



DRAFT

Burwood North Precinct Masterplan

Sustainability Statement

August 2023



Acknowledgment of Country

We recognise the Wangal People of the Eora Nation as the Traditional Custodians of this land that is being masterplanned. We respect their enduring cultural and spiritual connections to the land and waters, and celebrate their knowledge, kinship and values.

We acknowledge that these connections, to the land and waters, have existed for millennia and will continue into the future. We respect the Elders who have gone before, together with those of today for their guidance on our shared journey.

We recognise that we are, and always will be, on Aboriginal land.

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
0	28.02.2023	Camille Gaven	Alex Bogdanova	Daniel Fettell	Draft Issue
1	13.03.2023	Camille Gaven	Alex Bogdanova	Daniel Fettell	Final draft issue
2	13.07.2023	Camille Gaven	Alex Bogdanova	Daniel Fettell	Final issue
3	08.08.2023	Camille Gaven	Alex Bogdanova	Daniel Fettell	Final issue_Updated

Mott MacDonald Australia Pty Ltd

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

Mott MacDonald

Level 10 / 383 Kent Street
Sydney, NSW 2000

PO Box Q1678
QVB, Sydney, NSW 1230
Australia

+61 (2) 9098 6800
mottmac.com

Contents

Table of Contents

Executive Summary	vii	4 Sustainability Framework	19
1 Introduction	1	4.1 Sustainability Framework	20
1.1 Regional Context	2	4.2 Approach	21
1.2 Local Context	3	4.2.1 Precinct-Wide Strategies	21
1.3 Collaborative Design Process	4	4.2.2 Proposed Masterplan	22
1.4 Process	4	4.2.3 Public Domain	23
1.5 Policy Context	4	4.2.4 Buildings	24
2 Climate Analysis	7	5 Sustainability Strategies	27
2.1 Principles	8	5.1 Precinct Vision	28
2.2 Site Analysis	8	5.2 Priority _ Climate Positive	29
2.2.1 Climate Change	9	5.3 Priority _ Infrastructure	33
2.2.2 Urban Heat Island Effect	9	5.4 Priority _ Movement and Place	35
2.2.3 Natural Ventilation	9	5.5 Priority _ Nature-based Solutions	37
2.2.4 Sun Path	11	5.5.1 Urban Heat Controls	38
2.2.5 Cloud Cover	11	5.5.2 Blue Green grid	39
2.2.6 Wind	12	6 Requirements Summary	41
2.2.7 Humidity	12	6.1 Performance Objectives	42
3 Benchmarking	13	6.2 Summary of Strategies	43
3.1 Circular	14	6.3 Summary of Requirements	45
3.2 Infrastructure / Complex Ownership	15		
3.4 Infrastructure / Movement and Place	16		
3.3 Climate Positive / Social Housing	16		
3.5 Nature-Based Solutions	17		
3.6 Movement & Place	18		

List of Figures

Figure 1.1	Parramatta Road	2
Figure 1.2	Precinct map	3
Figure 2.1	Annual hourly ambient temperature between 19-25°C - 2070	9
Figure 2.2	Annual hourly ambient temperature above 30°C - current	10
Figure 2.3	Annual hourly ambient temperature above 30°C - 2070	10
Figure 2.4	Annual hourly ambient temperature between above 30°C - 2070 + urban heat island effect	10
Figure 2.5	Sun path diagrams	11
Figure 2.6	Annual cloud cover	11
Figure 2.7	Summer wind rose	12
Figure 2.9	Annual humidity	12
Figure 2.8	Winter wind rose	12
Figure 3.1	Channels of, Hammarby Sjöstad, Stockholm, Sweden	14
Figure 3.2	A bird's-eye view of Tonsley	15
Figure 3.3	Conceptual view to Anzac Parade	16
Figure 3.4	Approved architectural concept design	16
Figure 3.5	Rooftop of QV1 tower	17
Figure 3.6	Pedestrianised street	18
Figure 4.1	Net Zero Framework diagram	21
Figure 4.2	Proposed Masterplan with revised densities	22
Figure 4.3	Bus stop with green roof and PV (London)	23
Figure 4.4	Recycled plastic street furniture (New York)	23
Figure 5.1	Green Star Climate Positive Pathway	29
Figure 5.2	Embodied carbon reduction strategies during design and construction processes	32
Figure 5.3	Electrical demand profiles, incl. peak demand reduction strategies	33
Figure 5.4	Precinct utility services	34
Figure 5.5	Shared street (Rennes, France)	35
Figure 5.6	Urban park with flooding mitigation design (Norway)	37

List of Tables

Table 4.1	Sustainable strategies in the Public Domain	23
Table 4.2	Sustainable strategies for New Assets and Major Refurbishments	25
Table 4.3	Sustainable strategies for Remaining Assets	26
Table 5.1	Environmental Targets Summary for the Precinct	30
Table 5.2	Environmental Targets Summary for New Developments and Major Refurbishments	30
Table 5.7	Urban Spaces quality categories and acceptability range	38
Table 6.1	Summary of proposed requirements	45

Executive Summary

Project Description

Burwood Council is preparing an updated Masterplan and supporting studies for the Burwood North Precinct, building upon the work already undertaken as part of the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS). The Masterplan seeks to capture the opportunity afforded by a new metro station at Burwood North on the Sydney Metro West network.

The Masterplan strives to deliver an outcome that is feasible, maximises public benefit and delivers high quality public domain, open spaces and community infrastructure. The Masterplan articulates a cohesive vision for Burwood North that will underpin the growth and development of the precinct as a benchmark for sustainable urban renewal.

The Masterplan is the result of a collaborative process that has been undertaken between Burwood Council, a wide range of government, institutional and community stakeholders, and the project's consultant team.

An Implementation Plan will also be prepared that outlines the recommended planning controls, policies and infrastructure necessary to enable the successful delivery of the Masterplan. The recommendations may inform amendments to the Burwood Local Environmental Plan 2012 (LEP) and Burwood Development Control Plan 2012 (DCP).

Purpose

This Sustainability Statement has been prepared by Mott MacDonald Australia Pty Ltd on behalf of Burwood City Council for the Burwood North Precinct Masterplan.

This report identifies opportunities within the Precinct to implement sustainability objectives in future Development Control Plans. The accompanying Sustainability Statement demonstrates how the Precinct's design response aligns with or exceeds the following material considerations, highlighting its potential for sustainable development.:

- The vision and related themes set out in the current Burwood *Local Strategic Planning Statement* (BLSPS)
- The performance outcomes and sustainability targets outlined in the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) *Sustainability Implementation Plan*
- The increased standards put forward in the *State Environmental Planning Policy (Sustainable Buildings) 2022* (Sustainable Buildings SEPP)
- The objectives and controls of the current Burwood *Development Control Plan* (BDCP)

Climate Analysis

Resilience is fundamental to decision-making. The Precinct must take into account science-based climate impacts to ensure that investments in social and community infrastructure are secure, and assets can serve the community for years to come.

Urban environments produce microclimate conditions affecting the health and wellbeing of residents, workers and visitors.

The climate analysis consists of a series of studies that address different aspects of urban design, describing a range of qualitative factors such as urban heat island, sun path, cloud cover, humidity and wind, that can impact the project's design response.

As we are designing for the future, we need to consider the effects of climate change and the local urban heat island effect resulting from the proposed Masterplan.

Benchmarking

Looking at exemplar projects from around the world, including those in Australia, can provide valuable insights into how sustainable strategies can be implemented at the precinct scale.

By studying the successes and challenges faced by other precincts, the design team can identify potential issues in their own design and address them at early stages. Exemplar projects inform the design response by highlighting which strategies were successful and which ones need more thought or investment.

By incorporating these lessons into the proposed strategies, the team can propose a more effective, feasible and sustainable design for the Precinct.

Sustainability Strategy

Renewal within the Precinct presents the opportunity to be a catalyst for transformation in response to a decarbonisation and circular agenda.

The Precinct design, delivery and operation can be governed by a sustainability imperative, [Circular](#). This sustainability imperative fundamentally informs [Climate Positive](#), [Movement and Place](#), [Infrastructure](#) and [Nature-based Solutions](#) priorities.

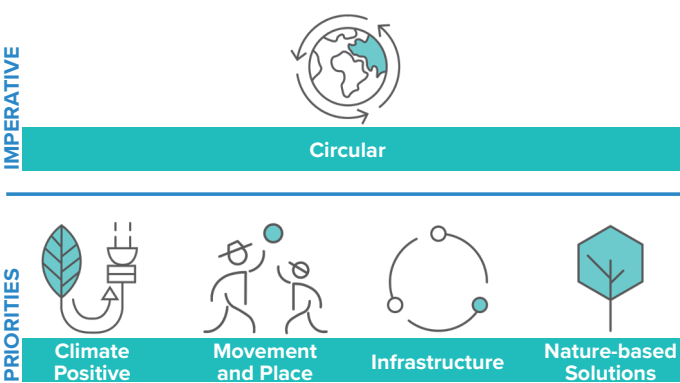
Imperative + Priorities

[Circular](#) | The linear model of production and consumption ('take-make-waste') cannot continue. A shift to a circular system is needed in which waste and pollution are 'designed out', products and materials are kept in use and natural systems are regenerated. Maximising the use and value of resources brings major financial, social, and environmental benefits. It contributes to innovation, growth, and job creation, whilst reducing our impact on the environment.

[Climate Positive](#) | Within the scope of the Precinct, the staged delivery of development will respond to market best practice. NSW Government has set objectives to achieve Net Zero by 2050 and reduce emissions by 50% below 2005 levels by 2030. The transformation of the built environment towards this objective will be accelerated under a range of Net Zero Buildings initiatives and green certifications.

[Movement and Place](#) | Mobility is undergoing a transformational shift with far-reaching implications. To underpin this shift, the Precinct will be walkable and liveable based on good urban design that promotes active and low-carbon transport options. As it develops, the Precinct must enhance public transport infrastructure (e.g., train, metro, rapid bus, etc.) to facilitate a progressive shift away from private vehicle use.

[Infrastructure](#) | An embedded network (incl. thermal network) benefits from the diversified demand profile offered at a precinct scale. Reducing peak demand is possible with the maximisation of on-site renewable energy generation. Management the of the on-site renewable energy generation to match electric vehicle (EV) charging and hot water storage demand minimises solar spill (grid export), and offers an enhanced solar PV system capacity and utilisation.



[Nature-based Solutions](#) | Nature-based solutions act to address the climate and ecological emergency. Biodiversity and habitat loss is accelerating and expanding cities are some of the most nature-depleted areas, putting at risk many of the life-sustaining ecosystems services upon which communities and livelihoods depend. Cities are also increasingly vulnerable to the impacts of climate change, including soaring temperatures, storm events and sea level rise. Nature based solutions improve air and water quality, and increase outdoor comfort, providing access to green spaces and nature that reinforce the physical and mental wellbeing of a community. By prioritising nature in investment decision-making, the resilience and liveability of cities is improved, contributing to a secure, sustainable future for nature and people.

1 Introduction

1.1 Regional Context

The Precinct is strategically located within the southern portion of Burwood-Concord Precinct (see Figure 1.1). The Precinct must be delivered consistently with the PRCUTS and its long-term vision for developing population and employment growth in the Parramatta Road Corridor.

While the PRCUTS does not directly rezone land, it establishes the framework for land use and transport planning to guide, coordinate and facilitate changes to local planning controls that will lead to the Parramatta Road Corridor's transformation.

The PRCUTS sets a vision for:

- Diverse housing choices and affordability
- Employment and economic growth
- Accessibility and connectivity
- Vibrant communities and places
- Green spaces and links
- Sustainable and resilient infrastructure and buildings

The Burwood-Concord Precinct is identified as a commercial gateway to Burwood Town Centre. A mixed-use Precinct strategically located between the two main central business districts (CBDs) of Parramatta and Sydney, the Burwood North Precinct Masterplan should focus on providing employment and housing opportunities that are supported by an extensive open space network and efficient vehicular, active, and public transport linkages.

The Precinct contributes to the reimagining of its future character as a mixed-use Precinct housing a community of residents and workers attracted to the area for its vibrant culture, diverse amenity, and access to employment at Rhodes, Sydney Olympic Park, and Parramatta.



Figure 1.1 Parramatta Road

1.2 Local Context

The Precinct is located in Burwood and Concord South, 11km west of the Sydney CBD. It is located within the Burwood Municipality Local Government Area, north and south of Parramatta Road, immediately east of Sydney Olympic Park and adjacent to the Burwood Train Station (see Figure 1.2).

The Burwood Train Station is located on the T1 North Shore & Western Line, T2 Inner West & Leppington Line, and T9 Northern Line. Burwood North Metro Station is located on the northern side of Parramatta Road within the northern extent of the Precinct. The future Sydney Metro West line is a city and corridor-shaping opportunity for many PRCUTS-identified precincts.

The Burwood North Precinct currently is primarily residential. It is characterised by low to medium-scale developments, including private properties, strata and mid-rise apartments. Opportunities exist in the suburb for significant redevelopment to meet dwelling targets.

The Precinct site is in proximity to the Burwood Town Centre. The connection provides expensive opportunities for the urban renewal of the Precinct to deliver vibrant and connected neighbourhood.

Neighbouring areas are subject to several ongoing development strategies that will feature an increase in density, improved activation and various Public Domain upgrades.



Figure 1.2 Precinct map

1.3 Collaborative Design Process

This report has been prepared in collaboration and must be read with the following reports:

- Burwood North Precinct Masterplan: Masterplan Report, by COX
- Burwood North Precinct Masterplan: Landscape and Public Domain Strategy Report, by Oculus
- Burwood North Precinct Masterplan: First Nations Design Principles Report, by Dominic Steel Consulting Archaeology
- Burwood North Precinct Masterplan: Rapid Transport Appraisal, by SCT Consulting
- Burwood North Precinct Masterplan: Sustainability Statement, by Mott MacDonald
- Burwood North Precinct Masterplan: Economic Assessment & Feasibility, by JLL
- Burwood North Precinct Masterplan: Stormwater and Flooding Report, by Mott MacDonald
- Burwood North Precinct Masterplan: Geotechnical Study, by Mott MacDonald
- Burwood North Precinct Masterplan: Utility Servicing Assessment, by Mott MacDonald
- Burwood North Precinct Masterplan: Preliminary Site Investigation, by Mott MacDonald
- Burwood North Precinct Masterplan: Engagement Outcomes Report, by COX

1.4 Process

This report supports the Vision of Burwood North and will inform proposed amendments for the revised Development Control Plans, Landscaping Code, policies, drivers and future guidelines associated with the Precinct.

