Waterloo State Significant Precinct

Baseline Investigations - Key Study Summaries

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Introduction

Waterloo contains large areas of government-owned land and is an area of state importance in achieving key government policy objectives, particularly those relating to increasing delivery of housing and jobs and the renewal of social housing.

In May 2017, the Minister for Planning determined that parts of Waterloo are of State planning significance, which should be investigated for rezoning through the State Significant Precinct process. This rezoning investigation area is known as the Nominated State Significant Precinct – Waterloo (the Precinct).

The Study Requirements for the Precinct have been prepared with the City of Sydney, in consultation with relevant State agencies. NSW Government agencies are working together to deliver a program of highly-integrated, but individually-delivered projects within the nominated Precinct. These projects include:

- Redevelopment of the Waterloo Estate
- Construction of the new Waterloo Metro Station
- Creation of the Waterloo Metro Quarter (the area above and around the new metro station).

This report provides a summary of key Stage 1 ‘Baseline’ investigations prepared to inform the development of proposals for the Precinct. Each summary describes the current conditions within the Precinct and identifies relevant opportunities and constraints.

The Precinct

The Waterloo Precinct is approximately 3.3 kilometres south of the Sydney CBD and comprises two key land areas, inclusive of City of Sydney streets and parks:

- **Waterloo Estate:** 18.12 hectares (gross) social housing owned by NSW Land & Housing Corporation (LAHC), part of the Department of Family and Community Services (FACS), as well as a number of privately owned sites. The Estate includes 2,012 social housing dwellings.
- **The Waterloo Metro Quarter:** This site is approximately 1.91 hectares (gross) in size, and has been acquired by Sydney Metro to deliver the new Waterloo Metro Station and over station development. The existing heritage listed church within the block does not form part of the Precinct.

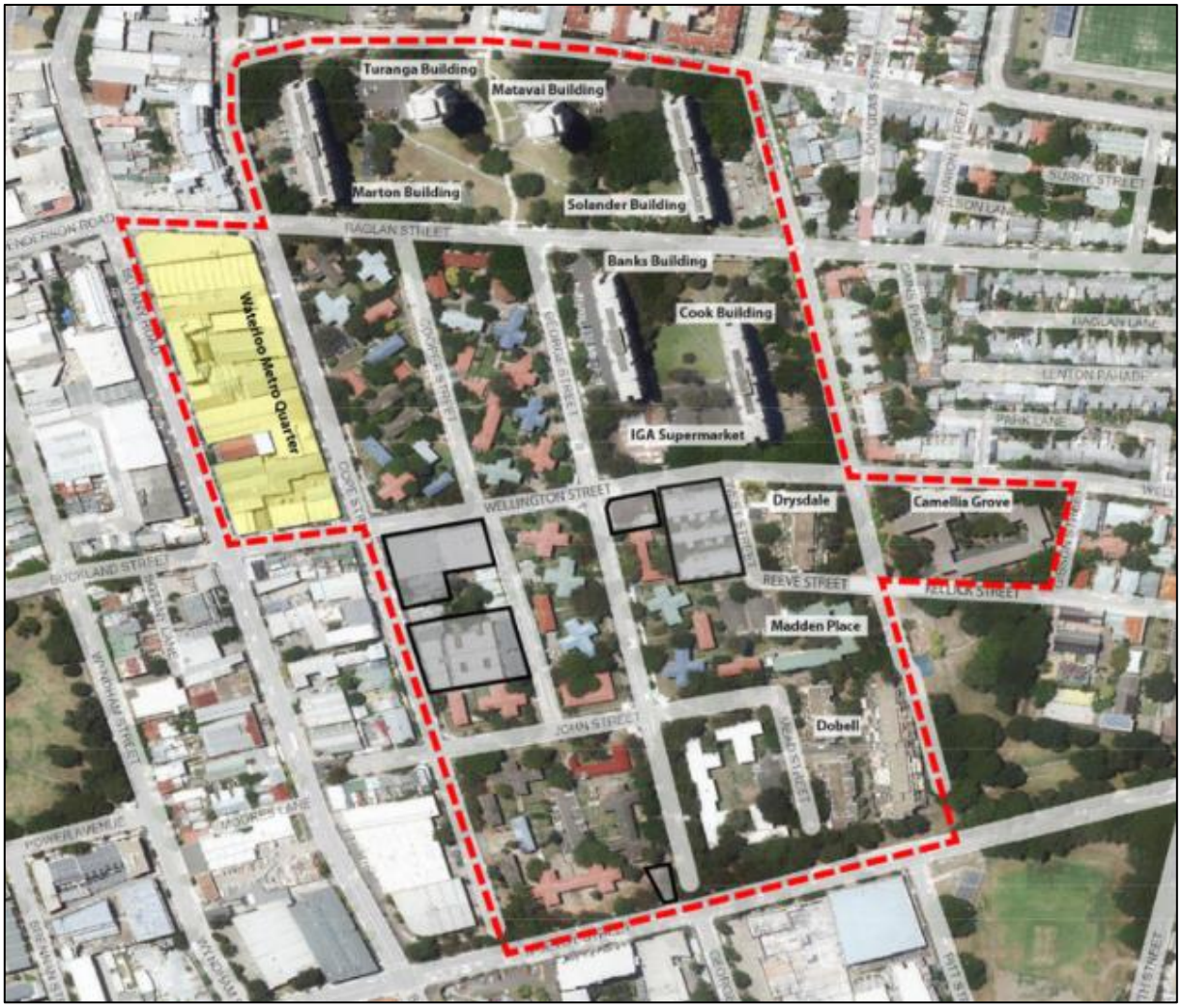


Figure 1: Waterloo Estate and Metro Quarter site

Purpose

The purpose of this document is to provide stakeholders with a high level understanding of the study methodology and to document the current situation across nine technical studies for the Waterloo Precinct, as requested by the Waterloo community.

As part of the NSW Government's State Significant Planning process (SSP), the Department of Planning and Environment (DPE) issued 27 study requirements. The technical study process and feedback from LAHC's community engagement program will inform the development of the master plan.

Once the master plan is lodged with DPE, it will be put on public exhibition, along with all the technical study reports.

The full set of study requirements can be found at http://www.planning.nsw.gov.au/Plans-for-your-area/State-Significant-Precincts/Waterloo/Waterloo-Estate

These baseline technical studies will help inform the development of concept design plans to determine what is possible in redeveloping the Precinct.

Following community feedback on different concept design options, a preferred plan will be determined and this is when the technical study process will be finalised.

LAHC has been engaging with the Waterloo community over the past two years as part of its master planning consultation program and has communicated the following key facts to social housing residents:

- The redevelopment of Waterloo will be staged over 15-20 years
- The master planning process will take approximately 12 months and will help determine the mix of social, affordable and private housing
- There will be no loss of social housing. The NSW Government has stated that all current social housing residents have the right to return to the Waterloo Estate.
- FACS will contact each resident six months before relocating and FACS will work with residents throughout the relocation process. There will be no relocations in 2018.
- The intention is for the majority of residents to be able to move from their current homes straight into new social housing as buildings are completed.
- A human services plan will be developed in parallel with the master planning process to support residents' health, safety and wellbeing.

Transport

Traffic and Transport

Overview

Jacobs has completed the first stage of the Waterloo Precinct Transport Study to identify existing conditions to inform the Waterloo State Significant Precinct study process. The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

An AIMSUN traffic model for the area surrounding Waterloo was built to test future options. The base AIMSUN model has been calibrated and validated to weekday peak periods using intersection counts, travel time surveys, and origin-destination surveys. The purpose of the model is to assess network impacts within the highest demand weekday period. This approach has been agreed with the state transport agencies and the City of Sydney.

A range of traffic and transport data was collected to calibrate and validate transport models. Data collected included:

- Intersection counts of light vehicles, heavy vehicles, buses, pedestrians, and cyclists covering every signalised intersection in the surrounding area, as indicated at Figure 2. Counts cover an average weekday between the hours of 6-10am and 3-7pm
- Travel time surveys on the key routes through the study area including Botany Road, McEvoy Street, and Elizabeth Street. Counts cover an average weekday between the hours of 6-10am and 3-7pm
- Origin-Destination surveys matching key entry / exit points within the surrounding area and covering 10 sites. Counts cover an average weekday between the hours of 6-10am and 3-7pm
- Traffic generation surveys of comparable residential / mixed used developments in Waterloo and Redfern including counts of pedestrians and cyclists. Counts cover an average weekday between the hours of 6-10am and 3-7pm. Intersection data was also collected at the same time to ensure volumes were comparable to previously collected days.

Current situation

- Mode share for work related public and active transport trips within the Waterloo Precinct is high (53%), with an even higher share within benchmark locations such as Ultimo (up to 70%)
- There is a high share of trips from the Precinct travelling to the Sydney CBD
- Compared with the City of Sydney LGA, the Waterloo Precinct has a much higher proportion of high density dwellings, much lower proportion of medium density dwellings, and a similarly low proportion of detached dwellings.
- Several key centres are located in proximity to Waterloo, in addition to the metropolitan centre of Sydney CBD located only 2.8km to the north. The emerging Green Square strategic centre is located only 0.9km to the south.

