



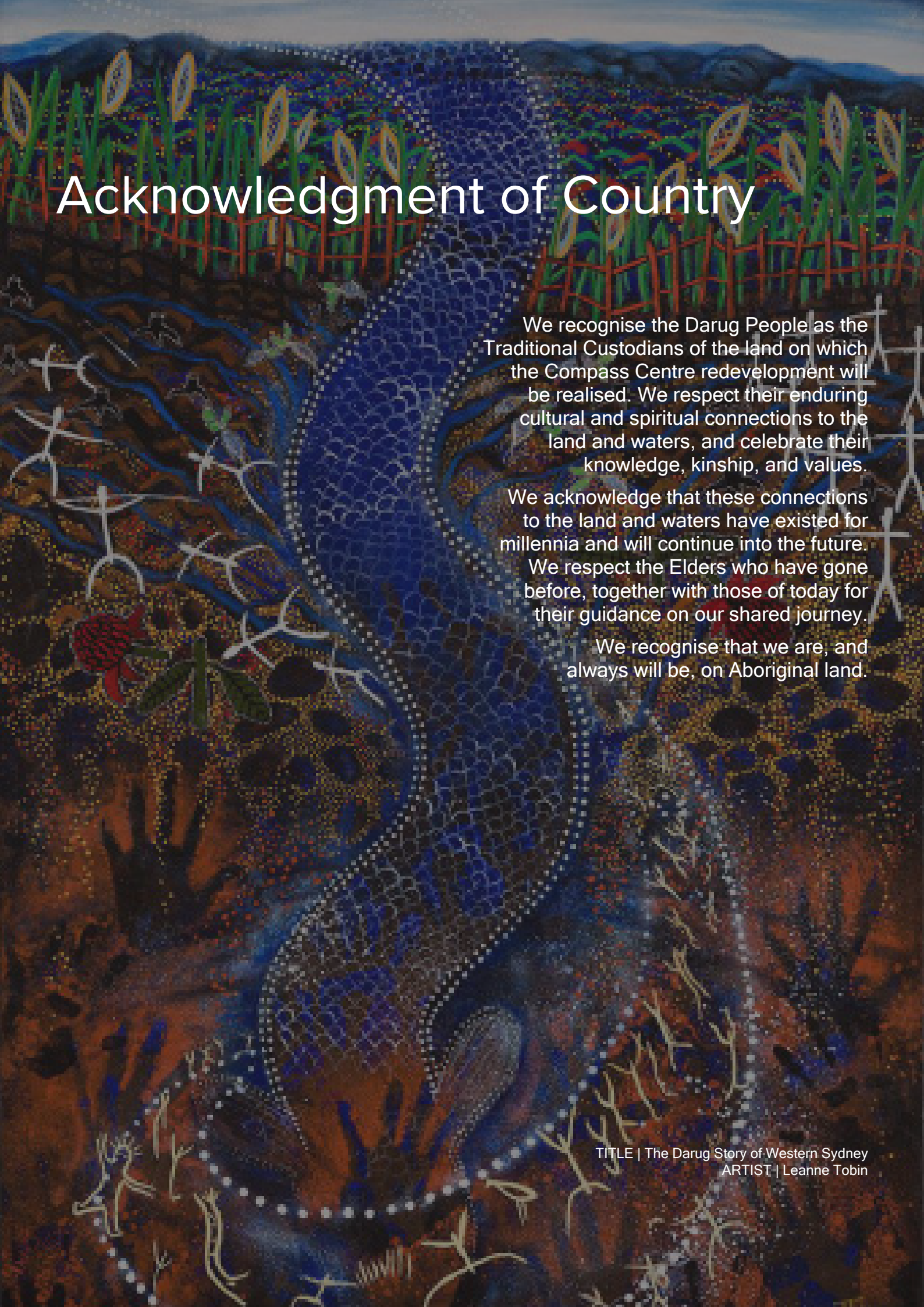
E-LAB Consulting
Where Engineering and Science Inspire Design.

Ecologically Sustainable Development Report

The Compass Centre, Bankstown | [BARINGS](#)

May 2024





Acknowledgment of Country

We recognise the Darug People as the Traditional Custodians of the land on which the Compass Centre redevelopment will be realised. 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.

TITLE | The Darug Story of Western Sydney
ARTIST | Leanne Tobin



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E-LAB Consulting

Level 11 / 10 Carrington St
Sydney, NSW 2000

e-lab.com.au

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Executive Summary

Designing for a more sustainable Bankstown -

Realising a higher standard of sustainability for the Project to showcase bold climate action in the built environment.

Purpose

Advancing Net Zero, a World Green Building Council (WorldGBC) global program, is working towards total built environment sector decarbonisation by 2050. It sets a 'Whole Life Carbon Vision'.

Barings is vocal about its stance on protecting the planet and the urgency in which we need to take serious action. The built environment sector must pursue a strategy to compensate for the total impacts of its activities that prioritises a reduction first approach, and embraces the potential of the offsets market to facilitate positive social and environmental impact in pursuit of overall net zero emissions.

This Ecologically Sustainable Development (ESD) Report has been prepared by E-LAB Consulting on behalf of Barings Real Estate Australia (Barings) for the proposed redevelopment of the Compass Centre (the Project) located in the heart of Bankstown City Centre at 83-99 North Terrace, Bankstown, NSW. It explores Barings' sustainability practices and goals, and translates these into an implementation framework that showcases bold climate action in the built environment.

This ESD Report accompanies a Development Application (DA) to the City of Canterbury Bankstown (Council).

This ESD Report demonstrates a Project design response that represents design excellence and a higher standard of sustainability, and is aligned with the following statutory planning documents:

- Canterbury-Bankstown Local Environment Plan (CBLEP) 2023
- Canterbury-Bankstown Development Control Plan (CBDCP) 2023
- Bankstown City Centre Adopted Master Plan 2021
- NSW State Environmental Planning Policy (Sustainable Buildings) 2022 (or NSW Sustainable Buildings SEPP)

Approach

The Project design, delivery, and operation will be governed by a guiding value → [Stewardship](#)

This guiding value fundamentally informs sustainability practices → [Environment](#) → [Social](#) → [Governance](#)

Figure 1 outlines the Project sustainability framework → setting sustainability practices and goals that translate into action.

Figure 2 details credible 'Whole Life Net Zero Ready' requirements for the Project.

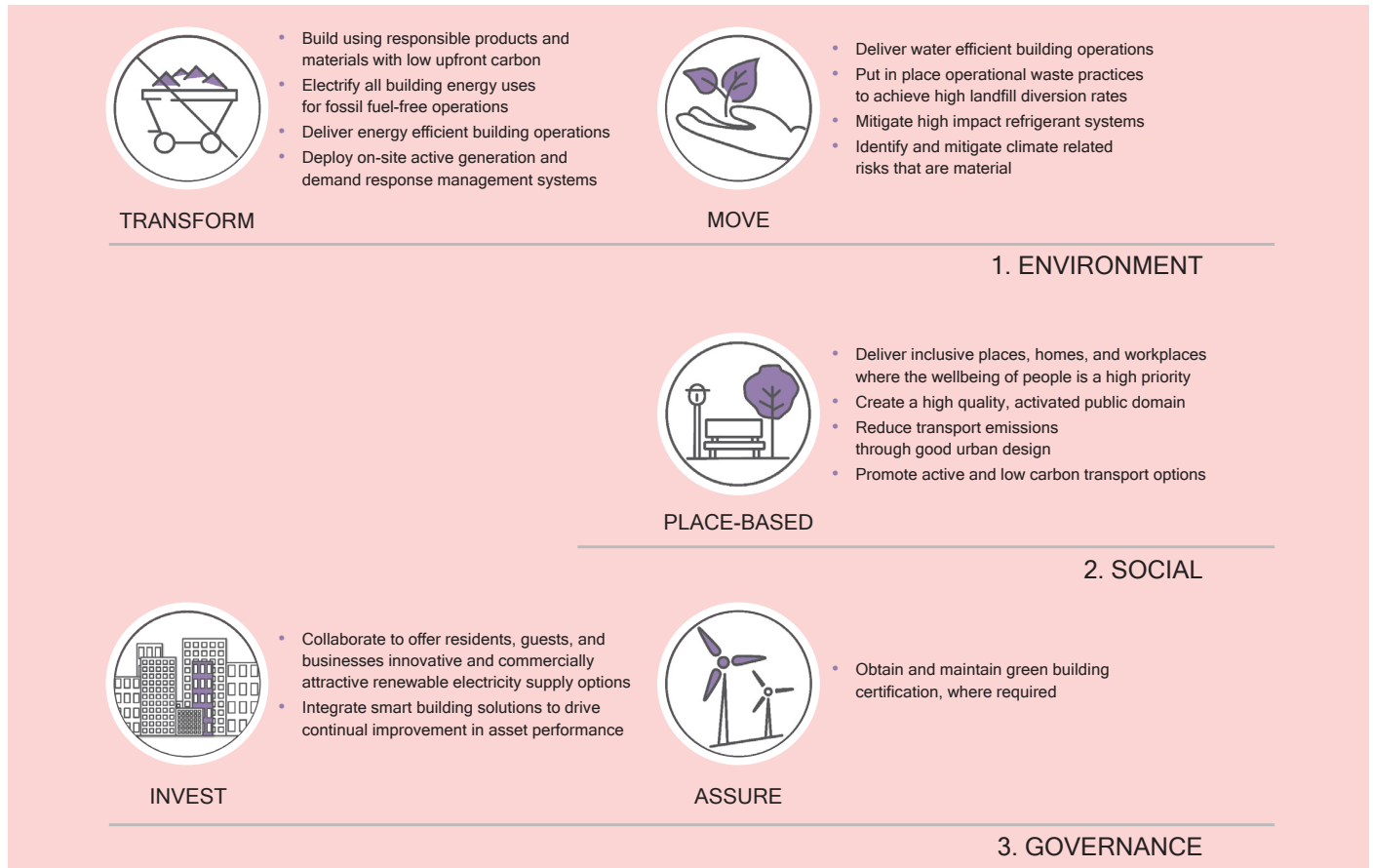
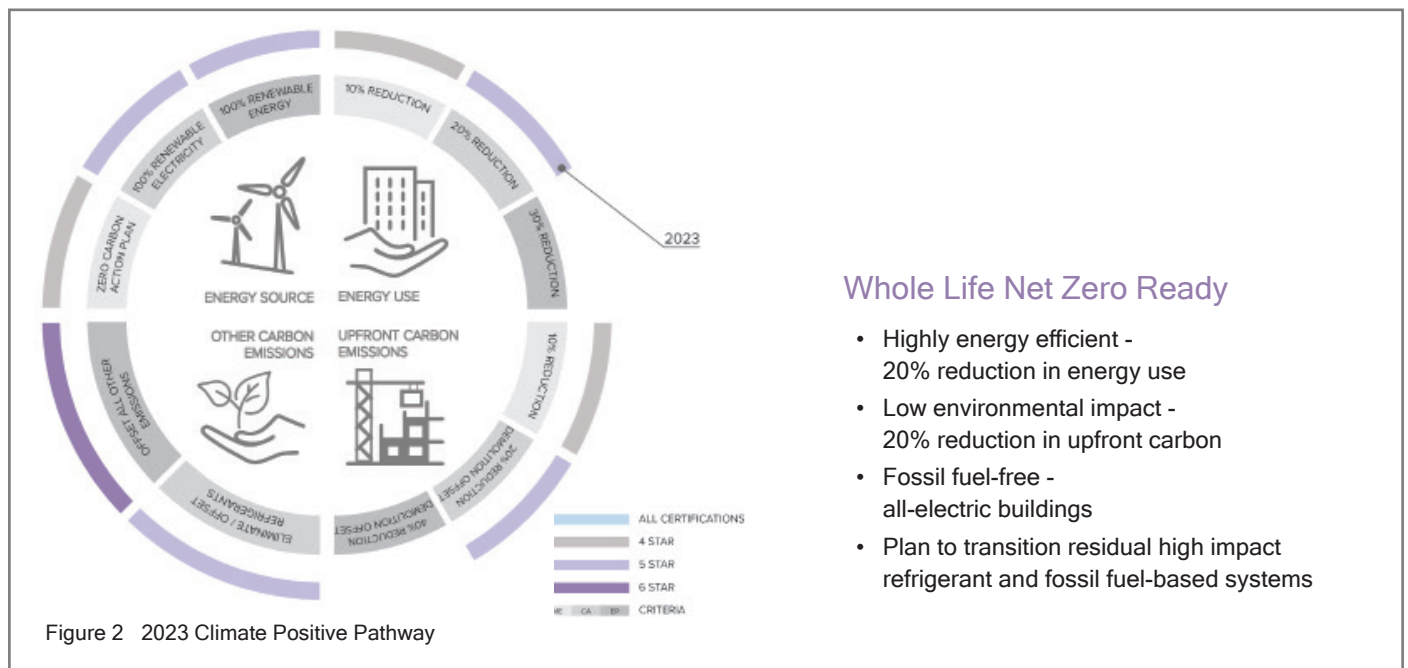


Figure 1 Sustainability practices and goals



Transform

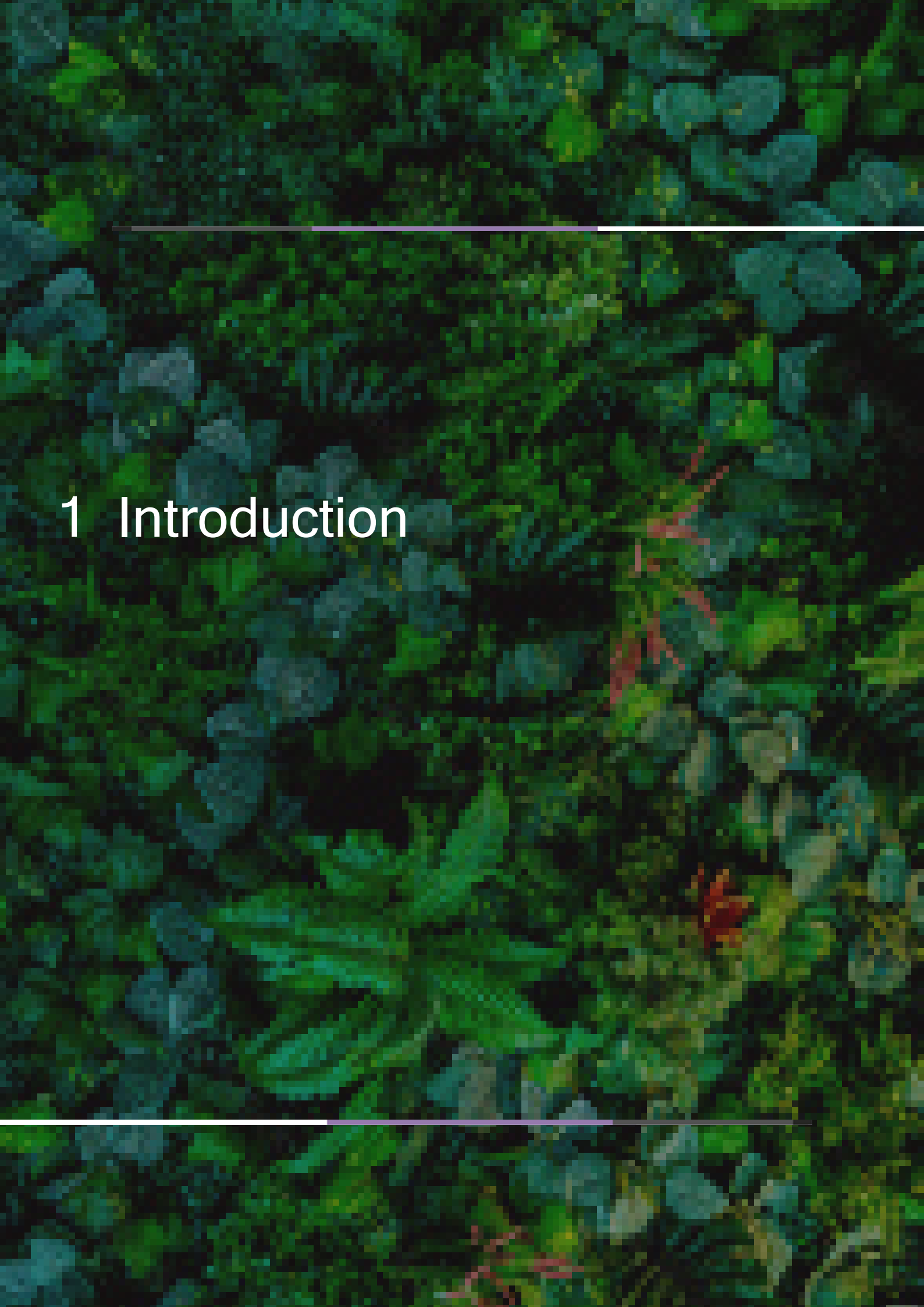
Table1 summarises the Project design response against key sustainability goals.

The Project is capable of achieving:

- Design excellence in sustainable development, in line with the ESD principles of the CBLEP 2023
- ESD objectives and controls of the CBDP 2023
- Higher standard of sustainability provisions identified in the Bankstown City Centre Adopted Master Plan 2021
- Energy and water standards of the NSW Sustainable Buildings SEPP
- Embodied emissions reporting requirements of the NSW Sustainable Buildings SEPP (by others)

Table 1 Implementation of key sustainability goals

Requirement	Met	Design Response
1. Highly energy efficient - 20% reduction in energy use	Yes Section 5.1.1	• Established passive and active design response, including a low carbon ambient loop, and on-site renewable energy strategy • Aligned Tower A (Hotel) with a 4.5 star NABERS Energy for Hotels performance (Commitment Agreement) • Achieved a BASIX Energy score of 63 (higher energy performance standard) for Towers B and C (BTR), and met the higher thermal performance standard (NSW Sustainable Buildings SEPP) • Met NCC 2022 Part J4 for the commercial retail use
2. Low environmental impact - 20% reduction in upfront carbon	Yes Section 5.1.2	• Considered dematerialisation and materials substitution measures to achieve at least a 20% upfront carbon reduction when compared to BAU, i.e., alignment with an embodied carbon benchmark target of approximately 800 kgCO₂e/m²
3. Fossil fuel-free	Yes Section 5.1.1	• Implemented all-electric buildings (building owner-controlled energy uses only)
4. Transition residual high impact refrigerant and fossil fuel-based systems	Yes Section 5.2.3	• Selected HFO refrigerant-based chillers and heat pumps (zero ODP; GWP < 10) • Where HFC refrigerant-based heat pumps (zero ODP; GWP > 1,000) are selected, a future ready transition plan will be developed
5. Meet the water standard	Yes Section 5.2.1	• Water efficient fixtures, fittings, and appliances • Rainwater collection from 90% of available roof catchment area • 20 kL rainwater tank for each tower and podium/public domain to serve non-potable water services • Install fire protection systems that do not expel water during testing • Non-potable water service, incl. future recycled water mains connection



1 Introduction

Designing for a more sustainable Bankstown -

Embracing the Bankstown's adopted master plan to realise a higher standard of sustainability for the Project and showcase bold climate action in the built environment.

1.1 Purpose

Advancing Net Zero, a World Green Building Council (WorldGBC) global program, is working towards total built environment sector decarbonisation by 2050. It sets a 'Whole Life Carbon Vision' (see Figure 1.1).

Barings is vocal about its stance on protecting the planet and the urgency in which we need to take serious action. The built environment sector must pursue a strategy to compensate for the total impacts of its activities that prioritises a reduction first approach, and embraces the potential of the offsets market to facilitate positive social and environmental impact in pursuit of overall net zero emissions.