1.5 Policy Context

The following statutory planning and policy instruments have been considered within the context of informing a sustainability strategy:

STATUTORY

1. Burwood Local Strategic Planning Statement (BLSPS)
2. NSW Sustainable Buildings SEPP
3. Parramatta Road Corridor Urban Transformation Strategy (PRCUTS)
4. Burwood Development Control Plan (BDCP)

CIRCULAR

5. NSW Circular Economy Policy Statement

CLIMATE POSITIVE

6. NSW Net Zero Plan Stage 1: 2020-2030

INFRASTRUCTURE

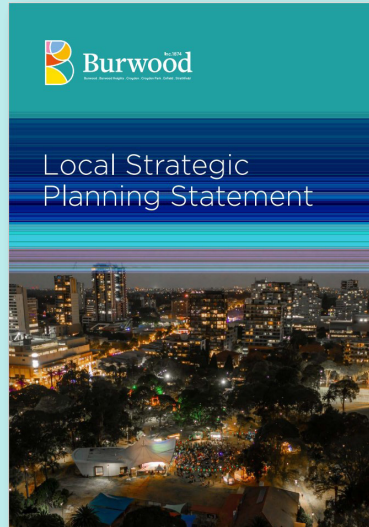
7. Staying Ahead State Infrastructure Strategy 2022-2042

MOVEMENT AND PLACE

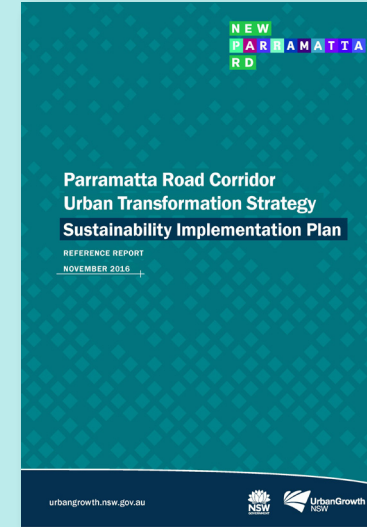
8. Cycleway Design Toolbox Designing for cycling and micromobility

NATURE-BASED SOLUTIONS

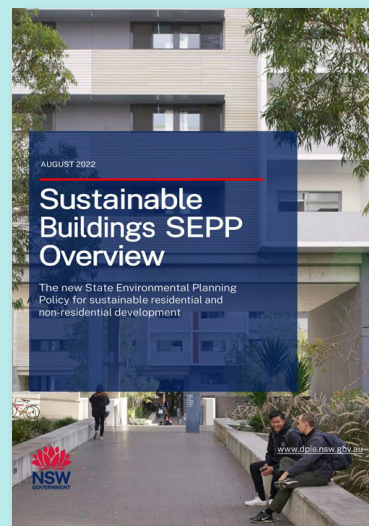
9. Central District, Sydney Green Grid



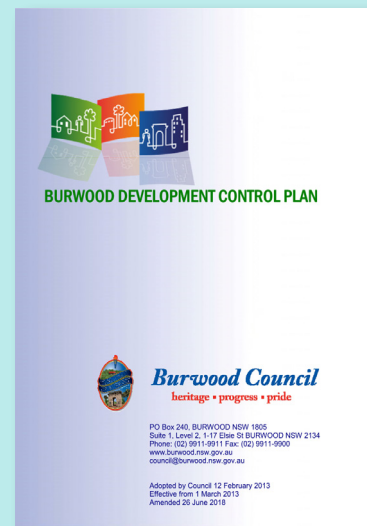
- Support the objectives of Greater Sydney to achieve Net Zero by 2050 by introducing controls to support efficient energy, water and waste systems
- Incorporate principles of passive solar design, and sustainable waste management, and achieve high levels of performance in environmental rating schemes (BASIX)
- Encourage the use of car share, electric and hybrid vehicles
- Maximise permeable areas, and reduce stormwater run-off volumes and pollution entering waterways
- Improve and strengthen waste recycling options
- Plan recycled water schemes for all non-potable water use
- Create a shared city, utilising rooftops, podiums, streets and lanes
- Improve walking and cycling, access to car sharing, carpooling and on-demand transport



- Meet relevant sustainability rating requirements, including BASIX, NABERS and NatHERs targets
- Transition future communities to a low car dependency:
 - Minimise car parking
 - Unbundle car parking
 - Share car parking
 - Decouple car parking
- Maximise the use of vegetation on buildings, including green roofs, green walls, and materials with a high solar reflectance index
- Support principles of water-sensitive urban design (WSUD)
- Accommodate future energy infrastructure and emerging technologies



- Align with the National Construction Code (NCC)
- Calculate and disclose the embodied emissions of construction materials
- Minimise construction and demolition waste
- Reduce peak demand for electricity
- Generate and store renewable energy
- Reduce reliance on artificial lighting, and mechanical heating and cooling through passive design
- Meter and monitor energy consumption
- Minimise water consumption

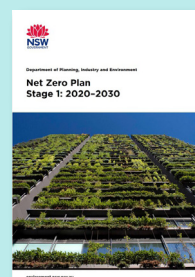


- Utilise car share schemes, unbundle and decouple car parking wherever possible to reduce on-site car parking
- Provide adequate bicycle parking for residents, workers and visitors to encourage recreational use and as an alternative mode of transport
- Provide facilities for charging electric vehicles to meet current and future demand
- Minimise environmental impacts of operational waste
- Reduce water demand
- Increase total urban tree canopy
- Design roof forms to allow for the current and future installation of solar panels without adverse impacts on the amenity of neighbours or the streetscape
- Provide spaces within the building for the current and future installation of battery storage

CIRCULAR



CLIMATE POSITIVE



INFRASTRUCTURE



MOVEMENT AND PLACE



NATURE-BASED SOLUTIONS



2 Climate Analysis

2.1 Principles

Urban environments produce microclimate conditions affecting the health and wellbeing of residents, workers and visitors. This section presents a climate analysis methodology and results that inform and enhance the urban design response and the quality of amenities.

The climate analysis methodology consists of a series of studies addressing different aspects of urban design.

A site analysis is initially conducted to describe and define urban heat island, sun path and wind qualitative factors that impact the urban design response.

2.2 Site Analysis

A site analysis has been undertaken to determine site-specific climate characteristics that inform the urban design response. This includes:

1. **Climate change** _ considering future climate scenarios and increasing the frequency of hot days (above 35°C)
2. **Urban heat island** _ consider future climate scenarios exacerbated by the urban heat island effect
3. **Natural ventilation** _ considering ambient temperature conditions of future climate scenarios to identify periods that are conducive for natural ventilation when assessing adaptive thermal comfort performance
4. **Sun path** _ considering sun movement and solar gain impact on the building envelope, and the public and communal open space provision
5. **Cloud cover** _ considering the level of the overcast sky to identify periods that impact the building envelope, and the public and communal open space provision
6. **Wind** _ considering prevailing wind conditions and built-form wind effects that impact the building envelope, and the public and communal open space provision
7. **Humidity** _ considering relative humidity conditions and built-form wind effects that impact the building envelope, and the public and communal open space provision

2.2.1 Climate Change

To affect sound decision-making, RCP (Representative Concentration Pathway) 8.5 (high emissions scenario) climate modelling, in line with the NARClIM (NSW and ACT Regional Climate Modelling) Project, has been incorporated into the climate analysis to account for future climate scenarios. A 2070 timeline horizon (far future) has been selected based on a design life of 50 years.

The following future climate projection impacts are identified:

- Maximum temperatures are projected to increase by 1.9°C and minimum temperatures are projected to increase by 2.0°C
- The number of cold nights will decrease
- The number of hot days (above 35°C) is projected to increase up to an additional 10-20 days per year. These increases in hot days are projected to occur mainly in spring and summer, extending into autumn.
- Rainfall is projected to increase in summer and autumn
- Severe fire weather days are projected to increase in summer and spring

Figure 2.2 and Figure 2.3 visually compare the projected increase in ambient temperature (2070) over current conditions.

The annual frequency of ambient temperatures and the intensity of ambient temperatures above 30°C is notably higher for 2070.

Adaptation measures to respond to increasing hot days and intense rainfall events could include a combination of the following:

- Water features
- Water-sensitive urban design (WSUD) principles
- Raingardens and bioretention tree pits
- Increased urban tree canopy
- Permeable pavement

2.2.2 Urban Heat Island Effect

The urban heat island effect occurs when natural land cover is replaced with dense concentrations of pavement, buildings and other surfaces that absorb and retain heat. Ambient temperatures in urban areas can be up to 10°C warmer than in rural areas.

Figure 2.4 visually demonstrates the impact of the urban heat island effect on the projected increase in ambient temperature (2070). This effect acts to increase energy costs, air pollution levels, and heat-related illness and mortality.

Mitigation measures to reduce the urban heat island effect could include a combination of the following:

- External shading features
- Building envelope reveals and returns
- Opaque wall surfaces that are matte or non-reflective
- Increased urban tree canopy
- Reflective hard surfaces and permeable pavement

2.2.3 Natural Ventilation

Figure 2.1 highlights the opportunity for the adoption of natural ventilation strategies with preferable outdoor temperatures in a range between 19 to 25 degrees. Future projections (RCP 8.5 for 2070) and accounts for urban heat island were considered.

Daytime through mid-season and winter and morning periods over summer allow for implementation of passive strategies.

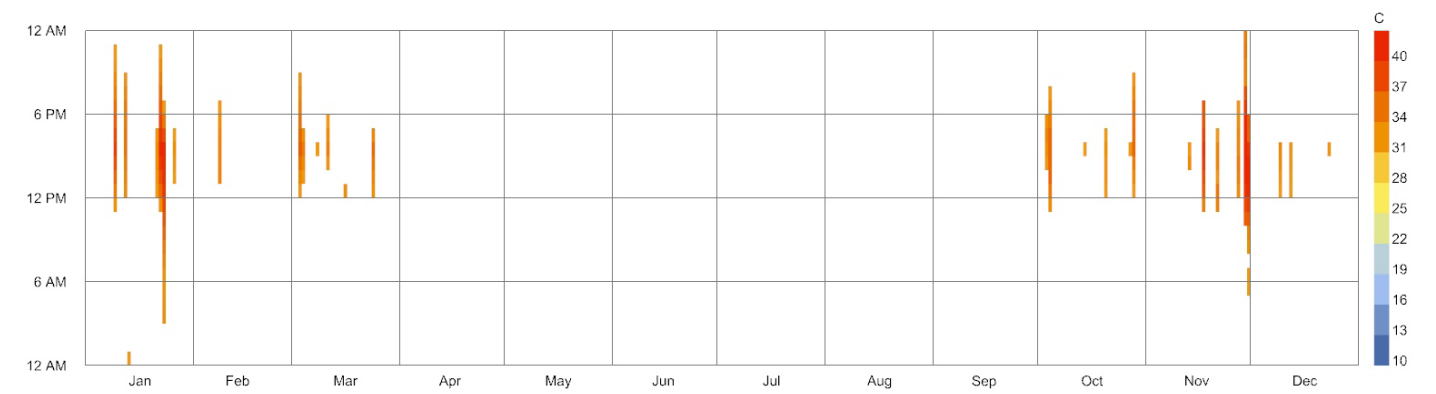


Figure 2.2 Annual hourly ambient temperature above 30°C - current



Figure 2.3 Annual hourly ambient temperature above 30°C - 2070

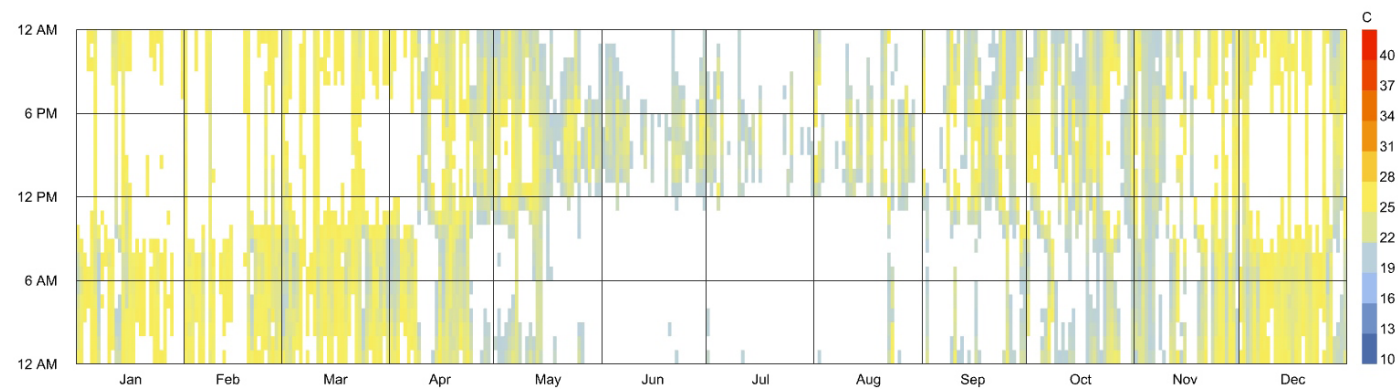


Figure 2.1 Annual hourly ambient temperature between 19-25°C - 2070

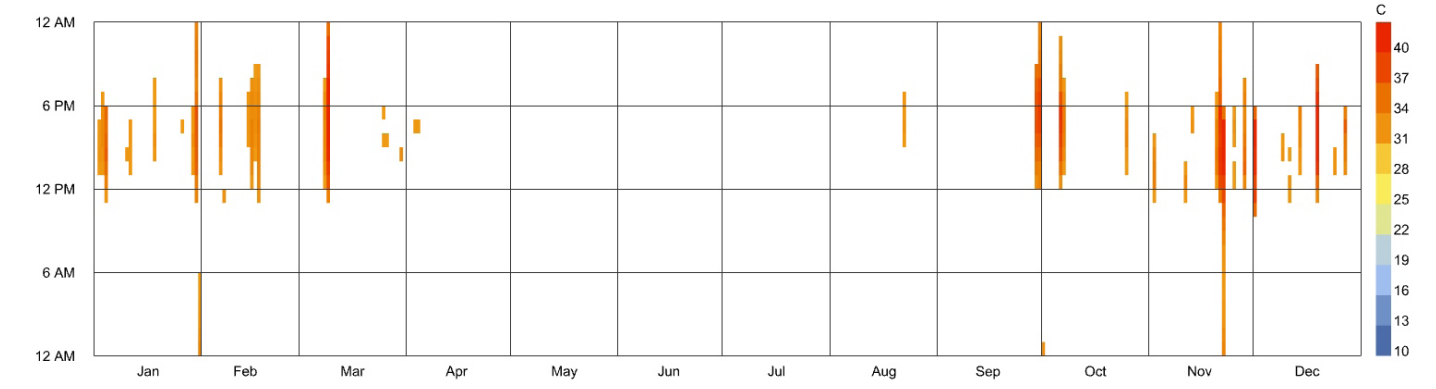


Figure 2.4 Annual hourly ambient temperature between above 30°C - 2070 + urban heat island effect

2.2.4 Sun Path

Figure 2.5 visually illustrates the sun path diagram for winter, mid-season and summer. The ambient temperature based on the monthly representative day is visually expressed.

The east-west urban grid typically receives high levels of direct sunlight throughout the year. This reinforces Precinct permeability with cross-connections to the wider community.

The north-south active movement and the Blue-green corridor have an opportunity to receive good levels of direct sunlight throughout the midday period but are generally overshadowed during morning and afternoon periods. Deciduous vegetation and urban canopy should be provided to create relief during hot hours, but allow for winter sun.