- Completion of WestConnex and the Alexandria to Moore Park Connectivity Upgrade are likely to change traffic levels and patterns along Botany Road and McEvoy Street.

Constraints

- East-west bus routes serve an important cross-regional function, but are often infrequent and sometimes operate for limited hours, especially during the evening. Many east-west routes are also convoluted and lengthy, reducing reliability.
- Average spare capacity on citybound trains stopping at Redfern is limited during the morning peak.
- Redfern Station is significantly constrained by a single concourse to the north of the station and narrow platforms which are accessed via a single set of stairs each.
- The road network in and around Waterloo Precinct is fairly constrained. Traffic data collected in May 2017 indicate traffic volumes greater than 1,000 vehicles per hour during the peak hour on Botany Road, Elizabeth Street, Henderson Road and McEvoy Street.
- The road network experiences congestion during both peak periods with vehicles travelling at low speeds compared to the speed limit (see Figure 2).

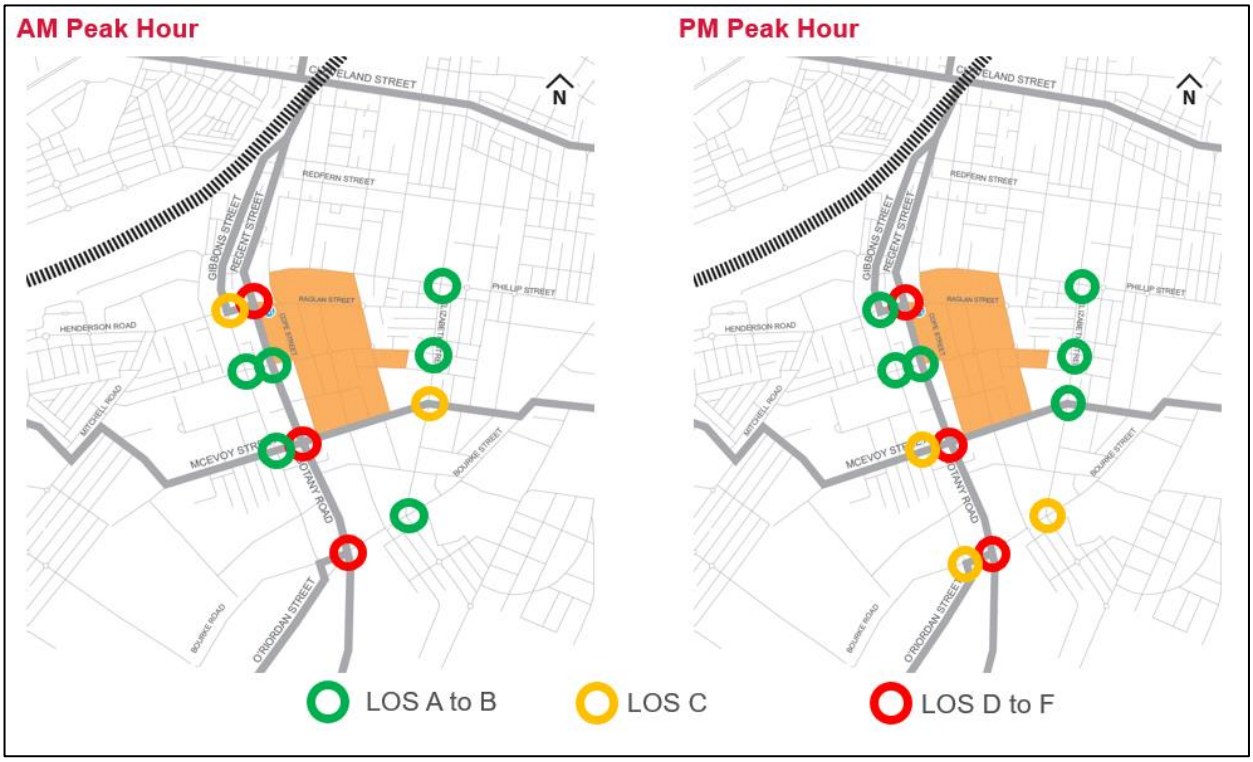


Figure 2: Level of Service (LOS) performance indicators of key intersections

- Constrained intersections where this is particularly evident include:
    - Botany Road / Henderson Street and Wyndham Street / Henderson Road
    - Botany Road / McEvoy Street and Wyndham Street / McEvoy Street
    - Botany Road / Bourke Street and O'Riordan Street / Wyndham Street / Bourke Road
    - Botany Road / Bourke Street.
- Because of the proximity of arterial roads (e.g. Botany Road) careful management of the risk of through-traffic impacting / infiltrating into the development will be required.

Opportunities

- Proximity to existing Sydney Trains Network and future metro will provide excellent rail access to the Sydney area and create an opportunity to support low private vehicle demand in the Precinct (Figure 3).
- The new metro creates an opportunity to improve public transport services to the surrounding subregions by enhancing bus connections and investigating options to improve connections to the industrial land to the south-west, known as the Southern Sydney Employment Lands.
- There is potential for active transport to play a significant role in short and medium distance trips to, from and within the Waterloo Precinct by providing new connections along existing streets and across the heavy rail corridor at Eveleigh.
- A greater level of trip self-containment could be achieved in the Waterloo Precinct by providing more opportunities to work, shop, and engage in recreational pursuits in and around the Precinct.
- Traffic passing through the Precinct could be redirected by road closures and/or intersection redesigns.
- There is potential to take advantage of the new high capacity north-south public transport connection provided by Sydney Metro, redesigning the bus network with stronger and simpler east-west connections linking heavy rail and metro hubs.

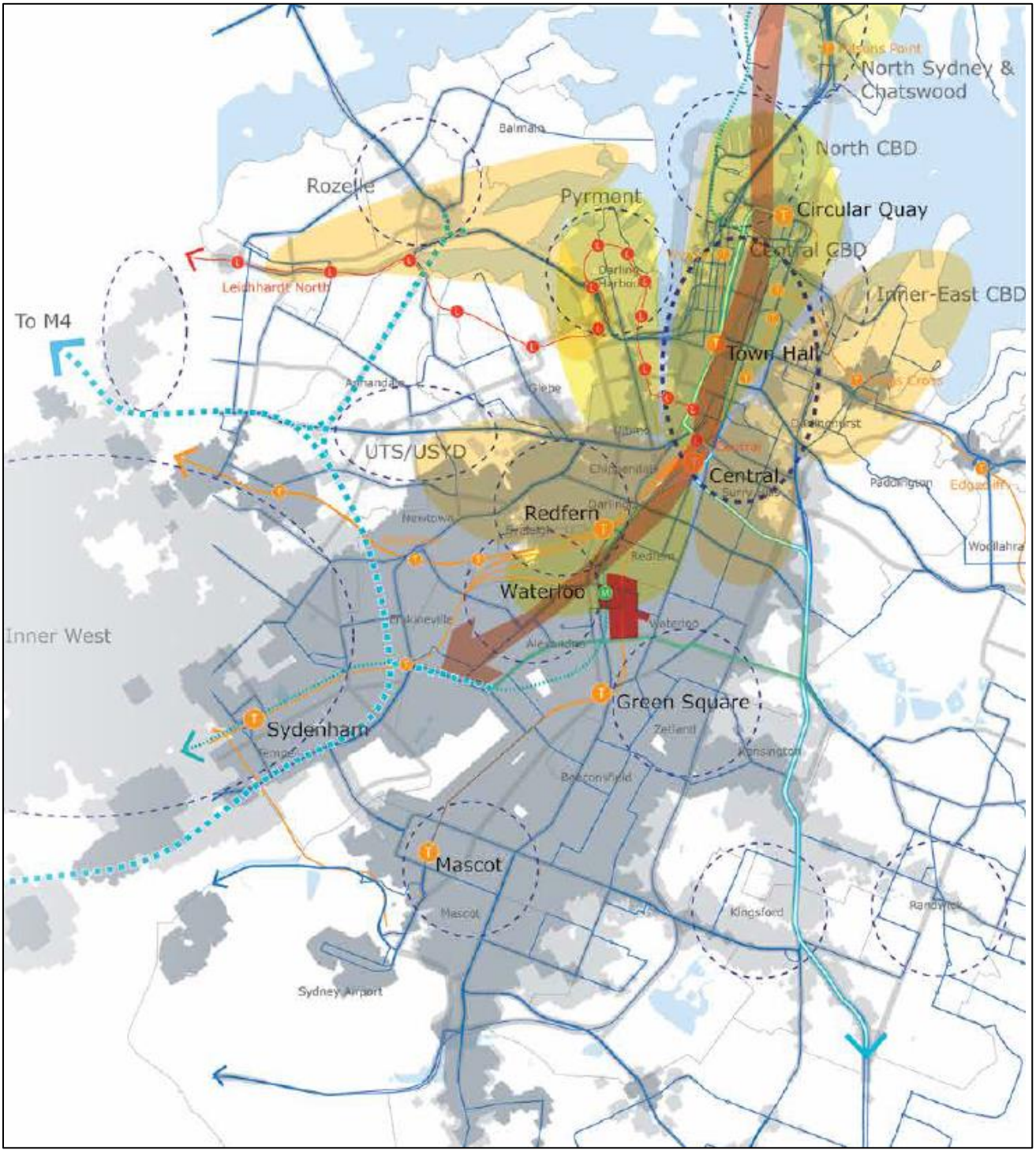


Figure 3: Public transport accessibility from the Precinct

Sustainability and Infrastructure

Sustainability

AECOM has completed the first stage of the Waterloo Sustainability Study to identify existing policy conditions to inform the Waterloo State Significant Precinct study process. The purpose of the report is to provide an analysis of existing policy conditions in order to identify issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current Situation

There is no sustainability framework currently applicable to existing development within the Precinct.