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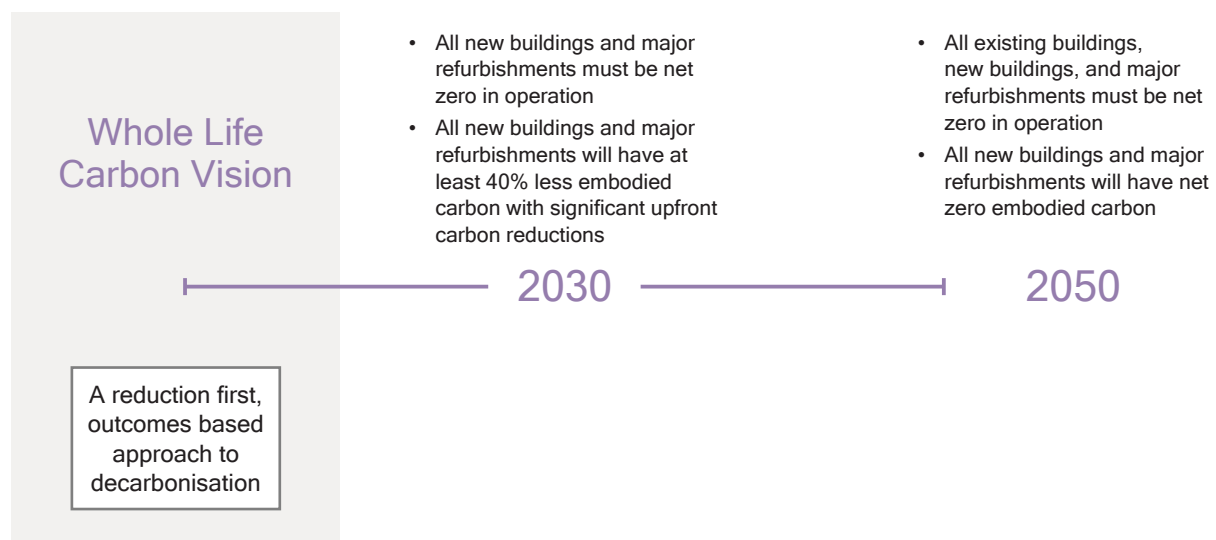


Figure 1.1 Decarbonisation roadmap

Project Vision

'The Compass Centre development represents a significant opportunity to contribute to the ongoing transformation in the heart of Bankstown City Centre by delivering a quality product and amenity attuned to its unique market conditions (see Figure 1.4).

Project Objectives

- Provide essential affordable housing for key workers on a long-term rental basis
- Retain the site as a single title and create a long-term investment
- Deliver a quality product that can stand the test of time yet be aesthetically modern
- Create a sense of community, authenticity, and discovery
- Exhibit Design Excellence through permeability, site-responsive form, and dynamic integration with the surroundings

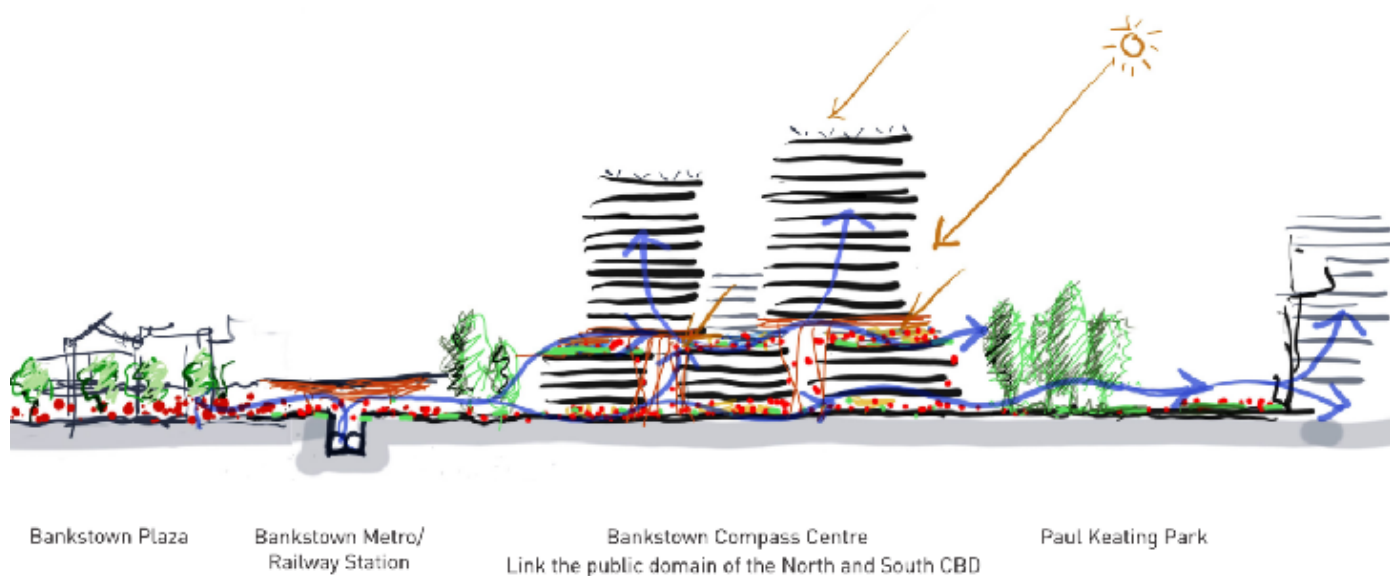


Figure 1.4 Concept diagram

1.3 Site Context

The site is located at 83-99 North Terrace, Bankstown within the City of Canterbury Bankstown local government area (LGA) (see Figure 1.5). It is located to the north of Bankstown railway station, to the south of Paul Keating Park, and forms part of the street block bounded by The Mall (north), The Appian Way (east), North Terrace (south), and Fetherstone Street (west), however does not comprise a street frontage to The Mall, given that its northern boundary interfaces with the former Bankstown City Library site and Phil Engisch Reserve.

The site is located within the Bankstown City Centre, surrounded by a mix of civic, retail, office, business and residential uses. It is situated in a location that is highly serviced by public transport, being approximately 60m to the north of Bankstown railway station and the future Bankstown metro station, and within the immediate proximity of the Bankstown bus interchange. It is also situated directly south of Paul Keating Park, Western Sydney University Bankstown Campus, the contemporary Bankstown Library and Knowledge Centre, Bryan Brown Theatre and Function Centre, and immediately west of the Bankstown Central Shopping Centre.

1.4 Urban Design Context

The site can contribute to the urbanity of the city with new urban spaces and greatly improved public street frontages to enhance connectivity to the numerous adjoining parks and green spaces (see Figure 1.6).

Design Principles

- Provide active street frontages
- Provide new urban spaces and through site links
- Complement the design of key civic spaces at landmark corners
- Contribute to greening of the city with streetscape and through site link planting, and extensive greenery on podiums, balconies, and roofs
- Provide green communal open spaces at podium and roof levels

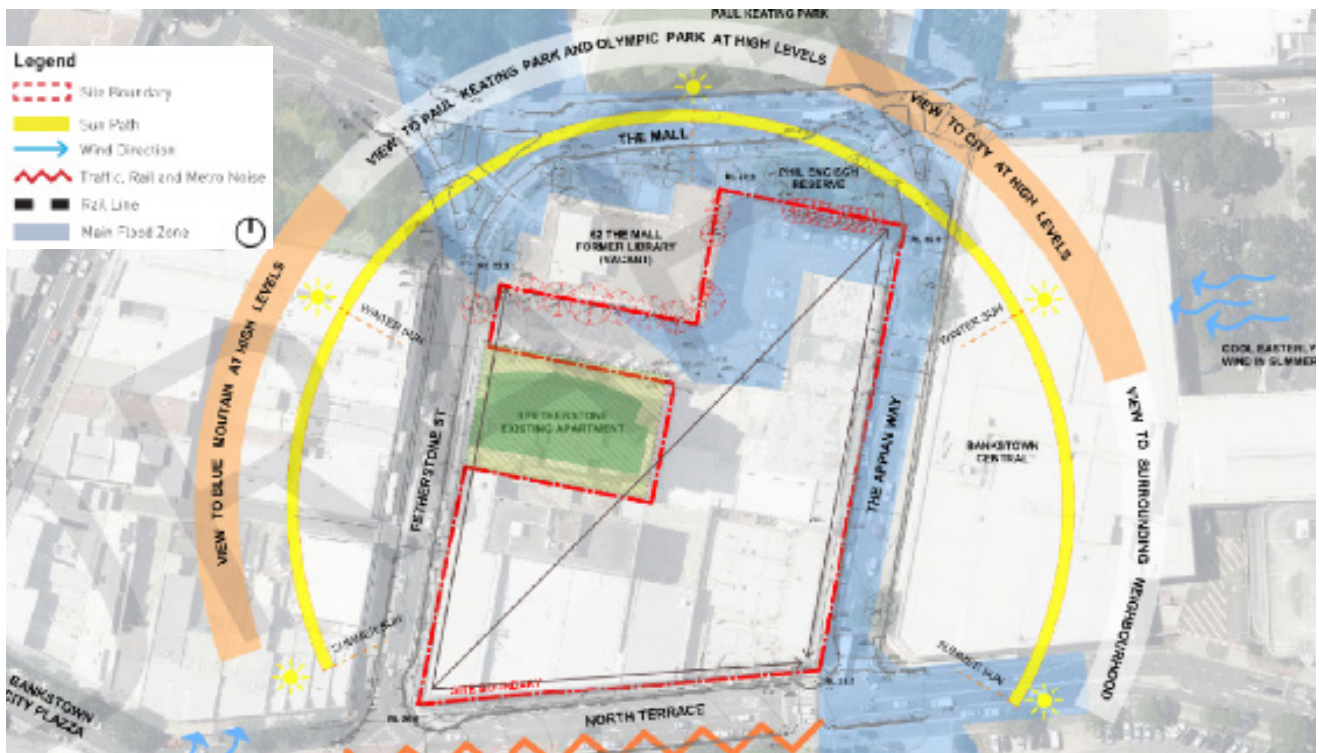
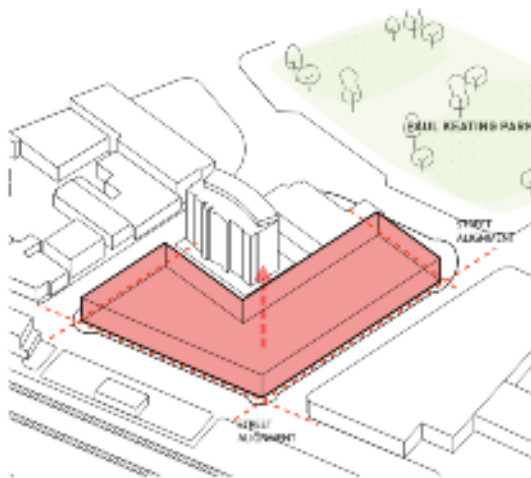
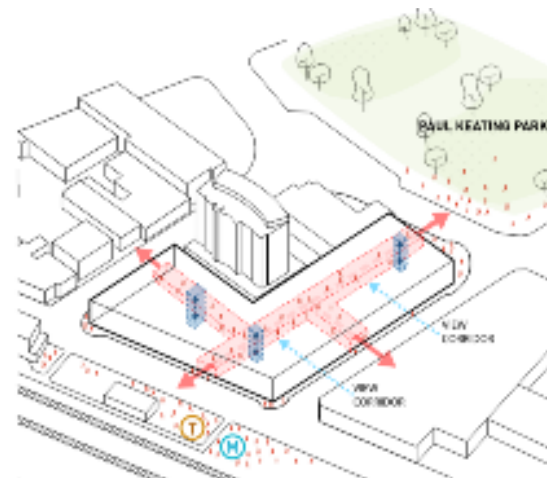


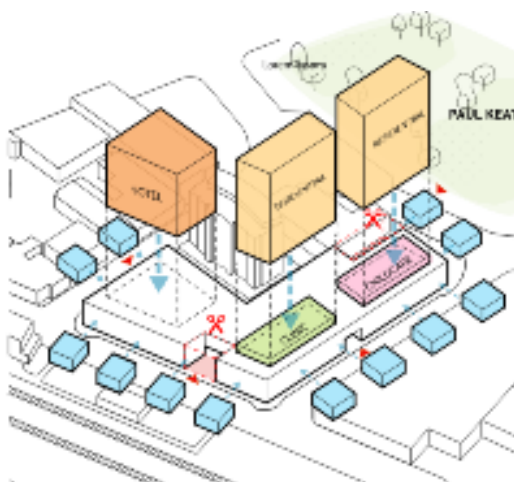
Figure 1.5 Site analysis



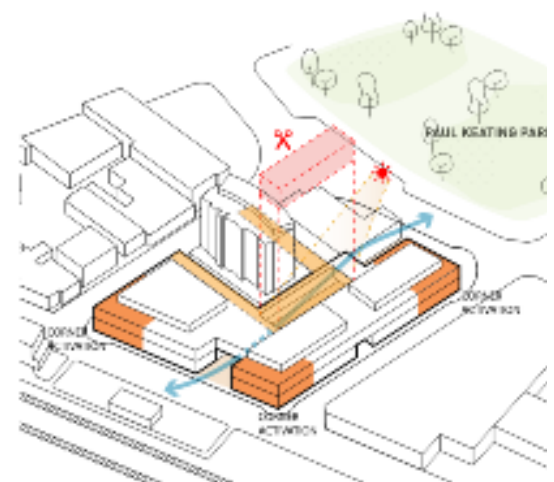
Extrusion - Street Walls



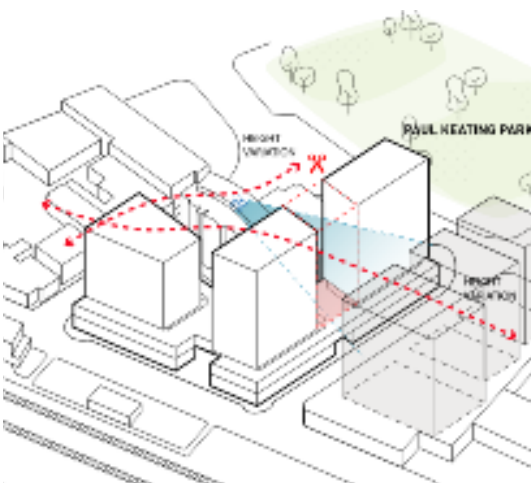
Connect to Surrounding - Through Site Link



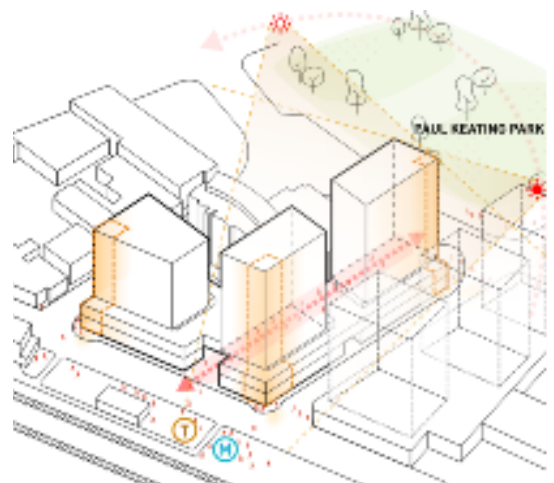
Site Activation



Light & Air & Quiet Zone



Tower Massing



Solar Access Maximisation

Figure 1.6 Site analysis

1.5 Sustainability Practices & Goals

Barings is committed to investing responsibly and enhancing investment performance by making a positive and sustainable contribution to global, local, corporate, and personal wellbeing, in an ethical culture, with enhanced investment performance and robust governance.



Environment

- Identify and mitigate climate related risks that are material to a portfolio
- Implement strategies to reduce the carbon footprint of managed investments
- Improve sustainability practices to support and enhance investment performance
- Implement sustainable technologies to improve energy and water efficiency



Social

- Make a positive contribution to local and global communities
- Undertake investments with strong positive social outcomes, such as delivering affordable key worker housing
- Encourage ethical behaviours in operations and decision making
- Adopt active policies to ensure no participation in modern slavery or labour exploitation
- Deliver inclusive places, homes, and workplaces where the wellbeing of people is a high priority



Governance

- Ensure governance is clear and robust, with continuous monitoring and reporting in accordance with market-responsive compliance frameworks
- Obtain and maintain green building certification
- Collaborate with like-minded investors to advocate for change across the investment and property sectors



Barings actively seeks opportunities to reduce impacts on the environment whilst providing positive benefits to building occupants, reducing operating costs, and improving the value of assets.

The following environmental targets have been set for a flagship property fund:



35% reduction in whole of building emissions per m² of NLA by 2028 compared to 2023



100% of asset energy, water and waste utility data for whole buildings measured by 2024

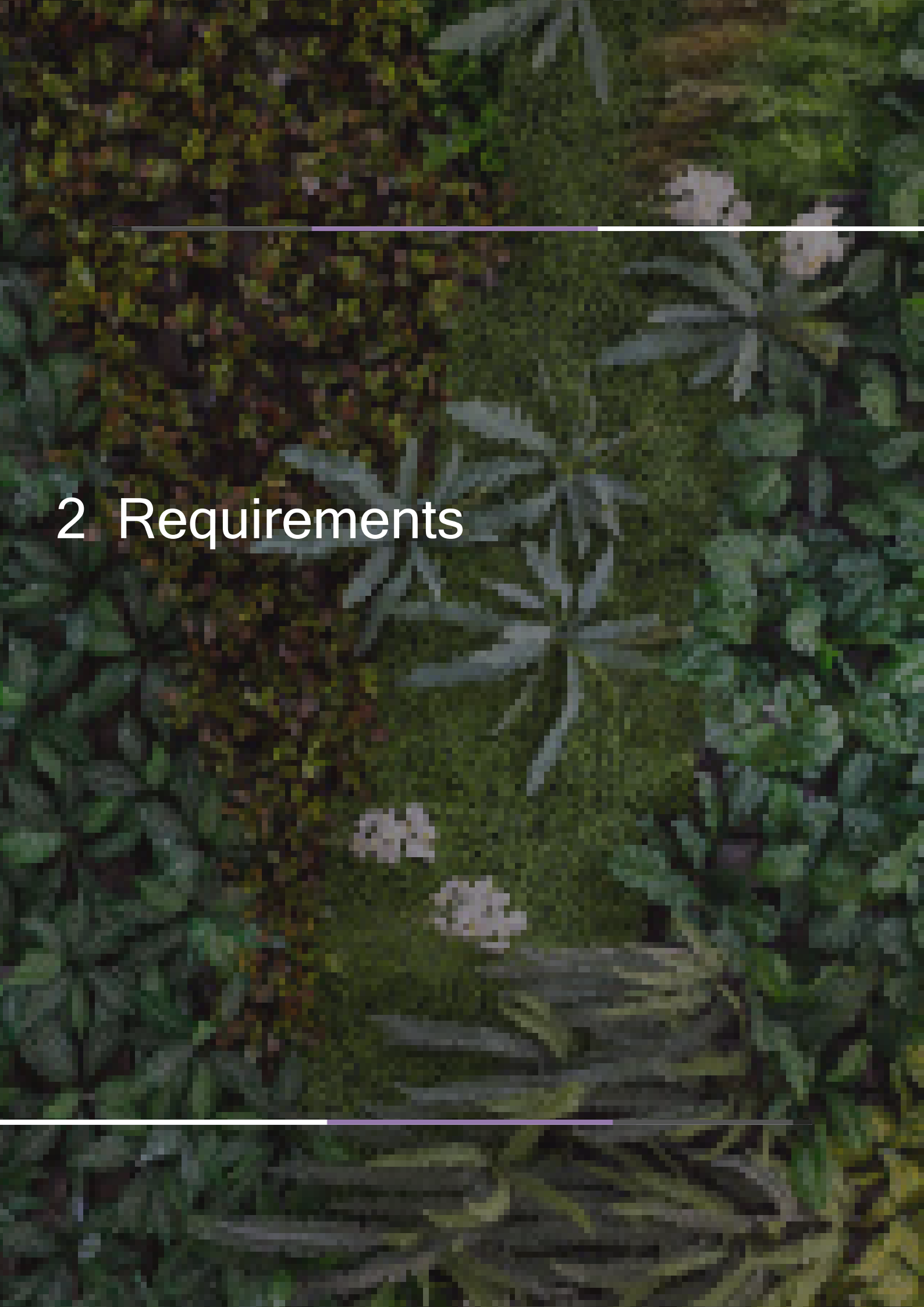


100% of assets to receive green building certification by 2025



100% renewable energy supplied to common areas by 2025





2 Requirements

2.1 Basis

The Project, a large, mixed-use development in Bankstown City Centre, is subject to a range of statutory planning controls, policies, and guidelines at a local and state government level. Inherently, projects must demonstrate that these controls, policies, and guidelines have been met by leveraging third-party assurance mechanisms, such as green building rating tools.