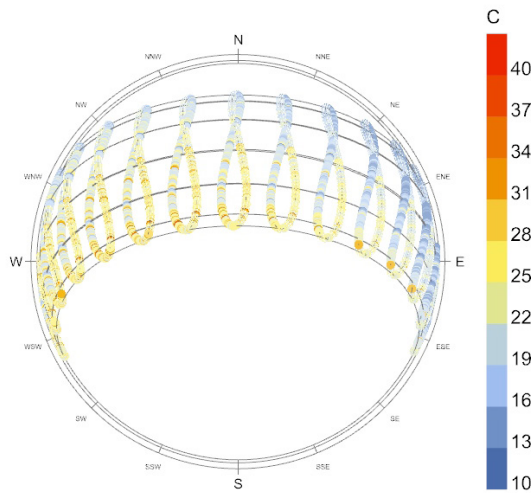


Figure 2.5 Sun path diagrams

2.2.5 Cloud Cover

Figure 2.6 visualises cloud cover over a typical year. Light blue represents a clear sky; dark grey represents an overcast sky.

Consistent clear sky conditions are observed during afternoons and throughout the day during mid-season periods. A deciduous urban tree canopy will shelter the Public Domain from the early afternoon sun during mid-season and summer periods whilst maintaining direct sunlight during the winter period to create a thermally and visually comfortable outdoor environment.

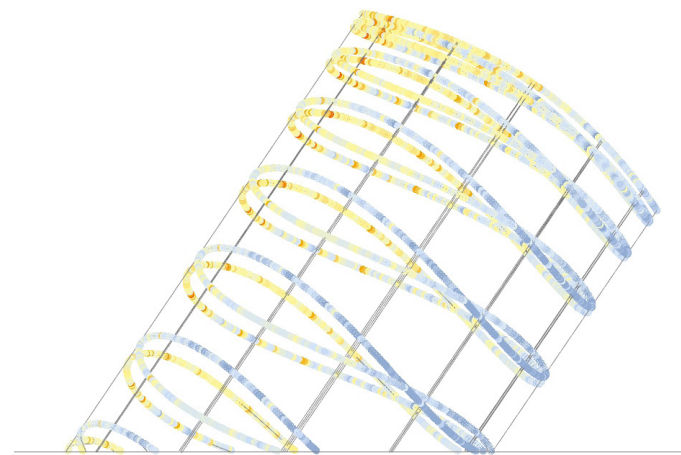


Figure 2.6 Annual cloud cover

2.2.6 Wind

Wind direction and velocity vary seasonally. Figure 2.7 and Figure 2.8 visualise the wind direction and velocity for summer and winter, respectively.

Prevailing northeast and southeast wind directions are observed in summer. Northeast summer breezes can permeate the north-south links in support of the active movement through the site, and the Public Domain spaces and experiences focussed along the active spine.

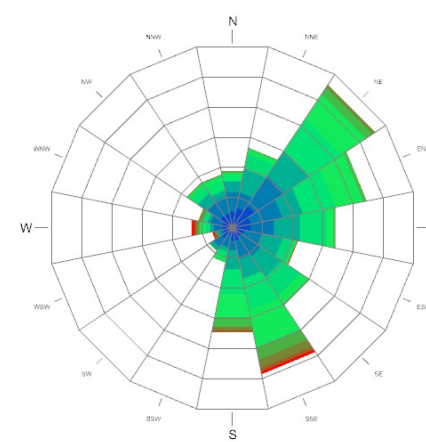


Figure 2.7 Summer wind rose

Southeast summer breezes reinforce the Blue-green corridor as a north-south active transport link through the site.

A prevailing northwest wind direction is observed in winter. The building envelope and an opportunity for a green boundary act to shelter the active movement zones and the Blue-green corridor.

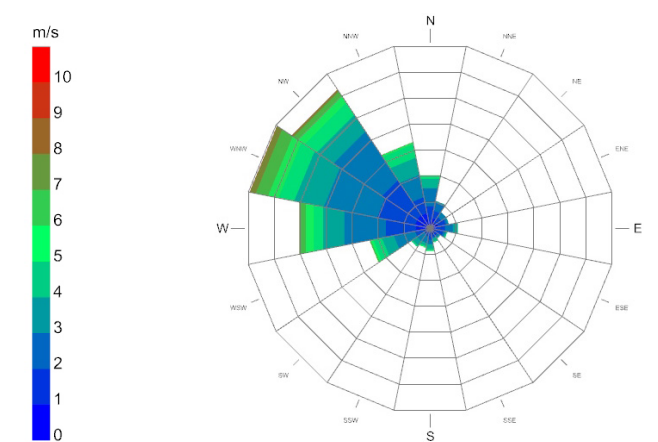


Figure 2.8 Winter wind rose

2.2.7 Humidity

High and low humidity can impact outdoor thermal comfort perceptions. Figure 2.9 visualises humidity over a typical year.

Humid conditions are observed during afternoons throughout the year.

Mornings and evenings are generally within a comfortable humidity range.

This provides an opportunity for active movement and transport through the site and the Blue-green corridor.

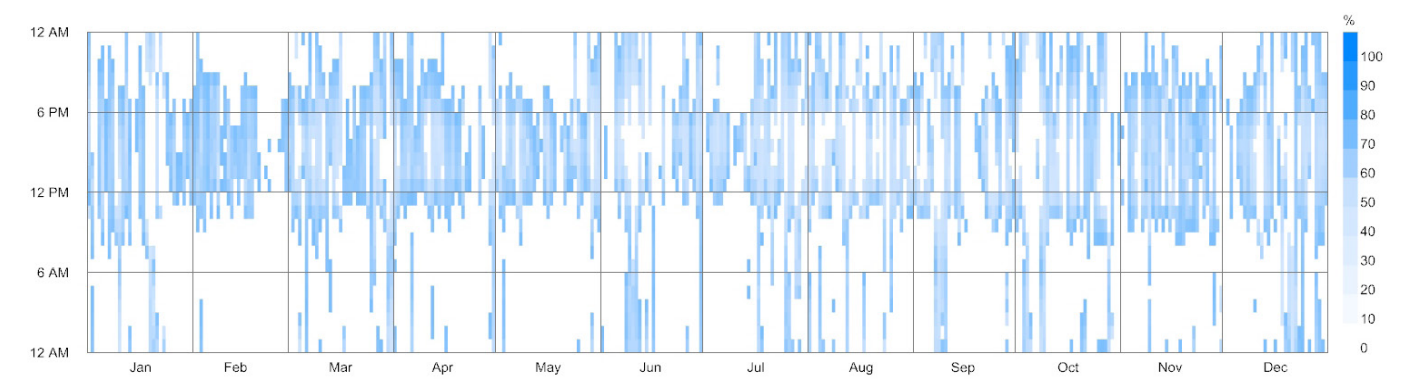
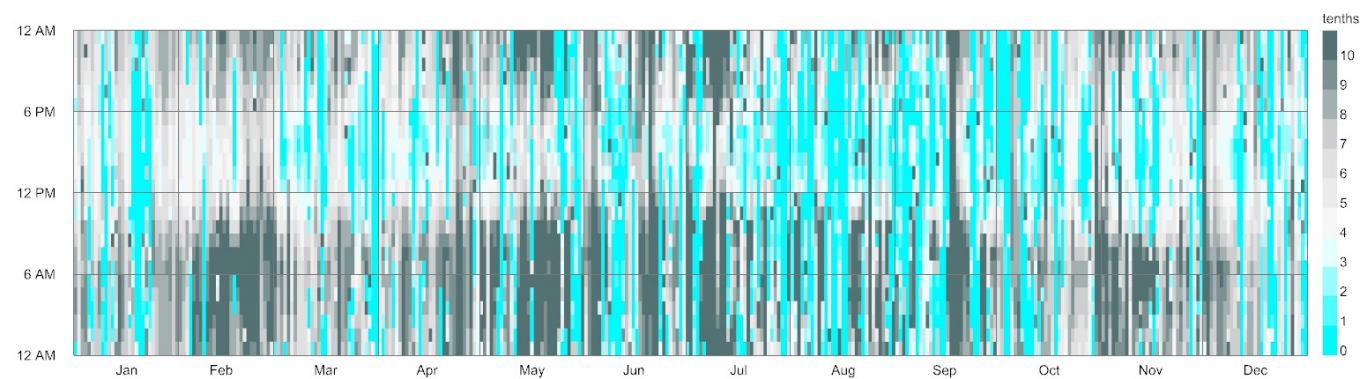


Figure 2.9 Annual humidity

3 Benchmarking

3.1 Circular

Hammarby Sjöstad, Stockholm, Sweden

The district has the strategy of a compact green town. A favourable balance has been found between the built and public spaces. The absence of fences and the permeability of public spaces yields a district with distinct characteristics and experiences.

- Heating is supplied by district sources
 - 34% of heat comes from purified wastewater
 - 47% from combustible household waste
 - 16% from biofuel (2002 figures)
- When the heat has been extracted from the warm, purified wastewater, the remaining cold water can be used for district cooling
- Reduction of potable water consumed by 50% through education and efficient fixture and fittings

- Local wastewater treatment. The sludge produced by the treatment process is recycled and used for fertilising farmland and forestry land. The waste releases biogas during processing. That biogas is used as fuel for vehicles such as buses, taxis and waste collection trucks, and to heat 1,000 homes in the area.
- Rainwater infiltrates the ground directly or is drained off through canals. The many small canals are part of the design of the urban landscape. Some of the roofs have been designed as green roofs that buffer much of the rainwater.
- Runoff from roads is captured separately and drained off to treatment pools before being allowed to infiltrate the ground



Figure 3.1 Channels of, Hammarby Sjöstad, Stockholm, Sweden

3.2 Infrastructure / Complex Ownership

Tonsley, SA

This innovative mixed-use Precinct integrates industrial, education, training, research, residential, retail, and community facilities.

A 61-ha site with an agricultural and industrial heritage, and is also home to the 11-ha former Mitsubishi Motors Main Assembly Building.

The Precinct focuses on high-value manufacturing in health, renewable energy, software, mining and energy services. It seeks to optimise collaboration between businesses.

The Precinct development is led by Renewal SA but reflects a complex delivery outcome whereby core delivery partners have been sought to realise the Precinct's ambitions. This includes institutional, corporate, residential, industrial, clean technology, retail, and energy stakeholders.

The Precinct has achieved:

- The first 6 star Green Star - Communities certification (2014)
- Australian design excellence through:
 - Low carbon and climate resilient infrastructure, including the re-use of existing buildings and materials
 - Integrated WSUD principles, including on-site rain gardens and recycled water from a nearby stormwater collection system
 - A focus on walkability, cycling and car share schemes
 - Four (4) on-site forests
 - Re-roofing the Main Assembly Building and supporting a 3 MW solar photovoltaic (PV) array to service the Precinct



Figure 3.2 A bird's-eye view of Tonsley

3.4 Infrastructure / Movement and Place

Kensington and Kingsford Town Centres, NSW

The Kensington and Kingsford town centres located along Anzac Parade, comprise an important urban renewal corridor in the Randwick City local government area. The town centres have been subject to a comprehensive planning review undertaken over 2016-2019 to address projected population growth and expected demographic changes, improve the quality of building design and the public realm, and accommodate the Sydney City to South East Light Rail infrastructure along Anzac Parade. It represents an exemplar in defining objectives and controls, including:

- All developments must equip 20% of all car parking spaces with EV charging points
- All new developments within strategic nodes are to incorporate future-ready provisions for a community-scale automated waste collection system
- Reduce congestion and carbon emissions by promoting active transport
- Reduce dependency on private vehicles and car ownership
- All new or substantial alterations of existing buildings within strategic nodes must achieve a 5 star Green Star rating



Figure 3.3 Conceptual view to Anzac Parade

3.3 Climate Positive / Social Housing

Eden Street, Arncliffe, NSW

The recently approved State Significant Development showcases a successful public-private partnership - the collaboration between NSW Government and the developer, Billbergia.

A Land and Housing Corporation (LACH) Communities Plus site, 25% of units must be delivered as social housing. The rest can be delivered as typical built-to-sell apartments, and commercial/retail and community spaces.

The 60,000 m² development will comprise four towers, one of 21 storeys, two at 20 storeys and one of 17 storeys that will house the social housing elements of the project. Together they will offer 714 apartments, including 180 social housing apartments, which will be owned, operated, and managed by Evolve Housing, one of Australia's largest community housing providers.

- The development has been approved through the NSW State Design Review Panel (SDRP) process
- A commitment to full site electrification has been made to offer cost of living benefits and empower residents and businesses to make better decisions



Figure 3.4 Approved architectural concept design

3.5 Nature-Based Solutions

QV1 Perth, WA

- A 40-storey building with internal and external landscaping
- The north plaza has upper and lower areas for functions and events, and a community garden on the top of the car park operated by Perth City Farm. Garden plots for edible plants provided to the retailers, bees produce local fresh honey, and chickens have been introduced.
- The next step of the lobby refurbishment will be to introduce seeding to internal landscaping and extend this out for al fresco dining on St Georges Terrace
- North-facing orientation and double-glazed windows allow light to penetrate deep into the floor plate in winter. Shading elements protect the space from overheating and visual discomfort during the summer.
- On-demand air conditioning based on occupancy
- End-of-trip facilities, a wellness centre, basketball courts, and a childcare centre are provided
- Sustainability certification, including:
 - WELL Core v2 Gold 2ating
 - WELL Health Safety Rating
 - 6 star NABERS Indoor Environment rating
 - 5.5 star NABERS Energy rating
 - 4.5 star NABERS Water rating
 - 4 star Green Star Performance rating
 - 2022 Platinum and Gold Waterwise Building of the Year
 - Climate Active Carbon Neutral certification

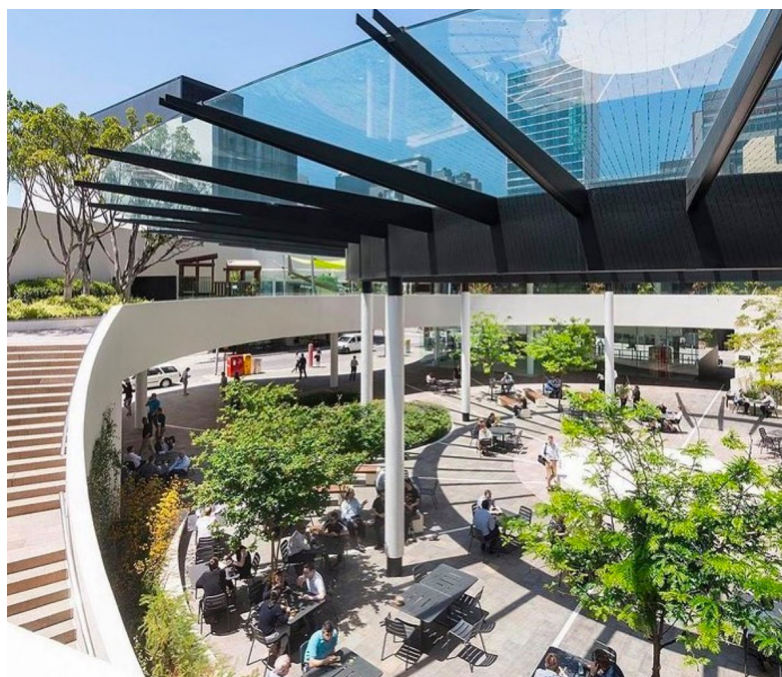


Figure 3.5 Rooftop of QV1 tower

3.6 Movement & Place

Ed. Square, Edmonds Park, NSW

- Ed. Square aims to knit the town centre into homes within the community, as well as the adjoining national park
- The community is drawn through a green spine of activity, which transforms along its length from civic to communal
- A 15-minute city concept was applied to the Precinct with essential amenities within a short walk or cycle journey, making it a liveable and desired place to live
- Frasers Property's embedded network provider, Real Utilities, supplies Ed. Square Town Centre and some of the homes with Climate Active certified carbon neutral electricity, significantly reducing operational carbon emissions from the community
- Approximately 40% of the energy demand is produced locally with a large-scale rooftop solar PV system installed across the community. A total solar PV capacity of 1,420 kW has already been installed on completed properties. The remaining energy is sourced off-site via a mixture of carbon offset certificates and large-scale generation certificates (LGCs).
- Homes within the Ed. Square development that cannot be connected to the embedded network will benefit from a large solar PV array on their roof, with both strategies reducing resident's home energy costs
- Frasers Property is also integrating energy-efficient features across the homes. The strategy varies across home typologies and product types but includes features such as geothermal heat pumps, LED lighting, efficient appliances and solar PV.
- The geothermal heat pumps installed aim to reduce heating and cooling energy use significantly while eliminating heat rejection during hot days
- All apartment buildings within Ed. Square are all 5 star Green Star Design & As Built certified. With the transition to all-electric, the new stages will be carbon neutral in operation. All terrace and townhouses at Ed. Square are designed to be 'EV ready'. The electrical infrastructure, including the home's power board, allows an easy connection of future charging equipment. EV charging stations are also available at Ed.Square's Town Centre for residents and visitors.