There are a number of constraints that affect future development of the Precinct. The sustainability direction for the Waterloo Estate is defined by the study requirements and supported by a range of policy requirements, planning and governance constraints. The following points provide a high level overview of the sustainability context from a policy perspective.

- State Significant Precinct Study Requirements
    - Investigate options for achieving net-zero buildings and a net-zero Precinct (carbon neutral) by 2050
    - Identify options to achieve at least 50% renewable energy for the Precinct
    - Provide integrated waste water management strategy that considers water, waste water and stormwater plus alternative water supply, and demonstration of water sensitive urban design
    - Identify and implement waste management strategies to achieve the NSW Government's Waste Avoidance and Resource Recovery Strategy, and compliments the NSW Government's Waste Less, Recycle More initiatives, and EPA waste and recycling programs
    - Commitment to compliance with a nationally recognised rating system
- Building Sustainability Index (BASIX)
    - All new residential dwellings in NSW must be designed in line with BASIX by meeting minimum BASIX targets for energy, water and thermal comfort
- Building Code of Australia
    - All newly constructed buildings must meet minimum necessary requirements for safety, health, amenity and sustainability. Section J of the Code specifically identifies sustainability requirements.

- Other guidance and supporting strategies that will help to shape the sustainability outcome of the Waterloo Estate:
    - National Energy Productivity Plan
    - Renewable Energy Target
    - National Carbon Offset Standards
    - Australian Guidelines for Water Recycling
    - National Australian Built Environment Rating System
    - Nationwide House Energy Rating Scheme
    - LAHC Environmental Sustainability Objectives
    - Residential Apartment Design Guide
    - Sydney Development Control Plan 2012
    - City of Sydney Environmental Action Plan 2016-2021
    - City of Sydney Urban Forestry Strategy
    - City of Sydney Sustainable Sydney 2030
    - City of Sydney Climate Change Adaptation Plan

Constraints

Potential sustainability initiatives need to be considered and prioritised in terms of the following attributes specific to the Waterloo Precinct:

- Cost of Living – one of the key features of the development includes a focus on affordable living. This will require any significant sustainability investments to be considered for their whole of life social, environmental and cost benefits and impacts.
- Timing – currently, at the approvals phase under the SSP, it is difficult or inappropriate to specify technical solutions prior to the disposal, procurement, governance strategy or the detailed technical specifications for the project being defined.
- Ownership – potential for multiple owners and developers on the site will introduce challenges to Precinct-wide coordination and could potentially require a governance / ownership structure pre-development to enable Precinct wide systems.
- Staging – differing staging timelines across the site will introduce challenges to Precinct level coordination in terms of capital expenditure timing for any Precinct scale solutions.

Opportunities

To enable the successful redevelopment of the Waterloo Estate Precinct from a sustainability perspective, the following opportunities are being considered:

- Early consideration within the design of building form and orientation – affects the amount of heating and cooling needed to maintain thermal comfort.
- Setting planning controls that create certainty in desired outcomes and also provide technical flexibility in the realisation of the outcome.
- Ensuring that any proposed outcomes can be achieved and ensure a positive impact on the social, environmental and economic value for the existing and future community.
- Focus on optimising building scale initiatives by focusing firstly on demand reductions then local supply solutions prior to Precinct solutions.
- Look to central / Precinct servicing facilities (energy, water and waste) at a scale where they are environmentally, socially or economically feasible.
- Consider stormwater harvesting from the public domain using passive and active distribution and reuse.

Several sustainability rating tools were identified and considered as a potential framework to guide sustainable planning, design and construction of the Waterloo Precinct. Commitment to a nationally recognised rating tool is required under the SSP Study Requirements. Following evaluation, the Green Building Council of Australia's Green Star – Communities rating tool has been identified as the preferred framework.

Noise, Pollution and Light

SLR Consulting Australia Pty Ltd (SLR) has completed the first stage of the Waterloo Pollution Study to identify existing conditions in relation to noise and vibration, air quality and lighting to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current situation

Noise & Vibration

- The existing noise environment throughout the Precinct is dominated by road traffic noise.
- Ambient noise measurements were undertaken over a period of one week at six locations (see Figure 4). The noise logging results confirmed that noise levels are controlled by road traffic noise.
- A detailed noise model was developed using traffic figures provided by the Traffic and Transport study. The noise model correlated well with the ambient noise monitoring undertaken and illustrated the noise impact across the project.
- The area does not currently have any significant sources of vibration.

Lighting

- The effect of light spill from outdoor lighting impacting on residents, transport users and transport signalling systems has been addressed in accordance with Australian Standard: AS 4282-1997 *Control of the Obtrusive Effect of Outdoor Lighting*.
- To define the existing lighting environment, a survey of the existing conditions at the site was conducted (see Figure 4), generally with measurements on footpaths, rather than directly next to the façade or residential windows of residences, which would have involved property access issues, etc.
- A number of surveyed areas failed to satisfy the AS 4282-1997 requirement. In general, these were areas close to and directly under light fixtures close to road intersections.

Figure 4: Location of baseline noise and lighting measurements

Air Quality

- A detailed review of the existing air-quality throughout the local area has been undertaken.
- The nearest air quality monitoring stations are located at Rozelle, Randwick and Earlwood which are considered to be representative of the project area.
- The nearest Bureau of Meteorology (BoM) weather station is located at Sydney Airport, which is located approximately 5 km to the southwest. Wind conditions at Sydney Airport are considered a reasonable representation of wind conditions at the site – prevailing (sea breeze) northeast winds during summer as well as southeast and southerly winds; prevailing westerly winds during winter, as well as less frequent southerly winds.
- The project area is characterised by urban arterial roads carrying high volumes of traffic. Vehicle emissions from traffic travelling along Botany Road and McEvoy Street would include:
    - Carbon Monoxide (CO), Oxides of Nitrogen (NOx), Sulphur Dioxide (SO2)
    - Particulate matter less than 2.5 µm & 10 µm in aerodynamic diameter (PM2.5, PM10)
    - Total Volatile Organic Compounds (TVOCs)
- A search of the Environmental Protection Act (EPA) public register and National Pollutant Inventory (NPI) database for the project area returned several records of industries in the vicinity of the Precinct which could potentially be a source of air pollutant emissions, the closest being just over 1 km from the nearest site boundary. These include an asphalt plant, alloy and light metals manufacturing and laundry/dry cleaning operations. Considering the nature and scale of the activities being undertaken and the large separation distances, significant cumulative air quality impacts from these identified industries at the site are considered unlikely.
- Air quality criteria relevant to the project come from the National Health and Medical Research Council [NHMRC], National Environment Protection Council [NEPC] and World Health Organisation [WHO].

Constraints

Noise & Vibration

- For the project area, Botany Road and to a lesser degree McEvoy Street, are the most significant noise sources. Botany Road carries a significant amount of traffic, which includes a large number of heavy vehicles. With the removal of buildings currently located within the future Metro Quarter area, noise levels throughout the Waterloo Precinct have the potential to increase.

- The built environment throughout the Metro Quarter should be designed to ensure that line-of-sight is eliminated from Botany Road to the Waterloo Precinct area as much as practicable. The structures providing this shielding should generally be at least two storeys high. Where possible absorptive and diffusive surfaces should be prioritised in close proximity to Botany Road, or down paths which noise could potentially propagate. SLR are working closely with the Metro Quarter design team to ensure the design progresses in a manner which mitigates the noise from Botany Road to the rest of the project area.

Air Quality

- Atmospheric dispersion modelling will be carried out to quantify air quality related emissions for projected traffic volumes in and around the Waterloo project area and to assess the impacts on nearby existing and proposed sensitive receptors.
- As air pollutant concentrations from road traffic (main source of emissions identified in the study area) tend to decrease with increasing distance from the road, it is recommended that sensitive receptors within the Precinct be located as far away from the main roads as possible. Considering the significant (75%) drop in pollutant concentrations 20 m away from the road, it is recommended that no sensitive receptors be located within a 20 m radius of the major roads.

Lighting

- AS4282-1997 sets out general principles that should be applied when designing outdoor light to minimise any adverse effect of the light installation. Some of the general recommendations that will be used for the Waterloo project include the following:
- Use luminaires that are aimed to minimise light spill, for example full cut off luminaires where no light is emitted above the horizontal plane. Less light spill means that more of the light output can be used to illuminate the area and a lower power output can be used. The energy consumption for the fitting can thus be reduced without decreasing the illuminance of the area.
- Minimise lighting energy consumption and hence the potential for light pollution by not “over-lighting” areas, subject to safety standards being satisfied.
- Keep glare to a minimum by keeping the main beam angle less than 70° and wherever possible use floodlights with asymmetric beams that permit the front glazing to be kept at or near parallel to the surface being lit.
- Carry out a detailed survey of the site with both current and future usage areas to direct the site lighting away from sensitive locations such as residential properties.

