construction of the Project. The GSM larvae would be translocated to a fenced area in the southeast cloverleaf. Areas of GSM habitat and the translocation area are shown in **Figure 9-8**.

For the purpose of this assessment of the potential impacts of the Project:

- Areas from which GSM larvae would have been removed during early works (north west and south west cloverleaves and the Commonwealth Avenue median) are taken to no longer be GSM habitat
- Other areas, most notably within the south east cloverleaf, are taken to continue to be GSM habitat (and subject to the ongoing requirements of the EPBC Approval)

This chapter addresses general biodiversity impacts from construction of the Project but focuses on impacts to the identified GSM population associated with the construction activities outlined in **Chapter 4.0**. For more information on other species that were considered, refer to Section 3.3.2 of the EPBC Act Preliminary Documentation.

9.3.2 Existing environment

The Project construction footprint is characterised as an urban environment. It is primarily comprised of road reserves interspersed with maintained grasslands dominated by exotic grasses. The grasses occur mainly within the three circular areas identified as cloverleaves. The remainder of the construction footprint contains road infrastructure, including footpaths, Commonwealth Avenue bridges, and asphalt sealed carparks.

There is sparse tree cover adjacent to the road reserves comprising predominantly deciduous exotic species with some native species. According to studies undertaken by Hassell (2020) the trees within the construction footprint are predominantly *Eucalyptus* species, *Ulmus* species (Elms), *Platanus x acerifolia* (London plane) and *Melaleuca linariifolia*. The ages of the trees were estimated to range from new plantings to more than 40 years old. Some elms showed signs of elm leaf beetle damage. The elm leaf beetle (*Xanthogaleruca luteola*) is considered a significant pest in the ACT, and is the greatest threat to the Australian elm tree population. No trees within the construction footprint are listed as significant plants (including declining, no rare and threatened species and endangered ecological communities listed under the *Nature Conservation Act 2014* (ACT) (NC Act) and EPBC Act) and no trees are listed on the ACT Tree Register.

According to the *2020-21 Invasive Plants Annual Report* (Environment, Planning and Sustainable Development Directorate, 2021) there are no surveyed areas of invasive plant species within the construction footprint. Ecological surveys to identify GSM habitat confirmed that the grassed areas are predominantly comprised of Chilean needle grass (*Nassella neesiana*) which is classified as a weed of national significance under the National Weeds Strategy. However, Chilean needle grass also provides habitat for the critically endangered GSM within the construction footprint, notwithstanding that it is considered to be low value habitat.

There are European rabbits (*Oryctolagus cuniculus)* present within the construction footprint; rabbits are a serious environmental pest in the ACT, adversely affecting a number of native and threatened species, including GSM.

Threatened species and communities relevant to this assessment are limited to GSM, which inhabits grassed areas within and adjacent to the construction footprint.

9.3.2.1 Golden Sun Moth habitat

The Golden Sun Moth is a medium-sized day-flying moth which gets its name from the golden colouring found on the hindwings of the female moth. It is listed as critically endangered under the EPBC Act and endangered under the NC Act.

Habitats within and adjacent to the construction footprint comprise maintained grassed areas dominated by Chilean needle grass offering low value habitat for the species. Wallaby grasses (*Rytidosperma spp*.) were also noted in study areas, however these made up only 3% of the grass species, and were considered uncommon.

Habitats within the study area are largely confined to small patches situated within roadside medians and verges (refer to **Figure 9-8**). These patches are subject to considerable fragmentation due to the roads and structures such as bridge abutments and piers, retaining walls, buildings and dense landscape plantings. According to DEWHA (2009), GSM habitats separated by more than 200m or divided by solid barriers higher than one metre, are effectively isolated and are to be considered separate populations. Desktop analysis indicates the distance between habitat patches within the study

area varies from about four to 150 metres. Despite there being some structural barriers, movement between habitat patches is likely to occur to some degree. Based on the ecological assessments conducted, the identified GSM habitat areas within the construction footprint were considered to support a single population with low to moderate habitat connectivity.

Habitat within the construction footprint

At the commencement of the Project, translocation of GSM larvae would have occurred from the north west and south west cloverleaves and Commonwealth Avenue median to the fenced area in the southeast cloverleaf (**Figure 9-8**). The southeast cloverleaf, outside of the fenced area, is considered habitat for the purpose of this chapter. Direct impacts to GSM (actions that result in a temporary or permanent loss of habitat) within the south east cloverleaf and their associated mitigation measures have been approved under the EPBC Act (2019 / 8582).

Habitat adjacent to the construction footprint

The GSM population extends beyond the construction footprint, as shown in **Figure 9-8**. These habitat areas may be affected by their proximity to the proposed works and are therefore included in subsequent discussions of potential impacts. Survey results indicate that the mapped habitat areas are likely to represent the full extent of the population, with any habitat further east on Parkes Way geographically disconnected from the population according to DEWHA (2009).

Indirect impacts to GSM (activities which result in a disturbance associated with habitat fragmentation, isolation, or degradation) and their associated mitigation measures have been approved under the EPBC Act (2019 / 8582), including at the following locations:

- Parkes Way median (also approved for direct impacts during the future City to Commonwealth Park)
- City Hill.

Figure 9-8 Golden Sun Moth habitat within the construction footprint

9.3.3 Assessment of potential impacts

The following Sections summarise the potential impacts of the Project on biodiversity during construction and operation.

9.3.3.1 Construction

Construction activities are outlined in **Chapter 4.0**. The potential construction biodiversity impacts include approved impacts to GSM, tree removal, and construction related rabbit mortality.

Golden Sun Moth

Direct and indirect impacts to GSM, and their associated mitigation measures, have been approved under the EPBC Act (2019 / 8582), and subsequently through the approved GSM Plan. This section provides a summary of the previously approved disturbance as it relates to the Project.

Taking into account the early works translocation of GSM larvae from the north west and south west cloverleaves, and from the Commonwealth Avenue median, the potential impacts of the Project on GSM habitat would be limited to:

- Temporary direct disturbance to approximately 0.11 ha of GSM habitat in the south east cloverleaf is required for utilities investigations
- Potential indirect impacts to GSM habitat in the Parkes Way median and City Hill (for example, through construction dust deposition).

Details of the approved impacts to GSM and its habitat during construction of the Project is detailed in the GSM Plan and summarised in **Table 9-12**. Impacts would be mitigated and offset in accordance with the measures outlined in **Section 9.3.4**.

Table 9-12 Summary of Project impacts on Golden Sun Moth habitat during construction

Impact	Nature	Impact type	Description
Habitat loss	Direct	Short-term subject to proposed restoration	Approximately 0.11 ha of low quality GSM habitat would be directly impacted as a result of proposed utilities investigations in the south east cloverleaf. This habitat would be cleared and rehabilitated post-construction by means of proposed habitat rehabilitation works. Rehabilitated habitats are likely to be recolonised by GSM where connectivity to adjacent remaining habitats is retained. As such, the impacts associated with habitat loss within lands proposed for restoration are considered temporary and reversible.
Species mortality	Direct	Permanent loss	It is likely that adult moths would be impacted during construction through collision with vehicles and construction equipment and potential trampling underfoot during the flying season. These impacts would be minimised through the erection of signage or construction fencing which would be designed to preclude unauthorised vehicle or pedestrian access. As this fencing would be required to have hoarding to comply with safety standards, the fencing may act as a barrier for GSM movement. It is considered that this impediment to movement poses a lower risk to GSM mortality than the risk of collisions and trampling.
Habitat degradation	Indirect	Short-term disturbance associated with construction	Approximately 3.33 ha of remaining GSM habitat adjacent to the construction footprint would likely be subject to indirect disturbance during construction. Any changes in slashing / mowing regimes for remaining grassland patches during construction would also impact grassland suitability for GSM. These impacts would be temporary and

Impact	Nature	Impact type	Description
			are unlikely to result in an ongoing disturbance to the habitat beyond construction. Where there are GSM habitat areas to be retained, fencing and exclusion markers must not interfere with access to continue the current slashing / mowing regime. Such interference may make existing habitat unsuitable and reduce available habitat. Impact may occur because of dust or stormwater diversion. It is possible that construction activities could facilitate the spread of exotic African Lovegrass. This has the potential to outcompete Chilean Needle Grass in dry, nutrient-poor environments. This could reduce the suitability of remaining habitats for GSM and could lead to displacement of the species if it is not appropriately managed (Sharp, 2011; MPC, 2020)
Habitat fragmentation isolation and edge effects	Indirect	Short -term loss, subject to proposed restoration	GSM habitat within the Parkes Way median and the south east cloverleaf would be temporarily fragmentated and isolated during construction. However, connectivity would be restored between these habitats by means of post-works habitat restoration.

Tree removal

Removal of vegetation, including about 100 mature trees within the construction footprint is required to facilitate the proposed works and site access. The trees to be removed are predominantly *Eucalyptus* species, *Ulmus* species (elm), *Platanus x acerifolia* (London plane) and *Melaleuca linariifolia* (paperbark). Following construction, more than 130 trees would be planted within the construction footprint.

The majority of the elm trees in the construction footprint would be removed, with some to be retained. The close proximity of the retained trees to the construction works, and potential ground disturbance, may stress the remaining elms. Additional stress can make elm trees more susceptible to elm leaf beetles and mitigation measures to minimise stress to the remaining elm trees may be required.

As identified in **Section 9.3.2**, no trees within the construction footprint are listed as significant plants and no trees are listed on the ACT Tree Register. The closest registered trees occur within Vernon circle, and would be retained.

Where possible, trees would be retained in the placement of construction compound sites.

Rabbit mortality

There are rabbits present within the construction footprint. Rabbits are considered a pest in the ACT, and must be managed to prevent their dispersal during construction of the Project. This is discussed in further detail in **Section 9.3.5**

9.3.3.2 Operation

The operational biodiversity impacts are limited to approved GSM impacts, given proposed tree planting following construction. Direct and indirect impacts to GSM, and their associated mitigation measures have been approved under the EPBC Act (2019 / 8582). **Table 9-13** provides a summary of the previously approved disturbance as it relates to the Project.

Table 9-13 Summary of Project impacts on Golden Sun Moth habitat during operation

Impact	Nature	Extent
Habitat fragmentation isolation and edge effects	Indirect	Existing GSM habitats within the study area are already subject to considerable edge effects. Edge effects are changes to populations or communities along the boundary of a habitat. Habitat boundaries are often exposed to different levels of disturbance, invasive species, and other environmental conditions which can impact populations. Any increased risk of edge effects due to the Project would be negligible, as the shape and size of remaining habitats would not change significantly, and no significant intensification of road use would occur. However, GSM habitat within the study area would be subject to further isolation from habitat fragmentation as a result of the Project. This includes marginal habitats within Vernon Circle and the Parkes Way median west of Commonwealth Avenue. This would decrease the habitat connectivity within the construction footprint to low or no connectivity between habitat areas. GSM populations remaining within isolated fragments are susceptible to loss from localised disturbances and stochastic (random) events and may not be viable in the long-term. As such, a permanent loss of these isolated habitat remnants is considered likely to occur following the Project. These impacts have been offset by the purchase of species credits which is outlined further in **Section 9.3.4**. The biodiversity offsets would result in the creation of new GSM habitat which would have high levels of internal habitat connectivity. Therefore, while the habitat connectivity within the construction footprint would be decreased, new habitat with high levels of connectivity would be created to replace the low to moderately connected habitat that the construction footprint accommodated prior to the impacts of the Project.
Species mortality	Direct	Some increased GSM mortality may occur within the road reserve as a part of proposed operations. The operation of the Project may involve vehicle collisions with GSM and potential trampling underfoot during the flying season, from pedestrian traffic. However, these impacts are considered negligible during operation.

9.3.4 Preliminary risk assessment

A preliminary assessment of potential biodiversity impacts, without mitigation measures, is presented in **Table 9-15** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Given all direct and indirect impacts to GSM and their associated mitigation measures have been approved under the EPBC Act (2019 / 8582) and are managed in accordance with the Conditions of Approval, risks to GSM have not been assigned a risk level.

Table 9-14 Preliminary risk assessment for biodiversity

Description	Preliminary risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Removal of exotic vegetation and associated removal of potential habitat.	Unlikely	Minor	**Very low**

9.3.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a potential biodiversity impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-15**, and have been prepared with the following objectives:

- Avoid any unplanned disturbance to habitat values
- Minimise impacts on hollow dependent fauna species
- Avoid weed infestation due to land disturbance
- To recognise landscape and ecological benefits of managing the rabbits present within the Project construction footprint
- Ensure the Project is undertaken in a manner consistent with the existing EPBC Act Approval.

Table 9-15 Management and mitigation measures – Biodiversity

Ref	Management and mitigation measure	Timing	Reference
B1	Marking-out, signage, and fencing of clearing limits are to be clearly identified. The details of fencing and signing measures to be implemented would, as necessary, be the subject of an NCA Works Approval.	Prior to clearing activities during construction	-
B2	Trees to be retained should be marked and care taken to not disturb, or compact the root zone of these trees. Pruning or lopping of branches should be minimised. If damage is noted a suitably qualified arborist should be consulted.	Prior to and during construction	-
B3	Trees proposed to be removed should be checked for potential habitat (e.g., hollows) prior to felling. The CEMP would outline proposed management measures in the event fauna is present.	Prior to clearing activities during construction	-
B4	The following control measures are to be implemented in line with standard biosecurity protocols including: • Inspect vehicle, equipment, and footwear prior to entering site • Preferably clean all vehicles, equipment, and footwear offsite prior to entering • If vehicles are not clean prior to entering site utilise dedicated cleaning bays at the compounds. • Within wash bays clean footwear, equipment and vehicles with a hard brush or stick to remove as much mud, soil and organic matter as practicable before disinfecting with a solution of 70% methylated spirits and 30% water applied through a spray bottle.	During Construction	
B5	The rabbit population present within Project disturbance areas would be managed in consultation with ACT PCS and consistent with best practice.	Prior to and during construction	Best Practice Management Guide for Rabbits in the ACT, ACT Government, 2015.
B6	A GSM Plan 2.0 covering Project activities would be developed and approved by DAWE prior to the commencement of works. Measures within the	Prior to Construction	EPBC Act Approval 2019/8582

Ref	Management and mitigation measure	Timing	Reference
	GSM Plan 2.0 must be implemented throughout construction.		

9.3.5.1 Golden Sun Moth habitat rehabilitation and enhancement works

The Project aims to have a net positive impact on GSM habitat value and connectivity. This would be achieved through a combination of habitat rehabilitation and enhancement (within the construction footprint) and biodiversity offsets (outside the construction footprint) to achieve no net loss of biodiversity.

While there are direct and indirect impacts from clearing areas of GSM habitat within the construction footprint, the habitat in the south east cloverleaf is to be rehabilitated and its habitat value improved. At the commencement of the Project, initiatives to reduce broad leaf exotic grasses (not favoured by GSM) and re-instate native grasses (favoured by GSM) would be implemented. Following works associated with utilities investigation, rehabilitation works would occur in the south east cloverleaf; this would involve trialling initiatives to improve GSM habitat. GSM rehabilitation works would be outlined in further detail in the GSM Plan 2.0 to be finalised in by end of 2021. Preparation of the GSM Plan is a Condition of Approval of EPBC2019 / 8582.

While these proposed rehabilitation works aim to improve the quality of GSM habitat within the construction footprint, the Project would decrease the overall area of habitat and the habitat connectivity within the construction footprint. To mitigate this, biodiversity offsets have been purchased which would result in the establishment and maintenance of off-site GSM habitat for 'no net loss' of biodiversity value. These offsets have been secured for GSM impacts associated with all activities approved under EPBC2019 / 8582, which includes the future City to Commonwealth Park component of the Light Rail to Woden project. The offsets package was delivered through the NSW Biodiversity Offsets Scheme (NSW BOS), which is the appropriate regional policy that sets out calculation criteria. The offsets are permanent and involve management regimes which ensure that the biodiversity objectives are achieved and maintained.

The combination of biodiversity offsets purchased to achieve no net loss of biodiversity and the rehabilitation and enhancement works within the construction footprint would result in an overall increase in ecological value and connectivity of GSM habitat.

9.3.6 Residual impacts

A residual risk assessment was undertaken to assess the remaining biodiversity issues after the proposed management and mitigation measures are applied, presented in Table 9-16. EPBC Approval 2019 / 8582 provides approval of residual impacts associated with GSM impacts, with conditions.

Table 9-16 Residual risk assessment for biodiversity

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Removal of exotic vegetation and associated removal of potential habitat.	Unlikely	Minor	**Very low**

9.4 Contamination and soil

This chapter provides an overview and assessment of the potential contamination and soil impacts and benefits associated with the construction and operation of the Project.

9.4.1 Approach

This chapter is based on information from the Contamination Assessment prepared by Environmental Resources Management Australia Pty Ltd (ERM) in August 2021. The full version of the Contamination Assessment is provided in **Appendix C (Environmental Assessment - Contamination)**.

The Contamination Assessment includes:

- A review of the history of land within and around the construction footprint based on aerial photography from 1951 to 2019
- Searches and review of data from contamination registers and databases, including:
  - Per- and polyfluoroalkyl substances (PFAS) investigations carried out by the Commonwealth Department of Defence, Airservices Australia and ACT Environment Protection Authority (EPA)
  - ACT EPA register of notified contaminated sites
  - ACT EPA public register of authorisations
  - ACT Asbestos Response Taskforce List
  - National Pollutant Inventory (NPI) industrial facilities
  - Department of Defence Regional Contamination Investigation Program (RCIP)
  - Other contaminating activities.
- Review of previous contamination site investigations relevant to the Project, including field sampling, analysis and classification investigations carried out in 2017, 2019 and 2020
- Development of a conceptual site model identifying contaminants of potential concern (CoPC) associated with current and historical land uses within and around the construction footprint, potential exposure pathways and potentially affected receivers
- Based on the conceptual site model, a risk assessment of potential contamination issues associated with the Project
- Recommendations and mitigation measures to reduce / avoid / manage identified contamination risks.

Information from the Contamination Assessment has been supplied with desktop investigations into soils / geology, groundwater and potential acid sulfate soils within and around the construction footprint.

9.4.2 Existing environment

9.4.2.1 Study area history

Aerial photographs have shown the construction footprint has been utilised as a roadway, with the current alignment, since 1951. No significant changes to the roadway have occurred since 1975 when the cloverleaf ramps were constructed to connect London Circuit, Commonwealth Avenue and Parkes Way. Land around the Project is currently used for a mix of road infrastructure and commercial developments along London Circuit, with land immediately adjacent to the London Circuit-Commonwealth interchange undeveloped (other than for the presence of the cloverleaf ramps) or occupied with temporary carparking (to the north east).

Given the historical use of land within and around the construction footprint for road infrastructure and commercial developments, there is a possibility for potential for contamination of soils and fill materials associated with historic filling / landforming activities, service corridors or infrastructure (bridges and buildings), however, this is considered limited in magnitude.

A detailed summary of the construction footprint history is presented the Contamination Assessment provided in **Appendix C (Environmental Assessment - Contamination)**.

9.4.2.2 Geology and soil conditions

Geology mapping indicated that the construction footprint is underlain by the Canberra formation comprising Palaeozoic aged mudstone, siltstone dacitic ignimbrite and volcaniclastic sediments. The soils local to the construction footprint are described as:

- Moderately deep, moderately well-drained Yellow Chromosols (Yellow Podzolic Soils) on Red and Brown Kandosols (Red and Yellow Earths) on upper rises and fan elements
- Moderately to very deep, poorly to imperfectly drained Sodosols (Solodic Soils and Solodized Solonetz Soils) on lower rises and fan elements.

Fill materials have been identified in the construction footprint, in particular where ground levels have been previously raised such as beneath the cloverleaf ramps and Commonwealth Avenue, as well as around underground service corridors (as bedding and backfill material).

9.4.2.3 Acid sulphate soils

Acid sulphate soils contain sulphides, predominantly iron sulphide. If these soils are exposed to oxygen, the iron sulphides react with oxygen to form sulphuric acids, which can cause metals in the soil such as iron to mobilise creating a potential risk of harm.

According to the Atlas of Australian Acid Sulphate Soil and Salinity mapping notes the construction footprint is considered to be of “Extremely low probability” for the occurrence of acid sulphate soils.

9.4.2.4 Groundwater

One groundwater bore (bore ID 473) is located within 100 m north west of the construction footprint. No data are available as to the purpose of the bore. Drillers logs for the bore recorded overburden residual clay soils to a depth of 1.8 m below ground level (BGL), prior to encountering mudstone and shales until the maximum extent of the bore at 15.0 m BGL.

Due to the permeability contrast at the overlying soils / solid geology (mudstone and shales) interface., there is potential for localised perched water lenses from rainwater infiltration. If present, it is likely any perched lenses would be discontinuous and not have vertical hydraulic connectivity with the underlying aquifer.

9.4.2.5 ACT EPA register of contaminated sites

A search of contaminated site registers kept by the ACT EPA under the *Environment Protection Act 1997* (EP Act) was undertaken as part of the Contamination Assessment.

Only one notified contaminated site has been registered with the ACT EPA on the Notified Contaminated Sites Register within 1 km of the construction footprint (refer to **Table 9-17**). Although the nature of the contamination and its exact location are not identified in the ACT EPA register, the general location of the site described as the Canberra Metro audit area on Northbourne Avenue indicates that the contamination is a significant distance from the construction footprint. It is unlikely that contamination at such a distance would affect, or be affected by, the Project.

Table 9-17 ACT EPA Register of notified contaminated sites

District	Location	Notified Under Section	Description	Distance from site	Direction
Canberra Central	-	76A(1)	Capital Metro audit area - Northbourne Avenue within the District of Canberra Central	Not mapped. Capital Metro is situated north of the construction footprint.	-

Three contaminated sites have been registered with the ACT EPA on the Register of Contaminated Sites (refer to **Table 9-17**). Each of these sites are located at least 300–400 m to the north / north - west of the construction footprint, and are likely to pose minimal risk of contamination impacts on or from the Project.

Table 9-18 ACT EPA Register of contaminated sites

ID Number	Block / Section	Address	Details
HCP393	Block 12 Section 3 Canberra Central	Tamar House London Circuit	Potential hydrocarbon contamination associated with fuel storage
HCP88	Block 1 Section 18 Canberra Central	20 - 22 London Circuit (Reserve Bank)	Potential hydrocarbon contamination associated with fuel storage
OTP226	Block 1 Section 5 Canberra Central	Unit 3 University Avenue	Dry cleaning chemicals (trichloroethene, TCE), (perchloroethene, PCE), *etc*.

9.4.3 Assessment of potential impacts

The following sections summarise the potential contamination and soil impacts of the Project during construction and operation.

9.4.3.1 Construction

Construction would involve compound site establishment, service decommissioning and relocation, bulk fill importation and infrastructure demolition (including the Commonwealth Avenue bridges over London Circuit). Potential impacts associated with these works are summarised in **Table 9-19**.

The generation and management of waste during construction is considered separately in **Section 9.11**.

Table 9-19 Construction phase impacts

Item	Description
Soil disturbance	The main Project impact on soils during construction activities is potential uncontrolled soil loss from erosion of exposed soils during bulk earthworks along London Circuit, and from stockpiles at construction compound sites. Other construction activities with the potential to expose soils and lead to erosion if not managed suitably, include vehicle movements, stockpiling, excavation and service relocation, importation of fill materials, vegetation removal, landscaping. The establishment of construction compound sites would not involve any clearing, grubbing or soil disturbance as the proposed locations are sealed carparks. There would therefore be minimal risk of soil disturbance or uncontrolled soil loss at construction compound sites, other than in relation to soil and materials stockpiling.
Soil contamination	Construction activities may potentially increase the exposure of workers and the environment to contamination hazards. Identified contamination hazards include: • Encountering existing contamination from fill material of poor quality, such as material imported to the site for raising various portions of the site including the cloverleaves and Commonwealth Avenue. Unexpected interaction with contaminated soils from historical activities, or adjacent land uses, have the potential to pose an unacceptable risk to human health and the surrounding environment if not controlled appropriately • Handling and processing of products where liquid waste and hazardous material can escape into the soil if uncontrolled - There would be 60,000 m^3 of fill material proposed to be imported as part of the construction activities. This volume would include all fill elements such as bulk general fill (54,000m^3), with the remainder making up the road base, fill for verge pavements, concrete and granite pavers for verge pavements, asphalt for roads and landscaped areas - The nature and character of contamination that may be present in the construction footprint can, when identified, be suitably managed under typical civil earthworks institutional controls (such as a CEMP) to mitigate human and environmental health risks. On that basis, impacts may be of low consequence in the environmental impact scenario, however, due to the scale of the earthworks, the potential for uncontrolled contamination of material and waste streams could aggregate to higher economic impacts (>$500,000 in variation to contract). It is on this basis that the consequence rating has been determined.
Hazardous building materials	Demolition works on the existing Commonwealth Avenue bridges over London Circuit may encounter hazardous materials including asbestos containing materials (ACMs) and lead based paints. In addition, construction activities may encounter ACM conduits cast into concrete footways.

Item	Description
Leaks and spills of bulk fuels	There is a risk of accidental spills and leaks of various chemical products, such as oils, fuels, lubricants, vehicle oil changing or re-fuelling, and cleaning agents during construction of the Project. Such spills and leaks may occur during transport of materials to construction sites, during use of those materials during construction, or during storage of the materials at construction compound sites. Improper methods of storing, transferring, and handling of these products can result in spills to the ground and subsequent soil contamination. Furthermore, dispersion of contaminated soils following rain events, dust dispersion and inadequate sediment barrier installation would result with direct impact to soils and nearby ecological communities.
Surface water and groundwater	Sediment run off into stormwater infrastructure and surface water bodies may increase sediment loading and lead to adverse environmental impacts. The construction work does not involve deep excavation and is primarily fill works and therefore it is unlikely to have a substantial impact on groundwater. The groundwater table is not expected to be intercepted.

9.4.3.2 Operation

The potential for contamination and soil impacts as a result of operation of the Project would be low and generally consistent with the existing operation of London Circuit and Commonwealth Avenue. There is expected to be no net change or impact from maintaining the road.

There is expected to be minimal impact to soils following completion of the Project and once the cover over disturbed areas has stabilised and groundcover / vegetation has been established.

9.4.4 Preliminary risk assessment

A preliminary assessment of potential contamination impacts, without mitigation measures, is presented in **Table 9-20** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-20 Preliminary risk assessment for contamination and soil

Description	Pre-mitigation risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Soil Disturbance Uncontrolled soil loss from bulk earthworks and stockpiling	Likely	Minor	**Medium**
Soil Contamination Encountering unexpected contamination in soils during earthworks.	Possible	Moderate	**Medium**
Soil Contamination Import of uncontrolled contaminated fill material and impacting broader material quality.	Unlikely	Moderate	**Low**
Hazardous Building Materials Improper controls during demolition of Commonwealth Avenue bridge, leading to the release of asbestos dust and free fibre outside of work area.	Unlikely	Minor	**Very Low**
Leaks and spills During storage and refuelling of plant and vehicles.	Unlikely	Minor	**Very Low**
Stormwater and Surface Water Stormwater and surface water impacts from uncontrolled run off.	Unlikely	Minor	**Very Low**
Groundwater	Rare	Moderate	**Low**

9.4.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a potential contamination and soil impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-21**, and have been prepared with the following objectives:

- Minimise disturbance to landform, geology and soils and prevent erosion and sedimentation
- Ensure that material handling and general construction activities mange the potential for contamination consistent with established polices and requirements
- Minimise potential for contamination due to failure in storage mechanisms for hazardous materials on site during construction.

Table 9-21 Management and mitigation measures – Contamination and Soil

Ref	Management and mitigation measure	Timing	Reference
CS1	Soil and Water Management Plan (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would at a minimum: • Assess erosion and sedimentation risks and impacts, include a process for developing detailed designs for major erosion and sedimentation control measures • Document procedures for managing pollution associated with spillage or contamination on the site and adjoining area.	Prior to and during construction	Appendix I – Hydrology and Water Quality Assessment
CS2	Effective erosion and sedimentation controls would be installed, maintained and managed prior to and during construction.	Prior to and during construction	Managing Urban Stormwater - Soils and Construction, Volume 2D - Main Road Construction
CS3	A Contamination and Material Management Plan (CMMP) would be prepared and implemented as part of the CEMP. The CMMP would at a minimum: • Detail specific requirements for the importation of any material onto the site including environmental properties, tracking requirements, reporting / record keeping requirements • Document material tracking and reporting mechanisms for import and export of material • Provide for ongoing compliance inspections and record keeping • Include an Unexpected Finds Protocol that outlines the roles and responsibilities where unexpected finds of potential contamination are identified during any works within the Project area • Identify the steps needed to be taken in the event that hazardous materials are identified (in particular, asbestos) • Describe procedures to enable the review and endorsement of the CMMP by the Project Independent Contaminated Sites Auditor.	Prior to and during construction	Contaminated sites environment protection policy and relevant Information Sheets (various) Environment Protection Authority (access Canberra)
CS4	A Sampling Analysis and Quality Plan (SAQP) would be prepared to guide the further assessment of residual fill soils within the Project area that may require management during construction.	During construction	-
CS6	Complete a hazardous materials survey of bridge and other structures requiring demolition.	Prior to demolition	-
CS7	A site-specific emergency spill procedure is to be developed and an emergency wet and dry spill kits would be kept in the Project area. All construction personnel are to be made aware of its locations and trained in how to respond to a spill.	Construction	-

Ref	Management and mitigation measure	Timing	Reference
CS8	Refuelling and storage of fuels, chemicals and liquids are to be within an impervious bunded area within the construction compound,	Construction	-

9.4.6 Residual impacts

A residual risk assessment was undertaken to assess the remaining contamination issues after the proposed management and mitigation measures are applied, presented in **Table 9-22**. No significant residual impacts are anticipated.

Table 9-22 Residual risk assessment for contamination and soil

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Soil Disturbance Uncontrolled soil loss from bulk earthworks and stockpiling	Unlikely	Minor	**Very Low**
Soil Contamination Encountering unexpected contamination in soils during earthworks.	Possible	Moderate	**Medium**
Soil Contamination Import of uncontrolled contaminated fill material and impacting broader material quality.	Rare	Moderate	**Very Low**
Hazardous Building Materials Improper controls during demolition of Commonwealth Avenue bridge, leading to the release of asbestos dust and free fibre outside of work area.	Unlikely	Minor	**Very Low**
Leaks and spills During storage and refuelling of plant and vehicles.	Rare	Minor	**Negligible**
Stormwater and Surface Water Stormwater and surface water impacts from uncontrolled run off.	Unlikely	Minor	**Very Low**
Groundwater	Rare	Moderate	**Low**

9.5 Noise and vibration

This chapter provides an overview and assessment of the potential noise and vibration impacts associated with the construction and operation of the Project.

9.5.1 Approach

This chapter is based on information from the Noise and Vibration Impact Assessment prepared by AECOM Pty Ltd in September 2021. The full version of this assessment is provided in **Appendix D (Noise and Vibration Impact Assessment)**.