These controls, policies, guidelines, and tools are a material consideration when developing project sustainability requirements that reflect a credible, market-leading sustainability strategy and implementation framework for the Project.

1. CBLEP 2023
2. CBDPC 2023
3. Bankstown City Centre Adopted Master Plan 2021
4. NSW Sustainable Buildings SEPP
5. NSW Circular Economy Policy Statement
6. NSW Climate Change Policy Framework
7. Green Star (Green Building Council of Australia)
8. NABERS Energy and Water

2.2 Controls



- Demonstrate that the Project exhibits design excellence, integrates a high quality public domain, and addresses environmental impacts, including sustainable design
 - Implement energy efficient practices and incorporate water conservation measures in the design and operation of the Project
 - Provide for the on-site collection and reuse of rainwater, greywater, and stormwater run-off, where practicable
 - Maximise resource recovery and encourage source separation of waste for reuse and recycling
 - Provide adequate and appropriate bin storage and collection areas
-
- Adopt higher standards of sustainability, including:
 - Achieve a 5% urban tree canopy and demonstrate an urban heat resilience design response
 - Promote sustainable transport options and increase access to active and shared mobility services
 - Adopt all-electric buildings
 - Install solar PV systems across 60% of the available roof area
 - Implement electric vehicle (EV) ready and capable infrastructure
 - Advance water sensitive urban design (WSUD) principles
 - Explore organic waste separation and collection, and encourage the provision of on-site recycling hubs

2.3 Policies

2.4 Tools



- Achieve the following minimum energy and water standards:
 - Tower A (Hotel)
 - i. 4 star NABERS Energy for Hotels
 - ii. 3 star NABERS Water for Hotels
- Measure primary construction materials for substructure, superstructure, and façade via a bill of quantities (BOQ) established in the NABERS Embodied Emissions Materials Forms (non-residential) and BASIX Materials Index (residential)
- Report embodied carbon emissions and demonstrate the consideration of dematerialisation and materials substitution measures, and construction methods or technologies that reduce embodied emissions

- Respond to global megatrends, and national and regional policies to define a Climate Positive Pathway
- Demonstrate a credible path to whole life net zero and ultimately deliver a Climate Positive outcome
- Disclose operational energy and water performance
- Demonstrate credible savings in energy and water costs through the efficient design of a building's fabric and services



- Use resources sustainably
- Minimise the use of virgin materials
- Replace raw materials with recycled products
- Improve the quality of collected materials, and sorting of materials for reuse
- Capture value from recycling resources
- Be more resilient to a changing climate
- Embed climate change considerations into asset and risk management
- Reduce climate change impacts on human health and wellbeing
- Manage impacts on natural resources, ecosystems, and communities



3 Approach

3.1 Sustainability Strategy

The Project will actively seek opportunities to reduce impacts on the environment whilst providing positive benefits to building occupants, reducing operating costs, and improving the value of assets.

The Project design, delivery, and operation will be governed by a guiding value

→ [Stewardship](#)

This guiding value fundamentally informs sustainability practices

→ [Environment](#)

→ [Social](#)

→ [Governance](#)



Stewardship



Environment



Social



Governance

3.2 Sustainability Framework

The Project will adopt and implement Barings' guiding value, including supporting sustainability practices and goals (see Figure 3.1).

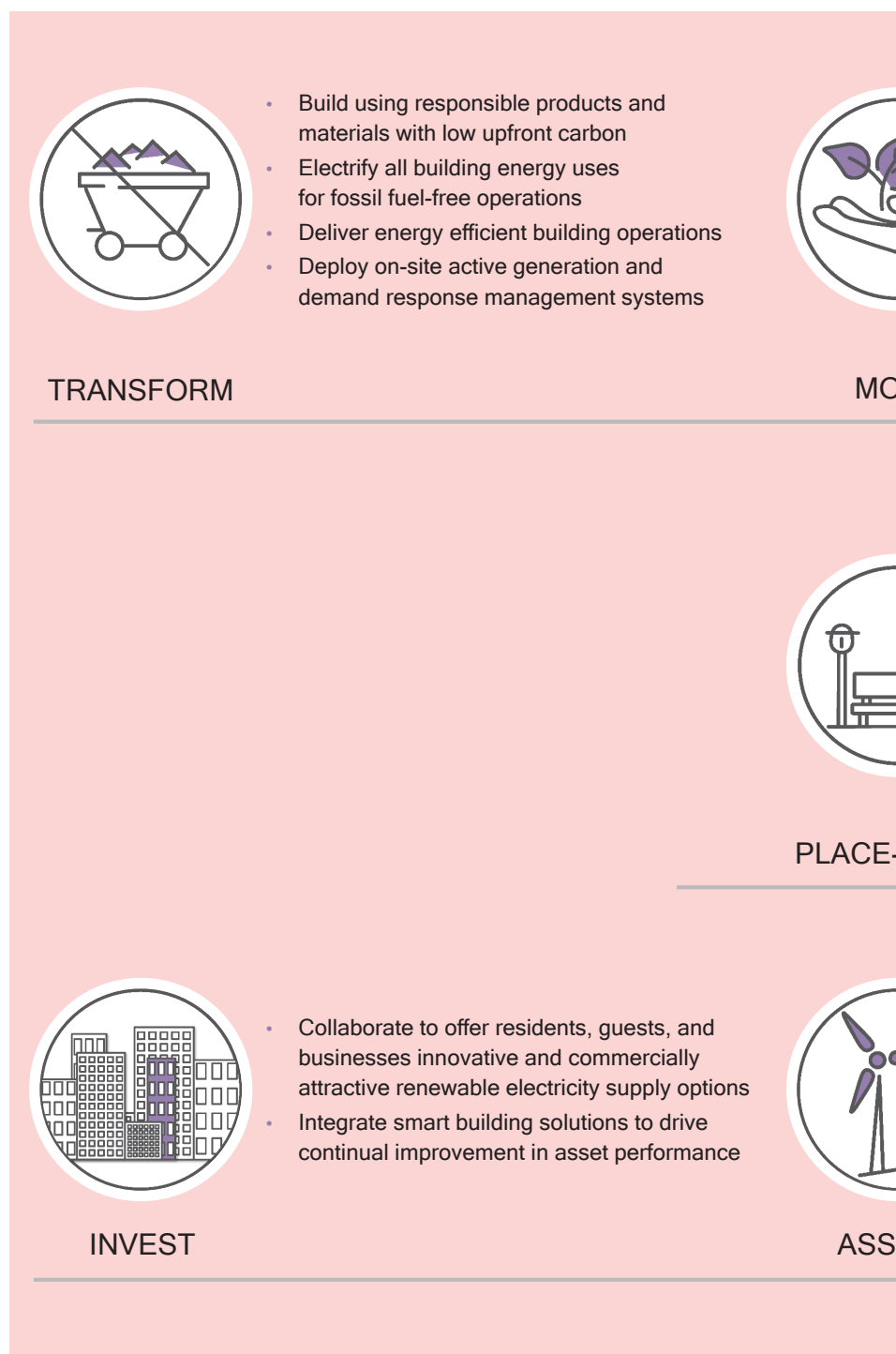


Figure 3.1 Sustainability p



- Deliver water efficient building operations
- Put in place operational waste practices to achieve high landfill diversion rates
- Mitigate high impact refrigerant systems
- Identify and mitigate climate related risks that are material

OVE

1. ENVIRONMENT



- Deliver inclusive places, homes, and workplaces where the wellbeing of people is a high priority
- Create a high quality, activated public domain
- Reduce transport emissions through good urban design
- Promote active and low carbon transport options

BASED

2. SOCIAL



- Obtain and maintain green building certification, where required

URE

3. GOVERNANCE

3.3 Environment

3.3.1 Transform

The Project will be Whole Life Net Zero Ready

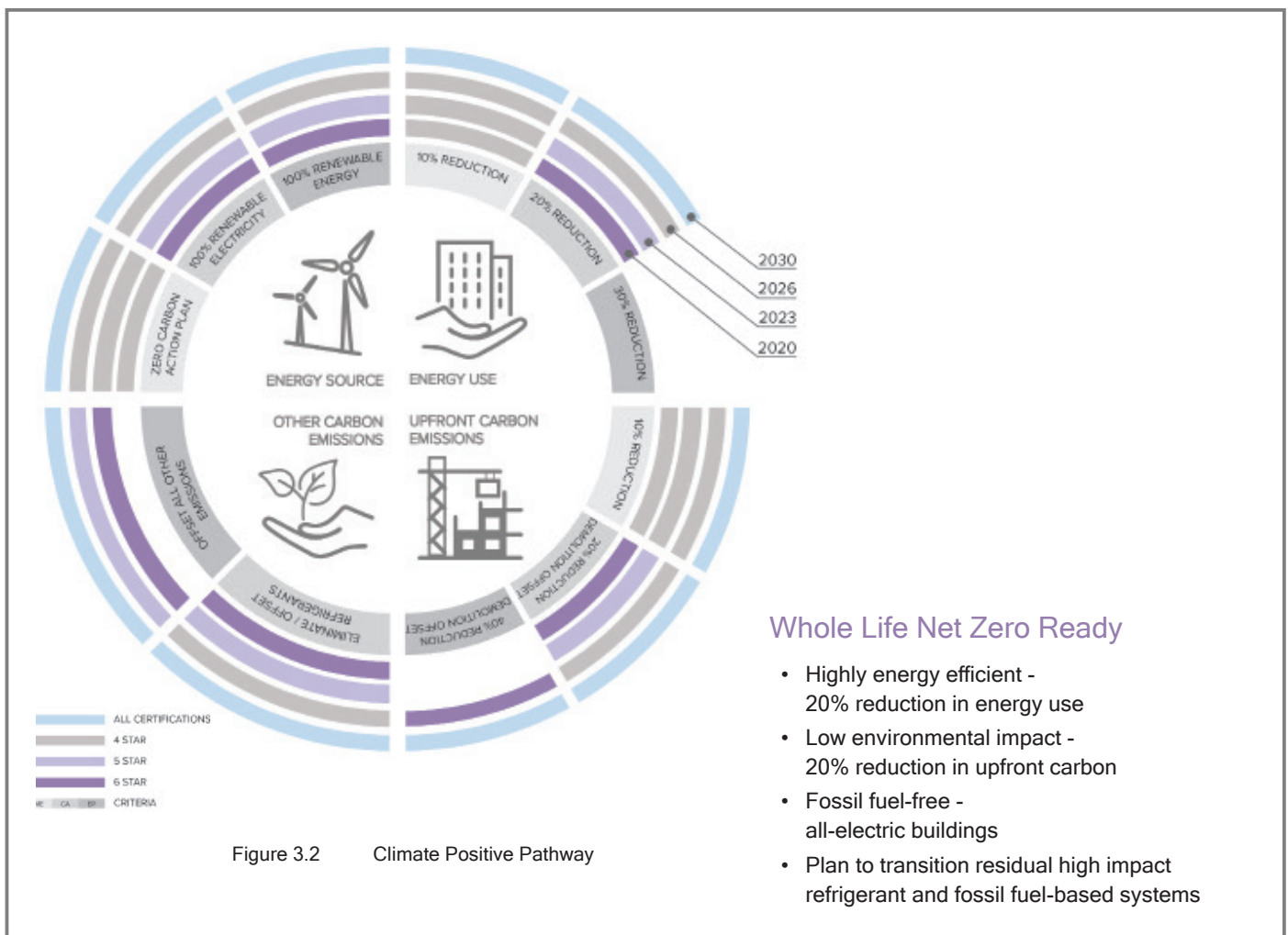
The Project must demonstrate a credible response to global heating. In the built environment, this calls for real and transparent carbon reductions in the design and delivery, and operations of buildings, and limiting the reliance on compensation mechanisms, such as the procurement of carbon credits to offset carbon emissions.

This thinking is reinforced by the NSW Government's objective to achieve net zero emissions by 2050 and reduce emissions by 50% below 2005 levels by 2030. The transformation of the built environment towards net zero emissions will be accelerated under a range of Net Zero Buildings initiatives and policies.

The Green Star Buildings rating tool embeds the WorldGBC's 'Whole Life Carbon Vision' by defining a Climate Positive Pathway for building design and delivery (see Figure 3.2). It represents the market-leading benchmark for ecologically sustainable development in Australia.

The Climate Positive Pathway increases in stringency over this decade. It requires registered projects to achieve Whole Life (upfront and operational) Net Zero by 2030, including strengthening credit criteria over three-year cycles (2020 → 2023 → 2026 → 2030).

A 'Whole Life Net Zero Ready' design response is required.



3.3.2 Move

To move beyond net zero requires us to redefine the boundary of the Project's whole life carbon footprint.

Figure 3.3 illustrates the carbon life cycle of buildings - from the supply of raw materials to manufacture products, to the potential reuse of materials in new products.

The carbon life cycle also recognises the buildings emissions impacts identified below. A design response has been developed to address these buildings emissions impacts.

1. Building water use and wastewater treatment [B7]

- To support water resilience, projects must integrate water efficient fixtures and appliance, and future ready water infrastructure that makes use of alternative water sources to reduce the demand for potable water.

2. Waste

- A low waste building reduces, reuses, and recovers all its operational waste streams to convert these to valuable resources, able to achieve a landfill diversion rate in excess of 50% and move towards a 70% diversion rate.
- During the design and delivery of a building, the focus must move to circular economy principles (see Figure 3.4), including dematerialisation and extending the intended lifespan of building components through the identification and promotion of alternative uses at end-of-life.

3. Refrigerant plant and equipment [B6]

- Subject to ratcheting regulations and rules, the specification and use of refrigerant plant and equipment requires careful consideration.
- Current HFC refrigerant plant and equipment are subject to an 85% phase out by 2036. Whilst HFC refrigerants have zero ozone depletion potential (ODP), they are potent greenhouse gases with a high global warming potential (GWP) and long lifetime.
- HFO and natural refrigerant plant and equipment (zero ODP and GWP < 10) must be selected, wherever practicable, and future ready provisions for alternative systems considered.

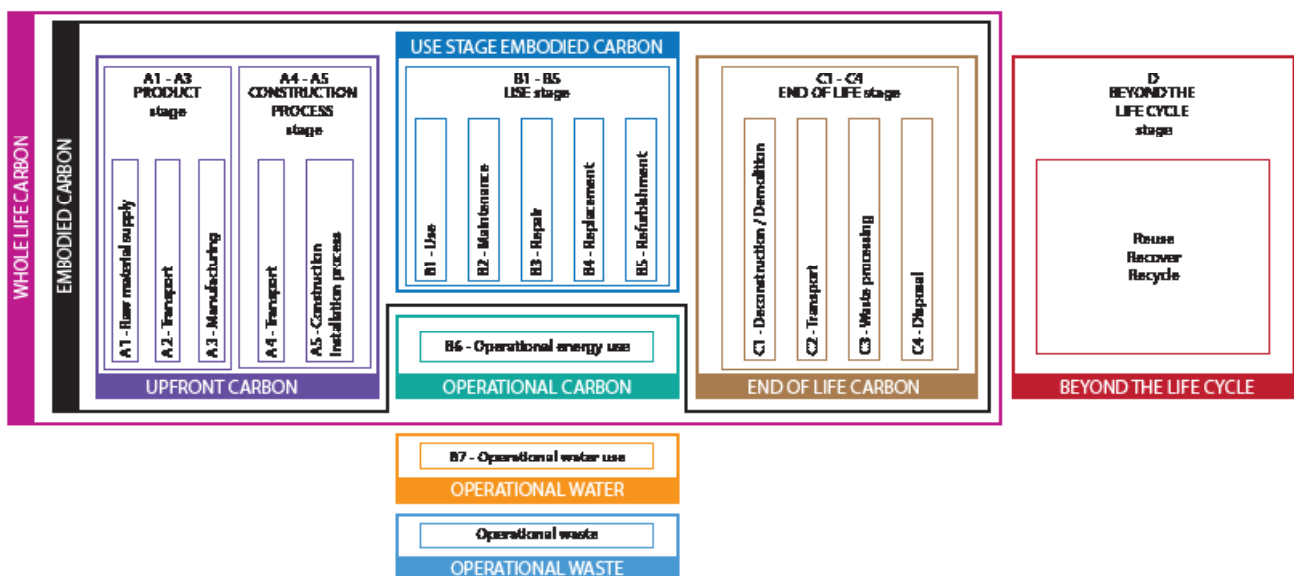


Figure 3.3 Carbon life cycle of buildings

3.4 Social

Good urban design

3.4.1 Place-based

Movement & 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, the Project must leverage the high quality public transport infrastructure available by implementing a range of Project-specific sustainable transport measures that will drive a move away from private vehicle use.

Urban Heat Resilience | Urban environments produce microclimate conditions affecting the health and wellbeing of residents, workers, and visitors. An advanced climate analysis methodology will be implemented to inform and enhance the urban design response and the quality of amenity.

A site analysis will be initially conducted to describe and define climate change, urban heat island effect, natural ventilation, sun path, wind, and humidity qualitative factors.

An urban design response is then articulated based on quantitative studies that measure the quality of amenity.

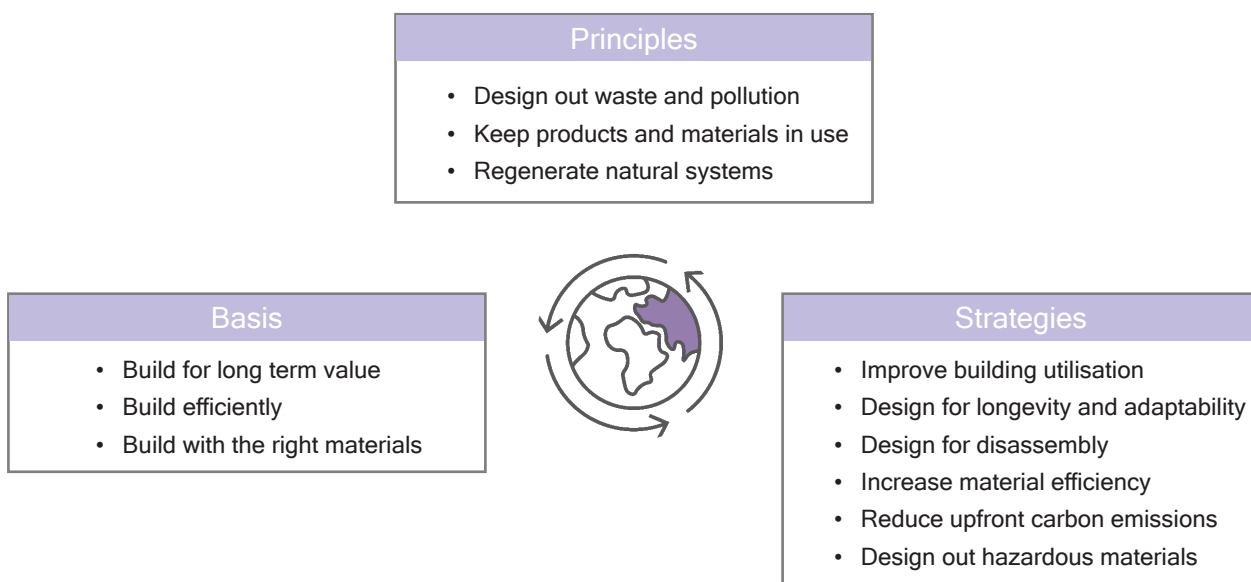


Figure 3.4 Circular design response

3.5 Governance

3.5.1 Stewardship

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.

A long-term, dynamic approach is required to constantly improve ESG integration, stewardship, and corporate responsibility practices to fully realise a circular economy. By capturing a more holistic understanding of the complex issues, risks, opportunities, and value drivers that may impact the Project over time, a circular design response can be realised (see Figure 3.4).