Opportunities

Noise & Vibration

- A detailed analysis of future noise levels from projected future traffic flows on the surrounding road network will be carried out. In particular, likely changes to the traffic flow on Botany Road due to WestConnex and the McEvoy Street widening projects will be addressed once detailed traffic information is available.
- The provision of quiet spaces for both passive and active recreation has many positive health benefits. To achieve this, green space should be provided within the Waterloo Precinct area away from roads and other noise sources. The built environment should be designed to provide quiet areas shielded from road traffic noise. Where practicable landscaping and vegetation should be considered which provides both a visual and physical barrier from roads.
- Local roads should include traffic calming measures. Speed humps should be avoided as these have the potential to create additional noise sources. Opportunities such as shared zones, curb extensions, pedestrian refuges and speed limits should be considered. In general, measures which reduce the propensity of vehicles to accelerate throughout the Precinct should be prioritised.
- Residential developments higher than five to ten storeys (dependant on their location) will have limited source mitigation options. These higher properties would be impacted by noise from the surrounding road and rail network to a greater extent than properties closer to the ground. Mitigation options will be limited to the properties themselves. The implementation plan will define appropriate conceptual noise mitigation.
- SLR will be investigating surface vibration levels associated with the Sydney and CBD Metro projects, including the potential need for a resilient trackform in relation to the development of the Metro Quarter element of the project.

Air Quality

- The built environment throughout the Precinct should be designed in a way that avoids the creation of street canyons. This can be done by setting back the upper floor of buildings on roads with buildings along both sides of the road. Where street canyons cannot be avoided, it is recommended that lower floors be used for commercial use and residential receivers should be located on higher floors.
- Vegetation barriers can play a significant role in mitigating urban air pollution and has many positive health benefits. Vegetation barriers force polluted air to flow either over or to pass through the vegetation. This is dependent upon porosity and physical dimensions. Low density vegetation results in the majority of air flowing through the barrier, whereas high density leads to little or no infiltration.
- In open road environments a mixture of trees and bushes can act as barriers to improving air quality. In street canyons however, depending on the urban and vegetation characteristics, trees may deteriorate air quality if their configuration is not planned adequately.
- Trees can reduce the wind speed in a street canyon, resulting in reduced air exchange between the air above the roof and within the canyon and hence leading to accumulation of pollutants inside the street canyon. Therefore, it is recommended that low-level hedgerows or green walls be used in street canyons.

Lighting

- Key lighting sources of interest for the proposal will likely be street lights or flood lights.
- The impact of light spill on all potentially affected neighbouring properties will be managed through mitigation measures, including a well-designed lighting fit-out in accordance with AS 4282-1997.

Arts & Culture

Milne and Stonehouse have completed the first stage of the Waterloo Arts and Culture Study to identify existing conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

The study looked at the existing diversity, history and stories of Waterloo and how these were represented through public art, temporary and permanent. The study also considered the broader context of existing creative cultural assets and how these contribute to cultural vitality, cohesiveness and community wellbeing.

Current Situation

Waterloo has rich layers of cultural resources through its community, history and environment. Its cultural life is organic, dynamic and complex. While rich in intangible culture, the number of physical cultural resources in the Estate is limited compared to a growing base of creative professionals, opportunities and businesses in the wider area (see Figure 5).

The City of Sydney's (CoS) definition of culture has been adopted and further refined to specifically express culture in Waterloo. In Waterloo culture is expressed through the "*production, distribution and participation in creativity by Waterloo's community of residents, workers and visitors and is the reflection and expression of its customs, traditions, heritage and social character. In Waterloo this includes the arts broadly defined, local creativity and the idea of Waterloo's sense of identity*."

The CoS Public Art policy defines "public art" in the broadest sense as artistic works or activities accessible to the public. The work may be of a temporary or permanent nature. It can be located in or part of a public space or facility, public art also includes the conceptual contribution of an artist to the design of public spaces and facilities

Current permanent public art in Waterloo is heavily weighted to a story of Captain Cooks Voyage, with Waterloo's Aboriginal heritage, postcolonial stories, customs and cultural traditions needing further exploration. Artistic references to Waterloo's Chinese, Ukrainian and other communities should also be considered.

Dedicated places for creatives as well as the general Waterloo community to participate in, experience and learn creative capabilities through the arts is limited. This includes community cultural organisations, studio and maker spaces, arts and cultural facilities, programs and services in community facilities, and public art and animation.

Opportunities are limited for residents to access and participate in cultural programs and events, and for the wider community to understand and engage in Waterloo's tangible and intangible Aboriginal cultural history and contemporary practice.

Figure 5: Map of physical creative cultural assets

Constraints

- Creative clusters and cultural vitality:
  Waterloo does not have a critical mass of creative opportunities and infrastructure. These "creative clusters" are enjoyed by surrounding areas including Redfern and Chippendale. These strong creative ecologies support local economies and cultural vitality.

- Valuing heritage:
  Waterloo has a diverse stock of intangible cultural resources (networks, places of memory, celebrations etc) that should inform redevelopment.

- Commitment to education and lifelong learning:
  Core or dedicated creative infrastructure is not available to fully support the role of art and culture in positive learning and education outcomes.

- Limited cultural infrastructure:
  The diversity and number of arts and cultural infrastructure including workshops, maker spaces, creative organisations and facilities is limited.

- Limited Maker Spaces:
  There is limited availability of local affordable studios and maker spaces.

- Unique local character:
  While there are several initiatives to document the history of Waterloo, such as 'We Live Here' and 'Here and Now: Waterloo', there is no systematic program that documents or celebrates, through activation or programs, the community's culture.

- Existing art works:
  Waterloo's small number of existing permanent art works are integrated into the built form and consideration will need to be given on their value, and need for integration into a new public art program.

Opportunities

- A suite of creative spaces and facilities:
  Accessible spaces for community arts engagement and participation as well as professional creative practice are a key consideration in building Waterloo's creative ecology.

- Increase community cultural participation:
  The impact of the provision of new accessible, relevant and inclusive creative cultural infrastructure in Waterloo will have positive benefits by providing the residents of Waterloo with opportunities to participate in, and engage with, arts and cultural experiences close to home.

- Build critical skills and cultural knowledge:
  Flexible, adaptive creative spaces that can facilitate skills development and educational opportunities for the community.

- Develop cultural confidence through employment programs:
  Employment programs in the creative sector for local Waterloo residents that will build confidence, nurture new skills, encourage a sense of belonging and foster economic growth.

- Capture and celebrate Waterloo's stories:
  A program of ongoing community-based storytelling programs using multiple arts media to celebrate the local culture and stories from past, present to future.

- Embed and integrate arts and culture:
  Ensuring that Waterloo's existing connections to place are retained and that new connections are nurtured through small-scale cultural initiatives as well as larger permanent infrastructure.

- Celebrate Aboriginal and Torres Strait Islander heritage and connection:
  Dedicated programs that collect and celebrate the Aboriginal community's sense of cultural connections and identity.

- A unique cultural destination:
  Waterloo is a unique destination that builds on Waterloo's rich cultural identity including its Aboriginal and Torres Strait Islander heritage, its demonstrated respect for cultural diversity and its connected and distinctive natural resources. Events, programs, innovative art and urban design, heritage and history could provide visitors with opportunities to engage with, understand, and often participate in a uniquely Waterloo experience.

- Foster active and ongoing community participation and engagement:
  The Waterloo community has a strong sense of neighbourhood which presents opportunities for ongoing, active engagement strategies that will enrich and celebrate Waterloo's distinctiveness.

- Develop Waterloo's public art assets:
  The potential for new public artworks is significant for building local identity, both permanent and temporary through a public art program that starts by celebrating and collaborating with the existing community and cultural elders.

Opportunities in relation to cultural facilities will be further explored in partnership with the Social Sustainability Study. Housing diversity is a consideration for city planning, including affordable housing which may include housing for creative industry workers and, for example, the City of Sydney *Creative City Cultural Policy and Action Plan 2014-2024*. This will be considered as part of the housing diversity study.

Social Sustainability

GHD has completed the first stage of the Social Sustainability Study to identify existing conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current situation

- Communities within the Precinct are diverse, comprising predominantly social housing.
- Dwellings outside the Estate feature younger and higher income households.
- The Waterloo Estate has a large elderly population, with almost half of the residents having lived there for over ten years. Other key characteristics include a high proportion of people who live alone, low income earners, people whose first language is not English, and people with a disability.
- The area surrounding the Waterloo Precinct has undergone significant redevelopment in recent years, including many higher density developments along Bourke, Lachlan and Danks Streets. These new developments have not only significantly changed the character and population density of the area, they have also changed local demographics, with more tertiary students, people from culturally and linguistically diverse backgrounds, professionals, young families, couples without children as well as some older people looking to age in place. This trend will continue with the redevelopment of other surrounding areas, including Green Square and Australian Technology Park.
- There is a range of community facilities and services located within one kilometre of the Waterloo Precinct, with many services targeted towards the needs of social housing tenants.