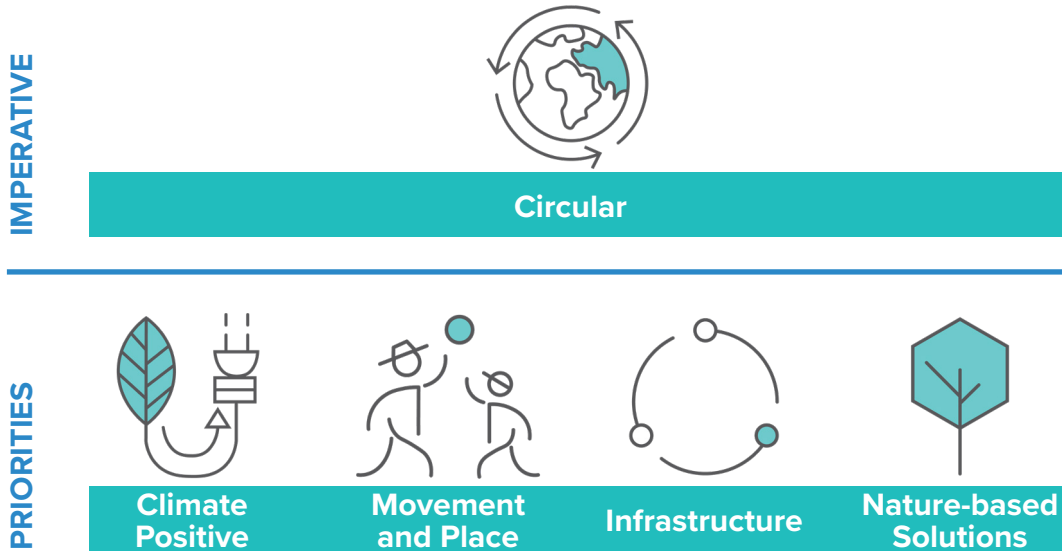
Figure 3.6 Pedestrianised street

4 Sustainability Framework

4.1 Sustainability Framework

Renewal within the Precinct presents the opportunity to be a catalyst for transformation in response to a decarbonisation and circular agenda.

The Precinct design, delivery and operation can be governed by a sustainability imperative, [Circular](#). This sustainability imperative fundamentally informs [Climate Positive](#), [Movement and Place](#), [Infrastructure](#) and [Nature-based Solutions](#) priorities.



4.2 Approach

4.2.1 Precinct-Wide Strategies

The sustainability imperative **Circular** and the **Climate Positive** priority align with NSW Government's objective to achieve Net Zero by 2050 and reduce emissions by 50% below 2005 levels by 2030. Different strategies are being developed on a precinct-wide basis to achieve this objective for both the Public Domain and all buildings. Burwood Council is working towards net zero emissions for Council by 2030 and for the community by 2050.

Figure 4.1 illustrates the stepped approach to achieve Net Zero the Precinct will have to pursue to reduce significantly emissions in the built-environment:

- No fossil fuel, promote on-site renewables, improve building fabrics
- Off-site renewable electricity procurement to deliver 100% energy
- Reduce upfront carbon, reduce waste, de-materialisation
- Offset residual emissions

Additionally, the **Movement and Place**, **Infrastructure** and **Nature-based Solutions** priorities address various sustainable precinct-wide strategies to improve liveability and circularity, which are applicable to both the Public Domain and all buildings:

- Promotion of active transport
- Reduce dependency on private vehicles and car ownership
- Promotion of small business towards 15-min city
- Improved waste separation and recycling at public realm and for residents
- Implement WSUD and reduce stormwater run off
- Increase green cover and tree canopy

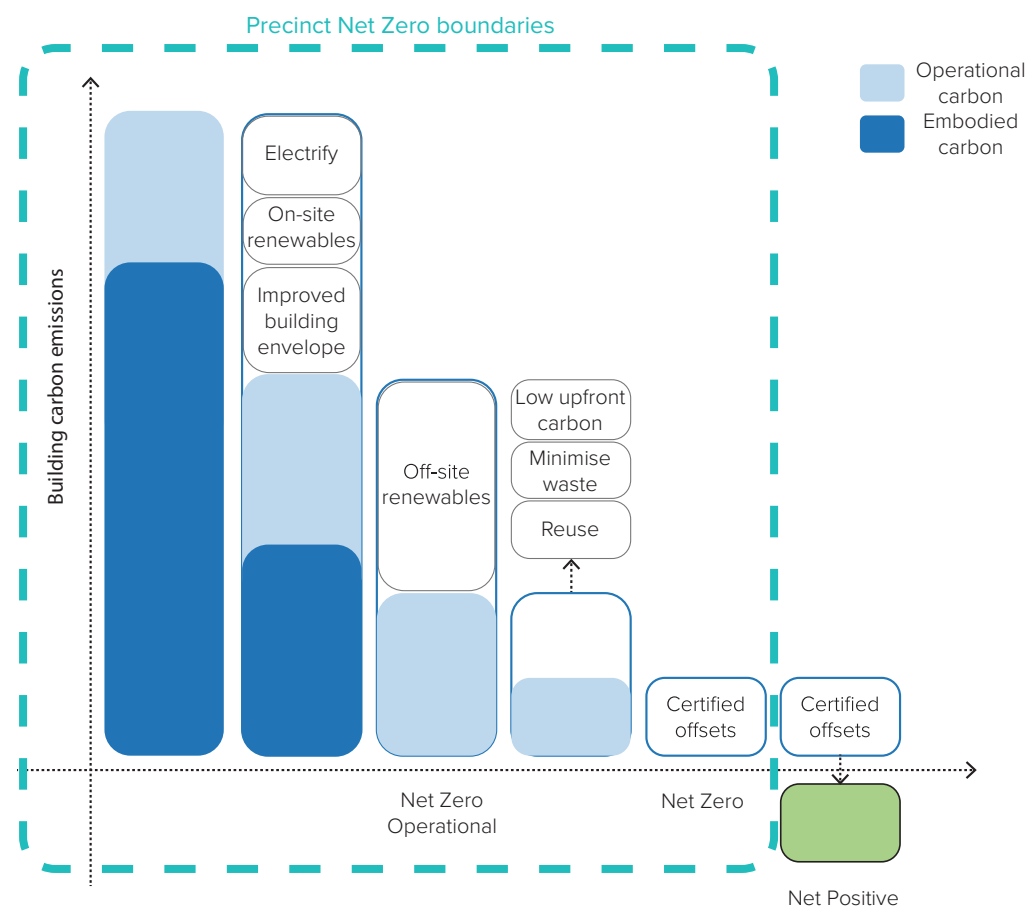


Figure 4.1 Net Zero Framework diagram

4.2.2 Proposed Masterplan

Circular principles are a fundamental consideration for all developments and the Public Domain, for both Council and private assets, under all densification scenarios. Figure 4.2 shows the proposed Masterplan for Burwood North with proposed new open space and buildings, and differentiates the lot distribution by FSR.

Climate Positive outcomes are expected to be achieved through the redevelopment of the Precinct, which will demonstrate leadership in aligning with the transition to Net Zero.

The new Masterplan provides an opportunity to review the Precinct's street hierarchy, allowing for a transition to a more pedestrian-oriented precinct. By promoting and developing active and public transport options, a reduction in car reliance is expected.

Precinct-wide infrastructure solutions can be implemented in stages, and the increase of density provides opportunity for improved energy, water and waste infrastructure.

The incorporation and integration of additional nature-based solutions presents a significant opportunity to foster strong social support and acceptance within the precinct. Defining and embedding these solutions has the potential to enhance the liveability, sustainability, and resilience of the precinct, while improving wellbeing of its residents and visitors.



Figure 4.2 Proposed Masterplan with revised densities

4.2.3 Public Domain

The Public Domain includes land and infrastructure that is accessible to the community. The Public Domain plays a critical role in shaping the livability and sustainability within the Precinct and can efficiently support the sustainable priorities defined previously (Table 4.1).

Climate Positive | Built elements (existing or new) in the Public Domain can support Climate Positive strategies and emission reduction by reducing energy demand, and using a high percentage of local and recycled materials. Single-use and virgin plastics should be removed from the Public Domain, and to divert waste from landfill, different waste streams must be implemented in all public areas. To reduce energy demand and night sky pollution from urban lighting, the following strategies have to be implemented:

- Energy efficient light fittings with warm colours
- Minimise urban light fittings
- Eliminate light spill (upwards and from reflective surfaces)
- Install PV on light fittings and public transport structures

Movement and Place | The Public Domain has an opportunity to deliver improved movement and place outcomes. This includes creating a walkable and liveable precinct through hard landscape that promotes active and low carbon transport options.

Infrastructure | Provisions for connection to the future Precinct embedded network and thermal network should be incorporated for all Public Domain assets.

Nature-Based Solutions | Soft landscaping is an important component of the Public Domain and is often used in combination with hard landscaping to create functional outdoor spaces. It refers to the living elements or vegetation used in a landscape, and it is often more cost-effective than physical (or grey) infrastructure. Soft landscaping also helps improve urban heat and climate resilience. When combined with strategies related to planting and Water Sensitive Urban Design (WSUD), it can create efficient, durable, and agreeable public spaces for the community.

4.2.4 Buildings

It is expected that the urban renewal of the precinct will happen over the next 20-30 years.

Educational buildings and heritage buildings are likely to remain, and properties that are difficult to acquire or have been recently constructed could potentially be retained.

The development strategies proposed in this report are divided into those aimed at future developments and major building refurbishments, as well as those addressed for potential remaining assets.

Table 4.1 Sustainable strategies in the Public Domain






	Climate Positive	Movement and Place	Infrastructure	Nature-Based Solutions
				
	<ul style="list-style-type: none">• Minimise energy demand• Photovoltaic installations and energy storage• Responsible material procurement• Use BASIX Material Index• Increase number of recycling streams	<ul style="list-style-type: none">• Improve and promote active transport and shared mobility services• Provide bicycle parking space in streetscape and open spaces• Provide high visibility and easy access to public open space	<ul style="list-style-type: none">• Non-potable water collection, storage and reuse• Connection to precinct networks• Reduce night sky pollution	<ul style="list-style-type: none">• Increase soft landscaping areas in streetscape• Green roof• WSUD strategies• Increase canopy cover• Drought resistant species• Soil cell systems• Community garden and composting



Figure 4.3 Bus stop with green roof and PV (London)



Figure 4.4 Recycled plastic street furniture (New York)

New developments and major refurbishments

New developments provide an opportunity to significantly reduce carbon emissions in the built environment and set higher standards for buildings regarding water and energy use, as well as thermal comfort and healthy indoor environment (Table 4.2).

Climate Positive | All developments are expected to achieve certifications from green rating tools demonstrating to ensure the Precinct will achieve its Net Zero target.

- Passive design strategies should be prioritized, as they have been proven to have a high impact on energy use and are cost-effective solutions.
- All buildings to be fully electric to progressively eliminate fossil fuel demand
- On-site energy generation should be maximised to reduce dependency to the Main grid.
- Water use is expected to be significantly reduced through the installation of efficient fittings and the collection and reuse of rainwater for non-potable uses such as washing machines, toilet flush, landscaping, washdown, and cooling towers if present. Reduction in water demand is also expected through user education.

Movement and Place | To promote active transport parking should be minimised, and dedicated parking for car sharing and e-bike charging stations should be implemented.

Infrastructure | Provisions for connection to the future Precinct embedded network and thermal network should be incorporated in all buildings.

Nature-Based Solutions | By integrating green open spaces within development sites, new developments can help to reduce the urban heat island effect, reduce energy demand and enhance local biodiversity.

- Developments should increase deep soil planting, tree canopy, and permeable areas to cool the local microclimate and reduce stormwater runoff. Additionally, intensive or extensive green roofs could be implemented to absorb rainwater, cool buildings and provide enjoyable communal space.
- Building rooftops and green spaces between Burwood Park and Concord Oval can support the delivery of a green corridor.

Remaining assets

Council assets | Strategies for remaining Councils assets aim to reduce energy and water usage, increase permeable area and tree cover, without having major impacts on building services and structure. Table 4.3 provides a comprehensive list of these strategies.