3.5.2 Collective Impact

The concept of collective impact focuses on shaping the necessary leadership, collaboration, and decision-making governance to support effective action through all phases of the design and delivery, and operation of the Project.

This calls for a shared vision and common agenda, established targets, and investment.

The collective formation of a range of Project stakeholders is required. The Project stakeholders, and their roles and responsibilities are outlined in Figure 3.5.



Figure 3.5 Stakeholder roles and responsibilities

EMBEDDED NETWORK | The Project will implement an embedded network solution. A **Services Provider** (or embedded network operator/electricity retailer) bills each Customer based on electricity and thermal energy usage, and network usage and demand charges.

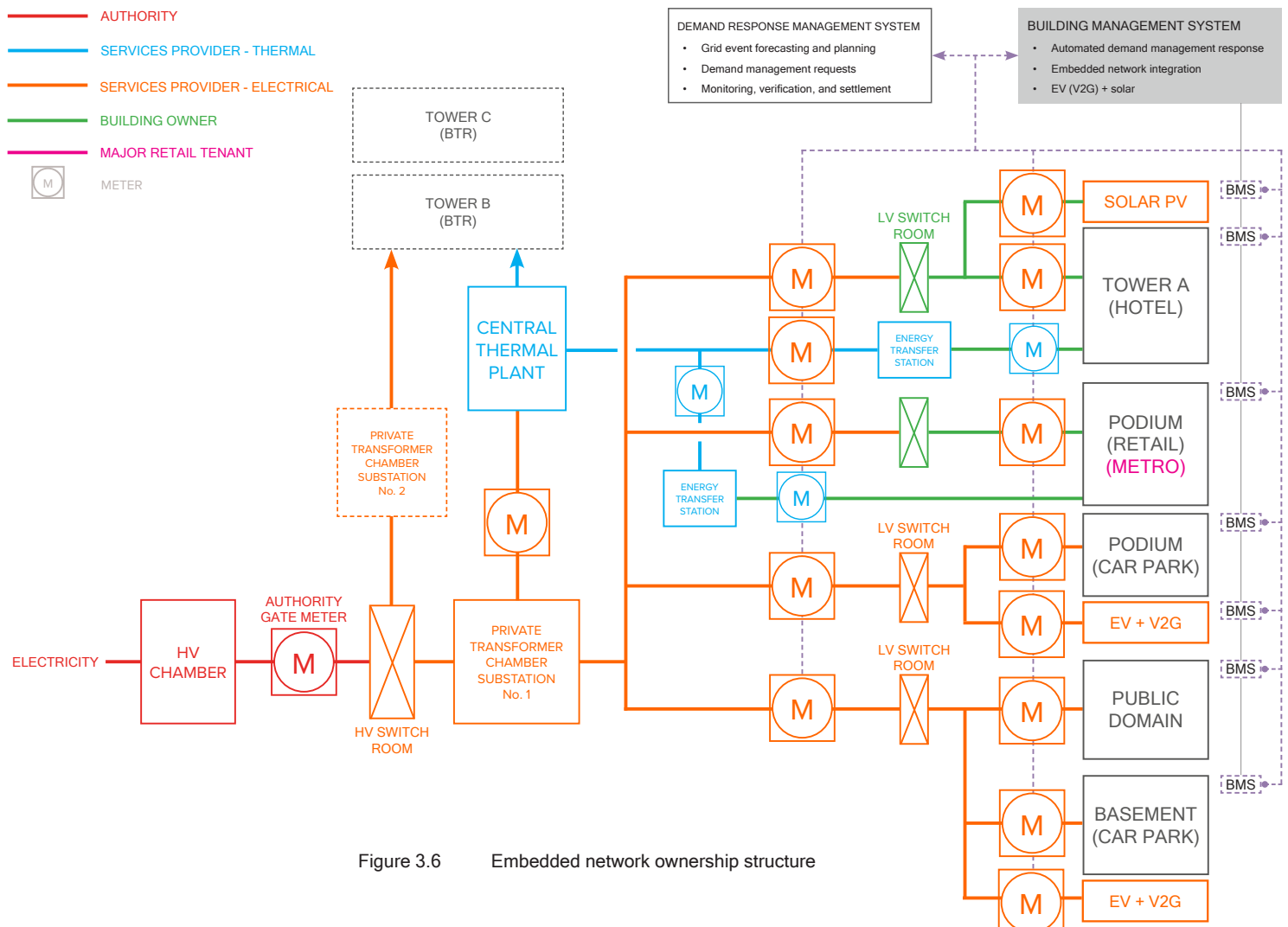
The **Services Provider** will be an energy market disruptor, offering the Customer a renewable electricity and thermal supply at equal to or better than market rates.

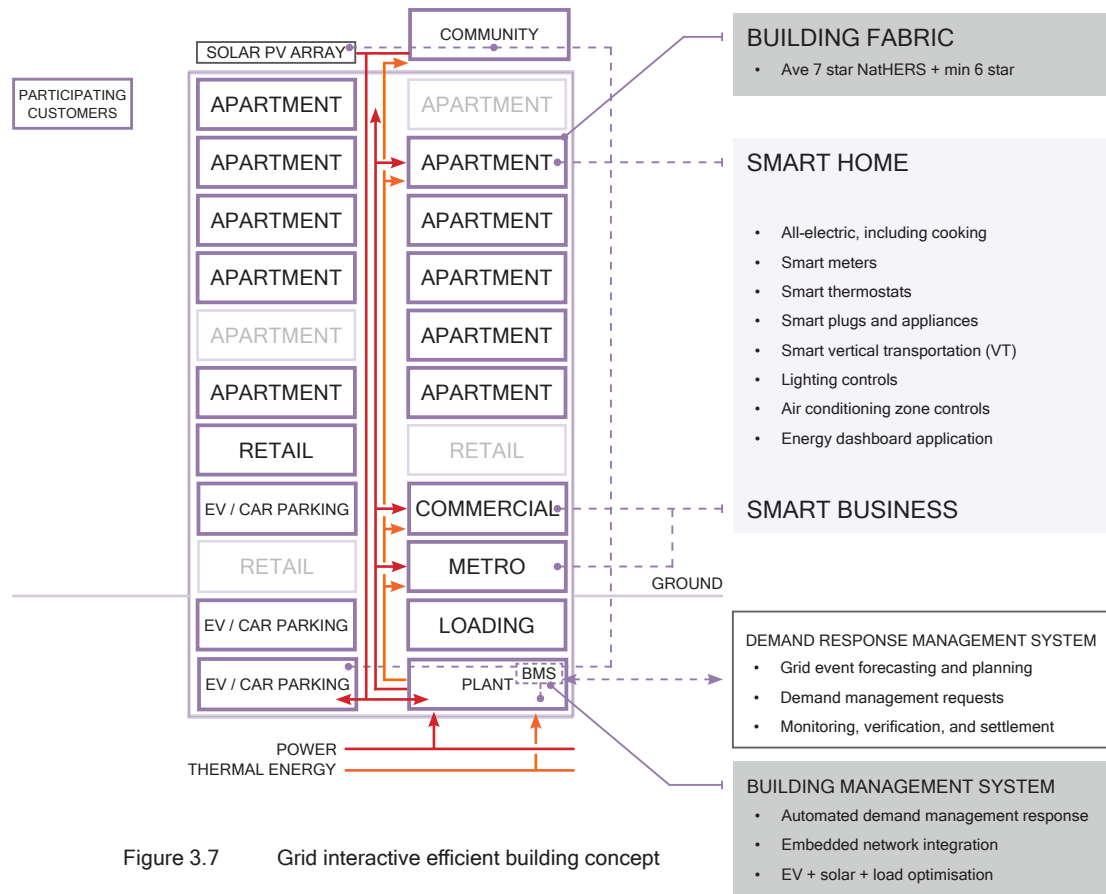
This will be achieved by integrating distributed energy resources (DERs) (e.g., solar photovoltaic - PV - systems), electric vehicle (EV) infrastructure with vehicle-to-grid (V2G) capabilities, precinct-wide thermal energy services, and a demand response management system (DRMS) that actively manages electricity demand to match favourable grid conditions (e.g., renewable energy grid penetration), including wholesale electricity costs (e.g., peak periods and aggregate demand charging).

By aggregating electrical demand, the **Services Provider** is able to collectively reduce Customer energy costs by managing demand and qualifying for more advantageous network tariff products.

The **Services Provider** is a smart grid participant (see Figures 3.6 and 3.7), offering each Customer easy-to-understand energy usage data analytics to support energy cost and carbon management. The Customer is able to participate in demand management requests and realise financial benefits by minimising exposure to volatile wholesale electricity costs, high network demand charges, and periods of poor renewable energy grid penetration.

It is expected that, as the energy transition and grid decarbonisation begins to stabilise around the mid-2030s, a participating Customer will realise a near 'zero cost energy' position for electricity and thermal energy usage.





SMART PRECINCT | Grid interactive efficient buildings (GEBs) are energy efficient buildings that use building management systems, smart end-use equipment and devices, and distributed and/or community energy resources to provide demand flexibility while optimising for energy cost, grid services, and occupant needs and preferences, in a continuous and integrated way (see Figure 3.7).

Figure 3.8 visualises electrical demand profiles for a range of strategies to demonstrate peak demand reduction opportunities inherent within an embedded network with multiple GEB Customers participating at a precinct scale.

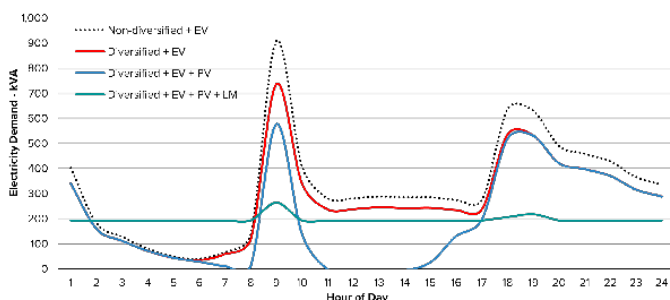


Figure 3.8 Electrical demand profile analysis

- The non-diversified electrical demand profile (black dotted line) demonstrates the typical daily electrical demand 'duck curve' profile with morning and evening peaks.
- The diversified electrical demand profile (red line) demonstrates the inherent electrical demand diversity attributed to the unique urban design characteristics of a precinct.
- The diversified + PV electrical demand profile (blue line) considers the installation of a distributed solar PV array. A morning peak reduction is observed. The daytime electrical demand is met by the distributed solar PV array (with some curtailment).
- To affect a demand response strategy that flattens the electrical demand profile (turquoise line), V2G and energy storage infrastructure should be considered. EV owners opt-in to demand management requests, whereby the EVs charge/discharge in a coordinated demand management response, peak demands can be flattened.
- This demonstrates the ability for real-time, effective demand response management that reduces the required electrical infrastructure capacity, drives real cost of living benefits, realises grid resilience, responds dynamically to the grid carbon intensity, and ultimately delivers a near 'zero cost energy' outcome for participating residents and businesses.

3.5.4 Assure

An assurance framework is required that responds to regulatory provisions and market signals, presents credible climate action in the design and delivery, and operation of the Project, and demonstrates design excellence through the Design Review Panel (DRP) process.

The Project will actively seek opportunities to reduce impacts on the environment whilst providing positive benefits to building occupants, and reducing running costs for residents, businesses, and guests.

* Cold shell retail; limited shared services; not reasonably rateable under NABERS for Shopping Centres

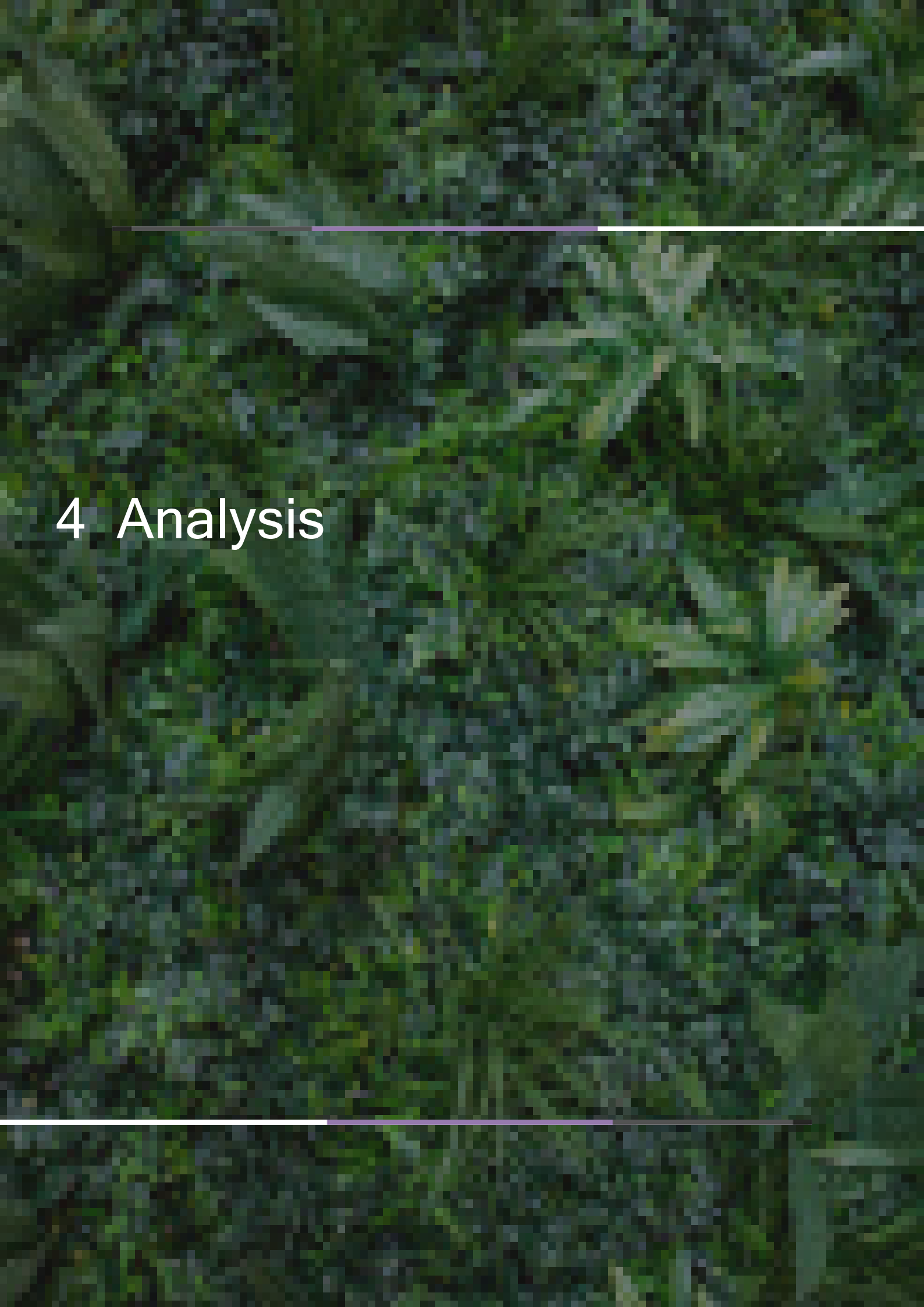
^ NABERS for Hotels

Table 3.1 Assurance framework

Tool or Parameter	BTI (Towers B
NatHERS	• Avg. • Min.
BASIX	• Energy High • Wat • Material
NABERS	-
Energy Use	• Sol
Upfront Carbon	• A • 75 • A • Primary constru
	• Site offices v
Water Use	• 20 kL r
Waste	
EV Infrastructure	•
Movement and Place	
Heat Resilience	
Future Proof	• • Sm
Precinct Services	• Active g



Retail (Podium)	Hotel (Tower A)	Basis
7 star	-	• NSW SB SEPP
6 star	-	• NCC 2022
Performance Standards	-	• NSW SB SEPP
Energy 50	-	• NCC 2022 (J1V1)
Green index	• 4.5 star Energy ^ • 3 star Water	• Higher standard of sustainability
• All-electric buildings (building owner-controlled energy uses only)		• Adopted Master Plan
• Solar PV systems across 60% of the available roof area (subject to feasibility) [FSR bonus]		• Higher standard of sustainability
• Measurement and reporting systems to drive continual improvement		• DRP1 and 2 comments (DRP1 - 4.03; DRP2 - 4.2)
• Average cement replacement of at least 30% across all concrete and masonry products		• NSW SB SEPP
• 50 MPa grade reinforcing steel to achieve a 33% reduction in the mass of steel filament		• Higher standard of sustainability
• Alignment with an embodied carbon benchmark target of approximately 800 kgCO ₂ e/m ²		• DRP#02 comments (4.2)
• Construction materials/products to have EPDs, third-party certification and independent verification, and high recycled content, where practicable		
• At least 20% of high emitting construction equipment will be fossil fuel-free		
• All buildings will be all-electric and all site electricity use will be 100% renewable electricity during construction		
• Water efficient fixtures, fittings, and appliances		• Adopted Master Plan
• Rainwater collection from 90% of available roof catchment area		• DRP1 comments (4.02)
• Rainwater tank for each tower and podium/public domain to serve non-potable water services		
• Install fire protection systems that do not expel water during testing		
• Non-potable water service, incl. future recycled water mains connection		
• BTR - Waste recycling chutes		• Adopted Master Plan
• Retail F&B / Hotel commercial kitchen - Organic waste collection		
• At least 90% of construction and demolition waste diverted from landfill		
• EV Ready (all uses) - 5% car parking spaces; all car share spaces		• Industry best practice
• EV Capable (Retail) - 10% car parking spaces		• NCC 2022
• EV Capable (BTR and Hotel) - 20% car parking spaces (TOD)		• Adopted Master Plan
• Infrastructure & load management systems - 20% building peak electrical demand		
• Traffic and transport impact assessment, including mode share analysis		• Higher standard of sustainability
• Optimal active mobility and public transport strategy		
• 5% urban tree canopy		• Adopted Master Plan
• Mitigate solar reflectivity impacts at grade and podium roof level		
• Introduce green walls and roofs		
• Advance passive design strategies		
• Transition planning for residual high impact refrigerant and fossil fuel-based systems		• DRP1 comments (4.04)
• Smart building infrastructure to support near 'zero cost energy' for participating Customers		
• Embedded network		• DRP1 comments (4.01 and 4.03)
• Innovative Services Provider providing electricity and thermal energy services		• DRP2 comments (Principle 4 - Sustainability)
• Renewable electricity supply at equal to or better than market rates		
• Generation systems, EV (+ V2G) infrastructure, and demand response management systems		



4 Analysis

4.1 Principles

Resiliency is fundamental to decision making. Development must take account of science-based climate impacts to ensure investment in social and community infrastructure is secure and assets can serve the community long into the future.

Urban environments produce microclimate conditions affecting the health and wellbeing of residents, workers, and visitors. A climate analysis has been undertaken to inform and enhance the urban design response and the quality of amenity.

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 climate change, urban heat island, natural ventilation, sun path, wind and humidity qualitative factors that impact the urban design response.

An urban design response is then articulated based on quantitative studies that measure the quality of amenity.

4.2 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 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. Cloud cover - considering consistency of clear sky conditions in informing urban tree canopy type and public and communal open space shading
5. Humidity - considering relative humidity conditions and built form wind effects 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. Sun path - considering sun movement and solar gain impact to the building envelope, and the public and communal open space provision

4.2.1 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 building design life of 40 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 4-18 days per year based on action taken to tackle global heating (see Figure 4.1; Climate Council Heat Map of Australia). 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

Figures 4.3 and 4.4 visually compare the projected increase in ambient temperature (2090) over current conditions. The annual frequency of ambient temperatures and the intensity of ambient temperatures above 35°C is notably higher than current conditions.