Constraints

- **Rehousing existing social housing residents** – many of the social housing residents in Waterloo are from vulnerable groups and have high needs (i.e. older tenants, Aboriginal and Torres Strait Islander people, Culturally and Linguistically Diverse (CALD) people, people with mental health issues). Many also are long term residents of the area and have strong connections and attachments to Waterloo. Support will be required to ensure the rehousing process is a smooth transition, particularly for vulnerable groups.
- **Temporary rehousing outside the Waterloo Estate** – although it is intended that the majority of tenants would be able to relocate from their current home to a new home on the site, some tenants may be required to be temporarily rehoused outside of the Precinct.
- **Ensuring social cohesion between current and future residents** – it is anticipated that future residents, particularly those in private housing, will have a different demographic to those of the current residents (according to e.g. income, education, employment levels). Sustainable communities need to maintain social cohesion, with strong community networks and linkages which enable them to deal collaboratively with emerging issues and challenges.

- **Economic implications of the development** – the development of private dwellings may impact on other economic activities within the Waterloo Estate. This includes decreased housing affordability and increased rent for existing businesses. Existing residents may have to move out of the area and there may be a loss of affordable services for low and moderate income residents (e.g. supermarket, pharmacy, child care).
- **Enabling older tenants to age in place** – there is a significant number of existing older tenants in the renewal area. Facilities and services will need to be provided to ensure that they are able to continue to live at home and age in place. These services could increase demand for residential aged care facilities (nursing home) and community care (in-home care) in the local area.
- **Increased need for social infrastructure for new residents** – incoming private residents will also require access to social infrastructure. The needs generated by this greater diversity of households may differ to those of existing residents and facilities will need to reflect the change in demand. Consideration will need to be given to ensure that the facilities contribute to an integrated community.
- **Change in local character** – areas in close proximity to the Waterloo Precinct have recently or are currently undergoing significant development (e.g. Danks Street, Zetland, Green Square, Australian Technology Park), and together with Waterloo, the broader area will result in higher density living. Although there are several high rise buildings in the Waterloo Estate, the redevelopment will increase the number of high rise buildings and density in the local area. The design will need to ensure lower scale buildings are integrated. With additional residents, there will also be increased demand on public spaces, which will create a need for new and well designed public spaces.
- **Long term construction impacts** – with a 15 to 20 year timeframe, residents in the local area may be exposed to construction impacts (e.g. noise, vibration, dust, visual) over many years. A construction management plan will be required to mitigate potential impacts on the community (e.g. sleep disturbance, annoyance).
- **Maintaining connections within the Culturally and Linguistically Diverse Community** – Waterloo has a significant population of CALD social housing residents (particularly Mandarin, Cantonese and Russian speakers) with many forming specific language clusters within buildings/areas. The rehousing process will need to consider how to maintain and reinforce these strong bonds, for example relocating language and cultural groups together, or providing specialised support services and facilities.
- **Respecting the area's rich Indigenous heritage** – ensuring that the area's rich Indigenous culture is reflected in a high density area may be a challenge, as well as maintaining the cultural and community connections of existing Aboriginal and Torres Strait Islander social housing and private residents through the renewal process

Opportunities

- **Provision of new, improved and more appropriate social housing dwellings to meet existing and future tenants' housing needs** – social housing dwellings will be significantly improved and may increase, enabling social housing tenants to live in appropriate housing in a location with good access to public transport, support services and community facilities.

- **Creating a socially cohesive and integrated community** – the development will reduce concentrations of disadvantage and facilitate a more diverse community in the Waterloo Precinct through changing the dwelling mix. This may be an opportunity to create a more cohesive and integrated community.
- **Increased housing diversity** – through provision of private dwellings for purchase and affordable rental dwellings managed by community housing providers. Together with a range of dwelling sizes (e.g. one, two and three bedroom apartments) there will be increased opportunity to meet the housing needs of different income groups and different household types. This includes essential and key workers who will be supported to live in an inner city location, and older people who will be supported to age in place.
- **Maintenance of social connections by ensuring that all current tenants have the right to return to new housing in the Estate** – the intention is for the majority of residents to move from their current home into their new home as the site is redeveloped. This will reduce the risk of severed support structures, such as community networks and access to familiar services and facilities.
- **New or increased capacity of existing social infrastructure to meet community needs** – these new/upgraded facilities and services would enhance community connections, particularly between people from different income groups and diverse target groups in the community. These facilities would also enhance the amenity of the area, while ensuring people with high needs have good access to support services.
- **Ensuring that benefits are delivered early** – with a timeframe of 15 to 20 years, a staging process should be undertaken to ensure that social infrastructure and other social benefits are delivered early and throughout each stage of development.
- **Enhanced access to public transport services due to the new Sydney Metro station** – this will lead to improved access to employment opportunities, and enhanced connectivity to other parts of Sydney. In particular, people on low incomes, young people, older people, and people with a disability are expected to benefit from improved public transport access.
- **Improved public domain safety and connectivity** – through redesign of public infrastructure including streets and pathways may lead to improved health outcomes through facilitating walking and cycling, while improving community wellbeing through enhanced feelings of safety.
- **New employment opportunities** – the development will provide opportunities for increased businesses within the Waterloo area, creating employment opportunities that will be available to local residents, including affordable and social housing tenants.
- **Recognition of strong community networks and cultural identity** – consultations indicate there is a strong sense of pride and identity amongst many community members. There are also strong connections for Aboriginal and Torres Strait Islander residents to Waterloo. The master planning process presents opportunities not only to recognise Aboriginal and non-Aboriginal cultural heritage in the design, but also to involve community members in the planning and design process.

Recommendations and next steps

Based on the potential social issues and risks, the following recommendations have been identified for the current planning and design work.

- **Accessible design and walkability** should be a key design consideration to ensure older residents can age in place and live independently. This relates to apartment and building design, as well as to the public domain.
- **Maintaining local culture and identity in the design** of various elements and features should be a key focus e.g. buildings, urban form and fabric, community facilities and spaces. There may be opportunities to involve community members and stakeholders in design and planning so that local character and identity is reflected and interpreted. This is particularly important for the local Aboriginal community to maintain cultural and community connections.
- **Planning for new and upgraded social infrastructure to consider the diverse needs of existing communities, and the changing characteristics of the community over time** as the renewal progresses. Facilities will need to be flexible, and should be planned in partnership with local service providers who understand the needs of the local communities. This includes considering the locations of facilities within the master plan, ensuring they are well-located in terms of public transport and co-located with other facilities.
- **Social housing dwellings should be designed to look similar to private dwellings** to facilitate social cohesiveness and create an integrated community.
- **Ongoing consultation with service providers is required** to confirm the capacity of existing services and facilities to meet the needs of existing and future residents, including private, affordable and social housing residents. Consultation will also confirm the status of planned facilities and provide information that is not available from a desktop study.

Heritage

Urbis has completed the first stage of the Heritage Study to identify existing conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Note: it is beyond the scope of this report to assess the social significance. A separate report is being commissioned which will consider the social significance of the subject site.

Current situation

There are a number of locally listed heritage items located both within the Precinct and adjacent to it. The Precinct is surrounded to the north and east by locally listed Heritage Conservation Areas (HCAs). It is noted that the locally listed heritage items that are located within the study area are privately owned and are to be retained in their current state. All currently listed heritage items and their curtilages are identified on the map and list below.