Private assets | Given the difficulties of implementing strategies on privately owned assets that already exist, the Council should instead seek to influence the behaviour of owners through measures such as requiring information disclosure and advocating for or developing incentives that promote sustainable strategies such as:

- Yearly energy and water usage disclosure
- Energy and water ratings where applicable
- Incentive for solar photovoltaic installation
- Incentive for full electrification
- Incentive for EV and Ebike charging station installation
- Incentive for rainwater tank installation
- Incentive for compost waste services
- Incentive for tree planting

Table 4.2 Sustainable strategies for New Assets and Major Refurbishments

	Climate Positive	Movement and Place	Infrastructure	Nature-Based Solutions
	<ul style="list-style-type: none"> • Green ratings (Refer to Table 5.1) • Passive design strategies • Fully electric, no fossil fuel • Photovoltaic panels • Efficient fixtures and fittings • Best practice waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • EV ready 	<ul style="list-style-type: none"> • Provision for embedded network • Provision for centralised heating/cooling 	<ul style="list-style-type: none"> • Increase deep soil planting • Increase tree canopy • Increase permeable areas • Collect and reuse rainwater
	<ul style="list-style-type: none"> • Green ratings (Refer to Table 5.1) • Net Zero by 2030 • Fully electric, no fossil fuel • Passive design strategies • Photovoltaic panels on roof and shading structures • Battery storage ready • Efficient fixtures and fittings • Waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • Car park attenuation & decoupled parking • Car share dedicated areas • EV ready • Ebike charging stations 	<ul style="list-style-type: none"> • Provision for embedded network • Provision for centralised heating/cooling 	<ul style="list-style-type: none"> • Increase tree canopy • Intensive and extensive green roofs • Rainwater collection and reuse • Communal productive gardens • Increase tree canopy • On-site composting
	<ul style="list-style-type: none"> • Green ratings (Refer to Table 5.1) • Net Zero by 2030 • Fully electric, no fossil fuel • Passive design strategies • Photovoltaic panels on roof and shading structures • Battery storage ready • Efficient fixtures and fittings • Waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • Car park attenuation & decoupled parking • Car share dedicated areas • EV ready • Ebike charging stations 	<ul style="list-style-type: none"> • Provision for embedded network • Provision for centralised heating/cooling 	<ul style="list-style-type: none"> • Increase tree canopy • Intensive and extensive green roofs • Rainwater collection and reuse • Communal productive gardens • On-site composting

Table 4.3 Sustainable strategies for Remaining Assets

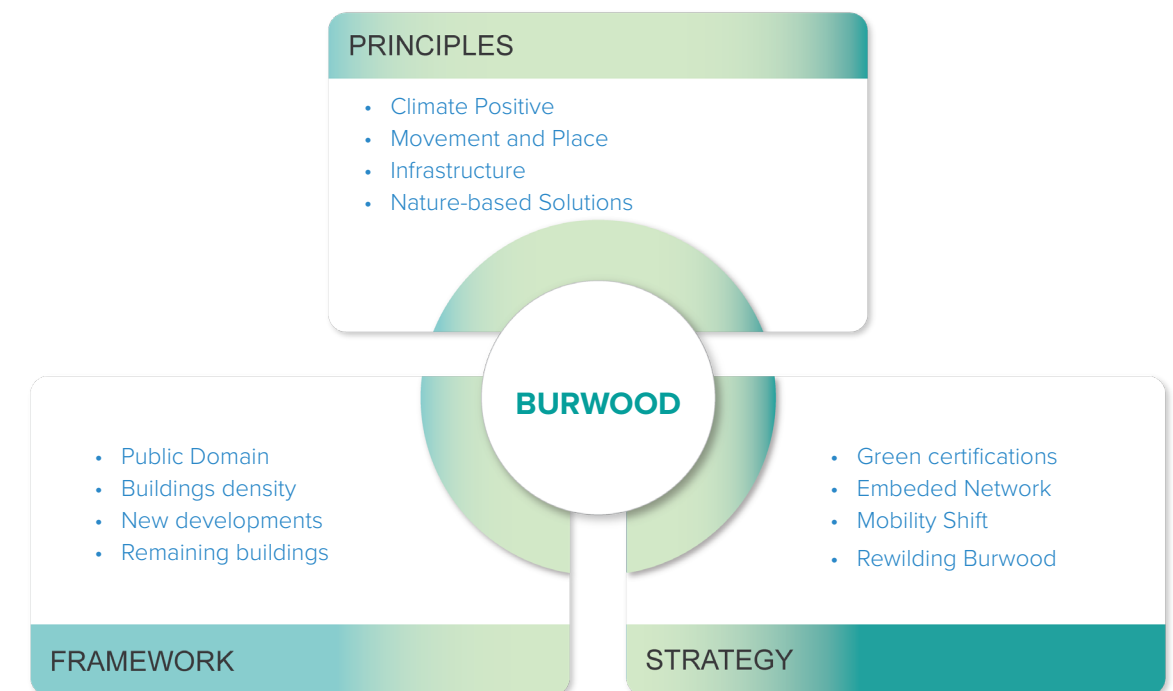
	Climate Positive	Movement and Place	Infrastructure	Nature-Based Solutions
	<ul style="list-style-type: none"> • Photovoltaic panels • Transition to fully electric • Passive design strategies • Best practice waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • EV ready 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Increase tree canopy • Increase permeable areas • Collect and reuse rainwater
	<ul style="list-style-type: none"> • Photovoltaic panels • Transition to fully electric • Passive design strategies • Shading canopy PV • Net Zero by 2050 • Efficient fixtures and fittings • Best practice waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • Car park attenuation & decoupled parking • Car share dedicated areas • EV provision • Ebike charging stations provision 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Increase tree canopy • Intensive and extensive green roofs • Rainwater collection and reuse • Communal productive gardens • On-site composting
	<ul style="list-style-type: none"> • Photovoltaic panels • Transition to fully electric • Passive design strategies • Shading canopy PV • Net Zero by 2050 • Efficient fixtures and fittings • Best practice waste separation and reduction • Increased number of recycling streams 	<ul style="list-style-type: none"> • Car park attenuation & decoupled parking • Car share dedicated areas • EV provision • Ebike charging stations provision 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Increase tree canopy • Intensive and extensive green roofs • Rainwater collection and reuse • Communal productive gardens • On-site composting

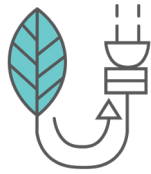
5 Sustainability Strategies

5.1 Sustainability Priorities

The review of the DCP is an opportunity to shift from business as usual thinking and set up high standards sustainability outcomes, to improve liveability and confirm the Precinct will achieve Net Zero.

The Precinct's objectives and targets can be reached through the implementation of new controls. These new controls are defined through the [Climate Positive](#), [Movement and Place](#), [Infrastructure](#) and [Nature-based Solutions](#) priorities.





5.2 Priority _ Climate Positive

The transformation of the built environment towards Net Zero emissions will be accelerated under a range of Net Zero Buildings initiatives. Energy sources have to evolve, energy use, water demand and embodied emissions have to reduce significantly. Waste has to be minimised and diverted from landfill. Circular economy principles have to be prioritised in the Public Domain and all developments.

Climate Positive Pathway for medium and high-rise

The Green Star Buildings rating tool responds to global megatrends, and national and regional policies to define a Climate Positive Pathway. This is addressed within the following four credits (see Figure 5.1):

- Credit 21 Upfront Carbon Emissions
- Credit 22 Energy Use
- Credit 23 Energy Source
- Credit 24 Other Carbon Emissions

The Climate Positive Pathway increases in stringency over this decade. All new development is required to achieve whole life (upfront and operational) Net Zero by 2030. This sustainable built environment response is captured in strengthening credit criteria over three-year cycles (2023 → 2026 → 2030).

Within the scope of the Precinct, the staged delivery of development will need to respond to this representation of market best practice.

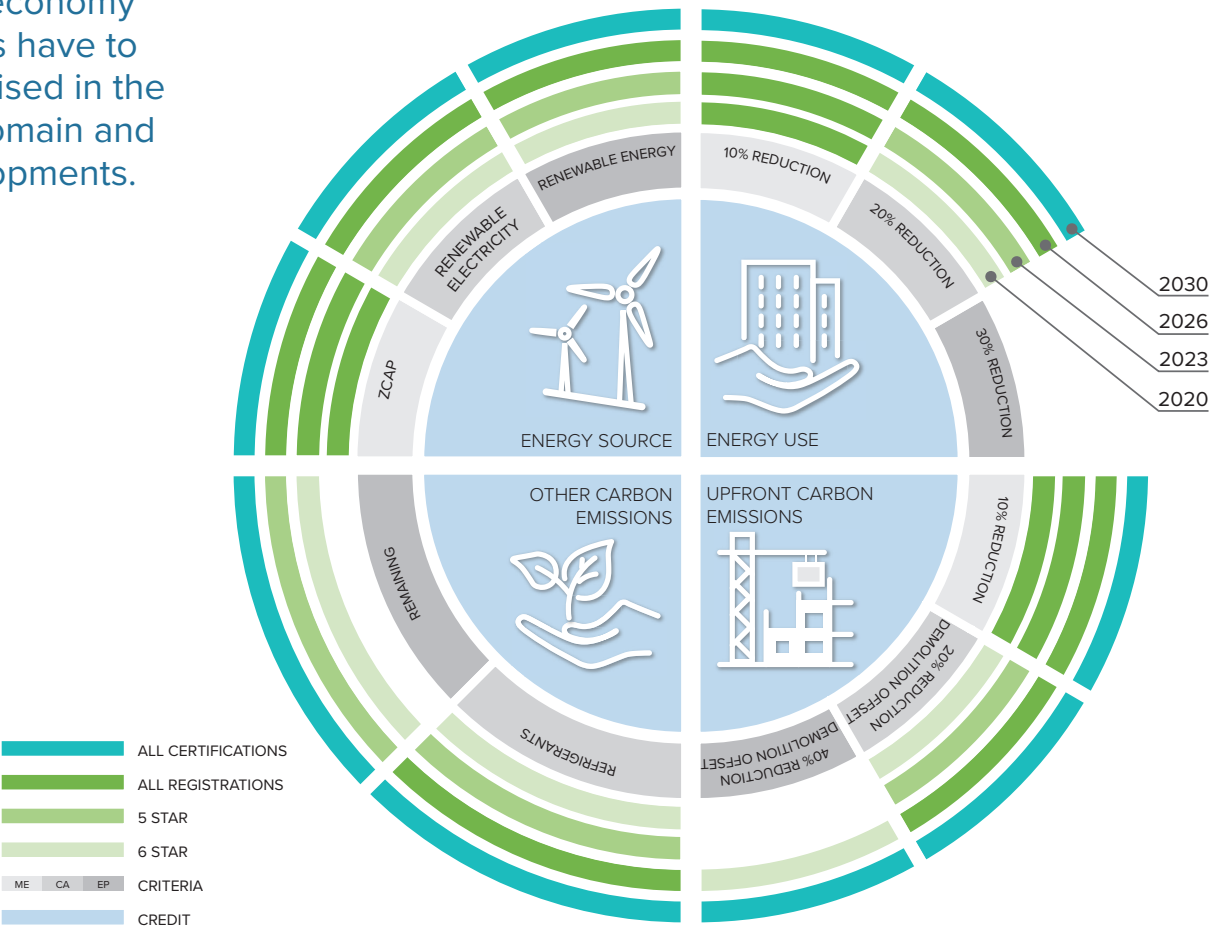


Figure 5.1 Green Star Climate Positive Pathway

Green rating tools

The following green ratings have been selected to demonstrate that the efforts required for the Precinct to achieve Net Zero and improve liveability are implemented in all new developments.

Green Star | There are five Green Star rating tools (Homes, Performance, Buildings, Interior and Communities) which focus on different concepts related to energy and water efficiency, indoor quality, carbon emission reduction, materials and responsible procurement, places, social inclusion and nature.

Climate Active Carbon Neutral | The certification is awarded to organisations that have credibly reached a state of carbon neutrality- based on an agreed emissions boundary for a specific certification type. It is available for precincts and buildings.

NatHERS | NatHERS provides energy ratings for new residential buildings with different benchmarks depending on the building location. NatHERS is pathway to demonstrate compliance with the NCC energy efficiency requirements.

BASIX | BASIX sets sustainability targets for water and energy as well as minimum performance levels for the thermal comfort of new development. The targets are expressed as a percentage saving against the NSW benchmark.

NABERS | NABERS is a tool that provides a rating for commercial buildings efficiency in terms of energy, water and waste. Ratings are publicly available and all office spaces over 1000 sqm are required to have an NABERS rating.

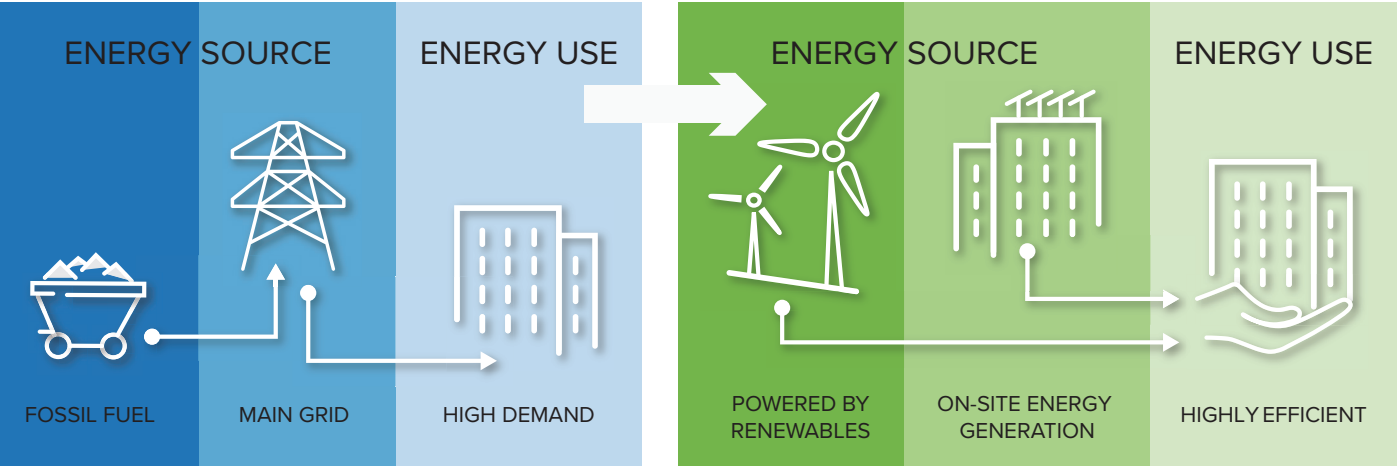


Table 5.1 Environmental Targets Summary for the Precinct

Precinct certifications	
Green Star	• Communities with staged approach (4 star 2030 → 5 star 2040 → 6 star 2050)
Climate Active Carbon Neutral	• Council developments to achieve Climate Active Carbon Neutral (operation)

Table 5.2 Environmental Targets Summary for New Developments and Major Refurbishments

Building Certifications	FSR 2:1 (dwellings)	Mid-rise (FSR 2.5:1 - 3:1)	High-rise (FSR 4:1 - 6:1)
Green Star	• Homes 5 star	• Buildings 5 star	• Buildings 5 star (6 star for DE)
NatHERS	• 7 star	• Average 7 star • Minimum 6 star	• Average 7 star • Minimum 6 star
BASIX	• Energy 60 • Water 50 • Material Index	• Energy 45 • Water 50 • Material Index	• Energy 35 (45 for Design Excellence (DE)) • Water 50 (60 for DE) • Material Index
NABERS	N/A under 1000sqm	• Energy 5.5 star (+25%) (without GreenPower) • Water & Waste : 5 star • Embodied emission tool	• Energy 5.5 star (+25%) (without GreenPower) • Water & Waste : 5 star • Embodied emission tool



Energy Source

Decarbonisation | The Precinct can take advantage of a decarbonising grid by transitioning all energy uses to fossil fuel-free operations and promoting on-site energy generation. Coupled with an embedded network operator (see 5.3 Priority _ Infrastructure) offering carbon neutral and renewable electricity, this could empower consumers and businesses to make sustainable choices, and reduce the cost of their operations. Through staged development of the Precinct, the ultimate aim is to establish a comprehensive embedded network connected to all Public Domain and private assets within Burwood North (see Section 5.3).

Table 5.3 Proposed Controls_ Energy Source	
PC.1	• All Public Domain and private developments to be all electric, fossil fuel-free
PC.2	• All new developments to have on-site Solar Photovoltaic installations that can cover: <ul style="list-style-type: none">– at least 50% of yearly energy use for dwellings FSR 2:1– at least 15% of yearly energy use for medium and high-rise (to be reviewed in stage 3)
PC.3	• All new developments to be battery storage ready

Energy and Water Demand

Sustainable Buildings | The PRCUTS *Sustainability Implementation Plan*, NSW Sustainable Buildings SEPP and Green Star Buildings establish energy use targets and requirements for new developments. Burwood North Masterplan aims to achieve Net Zero by 2050, and to accomplish this, it encourages all developments, whether new or existing, to be energy and water-efficient and significantly reduce the Precinct energy and water demand. Targeting high ratings with different green tools is a way to support and verify the energy and water demand has reduced.