The Noise and Vibration Impact Assessment includes:

- Identification of sensitive receivers likely to be impacted by construction and operational noise and vibration
- Ambient noise monitoring to determine background noise levels
- Assessment of noise and vibration impacts to nearby sensitive receivers using relevant guidelines and policies, and comparing against relevant criteria
- Recommendation of indicative noise management and mitigation measures where applicable.

9.5.2 Existing environment

The surrounding environment is typically urban with existing traffic noise. Noise sensitive receivers were identified through aerial imagery, and a ground-truthing survey utilising cadastral information to determine building uses. Sensitive receivers were classified as residential, commercial, recreational, educational, or community. Each type of sensitive receiver is present within the study area.

Unattended noise monitoring was carried out at five locations, as identified in **Figure 9-9**. These locations were selected in order to determine the nature of the local noise environment throughout the study area. Attended noise measurements were obtained, at these locations initially, to determine the nature of local noise environment and confirm controlling noise sources in the area. Specific locations and measurement periods associated with the unattended noise loggers used is presented in **Table 9-23**. Instrumentation information is provided in **Appendix D**.

Table 9-23 Noise logging locations and measurement periods

ID	Address	Measurement period	Days of data retrieved
NL1	Archbishops Residence, Parkes	26/07/2021 – 09/08/2021	14
NL2	QT Hotel, 1 London Circuit, Canberra	26/07/2021 – 09/08/2021	14
NL3	Police Station and RBA, Canberra	26/07/2021 – 09/08/2021	14
NL4	255 London Circuit, Canberra	10/08/2021 – 24/08/2021	14
NL5	ANU School of Art, 61 Marcus Clarke Street, Canberra	5/08/2021 – 19/08/2021	14

A noise logger measures noise level over a 15-minute sample period and then determines the following levels of the noise environment:

- L_{A1}, L_{A10}, L_{A90}: levels exceeded for 1 %, 10 % and 90 % of the sample period respectively. The L_{A90} level is taken as the background noise level.
- L_{Amax}: maximum noise level due to individual noise events
- L_{Aeq}.: the energy averaged noise level over the 15-minute period.

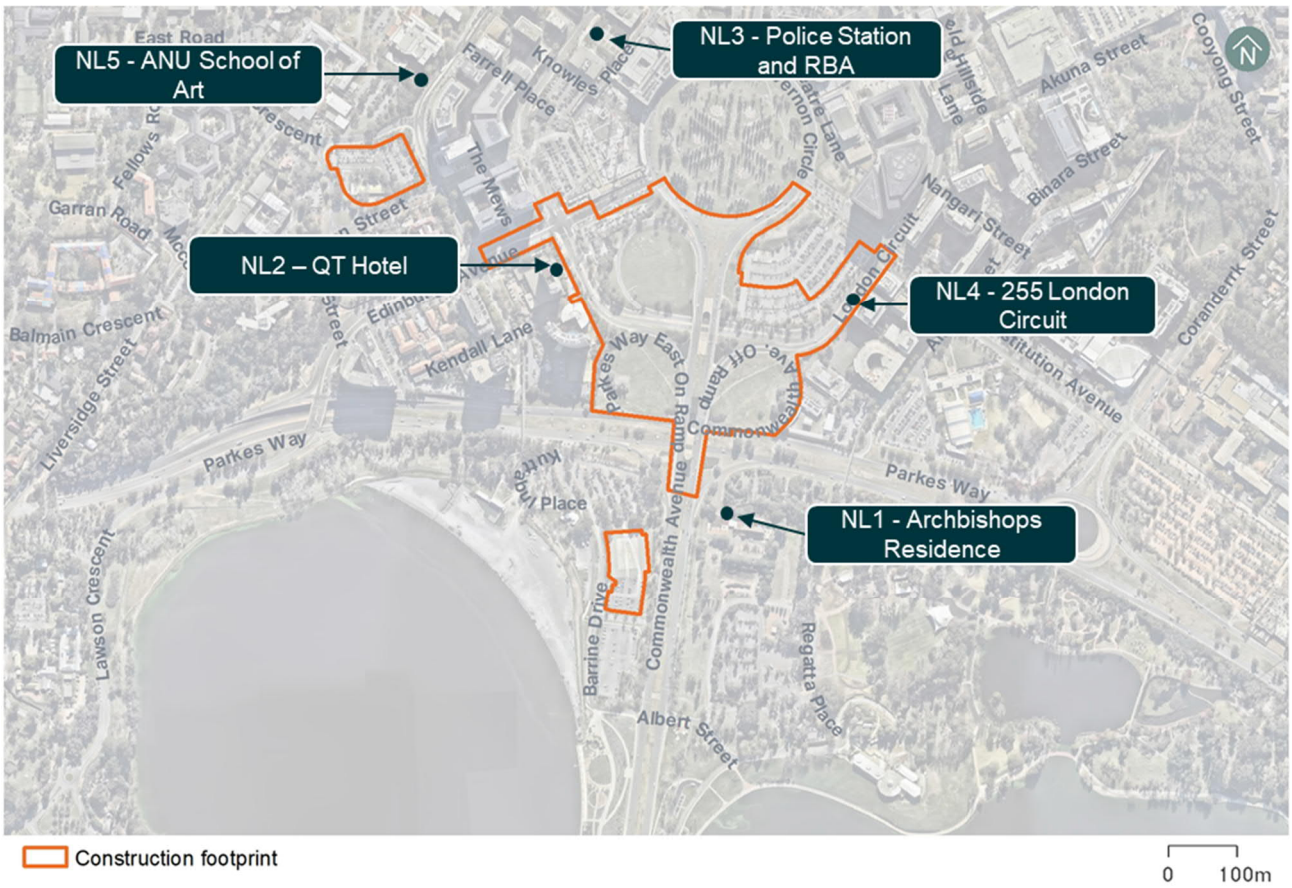

Figure 9-9 Noise logger locations in relation to the Project.

Weather data recorded during the noise monitoring periods were obtained from the Bureau of Meteorology weather station, located at Canberra Airport (ID: 070351). Periods which were affected by noise from extraneous wind and rain were omitted from the results.

The unattended background noise monitoring results are presented in **Table 9-24**.

Table 9-24 Unattended background noise monitoring results

ID	Rating Background Level (L_{A90}), dB(A)			Ambient noise level (L_{Aeq}), dB(A)		
	Day	Evening	Night	Day	Evening	Night
NL1	57	54	39	63	61	56
NL2	53	50	45	61	58	54
NL3	52	49	44	57	55	54
NL4	43	40	34	58	55	53
NL5	48	48	43	57	54	50

Notes:
dB(A) represents A-weighted decibels, the relative frequency response used in sound measuring instruments.
[1] *In accordance with the Noise Policy for Industry 2017 (NSW EPA), time of day is defined as follows: Day – the period from 7 am to 6 pm Monday to Saturday or 8 am to 6 pm on Sundays and public holidays. Evening – the period from 6 pm to 10 pm. Night – the remaining periods.*

9.5.3 Assessment of potential impacts

9.5.3.1 Construction noise

In accordance with section 29 and Schedule 2 Part 2.3 of the ACT Environmental Protection Regulation 2005, major road construction does not require noise assessment as it is not taken to cause environmental harm. The Environment Protection (Noise) Environment Protection Policy 2012 notes that *no time restrictions are placed on the construction and maintenance of major roads to enable work to take place during periods of low traffic flows*. Accordingly, construction noise generated by the Project has not been assessed against any specific numerical noise limits.

A qualitative assessment has been undertaken of the construction noise impacts associated with the Project at the nearest residential receivers, based on a worst-case scenario. The qualitative descriptions are related to the likely noise levels as follows:

- Clearly audible: average noise levels >10-20 dB(A) above the background
- Moderately intrusive: average noise levels >20-30 dB(A) above the background
- Highly intrusive: average noise levels > 30 dB(A) above background.

Noise levels due to construction activities have been assessed taking into consideration the following factors:

- Construction equipment
- Background noise environment
- Location of works in relation to sensitive receivers
- Duration of activities.

It has been assumed that all equipment is modern and in good working order.

Typical construction equipment for Project activities has been identified, with associated sound power levels obtained from:

- Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016)
- Australian Standard AS2436-2010, Guide to noise control on construction, demolition and maintenance sites
- British Standard BS5228: Part 1 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites Part 1: Noise.

Construction works would be generally undertaken between 7am – 6pm for weekdays and 7am – 1pm Saturdays (normal construction hours). From time to time works would need to be undertaken outside of these hours. Any such works outside of these hours would be the subject of a specific application to the Territory, detailing the need for such works and any additional or work specific noise mitigation measures. Activity specific communications and engagement activities would be undertaken in advance of the commencement of such works outside of normal construction hours.

Table 9-25 below describes the anticipated impacts of each proposed activity during standard construction hours. It is important to note that the construction scenarios consider sound power levels based on a worst-case 15-minute period and would likely not represent the ongoing day-to-day noise impact at sensitive receivers for an extended period of time.

Table 9-25 Qualitative construction noise assessment for standard construction hours

Works	Qualitative assessment of noise impacts
Bulk earthworks Drainage Pavement	**Highly intrusive** to nearest noise sensitive receivers when using high noise generating equipment, likely required during excavation, surface preparation, piling, earthworks, backfilling, profiling, levelling and grading. Extended **highly intrusive** noise impacts are likely, however can be managed in accordance with the measures detailed in **Section 9.5.5**.
Utilities Demolition Structural work: wall construction Finishing works	**Highly intrusive** noise levels are associated with the use of concrete saws and jackhammers. Remaining works are moderately intrusive. Shorter duration **highly intrusive** noise impacts are likely, however can be managed in accordance with the measures detailed in **Section 9.5.5**.

9.5.3.2 Construction vibration

Table 9-26 outlines the standards and guidelines used to assess vibration associated with construction of the Project.

Table 9-26 Standards / guidelines used for assessing construction vibration

Item	Standard / guideline
Structural damage	Heritage structures – German Standard DIN 4150 – Part 3 – Structural Vibration in Buildings – Effects on Structures (DIN 4150)[1] Non-heritage structures – Evaluation and Measurement for Vibration in Buildings Part 2, (British Standard (BS) 7385:Part 2-1993) (BS 7385)[1]
Human comfort (tactile vibration)	Assessing Vibration: A Technical Guideline [2] (DEC, 2006)
Human comfort (ground-borne noise)	Interim Construction Noise Guideline (DECC, 2009)

Notes:

[1] *There is a lack of Australian Standards for the assessment of building damage caused by vibration, these standards were used as they provided recommended maximum levels of vibration to reduce the likelihood of building damage caused by vibration.*

[2] *This document is based upon the guidelines contained in British Standard 6472:1992, "Evaluation of human exposure to vibration in buildings (1-80 Hz)". This British Standard was superseded in 2008 with BS 6472-1:2008 "Guide to evaluation of human exposure to vibration in buildings – Part 1: Vibration sources other than blasting" and the 1992 version of the Standard was withdrawn. Although a new version of BS 6472 has been published, the NSW Environment Protection Authority still requires vibration to be assessed in accordance with the 1992 version of the Standard at this point in time.*

Distance is one of the most effective mitigation measures against vibration, and minimum working distances aim to place as much distance as possible between the plant or equipment and the receivers. In order to comply with the cosmetic/structural damage and human discomfort criteria, vibration intensive works associated with the Project should be undertaken outside of the minimum working distances presented in **Table 9-27**. Where vibration intensive works are required within the minimum working distances, alternative equipment would be identified and vibration monitoring would be implemented in accordance with the mitigation measures.

Table 9-27 Recommended minimum working distances for vibration intensive plant

Plant item	Rating/Description	Minimum working distance		
		Cosmetic damage (BS 7385) Light-framed structures	Cosmetic damage (DIN 4150) Heritage and other sensitive structures	Human response (EPA's Vibration guideline)
Vibratory Roller	< 50 kN (Typically 1-2 t)	5 m	14 m	15 m to 20 m
	< 100 kN (Typically 2-4 t)	6 m	16 m	20 m
	< 200 kN (Typically 4-6 t)	12 m	33	40 m
	< 300 kN (Typically 7-13 t)	15 m	41	100 m
	> 300 kN (Typically 13-18 t)	20 m	54 m	100 m
	> 300 kN (> 18 t)	25 m	68 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12 t excavator)	2 m	5 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18 t excavator)	7 m	19 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34 t excavator)	22 m	60 m	73 m
Vibratory Pile Driver	Sheet piles	20 m	50 m	100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m	4 m
Jackhammer	Hand held	1 m (nominal)	2 m	2 m

Note:
More stringent conditions may apply to heritage or other sensitive structures. Any heritage property would need to be considered on a case by case basis and assessed in accordance with DIN4150:3 Structural vibration - Effects of vibration on structures.

9.5.3.3 Operational noise

To assess the potential impact of the Project on noise sensitive receivers, future road traffic noise levels have been modelled for the 'no build' (without the Project) (2026) and 'build' (2036) scenarios. The 2036 scenario does not consider the effect of other planned projects, such as Light Rail to Woden, on road traffic volumes.

The operational road traffic noise assessment criteria used in this assessment is from the Roads ACT Noise Management Guideline (2018) (NMG). Road traffic noise criteria applicable to upgrading roads in existing areas is provided in Table 9-28 below.

Table 9-28 Traffic noise levels resulting from upgraded road in existing areas of noise sensitive land use (ground level)

Existing traffic noise level at adjacent buildings, $L_{Aeq,15hr}$	Traffic noise level at adjacent buildings after road works completed
> 60 dB(A)	Equal to existing level (not greater than 65 dB(A))
55 – 60 dB(A)	60 dB(A)
< 55 dB(A)	Not more than 5 dB(A) above existing level

Noise modelling software (SoundPLAN version 8.0) has been used to calculate operational road traffic noise levels associated with the Project, applying the Calculation of Road Traffic Noise (CoRTN) algorithm. The following parameters were considered in the model:

- Traffic volumes and mix
- Traffic speeds
- Roadway gradient
- Road surface
- Ground absorption
- Terrain
- Buildings
- Noise barriers
- Façade
- Road network
- Standard corrections.

Noise levels have been predicted for the 2026 and 2036 scenarios across the extent of the Project. Road traffic noise levels are predicted to exceed the $L_{Aeq(15hr)}$ noise criteria (**Table 9-28**) at a total of two co-located noise sensitive receivers (**Figure 9-10**), however these do not reflect an actual increase in road traffic noise levels due to the Project. The exceedance of the applicable noise criterion at these receivers is predominantly caused by existing road traffic on Parkes Way. As a result, no operational road traffic noise mitigation is proposed.

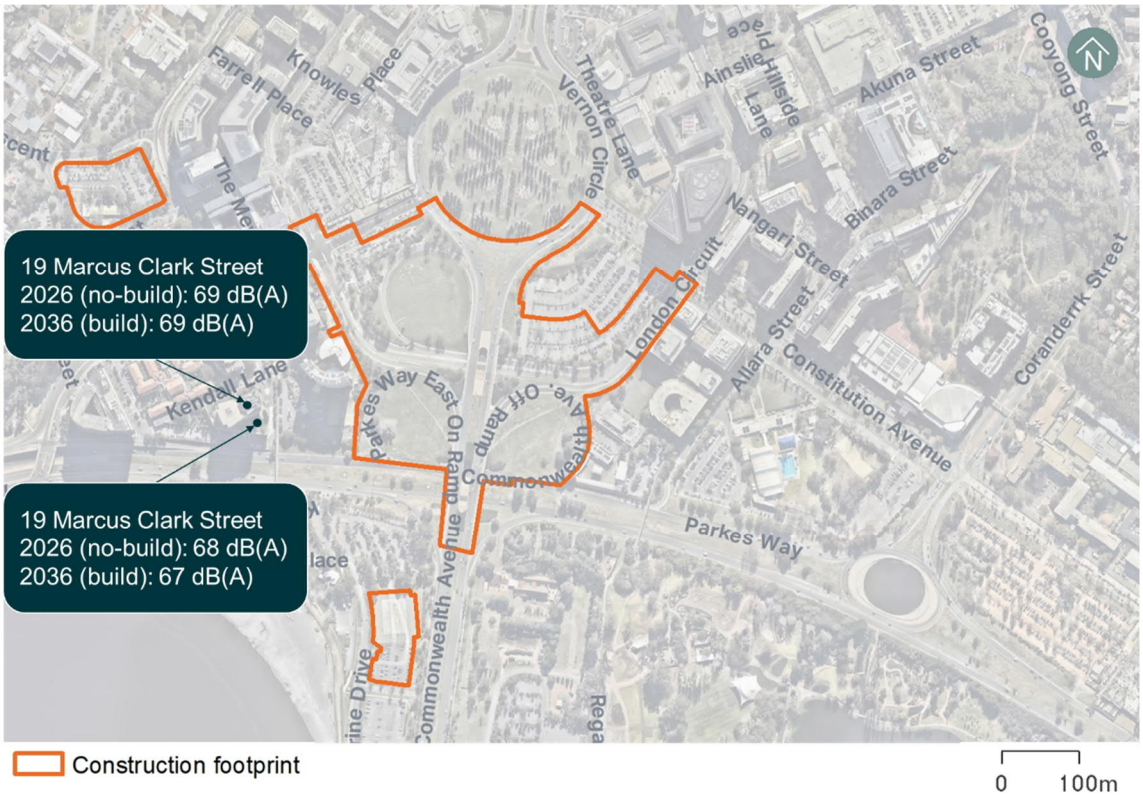

Figure 9-10 Modelled 2036 exceedances of Roads ACT Noise Management Guideline $L_{Aeq(15hr)}$ noise criteria

9.5.4 Preliminary risk assessment

A preliminary assessment of potential noise and vibration impacts, without mitigation measures, is presented in **Table 9-29** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-29 Preliminary risk assessment for noise and vibration

Description	Pre-mitigation risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Construction noise impacts experienced by nearest sensitive receivers in the worst-case scenario of high noise generating equipment in use at the same time.	Likely	Major	**Very high**
Construction noise impacts experienced by sensitive receivers in a typical scenario where machinery will not be operating continuously at the same time.	Likely	Moderate	**High**
Construction vibration impacts are experienced by nearest sensitive receivers.	Possible	Moderate	**Medium**
Operation Phase			
Road traffic noise exceeds Roads ACT Noise Management Guideline	Unlikely	Moderate	**Low**

9.5.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a potential noise and vibration impact occurring. The relevant management measures and safeguard protocols are provided in **Table 9-67**, and have been prepared with the following objectives:

- Minimise impacts on the amenity of adjacent land users due to noise and vibration during construction.

Table 9-30 Noise and vibration safeguards

Ref	Management and mitigation measure	Timing	Reference
NV1	Implement controls on construction equipment and activities in accordance with Australian Standards and manufacturer specifications. Regularly inspect, test and maintain all stationary and mobile plant equipment to ensure that emission levels do not deteriorate over the life of the project.	During construction	AS 2436-2010 Guide to Noise and Vibration Control
NV2	Provide residents with a contact name and number to allow noise complaints or questions to be raised. Establish a procedure for maintaining contact and responding to all noise complaints within 24 hours.	During construction	-
NV3	As necessary, undertake condition surveys on buildings and structures within the potential radius of effect prior to commencement of demolition and heavy earthworks activities	During construction	-

Ref	Management and mitigation measure	Timing	Reference
NV4	Construction activities for the Project would be undertaken between the hours of 7.00 am and 6.00 pm Monday to Friday and 7am to 1pm Saturdays (normal hours), with no work on Sundays and Public Holidays unless otherwise approved.	During construction	Refer NV 5
NV5	Construction works proposed to take place outside 'normal' construction hours would require individual assessment and approval on a case-by-case basis. In general, this process would include: • Identification of the duration, location, type of activities construction equipment involved • Assessment of the potential noise and vibration impact associated with the proposed construction activities and determination of the number and type of sensitive receivers potentially impacted • Identification of any reasonable and feasible mitigation measures to be implemented • Consultation with the potentially impacted receivers to inform them of the proposed out of hours works, and providing an opportunity for impacted receivers to provide feedback • Minimising out of hours works as much as practicable (e.g., deliveries of equipment and materials could be made, or disposal of construction waste may be delayed until on the following day).	During construction	MPC Out of Hours Works Request – Template (**Appendix D**)
NV6	A **Noise and Vibration Management Plan** (CNVMP) would be developed to: • Document all necessary measures to manage and mitigate potential noise and vibration levels during normal and out of hours construction activities • Document all necessary measures to manage and mitigate potential noise and vibration impacts, including to all identified heritage values, during construction activities.	During construction	-

9.5.6 Residual impacts

A residual risk assessment was undertaken to assess the potential noise and vibration impacts after the proposed management and mitigation measures are applied, presented in **Table 9-31**. There remains a high residual risk of construction noise impacts affecting nearby sensitive receivers. It is important to note that the construction scenarios above consider sound power levels based on a worst-case 15-minute period and would likely not represent the ongoing day-to-day noise impact at sensitive receivers for an extended period of time.

Construction works would be generally undertaken during daytime hours, with construction works proposed to take place outside 'normal' construction hours requiring individual assessment and approval on a case-by-case basis.

Table 9-31 Residual risk assessment for noise and vibration

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Construction noise impacts experienced by nearest sensitive receivers in the worst-case scenario of high noise generating equipment in use at the same time.	Likely	Moderate	**High**
Construction noise impacts experienced by sensitive receivers in a typical scenario where machinery will not be operating continuously at the same time.	Likely	Minor	**Medium**
Construction vibration impacts are experienced by nearest sensitive receivers.	Possible	Minor	**Low**
Operation Phase			
Road traffic noise exceeds Roads ACT Noise Management Guideline	Unlikely	Moderate	**Low**

9.6 Air quality

This chapter provides an overview and assessment of the potential air quality impacts and benefits associated with the construction and operation of the Project

9.6.1 Approach

This chapter provides a summary of the assessment of the Air Quality Technical Report prepared for the Project. A full copy of the assessment report is provided in **Appendix E (Air Quality Assessment)**.

9.6.1.1 Understanding the meteorological conditions

Baseline meteorological analysis was undertaken with reference to two of the Bureau of Meteorology's (BoM) automatic weather monitoring stations (AWS) located at the Canberra Airport and Tuggeranong.

The Computer Aided Learning in Meteorology (CALMET) model is a diagnostic meteorological model that reconstructs wind and temperature fields using a combination of regional meteorological observation data. A review of ten years of meteorological data from the BoM Canberra Airport AWS between 2011 and 2020 was carried out to determine a representative year of data for use in the CALMET modelling. 2018 was selected as a representative year, as conditions in this year were not adversely impacted by either an El Niño or La Niña event.

Meteorological analysis at the Project location has been undertaken using the results of the CALMET model outputs. The meteorological conditions have been discussed in **Section 9.6.2.1** with conditions presented in terms of the following parameters

- Wind speed and direction
- Temperature
- Mixing height (measure of potential for inversions)
- Stability class.

9.6.1.2 Air quality assessment methodology

The air quality impact assessment was approached with consideration of the pollutants anticipated to result from the construction of the Project, including:

- Excavation, fill and materials handling dust pollutants:
  - Total suspended particulates (TSP)
  - Particulates with a diameter less than 10 µm (PM_{10})
- Construction vehicle emissions (earthworks machinery, trucks, generators, site vehicles)
  - Carbon monoxide (CO)
  - Oxides of nitrogen (NO_X)
  - Particulate matter (PM_{10})
  - Particulate matter ($PM_{2.5}$).

The operation of the Project is not expected to result in any significant change in traffic volumes, vehicle mix or fuel types compared with existing traffic using London Circuit and Commonwealth Avenue. A detailed operational air quality assessment has therefore not been carried out. A qualitative assessment of potential operations impacts to air quality is discussed in **Section 9.6.3.2**.

A desktop assessment was undertaken to review baseline local air quality for the pollutants of concern using data gathered from a selection of three background air pollution stations within the Canberra area (**Section 9.7.2.1**), including:

- Civic, approximately 150 m to the southeast of the southern end of the Project
- Florey, approximately 10 km to the northwest of the Project
- Monash, approximately 15 km to the south of the Project.

Air quality standards or goals are used to assess the potential for ambient air quality to give rise to adverse health or nuisance effects. The air quality impact assessment uses criteria to assess the existing air quality in a region and provide an indication of the capacity of the airshed to receive additional air pollutants from a development or activity. The relevant air pollutant ground level criteria and corresponding averaging periods are taken from the *National Environment Protection (Ambient Air Quality) Measure* (NEPM) as varied (National Environmental Protection Council, 2021), and are shown in **Table 9-32**. This NEPM provides guidance relating to air in the external environment, which does not include air inside buildings or structures.

Table 9-32 Air Quality impact assessment criteria

Pollutant	Averaging period	Maximum concentration standard (ppm)	Maximum concentration standard (µg/m^3)
Particles as PM_{10}[1]	1 day 1 year	N/A	50 25
Particles as $PM_{2.5}$ *	1 day 1 year	N/A	25 8
NO_2 *	1 hour 1 year	0.08 0.015	164 31
CO *	8 hours	9.0	1,125

[1] Main particulate emissions expected on the site during construction

* Very low levels of these pollutants expected from combustion engine machinery and vehicles used on-site

Given that the nature of the Project works, i.e., common earthworks activities with no ongoing significant air pollution sources, a quantitative assessment using dispersion modelling has not been undertaken for air quality impacts. As such, the comparison of potential emissions from the Project with NEPM criteria has not been undertaken.

Potential impacts from dust generation during construction have been assessed using the UK Institute of Air Quality Management (IAQM), 2014 *Guidance on the assessment of dust from demolition and construction* (Holman et al, 2014). This document provides a qualitative risk assessment process for the potential unmitigated impact of dust generated from demolition, earthmoving and construction activities. The IAQM methodology assesses the risk of impacts, without the application of any mitigation measures, on people and property, and on human health. Assessment using the IAQM guidance provides a classification of the risk of dust impacts which then allows the identification of appropriate mitigation measures commensurate with the level of risk.

Further details on the air quality impact assessment methodology are provided in **Appendix E (Air Quality Assessment)**.

9.6.2 Existing environment

9.6.2.1 Meteorological conditions

Baseline meteorological analysis provides a basis on which to assess the potential dispersion and behaviour of air emissions that may potentially be generated by the Project. A summary of predictions, specific to the Project as modelled using CALMET, are provided below.

Wind predictions were extracted from CALMET within the Project construction footprint for reference against longer term (2011 to 2020) regional observations at the Canberra Airport BoM AWS. Modelling showed that the study area was predicted to have an average wind speed of 3.4 m/s with a frequency of calm winds (< 0.5 m/s) of 8.1%. Wind direction is affected by surrounding terrain such as Mt Ainslie, Black Mountain and Mt Pleasant and is predicted to have a predominant easterly (blowing from the east to the west) component along with a characteristic Canberran north-westerly component.

Temperature predictions were extracted from CALMET at the Project site (**Figure 9-11**). These are consistent with long term Canberra Airport BoM climate statistics.

Mixing height is a meteorological parameter which can be used to show the potential for temperature inversions to occur in an area. When temperature inversion occurs, emissions can be trapped beneath a layer of air reducing the vertical mixing potential and resulting in higher pollutant concentrations. Inversions commonly occur in cool periods of the day (typically at night) when wind speeds are low. The modelling indicated that large temperature inversions are not exceedingly common in the atmosphere above the study area.

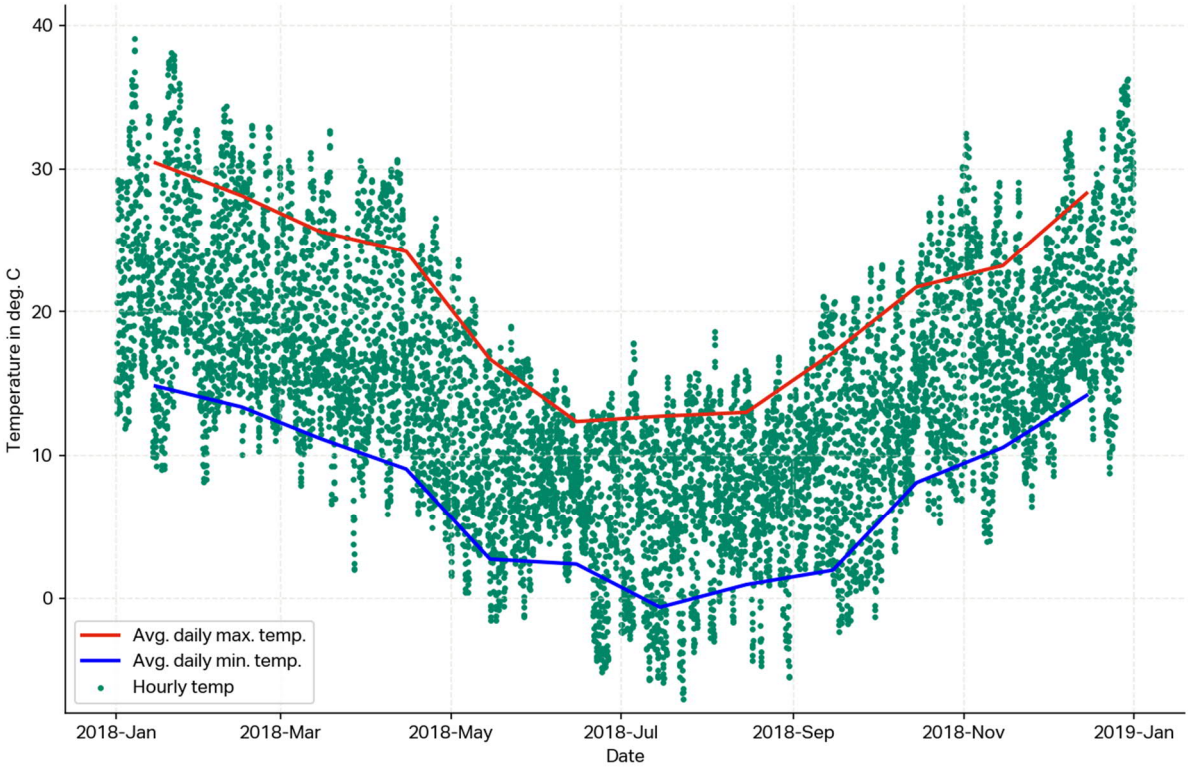

Figure 9-11 Predicted temperature data at the construction footprint

Stability class is used as an indicator of atmospheric turbulence for use in meteorological models. The class of atmospheric stability generally used in these types of assessments is based on the Pasquill-Gifford-Turner scheme where six categories are used which represent atmospheric stability from extremely unstable to moderately stable conditions. An analysis of stability class at the Project site indicated:

- Lower wind speeds are dominated by moderately stable conditions, and high winds speeds are dominated by neutral conditions
- Night-time hours are dominated by moderately stable conditions, daytime hours are dominated by slightly and moderately unstable conditions.

9.6.2.2 Existing air quality

The air quality in the construction footprint and surrounds is characteristic of an urban residential setting, with existing air quality largely influenced by motor vehicles in and around the city circle. Sensitive receivers with regards to air quality include, but are not limited to, residences, commercial businesses and recreational areas.