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) features
- Raingardens and bioretention tree pits
- Increased urban tree canopy
- Permeable pavement

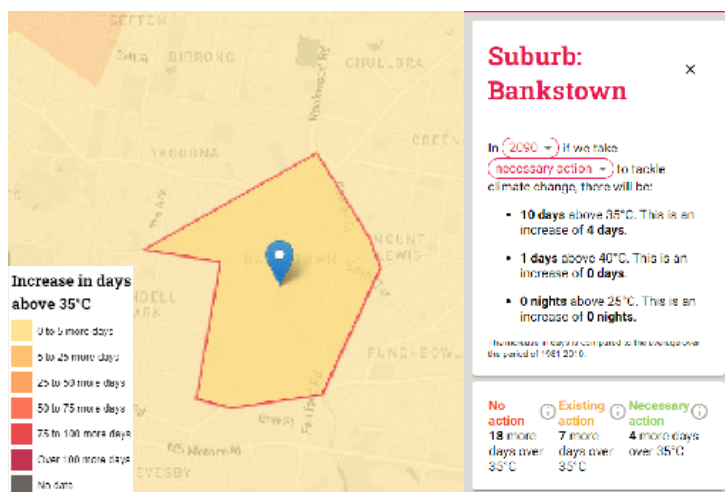


Figure 4.1 Increase in days above 35°C

4.2.2 Urban Heat Island Effect

The urban heat island effect (UHIE) 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 rural areas. This effect acts to increase energy costs, air pollution levels, and heat-related illness and mortality.

The site will generally experience temperatures that are 3-6°C warmer than rural areas, exacerbated by the UHIE (see Figure 4.2; source: The SEED Initiative). Bankstown City Centre will generally experience temperatures that are 9°C warmer.

Figure 4.5 visually demonstrates the impact of the UHIE on the projected increase in ambient temperature (2090). The annual frequency of ambient temperatures and the intensity of ambient temperatures above 35°C is notably higher than 2090 conditions.

Mitigation measures to reduce the UHIE include:

- Achieve a minimum 5% urban tree canopy
- Mitigate solar reflectivity impacts to the public domain at grade and podium roof level
- Integrate rooftop solar PV systems across 60% of the available roof area, wherever feasible
- Introduce green walls and roofs
- Advance passive design strategies

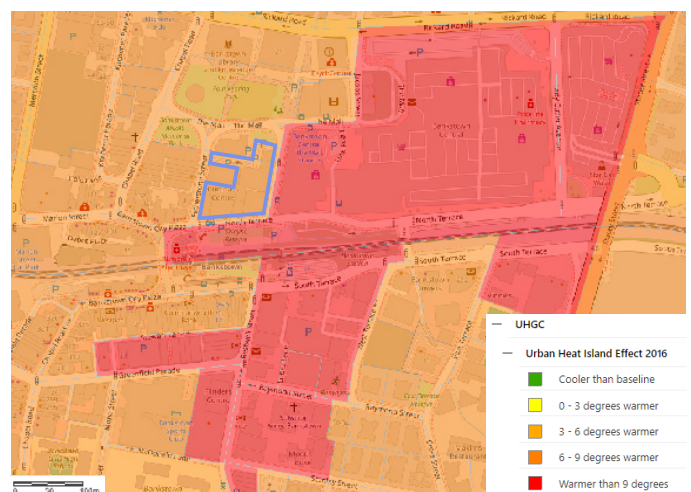


Figure 4.2 Project site UHIE

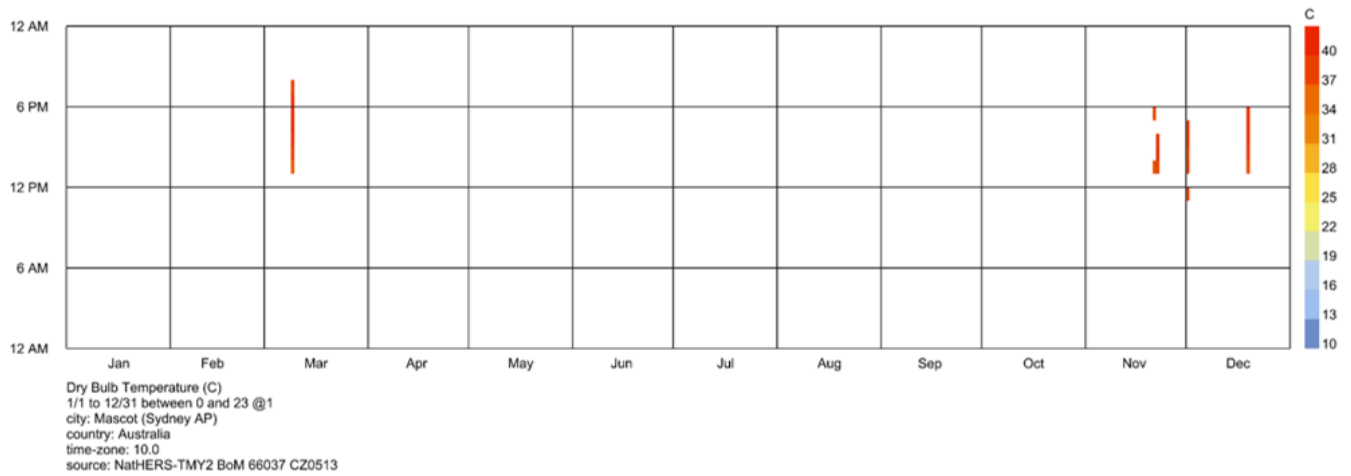


Figure 4.3 Annual hourly ambient temperature above 35°C - current

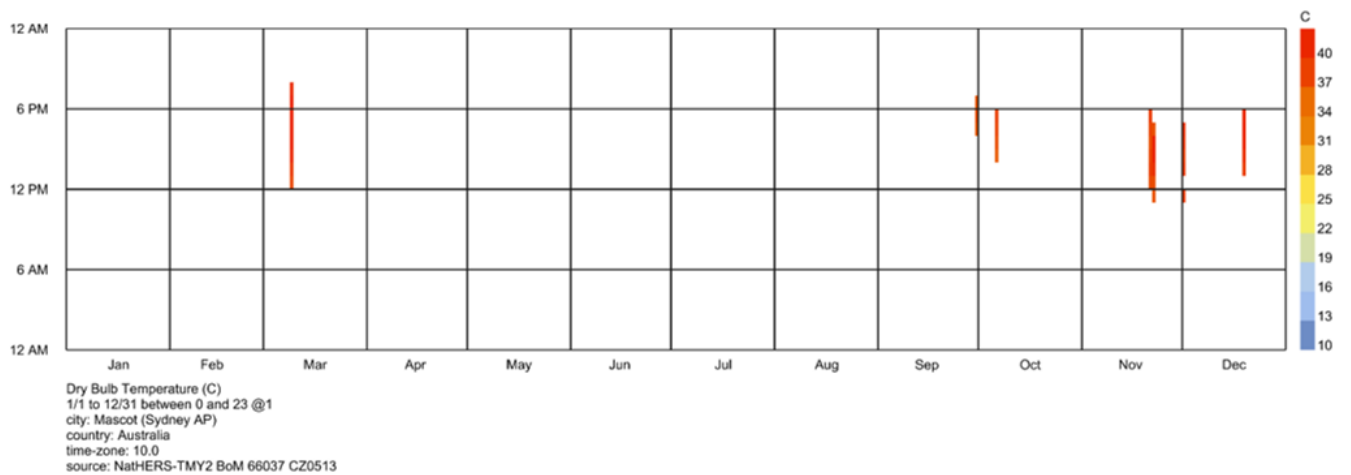


Figure 4.4 Annual hourly ambient temperature above 35°C - 2090

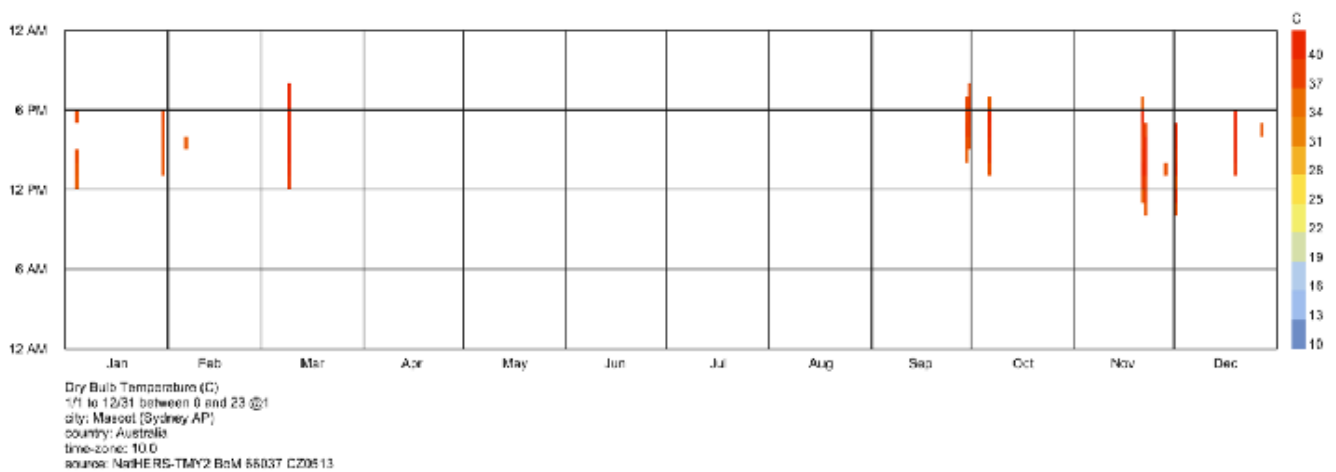


Figure 4.5 Annual hourly ambient temperature between above 35°C - 2090 + UHIE

4.2.3 Natural Ventilation

Figure 4.6 visually demonstrates the periods when ambient temperatures are between 19-25°C for 2090 conditions. This ambient temperature range is considered to be conducive to natural ventilation when assessing adaptive thermal comfort performance. Conditions are favourable for natural ventilation for more than 60% of the year.

4.2.4 Cloud Cover

Figure 4.7 visualises cloud cover over a typical year. Light blue represents clear sky; dark grey represents overcast sky.

Consistent clear sky conditions are observed during afternoons throughout the year. A deciduous urban tree canopy will shelter the public and communal open spaces from 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.

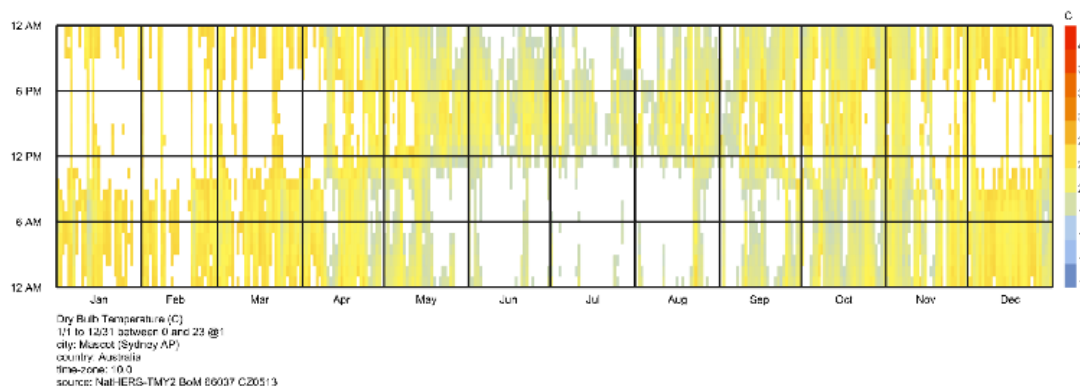


Figure 4.6 Annual hourly ambient temperature between 19-25°C - 2090

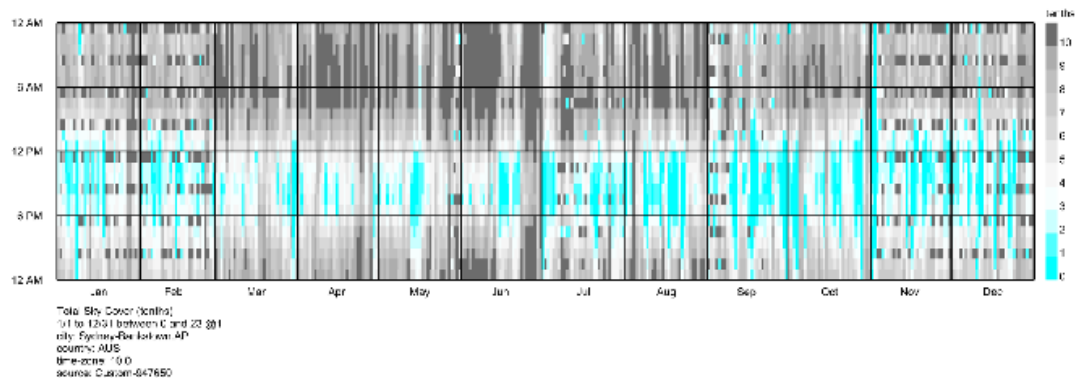


Figure 4.7 Annual cloud cover

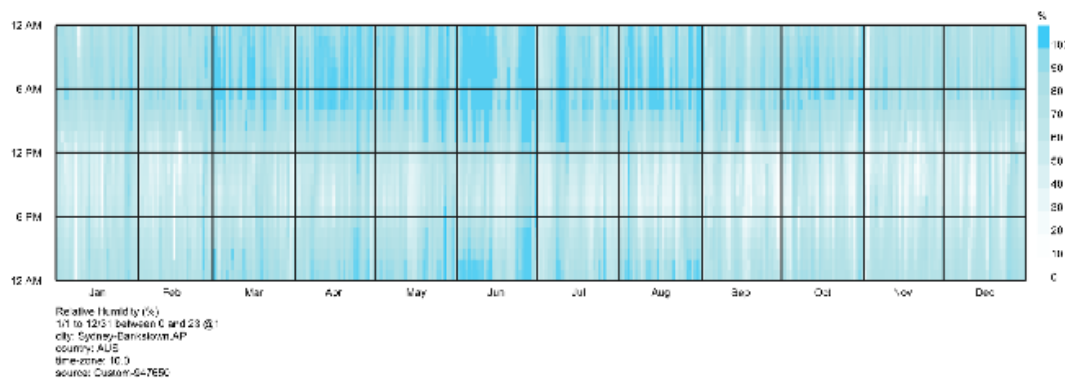


Figure 4.8 Annual humidity

4.2.5 Humidity

High and low humidity can impact outdoor thermal comfort perceptions. Figure 4.8 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 reinforces peak pedestrian movement and active transport through the active spine and green connector, respectively.

4.2.6 Wind

Wind direction and velocity varies seasonally. Figure 4.9 visualises the wind direction and velocity for summer and winter.

Prevailing north-east and south-east wind directions are observed in summer. North-east summer breezes can permeate Compass Way in support of the dominant through site pedestrian movement, and the integrated civic spaces.

A prevailing north-west wind direction is observed in winter. The western edge built form acts to shelter Compass Way and the civic spaces.

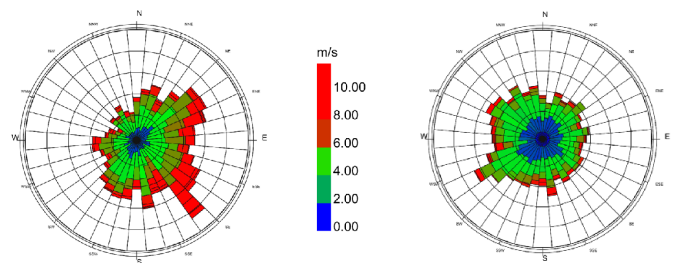


Figure 4.9 Wind rose; summer [left]; winter [right]

4.2.7 Sun Path

Figures 4.10 and 4.11 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 through site links and civic spaces receive good levels of direct sunlight throughout the year. This reinforces permeability of the ground plane and site activation.

The north-east and north-west landmark corners of the site receive very good levels of direct sunlight throughout the year. Low- / medium-height vegetation on the south-east / south-west corners of the site will assist in maximising direct sunlight.

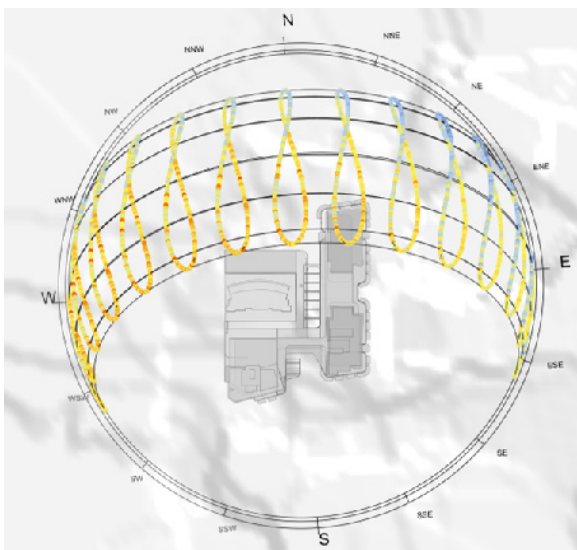


Figure 4.10 Sun path diagram - top view

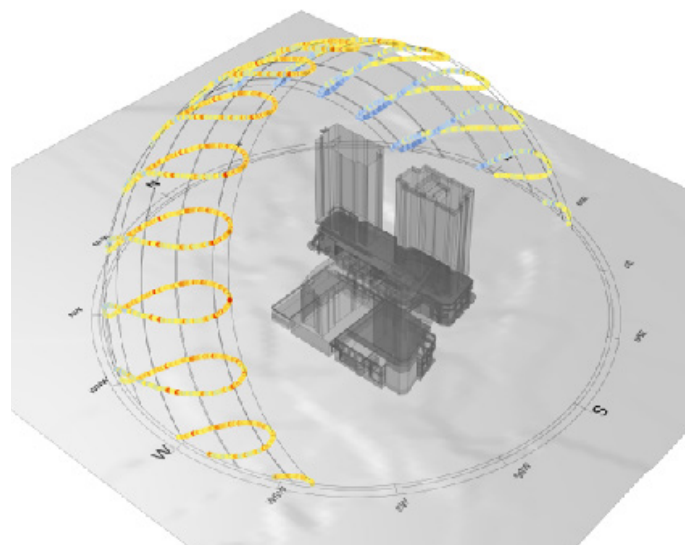


Figure 4.11 Sun path diagram - south-west perspective view

4.3 Urban Design Response

An urban design response has been articulated that qualifies the quality of the urban design. This includes:

1. Sun hours - demonstrating the quantity of solar exposure to the building envelope, and solar access to public and communal open spaces

4.3.1 Sun Hours

A sun hours analysis has been conducted to quantify solar exposure to the building envelope, and solar access to the public and communal open spaces. This is visually represented as follows:

- Figures 4.12 and 4.13 - summer sun hours for north-west and south-east perspective views, respectively
- Figures 4.14 and 4.15 - winter sun hours for north-west and south-east perspective views, respectively

The through site links and civic spaces achieve good levels of sun hours during the summer period. Low levels of sun hours are observed during the winter period. An appropriate landscape design is required to provide adequate shading during summer but maximise sun hours during winter. A deciduous tree canopy solution should be considered with low- / medium-height vegetation on the south-east / south-west corners of the site.

The roof level communal open spaces achieves good levels of sun hours throughout the year. The podium level communal open space achieves good levels of sun hours during the summer period. Low levels of sun hours are observed during the winter period. Strategies and solutions to boost the levels of sun hours achieved for the podium level communal open space should be considered.