Table 5.4 Proposed Controls_ Energy and Water Demand	
PC.5	• All new developments must achieve the different green ratings tools as per Table 5.1 and 5.2, where applicable
PC6.	• Public Domain elements must minimise energy demand and use energy efficient systems and fittings
PC.7	• All Public Domain and private developments to install sanitary fixture and appliances at a minimum of 1 star below the highest WELS and Energy ratings

Embodied emissions

Upfront carbon | The upfront carbon emissions from construction materials accounted for 16% of carbon emissions from Australia's building stock in 2019. Without any reduction actions, this will increase to 85% by 2050 due to a decarbonised grid. Public Domain and private developments within the Precinct can diligently calculate and disclose the embodied emissions of construction materials under the BASIX materials index and the future NABERS Embodied carbon tool. Reduction strategies aligned with the Green Star Climate Positive Pathway that leverage supply chain transformation and reduction targets can be set, where practicable.

End of life | At the end of life, materials should be appropriately separated, diverted from landfill and locally reused or recycled to minimize waste and environmental impact..

Anticipate | To further reduce carbon emissions, all Public Domain and private developments should source materials locally, design and build with minimising demolition and construction waste, and design for disassembly and reuse.

Table 5.5 Proposed Controls_ Embodied emissions	
PC.8	• All Public Domain and private developments must disclose and reduce upfront carbon emissions. Medium and high-rise buildings are expected to achieve the Green Star Credit 21_ Upfront Carbon Emissions
PC.9	• All Public Domain and private developments must divert at least 80% of materials from landfill from demolition processes

Waste

Reduce | The Precinct can investigate opportunities to reduce construction and operational waste. Promoting responsible waste stream separation and increased number of recycling streams aligned with the Council's development of waste separation strategy, implementing convenient and efficient waste management systems and organic compost on-site can significantly reduce the amount of waste that goes to landfill.

Remove | Additionally, all public spaces within the Precinct are to be plastic free zones, where no single-used plastic products are distributed or no virgin plastic is used as a construction or furniture material.

Anticipate | Adequate waste provisions and robust procedures that cater for potential changes during operation can be investigated, including additional area to store, collect and process waste and automatic vacuum waste collection system, dehydrators and any future technology.

Table 5.6 Proposed Controls_ Waste	
PC.10	• All new medium and high-rise developments must have dedicated waste chutes and sufficient bin store area to collect 4 different waste streams
PC.11	• All new medium and high-rise developments must account for the future collection of at least two additional waste streams (6 streams total) and allocate additional space accordingly
PC.12	• All Public Domain space must have at least 2 separated waste streams
PC.13	• All Public Domain areas to be plastic-free
PC.14	• All Public Domain and private developments must allocate space for on-site compost
PC.15	• All new medium and high-rise developments should make provision for future vacuum waste collection system
PC.16	• All Public Domain and private developments must divert at least 80% of all construction waste to landfill

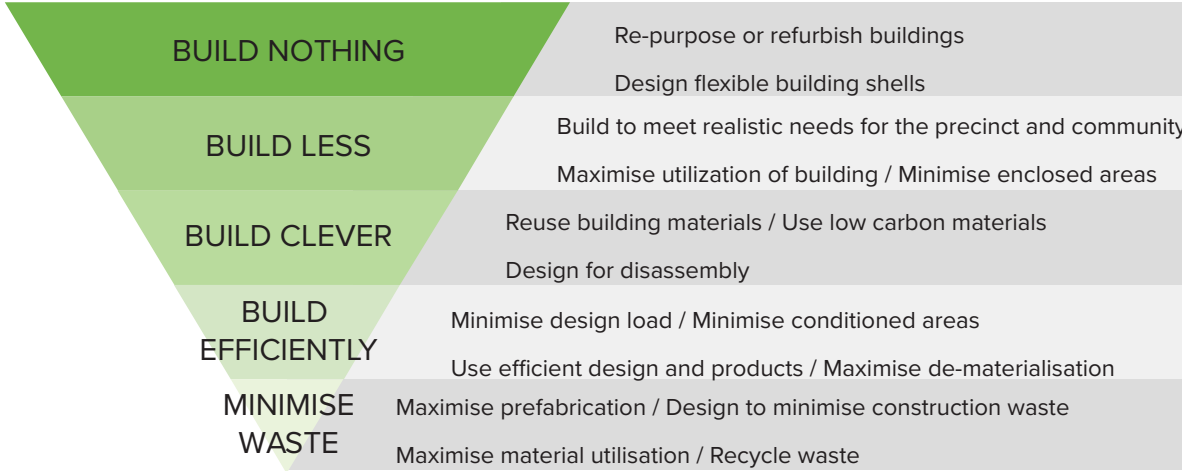


Figure 5.2 Embodied carbon reduction strategies during design and construction processes



5.3 Priority _ Infrastructure

The transition to a Net Zero economy is rapidly gaining ground. Key policies and statutory planning requirements are already in place or emerging. A key principle being considered is fossil fuel-free operations, electrification of all energy uses, and the supply of renewable electricity generated on- and off-site.

Diversified Demand

Figure 5.3 visualises electrical demand profiles for a range of scenarios to demonstrate opportunities inherent within the Precinct. A non-diversified electrical demand profile demonstrates the typical daily demand 'duck curve' with morning and evening peaks. The electrical demand profile includes hot water, heating, cooling and EV charging.

Peaks | The diversified electrical demand profile is reinforced by the thermal demand diversity and heat recovery potential inherent in the Precinct. Figure 4.3 further demonstrates the diversified electrical demand profile. Notable peak demand reductions are observed during the morning and evening peak periods.

On-site energy generation | The installation of the distributed solar PV system can reduce the morning peak reduction. The daytime electrical demand can be met by the distributed solar PV system.

Heat recovery | Heat rejected from cooling can be recovered for heating (primarily hot water heating). This effect can be captured in an ambient loop system, whereby heat rejected to and abstracted from an ambient (or condenser water) loop serving water-cooled VRF air conditioning and CO₂ electric heat pump hot water systems in each building drives down the thermal demand. Heatrecovery could be a potential strategy the Precinct could achieve.

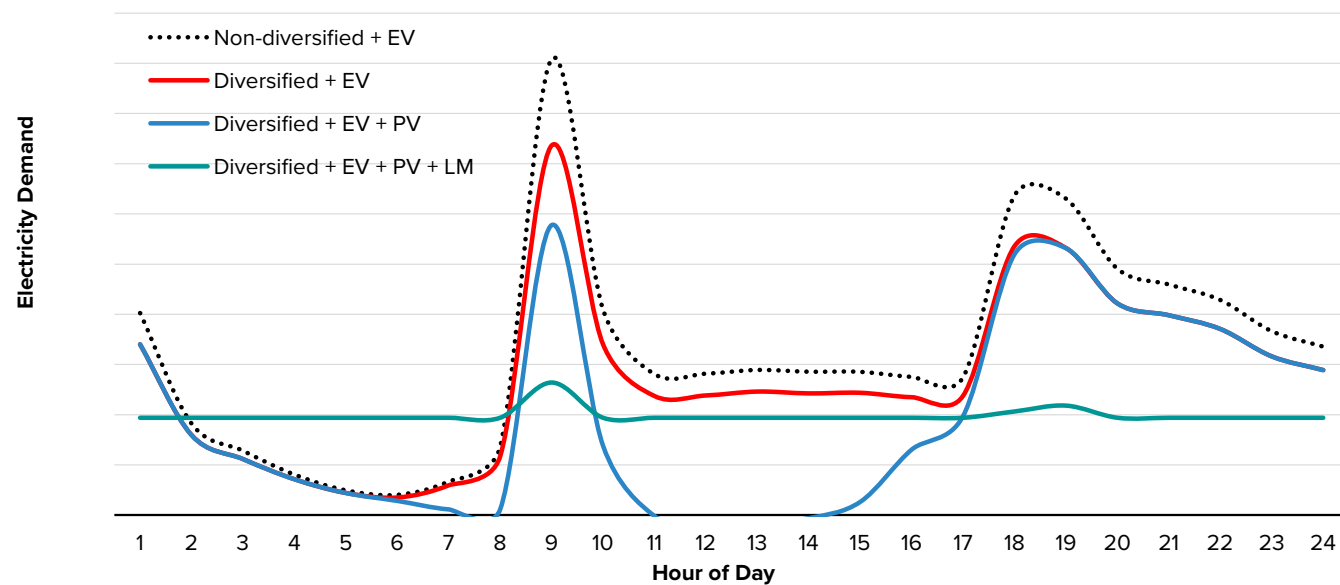


Figure 5.3 Electrical demand profiles, incl. peak demand reduction strategies

1. Business as Usual

Individual utility connections to each building and the Public Domain of the Precinct limits demand diversification and cumulatively impact utility amplifications. Opportunity for innovation and access to capital is lost.

Existing Networks

The site infrastructure opportunities, risk and constraints are identified in the Burwood North Precinct Masterplan _ Utility Servicing Assessment. Business as Usual strategies have been developed within this report to upgrade existing infrastructure networks according to the proposed development densities.

Commercial Structure

Feasible | Precinct utility services represent a fundamental investment decision to enable circular, resilient and Net Zero operations. The commercial ownership structures for the Precinct utility services are well established, proven and understood. Supported by strong investment interest, it offers the Precinct a seamless, low capital mechanism to drive high efficiency and Net Zero outcomes that do not impact the commercial feasibility of development. It will empower consumers and businesses to make sustainable choices, and reduce the cost of their operations.

Thermal Network

Open Space | A thermal network releases public and communal open space by centralising heat rejection plant and equipment. This approach offers increased rooftop amenity and mitigation of the urban heat island effect.

Diversity | Precinct development, where centrally serviced, delivers inherent diversity and demand reduction benefits, facilitating immediate capital plant and spatial savings. Capital plant reductions typically exceed 5% and spatial savings are estimated at approximately 2% of gross floor area (GFA). A thermal network aggregates plant away from high-value areas.

Environment | A thermal network facilitates the centralisation and effective management of pollution (e.g., acoustic impacts) to improve the overall performance of the Precinct in relation to acoustics, and visual and thermal comfort performance.

2. Precinct Utility Services

Precinct utility services leverage unique site features and can deliver an integrated approach to energy use.

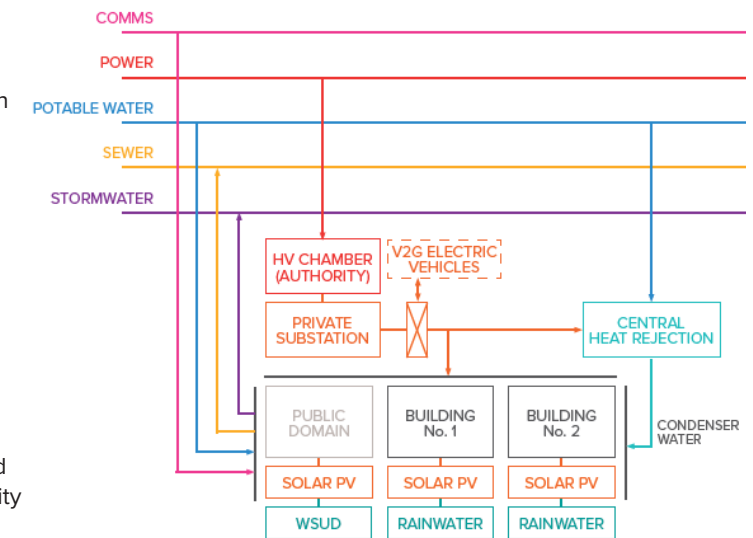


Figure 5.4 Precinct utility services

Embedded Network

Infrastructure | An embedded network optimises the high voltage (HV) incoming electrical feeder configuration, better matching feeder capacity to electrical load groups.

Authority design standards for transformer chamber substations are onerous. Transformer capacity and the number are limited for each chamber. Private transformer chamber substations, compliant with Australian standards, aggregate transformers within a chamber to better match capacity to load.

This realises a reduction in the number of substations.

Activation | Authority design standards impose rigid access and egress requirements, with substations generally located at grade. This acts to break up street frontage and activation. Private substations offer greater flexibility with respect to location. Contiguous street frontage and activation can be better maintained.

Integration | An embedded network offers ready integration of embedded generation and energy storage technologies, including electric vehicle bi-directional capabilities (also called V2G - vehicle-to-grid).



5.4 Priority _ Movement and Place

Mobility is undergoing a transformational shift with far-reaching implications. As personal transport technologies and choice expands, new infrastructure is required. To underpin this shift, renewal can create a walkable and liveable Precinct through good urban design that promotes active and low-carbon transport options. As the Precinct develops, it must increasingly leverage the enhanced active transport and public transport infrastructure to facilitate a progressive shift away from private vehicle use.

Future Mobility

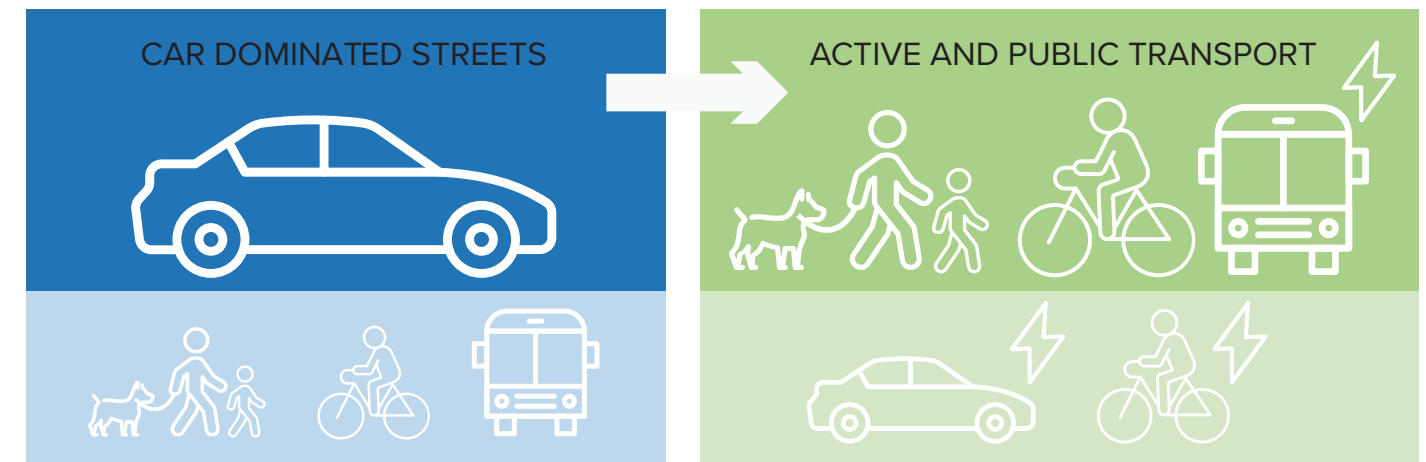
Transformation | The staged delivery of the Precinct will be critical to realising a mobility shift. Private vehicle use for residents, workers and visitors will be restricted and the number of car spaces reduced. The need for private vehicle will be progressively shift towards active transport thanks to the quality of existing and planned public infrastructure and active mobility conditions.