The study area experiences pollutant levels approaching or exceeding the national air quality guidelines for certain pollutants (**Section 9.6.1.2**). Pollutants of concern in the ACT are those specified in the NEPM: ozone, NO_2 and particulates. As mentioned in **Section 9.6.1.2**, there are three air quality monitoring stations located at Civic, Florey and Monash.

Given the proximity of the Project to the station located at Civic (Allara Street), this is considered to be the most representative of background pollutant levels in the study area. However, Civic station does not provide recent NO_2 data. As such, the NO_2 data for the nearby (next closest available) Florey and Monash stations has been used as a suitable alternative. It is noted that 2019 and 2020 air quality data was adversely affected by bushfires from later September 2019 and averages and maxima should be treated with caution as they are not representative of long-term conditions and are highly skewed.

Monitoring data from Civic station shown on **Figure 9-12** demonstrates that $PM_{2.5}$ and PM_{10} are generally well below the national guideline, with seasonal variation clearly observed with both $PM_{2.5}$ and PM_{10} having higher concentrations in winter and lower in summer. Any criteria breaches were short-

lived and directly attributable to particular meteorological events such as the severe dust storm that occurred in March 2018.

Monitoring data from the Florey and Monash stations demonstrates that the NO_2 concentration in the ambient environment nearby the Project is typically below 60 micrograms per cubic metre (µg/m^3), which is well below the national guideline.

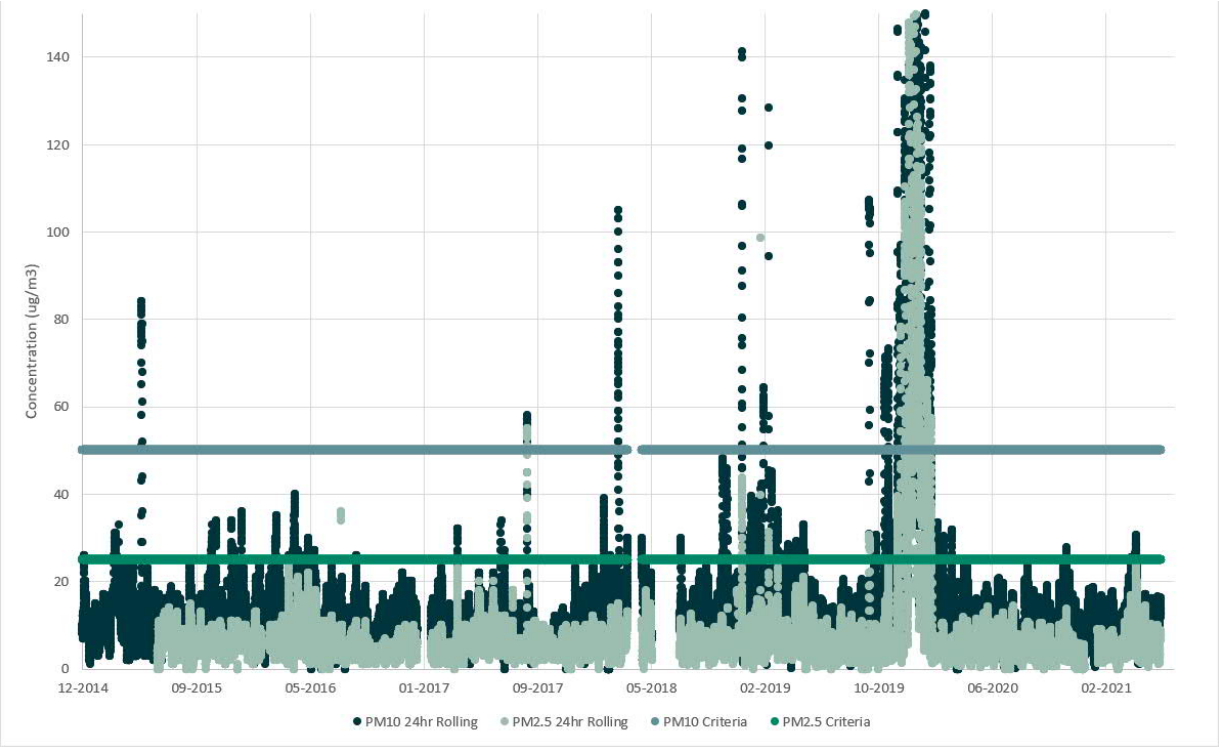

Figure 9-12 Background $PM_{2.5}$ and PM_{10} concentrations, Civic

9.6.3 Assessment of potential impacts

9.6.3.1 Construction

Dust assessment

The construction phase of the Project would see risks associated with dust emissions, generated from activities involving demolition, land clearing and earth moving. These activities are detailed in **Section 4.0**. An assessment of potential dust generation and impacts, with reference to the sensitivity of the surrounding land use is provided in **Appendix E (Air Quality Assessment)**. A summary of unmitigated risks associated with construction dust is provided in **Table 9-33**, using terminology aligned to the IAQM guidance (**Section 9.6.1.2**).

Table 9-33 Summary of unmitigated risk assessment for Project construction activities

Activity	Potential for dust emissions	Sensitivity of area		Risk of unmitigated dust impacts	
		Dust soiling	Human health	Dust soiling	Human health
Demolition	Large	Medium	Low	High	Medium
Earthworks	Large	Medium	Low	Medium	Low
Construction	Medium	Medium	Low	Medium	Low
Trackout	Large	Medium	Low	High	Low

Emissions assessment

Air emissions during the construction of the Project that are not related to dust would be due to the combustion of diesel fuel by heavy vehicles, mobile construction equipment and stationary equipment such as diesel generators. Emissions are expected to depend on the nature of the emissions source i.e., size of the equipment, usage rates, duration of operation etc. Pollutants emitted by construction vehicles, plant, and machinery include CO, particulate matter (PM_{10} and $PM_{2.5}$), nitrous oxides (N_2O, SO_2, volatile organic compounds (VOCs), and polycyclic aromatic hydrocarbons (PAHs).

Given the expected scale of the Project works, the typically transitory nature of construction site mobile equipment and machinery, and vehicle numbers, by construction vehicles, plant, and machinery emissions would be minimal. In addition, the implementation of commonly applied mitigation measures to minimise vehicle, plant and equipment emissions (such as not allowing machinery to idle when not in use) would further act to reduce the potential for adverse air quality impacts. For these reasons, the potential for air quality impacts as a result of the operation of vehicles, plant, and machinery during construction of the Project is considered to be negligible. As such, no further quantification of potential air quality impacts related to the use of construction equipment has been undertaken.

9.6.3.2 Operation

Following the completion of construction, all disturbed areas would be reinstated, and areas of exposed soil would be paved or vegetated. Further, no ongoing dust generating activities form part of the operational Project description.

The Project is not expected to generate additional traffic nor significantly affect the distribution of traffic on the road network, as such, no increase in vehicle emissions are anticipated. Conversely, the Project has been designed with the goal to improve active transport connections and would facilitate the delivery of the Light Rail to Woden project.

Through the delivery of the Project and Light Rail to Woden, MPC seeks to improve active and public transport uptake, and in turn reduce vehicle movements in the Canberra CBD.

As such, the potential air quality emissions attributed to the operation of the Project would be negligible and would be unlikely to have any significant air quality impacts.

9.6.4 Preliminary risk assessment

A preliminary risk assessment of potential air quality impacts, without mitigation measures, is presented in **Table 9-40** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-34 Preliminary risk assessment for air quality

Description	Preliminary risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Dust generation from site clearance and construction site establishment	Possible	Moderate	**Medium**
Dust generation from construction activities (e.g., earthworks and vehicle movements)	Possible	Moderate	**Medium**
Climatic conditions (dry periods and wind) resulting in the generation of dust	Possible	Moderate	**Medium**
Dust generation from handling and removal of spoil / earthworks	Possible	Moderate	**Medium**
Combustion emissions from construction activities	Unlikely	Minor	**Low**

9.6.5 Management and mitigation measures

Mitigation of pollutant and particulate emissions to acceptable levels during construction is of importance to ensuring the health and safety of the public and potential ecological receptors (including the location population of Golden Sun Moth) in the vicinity.

Mitigation measures are proposed to lower the significance, frequency or risk of a potential air quality impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-35**, and have been prepared with the following objectives:

- Minimise generation of dust through effective construction planning and day to day management.

Table 9-35 Management and mitigation measures – Air quality

Ref	Management and mitigation measure	Timing	Reference
AQ1	Plan site layout such that machinery and dust causing activities are located as far away from sensitive receivers as possible. Daily construction activities would be planned to consider the expected weather conditions for each workday, ensuring works zones are manageable.	Prior to and during construction	-
AQ2	Dust would be visually monitored, and observations recorded. Where necessary the following actions would be implemented: • Restrict vehicles to stabilised areas, and where necessary remove mud and dirt tracked on to road surfaces • Establish and enforce appropriate onsite vehicle speed limits • Place gravel on surfaces where there would be significant vehicle movement (e.g., construction access and egress points) • Implemented suitable controls for exposed stockpiles and unsealed construction areas as appropriate, including the stabilising of long-term stockpiles and exposed areas • Cover vehicle loads involving loose materials • Use water assisted dust sweepers on access and local roads. Avoid dry sweeping of large areas • Ensure cement and fine materials are delivered in enclosed tankers and stored in silos to prevent material escape. For smaller supplies reseal bags after use.	During construction	UK Institute of Air Quality Management (IAQM), *Guidance on the assessment of dust from demolition and construction* (Holman et al, 2014)

9.6.6 Residual impacts

A residual risk assessment was undertaken to assess potential air quality impacts after the proposed management and mitigation measures are applied, presented in **Table 9-36**. No significant residual impacts on air quality are anticipated.

Table 9-36 Residual risk assessment for air quality

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Dust generation from site clearance and construction site establishment	Unlikely	Moderate	**Low**
Dust generation from construction activities (e.g., earthworks and vehicle movements)	Unlikely	Moderate	**Low**
Climatic conditions result in the generation of dust	Unlikely	Moderate	**Low**
Dust generation from handling and removal of spoil / earthworks	Unlikely	Moderate	**Low**
Combustion emissions from construction activities	Unlikely	Minor	**Low**

As the risks associated with construction of infrastructure is well known and generally well managed using standard mitigation measure and safeguards the potential risks to the Project are considered to be low.

As indicated in the IAQM guidance, "*For almost all construction activity, the aim should be to prevent significant effects on receptors through the use of effective mitigation. Experience shows that this is normally possible. Hence the residual effect will normally be 'not significant'*". With the implementation of mitigation measures, the risks indicated above are expected to produce a residual effect which is not significant.

9.7 Greenhouse gases

This chapter provides an overview and assessment of the potential greenhouse gas impacts and benefits associated with the construction and operation of the Project.

9.7.1 Approach

This chapter provides a summary of the assessment of the Greenhouse Gas Technical Report prepared for the Project. A full copy of the assessment report is provided in **Appendix F (Greenhouse Gas Assessment)**.

9.7.1.1 Greenhouse gas accounting

The calculation methodology outlined in the *National Greenhouse and Energy Reporting Act 2007* and the accompanying *National Greenhouse and Energy Reporting (Measurement) Determination 2008* (amended 1 July 2021) has been used for this assessment. Specifically, Scope 1 and 2 emissions (defined in **Table 9-37**) have been estimated using the default method (Method 1) using greenhouse gas emission factors listed in *The National Greenhouse Accounts Factors, Australian National Greenhouse Accounts* (Department of Industry, Science, Energy and Resources, 2021) (NGA) to assess greenhouse gas contribution of the Project.

A bill of quantities was used for the purpose of this assessment, based on best estimates from the current Project design. If any quantities are changed significantly during the detailed design process typical of major infrastructure projects, especially concrete and steel estimates, then this assessment would be revisited and verified for accuracy.

The Greenhouse Gas Assessment Workbook for Road Projects (Transport Authorities Greenhouse Group, 2013) was consulted to estimate material quantities or qualities for the Project where data was not available.

9.7.1.2 Greenhouse gases assessed

The construction and operation activities proposed for the Project were reviewed to determine likely emission sources and greenhouse pollutants. Following this review, it was determined that the Project is likely to generate both direct and indirect emissions during the construction of the Project, with the main emission sources comprising:

- Energy including fuel (ULP and diesel)
- Electricity
- Waste generated in demolition and construction.

For the purpose of this assessment, greenhouse gas emissions have been reported as carbon dioxide equivalent (CO_2-e) a measure used to compare the emissions from various greenhouse gases on the basis of their global warming potential by converting amounts of other gases (e.g., NOx) to the equivalent amount of CO_2 with the same global warming potential.

Project emissions have been categorised into one of three scopes defined in **Table 9-37**. Where required, emissions would be reported as per the requirements for each scope, and in accordance with the NGA and the *National Greenhouse and Energy Reporting Act 2007.*

Table 9-37 Scope of emissions

Scope	Description	Relevance to the Project
Scope 1	Scope 1 emissions are direct greenhouse gas emissions that are produced by activities that are controlled by the proponent. Scope 1 are calculated from direct emission factors which give the carbon dioxide equivalent at the point of release within the boundary of the project. Scope 1 emissions are specified under the NGER scheme and must be reported.	Scope 1 emissions associated with the Project would include: • Earthwork plant, diesel combustion emissions • Stationary engines, petrol or diesel combustion emissions • Fleet vehicles of contractors, petrol or diesel combustion emissions • Removal of vegetation (resulting in a lost carbon sink) however this would be limited. It is estimated with the implementation of the Landscaping and Tree Management Plan for the Project, only about 111 mature trees would be removed, most of which are in fair to poor condition. Additional established trees are also expected to be planted as part of future landscaping works. Therefore, vegetation clearing is not considered a significant source of greenhouse gas emissions for the Project and has not been considered further in this assessment.
Scope 2	Scope 2 are indirect greenhouse gas emissions are a result of activities associated with a project from the consumption of electricity, heating cooling or steam that is produced offsite.	Scope 2 emissions for the Project would include electricity use in construction, such as electricity supply for temporary compounds, tools and lights.

Scope	Description	Relevance to the Project
	Scope 2 emissions are specified under the National Greenhouse and Energy Reporting (NGER) Scheme (enacted under the *National Greenhouse and Energy Reporting Act 2007*) and must be reported.	These emissions would be dependent on the origin of the electricity, and based on burning fossil fuels at the power station, outside of the Project boundary. Electricity in the ACT is sourced from 100% renewables and therefore Scope 2 emissions calculated for the Project are considered to be conservative.
Scope 3	Scope 3 emissions are indirect emissions that have not been accounted for in Scope 2. Scope 3 emissions are generally referred to as embodied emissions and refers to the emissions created over the entire lifecycle of a material from creation to disposal, not including direct emissions from usage. Scope 3 emissions are not reported under the NGER scheme, however primary Scope 3 emissions for the project include transport of construction materials (such as concrete, steel, asphalt, aggregate and sand), embodied energy within key construction materials and disposal of waste generated by the project have been included in this assessment.	Scope 3 emissions associated with the Project would include: • Embodied energy (including processing energy) of materials used in the project including: concrete, asphalt, cement, aggregate, steel, asphalt, bitumen, sand, water, lime; and imported fill • Transportation of materials, supplies and waste outside of the Project construction footprint by trucks, and associated diesel combustion emissions.

9.7.2 Existing environment

9.7.2.1 Air quality

The exiting air quality in the construction footprint and surrounds is described in **Section 9.6**, including existing NO_2 concentrations.

9.7.2.2 Greenhouse gas emissions

Each year the ACT Government reports the Territory's greenhouse gas emissions in the greenhouse gas emissions inventory report. **Table 9-38** describes the change in ACT emissions from 1989 – 1990 to 2019 – 2020 and the ACT's 2045 emissions reduction target (to be achieved in 2044 – 2045).

In 2019 – 2020, greenhouse gas emissions in the ACT were 1,684 kilotonnes (kt) CO_2-e, or 3.94 t CO_2^{-e} per person (Strategy Policy Research, 2020). In 2019, Australia's total greenhouse gas emissions were 529.3 megatonnes (Mt) CO_2-e (Department of Industry, Science, Energy and Resources, 2021).

Table 9-38 Summary of ACT emissions over time and 2045 target (kilotonnes of carbon dioxide equivalent)

1989-90	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2045 Target
3,077	4,120	4,204	4,158	4,169	3,967	3,924	1,684	0

The ACT Climate Change Strategy 2019 – 2025 aims to recognise new measures to further reduce emissions and increase the Territory's resilience to unavoidable climate change impacts. It sets a path to achieving a 50 to 60% reduction in emissions (from 1990 levels) by 2025 and the initial steps towards achieving net zero emissions by 2045. The Strategy recognises the need to support a higher uptake of public transport by continuing to improve services to meet community needs. It also encourages trialing new ways to: use roads more efficiently to move people; encourage active travel; encourage the uptake

of zero-emission vehicles; and plan for a compact and efficient city to improve public and active travel options and reduce travel distances and reliance on private car use.

9.7.3 Assessment of potential impacts

9.7.3.1 Construction

Greenhouse gas emissions are anticipated during the duration of the construction phase. Expected sources of emissions have been categorised into the three different “scopes” defined in **Table 9-37**.

A detailed assessment of the estimated greenhouse gas emissions from the Project (as CO_2-e) categorised by scope, source group and activity type is presented in Table 27 of **Appendix F (Greenhouse Gas Assessment)**. This assessment is summarised in **Table 9-39**.

As demonstrated in the table above the total emissions generated by the Project are estimated to be 1,875 t CO_2-e, inclusive of Scopes 1, 2 and 3. The majority of the emissions are Scope 3, which are emissions that are generated offsite, however are directly related to the Project in terms of offsite transport or greenhouse gas generation during the manufacture of materials and supplies. Diesel fuel used in stationary machinery on site during the Project accounts for about 22% of all emissions.

In 2019 Australia’s total greenhouse gas emissions were 529.3 megatonne (Mt) CO_2-e, with ACT contributing 1.28 Mt CO_2-e (Department of Industry, Science, Energy and Resources, 2021). In comparison with this data, the Project is expected to represent approximately 0.00036% of Australia’s total emissions and 0.15% of ACT’s total emissions.

As such, the potential greenhouse gas emissions attributed to the construction the Project are unlikely to have any significant impacts.

Table 9-39 Summary of Scope 1, 2 and 3 greenhouse gas emissions for the Project as CO_2 equivalent

Scope Type	Emission Source	Activity category	Qty	EF	Unit	GHG emissions (t CO_2-e)	Total (t CO_2-e)	Contribution to Project total (%)
Scope 1	Fuel Combustion (Diesel)	General Site Activities	5.2 kL	70.2	kg CO_2-e/GJ	14.1	429.0	22.9%
		Demolition Activities	69.1 kL	70.2	kg CO_2-e/GJ	69.1		
		Construction Activities	345.8 kL	70.2	kg CO_2-e/GJ	345.8		
Scope 2	Electricity	General Site Activities	71,280 kh	0	kWh	0	0	0%
Scope 3	Fuel Combustion (Diesel)	Demolition Activities	7.4 kL	70.2	kg CO_2-e/GJ	20.0	1446.1	77.1%
		Construction Activities	113.5 kL	70.2	kg CO_2-e/GJ	307.4		
		Waste Materials & Removal	0.42 kL	70.2	kg CO_2-e/GJ	1.1		
	Embodied Energy	Construction Materials (concrete)	1909 t	0.11175	kg CO_2-e/t	213.3		
		Construction Materials (aggregate)	804 t	0.005	kg CO_2-e/t	4.0		
		Construction Materials (steel)	109 t	1.05	kg CO_2-e/t	114.5		
		Construction Materials (general fill)	124,200 t	0.004	kg CO_2-e/t	496.8		
		Construction Materials (asphalt)	4,499 t	0.058	kg CO_2-e/t	260.9		
	Waste	Waste Materials (concrete)	250 t	0.11175	kg CO_2-e/t	27.9		
						Total	**1875.1**	**100.0%**
						ACT Contribution in 2019 (Mt CO^2-e)	**1.28**	**0.15089%**
						Australian Contribution in 2019 (Mt CO^2-e)	**529.3**	**0.00036%**

kL = kilolitre EF = Emissions factor
kg = kilogram GJ = = 278 kWh
kWh = kilowatt hour

9.7.3.2 Operation

Following the completion of construction, landscape plantings would be installed, and construction vehicles, plant, and machinery would be demobilised and removed from the Project construction footprint. The ongoing use of vehicles, plant and machinery would be limited to that required for routine maintenance of the Project.

The Project is not expected to generate additional traffic or to result in significant redistribution of traffic on the surrounding road network, and as such, no material increase in vehicle emissions relative to existing conditions are anticipated. Conversely, the Project has been designed with the goal to improve active transport connections and would facilitate the delivery of the Light Rail to Woden project.

Through the delivery of the Project and Light Rail to Woden, MPC seek to improve active and public transport uptake, and in turn reduce vehicle movements in the Canberra CBD.

As such, the potential greenhouse gas emissions attributed to the operation of the Project are considered to be minor and would be unlikely to have any significant greenhouse gas impacts.

9.7.4 Preliminary risk assessment

A preliminary assessment of potential greenhouse gas impacts, without mitigation measures, is presented in **Table 9-40** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-40 Preliminary risk assessment for greenhouse gases

Description	Preliminary risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Combustion emissions from construction activities	Unlikely	Minor	**Low**

9.7.5 Management and mitigation measures

Despite the low emissions generation, the Project aims to achieve net zero emissions, in alignment with the ACT Climate Change Strategy 2019 – 2025.

The Project seeks to minimise the requirement for new materials as far as practical, through reuse and recycling of materials from demolition, clearing and grubbing activities. Examples of proposed reuse and recycling measures are provided in **Section 9.10**. In addition, MPC would seek to prioritise local procurement of materials where practicable to reduce transport emissions. Works, including earthworks, have been programmed in a way to minimise double handing of materials. Further measures which may contribute to a reduction in greenhouse gas emissions are provided in **Section 3.9** and **Section 9.6**.

Mitigation measures are proposed to lower the significance, frequency or risk of a greenhouse gas impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-41**, and have been prepared with the following objectives:

Minimise direct greenhouse gas emissions.

Table 9-41 Management and mitigation measures – Greenhouse gases

Ref	Management and mitigation measure	Timing	Reference
AQ3	The following measures to manage vehicle emissions would be implemented: • Only use petrol or diesel generators where mains power is not feasible • Keep vehicles and construction equipment operating on site well maintained and turned off when not operating (minimise idling on the site).	During construction	-

9.7.6 Residual impacts

A residual risk assessment was undertaken to assess potential greenhouse gas impacts after the proposed management and mitigation measures are applied, presented in **Table 9-42**. No significant residual impacts on greenhouse gas are anticipated.

Table 9-42 Residual risk assessment for air quality

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Combustion emissions from construction activities	Unlikely	Minor	**Low**

9.8 Landscape visual and realm

This chapter provides an overview and assessment of the potential landscape and visual realm impacts and benefits associated with the construction and operation of the Project.

9.8.1 Approach

This chapter provides a summary of the Landscape Character and Visual Impact Assessment (LVIA) prepared for the Project. A full copy of the assessment report is provided in **Appendix G (Landscape Character and Visual Impact Assessment)**.

Key steps in the development of the LVIA included:

- Environmental and planning baseline - an analysis of the regional and local context of the Project
- Design review - a summary of urban and landscape, and sustainability design outcomes
- Impact assessment, including:
  - Landscape character impact assessment - an assessment of the anticipated impact of the Project on landscape character as a result of the final design outcome (**Section 9.8.1.1**)
  - Visual Impact Assessment - an evaluation of the impact of the Project on existing views and visual amenity within the study area (**Section 9.8.1.2**)
- Mitigation – design outcomes and mitigation measures to avoid, reduce or mitigate adverse impacts associated with the Project.

The methodology for the assessment generally followed the approach in *Environmental Impacts Assessment Practice Note – Guideline for Landscape Character and Visual Impact Assessment EIA-N04* (TfNSW, 2020), with more detailed guidance taken from *Guidelines for Landscape and Visual Impact Assessment, Third Edition* (Landscape Institute and Institute of Environmental Management UK, 2013)

9.8.1.1 Landscape character assessment

A landscape character assessment was undertaken to identify features and elements relevant to the Project. Landscape Character Zones (LCZ) were identified within the broad landscape setting. LCZs are an area of landscape with similar properties or strongly defined spatial qualities, distinct from areas immediately nearby.

The assessment of landscape effects considered the change due to the Project on the landscape as a resource in its own right. The assessment was based on the sensitivity to change and the magnitude of the change that is likely to occur. The sensitivity of a LCZ considered the susceptibility to change, the ability of the landscape to accommodate the Project without undue consequences, and the value of the landscape. Landscape effects were assessed at the commencement of operation of the Project, and only LCZs deemed likely to be impacted by the Project were assessed. Additional information regarding the assessment of impacts on the landscape character is provided in Section 4.3 of **Appendix G (Landscape Character and Visual Impact Assessment)**.

The degree of sensitivity of each LCZ and magnitude of change resulting from the Project provided an overall impact rating as per **Table 9-43** below. The rating did not consider if the impact would be beneficial or adverse.

Table 9-43 Landscape character and visual impact assessment matrix (TfNSW, 2020)

		Magnitude			
		High	**Moderate**	**Low**	**Negligible**
Sensitivity	**High**	High	High - Moderate	Moderate	Negligible
	Moderate	High - Moderate	Moderate	Moderate - Low	Negligible
	Low	Moderate	Moderate - Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible	Negligible

9.8.1.2 Visual impact assessment

A series of viewpoints were selected from which to assess the visual impact of the Project. Viewpoints were chosen to assess the changes due to the Project from publicly accessible locations, although some viewpoints were used to approximate these changes when seen from private locations such as residences or community facilities. Selected viewpoints are listed in **Table 9-45**

The visual impact assessment considered both the sensitivity of an existing viewpoint to change and the magnitude (scale, character and distance) of the change of view. Visual impacts were assessed during construction and at the commencement of operation of the Project. The sensitivity of each viewpoint and magnitude of change resulting from the Project were evaluated as per above using **Table 9-43**.

9.8.2 Existing environment

Land use in the general region immediately surrounding the construction footprint is characterised by a CBD setting, transitioning to residential dwellings further to the north. Immediately to the south is Lake Burley Griffin, with land use further south being commercial, industrial and residential. The nearest nature reserves to the construction footprint are located at Black Mountain reserve 2 km to the west and the Mt Ainslie reserve 2 km to the east. Further east and west are open plains which transition into the mountainous areas of the Brindabella ranges to the west and the Kowen escarpment including Mount Reedy to the east. This land use setting forms the basis to describe the existing environment of the LCZs (**Section 9.8.2.1**) and viewpoints (**Section 9.8.2.2**) used in this assessment.

9.8.2.1 Landscape character zones

Five LCZs were identified within the detailed study area (refer to **Figure 9-13** and **Table 9-44**). These are:

- LCZ 1: Parliamentary Zone and Cultural Triangle
- LCZ 2: Major Avenues and Axes
- LCZ 3: Lake Burley Griffin and Foreshores
- LCZ 4: London Circuit
- LCZ 5: Parkes Way.

The Project lies predominantly within LCZ 4: London Circuit, but also overlaps LCZ 2: Major Avenues and Axes, LCZ 3: Lake Burley Griffin and Foreshores and LCZ 4: Parkes Way.

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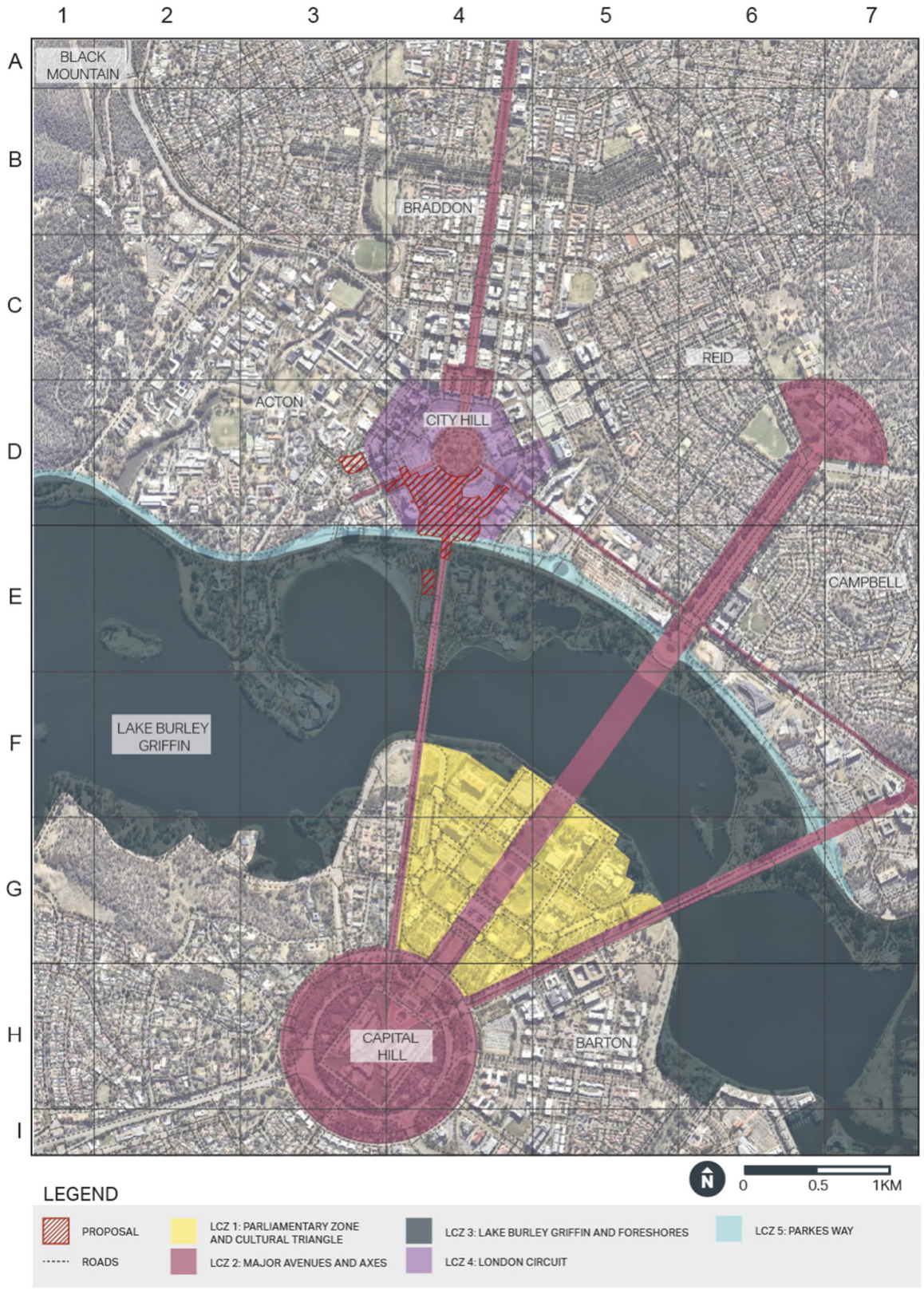

Figure 9-13 Landscape Character Zones

Table 9-44 LCZ Summary

LCZ	Description
LCZ 1: Parliamentary Zone and Cultural Triangle	Land uses within LCZ 1 are predominantly National Capital Use with some commercial buildings. Buildings within this LCZ are typically located on high points to give them a presence within the landscape. The LCZ contains several heritage listed items, the most notable being the Parliament House Vista, listed on the Commonwealth Heritage List. The topography of LCZ 1 is predominantly flat and very gently undulating. Vegetation is predominantly formal tree plantings along boundaries and some large open turf areas and small gardens.
LCZ 2: Major Avenues and Axes	LCZ 2 comprises a series of linear corridors with focal points including Parliament House, Old Parliament House and the Australian War Memorial. The strong linear elements is a major design feature of Canberra and assists with orientation and highlighting landmarks. This is further assisted with focal points being built on raised landforms. Vegetation is planted along the linear corridors. When planted along the central median, the width of the avenue allows views along the corridor to be maintained. Transport is the predominant land use within LCZ 2 with the exception of the Land Axis, which comprises public open spaces. Commonwealth Avenue forms part of the National Triangle and connects the major topographic landforms of Capital Hill and City Hill and the visual connection between the two is highly significant.
LCZ 3: Lake Burley Griffin and Foreshores	LCZ 3 comprises of large, open expanse of water of Lake Burley Griffin and the parkland foreshore areas which address the lake rather than the land uses behind them. The topography of this LCZ is relatively flat and low lying. The views across the lake and landscape beyond are visible from most locations. Views include Black Mountain, Mount Ainslie and landmark buildings which surround the lake.
LCZ 4: London Circuit	The Project predominantly lies within LCZ 4. The land is predominantly commercial and civic with some minor open air spaces and areas for accommodation. The immediate vicinity is occupied by medium to tall commercial building and large parking lots. The LCZ is designated for development and is currently undergoing rapid changes. The topography falls from the highest point at Vernon Circle to the lower London Circuit, Marcus Clarke Street and Allara Street. The LCZ is characterised by its concentric roads radiating outwards to a hexagonal shape with avenues radiating beyond that. Vegetation within the LCZ comprises predominantly avenues of street trees and some formal plazas, such as the plaza within the Law Courts Precinct. Trees within the streetscape include predominantly exotic deciduous species, with some newer plantings referencing the Cypress trees on City Hill.
LCZ 5: Parkes Way	The Parkes Way is a wide, linear road way. The topography undulates varyingly with steeper hills, embankments and retaining walls located along the interface with adjacent LCZs. These embankments and retaining walls often act as screens typically keeping the views within the roadway. Vegetation within the LCZ is sparse with the medium being turfed and the occasional planted tree, typically native.