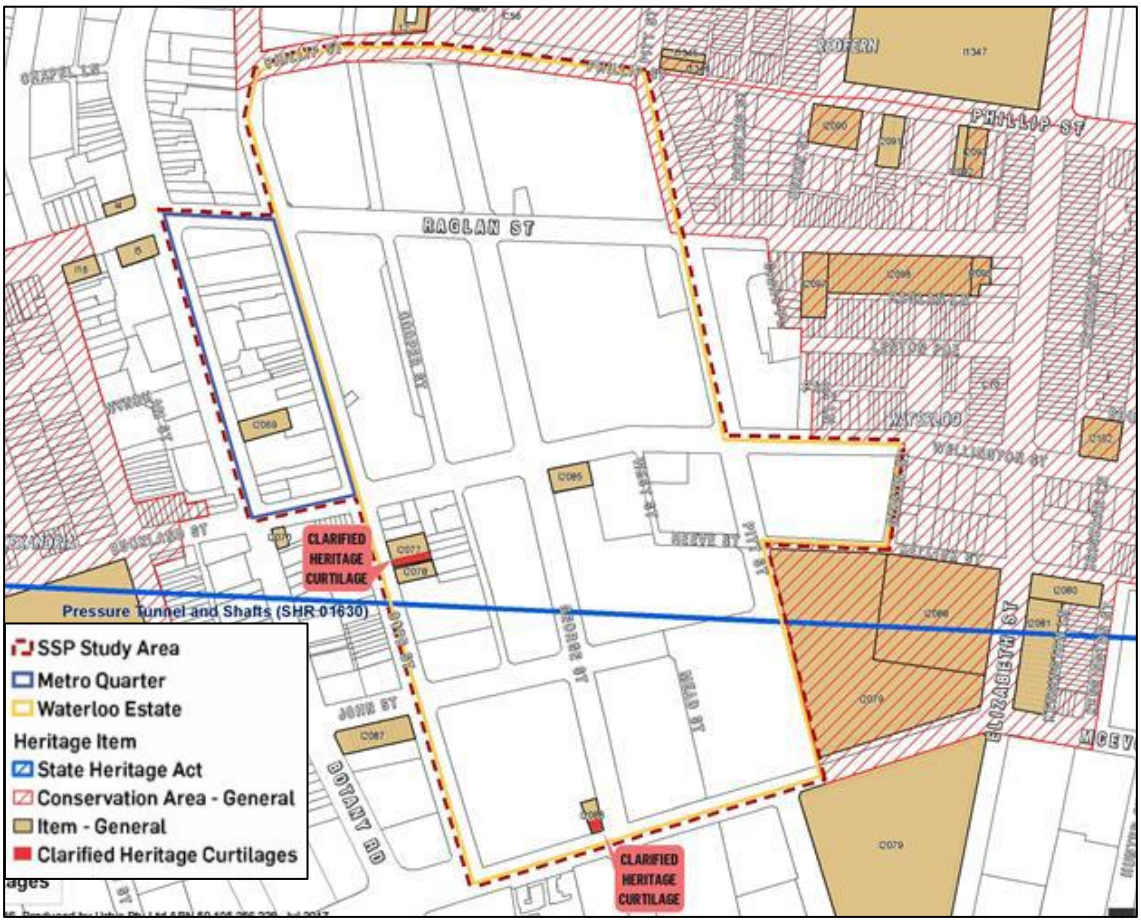
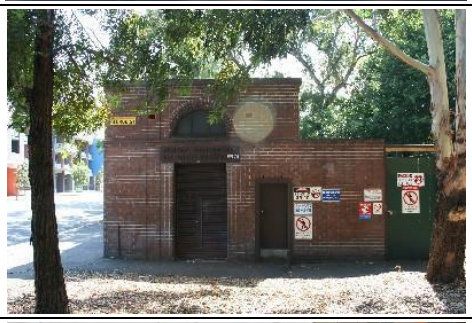


Figure 6: Sydney Local Environmental Plan 2012 Heritage Map (annotated)

Outlined below are the listed heritage items indicated on the map above.

Item	Significance	Photo
"Duke of Wellington Hotel including interior" — 291 George Street, Waterloo (Item I2085)	Local	
"Electricity Substation 174", 336 George Street, Waterloo (Item I2086)	Local	
"Terrace Houses", 229- 231 Cope Street, Waterloo (Item I2078)	Local	
"Former Waterloo Pre- School (225 Cope Street) including interior"—225- 227 Cope Street, Waterloo (Item I2077)	Local	

Potts Hill to Waterloo Pressure Tunnel and Shafts (SHR ID 01630) Beginning at Potts Hill, the tunnel passes under the suburbs of Chullora, Bankstown, Enfield, Canterbury, Ashfield, Petersham, Marrickville, Erskineville, and Waterloo at a depth below ground level that varies between 15 and 67 metres beneath ground.	State	
Items Located within the Metro Quarter		
"Congregational Church including interior", 103- 105 Botany Road, Waterloo (Item I2069)	Local	

Figure 7: Photographs of existing heritage items within the Precinct

Clarifications

- Although not shown on the heritage map, the heritage assessment concluded that listing I2077, being the "Former Waterloo Pre-School including interior" located at 225-227 Cope Street should have included Lot 4 DP 10721;
- Although not shown on the heritage map, the heritage assessment concluded that listing I2086, being the "Electricity Substation 174" should have included the entirety of Lot 3 DP 10686.

In addition to the above listed heritage items, the potential heritage significance of existing, non-listed buildings and other elements within the Precinct has been subject to detailed assessment as part of this study.

This assessment has determined that the majority of the existing building stock within the Precinct is of no heritage significance. It has also identified that the two 30-storey towers, Matavai and Turanga, as shown at Figure 8, are assessed to demonstrate a local level of heritage significance not previously identified. This assessment is summarised in the table below.

Building	Local Significance	State Significance
One Storey Units for aged tenants and walk up flats	No	No
Dobell & Drysdale	No	No
Cook, Banks, Solander and Marton	No	No
Matavai & Turanga (see Figure 8)	Yes	No
Referential Terrace Infill Housing	No	No

Figure 8: Photograph of Matavai and Turanga Buildings – 1977

(The Housing Commission of New South Wales Annual Report, 1977, p.1)

Constraints affecting the Precinct

- Heritage items and the Heritage Conservation Areas in the vicinity of the site will need to be considered as part of any proposed redevelopment schemes. Any new development that adjoins a Conservation Area or that is located adjacent to a heritage item must have regard for the scale and character of significant buildings/items, and should respond appropriately;
- Appropriate responses include allowing for a buffer between any new developments and adjoining/adjacent conservation areas and items, and/or providing a transition of scale between new development and existing adjoining development.
- This assessment has determined that the majority of the existing building stock not previously identified as being of heritage significance within the Precinct is of no identified heritage significance. This includes all single-storey units for aged tenants, walk-up flat buildings, the four 17-storey high-rise buildings, and referential terrace infill housing.
- This assessment has also identified that the two 30-storey towers, Matavai and Turanga, are assessed to demonstrate a local level of heritage significance. This local significance comprises the historical, associative, and aesthetic values of the towers, as well as their representativeness of former public housing practices.

Opportunities to support the Precinct

- Development should be focussed, in terms of scale and density, in the parts of the Precinct which do not interface directly with listed items or heritage conservation areas.
- This assessment has determined that the majority of the existing building stock not previously identified as being of heritage significance within the Precinct is of no identified heritage significance.

Housing Diversity and Affordability

Housing Diversity and Affordability

HillPDA has completed the first stage of the Housing Diversity and Affordability Study to identify conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current situation

The Waterloo Estate was developed over three decades with the low rise walk-up apartments built in the 1950s and 1960s, the high rise developments built in the mid-1970s (2 x 30 storey and 4 x 16 storey) and the medium rise developments following in the 1970s and 1980s (4-7 storeys high). The average age of the dwellings is 44 years.

As of 2016 there were 3,259 residents living in the Waterloo Precinct (i.e. the Waterloo metro site, the Estate and the private residences), representing 1.8% of the City of Sydney's (CoS) resident population. The residents of the Precinct were quite elderly with just under a third of the residents aged over 65 in 2016, compared to 8% in the CoS and 14% across Greater Sydney.

Other significant characteristics of the Waterloo Estate include:

- The Estate has a high Indigenous population, with a high concentration of Indigenous middle aged and an emergence of young Indigenous families.
- In 2016 there were 2,024 dwellings in the Waterloo Precinct (ie the Waterloo metro site, the Estate and the private residences), with almost all being high density dwellings.
- In line with the CoS, the Precinct has a high proportion of one bedroom dwellings.
- Lone households dominate the Waterloo Precinct (ie the Waterloo metro site, the Estate and the private residences) where around two thirds are lone person households compared to approximately 37% for the CoS and 22% for Greater Sydney.

Opportunities

The Precinct has been identified for urban renewal, through the NSW Government's Future Directions for Social Housing in NSW strategy, which seeks to deliver deconcentrated social housing estates with improved physical environments, including infrastructure and community facilities. The new Metro Station at Waterloo will act as a catalyst for renewal, providing future residents with access to good public transport. The aims of the Future Directions strategy are to:

- deliver more housing and a better social housing experience, with more opportunities and incentives to avoid or move beyond social housing.
- develop new mixed communities where private and affordable housing blends in with social housing at a ratio of 70:30, with better access to transport and employment, improved community facilities and open spaces.
- partner with the private and not for profit sectors to fast track the redevelopment of sites in metropolitan Sydney and regional NSW.

The Study has a specific focus on all three components of the housing supply continuum being the market, non-market (affordable rental housing,) and Government sector housing (social/public).

The Waterloo SSP is to develop into a leading example of a well located, socially integrated neighbourhood where social, affordable and private dwellings are situated together, with all housing achieving at least a 'Silver Level' of Universal Housing design.

There are various ways in which a mixed tenure estate could be delivered. The implications of each option, from both a social and an economic perspective are presented for consideration and discussion. Direction on the social mix approach and options will be set through the master planning process. The direction on the approach will set the expectation for existing residents, the community in general and developers and how development (and tenure types) are to be delivered.

Development will be staged over a number of years, and therefore the approach taken needs to be able to deliver the social integration outcomes, as well as a workable staging and rehousing program (for existing tenants). Figure 9 shows the intention for social integration and Figure 10 shows the main approaches.