The following observations are made for the building envelope:

1. North and north-west elevations of all buildings achieve high levels of sun hours during the summer period
2. North elevations of Tower A and C demonstrate an effective façade articulation (and core arrangement for Tower A) to minimise sun hours during the summer period but maximise sun hours during the winter period
3. The north elevation of Tower B maintains good sun hours during the summer period, i.e., is not overshadowed by Tower C. North-facing, mid- to high-rise apartments in Building B maintain good sun hours during the winter period.
4. Tower roof levels achieve high levels of sun hours throughout the year and are deemed viable locations for on-site renewable energy systems (e.g., solar PV systems), where coordinated with plant and communal open space provisions

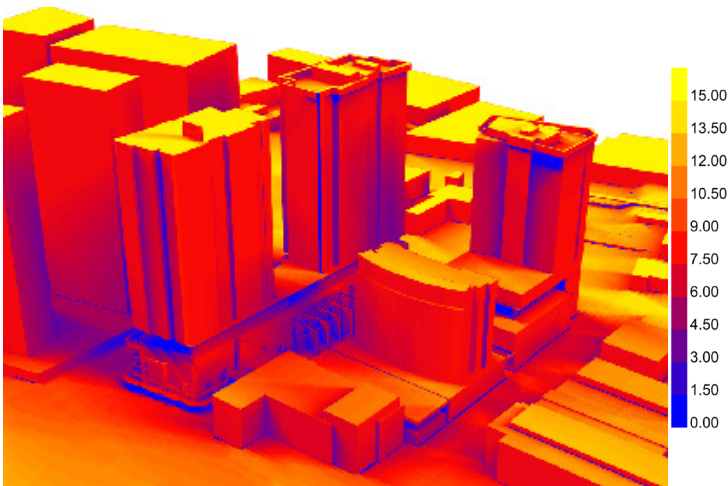


Figure 4.12 Summer sun hours - north-west perspective view

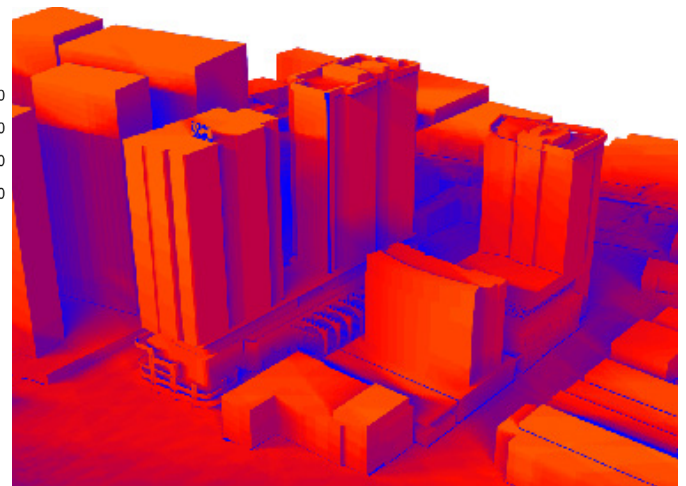


Figure 4.13 Winter sun hours - north-west perspective view

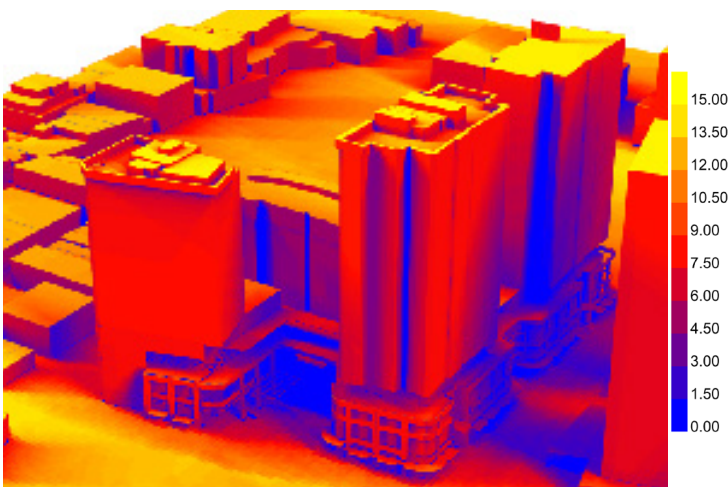


Figure 4.14 Summer sun hours - south-east perspective view

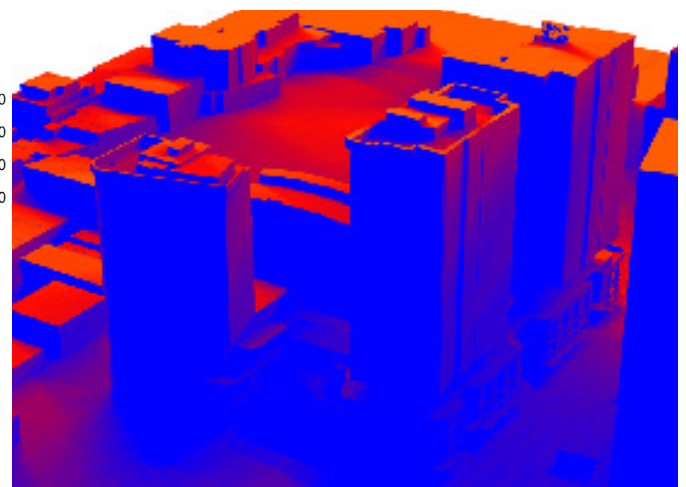


Figure 4.15 Winter sun hours - south-east perspective view

5 Implementation

5.1 Transform

The Project must demonstrate a credible response to global heating. In the built environment, this calls for real and transparent carbon reductions in the design and delivery, and operations of buildings, and limiting the reliance on compensation mechanisms, such as the procurement of carbon credits to offset carbon emissions.

A 'Whole Life Net Zero Ready' design response is required.

5.1.1 Energy Use

Operational energy performance is a major contributor to the building life cycle carbon footprint. The Project is deploying precinct-wide technologies and solutions to realise a low-cost energy supply for participating residents, businesses, and visitors (see Figure 5.1).

This will be achieved by integrating DERs (e.g., solar PV systems), EV infrastructure with V2G capabilities, precinct-wide thermal energy services (ambient loop), and a DRMS that actively manages electricity demand to match favourable grid conditions (e.g., renewable energy grid penetration), including wholesale electricity costs (e.g., peak periods and aggregate demand charging).

This represents a leading technology and infrastructure design response, positioning the Project as a highly resilient, low carbon community.

The Project has been evaluated against the nominated thermal comfort and energy use performance objectives detailed in Table 3.1. This evaluation is only intended to verify that the Project is capable of meeting the energy use and thermal comfort performance objectives, and that this represents design excellence.

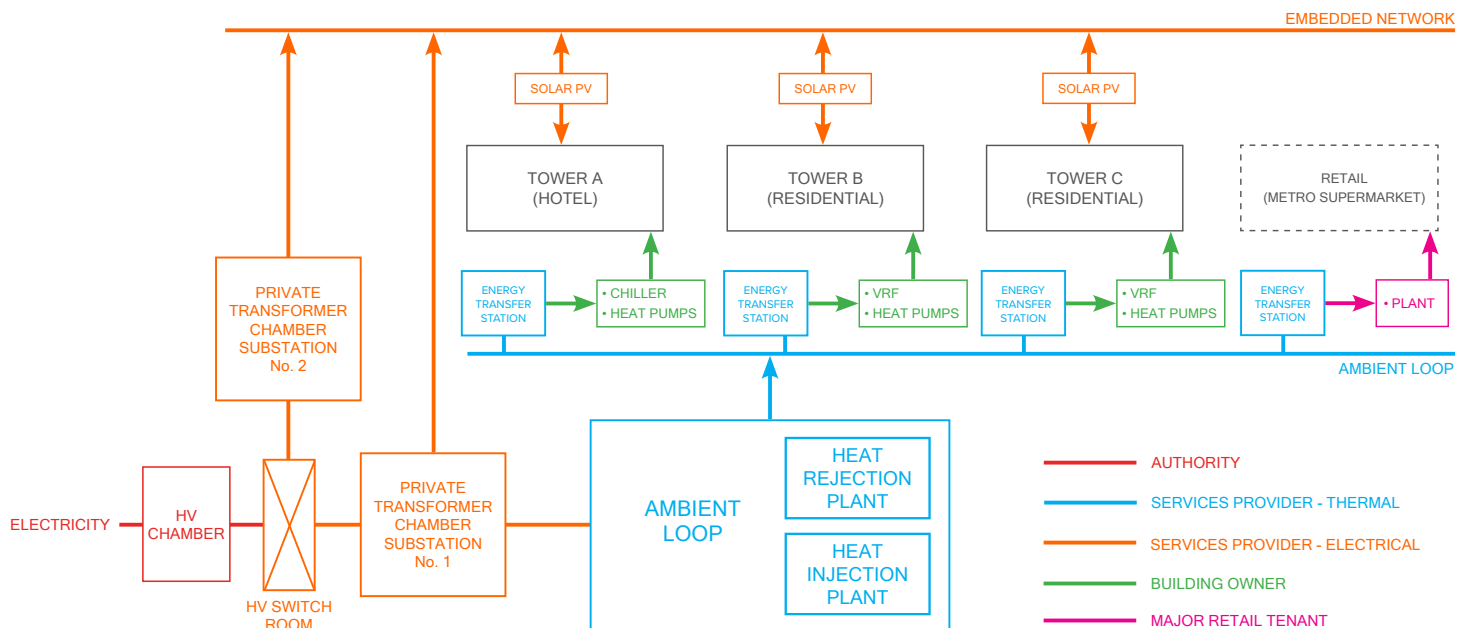


Figure 5.1 Embedded network and ambient loop configuration

Residential Performance

The following passive design measures have been integrated to address the NatHERS performance objectives - achieve an average 7 star / minimum 6 star NatHERS rating (higher thermal performance standard under the NSW Sustainable Buildings SEPP):

1. Good façade articulation for private open space and integration of extensive built form feature shading
2. High performance glazing for fixed / awning / sliding windows, and sliding doors, including:
 - a. Clear, low-e double glazing + thermally broken aluminium frame
 - b. System U-value of 3.1 W/m².K and solar heat gain coefficient (SHGC) of 0.39
 - c. Visible light transmittance (VLT) of circa 50%
3. Roof - achieve a total R-value of 5.0 m².K/W (R2.85 underslab insulation + R0.7 ceiling insulation)
4. External wall - achieve a total R-value of 2.8 m².K/W (R2.5 insulation)
5. Suspended floor - achieve a total R-value of 3.0 m².K/W (R1.3 insulation)
6. Ceiling light penetration - insulated

The following active design measures have been integrated to address the BASIX Energy performance objectives - achieve a BASIX Energy score of 63 (higher energy performance standard under the NSW Sustainable Buildings SEPP):

1. Precinct-wide ambient loop (see Figure 5.1) providing heat sink, heat source, and heat recovery for the water-cooled variable refrigerant flow (VRF) systems providing air conditioning to apartments, and water-to-water heat pumps and thermal buffer tanks providing hot water to the apartments. The ambient loop flow temperature is controlled by centralised cooling towers with variable speed fans for heat rejection and air-to-water heat pumps with a coefficient of performance (COP) > 3.0 for heat injection.
2. Water-cooled VRF systems with a COP of 5.5 providing air conditioning to apartments
3. Water-to-water heat pumps and thermal buffer tanks providing domestic hot water services with a COP of 3.0
4. Building management system
5. Power factor correction equipment
6. All-electric buildings; no residual fossil fuel based systems
7. Corridor ventilation - supply only / timeclock / providing a proportion of make-up air for apartment bathroom, laundry, and kitchen exhaust ventilation
8. Ground floor lobby, lift lobbies, security room/entry office, and L2 and L3 community spaces - air-conditioned, thermostatically controlled
9. Energy transfer station (ETS) ventilation supply only - thermostatically controlled

10. Basement car park supply and exhaust ventilation
- CO sensors + VSD fans
11. Podium car park exhaust ventilation only
- CO sensors + VSD fans
12. Lift motor rooms supply ventilation
- thermostatically controlled
13. Garbage and relevant plant rooms
- mechanical exhaust ventilation
14. Hot water piping insulation - $R1.0 \text{ m}^2\text{K/W}$
15. Lighting (dwellings) - 100% LED fittings in all rooms
16. Lighting (common areas) - 100% LED fittings + controls
17. Mechanical exhaust (bathroom + laundry) to façade / roof
- manual on / timer off
18. Mechanical exhaust (kitchen) to façade or roof
- manual on / off
19. Induction cooktop and electric oven
20. Dishwasher - 4 star
21. Clothes dryer - 9 star
22. Internal clothes drying line
23. Vertical transportation - gearless traction with VVVF and regenerative drive
24. 70 kWp rooftop PV system (see Figure 5.10)

Hotel Performance

Façade window-to-wall ratio (WWR) performance requirements have been established in line with the deemed-to-satisfy (DTS) provisions under NCC 2022 Section J Energy efficiency, Part J4 Building fabric (see Figures 5.2 - 5.3).

A curtain wall solution is considered, consisting of a standard 1.5m wide module with a 700mm deep high-level spandrel panel to ceiling zone. This generally achieves a 70% WWR.

Figure 5.2 identifies the WWR requirements based on orientation. Where a WWR less than 70% is required, a full-height standard module would perform as a spandrel panel, e.g., every third module would need to be a spandrel panel for the east- and west-facing rooms.

The glazing performance requirements drive low-e double glazing with body tint + aluminium thermally broken frames to achieve the thermal performance detailed in Table 5.1. This represents an effective passive design response for Tower A (see Figure 5.4).

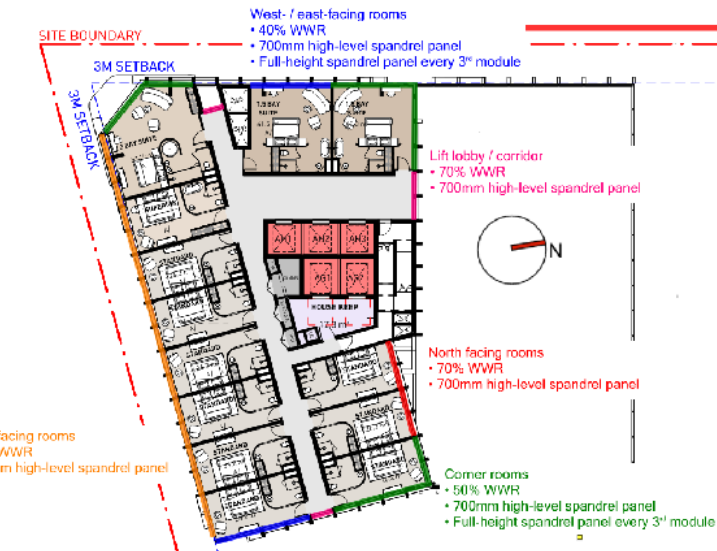


Figure 5.2 Typical floor - façade window-to-wall ratio requirements



Figure 5.3 Typical floor - room loads

Table 5.1 Hotel building fabric thermal performance requirements

Element	Performance *
Glazing	
Low-e double glazing with body tint + aluminium thermally broken frames	U 2.45 SHGC 0.19
WWR - north + south-facing rooms	70%
WWR - east + west-facing rooms	40%
WWR - corner rooms	50%
External wall	R 2.5
Internal wall (conditioned to non-conditioned)	R 2.8
Roof (downward heat flow)	R 3.2
Floor	-
Suspended floor	R 2.0
Infiltration	7 m³/hr.m² @ 50 Pa

* R- / U-values represent whole system/total thermal performance, including thermal bridging

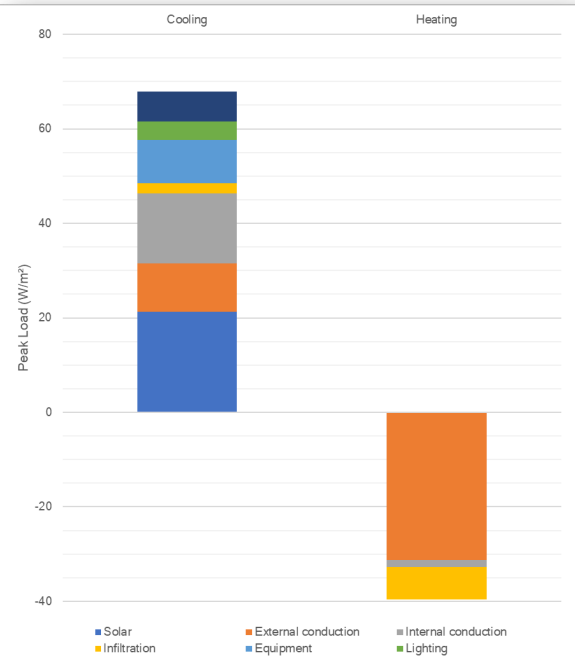


Figure 5.4 Typical floor - average room cooling and heating load

Together with the passive design response, the active design measures detailed in Figure 5.5 have been integrated to address the NABERS Energy performance objective - achieve a 4.5 star NABERS Energy for Hotels rating (exceeds the energy standard under the NSW Sustainable Buildings SEPP - 4 star).

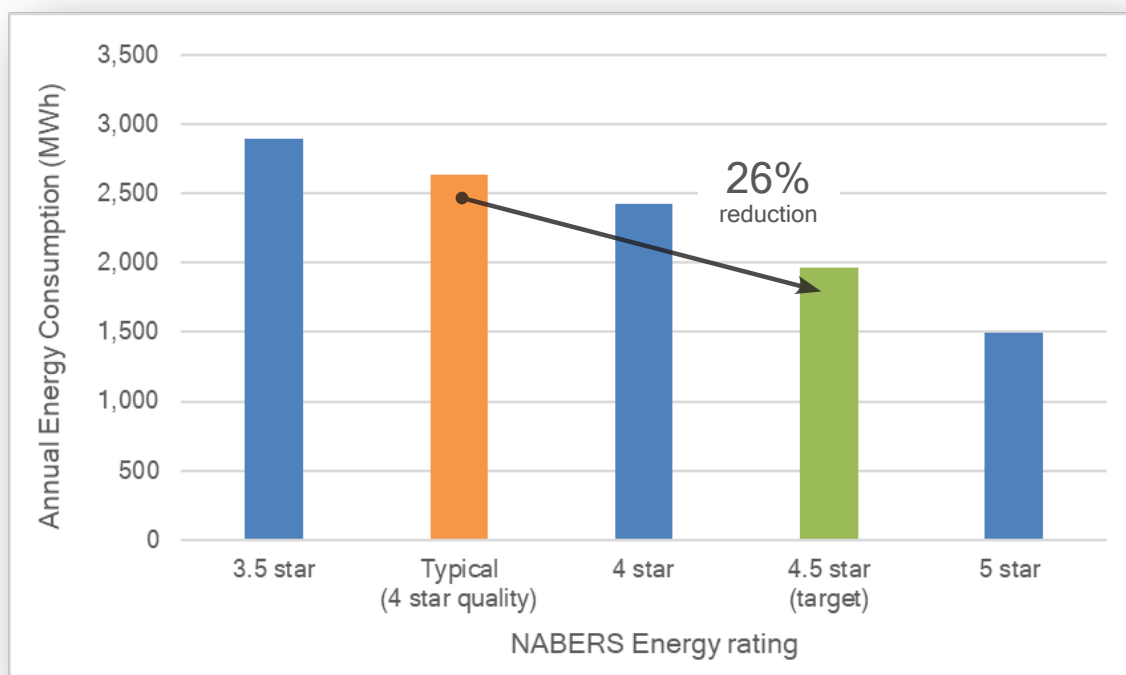
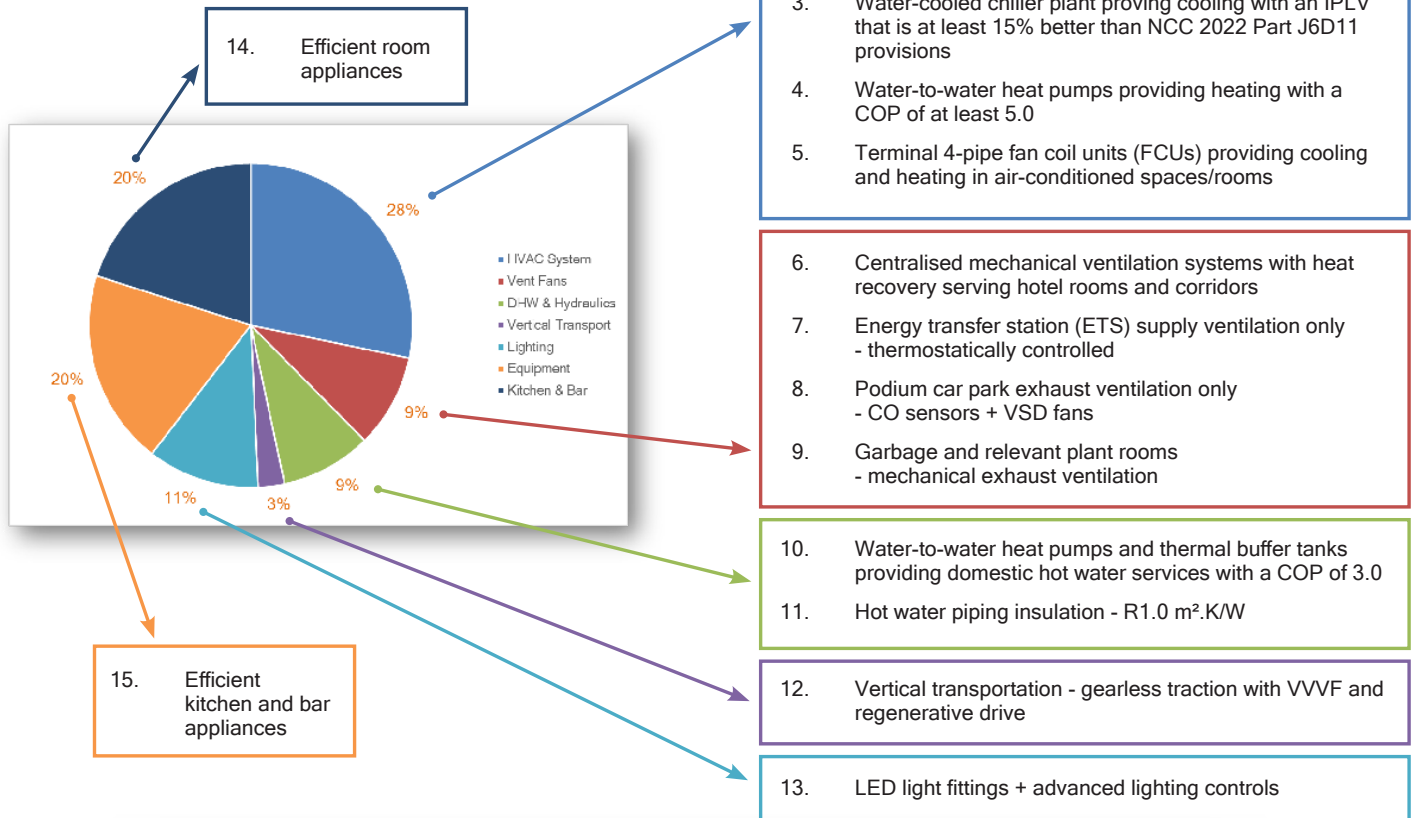


Figure 5.5 Predicted NABERS Energy performance

Retail Performance

A passive design response has been established for the commercial retail use in line with the DTS provisions under NCC 2022 Section J Energy efficiency, Part J4 Building fabric (see Table 5.2).