9.8.2.2 Viewpoints

Thirteen viewpoints were selected for assessment and are presented in **Table 9-45**, **Figure 9-14** and **Figure 9-15** below. A detailed impact assessment, including images of the viewpoints is presented in the **Appendix G (Landscape Character and Visual Impact Assessment)**.

Table 9-45 Viewpoints

Viewpoint	Location	Description
Viewpoint 1	City Hill West	View south west along Edinburgh Avenue from City Hill
Viewpoint 2	City Hill South	View south along Commonwealth Avenue from City Hill
Viewpoint 3	7 London Circuit	View south east along London Circuit
Viewpoint 4	1 London Circuit	View south east along London Circuit from the QT Canberra hotel
Viewpoint 5	London Circuit South West	View from London Circuit looking east towards the Project
Viewpoint 6	London Circuit South East	View from near the south eastern corner of London Circuit looking west to the Project
Viewpoint 7	Commonwealth Avenue	View from Commonwealth Avenue north towards the Project
Viewpoint 8	Parkes Way Overpass	View from the Parkes Way overpass north west towards the Project
Viewpoint 9	Archbishops Residence	View from the garden outside the Archbishops house north west towards the Project
Viewpoint 10	Lake Burley Griffin / Land Axis	View from the south bank of Lake Burley Griffin looking north towards Project
Viewpoint 11	Black Mountain	View from the Telstra Tower on Black Mountain looking south east towards the Project
Viewpoint 12	Mount Ainslie	View from the lookout on Mount Ainslie looking south west towards the Project
Viewpoint 13	Parliament House	View from Parliament House lawn north along Commonwealth Avenue towards the Project

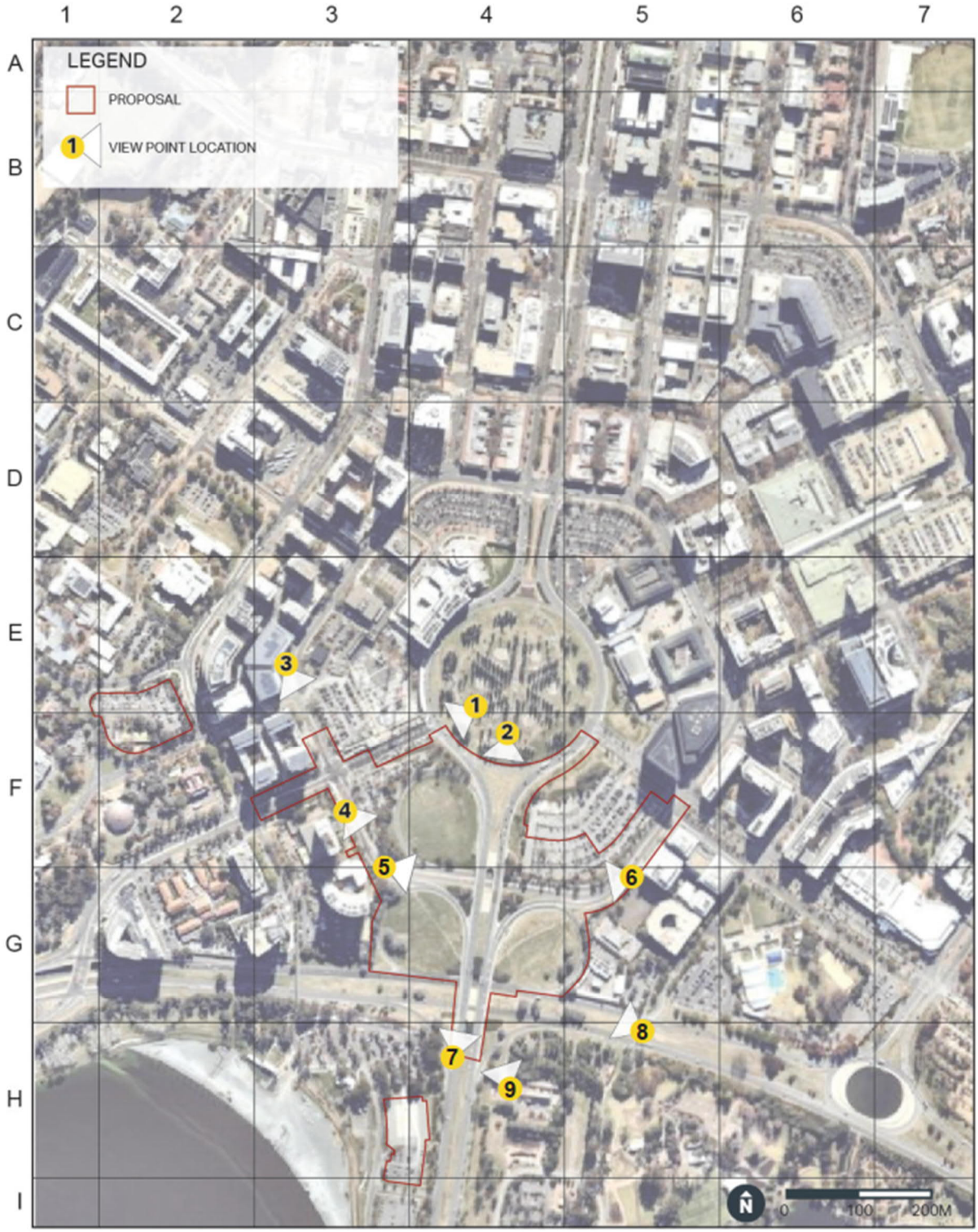

Figure 9-14 View points (near)

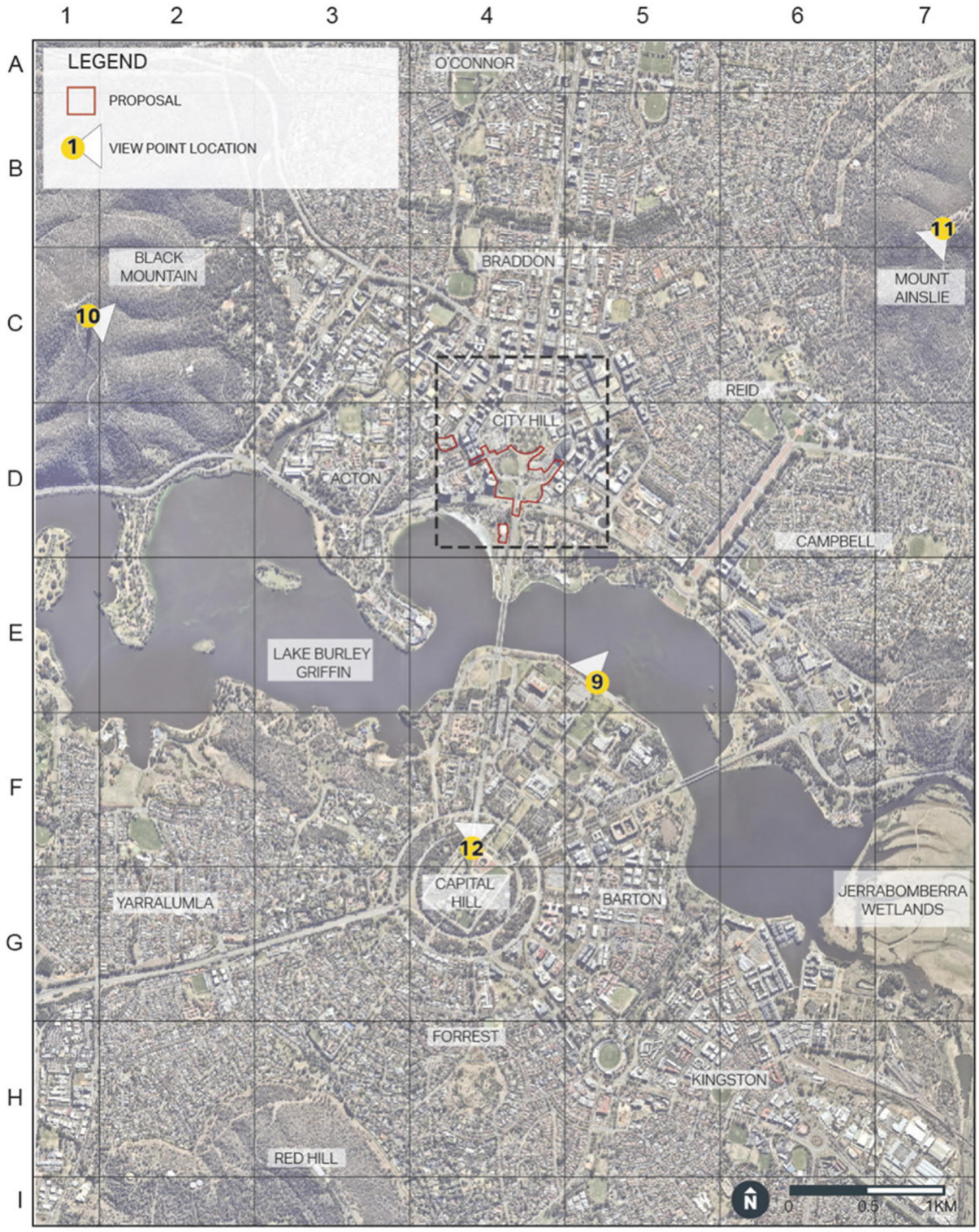

Figure 9-15 View points (distant)

9.8.3 Assessment of potential impacts

9.8.3.1 Construction

Landscape character

Construction works are anticipated to have a temporary adverse impact on the landscape of the area. However due to other construction currently occurring within the area and the temporary nature of construction the potential landscape impacts would be low.

Visual assessment

The visual impact assessment considered both the sensitivity of an existing viewpoint to change and the magnitude (scale, character and distance) of the change of view. A description of the anticipated change, and the associated potential impact is summarised in **Table 9-46**. Visual impacts associated with construction would be temporary in nature. The anticipated change at each viewpoint is described in planes to convey a sense of depth, using foreground, middle ground, and background, as if viewing a photograph from this location.

Five viewpoints are considered to have an adverse qualitative rating for visual impact during construction:

- Viewpoint 1: City Hill (Moderate impact)
- Viewpoint 2: City Hill South (High impact)
- Viewpoint 3: London Circuit (Moderate to Low impact)
- Viewpoint 7: Commonwealth Avenue (High to Moderate impact)
- Viewpoint 13: Parliament House (High to Moderate impact).

Table 9-46 Viewpoints construction impact summary

Viewpoint	Anticipated change	Impact summary
VP 1: City Hill West	The construction of the Project would be visible from this viewpoint, particularly views of construction activities seen in the middle ground on Vernon Circle and at the intersection of Edinburgh Avenue and London Circuit. Views of construction activities would be shielded by the Cypress trees within City Hill Park reducing the magnitude of impacts on visual receivers within the park. Other forms of construction are already occurring within the visual catchment of this viewpoint, and the construction of the Project would not result in a large variance in visual appearance compared with the existing environment.	**Sensitivity**: High
		Magnitude: Low
		Overall impact: Moderate
		Qualitative rating: Adverse
VP 2: City Hill South	Construction activity is anticipated to be seen in the middle to background of the view, comprising hoarding around the works, the construction of sidetrack and temporary road pavements on the Commonwealth Avenue median and verge to provide temporary lanes to bypass staged work areas, demolition of the Commonwealth Avenue bridges, and construction of the	**Sensitivity**: High
		Magnitude: High
		Overall impact: High

Viewpoint	Anticipated change	Impact summary
	new London Circuit-Commonwealth Avenue intersection and associated tie in works. Due to the fall in topography along the Commonwealth Avenue corridor south towards Lake Burley Griffin, and then the rise towards Capital Hill, it is likely that the view to Parliament House would remain largely unobstructed by construction activities. The view towards construction activities would be seen primarily framed between the row of Cypress trees that focus the view from this location along Commonwealth Avenue to a focal point at Parliament House on Capital Hill. Some construction activity would be seen to the west (right of frame) between the trees in City Hill Park. Views to the east (left of frame) would be screened by landform and vegetation.	**Qualitative rating:** Adverse
VP 3: London Circuit	Construction activities, construction compound sties and temporary hoarding is anticipated to be visible in the middle ground of this view. Construction activities would include the removal of trees, demolition of road and pavements and earthworks, installation of new road pavements, footpaths and cycle facilities, electrical infrastructure, landscaping and street furniture. Other forms of construction are already occurring within the visual catchment of this viewpoint, and the construction of the Project would not result in a large variance in visual appearance compared with the existing environment	**Sensitivity**: Moderate **Magnitude**: Low **Overall Impact:** Moderate to Low **Qualitative rating:** Adverse
VP 4: London Circuit	It is anticipated this viewpoint would not be accessible during construction due to restrictions on access to the construction footprint.	**Overall Impact:** Negligible
VP 5: London Circuit South West	It is anticipated this viewpoint would not be accessible during construction due to restrictions on access to the construction footprint.	**Overall Impact**: Negligible
VP 6: London Circuit South East	It is anticipated this viewpoint would not be accessible during construction due to the alterations along the verge.	**Overall Impact:** Negligible
VP 7: Commonwealth Avenue	Construction activities would be seen along the Commonwealth Avenue road corridor. Works to remove the south west cloverleaf ramp may be slightly visible from this viewpoint. Construction activities would be seen in the middle to the background of the view and would comprise tree removal, hoarding and traffic diversions, demolition of the Commonwealth Avenue bridges over London Circuit and construction of the new London Circuit-Commonwealth Avenue intersection. Due to the fall in topography to the south from City Hill towards Lake Burley Griffin, it is likely that construction activities would obstruct the view towards City Hill.	**Sensitivity**: Moderate **Magnitude**: High **Overall Impact**: High to moderate **Qualitative rating:** Adverse
VP 8: Parkes way Overpass	Construction of the Project would not be visible from this viewpoint due to screening by intervening structures, including Commonwealth Avenue, and thus the quality of the view would not be impacted.	**Overall Impact**: Negligible
	The demolition of the existing Commonwealth Avenue bridges and construction of the new London Circuit -	**Sensitivity**: Low

Viewpoint	Anticipated change	Impact summary
VP 9: Archbishops Residence	Commonwealth Avenue intersection may be viewed from this viewpoint. At its closest construction activities may be viewed from 100 m.	**Magnitude**: Low
		Overall Impact: Low
		Qualitative rating: Neutral
VP 10: Lake Burley Griffin / Land Axis	Construction of the Project would not be visible from this viewpoint due to screening by landforms, vegetation and built environment and thus the quality of the view would not be impacted.	**Overall Impact**: Negligible
VP 11: Black Mountain	It is anticipated only the largest and most visually prominent construction activities would be visible from this viewpoint due to its distance from the construction footprint. Construction of the Project would be partially screened from view due to the built environment.	**Overall Impact**: Negligible
VP 12: Mount Ainslie	It is anticipated only the largest and most visually prominent construction activities would be visible from this viewpoint due to its distance from the construction footprint. Construction of the Project would be partially screened from view due to vegetation and the built environment.	**Overall Impact**: Negligible
VP 13: Parliament House	Whilst this viewpoint is some distance from the construction footprint, it is likely that construction activities would create a visual shortening of the elongated view along Commonwealth Avenue. It is anticipated the construction activities would be viewed as a dark patch, creating contrast against the existing pale pavements on Commonwealth Avenue south of City Hill.	**Sensitivity**: High
		Magnitude: Moderate
		Overall Impact: Moderate to High
		Qualitative rating: Adverse

9.8.3.2 Operation

Landscape character

The assessment of landscape effects considered the change due to the Project on the landscape as a resource in its own right. The assessment was based on the sensitivity to change and the magnitude of the change that is likely to occur. A description of the anticipated change, and the associated potential impact, for the five identified LCZs is summarised in **Table 9-47**. The impact to the remaining LCZ is considered to be negligible due to the distance from the Project.

Two LCZs returned an overall impact greater than negligible, with impacts on both considered to be beneficial:

- LCZ 2: Major Avenues and Axes
- LCZ 4: London Circuit Landscape Character.

The low quantity of landscape zones with results greater than negligible is a result of the low visual prominence of the Project. Whilst the Project is a large structural change it is supported within strategic planning documents and the Griffin Plan thus changes are considered to be in line with the existing or planned future land use and development patterns.

Table 9-47 Landscape character operation summary

LCZ	Anticipated change	Impact
LCZ 1: Parliamentary Zone and Cultural Triangle	The Project does not fall within this LCZ and although it lies within the views of major landscape features, Mount Ainslie and Black Mountain, it would be visually recessive within the view due to its distance from the LCZ.	**Overall Impact:** Negligible
LCZ 2: Major Avenues and Axes	The Project would be partially located within this LCZ and is characteristic of the area. The Project adheres to principles set out in the NCP and respects the geometry and intent of the Griffin Plan, thus not changing any key aesthetic properties of the LCZ. The Project would result in the loss of elements within the LCZ, namely the removal of the Commonwealth Avenue bridges over London Circuit and the removal of trees. The Project would introduce additional vegetation and landscaping in addition to other features including new pedestrian and cycling facilities. This would result in a positive improvement to the landscape character of the area. Particularly, the vegetation may assist in strengthening and framing the two landmarks within the LCZ (City Hill and Capital Hill).	**Sensitivity:** Moderate **Magnitude:** Low **Overall Impact:** Moderate to low **Qualitative rating:** Beneficial
LCZ 3: Lake Burley Griffin and Foreshores	The Project does not lie within this LCZ and is separated by landforms and vegetative screening, although the changes to Commonwealth Avenue are within 50 m of the boundary of the LCZ.	**Overall Impact:** Negligible
LCZ 4: London Circuit	The Project would be primarily located within this LCZ and would comprise changes to the height of London Circuit between Edinburgh Avenue and Constitution Avenue. Elements of the Project, including the removal of cloverleaf ramps, are not in line with the existing character of the LCZ. However, this alteration is anticipated in strategic planning documents including the NCP and is therefore considered characteristic of the future character of the area. The inclusion of street trees on both sides of London Circuit between Edinburgh Avenue and nearing Constitution Avenue, would unify the road, providing an almost continuous ring of Plane Trees (*Platanus* x *acerifolius*) along its length. The Project respects the geometry and intent of the Griffin's formally adopted plan for Canberra. Elements such as roadway, footpaths, street trees and street furniture would be replaced as a result of the Project. Although these upgrades are likely to be favourably noticeable, particularly with increased areas of hard landscaped verges, they are generally in line with the existing character of the LCZ. London Circuit would continue to serve as a gateway roadway thereby reducing traffic through the inner City Hill area.	**Sensitivity:** Moderate **Magnitude:** Moderate Overall **Impact:** Moderate **Qualitative rating:** Beneficial
LCZ 5: Parkes Way	The Project would not lie within this LCZ and is separated by landforms and vegetative screening, although the changes to Commonwealth Avenue would extend along the boundary of the LCZ.	**Overall Impact:** Negligible

Visual assessment

A description of the anticipated change, and the associated potential impact is summarised in **Table 9-48**. The anticipated change at each viewpoint is described in planes to convey a sense of depth, using foreground, middle ground, and background, as if viewing a photograph from this location.

One viewpoint (Viewpoint 5: London Circuit South West) is considered to have an adverse qualitative rating for visual impact during operation, with an overall moderate impact at this location. Four viewpoints are considered to have a beneficial impact during operation:

- Viewpoint 2: City Hill South
- Viewpoint 4: London Circuit
- Viewpoint 6: London Circuit South East
- Viewpoint 7: Commonwealth Avenue.

Table 9-48 Viewpoints operation impact summary

Viewpoint	Anticipated change	Impact
VP 1: City Hill West	The Project would lead to the alteration of London Circuit and Edinburgh Avenue, including changes to road surface, lane markings, pedestrian pavement and street trees. Whilst these alterations would be visible from this viewpoint, they would lie within the middle ground and are not dominant within the wider view. Key elements and focal points within this viewpoint would remain as within the existing environment	**Overall Impact:** Negligible
VP 2: City Hill South	The Project would be seen in the middle ground of this viewpoint. The new intersection of London Circuit and Commonwealth Avenue may be more predominant than the existing view of the Commonwealth Avenue bridges over London Circuit. While the road pavement of the new London Circuit - Commonwealth Avenue intersection would be screened from view by the shrubs and groundcovers in the central median, the traffic lights and road signage would be seen as new elements within the view, albeit visually recessive ones due to their slender forms. The mast arm traffic lights would 'lean' into the intersection and be seen within the corridor view along Commonwealth Avenue. The foreground views would remain unchanged with turf and trees within City Hill Park.	**Sensitivity:** High **Magnitude:** Moderate **Overall Impact:** High to Moderate **Qualitative rating:** Beneficial
VP 3: London Circuit	The Project would be seen in the middle ground of the viewpoint. The appearance from the viewpoint would not differ greatly from the existing situation as most elements of the London Circuit streetscape would be reinstated. The raising of London Circuit on approach to Commonwealth Avenue would differ from the existing view. The central area of London Circuit around and on approach to the new London Circuit - Commonwealth Avenue intersection would differ slightly with the new central median, pedestrian and cycleways, street trees and retaining wall being visible. These changes would be visible at distance.	**Sensitivity**: Moderate **Magnitude:** Low **Overall Impact:** Moderate to Low **Qualitative rating:** Neutral
VP 4: London Circuit	The Project would be visible within the foreground of this viewpoint. The view would comprise of the reinstated, raised London Circuit.	**Sensitivity:** Moderate **Magnitude:** High

Viewpoint	Anticipated change	Impact
		Overall Impact: High to moderate
		Qualitative rating: Beneficial
VP 5: London Circuit South West	This viewpoint would be dominated by 2 m high retaining walls. Taller elements on London Circuit, such a street trees, lighting and signage, may be visible beyond the retaining walls.	**Sensitivity:** Low
		Magnitude: High
		Overall Impact: Moderate
		Qualitative rating: Adverse
VP 6: London Circuit South East	The reinstatement of London Circuit may be seen from this viewpoint, although the landform would be different as London Circuit rises to meet Commonwealth Avenue, replacing the existing Commonwealth Avenue bridges and London Circuit underpass. The view of London Circuit, although widened, would be softened to include planted medians and street trees previously sparse from this viewpoint. Cycleways and pedestrian walkways would be widened compared to existing infrastructure. Views of the landscape beyond the London Circuit corridor would be limited and screened by street trees. Changes would continue over time as the trees mature.	**Sensitivity:** Low
		Magnitude: High
		Overall Impact: Moderate
		Qualitative rating: Beneficial
VP 7: Commonwealth Avenue	The Project would be visible from this viewpoint. The existing turf batter to the south of London Circuit would be retained in view with the additional feature of the retaining wall at the south western corner of London Circuit. Street trees can be seen to line the verges of the Project aiding to visually unify the road corridor with the landscape. The new median to the north of the intersection would be visible in the background providing aesthetic vegetation below City Hill. Taller electrical infrastructure would be seen within the new intersection. The traffic lights and road signage are seen as new elements within the view, albeit visually recessive ones due to their slender forms. The mast arm traffic lights would 'lean' into the intersection and be seen within the corridor view along the road.	**Sensitivity:** Moderate
		Magnitude: Moderate
		Overall Impact: Moderate
		Qualitative rating: Beneficial
VP 8: Parkes way Overpass	The Project would not be visible from this location due to screening and thus the quality of the view would not be impacted.	**Overall Impact:** Negligible
VP 9: Archbishops Residence	An overall change may be visible on Commonwealth Avenue, however details such as road pavements and footpaths may be screened by street trees along the eastern side of Commonwealth Avenue and southern verge of London Circuit. The street trees are anticipated to be the dominant visual feature.	**Overall Impact:** Negligible

Viewpoint	Anticipated change	Impact
VP 10: Lake Burley Griffin / Land Axis	The Project would not be visible from this location due to screening by landforms, vegetation and built environment and thus the quality of the view would not be impacted.	**Overall Impact:** Negligible
VP 11: Black Mountain	The view of the Project from this viewpoint would comprise of the road infrastructure and additional verge vegetation on London Circuit and Commonwealth Avenue. Due to the low profile of these elements and screening from the built environment it is unlikely they would be viewed at distance.	**Overall Impact:** Negligible
VP 12: Mount Ainslie	The view of the Project from this viewpoint would comprise of the road infrastructure and additional verge vegetation on London Circuit and Commonwealth Avenue. Due to the low profile of these elements and screening from the built environment it is unlikely they would be viewed at distance.	**Overall Impact:** Negligible
VP 13: Parliament House	It is unlikely the Project would result in a change in this viewpoint due to the distance from view.	**Overall Impact:** Negligible

9.8.4 Preliminary risk assessment

As the landscape character and visual impact assessment has been undertaken using the TfNSW (2020) matrix and framework, a further risk assessment using the methodology detailed in **Chapter 8.0** has not been undertaken.

9.8.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of landscape and visual realm impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-49**, and have been prepared with the following objectives:

- Minimise the visual impacts of construction activities
- Minimise long term impacts to the Commonwealth Avenue view corridor
- Ensure that the finishes of retaining walls are suitable given their visual prominence.

Table 9-49 Management and mitigation measures – Landscape and visual

Ref	Management and mitigation measure	Timing	Reference
LV1	Wherever possible, high quality construction hoarding would be used with consideration given to the potential for public art or heritage interpretation. The design of the hoarding should consider visually recessive, natural colours and images, and where possible be developed with input from local schools or artists.	Prior to and during construction	See also H1 (**Table 9-11**)
LV2	Wherever practicable, combine above-ground street elements (lighting, traffic signals, traffic signs) on common use poles to reduce visual clutter and to reduce potential conflict with landscape elements, in consultation with TCCS and NCA.	Detailed design, prior to construction	-
LV3	The final finish of retaining walls required for the project would be determined in consultation with the NCA, having regard to visual impacts.	Prior to construction	-

9.8.6 Residual Impacts

A residual impacts assessment was undertaken to assess potential land use impacts after the proposed management and mitigation measures are applied, presented in **Table 9-50.**

There are no adverse impacts anticipated on landscape character during operation, with beneficial impacts identified at LCZ 2: Major Avenues and Axes and LCZ 4: London Circuit.

There are adverse impacts rated above moderate at three viewpoints during construction (VP2, VP7, VP13), and no viewpoints during operation (**Table 9-50**). Four viewpoints are considered to have a beneficial impact at operation (VP2, VP4, VP6, VP7).

Table 9-50 Residual adverse visual impact assessment

Viewpoint	Sensitivity	Unmitigated impact		Mitigated impact	
		Magnitude	Overall rating	Magnitude	Overall rating
Construction					
Viewpoint 1: City Hill	High	Low	Moderate	Low	Moderate
Viewpoint 2: City Hill South	High	Moderate	High	Moderate	High to Moderate
Viewpoint 3: London Circuit	Moderate	Low	Moderate to Low	Low	Moderate to Low
Viewpoint 7: Commonwealth Avenue	High	High	High to Moderate	High	High to Moderate
Viewpoint 13: Parliament House	High	Moderate	High to Moderate	Moderate	High to Moderate
Operation					
Viewpoint 5: London Circuit South West	Low	High	Moderate	Moderate	Moderate to Low

As the landscape character and visual impact assessment has been undertaken using the TfNSW (2020) matrix and framework, a further risk assessment using the methodology detailed in **Chapter 8.0** has not been undertaken.

9.9 Socioeconomic

This chapter provides a summarised assessment of the socioeconomic impacts and benefits associated with the Project.

9.9.1 Approach

A socioeconomic impact assessment (SEIA) was conducted by bd infrastructure. This chapter draws reference from that assessment, and a full copy of the assessment is provided in **Appendix H (Socioeconomic impact assessment)**.

Socioeconomic impact assessment is the process of understanding and managing the social impact of projects and programs on people. The socioeconomic impact assessment has considered who may be impacted by the Project and what kind of communities they live in, what kind of socioeconomic impacts are likely to be experienced by those people, and how those impacts can best be managed and monitored throughout the lifecycle of the Project.

A best practice approach has been adopted for the SEIA that considers the International Association for Impact Assessment's (IAIA) *Social Impact Assessment: Guidance for assessing and managing the social impacts of projects* (Vanclay, Esteves, Aucamp, & Franks, 2015) and other industry leading frameworks, including the NSW Department of Planning, Industry and Environment's *Social Impact Assessment Guideline* (July 2021) (DPIE, 2021).