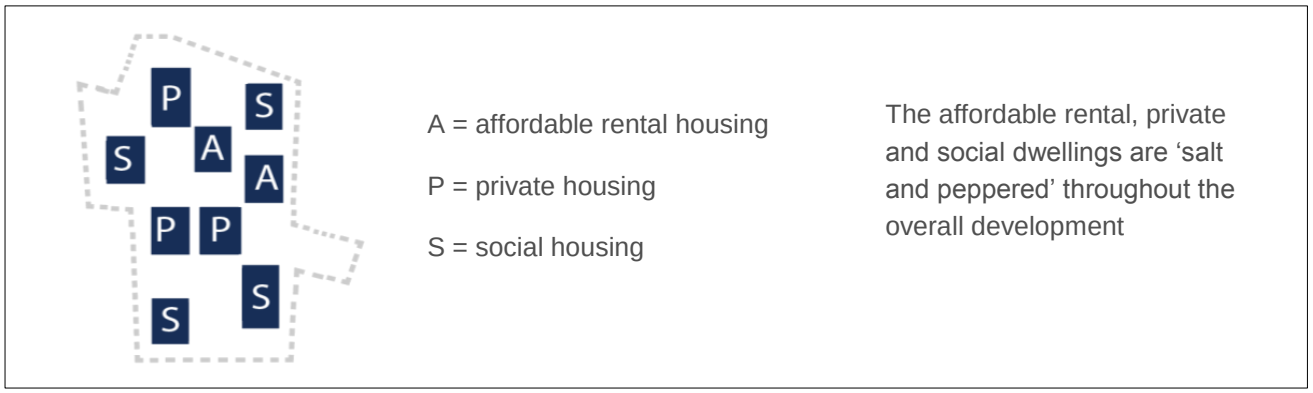


Figure 9: Social integration

Four main approaches for mixing social, affordable and market housing have been identified for consideration:

A. salt & peppering of private, affordable and social (within the one building)
B. different tenures, of social, affordable and private stacked (within a building)
C. salt and peppering of social, affordable and private buildings (within a block)
D. banded into social, affordable and private (site-wide)

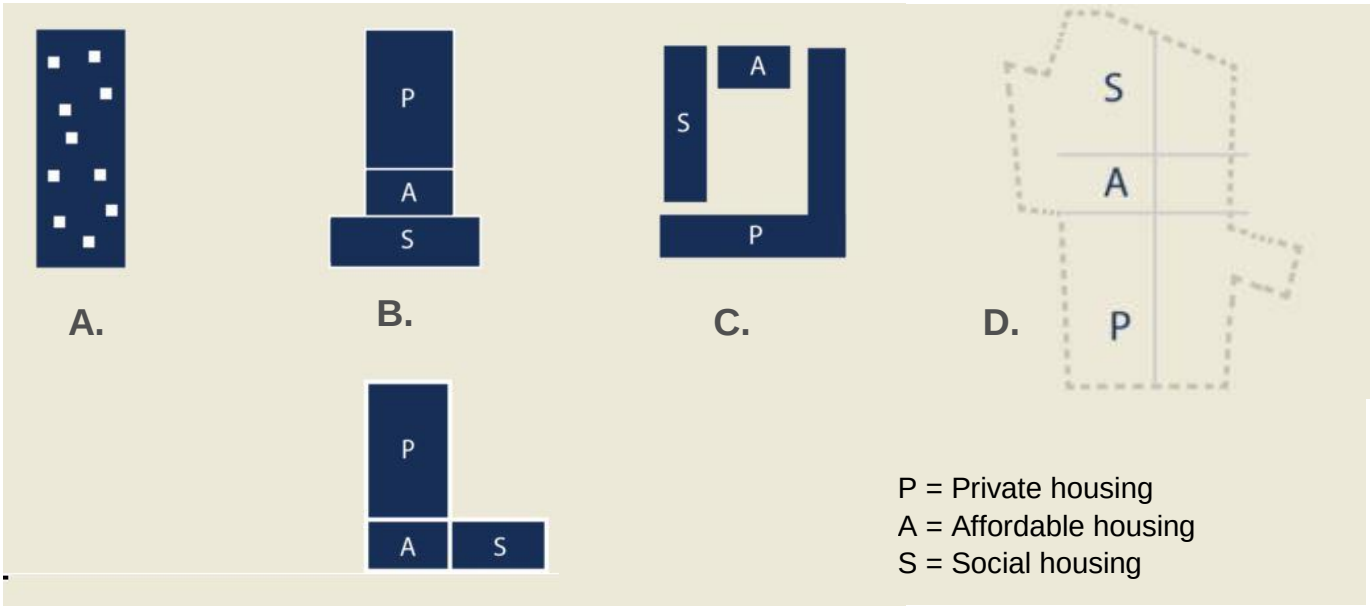


Figure 10: Potential approaches to mixing social, affordable & private housing

Constraints

In order to implement a successful, socially integrated community where social, affordable and private dwellings are to be located throughout the whole redevelopment site; five key issues need to be considered as outlined below:

- The scale at which social mix is implemented
  This relates to the scale of delivery ie, at the neighbourhood level, or large housing redevelopment or within a building or housing cluster. The large housing redevelopment at the scale of Waterloo would appear to be optimal so that social integration can be spread throughout a larger area and limit concentration.
- The degree of implementation (what approach is to be employed)
  Options A – D for social mixing range from complete integration to segregation. Each has their positives and negatives. The integration approach is central to setting the integration expectation at the beginning of the redevelopment process. This would be to ensure that existing residents, developers, Government and new residents understand the approach and the proposed social outcomes that are to be delivered.

- The external appearance (quality and design of all buildings)
  This relates to the degree of differences (if any) in external appearances of the various tenures, social, affordable and private. The literature emphasises that architectural design is vital for successful social integration. Of importance is that social housing design should not be identifiable as such, as this may lead to stigma against their tenure. Arthurson (2010)[1] wrote that it is important to design the housing to blur the distinctions between tenures.

- Nature of public and private open spaces (location and access)
  The fourth issue deals with the nature of open space – both private and shared. The literature suggests that to avoid the potential for conflict, a hierarchy of private-public spaces is recommended, including parks, shops, and community facilities. Roberts (2007: 198)[2] found that school and children's play areas perform important roles. This should be allowed or facilitated through urban design.

- Role of government
  The continuation of the role of government is an important consideration to ensure that the objectives of Future Directions are upheld and delivered to ensure that social integration outcomes are achieved.

Consideration should be given to these approaches in light of the five issues raised above. Option D would be problematic to implement as development staging and the rehousing of existing residents would be extremely difficult, if not impossible.

[1] Arthurson, K. (2010). Operationalising social mix: Spatial scale, lifestyle and stigma as mediating points in resident interaction. *Urban Policy and Research, 28*, *46–63*.

[2] Roberts, M. (2007). Sharing space: Urban design and social mixing in mixed income new communities. *Planning Theory & Practice, 8, 183–204*

Environment and Open Space

Urban Forest

Arterra has completed the first stage of the Urban Forest Study to identify existing conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current situation

Significant trees line many of the streets within the Estate. Trees located in the adjoining parks, together with those within the setback of the residential developments, currently make significant contributions to the overall urban forest of the Precinct and the area.

- There are currently 1084 trees within the Waterloo SSP study area.
- 338 (30%) are street trees.
- A further 175 trees are in close proximity to the streets. Therefore a total of 513 trees or 47%, of all trees are on, or very close, to the streets and may be affected by work that may happen in the streets.
- The majority of the ‘High Value’ trees are directly related to the streets, either street trees themselves or very close to the street edges.
- Trees in the McEvoy Street setback may become more important if McEvoy Street is widened.
- The ‘overall’ canopy coverage currently for the SSP area stands at 28%. The CoS target is 27%.
- 30% of the SSP site area is road reserve. Currently street trees provide 32% canopy coverage to ‘street areas’. The City of Sydney (CoS) target is 50%.
- Although the site now has very good canopy coverage, no historically significant trees were evident in the aerial images from 1943.
- The only significant trees evident in the 1943 aerial are located outside the SSP in the adjacent historical parks of Waterloo Park (Mt Carmel), and nearby Redfern Oval and Alexandria Park. This highlights that all the large and prominent figs and eucalyptus trees now scattered throughout the study area are typically less than 45 years old.

- The tree population is dominated by 4-5 main ‘Families’. As expected, and is very common throughout many Australian cities, Myrtaceae (includes gum trees) dominates, at over 45% of the total population. The ‘best practice’ target is to have no more than 40% in any one ‘Family’.
- Tree Retention Values. The individual number and the percentage of the total population of trees in the different retention values are:-
    - High 181 (17%)
    - Moderate 342 (32%)
    - Low 537 (49%)
    - Very Low / Remove 24 (2%)
- With regard to the High Value trees, the majority are represented by the following species:-
    - *Eucalyptus microcorys* (Tallowood) (25%),
    - *Ficus macrocarpa var. hillii* (Hills Weeping Fig) (17%),
    - *Ficus rubiginosa* (Port Jackson Fig) (15%)
    - *Corymbia maculata* (Spotted Gum) (7%)
    - *Eucalyptus saligna* (Sydney Blue Gum) (4%) and
    - *Corymbia citriodora* (Lemon Scented Gum) (4%).

Existing trees, most planted only 30-40 years ago, create a perception of an extensively planted, green area. They represent a large mix of species, sizes and ages and provide a good framework for a sustainable urban forest going forward.

Figure 11: Existing trees

Constraints

The tree population represents what would be considered a relatively normal breakup of age class, size and origin. None of these statistically represent a great cause for concern and the existing population provides a good basis upon which to create a sustainable urban forest strategy moving forward. The trees are situated widely throughout the study area, within the roadside verges, in the gardens surrounding the buildings and the public and semi-public open spaces. Most of the significant and important trees are often located either on the road verge or within the setback between the road reserve and the buildings.