As an example, one approach could be, after reducing the speed on Burwood Road, to completely eliminate car traffic, dedicating it solely to buses and ultimately transitioning it to a fully pedestrianized area.

Shared mobility | As the quality of public transport and active mobility conditions improves (e.g., metro services commence circa 2030 and active mobility networks are expanded) acceptance of and preference for unbundled and decoupled car parking will accelerate, and shared mobility services are expected to become the norm.



Figure 5.5 Shared street (Rennes, France)



Mobility Shift

To achieve the desired mobility shift and provide a pedestrian friendly environment, a change needs to happen at all levels. Car parking rates and bicycle provisions are one of the steps that can be adjusted for new developments.

Context | Burwood North Precinct Masterplan: Rapid Transport Appraisal, by SCT Consulting addresses the desired increase in walkability and parking policy adjustments. Burwood North is adjacent to Canada Bay council, which implemented recent changes to DCP to support the mode shift and achieve Net Zero targets. BDCP design controls can align movement and place provisions with CBDP, and Rhodes in particular.

Active transport | New pedestrianised streets and links are proposed within the site as well as larger footpaths, new cycling lanes, shared streets and open spaces which will create a permeable site and encourage walking and cycling.

Public Transport | The addition of the Metro station, as well as the implementation of slower speed limits and reduced traffic on roads such as Wilga Street and Burwood Road, are promising options that residents would enjoy using.

Parking | Improving the development of active and public transport infrastructure can effectively reduce the need for car parks, especially at a precinct scale. The proposed parking rates for residential and commercial buildings are provided by SCT Consulting in their report, Rapid Transport Appraisal.

The new rates are generally aligned with benchmark precincts across Sydney and include the following:

- Bicycle parking rates for residents and visitors
- Car share and ride share rates
- Car park rates for resident and visitors
- Accessible parking rates
- Motobicycle rates
- Freight and servicing vehicle parking

Electric Vehicles

All electric | To ensure future developments can support the transition to electric vehicles, the following initiatives can be addressed within the context of electrical infrastructure, and EV-ready and EV-capable capacity.

Electric charging station rates are provided by SCT Consulting in the Rapid Transport Appraisal.

Electric vehicle charging facility is to be provided for car spaces, for both residential and commercial developments.



5.5 Priority _ Nature-based Solutions

Nature-based solutions act to address the climate and ecological emergency. Biodiversity and habitat loss is accelerating and expanding cities are some of the most nature-depleted areas, putting at risk many of the life-sustaining ecosystem services upon which communities and livelihoods depend. Cities are also increasingly vulnerable to the impacts of climate change, including soaring temperatures, storm events and sea level rise. Nature-based solutions improve air and water quality, and regulate temperatures, providing access to green spaces and nature that reinforce the physical and mental wellbeing of a community.

Design with Nature

Design for future | By prioritising nature in investment decision-making, the resilience and liveability of the Precinct is expected to rapidly improve, contributing to a secure, sustainable future for nature and people.

Resilience | In Burwood North, nature-based solutions can be implemented within the Blue Green grid by increasing the tree canopy, deep soil planting and permeable surfaces. By using Water Sensitive Urban Design (WSUD) strategies in open spaces and communal spaces, the Precinct will be more resilient to extreme weather events, and will reduce water demand by capturing, filtering, storing and reusing water appropriately.



Figure 5.6 Urban park with flooding mitigation design (Norway)

5.5.1 Urban Heat Controls

Universal Thermal Climate Index (UTCI)

UTCI is an international standard defined by the COST European Cooperation in Scientific and Technical Research Action 730, and is based on recent research in human response-related thermophysiological effects of the atmospheric environment in human biometeorology. This metric analyses outdoor thermal comfort and how it is perceived by users of the public and communal open space. It quantifies the quality of amenity based on site-specific conditions including:

- Ambient air temperature
- Mean radiant temperature (produced with account of reflectivity and urban heat island effect)
- Wind velocity
- Relative humidity

When combined, these site-specific conditions describe an outdoor thermal comfort performance.

Analysis and results | UTCI analysis results are presented as perceived outdoor thermal comfort categories, as follows:

- +2 (Moderate heat stress: $28^{\circ} < UTCI < 32^{\circ}$)
- +1 (Slight heat stress: $26^{\circ} < UTCI < 28^{\circ}$)
- 0 (No thermal stress: $9^{\circ} < UTCI < 26^{\circ}$)
- -1 (Slight cold stress: $0^{\circ} < UTCI < 9^{\circ}$)
- -2 (Moderate cold stress: $-12^{\circ} < UTCI < 0^{\circ}$)

Broader thermal comfort parameters are statistically interpreted to provide a quantitative measure of the quality of amenity.

Table 5.7 categorises the quality of amenity based on the acceptability of an urban space depending on their use throughout a statistical year.

Table 5.7 Urban Spaces quality categories and acceptability range

Category	Acceptability	Description	Colour	Function examples
All seasons	>90% acceptable hours in each season	Appropriate for use year-round	<div></div>	<ul style="list-style-type: none">• Parks and courtyards• Playground• AI fresco dining areas
Seasonal	>90% acceptable hours in spring-autumn, >70% acceptable hours in winter	Appropriate for use during most of the year	<div></div>	<ul style="list-style-type: none">• Rooftops and podiums
Short-term	>50% acceptable hours in each season	Appropriate for short term duration year-round	<div></div>	<ul style="list-style-type: none">• Public transport waiting areas• Footpath
Short-term seasonal	>50% acceptable hours in spring-autumn, >25% acceptable hours in winter	Appropriate for short term duration most of the year	<div></div>	<ul style="list-style-type: none">• Bicycle lane
Transient	>25% acceptable hours in spring-autumn, >50% acceptable hours in winter	Appropriate for transient public spaces	<div></div>	<ul style="list-style-type: none">• Parking areas

Requirements

The Universal Thermal Climate Index (UTCI) metric is suggested for predicting outdoor thermal comfort in the Burwood North precinct. The methodology for computing this metric is provided at <http://www.utci.org/>.

UTCI analysis to be conducted on an annual basis for every hour, using predictive weather file and accounting for the urban heat island effect.

The frequency of the occurrence of UTCI 'comfortable range' (between 0° and 28°) is to be calculated. The categorisation of the area's performance is divided as follows:



To tackle and mitigate the impacts of climate change on urban outdoor environments, the following measures are proposed:

Table 5.8 Proposed Controls_ Urban Heat	
PC.17	<ul style="list-style-type: none">• Undertake a UTCI analysis for all outdoor areas within the Public Domain and for medium and high-rise buildings<ul style="list-style-type: none">– Adjust the current conditions weather file for the future climate projections RCP 8.5 to consider the life span of the development– Adjust the future projections weather file accounting for the Urban Heat Island Effect for the future development and remaining assets– Identify areas of concern and provide mitigation strategies
PC.18	<ul style="list-style-type: none">• All outdoor areas have to comply with the percentage of acceptability listed in Table 5.7, depending on their functionality

5.5.2 Blue Green grid

The Blue Green grid network combines landscape, urban design and ecology, and helps bring nature back into urban areas. The different advantages of the Blue Green grid are the following:

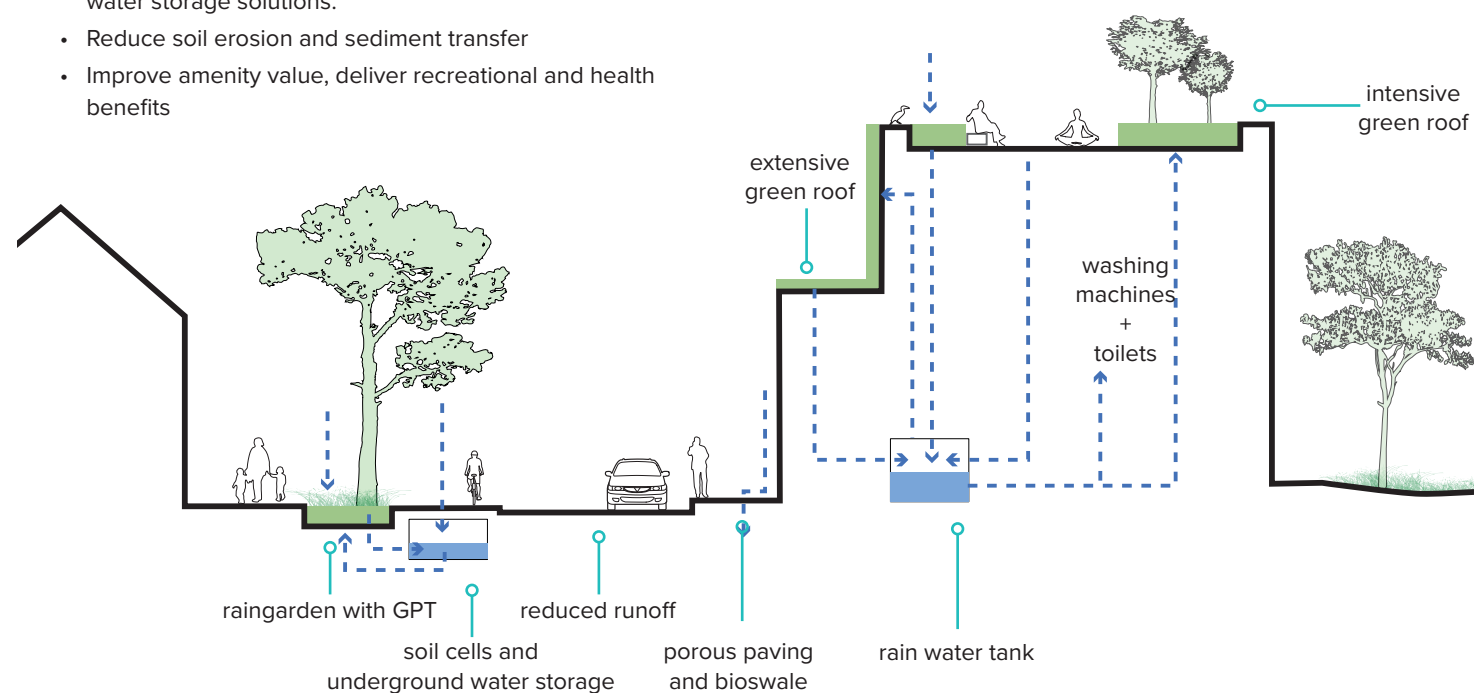
- Improve flood resilience
- Store carbon - climate crisis mitigation
- Increase natural and social capital, improve tourism and recreation
- Enhance biodiversity and habitat connectivity, protect, restore, expand and create natural habitats
- Reduce exposure to polluting substances, improve amenity value, and deliver recreational and health benefits

Proposed requirements for the Blue Green grid are developed in the Stormwater and Flooding Report, by Mott MacDonald and the Landscape and Public Domain Strategy Report, by Oculus.

Water Sensitive Urban Design

WSUD manages rain water, storing and slowing runoff before it enters waterbodies. WSUD generally combines natural elements, such as On-Site Detention strategies (OSD), bioswales, raingardens, integrated depressions, and porous surfacing. They mimic nature by managing rainfall close to where it falls to mitigate the risk of flooding in urban areas and further downstream.

- Maintain and improve water quality using Gross Trap Pollutant (GPT) and natural filtration
- Improve flood and drought resilience with porous surfaces, bioswale, ground integrated depression and water storage solutions.
- Reduce soil erosion and sediment transfer
- Improve amenity value, deliver recreational and health benefits



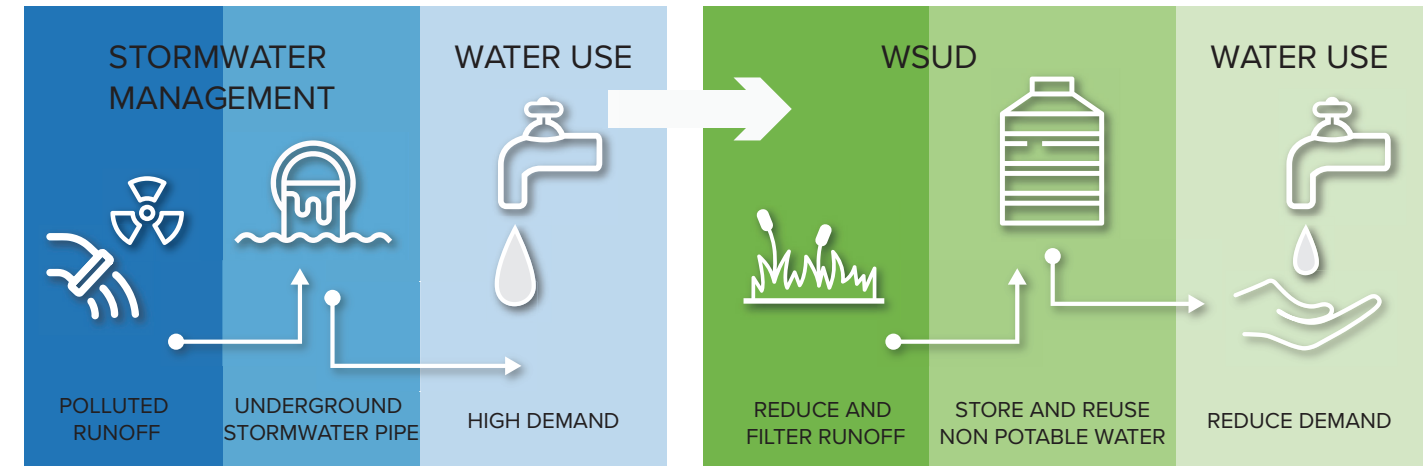
Rewilding Burwood

Blue Green grid strategies create a visible green corridor through the Precinct and can be implemented by increasing tree canopy, permeable areas and by returning culverted watercourses to open water. Some of the proposed linked open spaces will connect existing habitats, Burwood Park and Concord Oval, and create a green trail.

Tree canopy | Increasing the tree canopy by 40% is a NSW state target. In the Public Domain, street trees contribute to the character of our urban areas, but also to better air quality by filtering the air and storing carbon. Trees provide shade for people and buildings and by cooling the local microclimate, reduce the urban heat island effect and create an enjoyable environment while encouraging biodiversity and wildlife, including providing travel corridors for birds and insects. The inclusion of indigenous species, for trees and plants, will enhance the local flora and fauna and contribute to rewilding Burwood and bring back connection to Country.

Green Roofs and Green Walls

Intensive or extensive green roofs and walls act as a rainwater buffer and an air purifier, as well as helping to reduce the ambient temperature and provide temporary storage for water. An accessible green roof is a place for meetings or recreation for a building's occupant and is a refuge for insects and birds. Nature-based solutions for roofs also include blue roofs – designed to slowly drain and store water – and brown roofs, where the substrate surface is left to self-vegetate. At least 30% of the available rooftop of high and mid-rise buildings has to be covered with vegetation.