Assessment of the socioeconomic impacts from the construction and operation of the Project has been informed by a review of the following data and information:

- Existing socioeconomic characteristics of the study area through desktop research, reviewing secondary source quantitative data, undertaking limited primary research, and in particular referring to:
  - Census data (Australian Bureau of Statistics – Census Quick Stats, 2016)
  - Information on local community structure and patterns
- Exploratory research
- Targeted surveys of the surrounding community and
- A review of relevant technical assessment reports completed for the Project including in relation to:
  - Traffic and transport
  - Air quality
  - Noise and vibration
  - Contamination and soil
  - Landscape and visual impact analysis.

9.9.1.1 Social area of influence

The assessment has broken the social area of influence into the following three primary areas:

- ***Locality***: This term has been applied to the catchment around the construction and operational footprints of the Project. This has been identified as the area in which people are most likely to experience both construction and operational socioeconomic impacts from the Project, or a level of direct impact. These people could, for example, be businesses, developers, workers, residents, or visitors to the area. **Figure 9-16** defines the Civic locality used in the SEIA.
- ***Suburb***: This term has been applied where the spatial extent of socioeconomic impacts on people is generally broader than the are immediately around the construction and operational footprints of the Project. 'Suburb' refers to a conceptual geography not necessarily aligned to actual suburb boundaries. **Figure 9-16** defines the North Canberra area used in the SEIA for this level of analysis.
- ***Region:*** In some instances, the social area of influence is extended to a 'region' to reflect broader potential social impacts, as distinct from the narrower concepts of 'locality' and 'suburb'. This term has been applied where the Project is within or proximate to a social area of influence frequented by regional populations, for example a key employment centre, or a locality in which there is regional or national infrastructure or services (i.e. Canberra CBD). The SEIA defines the whole of the ACT for this level of analysis.

To provide statistical analysis, the primary areas of interest have been aligned with Australian Bureau of Statistics (ABS) Australian Statistical Geography Standard (ASGS) statistical areas (**Table 9-51**), using 2016 census data. The social area of influence for the Project is presented in **Figure 9-16** below.

Table 9-51 Area of influence statistical analysis

Area	Statistical Area name
Locality	Civic Statistical Area 2 (SA2)
Suburb	North Canberra Statistical Area 3 (SA3)
Region	ACT

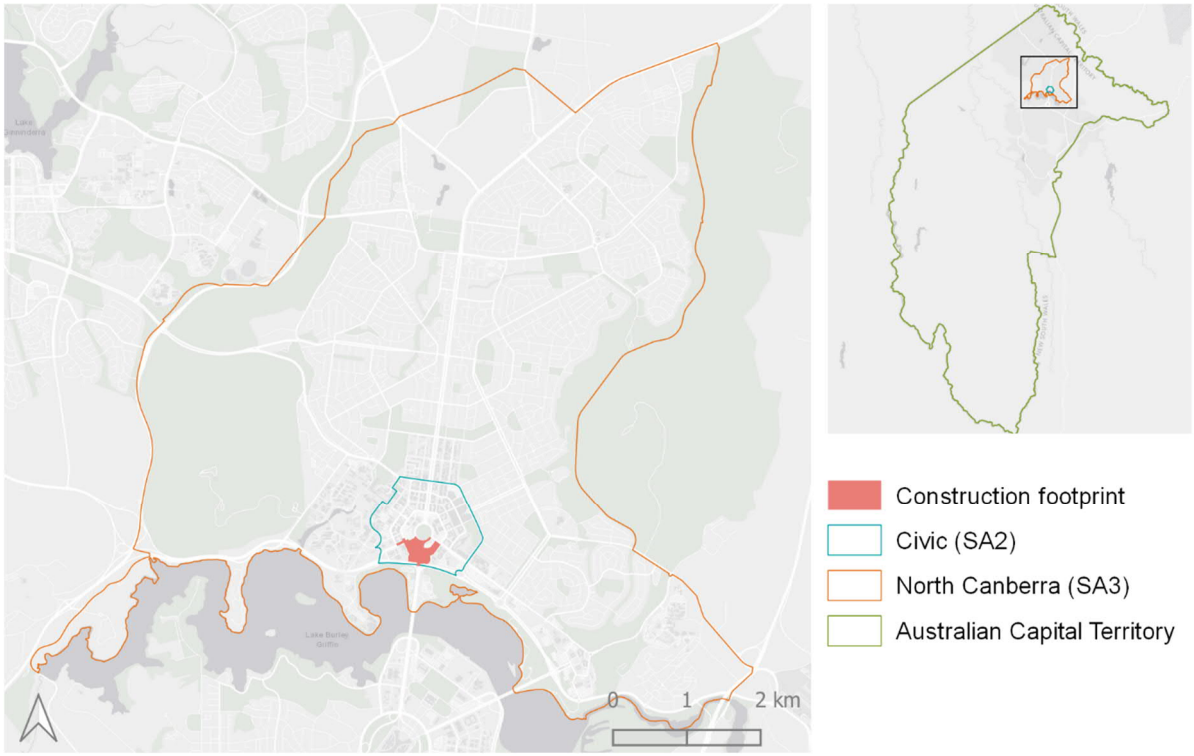

Figure 9-16 Social areas of influence

9.9.1.2 Community and stakeholder engagement

The SEIA has been informed by community and stakeholder engagement undertaken for the Project to date. Local community plans have been reviewed and the feedback received during consultation has been analysed to provide insights into community identity, values, priority issues and goals. A summary of these outcomes is provided in **Appendix H**.

9.9.2 Existing environment

As discussed in Section 4.2.3 of **Appendix H**, the SEIA draws on the sustainable livelihoods approach where community profiling is divided into five 'community capitals' or 'capital assets.' These include human, social, economic, physical, and natural capital. Further detail on these five 'community capitals' is provided in **Appendix H** and summarised below.

9.9.2.1 Human Capital

The social area of influence consists of a young population, with an average age of 24, which is considerably lower than the ACT average of 35 years old. The community is well educated and has achieved a higher than average education level. This may be in correlation to the economic cluster and proximity to the Australian National University. The North Canberra statistical area records a slightly higher median age at 30 years old, and a slightly higher portion of bachelor's degrees or higher university education. This may be related to the fact that many of those residing in the area are currently studying towards attaining a tertiary qualification.

ACT, as a region, has a high portion of the youth population (15-24 years old) engaged in schooling or further education. There is a low percentage of the population at risk of not completing schooling or gaining employment. The ACT region has approximately twice the proportion of people living with profound or severe disabilities in comparison to the North Canberra statistical area.

9.9.2.2 Social Capital

The locality has a mobile community with an average of 47% people living at the same address of over a year (lower than the ACT regional average of 75%) and only 8% living at the same address for five years. This is typical of an area with high rates of residents undertaking tertiary education.

A small portion (2.7%) of residents in the locality indicated a need for assistance with core activities in the 2016 Census, less than the ACT region (12.4%). Those who were willing to volunteer for an organisation or group for over 12 months is relatively uniform across areas of influence. This shows a strong willingness for the population to support their community.

9.9.2.3 Economic Capital

Professional occupations are the top occupations within the ACT and are slightly more dominant within the locality. These knowledge-based occupations were less impacted by COVID-19 than other occupations. The locality recorded a median weekly household income of $2,222, higher than the ACT median income (ABS, 2016). This suggests a more affluent area when compared to North Canberra.

The predominant industries for employment are consistent across the ACT, and include Central Government Administration, Defence, Higher Education, and Health.

9.9.2.4 Physical Capital

Active transport is the preferred mode of transport for those who live close to the Project. This is likely linked to the large number of job opportunities within the locality. Those who work in the vicinity of the Project and live outside of the area are more likely to use public transport. Private vehicle use for commuting is higher on average across the ACT (71%) in comparisons to the locality (33.6%). This is likely linked to the centralisation of employment opportunities closer to the Canberra CBD. Households in the ACT have a greater number of car owners per household in comparison to the locality.

9.9.2.5 Natural Capital

Natural capital in the ACT mainly takes the form of bushland, lakes, rivers, or reservoirs. Many of these examples of natural capital in the ACT can act as environmental assets, capable of generating tourism and providing other social, cultural, and recreational value. Of particular note in the social area of influence is Lake Burley Griffin and surrounding foreshores, Black Mountain Nature Reserve, and the Molonglo River and surrounding foreshores.

9.9.3 Assessment of potential impacts

The SEIA identified potential and perceived socioeconomic impacts (both positive and negative) on stakeholders across the social area of influence. This included socioeconomic impacts associated with potential construction and operational impacts from other environmental aspects, which are assessed in detail in the following chapters:

- **Section 9.1**, Traffic and Transport
- **Section 9.5**, Noise and Vibration
- **Section 9.6**, Air Quality
- **Section 9.8**, Landscape and Visual Realm
- **Section 9.12**, Land Use.

9.9.3.1 Categories of social impact

The IAIA Guidelines provide for eight social impact categories (**Table 9-52**) (Vanclay, Esteves, Aucamp, & Franks, 2015). These categories have been used to broadly classify the potential and perceived socioeconomic impacts associated with the Project, noting that socioeconomic impacts may be relevant to more than one social impact category.

Table 9-52 Social impact categories

Category	Meaning
Way of life	How people live, work, play and interact with one another on a day-to-day basis.
Culture	People's shared beliefs, customs, values and language or dialect.
Community	Its cohesion, stability, character, services and facilities.
Political systems	The extent to which people are able to participate in decisions that affect their lives, the level of democratisation that is taking place, and the resources provided for this purpose.
Environment	The quality of the air and water people use; the availability and quality of the food they eat; the level of hazard or risk, dust and noise they are exposed to; the adequacy of sanitation, their physical safety, and their access to and control over resources.
Health and wellbeing	Health is a state of complete physical, mental, social and spiritual wellbeing and not merely the absence of disease or infirmity.
Personal and property rights	Whether people are economically affected or experience personal disadvantage which may include a violation of their civil liberties.
Fears and aspirations	People's perceptions about their safety, their fears about the future of their community, and their aspirations for their future and the future of their children.

9.9.3.2 Construction

The SEIA identified that the construction phase of the Project may have a socioeconomic impact on the community through the following broad impact themes:

- Changes to the road network
- Access to and use of social infrastructure and services
- Active and public transport
- Health and wellbeing
- Amenity and social character
- Economic contributions, employment, and partnerships.

Cumulative socioeconomic impacts are discussed in **Section 9.13, Cumulative Impacts**.

Changes to the road network

Temporary impacts to existing road network users due to traffic congestion during construction

Increased traffic congestion around the Canberra CBD associated with construction works was one of the most frequently commented impacts raised by community members during consultation activities. Traffic and transport impacts, and proposed mitigation measures, are discussed in **Chapter 9.1**.

Several traffic changes are anticipated during the construction phase of the Project, including temporary road closures, reduced speed limits, changes to road signalling, traffic detours, increased traffic congestion, decreased road accessibility, and increased travel times. Where local area traffic diversions are required, these generally have similar lengths to the existing routes and would therefore result in negligible increases to travel distances

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Way of life.

Although road users are likely to change their behaviours and travel patterns to avoid congestion, road closures and detours, this has the potential to impact road users' ability to move freely within the Canberra CBD, impacting on their commute to work and services such as education.

Access to and use of social infrastructure and services

Effects of temporary loss of parking on accessibility to services and business

The civic locality is the service and business hub of Canberra, with many Government departments, legal services, and community and wellbeing services clustered in a small area. Community consultation activities found that access to services is highly valued by community members and concerns were raised by several respondents to the online survey regarding the loss of access to important social infrastructure. Respondents were also concerned about the Project's impact on access to businesses and professional services, and the consequential impact of a loss of customers.

As identified in **Section 9.1**, there would be a temporary loss of carparking associated with construction of the Project. The impacts of the temporary loss of parking, combined with anticipated changes to the road network, would reduce access to existing services and businesses in the locality. This would impact residents, service provides, businesses and people who have travelled from out of area. If unmitigated, impacts could result in:

- Reduced trade for services and businesses and potential challenges for deliveries and trade
- People disconnecting with community and service providers as regular visitation may become too difficult
- Additional stress caused by construction activities for individuals or businesses who are already experiencing hardship.

Whilst traffic and parking impacts associated with the Project would be restricted to the construction period, the impact of lost trade and disconnection with community and social services may extend beyond this period. Vulnerable groups are at a higher risk of being negatively impacted by disconnecting with community and service providers, and the Project has committed to no net loss of accessible parking across the Project area.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Way of life
- Environment.

Active and public transport

Safety of pedestrians and commuters during construction

The safety of pedestrians and commuters during construction and the impact on pedestrian and cycling travel patterns is a key consideration in assessing the potential social impact of the Project, given almost 40% of the civic locality use active transport such as walking or cycling to get to work. Construction impacts such as noise, reduced lines of sight, increased vehicle movements, dust, poor wayfinding, and the introduction of temporary uneven surfaces (e.g. using hot mix to create temporary footpaths) could increase safety risks.

In terms of accessibility, cyclists and pedestrians are expected to experience some negative impacts during construction. For example, the closure of footpaths between London Circuit, Edinburgh Avenue and Constitution Avenue would require the use of alternate routes with increased travel times of up to four minutes for pedestrians.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Health and wellbeing
- Community.

Delays and changes to accessibility for users of public transport

Disruptions to bus services resulting from the construction of the Project may reduce people's ability to access other areas and increase travel times and traffic-related stress. Respondents to the online survey expressed concern that the Project would adversely impact their commute. In addition, people who use public transport to access social and community services, specifically support and legal services, within the locality are most vulnerable to these disruptions.

The Project would have a temporary impact on existing public transport routes in the area. Transport Canberra bus services travelling to/from the south generally use Commonwealth Avenue (10 routes) or Constitution Avenue (four routes) and London Circuit east to access the City Interchange. Commonwealth Avenue bus routes would be rerouted to use Vernon Circle, with an impact on:

Total bus route times (delays between one and seven minutes depending on the route)

Access to bus stops along Commonwealth Avenue and Constitution Avenue

Other routes and the broader road network due to road closures and increased traffic flow in adjacent areas, specifically increased bus traffic which tends to be slower and frequently stopping compared to other road users.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Way of life.

Health and wellbeing

Potential impacts on health and wellbeing as a result of construction activities

In reviewing the outcomes of engagement there was the perception that the health and wellbeing of the community may be impacted by pollution caused by the Project and mental stress caused by congestion, traffic delays and impacts on day-to-day commutes.

In relation to the Project, noise, odour, light pollution, vibration, and air quality are the primary source of health and wellbeing impacts associated with construction activities. Potentially vulnerable receivers include local residents, workers and people with existing chronic illnesses or a disability. Assessment of relevant areas of potential impact, as presented in this EA, have concluded that:

- Dust and air emissions during the construction phase of the Project were assessed in **Section 9.6** as being of low risk to the community with management and mitigation measures in place
- Minimal light pollution is anticipated as night works are not included in the regular program of construction works, and night works would only be undertaken when unavoidable. As the Project is in Civic, a central section of the Canberra CBD, any additional light pollution would be minimal in the context of the wider landscape
- A qualitative construction noise assessment (**Section 9.5**) identified that highly intrusive noise impacts are likely during standard work hours, associated with high noise generating equipment. Other activities, associated with structural work and finishing works, may be moderately intrusive. These impacts may be extensive for the nearest sensitive receivers to the noise generating activity. It is important to note that the construction scenarios considered sound power levels based on a worst-case 15-minute period and would likely not represent the ongoing day-to-day noise impact at sensitive receivers for an extended period of time. Construction impacts would be managed through a Noise and Vibration Management Plan, which would document all necessary measures to manage and mitigate potential noise and vibration levels and impacts during normal and out of hours construction activities.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Health and wellbeing.

Amenity and visual landscape

Changes to the aesthetic value of the existing surroundings during construction

During consultation activities, community members commented on the importance of character in their local area. This included open space, tree canopy and blue spaces associated with Lake Burley Griffin and surrounds. When asked about key strengths and assets of their local area, community members frequently commented on the value that verdant, open spaces bring to their locality.

Construction activities would temporarily change the aesthetic value of the environment surrounding the construction footprint. This is due to the visual intrusion on the landscape including associated plant, equipment and ancillary facilities, removal of existing street furniture and vegetation, as well as the installation of temporary environmental treatments such as un-landscaped batters, silt socks, and sandbags.

The Project is in Civic, a central section of the Canberra CBD. The area is characterised by commercial and high-density residential buildings. The character of the immediate visual environment is strongly influenced by existing road infrastructure, commercial and government buildings, as well as hotels and accommodation services.

An assessment of the potential impacts of construction on the visual amenity and landscape character of the locality is provided in **Section 9.8**. The visual amenity assessment concluded that during construction there would be some temporary adverse impacts at five viewpoints during construction.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Personal and property rights.

Effects on social amenity and/or way of life for nearby residents and accommodation providers associated with construction

The range of impacts outlined above has the potential to negatively impact social amenity for nearby residents and accommodation providers (local stakeholders). Any construction impacts associated with noise, odour, dust, light pollution, vibration, air quality, landscape character, and visual amenity would impact the quality of life of local stakeholders. There is the potential for one or more of these impacts to occur simultaneously, cumulatively impacting the social amenity in the locality. It is also important to note that different stakeholders would experience different impacts associated with reduced social amenity.

<u>Residents</u>

There are a range of potential wellbeing impacts for residents associated with decreases in social amenity. Social amenity impacts may go beyond health, impacting how residents interact, move, and live in the locality, overall impacting their way of life. Examples include:

- Residents may stop having friends and family over to their home due to noise and dust impacts, restricting their ability to socialise
- Residents may stop exercising locally due to dust, access, or visual amenity impacts, impacting both their health and appreciation for their local community
- Residents may find it harder to work or study from home due to increased noise, impacting their quality of work and restricting when/where they work.

Considering the young age of the resident profile in the locality and the high proportion of residents who work and/or study, it is likely that work and study can be undertaken in other spaces (such as workspaces and universities) other than the home. This may overall reduce the exposure of residents to day-time construction activities, pending how COVID-19 responses may impact future work and study arrangements.

<u>Accommodation providers</u>

Within the locality there are a range of accommodation providers. Reduced social amenity may impact customer experience, and in turn reflect poorly on accommodation providers. Negative customer experiences could impact accommodation providers in the medium- and long-term through a

combination of complaints and repeated negative reviews on sites such as Google, TripAdvisor and Hotels.com. This could:

- Reduce repeat business
- Deter future customers.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Health and wellbeing.

Economic contributions, employment, and partnerships

Increased employment and training opportunities and regional expenditure

Positive opportunities associated with the Project were raised by stakeholders during consultation. In this regard, it was suggested that economic activity associated with the Project should have maximum benefit for locals, with as much employment and commercial opportunity as possible retained within Canberra.

The Project would provide new employment and training opportunities for workers, contractors, and developers. Construction operations specifically make a significant economic contribution to local communities through:

- Employment (direct impact)
- Business expenditure (direct impact)
- Employee household expenditure (indirect impact).

An employee's expenditure on goods and services occurs largely within their local communities. Research undertaken in 2015 found that almost one in three Australians purchased food and/or beverages during their workday/commute at least once a week while almost a quarter of Australians (22 per cent) said they purchase food and beverages every day.

Economic benefits would be enhanced by the adoption of a Local Procurement Policy by MPC. A Local Procurement Policy which focuses on using trade and materials from within Canberra, and more broadly, the ACT, would ensure the Project spend is captured in the region. The implementation of such enhancement measures would result in a positive socioeconomic impact.

From a socioeconomic perspective, this would beneficially impact on the following social impact categories:

- Way of life
- Personal and property rights.

Lack of trust in decision making, including the perceived lack of positive benefit/need

A key theme which emerged from community consultation activities was the perception that the Project financial investment was not justified. Discontent with Government decisions, such as infrastructure expenditure, can lead to impacts on local communities. The perception that people have not been heard or consulted with on major projects can impact opposed individuals by:

- Causing additional stress, fear and/or anxiety about an anticipated project and associated changes
- Fostering negative emotions about a project, consequently intensifying the experience of negative impacts caused by the project
- Generating a sense of disempowerment and disconnect within the community.

As detailed in **Section 2.1**, the Project is proposed as one of a series of major projects being planned and delivered in a coordinated and holistic way to give effect to the strategic planning and development vision in the National Capital Plan for Canberra City and its surrounds.

From a socioeconomic perspective, this has the potential to adversely impact on the following social impact categories:

- Political systems.

9.9.3.3 Operation

The SEIA identified that the operation phase of the Project may impact the local community through the following broad impact themes:

- Changes to the road network
- Active and public transport
- Amenity and social character.

Changes to the road network

Improved public safety resulting from permanent changes to the existing road network

The Project is expected to increase road safety once completed by:

- Minimising the number of crashes related to ramp merges
- Providing a lower speed environment along Commonwealth Avenue
- Providing separated off-road cycleways
- Providing separated pedestrian and cycle paths.

In terms of permanent loss of parking, there would be a total loss of 50 long stay carparks on London Circuit east, with the existing local car park network having the capacity to absorb the demand generated.

From a socioeconomic perspective, this would beneficially impact on the following social impact categories:

- Surroundings.

Active and public transport

Improved accessibility and connectivity for cyclists and pedestrians throughout the city

There were several respondents to the online survey who were concerned that the Project would have a negative impact on accessibility and connectivity for cyclist and pedestrians, due to the potential for additional traffic conflicts and the perceived steep gradient to cross Commonwealth Avenue. These perceptions are likely the result of the lack of detailed design information available to the public at the time.

The Project would provide supporting infrastructure for pedestrians and cyclists. Connectivity improvements associated with the Project would also contribute to the city-wide active transport network, further strengthening connections within the city and between the city and other key destinations. This would benefit residents in the locality as well as commuters who use active transport methods to get to work.

The Project would reduce the dominance of cars through London Circuit east by allocating more space for walking, cycling and future public transport infrastructure. These benefits were reflected in the responses received to the online survey; respondents saw the removal of the clover leaf ramps and development of the Project as an opportunity to create a better pedestrian and cyclist-friendly environment.

From a socioeconomic perspective, this would beneficially impact on the following social impact categories:

- Community.

Enabling future transport infrastructure, such as Canberra Light Rail

Public transport is a strategic priority for the ACT Government. Strategies, such as the ACT Transport Recovery Plan 2021, identify a vision where Canberrans can move around easily and sustainably without needing to rely on their cars. Both the Project and the City to Commonwealth Park component of the Light Rail to Woden project are identified in the Strategy as key future projects, central to delivering the ACT Transport Recovery Plan 2021.

The Project would future-proof the transport network by providing infrastructure that responds to current needs and also provides strategic capacity for future growth as development continues. The Project would directly facilitate the delivery of the Canberra Light Rail network extension from its current terminus on Northbourne Avenue, near Alinga Street, along London Circuit and Commonwealth Avenue and southward to Woden.

Engagement activities identified varying levels of Project understanding within the community. Some community members are highly aware of the interface between the Project and the City to Commonwealth Park Light Rail project, while others did not understand the purpose of the Project or its future public transport integration. MPC will continue to engage with the community and stakeholders on the Project during the assessment and approvals process, and during the construction period. Future engagement will continue to be integrated with Light Rail to Woden, including the City to Commonwealth Park component, to ensure consultation is timely and targeted, and to deliver engagement activities in a coordinated manner.

From a socioeconomic perspective, this would beneficially impact on the following social impact categories:

- Way of life
- Community.

Amenity and visual landscape

Improvements to the aesthetic value of the area by creating an attractive and active public space for people to experience

Changes to the visual landscape were raised by a small number of respondents during consultation in terms of the removal of existing landscaping. Green and recreation spaces are highly valued by communities and identified as desirable community characteristics in respondents to the online survey.

While areas of the construction footprint would be re-landscaped upon completion, there is an amenity impact between when landscaping is removed and until the new landscaping is mature and well established. **Section 9.8** indicates that increased tree screening and landscaping would provide an overall net positive benefit in the long term.

Section 9.8 notes that improved landscaping and the Project's design both align with the strategic vision for the area. The proposed increase in vegetation is expected to soften the view of the Project. **Section 9.8** also notes that the Project has been flagged in strategic documents, making the visual changes part of the future vision for the area, and consequently part of the character of the local area. These longer-term operational benefits would strongly align with community values.

From a socioeconomic perspective, this would beneficially impact on the following social impact categories:

- Personal and property rights.

9.9.4 Preliminary Impact Assessment

A preliminary assessment of potential socioeconomic impacts, without mitigation measures, is presented in **Table 9-53** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-53 Summary of potential and perceived socioeconomic impacts and preliminary risk assessment

Social impact theme	Impact to people	Likelihood	Consequence	Risk rating
Construction				
Changes to road network	Temporary impacts to existing road network users due to traffic congestion during construction	Likely	Moderate	High
Access to and use of social infrastructure and services	Effects of temporary loss of parking on accessibility to services and business	Almost Certain	Moderate	Very High
Active and public transport	Safety of pedestrians and commuters during construction	Likely	Moderate	High
	Delays and changes to accessibility for users of public transport	Almost Certain	Moderate	Very High
Health and wellbeing	Potential impacts on health and wellbeing as a result of construction activities	Likely	Moderate	High
Amenity and visual landscape	Changes to the aesthetic value of the existing surroundings during construction	Likely	Minor	Medium
	Effects on social amenity and/or way of life for nearby residents and accommodation providers associated with construction	Likely	Moderate	High
Economic contributions, employment, and partnerships	Increased employment and training opportunities and regional expenditure	N/A	N/A	Beneficial
	Lack of trust in decision making, including the perceived lack of positive benefit/need	Likely	Minor	Medium
Operation				
Changes to road network	Improved public safety resulting from permanent changes to the existing road network	N/A	N/A	Beneficial
Access to and use of social infrastructure and services	Effects of permanent loss of parking (approximately 50 spaces) on accessibility to services and business	Unlikely	Minor	Very Low
Active and public transport	Improved accessibility and connectivity for cyclists and pedestrians throughout the city	N/A	N/A	Beneficial

Social impact theme	Impact to people	Likelihood	Consequence	Risk rating
	Enabling future transport infrastructure, such as Canberra Light Rail	N/A	N/A	Beneficial
Amenity and social character	Improvements to the aesthetic value of the area by creating an attractive and active public space for people to experience	N/A	N/A	Beneficial

9.9.5 Management and mitigation measures

Mitigation measures are proposed to reduce the potential socioeconomic impacts of the Project to the greatest extent practicable. The relevant management measures and safeguard protocols are provided in **Table 9-67**, and have been prepared with the following objectives:

- To minimise the duration of impactful construction works
- Work with the community optimise construction activities and leverage identified opportunities wherever possible
- To ensure that key project information is publicly available and easy to find
- Ensure effective management of complaints and proactively address work practices to minimise complaints
- Ensure pedestrian and cyclists are notified in advance of any changes to access and movement arrangements
- Enable and support the involvement of local industry in the Project
- Implement continuous improvement culture to the management of social impacts
- Establish effective and mutually agreeable interface agreements with adjacent stakeholders.

The SEIA also identified that management and mitigation measures implemented across other aspects would have beneficial flow-on effects regarding socioeconomic impacts. These management and mitigation measures have been detailed in the following sections:

- **Section 9.1**, Traffic and Transport
- **Section 9.5**, Noise and Vibration
- **Section 9.6**, Air Quality
- **Section 9.8**, Landscape and Visual Realm
- **Section 9.12**, Land Use
- **Section 9.13**, Cumulative Impacts.

Table 9-54 Management and mitigation measures – Socioeconomic

Ref	Management and mitigation measure	Timing	Reference
SE1	The construction program will be reviewed quarterly and opportunities to consolidate and shorten the duration of impactful work will be explored in consultation with MPC.	During construction	-
SE2	A **Communications Strategy** will be prepared to facilitate Project communication with the community generally, and relevant government	Prior to and during construction	IAP2 Public Participation

Ref	Management and mitigation measure	Timing	Reference
	authorities, adjoining affected landowners and businesses. The strategy will include a summary of known negotiable and non-negotiable issues and be compiled through active stakeholder involvement and participation. The Communication Strategy will be reviewed at least every six months to ensure adequacy and relevancy.		Spectrum ('Collaborate')
SE3	Communication materials, including non-negotiable issues identified through the **Communications Strategy**, will be made available on the Project website.	Prior to and during construction	IAP2 Spectrum of Public Participation ('Inform')
SE4	The following communications channels and support will be available to manage community enquiries and complaints: • A 24-hour toll-free telephone number for the registration of complaints and enquiries about the Project (when Project works are occurring) • A postal address to which written complaints and enquires may be sent • An email address to which electronic complaints and enquiries may be transmitted • A mechanism for community members to make enquiries in common community languages of the area.	During construction	-
SE5	A grievance process for the community to raise comments, questions and complaints must be established prior to construction commencing. The grievance process must be made publicly available and must include a feedback process through which the complainant is provided with information relating to how their concern has been assessed, considered, and where feasible, addressed.	During construction	-
SE6	Where necessary light pollution, noise, vibration, and air quality monitoring and investigation will be undertaken in response to complaints.	During construction	-
SE7	Clear and safe pedestrian and cyclist signage and wayfinding mechanisms will be in place prior to works commencing that would change access and movement arrangements through the Project delivery phase area.	Prior to and during construction	IAP2 Spectrum of Public Participation ('Inform'); Hea-2 ISC IS Rating Tool 1.2
SE8	To the greatest extent practicable, procurement activities associated with the Project will prioritise the use of trade and materials from within the local region.	Prior to and during construction	Canberra Regional Local Industry Participation Policy
SE9	Develop and implement a **Social Impact Management Plan** (SIMP) to monitor and evaluate effectiveness of (and where necessary adjust) proposed mitigations and management measures.	During construction	G5; Hea-1 ISC IS Rating Tool 1.2
SE10	Continue to engage stakeholders with site and operationally specific needs and complex Project interface.	Prior to and during construction	-

9.9.6 Residual Impacts

A residual risk assessment was undertaken to assess the remaining risk that the Project poses to socioeconomic values after the proposed management and mitigation measures are applied, presented in **Table 9-55**.

Overall, the Project is anticipated to cause temporary negative socioeconomic impacts during the construction phase of the Project, but would have beneficial socioeconomic impacts for residents and the community in the long-term.

Table 9-55 Residual risk assessment for socioeconomic

Social impact theme	Impact to people	Likelihood	Consequence	Risk rating
Construction				
Changes to road network	Temporary impacts to existing road network users due to traffic congestion during construction	Possible	Moderate	**Medium**
Access to and use of social infrastructure and services	Effects of temporary loss of parking on accessibility to services and business	Almost certain	Minor	**High**
Active and public transport	Safety of pedestrians and commuters during construction	Unlikely	Minor	**Very Low**
	Delays and changes to accessibility for users of public transport	Almost Certain	Insignificant	**Medium**
Health and wellbeing	Potential impacts on health and wellbeing as a result of construction activities	Possible	Moderate	**Medium**
Amenity and visual landscape	Changes to the aesthetic value of the existing surroundings during construction	N/A	N/A	**Beneficial**
	Effects on social amenity and/or way of life for nearby residents and accommodation providers associated with construction	Possible	Minor	**Low**
Economic contributions, employment, and partnerships	Increased employment and training opportunities and regional expenditure	N/A	N/A	**Beneficial**
	Lack of trust in decision making, including the perceived lack of positive benefit/need	Possible	Minor	**Low**
Operation				
Changes to road network	Improved public safety resulting from permanent changes to the existing road network	N/A	N/A	**Beneficial**
Access to and use of social infrastructure and services	Effects of permanent loss of parking (approximately 50 spaces) on accessibility to services and business	Unlikely	Minor	**Very Low**
Active and public transport	Improved accessibility and connectivity for cyclists and pedestrians throughout the city	N/A	N/A	**Beneficial**

Social impact theme	Impact to people	Likelihood	Consequence	Risk rating
	Enabling future transport infrastructure, such as Canberra Light Rail	N/A	N/A	**Beneficial**
Amenity and social character	Improvements to the aesthetic value of the area by creating an attractive and active public space for people to experience	N/A	N/A	**Beneficial**

9.10 Surface water and hydrology

This chapter provides a summarised assessment of the hydrology and water quality impacts associated with the Project.