The major retail tenant will be connected to the low carbon ambient loop via an ETS, which will serve tenant refrigeration and air conditioning plant. All other retail tenancies are generally cold shell.

Table 5.2 Retail building fabric thermal performance requirements

Element	Performance *
Glazing - display	U 5.8 SHGC 0.4
Glazing - non-display	U 4.5 SHGC 0.4
External wall	R 1.0
Internal wall (conditioned to non-conditioned)	R 1.4
Roof (downward heat flow)	R 3.2
Floor	-
Suspended floor	R 2.0

* R- / U-values represent whole system/total thermal performance, including thermal bridging

Renewable Energy Strategy

The passive and active design response established for the Project delivers a high energy efficiency outcome. This outcome ensures that DERs (e.g., on-site solar PV systems) can be impactful in further reducing energy use.

To be credible, it is recognised that the Project must add 'new' renewable energy generation to collectively support replacing fossil fuel-based energy generation as quickly as possible in response to global heating.

However, the complexity of integrating these systems as part of a high-density, mixed-use development poses major constraints and challenges for the Project. Any application must be balanced with building services and communal open space provisions, all of which compete for valuable roof area.

Building on the sun hours analysis undertaken in Section 4.3.1, Figures 5.6 - 5.7 demonstrate the tower roofs generally receive high levels of solar exposure throughout the year. Also identified are façade areas that may be suitable for building-integrated PV (BIPV) systems (see Figures 5.8 - 5.9), including the Tower A north elevation core wall and Tower B north elevation privacy wall.

The L5 communal open space was not considered due to inconsistent solar exposure throughout the year (see Figures 4.12 and 4.13).

Table 5.3 and Figure 5.10 details the available and potential solar PV capacity for the Project. A minimum rooftop solar PV capacity of 70 kWp is required across Towers B and C to meet the BASIX Energy score of 63 (higher energy performance standard under the NSW Sustainable Buildings SEPP). The available and potential rooftop solar PV capacity of 46 kWp for Tower A is proposed for design integration. This acts to further verify that the Project is capable of meeting the relevant energy use performance objectives set out in Table 3.1.

Table 5.3 Available and potential solar PV capacity

Available Solar PV Capacity	
Tower A - rooftop [kWp]	17
Tower B - rooftop [kWp]	15
Tower C - rooftop [kWp]	22
TOTAL [kWp]	55
Potential Solar PV Capacity (incl. Available)	
Tower A - rooftop + BIPV [kWp]	80.5
Tower B - rooftop + BIPV [kWp]	61
Tower C - rooftop [kWp]	75
TOTAL [kWp]	216.5

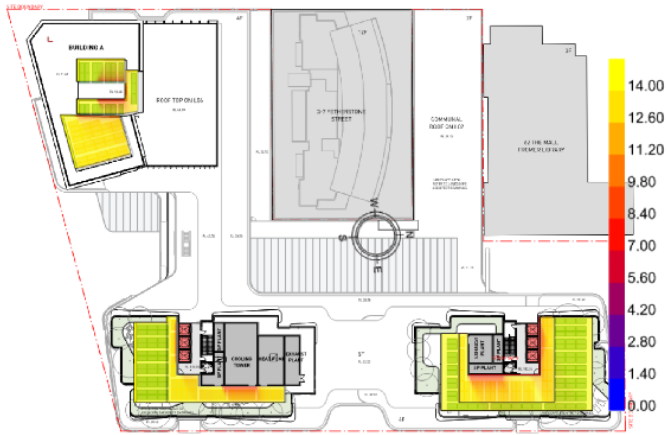


Figure 5.6 Roof solar exposure - summer



Figure 5.7 Roof solar exposure - winter

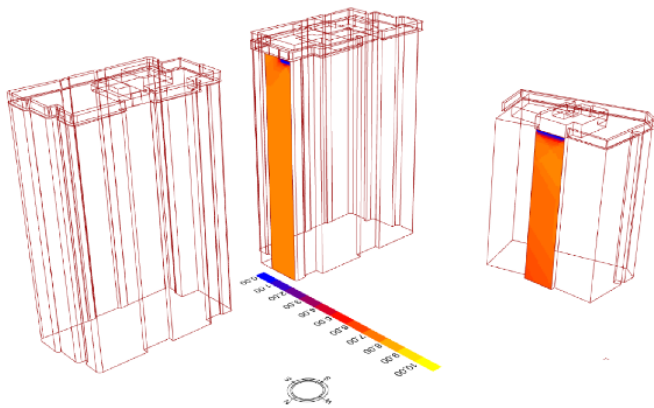


Figure 5.8 Façade solar exposure - summer

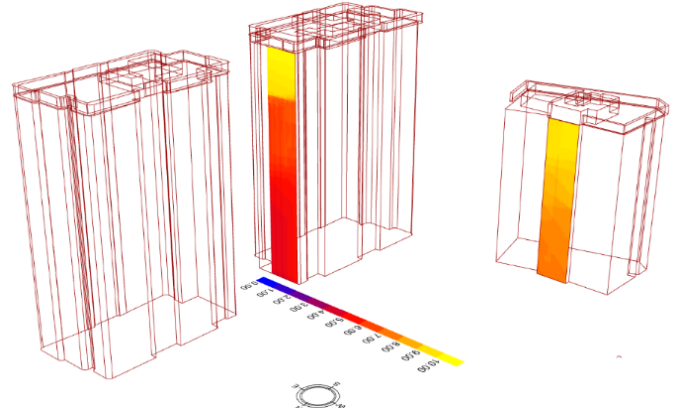


Figure 5.9 Façade solar exposure - winter



Figure 5.10 Available and potential solar PV capacity

5.1.2 Upfront Carbon

Target Setting

The scope of upfront carbon considers construction materials [A1-A3] and construction activities [A4-A5] is illustrated in Figure 5.11, which sets out the carbon life cycle of a building.

Research by the London Energy Transformation Initiative (LETI), a network of over 200 built environment professionals, shows that buildings must reduce embodied carbon if we are to achieve credible whole life net zero outcomes. LETI identifies a business-as-usual (BAU) embodied carbon benchmark of 1,000 kgCO₂e/m² for residential apartment buildings.

A credible design response represents at least a 20% upfront carbon reduction (see Section 3.3.1) when compared to BAU, i.e., an embodied carbon benchmark target of approximately 800 kgCO₂e/m².

Design Response

Achieving credible reductions in upfront carbon drive materials substitution measures, including:

- An average cement replacement of at least 30% across all concrete and masonry products, including precast concrete and masonry block products
- 750 MPa grade reinforcing steel to achieve a 33% reduction in the mass of steel filament

Primary construction materials/products with product-specific (industry-specific, where not available) Environmental Product Declarations (EPDs) will be procured, wherever practicable.

The supply chain will be engaged to demonstrate third-party certification schemes and independent verification methods for their products, and be pre-approved under the Responsible Products Framework developed by the GBCA, wherever practicable.

Products with a high recycled content (e.g., reinforcing and structural steel, aluminium, fibre cement sheet, etc.) will be sourced, wherever practicable.

The following initiatives will be considered to drive upfront carbon reductions for construction-related activities:

- At least 20% of high emitting construction equipment will be fossil fuel-free
- Site offices will be all-electric and powered by 100% renewable electricity
- All electricity used by the construction site will be 100% renewable electricity

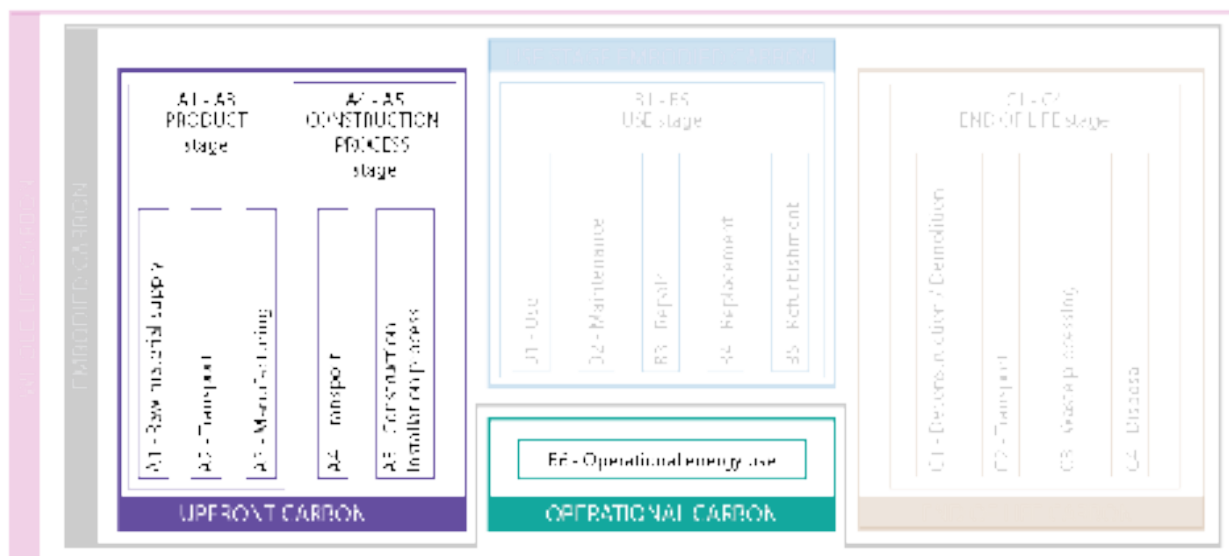


Figure 5.11 Carbon life cycle

Predicted Performance

Drawing on the Embodied Emissions Materials Form (or bill of quantities - BOQ) prepared by the Quantity Surveyor in support of the DA [NSW Sustainable Buildings SEPP], and applying appropriate materials emissions data in line with the Upfront Carbon Emissions calculation guide - interim (developed by the GBCA in coordination with NABERS), the GWP [kgCO₂e] of the Project has been determined.

Table 5.4 and Figure 5.12 detail the predicted upfront carbon emissions performance of the Project, broken down into typical building elements.

The predicted performance demonstrates a credible upfront carbon reduction. This acts to verify that the Project is capable of meeting an upfront carbon emissions benchmark performance of approximately 800 kgCO₂e/m² GFA.

Table 5.4 Building element breakdown

Building Element	GWP [kgCO ₂ e]
Structure	40,649,651
Envelope	4,939,203
Interior	488,482
External works	158,939
Building services	9,421,320
Construction	2,926,134
TOTAL	58,583,728
kgCO₂e/m² GFA	746.18

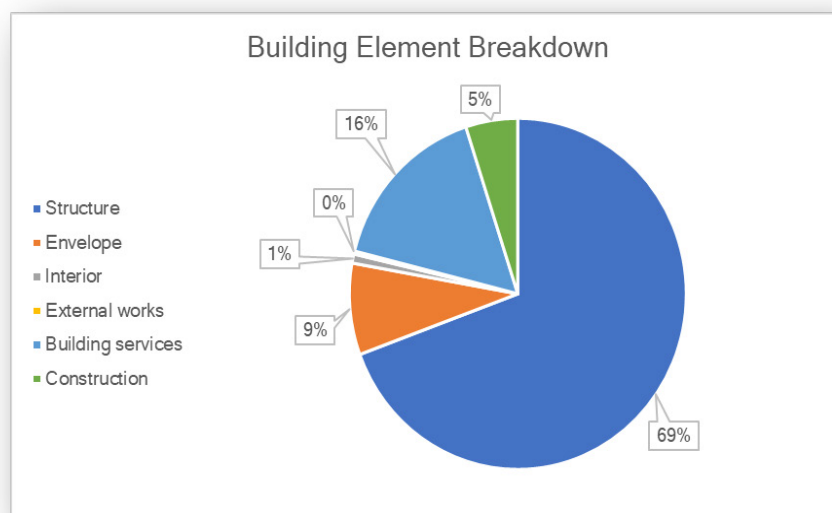


Figure 5.12 Building element breakdown

5.1.3 Whole Life Net Zero Ready

Table 5.5 summarises the design response to deliver a Whole Life Net Zero Ready outcome for the Project (see Section 3.3.1).

Table 5.5 Summary - Whole Life Net Zero Ready

Requirement	Met	Design Response
1. Highly energy efficient - 20% reduction in energy use	Yes Section 5.1.1	- Established passive and active design response, including a low carbon ambient loop, and on-site renewable energy strategy - Aligned Tower A (Hotel) with a 4.5 star NABERS Energy for Hotels performance (Commitment Agreement) - Achieved a BASIX Energy score of 63 (higher energy performance standard) for Towers B and C (BTR), and met the higher thermal performance standard (NSW Sustainable Buildings SEPP) - Met NCC 2022 Part J4 for the commercial retail use
2. Low environmental impact - 20% reduction in upfront carbon	Yes Section 5.1.2	Considered dematerialisation and materials substitution measures to achieve at least a 20% upfront carbon reduction when compared to BAU, i.e., alignment with an embodied carbon benchmark target of approximately 800 kgCO₂e/m²
3. Fossil fuel-free	Yes Section 5.1	Implemented all-electric buildings (building owner-controlled energy uses only)
4. Transition residual high impact refrigerant and fossil fuel-based systems	Yes Section 5.2.3	- Selected HFO refrigerant-based chillers and heat pumps (zero ODP; GWP < 10) - Where HFC refrigerant-based heat pumps (zero ODP; GWP > 1,000) are selected, a future ready transition plan will be developed

5.2 Move

5.2.1 Water Use

A water use reduction strategy has been established for the Project (see Table 3.1).

Towers B and C (BTR)

Water efficiency measures and alternative water sources have been integrated to achieve the BASIX Water performance objectives - achieve a BASIX Water score of 50, which represents a 25% improvement on the minimum BASIX Water score requirement (40).

Tower A (Hotel)

Water efficiency measures and alternative water sources have been integrated to achieve the NABERS Water performance objective - achieve a 3 star NABERS Water for Hotels rating (meets the water standard under the NSW Sustainable Buildings SEPP).

Water Use Reduction Strategy

The Project will integrate the following water use reduction strategy:

1. Through implementation of a higher thermal performance standard, reduce air conditioning loads to minimise heat rejection and cooling tower water use
2. Specify fixtures and fittings with the highest WELS star rating available at the time of development
3. Integrate high water efficiency residential and commercial appliances
4. Install non-potable water services, incl. future recycled water mains connection
5. Collect rainwater from 90% of the available roof catchment area
6. Provide a 20 kL rainwater tank for each tower and podium/public domain to serve non-potable water services
7. Install fire protection systems that do not expel water during testing
8. Smart precinct functionality to manage water use and reduce demand

5.2.2 Waste Management

Responsible Construction

The Project will:

1. Put in place an environmental management system to manage environmental impacts on site during construction
2. Implement an environmental management plan to cover the scope of construction activities
3. Divert at least 90% of construction and demolition waste from landfill
4. Utilise certified waste contractors and certified waste processing facilities to handle construction and demolition waste
5. Implement a construction and demolition waste management plan for the Project

Responsible Operations

1. Retail tenancy fitouts and the hotel will be designed with sufficient dedicated space to accommodate separate bins for general waste and the following designated recycling streams:
 - a. Paper/Cardboard Recycling
 - b. Commingled Recycling
 - c. Organics Recycling
 - d. General Waste
2. Retailers/hotel operator will be responsible for the separation of general waste and recyclables within their tenancy and bringing these materials to the Loading Dock for disposal at specified times throughout the trading day
3. BTR apartments will be designed to accommodate separate bin housings in kitchens for general waste and recycling streams
4. Waste chutes and chute rooms will be provided in Towers B and C
5. Be designed for the effective separation and collection of operational waste streams, including general waste, co-mingled recycling, cardboard and paper, and food organics
6. Tenancy leases will require compliance with the site's materials separation systems, and an ongoing tenant education program will be implemented for all existing tenancies and new tenancies as they move into the site. Specific clauses will also be written into cleaning contracts requiring monitoring contamination of recycling streams and condition of bins and compactor equipment, and providing feedback on ongoing performance.
7. Specific targets for diverting operational waste from landfill to resource recovery outcomes will form part of the contract between the development and its private waste contractor. The following targets will be set for the development:
 - a. Year 1: 50% diversion
 - b. Year 2: 55% diversion
 - c. Year 3: 60% diversion
8. To evaluate performance, the development will implement a monthly reporting system, based on the Better Buildings Partnership (BBP) Operational Waste Guidelines

5.2.3 Materials

Refrigerant Plant & Equipment

The Project will:

1. Install HFO / natural refrigerant-based chillers and water-to-water heat pumps (zero ODP; GWP < 10)
2. Where residual HFC refrigerant-based heat pump systems are required (zero ODP; GWP > 1,000), minimise the HFC refrigerant volume through the selection of air-to-water heat pump systems, which do not circulate refrigerants.
3. The air conditioning plant selection facilitates ready transition in response to the planned phase out of HFC refrigerants. Water-based systems can readily integrate alternative technologies without having to replace pipework reticulation.