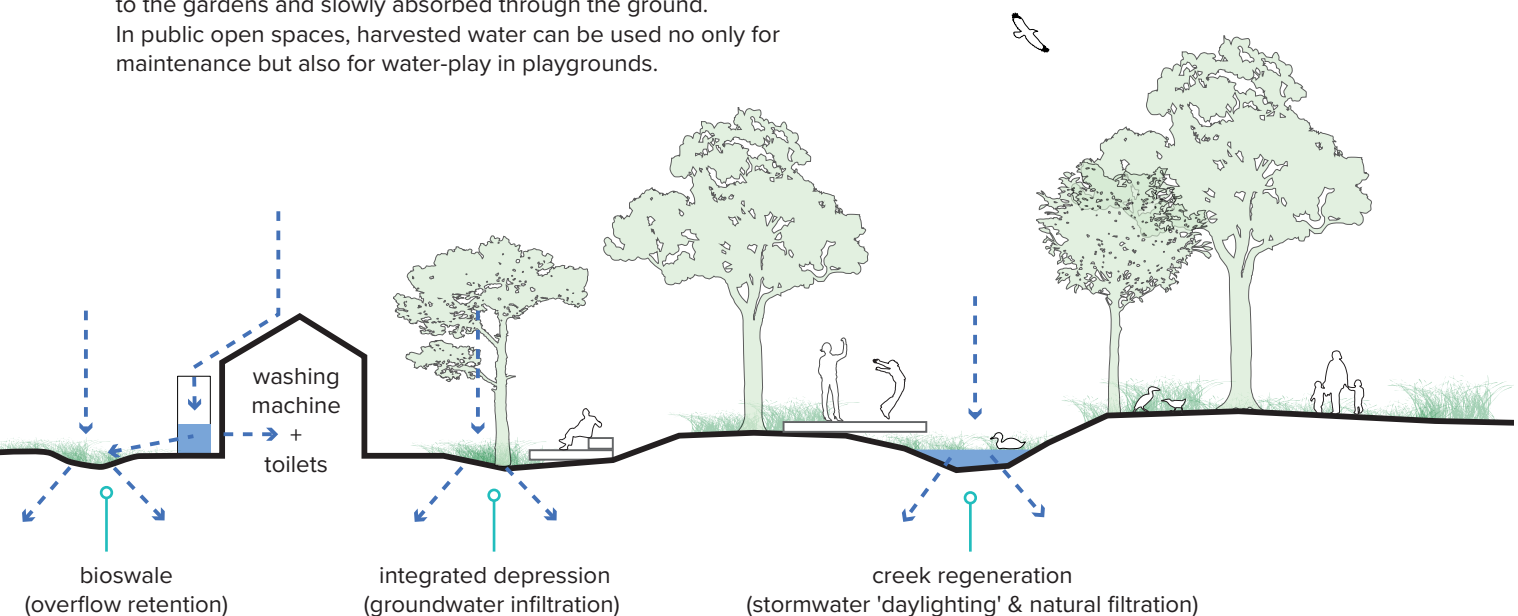
Green Spaces

All Public Domain or private green spaces contribute to cool the local microclimate, mitigate flooding and enhance biodiversity.

Green spaces intercept the overland flow of water, trapping and storing water before it can reach the roads susceptible to flooding. Vegetation provides carbon sequestration and air filtering and reduces a road's environmental footprint while delivering biodiversity net gain. Gardens and parks can be designed to natural filter and absorb rainwater. These different strategies can clean and reduce significantly runoffs to the streets, improving the Precinct flood resilience. Harvested rain water from buildings stored and recycled for non-potable usage such as watering plants, toilet flushing and washing machines while overflow can be diverted to the gardens and slowly absorbed through the ground. In public open spaces, harvested water can be used no only for maintenance but also for water-play in playgrounds.

Linear Park

Burwood has an opportunity to create a linear park by connecting pocket parks, green roofs/podiums and street landscaping. The linear park creates a green urban network, promote wild life presence which enhance the connection to nature in the city. Partial naturalisation or interpretation through the streetscape and open spaces design of a historical creek running from Burwood Park to Concord Oval could bring back connection to Country and a natural flow. Opening up the creek that was sealed can provide enjoyable spaces for wanderings, develop Blue Green grid and improve flood resilience.



6 Requirements Summary

6.1 Performance Objectives

Opportunities within the Precinct to implement sustainability objectives are identified in section 5.2 of this report. This Sustainability Statement demonstrates the opportunity for the Precinct to respond in line with the following material considerations:

- The vision and related themes set out in *Burwood Local Strategic Planning Statement (BLSPS)*
- The performance outcomes and sustainability targets outlined in the *Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) Sustainability Implementation Plan*
- The increased standards put forward in the *State Environmental Planning Policy (Sustainable Buildings) 2022 (Sustainable Buildings SEPP)*
- The objectives and controls of the *Burwood Development Control Plan (BDCP)*



6.2 Summary of Strategies



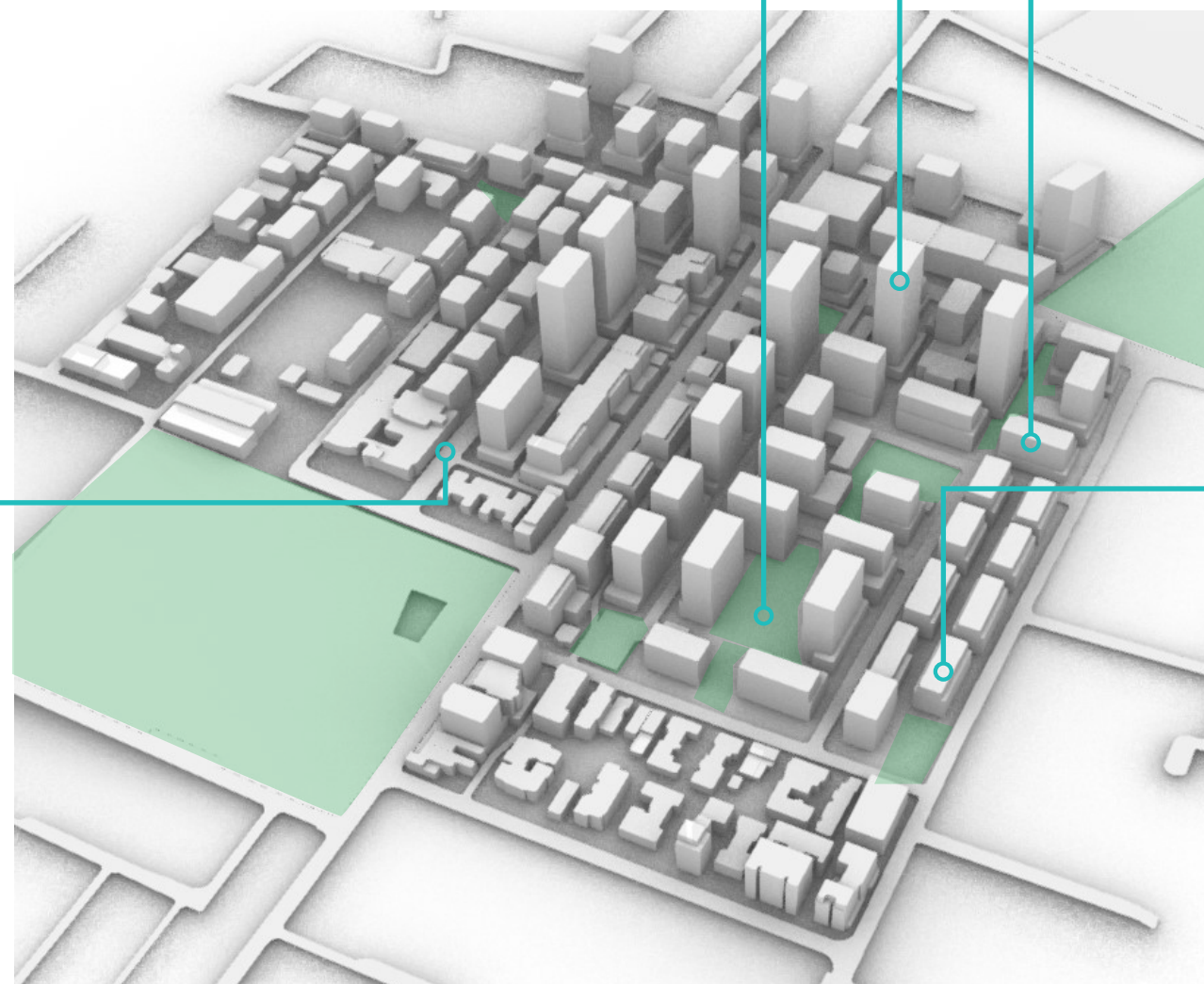
OPEN SPACE

- Responsible material procurement
- increased number of recycling streams
- Provide bicycle parking
- Reduce night sky pollution
- Community garden and composting
- WSUD strategies
- Increase canopy cover
- Drought resistant species
- Indigenous species



STREETSCAPE

- Energy demand reduction
- Photovoltaic panels installations
- Responsible material procurement
- Increase number of recycling streams
- Improve and promote active transport and shared mobility services
- Provide bicycle parking
- Reduce night sky pollution
- Increase soft landscaping and permeable areas
- Green roof
- WSUD strategies
- Increase canopy cover
- Drought resistant species
- Soil cell system



DEVELOPMENTS with FSR 2.5 - 6 : 1

- Net Zero by 2030
- Fully electric / Transition to fully electric
- Passive design strategies
- Photovoltaic panels on roof and shading structures
- Battery storage ready
- Efficient fixtures and fittings
- Car park attenuation & decoupled parking
- Car share dedicated areas
- EV / Ebike ready
- Car park attenuation & decoupled parking
- Car share dedicated areas
- Embedded network
- 4 waste separation
- Increase number of recycling streams
- Green roofs
- WSUD strategies
- Increase canopy cover
- Drought resistant species
- Indigenous species
- Communal productive gardens
- On-site composting



DWELLINGS with FSR 2:1

- Passive design strategies
- Fully electric / Transition to fully electric
- Photovoltaic panels
- Efficient fixtures and fittings
- EV ready
- Increase tree canopy
- Increase permeable areas
- Collect and reuse rainwater
- Best practice waste separation and reduction
- Increase number of recycling streams



6.3 Summary of Requirements

The vision of Burwood North will be enforced through specific requirements from this report and reports listed in Section 1.3.

The sustainability requirements for Burwood North Masterplan are presented in Table 6.1. They intend to summarise the sustainable strategies described in Section 6.2 and complement other discipline reports.

Table 6.1 Summary of proposed requirements

Use Type	Public Domain	FSR 2: 1 (dwellings)	FSR 2.5 - 3 : 1	FSR 4-6 : 1
Framework	<ul style="list-style-type: none">PC.5 - Green Star Communities (to be reviewed with Council)PC.5 - Carbon neutral Climate Active Precinct (to be reviewed with Council)	<ul style="list-style-type: none">PC.5 - Green Star Homes	<ul style="list-style-type: none">PC.5 - Minimum 5 star Green Star Buildings	<ul style="list-style-type: none">PC.5 - Minimum 5 star Green Star BuildingsPC.5 - Minimum 6 star for Design Excellence projects
Thermal comfort	<ul style="list-style-type: none">N/A	<ul style="list-style-type: none">PC.5 - 7 star NatHERS	<ul style="list-style-type: none">PC.5 - Average 7 star NatHERSPC.5 - Minimum 6 star NatHERS	<ul style="list-style-type: none">PC.5 - Average 7 star NatHERSPC.5 - Minimum 6 star NatHERS
Energy source	<ul style="list-style-type: none">PC.1 - Fully electric, fossil fuel-freePC.2 - On-site energy generationPC.4 - Provision for future Precinct electricity network	<ul style="list-style-type: none">PC.1 - Fully electric, fossil fuel-freePC.2 - 50% of yearly energy use is produced by on-site solar photovoltaicPC.4 - Provision for future Precinct electricity network	<ul style="list-style-type: none">PC.1 - Fully electric, fossil fuel-freePC.2 - 15% of yearly energy use is produced by on-site solar photovoltaicPC.4 - Provision for future Precinct electricity network	<ul style="list-style-type: none">PC.1 - Fully electric, fossil fuel-freePC.2 - 15% of yearly energy use is produced by on-site solar photovoltaicPC.4 - Provision for future Precinct electricity network
Energy demand	<ul style="list-style-type: none">PC.6 - Minimise demand and use energy efficient systems and fittings	<ul style="list-style-type: none">PC.5 - BASIX Energy 60PC.5 - 5.5 star (+25%) NABERS Energy for Offices and Shopping Centres	<ul style="list-style-type: none">PC.5 - BASIX Energy 45PC.5 - 5.5 star (+25%) NABERS Energy for Offices	<ul style="list-style-type: none">PC.5 - BASIX Energy 35PC.5 - 5.5 star (+25%) NABERS Energy for Offices
Water Demand	<ul style="list-style-type: none">PC.7 - Install efficient sanitary fixture	<ul style="list-style-type: none">PC.7 - Water efficient appliancesPC.5 - BASIX water 50	<ul style="list-style-type: none">PC.7 - Water efficient appliancesPC.5 - BASIX water 50	<ul style="list-style-type: none">PC.7 - Water efficient appliancesPC.5 - BASIX water 50
Embodied emissions	<ul style="list-style-type: none">PC.8 - Disclose and reduce upfront carbon emissionsPC.9 - Divert at least 80% of materials from landfill from demolition processes	<ul style="list-style-type: none">PC.8 - Disclose and reduce upfront carbon emissionsPC.9 - Divert at least 80% of materials from landfill from demolition processes	<ul style="list-style-type: none">PC.8 - Achieve Green Star Credit 21 (20% upfront carbon emissions)PC.9 - Divert at least 80% of materials from landfill from demolition processes	<ul style="list-style-type: none">PC.8 - Achieve Green Star Credit 21 (20% upfront carbon emissions)PC.9 - Divert at least 80% of materials from landfill from demolition processes
Waste	<ul style="list-style-type: none">PC.12 - Provide at least 2 separated waste streamsPC.13 - All areas to be plastic-free zonesPC.14 - Allocate space for on-site compostingPC.16 Divert at least 85% of construction waste from landfill	<ul style="list-style-type: none">PC.14 - Allocate space for on-site compostingPC.16 - Divert at least 80% of construction waste from landfill	<ul style="list-style-type: none">PC.5 - NABERS Waste 5 starPC.10 - Minimum 4 waste streams separationPC.11 - Provision for 2 additional waste streamsPC.12 - Provision for the future vacuum waste connection (underground automated system)PC.14 - Allocate space for on-site compostingPC.15 - Provision for future vacuum waste collectionPC.16 - Divert at least 80% of construction waste from landfill	<ul style="list-style-type: none">PC.5 - NABERS Waste 5 starPC.10 - Minimum 4 waste streams separationPC.11 - Provision for 2 additional waste streamsPC.12 - Provision for the future vacuum waste connection (underground automated system)PC.14 - Allocate space for on-site compostingPC.15 - Provision for future vacuum waste collectionPC.16 - Divert at least 80% of construction waste from landfill
Urban Heat Control	<ul style="list-style-type: none">PC.17 - Undertake a UTCI analysis for all outdoor areasPC.18 - Areas to comply with Table 5.7 depending on their functionality		<ul style="list-style-type: none">PC.17 - Undertake a UTCI analysis for all outdoor areasPC.18 - Areas to comply with Table 5.7 depending on their functionality	<ul style="list-style-type: none">PC.17 - Undertake a UTCI analysis for all outdoor areasPC.18 - Areas to comply with Table 5.7 depending on their functionality