- There are many large trees with extensive root systems often conflicting with buildings and services.
- The sandy soils mean that tree roots could be widespread and under the roads, much more than in other soil conditions.
- Large, mature trees (eucalypts and figs) require lots of space to be protected around them during demolition and construction to ensure their long term survival.

- Services installation and upgrades are likely to have the greatest impact on the trees and tree retention.
- There will be a need to carefully consider the location and extent of trenching, particularly for major service upgrades.
- There may be need to consider re-alignments or under-boring techniques to manage impacts to existing trees.
- Most existing power is provided by overhead cabling. The redevelopment should consider undergrounding of power lines but only with due consideration for the existing trees. Trenching past well established trees could have significant impacts on tree health.
- Tree protection and retention will be a very important consideration.

Figure 92: The locations of the existing tree population and their relative Retention Values

Opportunities

There are a range of opportunities to protect and enhance the existing urban forest.
Some key ideas are outlined below.

- Maintain, or ideally increase, the current 27.8% canopy coverage within the study area. CoS targets 50% canopy to streets, 25% to parks, 25% to private property, as a minimum.
- Retain and protect the most significant existing trees on the site. Incorporate them as mature elements within the proposed landscape to provide a framework for new parks and green spaces.
- Recognise that mature trees require space around them, to protect their roots, so it will be necessary to minimise buildings, level changes or service trenching though any areas retaining trees. Consider raised or suspended structures or walkways around existing trees, as long as they are sensitively designed.
- Take a holistic view to new street profile design to work trees in as a core design element, not as an after-thought. Provide appropriate space above and below ground for trees to flourish. Consider final sizes of root plates, trunks and canopy, particularly around figs.
- Incorporate new and existing trees into spacious garden/ lawn areas. Provide adequate space for the trees trunks and structural roots to expand and allow infiltration of air and water into the root zones.
- Design to direct surface water and runoff towards existing and new trees to passively irrigate the trees in an ever-warming climate.
- Utilise trees for wind amelioration, understanding the most desirable forms, sizes and densities of tree canopy in given locations. Larger trees with dense canopy will typically be more important than smaller trees or trees with very open canopies.
- Incorporate a wide range of species into the final designs to increase resilience, population diversity. CoS targets no more than 40% in any one family, 30% in any one genus, 10% in any one species. Consider species that currently prosper in slightly warmer climates to cater for climate change (eg. Caesalpinia Ferrea). Some deciduous trees will be required for better solar access during cooler months.
- Specify a diversity of sizes. CoS targets 10% small trees, 45% medium, 35% large trees and 10% civic scale (extra large).
- Utilise large ‘civic-scaled’ trees such as figs, araucarias, eucalypts and agathis to provide signature and landmark trees at key visual points and to allow trees to be seen out of windows even many storeys above ground level.
- Incorporate trees into upper levels of built forms, on podiums and on roof tops to improve canopy coverage and increase connections to nature.
- Explore opportunities for community orchard style planting in semi-public open spaces such as roof terraces and podiums to provide urban food and community engagement with trees. (Generally not recommended in very public or streetscape contexts).

- Consider median and in-road planting opportunities to move trees away from services and building facades, allowing them to fully develop their canopies and ultimate sizes. This also shades street pavements and helps achieve canopy coverage targets. This type of planting also calms traffic and improves perception of the street.
- Utilise structural soil systems and vaulted tree pit designs to provide appropriate soil volumes for vigorous and healthy tree growth under pavements in the long term. Utilise generous setback zones near the streets to allow the planting of larger trees away from street kerbs and footpaths.
- Don’t over plant for instant visual impact – allow time and space for trees to mature with full and symmetrical canopies where possible. Give trees space to access adequate resources rather than compete with each other. Trees will be easier to manage with better long-term health and when the time comes for tree replacement, it will be easier and less likely to damage surrounding trees.

Trees are a multi-tasking asset that provide shade, traffic calming, wind amelioration, environmental services, fauna connectivity and aesthetic benefits. They make the streets more inviting and contribute to people wanting to use them for activities like walking and cycling.

Open Space

CLOUSTON Associates has completed the first stage of the Open Space Study to identify existing conditions to inform the Waterloo State Significant Precinct study process.

The existing conditions analysis has reviewed the current situation and identified issues, opportunities and constraints to be explored through the master planning process, including land use and community needs to support the redevelopment.

Current Situation

The open space of the Estate today is characterised by a mostly verdant landscape, with large expanses of relatively unembellished public open space (sometimes poorly defined) in the Estate's north, significant areas of communal and private space in the Estate's southern sections and groups of large trees – particularly figs - throughout the Estate and on the street fronts.

Importantly, there are two major regional parks within a 2km radius of the Precinct being those of Moore Park (115 Ha) and Sydney Park (40 Ha), while at a district and local level there are five significant parks and recreation facilities in the immediate locality being Waterloo Park, Alexandria Park, Redfern Park, Erskineville Park and Gunyuma Park Aquatic and Recreation Centre. It should be noted that more than 50% of the area of these parks is dedicated to sports use.

Constraints

There is a range of constraints that prevail in the Precinct today that will have a bearing on its future urban renewal. These constraints are briefly summarised below.

Context

- The walkable access to local parks such as Waterloo Park and Alexandria Park crosses major roads, extending the time within which they may be reached by residents within the Estate
- Many of the district level reserves in the immediate locality are close to the Precinct but are heavily dedicated to sport and will also need to provide capacity for additional sport requirements of the Waterloo population.

Street form and hierarchy

- The large block sizes of the Estate – particularly in the northern half – contrast strongly with the fine grain streets of the neighbouring area and reduce permeability for pedestrian and cycle movement in and across the Estate.

Walking and walkability

- The linear north/south configuration of the Estate and the relatively steep topography of the southeast quarter mean that walkability varies greatly across the Precinct.

Open Space and amenities

- The scale and nature of open space differs greatly across the site but is not presently well distributed to meet future recreation needs
- Most residents within the Estate have at maximum 400m access to the larger open space areas in the northern half of the Estate (400m is a basic access benchmark to open space in low and medium density areas) but these spaces lack definition or recreational opportunity
- Some residents in the southern half of the Estate do not have 200m access to the open spaces in the northern part of the Estate (200m is considered a benchmark for higher density urban environments).

Natural environment and landscape

- The western side of the Estate in particular is prone to flooding and the urban renewal will need to better accommodate this issue, including through streetscapes and public open space, potentially.

Management and maintenance

- The roots of many fig trees pose some long term challenges in future integration into streetscapes and open spaces, often being woven into walls and rock revetments.

Sunlight to publicly accessible spaces

- The design and layout of new apartment buildings will need to allow for sunlight access requirements for open space as required by Council's DCP (50% of the total area to receive sunlight for 4 hours between the hours of 9am to 3pm on 21 June).

Opportunities

There is a range of opportunities and open space needs that prevail in the Precinct that can be integrated into its future urban renewal. These opportunities and needs are briefly summarised below.

Destinations and connections

- The new metro station will be a major focus for pedestrian activity in the locality, with parks being critical to enhancing that walking experience and potentially acting as important through-routes to and from the station.

Cycling

- The Estate has opportunities to further develop cycling from the existing dedicated cycle route along George Street and with an east/west connection along Wellington Street.

Urban Trees and ecology

- Many existing trees are close to or within the street corridor and can be retained in green streets and boulevards to assist heat island mitigation and extend ecological corridors.
- The ecological desirability of dense, mid-level species needs to balanced against safety and security concerns arising from the obstruction of ground level sight lines.

Flooding and stormwater

- The design of new parks and streets in the Precinct may be able to assist in the management of flooding in the western part of the Estate.

The Green Grid of Sydney

- Current mapping of Sydney's Green Grid (Greater Sydney Commission) suggests potential to make green linkages into the network running north/south and east/west.

Cultural heritage

- The Precinct has a rich Aboriginal and non-Aboriginal heritage that can be interpreted within the Estate's landscape.

Landscape character and Identity

- The extensive mature trees across the Estate lend a sense of an established landscape and many are located where they can be retained.

Open space needs

- Current benchmarks for high density urban environments recommend a 200m actual walking distance (5-10 minute walk, dependent on age and mobility) from all residents to some public open space
- An urban plaza space is proposed within the Metro Quarter, occupying most of the space fronting Cope Street, between the two Metro Station buildings
- More open space is required within the Estate. In accordance with the City of Sydney Open Space, Sport & Recreation Needs Study 2016 an area of 15% (2.34 hectares) of the developable area of the Estate is required.
- For the scale of projected population at Waterloo it is considered that a larger park of 2Ha will be required, preferably on level ground, to meet the needs of the new community
- A further smaller park may also be warranted in order to meet the 200m access metrics in the Estate
- Passive open space is highly desirable given the high provision of active open space for sport function in surrounding district open space.

Design and maintenance needs

- The significant projected population growth and its increased density implies that future open spaces will need to be appealing and the designs adequately robust to take the expected level and intensity of use.
- There will be a need to ensure maintenance levels reflect the levels of use expected.