9.10.1 Approach

This chapter is based on information from the Hydrology and Water Quality Impact Assessment prepared by AECOM in August 2021 for the Project. The full version of this assessment is provided in **Appendix I (Hydrology and Water Quality Assessment).**

The following approach was adopted to assess potential hydrology and water quality impacts associated with the Project:

- Data collection and review
- Establishment of methodology
- Existing environment modelling and analysis
- Construction and operational impact assessments
- Development of mitigation and management measures
- Determination of residual impacts.
- Information from flood modelling undertaken for the Canberra Light Rail City to Commonwealth Park component of the Light Rail to Woden project was utilised for this assessment. The flood models were updated to represent existing conditions in the catchment and incorporating current Project design.

This impact assessment adopts:

- The Watershed Bounded Network Model (WBNM) to provide inflows to the TUFLOW (hydraulic modelling software) to predict flood behaviour.
- Australian Rainfall Runoff 2019 (ARR2019) methodology (Geoscience Australia, 2019).
- The Model for Urban Stormwater Improvement Conceptualisation (MUSIC) software, industry leading tool for water sensitive urban design which estimates pollutant loads generated by development and assesses effectiveness of the recommended mitigation measures.
- Hydrological data obtained from the ARR2019 Datahub, including rainfall intensity-frequency-duration (IFD) data, rainfall temporal patterns and loss rates.
- Road design data developed as part of this Project was also incorporated where available.

Scenarios assessed in this chapter refer to Annual Exceedance Probability (AEP), specifically:

- 1% AEP: A flood with a one in a 100 chance of being exceeded in any year
- 5% AEP: A flood with a one in a 20 chance of being exceeded in any year.

Sensitivity analysis for climate change was undertaken for all catchments to assess the potential impacts on flood behaviour. An increase in rainfall intensity of 20% was conservatively adopted in the modelling. This rainfall increase was assessed for the 5% and 1% AEP events.

Sensitivity analysis for potential blockage of the stormwater network was undertaken for the 1% AEP event by assuming a blockage of 20% for on-grade and 50% for sag pit capacities.

9.10.2 Existing environment

The Project would be located within the Canberra Centra Business District (CBD) with a catchment of approximately two kilometres. Stormwater runoff from the catchment predominantly flows in a southerly direction where it enters a system of underground stormwater pipes, discharging at various outlets into Lake Burley Griffin.

9.10.2.1 Flood extents, levels and depths

Figure 9-17 and Figure 9-18 show the flood extents and depths for the existing 5% AEP and 1% AEP design flows respectively. The existing stormwater drainage network generally has sufficient capacity to convey the existing 5% AEP design flow. For the 1% AEP design event, there are more flood affected areas.

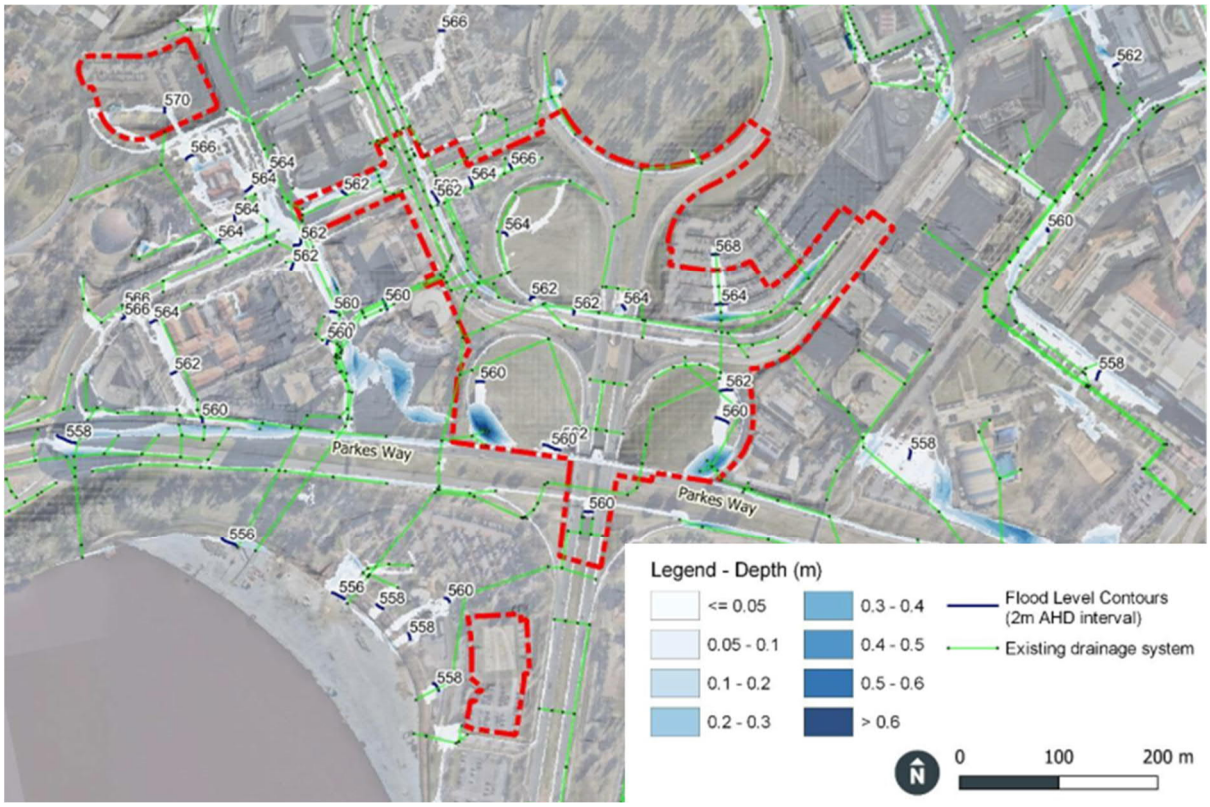

Figure 9-17 Existing conditions 5% AEP flood extents, levels and depths

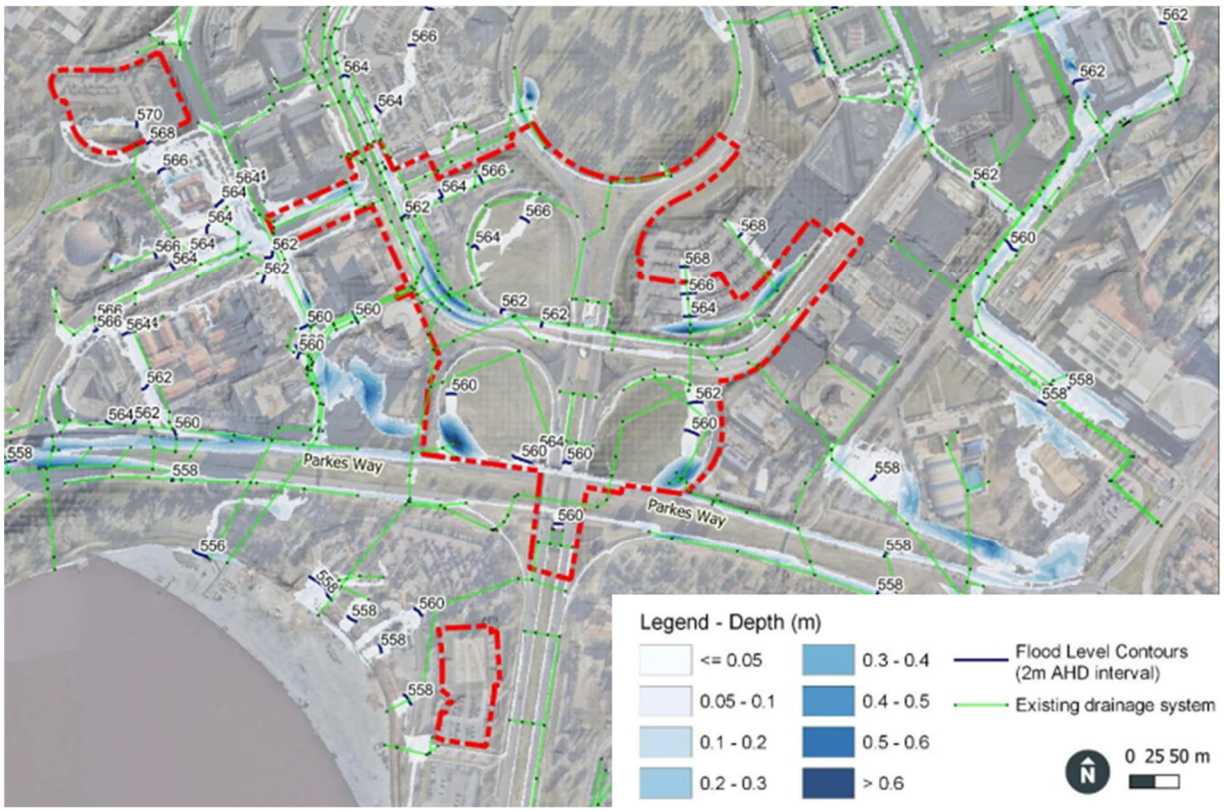

Figure 9-18 Existing conditions 1% AEP flood extents, levels and depths

9.10.2.2 Sensitivity to climate change

The range of flow depth increase, or afflux, due to climate change related increase in rainfall intensity of 20% is summarised below.

For areas within the Project construction footprint, increases in flood depths of more than 50 mm due to climate change were identified at:

- For the 5% AEP event, five locations
- For the 1% AEP event, three locations.

For areas outside of the Project boundary, increases in flood depths of more than 50 mm due to climate change were identified at:

- For the 5% AEP event, one location
- For the 1% AEP event, two locations.

The results indicate climate change poses minor localised impacts to the existing conditions and is not considered significant on existing flood behaviour.

9.10.2.3 Sensitivity to blockage

The potential impact of blockage on the flood behaviour was assessed for the 1% AEP event. The results are summarised below.

For areas within the Project construction footprint, the following changes to flood depth from blockage were identified by modelling:

- An increase in flood depth of up to 40 mm at five locations
- A decrease in flood depth of 10 mm or more at two locations.

For areas outside the construction footprint, the following changes to flood depth from blockage were identified by modelling:

- An increase in flood depth of up to 10 mm at three locations
- A decrease in flood depth of 10 mm or more at one location.

The modelling indicated that the flood levels, depths and extents with blockage are not significantly different to the existing conditions.

9.10.2.4 Flood hazard

ARR2019 classifies flood hazard in accordance with the Australian Disaster Resilience Handbook (2017). This specifies six categories of hazard, as shown in **Table 9-56**.

Under existing catchment and drainage conditions within the construction footprint and surrounds, all 5% and 1% AEP events pose low flood hazard, H1 classification, meaning it is generally safe for vehicles, people and buildings.

Table 9-56 Hazard classification

Hazard vulnerability classification	Description
H1	Generally safe for vehicles, people and buildings
H2	Unsafe for small vehicles
H3	Unsafe for vehicles, children and the elderly
H4	Unsafe for vehicles and people
H5	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure
H6	Unsafe for vehicles and people. All building types considered vulnerable to failure

9.10.3 Assessment of potential impacts

9.10.3.1 Construction

Hydrology impacts

Where impervious surfaces are increased during construction or temporary works, the volume of runoff from the site would increase due to a reduction in ground surface infiltration. Without mitigation, this would result in increased peak flows from the site and the potential for associated flood impacts downstream.

The Project would include substantial and large-scale earthworks, which would modify drainage direction and overland flow paths, changing the nature of flooding on site. There is potential for large quantities of sediment to be directed into the network of temporary drainage as it is progressively constructed. If not appropriately managed, this would result in blockage of the on-site stormwater management network, reducing its effectiveness and increasing the likelihood of flow breakouts and overland flow paths with the effect of causing on-site flooding or flooding downstream.

Water quality impacts

Construction activities associated with the Project have the potential to impact on surface water quality and flow. These activities may include:

- Removal of trees
- Stripping, stockpiling and reuse of topsoil
- Utilities treatments requiring excavating ground and stockpiling spoil onsite
- Earthworks

- Installation of stormwater drainage new utilities, road pavements, hard and soft landscaping
- Temporary works, including sheet pilling to support existing earth and terrain, diversions of water, erosion and sediment controls and construction of crane pads
- The construction and operation of temporary compounds that would comprise the construction site office and worker amenities, equipment and material storage, temporary storage of waste, chemical and fuel storage and storage of construction plant and parking for light and heavy vehicles.

The Project may indirectly impact on nearby waterways as the construction footprint is drained by a stormwater pipe network which ultimately discharges to Lake Burley Griffin. There is potential for the water quality of the lake to be impacted by the Project during construction, such as during run-off or flood events where potential contaminants from spills and leaks of plants and equipment may be washed from the construction footprint into the lake. There is also the potential for disturbed soil during construction to increase sediment load runoff which can mobilise nutrients and potential contaminants which may be present in the soil, disrupting downstream aquatic habitats and potentially supporting algal blooms.

With standard mitigation measures in place, construction is not anticipated to have any significant impact on existing water quality in the receiving waters downstream of the site. Any exceedances would likely be localised and short term.

9.10.3.2 Operation

Hydrology impacts

The following assessment of operational impacts must be considered in the context of the Project extent. Flood impact mitigation in the existing environment is constrained by the size of surrounding drainage infrastructure. Although all drainage infrastructure associated with the Project has been sized such that full mitigation of flooding impacts, including for the climate change scenario, can be achieved, this requires upgrade of drainage infrastructure outside the Project extent by others in the future.

The Project involves upgrading the existing stormwater network to cater for flow characteristic changes to mitigate any potential adverse drainage impacts during operation of the Project. This upgrade is designed to cater for up to 1% AEP events. The results indicate that the performance of the drainage system is significantly improved under the proposed conditions, with the upgraded drainage system in place.

Decreases in flood depths of more than 50 mm due to the upgraded drainage system were identified at:

- For the 5% AEP event, eight locations
- For the 1% AEP event, nine locations.

Increases in flood depths of more than 50 mm due to the upgraded drainage system were identified at:

- For the 5% AEP event, one location
- For the 1% AEP event, one location.

Of the areas which are predicted to flood during 5% and 1% AEP events, these are found to have a low flood hazard meaning it would be generally safe for vehicles, people and buildings in accordance with ARR2019. This is similar to existing conditions.

With consideration of a climate change related increase in rainfall intensity of 20%, the upgraded drainage system would result in a more resilient Project to climate change, compared to the existing conditions. For a 5% AEP scenario, 24 locations have been modelled to have a reduction in flood depth of 10 mm or more, when compared to the existing (with climate change) scenario. For a 1% AEP scenario, 16 locations have been modelled to experience this reduction.

Similarly, the Project, with the upgraded drainage system in place, would be more resilient to blockage compared to that under existing conditions. Modelling has indicated that 23 locations would experience a reduction in flood depth of 10 mm or more, when compared to existing conditions.

Water quality impacts

Stormwater treatment has been incorporated into the Project design, with a minimum target of no increase in pollutant loads as a result of the Project (neutral or beneficial effect).

Potential contaminants include general litter and waste, sediment, minor discharges of hydrocarbons from vehicles (such as engine oil leaks), and wear products from vehicle parts (such as tyres and brakes). Potential contaminants would build up on impervious surfaces over time and during rainfall events may end up discharged into the environment.

To mitigate any potential impacts associated with increased contaminant loads entering Lake Burley Griffin via the stormwater network, permeable landscaping and passive irrigation (directing runoff from paved areas to areas where water can infiltrate into the landscape soils) have been incorporated into the design of the Project. MUSIC modelling indicates that with these measures in place, the potential pollutant loads discharged by the Project to the Lake would be reduced compared with existing conditions.

9.10.4 Preliminary risk assessment

A preliminary assessment of potential noise and vibration impacts, without mitigation measures, is presented in Table 9-57 below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-57 Preliminary risk assessment for hydrology and water quality

Description	Pre-mitigation risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Impacts to the frequency and / or extent of flooding events	Possible	Minor	**Low**
Impacts to the water quality discharged through the stormwater network to Lake Burley Griffin	Possible	Minor	**Low**
Operation Phase			
Impacts to the frequency and / or extent of flooding events	N/A	N/A	**Beneficial**
Impacts to the water quality discharged through the stormwater network to Lake Burley Griffin	N/A	N/A	**Beneficial**

9.10.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of a potential hydrology and water quality impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-58**, and have been prepared with the following objectives:

- To ensure that the Project contributes to the long-term resilience of the stormwater network to projected climate changes impacts
- Collect relevant information to establish project performance in maintaining local water quality values
- Ensure that Water Sensitive Urban Design measures continue to work effectively throughout operation.

The development of a Soil and Water Management Plan, and implementation of effective erosion and sediment control measures, is discussed in **Section 9.4**.

Table 9-58 Management and mitigation measures – Surface water and hydrology

Ref	Management and mitigation measure	Timing	Reference
WH1	Within the Project area, stormwater infrastructure would be sized to account for projected climate change, consistent with TCCS standards, and enable future downstream network augmentation to be completed by others.	Prior to and during construction	MIS08 Stormwater
WH2	A water quality monitoring program would be developed to establish baseline surface water quality prior to construction and to identify impacts associated with the construction phase of the Project. Monitoring locations would be identified during detailed design for receiving waters potentially affected by the Project.	Prior to and during construction	-
WH3	Detailed asset handover information would be developed to describe: • The function of porous paving and how it is to be maintained in accordance with manufacturer's instructions to maintain permeability • The passive irrigation infrastructure and how it is to be maintained to keep it free of blockage.	During construction and operation	-

9.10.6 Residual impacts

A residual risk assessment was undertaken to assess the potential hydrology and water quality impacts after the proposed management and mitigation measures are applied, presented in **Table 9-59**. No significant residual impacts are anticipated.

Table 9-59 Residual risk assessment for hydrology and water quality

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction Phase			
Impacts to the frequency and / or extent of flooding events	Unlikely	Minor	**Very Low**
Impacts to the water quality discharged through the stormwater network to Lake Burley Griffin	Unlikely	Minor	**Very Low**
Operation Phase			
Impacts to the frequency and / or extent of flooding events	N/A	N/A	**Beneficial**
Impacts to the water quality discharged through the stormwater network to Lake Burley Griffin	N/A	N/A	**Beneficial**

9.11 Resource management and waste minimisation

This chapter provides an overview and assessment of the potential waste impacts and benefits associated with the construction and operation of the Project.

9.11.1 Approach

Resource use and waste impacts associated with the Project have been assessed qualitatively by reviewing likely resource consumption and waste streams during construction and operation. This chapter documents the Project's commitment to better waste management, in accordance with the ACT Waste Management Strategy 2011-25 (Environment, Planning and Sustainable Development Directorate, 2011), through the identification of opportunities to:

- Relieve pressure on raw materials through the reuse of and recycling of material
- Ensure Canberra remains a clean safe place to live and enjoy through reduced litter, best practice hazardous waste management and the provision of safe landfill as an option of last resort. This includes identification of options for avoiding, mitigating and managing major waste streams in accordance with the waste hierarchy (**Figure 9-19**).

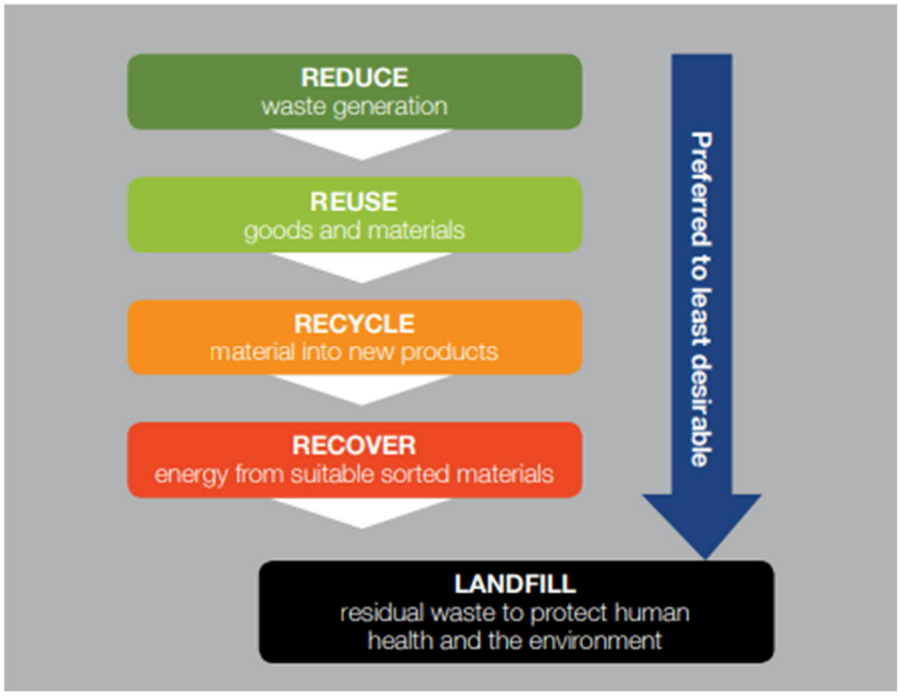

Figure 9-19 ACT Waste Hierarchy (Environment, Planning and Sustainable Development Directorate, 2011)

9.11.2 Assessment of potential impacts

The following provides a preliminary risk assessment of the potential impacts of the project relating to resources and waste. The risk has been assessed using the methodology detailed in **Chapter 8.0**.

9.11.2.1 Construction

The construction methodology for the Project is provided in **Chapter 4.0. Table 9-60** identifies the likely resources required during the construction period. The Project would seek to minimise the requirement for new materials as far as practical, through reuse and recycling of materials from demolition, clearing and grubbing activities. Examples of proposed reuse and recycling measures are provided in **Table 9-61**, and the Project would continue to explore opportunities to reuse materials onsite, where practicable.

Table 9-60 Resources and materials required

Resource	Description
Construction	
Fill material	The main embankment would require the importation of around 60,000 m^3 of fill material, including: • Around 54,000 m^3 of bulk general fill to form the majority of the main embankment • Around 6,000 m^3 of other materials, including controlled road base (roads), controlled fill (verges), pavers and asphalt, and topsoil (landscaped areas).
Road pavements	Preconditioned manufactured road base material Asphalt to form the final road pavement.
Kerbs and gutters	Concrete.
Ancillary	Active transport infrastructure, permanent drainage and utilities works Lighting and street furniture Landscaping materials.
General	
Potable water	In addition to the requirement for construction materials, daily activities would require the consumption of potable water, electricity and fuel.
Electricity	
Fuel	

Table 9-61 Proposed materials reuse and recycling

Activity	General measures
Demolition of bridges and retaining walls	• Minimise demolition efforts i.e. leaving in place foundations, and not impacting permanent works where practical • The following materials would be recycled either onsite or taken to a facility that is capable of recycling that material - Concrete - Steel (including steel rails, and reinforcement separated from concrete).
General demolition	• Gravel pavements would be reused onsite in service trench backfill, and select material would be reused in new pavements • Excavated material from services would be incorporated into earthworks to minimise the export of material and import of additional materials • The following materials would be recycled either onsite on taken to a facility that is capable of recycling that material - Concrete - Steel and copper - Asphalt - Steel streetlights - Concrete pipes.
Clearing and grubbing	Vegetation material would be mulched and stockpiled for reuse onsite or at other locations. Where this is not feasible, it would be transported for use at alternative sites. In the instance that significant environmental weeds or pathogens are identified in any vegetation material, this would be removed from site to undergo any required treatment prior to being directed to reuse or waste, as appropriate.
Domestic recyclable waste	Domestic recyclable waste would be disposed of via mixed recycling bins.

The construction of the Project would generate various waste streams (**Table 9-62**). As noted in **Table 9-61**, the Project would seek to reuse and recycle material where practicable. Where storage and / or disposal of waste is required, this would be managed in accordance with a Project-specific CEMP.

The environment has the potential to be impacted if waste is not stored / disposed appropriately, resulting in uncontrolled release of waste products to the environment and inadvertent contamination of on-site soil, groundwater and surface water.

Table 9-62 Waste generated

Waste	Description
Demolition waste	Concrete, steel, asphalt, copper, and gravel.
General construction waste	Off-cuts, packaging, and excess construction material (such as concrete, timber, plastic and metal).
Green waste	Organic waste from vegetation clearing.
Hazardous substances	Excess flammable liquids (e.g. fuels and oils) and excess corrosive substances (e.g. paints, chemicals and cement).
Domestic waste	Food scraps, glass and plastic bottles, paper and plastic containers from site personnel.
Wastewater	Site run-off, water used to control dust, and slurry from vacuum excavation trucks.
Spoil	Excess fill material, including virgin excavated natural material (VENM) and material for beneficial reuse (BRU)[1].

[1] Note: material destined for removal off site would be tested and classified in accordance with EPA guidelines to allow for the most efficient re-use of material where possible.

Management and mitigation measures to minimise potential impacts are provided in **Section 9.11.4**.

9.11.2.2 Operation

Resource consumption and waste generation during the operational phase of the Project are anticipated to be minimal and limited to maintenance activities.

Resource consumption may include materials required for repair and maintenance of the roadway, ancillary infrastructure, and street furniture. Waste generated during operation of the Project may include green waste from vegetation maintenance on verges and medians. This is not considered to be significant and would not differ greatly from the current maintenance activities required in the construction footprint.

9.11.3 Preliminary risk assessment

A preliminary assessment of potential resource use and waste impacts, without mitigation measures, is presented in **Table 9-63** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-63 Preliminary risk assessment for resource management and waste minimisation

Description	Preliminary risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Uncontrolled release of waste products to the environment and inadvertent contamination of on-site soil, groundwater and surface water resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Possible	Minor	**Low**
Industrial / construction / demolition waste, including hazardous chemicals, are stored or disposed of incorrectly, causing contamination, resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Possible	Moderate	**Medium**
Waste generated during construction that could be disposed of outside landfill reaches landfill resulting in the generation of unnecessary waste.	Possible	Minor	**Low**
Contaminated fill material is brought on site resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Possible	Moderate	**Medium**

9.11.4 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of resource use and waste impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-64**, and have been prepared with the following objectives:

- Minimise additional pressure on the ACT waste and resource management facilities.

Table 9-64 Management and mitigation measures – Resources and waste

Ref	Management and mitigation measure	Timing	Reference
RM1	A **Resource and Waste Management Plan** (RWMP) would be prepared prior to construction commencing that details strategies to apply the waste hierarchy (avoid, minimise, re-use, recycle, dispose) during construction.	Prior to and during construction	ACT Waste Management Strategy 2011–2025
RM2	Where green waste from vegetation removal cannot be reused on site, reuse on other sites would be investigated prior to disposal.	During construction	-
RM3	Worksites would be maintained in a tidy state, and all general litter would be appropriately disposed of, and recycled where possible.	During construction	-
RM4	Waste generated from the construction of the Project would be transported to an appropriately licenced waste disposal or transfer facility. Where required, this would include using a licensed contractor to remove regulated waste, under current ACT EPA Guidelines.	During construction	Environment Protection Act 1997 (and Regulation) and accompanying Environment Protection Policies

Ref	Management and mitigation measure	Timing	Reference
RM5	All waste disposal would be monitored and recorded including volumes and categories of waste, transport and end point. This would be reviewed annually by a qualified professional.	During construction	-
RM6	Hazardous chemicals and other volatile construction waste would be stored in accordance with the Dangerous Substances Act 2004.	During construction	-

9.11.5 Residual risk assessment

A residual risk assessment was undertaken to assess potential resource use and waste impacts after the proposed management and mitigation measures are applied, presented in **Table 9-65**. No significant residual impacts are anticipated.

Table 9-65 Residual risk assessment for resource use and waste management

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Uncontrolled release of waste products to the environment and inadvertent contamination of on-site soil, groundwater and surface water resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Unlikely	Minor	**Very Low**
Industrial / construction / demolition waste, including hazardous chemicals, are stored or disposed of incorrectly, causing contamination, resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Unlikely	Moderate	**Low**
Waste generated during construction that could be disposed of outside landfill reaches landfill resulting in the generation of unnecessary waste.	Unlikely	Minor	**Very Low**
Contaminated fill material is brought on site resulting in the generation of waste that must be removed off site and disposed of at an appropriate facility.	Unlikely	Moderate	**Low**

9.12 Land use

This chapter provides an overview and assessment of the potential land use impacts and benefits associated with the construction and operation of the Project.

9.12.1 Approach

The legislative and strategic planning context of the Project and the site is considered in **Section 2.1** and **Chapter 6.0** of this Environmental Assessment, and detailed further in the Works Approval Planning Report (Canberra Town Planning, 2021)prepared to support the application for a Works Approval for the Project.

The assessment of land use impacts and benefits involved:

- An analysis of existing land uses within the construction footprint of the Project and its surrounds
- Identification and consideration of potential future developments near the construction footprint to understand likely future land use changes

- An assessment of potential implications for existing and likely future land uses arising from the Project's construction and operation
- Identification of measures to avoid or manage and mitigate potential impacts on land use and enhance opportunities for future land use
- Review of ACTmapi (ACT Government, 2021).
- An assessment of the Project against planning policy has been undertaken in the Works Approval Planning Report (Canberra Town Planning, 2021), and briefly summarised in this chapter.

9.12.2 Existing environment

Land use in the area immediately surrounding the construction footprint is characterised by a CBD setting, transitioning to residential dwellings further to the north. Immediately to the south is Lake Burley Griffin, with land use further south being commercial, industrial and residential. The nearest nature reserves to the construction footprint are located at the Black Mountain reserve 2 km to the west and the Mt Ainslie reserve 2 km to the east. Further east and west are open plains which transition into the mountainous areas of the Brindabella ranges to the west and the Kowen escarpment including Mount Reedy to the east.

The Project would involve works on the following land types:

- Unleased National Land within the Commonwealth Avenue road reserve, including the existing crossing of London Circuit
- Unleased Territory Land under the custodianship of Transport Canberra and City Services (TCCS – Roads ACT), including all other parts of London Circuit (other than the land crossed by Commonwealth Avenue) between Edinburgh Avenue and Constitution Avenue
- Unleased Territory Land under the custodianship of the City Renewal Authority (CRA), including the section 63 carpark and Action Block 23 Section 33 carpark
- Land subject to a private Crown lease at Block 9 Section 8 City (partial block).

The key existing land use within the construction footprint is a mixture of major and minor roads, and carparks. Key land uses within and adjacent to the construction footprint are shown in **Figure 9-20** below.

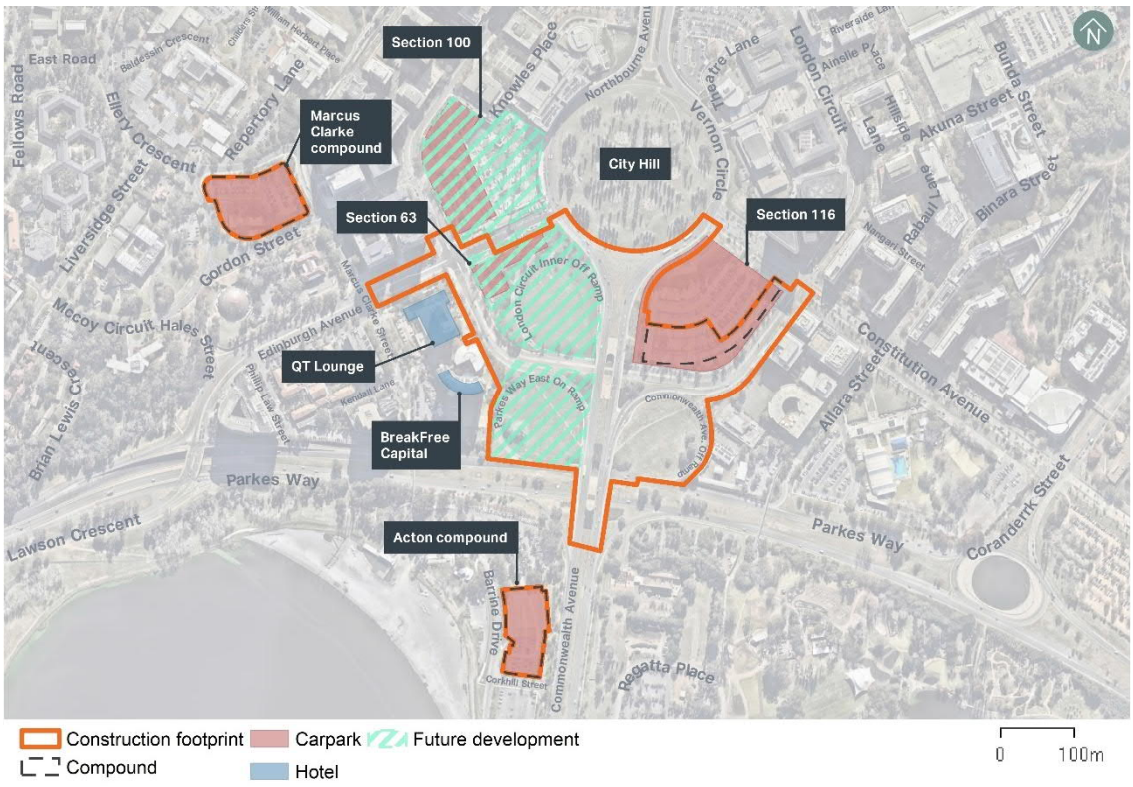

Figure 9-20 Key land uses for the Project

9.12.3 Assessment of potential impacts

The Project would be carried out within the London Circuit, Commonwealth Avenue and Edinburgh Avenue road reserves and would be consistent with the existing and intended future use of that land for the purpose of transport infrastructure. During construction and operation, the Project raises potential land use impacts and benefits through:

- Construction phase amenity impacts
- Implications for existing and future land use
- Consistency with relevant planning policies and approvals.

9.12.3.1 Construction phase amenity impacts

Construction works have the potential to impact on existing surrounding land uses including residential, commercial, businesses and public open spaces. The works include the potential for additional noise and traffic generation associated with construction works to impact residents, businesses and workers. The potential impacts and mitigation measures are discussed in:

- Section 9.1, Traffic and Transport
- Section 9.5, Noise and Vibration
- Section 9.9, Social and Economic.

Construction of the Project would be carried out over a period of around two years, and potential construction phase amenity impacts would be limited to that period. Through the careful management of construction activities, including engagement with potentially affected stakeholders around the construction footprint, the amenity impacts associated with construction activities are likely to be manageable within acceptable limits.

9.12.3.2 Implications for existing and future land use

Construction activities associated with the Project would be carried out on unleased National Land, unleased Territory Land under the custodianship of TCCS – Roads ACT and CRA, and land subject to a private lease (**Section 9.12.2**).

The majority of construction activities for the Project would be carried out in the Commonwealth Avenue, London Circuit and Edinburgh Avenue road reserves. The final configuration of London Circuit and the Commonwealth Avenue intersection would be located wholly within the road reserve, consistent with the existing and future use of this land.

The Project would involve the removal of the north west cloverleaf ramp and the south west cloverleaf ramp, requiring the published removal of the official status of these two roads (degazetting). Land affected by removal of these cloverleaf ramps would be stabilised and rehabilitated consistent with adjacent land, and would facilitate redevelopment of the affected land for permitted uses in the future. The area currently occupied by the south west cloverleaf is expected to be released for development as part of a long term land release program. This aligns with The Griffin Legacy which proposes releasing sites for new development for government and private sector investment, including land currently locked up in over-scaled road reservations and cloverleaf intersections.

Approximately 800 square metres of Block 9 Section 8 City, which is subject to private lease, is anticipated to be required for the construction of the Project, including construction of the retaining wall of London Circuit West and maintaining access to utilities infrastructure. The London Circuit West retaining wall would be located outside the block boundary. The two areas of the block within the construction footprint are undeveloped, containing grass and trees (**Figure 9-21**). Following construction of the Project, these areas would be reinstated and returned to the lessee, with no further impacts on land use anticipated.

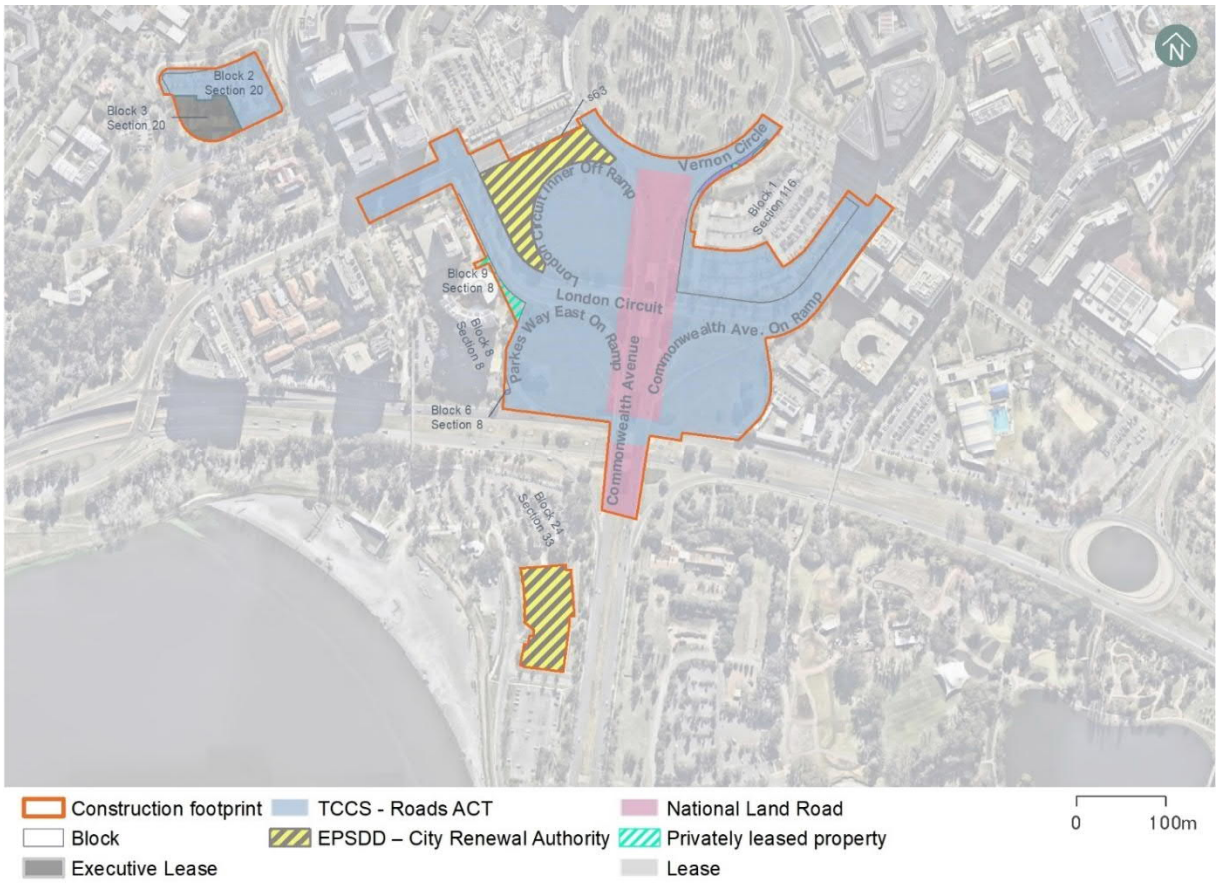

Figure 9-21 Area within Block 9 Section 8 City within construction footprint

Construction of the Project would rely on three construction compounds, two of which have previously been approved for utility relocation activities (Works Approval WA102408) (City Block 1 Section 116, and City Block 2 and Block 3 Section 20). The third compound would be located at Acton Block 23 Section 33. The three construction compounds would occupy land currently used for carparking. Loss of this carparking capacity would be temporary, with carparking reinstated at the conclusion of construction of the Project, with the exception of 50 carparking spaces on City Block 1 Section 116. This would result in some sterilisation of the existing land use (carparking) at this location. This carpark doesn't typically reach capacity on a weekday and therefore, the number of vehicles displaced by the Project would likely be less than 50. The impacts of the reduced carparking spaces are covered further in **Section 9.1**. There would be no permanent loss of carparking at City Block 2 and Block 3 Section 20 or Action Block 23 Section 33.

An informal carpark exists at Section 63, between the north west cloverleaf and Edinburgh Avenue. This area is proposed for parking and minor storage of equipment and materials during construction. This carpark would not be reinstated following construction and, along with the north west cloverleaf, would be available for redevelopment for permitted uses (EPBC referral number: 2019/8449).

9.12.3.3 Consistency with relevant planning policy and approvals

The Project would span several Designated Areas regulated under the National Capital Plan (NCP) and is subject to planning principles, policies and requirements under relevant precincts of the NCP. The Project has been designed with consideration for the NCP and ACT Planning and Infrastructure Policies

The Works Approval Planning Report concludes that the Project is consistent with the *Australian Capital Territory (Planning and Land Management) Act 1998* (Cth) and NCP, and does not create adverse planning impacts (Canberra Town Planning, 2021). As discussed above, the Project would provide positive planning outcomes through the removal of existing cloverleaf ramps, which would facilitate future development of that land for permitted uses, consistent with the NCP. It would also facilitate the Light Rail to Woden project, consistent with the NCP vision of London Circuit operating as a major public transport corridor through Canberra City.

The Project is consistent with applicable planning policies, the planning principles of the NCP and Central National Area. It is aligned with the strategic planning and development objectives for the various Designated Area precincts under the NCP affected by the Project. It is therefore considered that the land uses proposed for the Project are consistent with surrounding areas and minimal impact to the current or future use of surrounding land is expected.

9.12.4 Preliminary risk assessment

A preliminary assessment of potential land use impacts, without mitigation measures, is presented in **Table 9-66** below. The risk has been calculated using the methodology detailed in **Chapter 8.0**.

Table 9-66 Preliminary risk assessment for land use

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Temporary loss of existing land use (carparking).	Possible	Moderate	**Medium**
Operation phase			
The Project contributes to the achievement of the general land use outcomes specified in the National Capital Plan (NCP) and the Griffin Legacy to realise the broader vision for Canberra and future city planning and land releases.	Almost certain	N/A	**Beneficial**

9.12.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of land use impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-67**, and have been prepared with the following objectives:

- Limit construction activities to the identified Project area
- To proactively keep local stakeholders informed of construction activities and overall progress.

Table 9-67 Management and mitigation measures – Land use

Ref	Management and mitigation measure	Timing	Reference
LU1	Clearly identify project delivery phase area (DPA) on all construction documentation and undertake inductions for all construction personnel to ensure thorough understanding of DPA limits.	Prior to construction	-
LU2	Continue to undertake community engagement with surrounding land users to communicate scope of works including expectations around construction hours and timeline. Where activities are to occur outside of normal hours or involve impactful works, engagement would occur at least seven days prior to the commencement of those activities.	Prior to and during construction	**Section 9.9** of this EA

9.12.6 Residual impacts

A residual risk assessment was undertaken to assess potential land use impacts after the proposed management and mitigation measures are applied, presented in **Table 9-68**. No significant residual impacts on land use are anticipated.

Table 9-68 Residual risk assessment for land use

Description	Residual risk assessment		
Impact / Risk scenario	**Likelihood**	**Consequence**	**Risk level**
Construction phase			
Temporary loss of existing land use (carparking).	Possible	Moderate	**Medium**
Operation phase			
The Project contributes to the achievement of the general land use outcomes specified in the National Capital Plan (NCP) and the Griffin Legacy to realise the broader vision for Canberra and future city planning and land releases.	Almost certain	N/A	**Beneficial**

9.13 Cumulative impacts

Cumulative environmental impacts are the combined effect of individual impacts from multiple proposals occurring in proximity or concurrently at a given time. This section provides an assessment of the potential cumulative impacts of the Project with other surrounding proposals in the study area.

9.13.1 Approach

The following tasks were undertaken to assess the potential for cumulative impacts:

- Identify existing proposals (approved or under construction) and proposals in the planning phase within the vicinity of the Project, based on information in the public domain (**Section 9.13.2**). Searches included:
  - A review of the MPC website
  - Australian Government National Capital Authority – current projects
  - A search and review of media releases relating to major projects.
- Stakeholder engagement to identify proposals which have the potential to interact with the Project
- Identify and assess the significance of potential cumulative impacts by considering specific impacts from the Project with the potential for cumulative impacts:
  - Consideration was given to the location and timing of the current and potential developments identified in the desktop search
  - Information on the potential traffic, air quality and noise impacts associated with each proposal is typically not publicly available and has been assumed based on understanding of the type and scale of each proposal.

9.13.2 Proposals and developments in proximity to the Project

The proposals in **Table 9-69** and **Figure 9-22** were identified as occurring within close proximity or having the potential for a cumulative effect with the Project. Minor developments, such as alterations to residential properties and pavement resurfacing, were not included due to the limited nature and extent of those developments to interact cumulatively with the Project.

Table 9-69 Identified proposals in proximity to the Project

Proposal name and timing	Description	Considered in cumulative impacts assessment
Commonwealth Avenue – Bridge Strengthening	The Commonwealth Avenue Bridge would be widened to accommodate active transport lanes, including upgrades to safety barriers. The load bearing capacity of the bridge would be increased to accommodate future traffic demands. These upgrades would extend the lifespan of the bridge by another 50 years. For the purposes of this assessment, construction is anticipated to commence in 2022.	Yes
Section 100 Mixed-use development	The Section 100 mixed-use development is proposed to be constructed between London Circuit and Vernon Circle, to the north of Edinburgh Avenue. The development would include commercial properties, retail spaces and private basement parking spaces. Construction has commenced, and is anticipated to continue during Project construction.	Yes
Acton Waterfront Renewal Land	The CRA is planning to reclaim a portion of Lake Burley Griffin along the West Basin, to re-align the lake edge with	Yes

Proposal name and timing	Description	Considered in cumulative impacts assessment
Release - West Basin Precinct	the 1918 Griffith Plan for the lake. The new West Basin precinct would include a mixture of commercial properties, cafes, tourist activities and accommodation. The waterfront promenade would be utilised by active transport with limited provision for cars. Landscaping of the waterfront to be conducted. Construction activities have commenced, and, for the purposes of this assessment, are anticipated to continue until 2026.	
Parkes Way Upgrade - Coranderrk Signalisation	The ACT Government is proposing the upgrade of the Parkes Way corridor between Glenloch Interchange and Kings Avenue. These works would include the signalisation of the Coranderrk and Parkes Way roundabout. The proposed works aim to improve road safety, capacity of the road network and access for active transport users. Construction is anticipated to commence in early 2022.	Yes
City Hill footpath	Construction of a new footpath between Edinburgh Avenue and Constitution Avenue on the inner verge of Vernon Circle. For the purposes of this assessment, construction is anticipated to occur in 2022.	Yes
HTI Hotel Development (13 London Circuit)	Demolition of the existing hotel and construction of a new 16 storey hotel. For the purposes of this assessment, construction is anticipated to commence in 2022, for approximately 18 months.	Yes
7 London Circuit, Knight Frank	A three phase approach, the redevelopment of 7 London Circuit would involve the build-out of the existing building towards the verge, the pedestalisation of William Clement Street and landscaping. For the purposes of this assessment, construction is anticipated to commence in 2021.	Yes
Geocon Development (70 Allara Street)	Approximately 7,640 m^2 is available for future residential development. For the purposes of this assessment, construction is conservatively anticipated to occur at some time concurrently with the Project, pending planning approval for the proposal.	Yes
City to Commonwealth Park component of Light Rail to Woden	The Light Rail to Woden project is being delivered in two phases. In the first phase, from City to Commonwealth Park, 1.7 km of track would be constructed from the City to Commonwealth Park. The construction of the light rail would assist in accommodating for population growth and delivering the next stage of Canberra's integrated public transport network. The project would reduce road congestion, improve travel times and improve rail	No

Proposal name and timing	Description	Considered in cumulative impacts assessment
	passenger services. For the purposes of this assessment, construction is anticipated to occur from 2024, following completion of the Project.	
Section 63 Block 20 future development	The CRA is planning to construct a mixed-use development where the north west cloverleaf currently stands. The development would include residential, commercial and retail spaces. The land required for this development would be facilitated by the Project, with no construction anticipated in the foreseeable future.	No
Theatre	The Canberra Civic and Cultural District is undergoing redevelopment. Plans for the Canberra Theatre would progress to detailed design late 2024. The redevelopment of the Theatre would likely increase the capacity of the theatre and the public's experience of the place. For the purposes of this assessment, construction is anticipated to commence in 2024, with early works, and is not anticipated to substantially occur concurrently with the Project.	No
UNSW Development (Stage 1 / 2)	Development of landmark university campus facility on Constitution Avenue near Parkes Way. For the purposes of this assessment, construction is not anticipated to commence until after the Project is operational.	No
Section 19 Development	The demolition of the existing landscape and redevelopment of the area into a mixed use residential and commercial space. For the purposes of this assessment, construction is anticipated to commence in 2024, with early works, and is not anticipated to substantially occur concurrently with the Project.	No
Block 40 Development	Approximately 11,389 m^2 is available for development on the corner of Northbourne Avenue and London Circuit. No construction is anticipated in the foreseeable future.	No

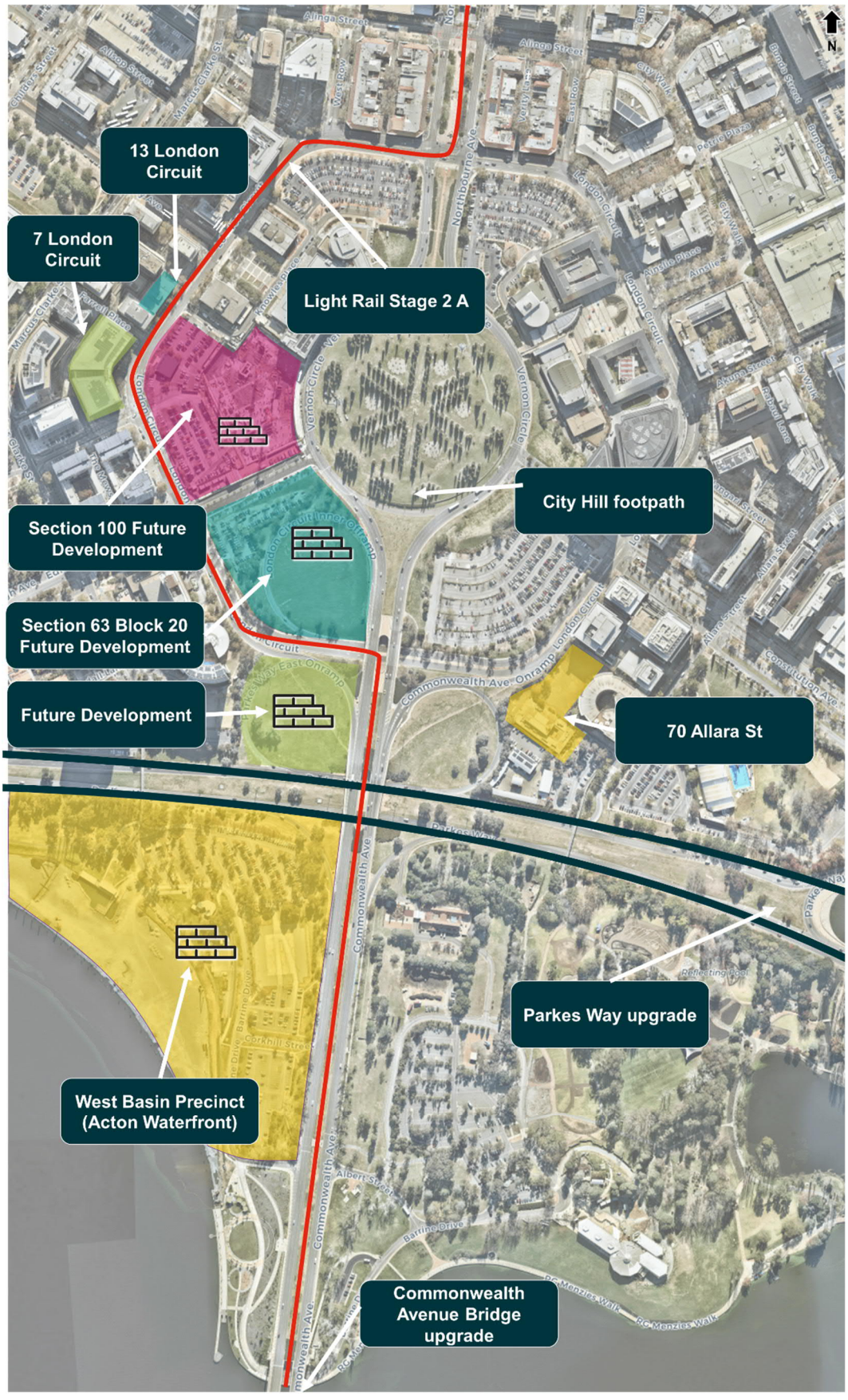

Figure 9-22 Identified proposals in proximity to the Project

9.13.3 Construction cumulative impacts

It is anticipated that the Project would be undertaken over a period of approximately two years, commencing in April 2022. Potential cumulative impacts associated with construction of the Project and the relevant proposals with potential for cumulative impacts are discussed in **Table 9-70** below.

Measures to minimise and manage impacts associated with the Project are provided in relevant sections of this Environmental Assessment. These measures would contribute to the management of cumulative impacts.

Table 9-70 Potential cumulative impacts during construction

Environmental factor	Cumulative impacts assessment
Traffic	Potential traffic and transport impacts associated with the project are discussed in **Section 9.1**, including measures to minimise and manage impacts associated with the Project. Construction of the Project would require the closure of London Circuit between Edinburgh Avenue and Constitution Avenue for the duration of construction, and temporary road closures and traffic changes in the vicinity, including on Commonwealth Avenue. Temporary carriageways (sidetracks) are proposed to be constructed as part of the Project to maintain two northbound traffic lanes and two southbound traffic lanes on Commonwealth Avenue during construction. The traffic and transport assessment **(Section 9.1)** considers a worst-case scenario, assuming that one of the three northbound traffic lanes would need to be closed during the construction works. In addition, Constitution Avenue would be changed from two lanes to one lane in both directions, between Vernon Circle and Constitution Avenue. The posted speed limit on Commonwealth Avenue between Vernon Circle and Parkes Way would be reduced from 60-70 km/h to 40km/h for the duration of the works. The Project would also require a range of traffic movements, including trucks for the movement of materials, and light vehicles for the movement of personnel. Long term road closures are not anticipated to be required for other proposals in the vicinity of the Project construction footprint, however temporary traffic management may be required at times. Typically, these activities are likely to be undertaken during non-peak periods and would be coordinated to minimise conflict between proposals. Vehicle movements would be generated by each proposal, however anticipated traffic volumes are not publicly available. Given the location of the Project and proposals in the area, similar haulage routes may be required. As discussed in **Section 9.1**, up to four two-way truck movements per hour are anticipated to be generated on Edinburgh Avenue, Constitution Avenue and Commonwealth Avenue. Light vehicle movements associated with the Project and other proposals are likely to occur during non-peak periods. Construction workers would be the main generator of light vehicle trips for the Project, typically arriving to site earlier than the weekday AM peak hour at 8:00 am, and leaving before the PM peak at 5:00 pm. Given that off-peak traffic volumes on the surrounding road network are significantly lower than during the weekday peak hours, the additional construction worker traffic and any additional light vehicle activity generated by the Project and proximal proposals during the off-peak periods would be manageable within the existing road network. Nevertheless, **Section 9.1** provides mitigation measures to minimise the number of worker vehicles generated by the works. Volumes of truck and light vehicle movements, combined with other proposals, are not anticipated to contribute to a significant cumulative impact on traffic during construction.

Environmental factor	Cumulative impacts assessment
Heritage	Potential heritage impacts associated with the Project are discussed in **Section 9.2**, including measures to minimise and manage impacts associated with the Project. Potential impacts are limited to the temporary obstruction of significant views along Commonwealth Avenue and of the Central National Area. Other proposals in the area are located outside this vista, and the Project is therefore unlikely to contribute to a cumulate impact on heritage.
Biodiversity	Potential biodiversity impacts associated with the Project are discussed in **Section 9.3**, including measures to minimise and manage impacts associated with the Project. Potential cumulative impacts on biodiversity have also been assessed in the EPBC Act Approval Preliminary Documentation for the Project. The Preliminary Documentation identified potential GSM habitat within the Acton Waterfront Renewal Land Release - West Basin Precinct and Section 63 Block 20 mixed-use development. West Basin Precinct: Works associated with future stages of the Acton Waterfront development, including access options for connecting the City to Lake Burley Griffin over Parkes Way are likely to directly impact on Golden Sun Moth habitats to the west of Commonwealth Avenue at Parkes Way. There is the potential for cumulative impacts on GSM associated with this proposal. Section 63 Block 20: the approved GSM impacts from the Project, and associated mitigations and offsets, discussed in **Section 9.3**, would have the effect of extinguishing and appropriately offsetting GSM habitat values within the Section 63 development site. There are therefore no cumulative impacts on GSM associated with this proposal. There is the potential for indirect impacts to occur, particularly the generation and dispersion of dust to golden sun moth habitat. Each proposal, including the Project, would be required to develop a construction environmental management plan which includes measures for the minimisation and management of dust. Therefore, cumulative indirect impacts on biodiversity such as dust deposition on GSM habitat are anticipated to be minimised through appropriate management at the source, and are not considered to be significant.
Noise and Vibration	Potential noise and vibration impacts associated with the Project are discussed in **Section 9.5**, including measures to minimise and manage impacts associated with the Project. Where possible, Project construction activities would be limited to daytime hours. However, from time to time works would need to be undertaken outside of these hours. Any such works outside of these hours would be the subject of a specific application to the Territory, detailing the need for such works and any additional or work specific noise mitigation measures. Activity specific communications and engagement activities would be undertaken in advance of the commencement of such works outside of normal work hours. The qualitative construction noise assessment identified that moderately intrusive (>20-30 dB above background levels) to highly intrusive noise impacts (>30 decibels (dB) above background levels) are likely during standard work hours These impacts may be extensive for the nearest sensitive receivers to the noise generating activity.

Environmental factor	Cumulative impacts assessment
	The proposals considered are likely to contribute to cumulative construction noise and vibration impacts at sensitive receivers including from the Section 100 development, Acton Waterfront Renewal, HTI Hotel Development, 7 London Circuit, and 70 Allara Street. The construction of these developments would not all occur concurrently, however it can be anticipated that some activities would overlap including with the Project. In addition, it can be expected that night works would sometimes be required by these proposals. Stakeholder feedback has indicated that the significance of construction noise, in particular to residences and hotels, can be significant despite the central business district location where construction noise and vibration occurs regularly. There is the potential for cumulative noise and vibration to cause nuisance to nearby sensitive receptors.
GHG and Air quality	Potential air quality and greenhouse gas impacts associated with the Project are discussed in **Section 9.6**, including measures to minimise and manage impacts associated with the Project. Air quality impacts associated with the Project would be low. The air quality risks associated with construction of infrastructure are well known and generally well managed using standard mitigation measure and safeguards. Each proposal, including the Project, would be required to develop a construction environmental management plan which includes measures for the minimisation and management of dust. Therefore, cumulative air quality impacts are anticipated to be minimised through appropriate management at the source, and are not considered to be significant.
Landscape and Visual	Potential landscape and visual impacts associated with the Project are discussed in **Section 9.7**, including measures to minimise and manage impacts associated with the Project. The landscape and visual impact assessment identified that the cumulative construction activity in the area would reduce the overall visual impact of the Project, as it would provide a blending influence rather than highlighting a standalone construction site. The construction of the proposals would not all occur concurrently, resulting in a steady level of visual impacts as individual proposals commence and others are completed. Such views are also considered common given the central business district location of the Project and other proposals. Cumulative landscape and visual impacts are not anticipated to be significant.
Social and Economic	Personal wellbeing of residents and the community is likely to be impacted by cumulative impacts. Impacts which impede on everyday life (such as construction traffic, reduced amenity, reduced pedestrian accessibility, heritage, and local character) can generate frustration and stress. Cumulative impacts can have impacts on people's mental and physical health. Although cumulative impacts described above are not anticipated to be significant, there is still a risk that residents and community members may become frustrated with continuous and extended construction works regardless of the significance of cumulative impacts. Similarly, there is notable risk that community members and residents would experience consultation fatigue associated with numerous construction activities.

9.13.4 Operation

Cumulative impacts associated with operation of the Project are not anticipated, given that the study area retains its pre-construction land use as a travel corridor for vehicles, pedestrians and cyclists. The Project would facilitate future developments, as noted in **Table 9-69**, for which relevant approval documentation identifying potential environmental impacts would be required.

9.13.5 Management and mitigation measures

Mitigation measures are proposed to lower the significance, frequency or risk of cumulative impacts occurring. The relevant management measures and safeguard protocols are provided in **Table 9-71**, and have been prepared with the following objectives:

- Reduce the potential for adverse impacts from the Project to operate cumulatively with adverse impacts of other projects.

Table 9-71 Management and mitigation measures – Cumulative impacts

Ref	Management and mitigation measure	Timing	Reference
CI1	Proactively engage with proponents of other projects in the area to: • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g., respite periods) • Consider incorporating additional noise management and mitigation measures considering consecutive construction noise impacts.	Prior to and during construction	-

10.0 Environmental mitigation and management measures

This chapter provides a consolidated summary of the measures identified to manage and mitigate potential environmental impacts associated with the construction and operation of the Project.

The Project would be undertaken in accordance with the Conditions of Approval of EPBC2019/8582. These conditions are not reproduced in this chapter.

10.1 Environmental management approach

The assessment of key environmental issues associated with the Project is documented in Chapter 9.0. The environmental impact assessment has been approached using best-practice methodology, as detailed in Chapter 8; this includes a risk assessment process performed in accordance with the principles of AS/NZS/ISO31000:2018 Risk Management – Principles and Guidelines. Classifying the consequences of impacts and the likelihood of occurrence allows the ranking of potential impacts into one of seven risk levels.

Mitigation measures are proposed to lower the significance, frequency or risk of an impact occurring. Industry standard management measures have been identified for relevant impacts at all risk levels. Where the risk was noted to be medium or above, additional mitigation measures were identified to reduce impacts to below a medium risk level.

10.2 Management plans

Management and mitigation measures proposed for the construction phase of the Project are anticipated to be consolidated in relevant management plans.

The primary environmental management plan to manage and mitigate environmental impacts during construction would be the Construction Environmental Management Plan (CEMP). The CEMP would be prepared by the Delivery Contractor and would incorporate the management and mitigation measures outlined in this Environmental Assessment. The CEMP would also outline in further detail how environmental management for the Project would be achieved and detail the roles and responsibilities of key personnel involved in the construction of the Project.

The CEMP would include specific subplans which would comprise (at minimum) the following:

- Construction Transport Management Plan
- Construction Noise and Vibration Management Plan
- Contamination and Material Management Plan
- Resource and Waste Management Plan
- Soil and Water Management Plan
- Golden Sun Moth Construction Environmental Management and Rehabilitation Plan 2.0
- Social Impact Management Plan.

10.3 Management and mitigation measures

Environmental mitigation measures to be implemented during each phase of the Project, and detailed in previous chapters, are summarised in **Table 10-1**. The measures in **Table 10-1** have in many cases been developed from the specialist technical reports that are appended to Environmental Assessment. In the event of any inconsistency between environmental management recommendations canvassed in the appendices to the EA and the measures outlined in **Table 10-1** the measures in **Table 10-1** would prevail.

Each construction mitigation measure would be monitored during the relevant phase to ensure effective implementation. The Project's compliance with the mitigation measures outlined below would be assessed upon completion of the relevant stage.

Table 10-1 Proposed mitigation measures for the construction stage of the Project

Ref	Objective	Management and mitigation measure	Timing	Reference
G	**General management measures**			
G1	Provide a centralised mechanism through which potential environmental impacts would be managed	A **Construction Environmental Management Plan** (CEMP) would be prepared prior to construction to outline the construction conditions and temporary environmental protection measures to manage the impact of construction activities. The CEMP would be consistent with the environmental management measures documented in this EA and identified in the Works Approval, planning approval conditions from the NCA Works Approval, and any other requirements or conditions within any licences or permits as issued by Government Authorities. The CEMP would be prepared by the Contractor and would be endorsed by MPC and the Principal's Authorised Person prior to commencement of construction.	Prior to and during construction	AS ISO 14001 Environmental Management Systems EPA *Environmental guidelines for preparation of an Environment Management Plan*
G2	All Project workers are familiar with their obligations to protect the environment and comply with relevant Project requirements.	All Project workers would be provided with an environmental induction prior to commencing work on-site. This induction would include information on the following: • Environmental protection measures to be implemented to protect the quality of the surrounding environment, including flora and fauna management, weed control, erosion and sediment control, and water quality management • The location of, and protection measures for, any sensitive ecological areas • Noise and vibration management, including location of sensitive receivers, good working practices and measures for reducing the source noise levels of construction equipment by construction planning and equipment selection where practicable • Traffic and transport management, including use of compounds or approved areas for vehicle parking, minimising impacts to property accesses and use of designated construction traffic vehicle routes • Basic training in the identification of potential Aboriginal archaeological issues, measures to minimise construction	Prior to and during construction	-

Ref	Objective	Management and mitigation measure	Timing	Reference
		impacts to built and landscape heritage items and protocols for unexpected archaeological remains and any unexpected finds • A cultural awareness induction which would serve to outline the significance of areas of the route to Aboriginal people and to alert construction personnel to the possibility of unexpected finds during the work • Bushfire protection measures and requirements would be included in the site induction for contractors working on the Project, including the restriction of hot works on Total Fire Ban Days.		
G3	Ensure the adequacy and compliance of environmental management measures.	Dedicated, suitably qualified environmental personnel would be appointed to monitor the performance of the environmental management measures of the Project.	Prior to and during construction	-
G4	Ensure the Project can obtain an ISC IS Rating, of Leading or above	Dedicated, suitably qualified sustainability personnel would be appointed to monitor and report on all sustainability requirements of the Project.	Prior to and during construction	ACT Climate Change Strategy 2019; ISC IS Rating Tool Version 1.2
G5	Ensure that the mitigation and management measures remain appropriate for the life of the Project	In consultation with key stakeholders and regulators, undertake a review of, and as necessary update, the management and mitigation measures.	Biannually during construction	-
T	**Traffic**			
T1	Holistically consider traffic implications of proposed construction activities	A Traffic and Transport Liaison Group (TTLG) would be established to oversee and review traffic and multi modal implications of proposed construction activities and network arrangements. TTLG would include representation from: • TCCS • MPC • ESA • NCA • AFP • CRA.	Prior to and during construction	-

Ref	Objective	Management and mitigation measure	Timing	Reference
T2	Minimise the potential strain on the road network during construction	Prior to implementation, Temporary Traffic Management (TTM) Plans must be endorsed by the Traffic and Transport Liaison Group and have all other necessary approvals in place.	During construction	*Planning and Land Management Act 1988; AS1742 Part 3; Traffic Control at Worksites Manual (RMS 2012); Austroads Guide to Temporary Traffic Management*
T3	Through the Disruption Taskforce, adopt a whole of Government approach to citywide transport planning and management throughout construction	A travel demand management strategy would be developed, to reduce the private vehicle trip generation and parking demand, particularly during weekday AM and PM peak hours, generated by local residents and employees of the broader CBD and surrounding area.	Prior to construction	ACT Transport Strategy 2020 ACT Transport Recovery Plan 2021 ACT Climate Change Strategy 2019
T4	Minimise impacts to pedestrians and cyclists during construction	A more direct east-west active travel connection between Edinburgh Avenue and Constitution Avenue would be investigated.	Detailed design, Prior to construction	
T5	Maintain appropriate vehicular access to directly impacted neighbours	In consultation would relevant stakeholders, appropriate vehicular access would be maintained to 255 London Cct and 1 London Cct at all times during construction.	During construction	-
T6	Minimise general impacts from construction traffic movements	A **Construction Transport Management Plan** (CTMP) would be developed to manage the impacts of the construction activities on the transport network and local parking.	Prior to construction	
T7		As part of the CTMP, construction vehicle movement arrangements would be developed in consultation with the Traffic and Transport liaison Group (TTLG) to minimise impacts on the city generally, with specific regard to: • Bus movements, and bus priority measures • Key pedestrian movements and activity areas • Other construction projects in the locality • Local traffic movement requirements and peak traffic volumes, including long weekends and holiday periods	Prior to and during construction	Hea-2 ISC IS Rating Tool 1.2

Ref	Objective	Management and mitigation measure	Timing	Reference
		• Crime prevention through environmental design principles • Special events.		
T8	Ensure that accessible parking provisions are not impacted from construction	No net loss of accessible parking across the Project area.	During construction and operation	-
T9	Minimise the impacts to parking facilities from the construction workforce	To reduce the impact on public parking facilities, particularly in the Civic region, site workers parking would be provided at appropriate construction compounds to minimise the use of on-street parking. Consideration would be given to providing shuttle services to transport site workers. If shuttle buses are not provided as part of the Project, parking restrictions around work zones would be considered to prevent potential impacts due to the Project use of on- or off-street parking, this must be included in the relevant TMP and approved by TCCS.	During construction	-
T10	Optimise the performance of the road traffic network	Continue to investigate measures to optimise the performance of key intersections (e.g., adjusted signal phasing).	Prior to operation	-
H	**Heritage**			
H1	Celebrate the heritage values of Canberra, the Parliament House Vista, Commonwealth Avenue and City Hill	Develop project strategies to identify, interpret and communicate the history and heritage values of Canberra, the Parliament House Vista, Commonwealth Avenue and City Hill, from early site establishment, throughout the construction phase and in the final completed landscape design.	Prior to and during construction	See also LV1; Her-1 ISC IS Rating Tool 1.2
H2	Document the heritage values of the Project area for future generations	Complete a general photographic archival recording of Commonwealth Avenue from City Hill to Commonwealth Avenue Park (including offramps to the West in this area), and provision for these recordings to be made publicly available.	Prior to construction	Photographic Recording of Heritage Items Using Film or Digital Capture (NSW Heritage Office, 2006)
H3	Strengthen the landscape character of Commonwealth Avenue	In consultation with key stakeholders and technical specialists, develop detailed designs that are consistent with an overarching landscape masterplan for Commonwealth Avenue.	Prior to construction	Commonwealth Avenue Landscape Heritage Advice (GML Heritage, 2021a); EPBC Act

Ref	Objective	Management and mitigation measure	Timing	Reference
				Approval 2019/8582; Urb-2 ISC IS Rating Tool 1.2
H4	Minimise potential for impacts (destruction/damage) to unexpected heritage items	Implement an unexpected heritage finds protocol which includes: • Measures to enable all personnel working on site to receive awareness training relating to heritage matters • Cessation of all activity in the vicinity of the find and consultation with Representative Aboriginal Organisations and the ACT Heritage • Clear mechanisms to enable relevant clearance to be obtained and works to recommence.	During construction	**Appendix B (Heritage Impact Assessment)** (GML Heritage, 2021b)
B	**Biodiversity**			
B1	Avoid any unplanned disturbance to habitat values	Marking-out, signage, and fencing of clearing limits are to be clearly identified. The details of fencing and signing measures to be implemented would, as necessary, be the subject of an NCA Works Approval.	Prior to clearing activities during construction	-
B2		Trees to be retained should be marked and care taken to not disturb, or compact the root zone of these trees. Pruning or lopping of branches should be minimised. If damage is noted a suitably qualified arborist should be consulted.	Prior to and during construction	-
B3	Minimise impacts on hollow dependent fauna species	Trees proposed to be removed should be checked for potential habitat (e.g., hollows) prior to felling. The CEMP would outline proposed management measures in the event fauna is present.	Prior to clearing activities during construction	-
B4	Avoid weed infestation due to land disturbance	The following control measures are to be implemented in line with standard biosecurity protocols including: • Inspect vehicle, equipment, and footwear prior to entering site • Preferably clean all vehicles, equipment, and footwear offsite prior to entering • If vehicles are not clean prior to entering site utilise dedicated cleaning bays at the compounds.	During Construction	

Ref	Objective	Management and mitigation measure	Timing	Reference
		• Within wash bays clean footwear, equipment and vehicles with a hard brush or stick to remove as much mud, soil and organic matter as practicable before disinfecting with a solution of 70% methylated spirits and 30% water applied through a spray bottle.		
B5	To recognise landscape and ecological benefits of managing the rabbits present within the Project construction footprint	The rabbit population present within Project disturbance areas would be managed in consultation with ACT PCS and consistent with best practice.	Prior to and during construction	Best Practice Management Guide for Rabbits in the ACT, ACT Government, 2015.
B6	Ensure the Project is undertaken in a manner consistent with the existing EPBC Act Approval	A GSM Plan 2.0 covering Project activities would be developed and approved by DAWE prior to the commencement of works. Measures within the GSM Plan 2.0 must be implemented throughout construction.	Prior to Construction	EPBC Act Approval 2019/8582
CS	**Contamination and soil**			
CS1	Minimise disturbance to landform, geology and soils and prevent erosion and sedimentation	**Soil and Water Management Plan** (SWMP) would be prepared and implemented as part of the CEMP. The SWMP would at a minimum: • Assess erosion and sedimentation risks and impacts, include a process for developing detailed designs for major erosion and sedimentation control measures • Document procedures for managing pollution associated with spillage or contamination on the site and adjoining area.	Prior to and during construction	Appendix I – Hydrology and Water Quality Assessment
CS2		Effective erosion and sedimentation controls would be installed, maintained and managed prior to and during construction.	Prior to and during construction	*Managing Urban Stormwater - Soils and Construction*, Volume 2D - Main Road Construction
CS3	Ensure that material handling and general construction activities	A **Contamination and Material Management Plan** (CMMP) would be prepared and implemented as part of the CEMP. The CMMP would at a minimum:	Prior to and during construction	Contaminated sites environment protection policy and relevant

Ref	Objective	Management and mitigation measure	Timing	Reference
	mange the potential for contamination consistent with established polices and requirements	• Detail specific requirements for the importation of any material onto the site including environmental properties, tracking requirements, reporting / record keeping requirements • Document material tracking and reporting mechanisms for import and export of material • Provide for ongoing compliance inspections and record keeping • Include an Unexpected Finds Protocol that outlines the roles and responsibilities where unexpected finds of potential contamination are identified during any works within the Project area • Identify the steps needed to be taken in the event that hazardous materials are identified (in particular, asbestos) • Describe procedures to enable the review and endorsement of the CMMP by the Project Independent Contaminated Sites Auditor.		Information Sheets (various) Environment Protection Authority (access Canberra)
CS4		A Sampling Analysis and Quality Plan (SAQP) would be prepared to guide the further assessment of residual fill soils within the Project area that may require management during construction.	During construction	-
CS6		Complete a hazardous materials survey of bridge and other structures requiring demolition.	Prior to demolition	-
CS7	Minimise potential for contamination due to failure in storage mechanisms for hazardous materials on site during construction	A site-specific emergency spill procedure is to be developed and an emergency wet and dry spill kits would be kept in the Project area. All construction personnel are to be made aware of its locations and trained in how to respond to a spill.	Construction	-
CS8		Refuelling and storage of fuels, chemicals and liquids are to be within an impervious bunded area within the construction compound,	Construction	-
NV	**Noise and vibration**			
NV1	Minimise impacts on the amenity of adjacent land users due to noise and	Implement controls on construction equipment and activities in accordance with Australian Standards and manufacturer specifications. Regularly inspect, test and maintain all stationary	During construction	AS 2436-2010 Guide to Noise and Vibration Control

Ref	Objective	Management and mitigation measure	Timing	Reference
	vibration during construction	and mobile plant equipment to ensure that emission levels do not deteriorate over the life of the project.		
NV2		Provide residents with a contact name and number to allow noise complaints or questions to be raised. Establish a procedure for maintaining contact and responding to all noise complaints within 24 hours.	During construction	-
NV3		As necessary, undertake condition surveys on buildings and structures within the potential radius of effect prior to commencement of demolition and heavy earthworks activities.	During construction	-
NV4		Construction activities for the Project would be undertaken between the hours of 7.00 am and 6.00 pm Monday to Friday and 7am to 1pm Saturdays (normal hours), with no work on Sundays and Public Holidays unless otherwise approved.	During construction	Refer NV 5
NV5		Construction works proposed to take place outside 'normal' construction hours would require individual assessment and approval on a case-by-case basis. In general, this process would include: • Identification of the duration, location, type of activities construction equipment involved • Assessment of the potential noise and vibration impact associated with the proposed construction activities and determination of the number and type of sensitive receivers potentially impacted • Identification of any reasonable and feasible mitigation measures to be implemented • Consultation with the potentially impacted receivers to inform them of the proposed out of hours works, and providing an opportunity for impacted receivers to provide feedback • Minimising out of hours works as much as practicable (e.g., deliveries of equipment and materials could be made, or disposal of construction waste may be delayed until on the following day).	During construction	MPC Out of Hours Works Request (**refer Appendix D**)

Ref	Objective	Management and mitigation measure	Timing	Reference
NV6		A **Noise and Vibration Management Plan** (CNVMP) would be developed to: • Document all necessary measures to manage and mitigate potential noise and vibration levels during normal and out of hours construction activities • Document all necessary measures to manage and mitigate potential noise and vibration impacts, including to all identified heritage values, during construction activities.	During construction	-
AQ	**Air quality**			
AQ1	Minimise generation of dust through effective construction planning and day to day management	Plan site layout such that machinery and dust causing activities are located as far away from sensitive receivers as possible. Daily construction activities would be planned to consider the expected weather conditions for each workday, ensuring works zones are manageable.	Prior to and during construction	-
AQ2		Dust would be visually monitored, and observations recorded. Where necessary the following actions would be implemented: • Restrict vehicles to stabilised areas, and where necessary remove mud and dirt tracked on to road surfaces • Establish and enforce appropriate onsite vehicle speed limits • Place gravel on surfaces where there would be significant vehicle movement (e.g., construction access and egress points) • Implemented suitable controls for exposed stockpiles and unsealed construction areas as appropriate, including the stabilising of long-term stockpiles and exposed areas • Cover vehicle loads involving loose materials • Use water assisted dust sweepers on access and local roads. Avoid dry sweeping of large areas • Ensure cement and fine materials are delivered in enclosed tankers and stored in silos to prevent material escape. For smaller supplies reseal bags after use.	During construction	UK Institute of Air Quality Management (IAQM), *Guidance on the assessment of dust from demolition and construction* (Holman et al, 2014)
AQ3	Minimise direct greenhouse gas emissions	The following measures to manage vehicle emissions would be implemented:	During construction	-

Ref	Objective	Management and mitigation measure	Timing	Reference
		• Only use petrol or diesel generators where mains power is not feasible • Keep vehicles and construction equipment operating on site well maintained and turned off when not operating (minimise idling on the site).		
LV	**Landscape visual and realm**			
LV1	Minimise the visual impacts of construction activities	Wherever possible, high quality construction hoarding would be used with consideration given to the potential for public art or heritage interpretation. The design of the hoarding should consider visually recessive, natural colours and images, and where possible be developed with input from local schools or artists.	Prior to and during construction	See also H1
LV2	Minimise long term impacts to the Commonwealth Avenue view corridor	Wherever practicable, combine above-ground street elements (lighting, traffic signals, traffic signs) on common use poles to reduce visual clutter and to reduce potential conflict with landscape elements, in consultation with TCCS and NCA.	Detailed design, prior to construction	-
LV3	Ensure that the finishes of retaining walls are suitable given their visual prominence	The final finish of retaining walls required for the project would be determined in consultation with the NCA, having regard to visual impacts.	Prior to construction	-
SE	**Socio economic impacts**			
SE1	To minimise the duration of impactful construction works	The construction program would be reviewed quarterly and opportunities to consolidate and shorten the duration of impactful work would be explored in consultation with MPC.	During construction	-
SE2	Work with the community optimise construction activities and leverage identified opportunities wherever possible	A **Communication Strategy** would be prepared to facilitate Project communication with the community generally, and relevant government authorities, adjoining affected landowners and businesses. The strategy would include a summary of known negotiable and non-negotiable issues and be compiled through active stakeholder involvement and participation. The Communication Strategy would be reviewed at least every six months to ensure adequacy and relevancy.	Prior to and during construction	IAP2 Public Participation Spectrum (‘Collaborate’)

Ref	Objective	Management and mitigation measure	Timing	Reference
SE3	To ensure that key project information is publicly available and easy to find	Communication materials, including non-negotiable issues identified through the **Communications Strategy**, would be made available on the Project website.	Prior to and during construction	IAP2 Spectrum of Public Participation ('Inform')
SE4	Ensure effective management of complaints	The following communications channels and support would be available to manage community enquiries and complaints: • A 24-hour toll-free telephone number for the registration of complaints and enquiries about the Project (when Project works are occurring) • A postal address to which written complaints and enquires may be sent • An email address to which electronic complaints and enquiries may be transmitted • A mechanism for community members to make enquiries in common community languages of the area.	During construction	-
SE5		A grievance process for the community to raise comments, questions and complaints must be established prior to construction commencing. The grievance process must be made publicly available and must include a feedback process through which the complainant is provided with information relating to how their concern has been assessed, considered, and where feasible, addressed.	During construction	-
SE6	Proactively address work practices to minimise complaints	Where necessary light pollution, noise, vibration, and air quality monitoring and investigation would be undertaken in response to complaints.	During construction	-
SE7	Ensure pedestrian and cyclists are notified in advance of any changes to access and movement arrangements	Clear and safe pedestrian and cyclist signage and wayfinding mechanisms would be in place prior to works commencing that would change access and movement arrangements through the Project delivery phase area.	Prior to and during construction	IAP2 Spectrum of Public Participation ('Inform'); Hea-2 ISC IS Rating Tool 1.2
SE8	Enable and support the involvement of local industry in the Project	To the greatest extent practicable, procurement activities associated with the Project would prioritise the use of trade and materials from within the local region.	Prior to and during construction	Canberra Regional Local Industry Participation Policy

Ref	Objective	Management and mitigation measure	Timing	Reference
SE9	Implement continuous improvement culture to the management of social impacts	Develop and implement a **Social Impact Management Plan** (SIMP) to monitor and evaluate effectiveness of (and where necessary adjust) proposed mitigations and management measures.	During construction	G5; Hea-1 ISC IS Rating Tool 1.2
SE10	Establish effective and mutually agreeable interface agreements with adjacent stakeholders	Continue to engage stakeholders with site and operationally specific needs and complex Project interface.	Prior to and during construction	-
WH	**Water and hydrology**			
WH1	To ensure that the Project contributes to the long-term resilience of the stormwater network to projected climate changes impacts	Within the Project area, stormwater infrastructure would be sized to account for projected climate change, consistent with TCCS standards, and enable future downstream network augmentation to be completed by others.	Prior to and during construction	MIS08 Stormwater
WH2	Collect relevant information to establish project performance in maintaining local water quality values	A water quality monitoring program would be developed to establish baseline surface water quality prior to construction and to identify impacts associated with the construction phase of the Project. Monitoring locations would be identified during detailed design for receiving waters potentially affected by the Project.	Prior to and during construction	-
WH3	Ensure that Water Sensitive Urban Design measures continue to work effectively throughout operation	Detailed asset handover information would be developed to describe: • The function of porous paving and how it is to be maintained in accordance with manufacturer's instructions to maintain permeability • The passive irrigation infrastructure and how it is to be maintained to keep it free of blockage.	During construction and operation	-

Ref	Objective	Management and mitigation measure	Timing	Reference
RM	**Resource management and waste minimisation**			
RM1	Minimise additional pressure on the ACT waste and resource management facilities	A **Resource and Waste Management Plan** (RWMP) would be prepared prior to construction commencing that details strategies to apply the waste hierarchy (avoid, minimise, re-use, recycle, dispose) during construction.	Prior to and during construction	ACT Waste Management Strategy 2011–2025
RM2		Where green waste from vegetation removal cannot be reused on site, reuse on other sites would be investigated prior to disposal.	During construction	-
RM3		Worksites would be maintained in a tidy state, and all general litter would be appropriately disposed of, and recycled where possible.	During construction	-
RM4		Waste generated from the construction of the Project would be transported to an appropriately licenced waste disposal or transfer facility. Where required, this would include using a licensed contractor to remove regulated waste, under current ACT EPA Guidelines.	During construction	*Environment Protection Act 1997* (and Regulation) and accompanying Environment Protection Policies
RM5		All waste disposal would be monitored and recorded including volumes and categories of waste, transport and end point. This would be reviewed annually by a qualified professional.	During construction	-
RM6		Hazardous chemicals and other volatile construction waste would be stored in accordance with the *Dangerous Substances Act 2004.*	During construction	-
LU	**Land use**			
LU1	Limit construction activities to the identified Project area	Clearly identify project delivery phase area (DPA) on all construction documentation and undertake inductions for all construction personnel to ensure thorough understanding of DPA limits.	Prior to construction	-
LU2	To proactively keep local stakeholders informed of construction activities and overall progress	Continue to undertake community engagement with surrounding land users to communicate scope of works including expectations around construction hours and timeline. Where activities are to occur outside of normal hours or involve impactful works, engagement would occur at least seven days prior to the commencement of those activities.	Prior to and during construction	**Section 9.9** of this EA

Ref	Objective	Management and mitigation measure	Timing	Reference
CI	**Cumulative impacts**			
CI1	Reduce the potential for adverse impacts from the Project to operate cumulatively with adverse impacts of other projects	Proactively engage with proponents of other projects in the area to: • Increase awareness of construction timeframes and impacts • Coordinate impact mitigation and management (e.g., respite periods) • Consider incorporating additional noise management and mitigation measures considering consecutive construction noise impacts.	Prior to and during construction	-
CC	**Climate change**			
CC1	To ensure that project activities respond to observed and projected climate change	Climate change risk treatments would be incorporated into the detailed design and delivery of the project. Treatments would be developed from the relevant measures proposed in this EA.	Prior to and during construction	**Table 3-6** of this EA
CC2		Construction-related climate change risks (e.g., heatwaves or increased frequency and severity of extreme rainfall events placing increased pressure on construction water quality control measures) would be considered during the development of environmental management measures as part of the CEMP.	During construction	-
CC3	To offset greenhouse gas emissions associated with the Project	Carbon offsets would be retired at the completion of construction to account for emissions associated with the construction of the Project.	Post construction	-

10.4 Offsets

An environmental offset is intended to compensate for the negative environmental impacts of activity, such as a development. Offset activities are required to directly correlate with the impacts of any proposed activities such as construction work. In practical terms, offsets can include protecting at-risk environmental assets, restoring or extending habitat for threatened species, or improving the values of a heritage place.

In the case of the Project, MPC has already purchased environmental credits relating to Golden Sun Moth (*Synemon plana*) to offset expected impacts to Golden Sun Moth habitat within the city area. Impacts to Golden Sun Moth occurring as a result of the Project have been considered and approved under the EPBC Act Approval 2019/8582. Consistent with the requirements of the EPBC Act Approval, biodiversity credits were retired in mid-2021. The availability of suitable environmental offset land for Golden Sun Moth within the ACT is extremely limited. Investigations by MPC into potentially suitable environmental offset opportunities within the ACT proved unsuccessful. As such investigations were completed into using registered environmental offset lands within NSW that are within proximity to the ACT. Approval to use such this methodology has been provided by the Commonwealth Department of Agriculture, Water and the Environment (DAWE).

10.5 Residual Impacts

A summary of residual risk ratings for each environmental issue, following the implementation of management and mitigation measures outlined in **Table 10-1**, is provided in **Table 10-2**.

There remains a high residual risk associated with construction noise (based on a worst-case scenario) and temporary loss of parking, with all remaining potential impacts for construction and operation reduced to a medium risk or below. Operation of the Project is anticipated to result in beneficial impacts to traffic and transport, landscape and visual realm, socioeconomic conditions, surface water and hydrology, and land use.

Table 10-2 Residual risks with a rating of high or greater

Environmental issue	Residual risk rating	
	Construction	Operation
Traffic and Transport	**Low to Medium**	**Very low to Low / Beneficial**
Heritage[1]	**Nil**	**Nil**
Biodiversity	**Very low**	**Nil**
Contamination and soil	**Negligible to Medium**	**Nil**
Noise and vibration	**Low to High**	**Low**
Air quality	**Low**	**Nil**
Greenhouse gases	**Low**	**Nil**
Landscape and visual realm[2]	**N/A**[2]	**N/A**[2]
Socioeconomic	**Very low to medium / Beneficial**	**Very low / Beneficial**
Surface water and hydrology	**Very low**	**Beneficial**
Resource management and waste minimisation	**Very low to Low**	**Nil**
Land use	**Medium**	**Beneficial**

[1] Given no heritage provisions were determined under the EPBC Act Referral and Approval (2019 / 8582), risks to heritage have not been assigned a risk level.

[2] As the landscape character and visual impact assessment has been undertaken using the TfNSW (2020) matrix and framework, a further risk assessment using the methodology detailed in **Chapter 8.0** has not been undertaken. There are no adverse impacts anticipated on landscape character during

operation, with beneficial impacts identified at LCZ 2: Major Avenues and Axes and LCZ 4: London Circuit. There are adverse impacts rated above moderate at three viewpoints during construction (City Hill South, Commonwealth Avenue, Parliament House), and no viewpoints during operation. Four viewpoints are considered to have a beneficial impact at operation (City Hill, London Circuit, London Circuit South East, Commonwealth Avenue).

11.0 Justification and Conclusion

MPC proposes to raise London Circuit between Edinburgh Avenue and Constitution Avenue to provide a new at-grade, signalised intersection with Commonwealth Avenue. London Circuit currently passes under Commonwealth Avenue in a grade separated interchange with ramp connections between Commonwealth Avenue, London Circuit, and Parkes Way.

The principal strategic planning and development context for the Project is set by the National Capital Plan (NCP) and the four Designated Area Precincts relevant to the Project: Main Avenues and Approach Routes, City Hill, West Basin, and Constitution Avenue and Anzac Parade. The Project has been designed with consideration of the NCP and ACT Planning and Infrastructure Policies. The Project is consistent with the key strategic plans, policies, and guidelines of relevance to strategic transport planning, including integration with land use planning, urban planning and placemaking, and sustainability planning.

The Project is needed as part of coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for the city presented in the NCP. It would facilitate other major projects, most notably the extension of the Canberra Light Rail network and development of Section 63, and through well-timed delivery would support orderly, economic and efficient development of land within Canberra City. The Project would also provide an important opportunity to future proof the city's transport network to accommodate future growth, and to provide high quality urban design and amenity outcomes consistent with the NCP.

This Environmental Assessment is not a statutory requirement for the Project but has been prepared to provide the community and other stakeholders with complete and consolidated details of the Project, its anticipated environmental impacts and the mitigation measures proposed to manage those impacts. A number of assessments are supported by technical reports which are appended to this Environmental Assessment.

As the Project would generally be within the existing road easement which is a highly modified environment, it largely avoids impacts on environmental values and land use. Despite best efforts to avoid impacts, there are some adverse environmental effects, most temporary in nature, which are likely to occur. Adverse environmental impacts would be minimised by implementing mitigation and management measures outlined in this Environmental Assessment, and would include preparing and implementing a Construction Environmental Management Plan. This Environmental Assessment found that, with suitable mitigation and management measures in place, the environmental and social risks generated through the construction and operation of the Project can be managed to a general overall residual risk rating level of Low. There remains a high residual risk associated with construction noise (based on a worst-case scenario) and temporary loss of parking, with all remaining potential impacts for construction and operation reduced to a medium risk or below. Operation of the Project is anticipated to result in beneficial impacts to traffic and transport, landscape and visual realm, socioeconomic conditions, surface water and hydrology, and land use.

The Works Approval Planning Report (Canberra Town Planning, 2021) concludes that the Project is consistent with the *Australian Capital Territory (Planning and Land Management) Act 1998* (Cth) and NCP, does not create adverse planning impacts, and is aligned with the strategic planning and development objectives for the various Designated Area precincts under the NCP affected by the Project.

Overall, it is recommended that the Project be approved, subject to suitable mitigation measures.

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