Responsible Practices

The Project will:

1. Focus on circular economy principles through extending the lifespan of building components
2. Select paints, carpets, adhesives, sealants, and floor coverings with low or ultra low volatile organic compounds (VOCs)
3. Select engineered wood products with low or no formaldehyde levels
4. Select best-practice PVC products for cables, pipes, flooring, blinds, etc.
5. Achieve an average cement replacement of 30% across all concrete and masonry products
6. Consider and integrate dematerialisation and disassembly measures, wherever feasible
7. Procure primary construction materials with product-specific (industry-specific, where not available) EPDs, wherever practicable
8. Engage with the supply chain to demonstrate third-party certification schemes and independent verification methods for their products, and be pre-approved under the Responsible Products Framework developed by the GBCA, wherever practicable
9. Source products with a high recycled content (e.g., reinforcing and structural steel, aluminium, fibre cement sheet, etc.), wherever practicable

5.2.4 Sustainable Transport

Active Mode Facilities

To encourage residents, workers, and visitors to use active, low carbon, and public transport options instead of private vehicles, the Project has implemented a range of sustainable transport initiatives that will leverage the high quality public transport infrastructure available.

1. The following enhancements are expected to be made to buses and rail infrastructure and network
 - a. Simplified north-south bus services along one route
 - b. Amalgamated bus interchange on the north side of the future Metro station
 - c. Significant bus stop maintained at Bankstown Plaza south
 - d. Train station extended east for new Metro platforms
 - e. New direct at-grade connection across rail corridor between the Metro and train platforms (in line with The Appian Way and Restwell St)
 - f. Upgrades to public space outside station
2. The east and west site frontage roads are expected to be transformed into shared zones, which allow higher pedestrian activities. New or improved pedestrian and cyclist links (paths), signalised pedestrian crossings are also expected to be implemented in close proximity to the site.
3. As part of the proposed active transport infrastructure upgrades, the existing signalised mid-block pedestrian crossing on The Appian Way is expected to be removed when the area is transformed into a shared zone
4. The planned Complete Streets active transport infrastructure upgrades will provide better pedestrian and cyclist connections in Bankstown City Centre, especially the north-south connection across the railway line than the current limited options
5. Upon completion, the prospective users of the site will be adequately serviced by the improved active transport amenities

Private Vehicle Use Reduction

The Green Star Movement and Place calculator was applied to evaluate the private vehicle use reduction performance of the Project. A proposed mode share has developed and compared to a reference mode share [2011 Census data] (see Table 5.7).

Table 5.8 details the performance of the Project against a range of private vehicle use reduction metrics. The vehicle kilometres travelled (VKT) reduction performance significantly exceeds the Green Star reduction target (20%).

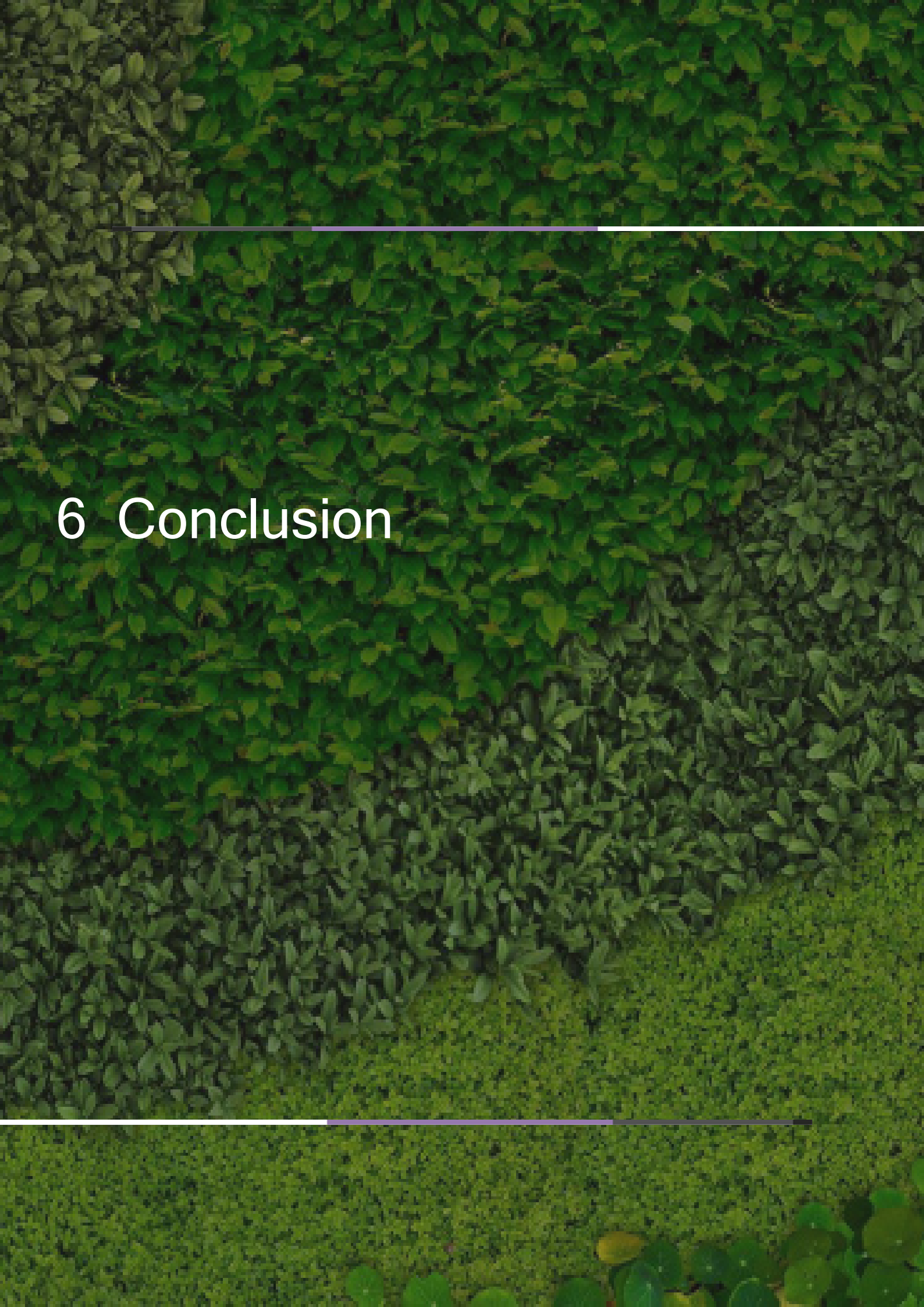
Table 5.6 Transport mode share

Mode	Reference	Proposed
Train (incl. metro) *	3.63%	50%
Bus	2.55%	15%
Ferry	-	-
Tram	-	-
Car (driver)	83.61%	18%
Car (passenger)	6.75%	9%
Motorbike	0.32%	2%
Bicycle	0.27%	2.5%
Walk	2.87%	3.5%
Total	100%	100%

* 100% renewable electricity

Table 5.7 Private vehicle use reduction

Private Vehicle Use Reduction	
Active Mode Encouragement [%]	75%
Emissions Reduction [%]	90%
VKT reduction [%]	75%



6 Conclusion

6.1 ESD Principles

The principles of ecologically sustainable development are detailed in Table 6.1. A design excellence response is presented to demonstrate how these ESD principles are incorporated in the design and delivery, and operation of the Project.

6.2 Design Response

Table 6.1 summarises the Project's design response to the statutory drivers and market context outlined in Section 2. The Project is capable of achieving:

- Design excellence in sustainable development, in line with the ESD principles of the CBLEP 2023
- ESD objectives and controls of the CBDCP 2023
- Higher standard of sustainability provisions identified in the Bankstown City Centre Adopted Master Plan 2021
- Energy and water standards of the NSW Sustainable Buildings SEPP
- Embodied emissions reporting requirements of the NSW Sustainable Buildings SEPP (by others)

Table 6.1 ESD design excellence response

Principle	Design Excellence Response
The precautionary principle - The precautionary principle is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. (3) In applying the precautionary principle, public and private decisions should be guided by - (a) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and (b) an assessment of the risk-weighted consequences of various options.	• Tower A - predicted 4.5 star NABERS Energy performance • Towers B and C - BASIX Energy (higher thermal and energy performance standard) • Embodied carbon benchmark performance of approx. 800 kgCO₂e/m² • All-electric buildings (building owner-controlled energy uses only) • Natural refrigerant and HFO refrigerant-based chillers and heat pumps (low impact systems); residual high impact refrigerant systems future ready for phase out of HFC refrigerants by 2036 • Environmental management system to manage environmental impacts on site during construction • Environmental management plan, and construction and demolition waste plan to cover the scope of construction activities • Certified waste contractors and certified waste processing facilities utilised to handle construction and demolition waste
Intergenerational equity - The principle of intergenerational equity is that the present generation should ensure the health, diversity, and productivity of the environment are maintained or enhanced for the benefit of future generations.	• The Project will actively seek opportunities to reduce impacts on the environment whilst providing positive benefits to building occupants, and reducing running costs for residents, businesses, and guests • The established passive and active design response, and on-site active generation systems act to verify that the Project is capable of meeting the energy performance objectives • The established water use reduction strategy acts to verify that the Project is capable of meeting the water performance objectives; Tower A - predicted 3 star NABERS Water performance; Tower B - BASIX Water • At least 90% of construction and demolition waste will be diverted from landfill • The prospective users of the site will be adequately serviced by improved active transport amenities

Principle

Design Excellence Response

Conservation of biological diversity and ecological integrity -

The conservation of biological diversity and ecological integrity should be a fundamental consideration.

- The site contributes to the urbanity of Bankstown City Centre with new urban spaces and greatly improved public street frontages to enhance connectivity to the numerous adjoining parks and green spaces
- Active street frontages, new urban spaces, and through site links are provided that complement the design of key civic spaces at landmark corners
- The Project contributes to the greening of the City Centre with streetscape and through site link planting, and extensive greenery on podiums, balconies, and roofs
- Green communal open spaces are provided at podium and roof levels

Improved valuation, pricing and incentive mechanisms -

The principle of improved valuation, pricing and incentive mechanisms is that environmental factors should be included in the valuation of assets and services, such as -

(a) polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement, and

(b) the users of goods and services should pay prices based on the full life cycle of the costs of providing the goods and services, including the use of natural resources and assets and the ultimate disposal of waste, and

(c) established environmental goals should be pursued in the most cost effective way by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

- Average cement replacement of 30% across all concrete and masonry products, including precast concrete and masonry block products
- 750 MPa grade reinforcing steel to achieve a 33% reduction in the mass of steel filament
- Primary construction materials/products with EPDs to be procured, wherever practicable
- Supply chain to demonstrate third-party certification schemes and independent verification methods for their products
- Products with a high recycled content (e.g., reinforcing and structural steel, aluminium, fibre cement sheet, etc.) to be sourced, wherever practicable

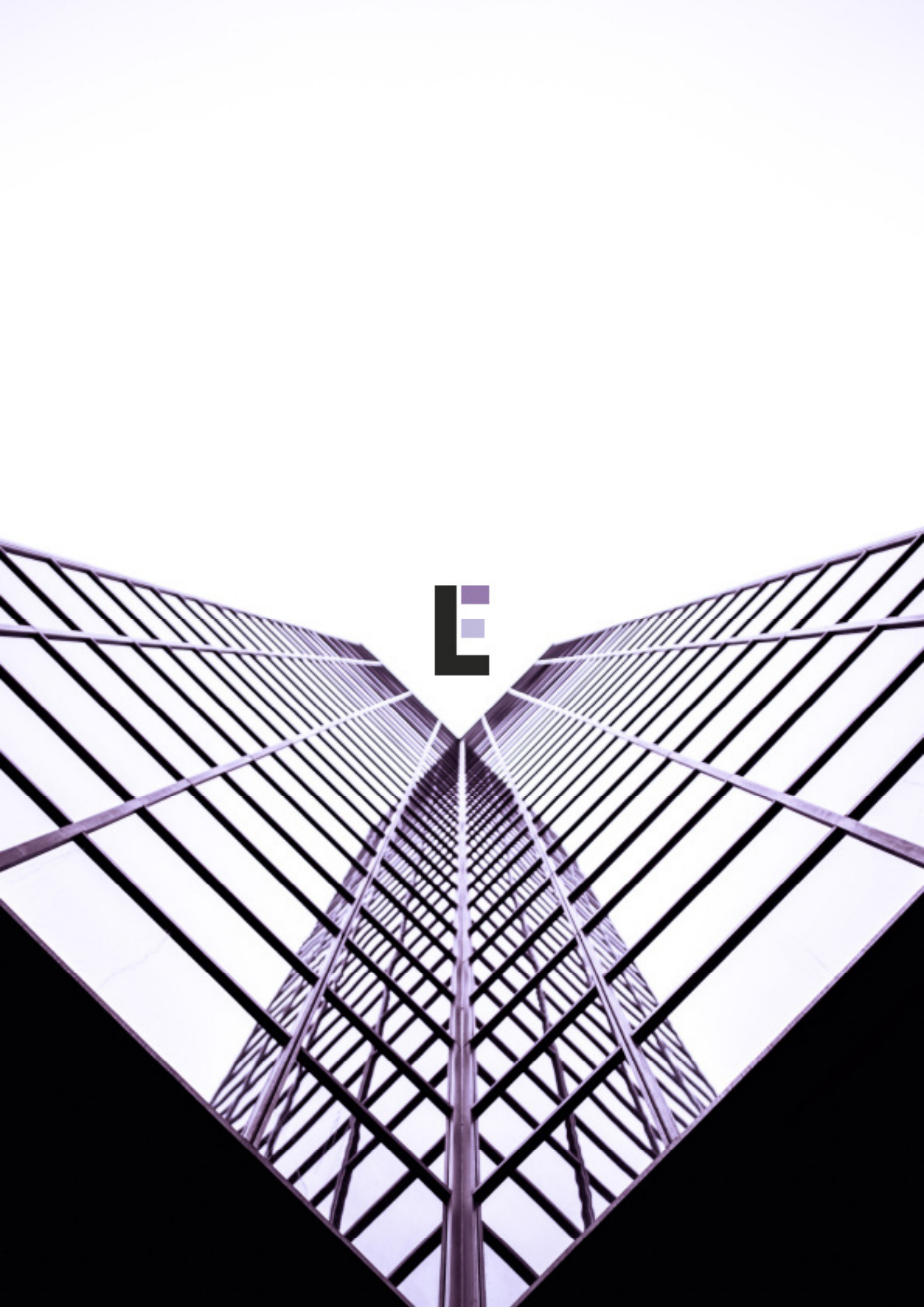
Table 6.2 Design response

Driver	Requirements	Section	Design Response
CBDP 2023, cl. 3.4 CBLEP 2023, cl. 6.15 Adopted Bankstown Master Plan, Objectives 5.3 and 7.1	• Maximise solar and daylight access within the built form • Demonstrate sustainable design	• Built form performance - see Sections 4.2.7 and 4.3.1 • Passive design response - see Section 5.1.1	• North and north-west elevations of all buildings achieve high levels of sun hours during the summer period • North elevations of Tower A and C demonstrate an effective façade articulation (and core arrangement for Tower A) to minimise sun hours during the summer period but maximise sun hours during the winter period • The north elevation of Tower B maintains good sun hours during the summer period, i.e., is not overshadowed by Tower C. North-facing, mid- to high-rise apartments in Building B maintain good sun hours during the winter period. • Tower roof levels achieve high levels of sun hours throughout the year and are deemed viable locations for on-site renewable energy systems (e.g., solar PV systems), where coordinated with rooftop plant and communal open space provisions • The through site links and civic spaces receive good levels of direct sunlight throughout the year. This reinforces permeability of the ground plane and site activation. • The north-east and north-west landmark corners of the site receive very good levels of direct sunlight throughout the year. Low- / medium-height vegetation on the south-east / south-west corners of the site will assist in maximising direct sunlight. • A passive design response has been established the meets a higher thermal performance standards
CBDP 2023, cl. 3.4 Adopted Bankstown Master Plan, Objective 7.1 NSW Sustainable Buildings SEPP (Energy standard)	• Incorporate energy efficient practices and systems in the design and operation of development • Tower A (Hotel) only - target a minimum 4.5 star NABERS Energy (Commitment Agreement)	• Energy use - see Section 5.1	• All-electric buildings (building owner-controlled energy uses only), including solar PV systems • Smart precinct functionality to manage energy use and demand, including DRMS • Precinct-wide ambient loop to provide heat sink, heat source, and heat recovery for the air conditioning and hot water systems serving all towers and the major retail tenant • High-efficiency air conditioning and hot water systems • Podium car parking to minimise mechanical ventilation • Vertical transportation to include gearless traction with VVVF and regenerative drive • LED light fittings and advanced lighting controls to be selected based on function • Efficient room appliances, and kitchen and bar appliances to be specified for Tower A (Hotel)

Driver	Requirements	Section	Design Response
CBLEP 2023, cl. 6.15	Demonstrate sustainable design	Materials - see Section 5.2.3	- Paints, carpets, adhesives, sealants, and floor coverings with low or ultra low volatile organic compounds (VOCs) - Engineered wood products with low or no formaldehyde levels - Best-practice PVC products for cables, pipes, flooring, blinds, etc.
CBDPCP 2023, cl. 3.4 Adopted Bankstown Master Plan, Objective 7.3 NSW Sustainable Buildings SEPP (Water standard)	- Incorporate water conservation measures in the design and operation of the proposed development - Submit a site water management plan that investigates the integrated management and use of water for the proposed development - Tower A (Hotel) only - target a minimum 3 star NABERS Water (Agreement to Rate)	Water use - see Section 5.2.1	- Towers B and C (BTR) are capable of meeting BASIX Water 50, representing a 25% improvement on the current standard (40) - Tower A (Hotel) is capable of meeting the minimum 3 star NABERS Water performance target - Through implementation of a higher thermal performance standard, air conditioning loads are reduced to minimise heat rejection and cooling tower make-up water use - Fixtures and fittings with the highest WELS star rating available at the time of development will be specified - High water efficiency residential and commercial appliances will be specified - Non-potable water services, incl. future recycled water mains connection - Rainwater collection from 90% of the available roof catchment area 20 kL rainwater tanks for each tower and podium/public domain to serve non-potable water services - Fire protection systems will not expel water during testing - Smart precinct functionality to manage water use and reduce demand
Adopted Bankstown Master Plan, Objectives 6.4, 6.5, and 7.1	- Promote active movement and low carbon transport options - Address the pedestrian, cycle, vehicular, and service access and circulation requirements, including the permeability of any pedestrian network	Sustainable transport - see Section 5.2.4	- EV Ready (all uses) - 5% car parking spaces; all car share spaces - EV Capable (Retail) - 10% car parking spaces - EV Capable (BTR and Hotel) - 20% car parking spaces (TOD) - Infrastructure & load management systems - 20% building peak electrical demand - EOT facilities and bicycle parking are accessible, inclusive, and safe - A VKT and emissions reduction of 75% and 90% is achieved, respectively, and an active mode encouragement improvement of 90% based on the proposed transport mode share

Driver	Requirements	Section	Design Response
Adopted Bankstown Master Plan, Objective 5.2 and 7.2	• Maximise tree canopy (minimum 5% in commercial centres) • Minimise the urban heat island effect	• Climate and site analysis - see Section 4	• Mitigate solar reflectivity impacts to the public domain at grade and podium roof level • Integrate rooftop solar PV systems across 60% of the available roof area, wherever feasible • Introduce green walls and roofs • Advance passive design strategies
Adopted Bankstown Master Plan, Objective 6.5 NSW Sustainable Buildings SEPP (embodied carbon)	• Procure responsible building materials and products to support a supply chain transformation • Increase the use of products from recycled sources	• Responsible materials practices - see Section 5.2.3	• Average cement replacement of 30% across all concrete and masonry products, including precast concrete and masonry block products • 750 MPa grade reinforcing steel to achieve a 33% reduction in the mass of steel filament • Primary construction materials/products with EPDs to be procured, wherever practicable • Supply chain to demonstrate third-party certification schemes and independent verification methods for their products • Products with a high recycled content (e.g., reinforcing and structural steel, aluminium, fibre cement sheet, etc.) to be sourced, wherever practicable • At least 20% of high emitting construction equipment will be fossil fuel-free • Site offices will be all-electric and all site electricity use will be 100% renewable electricity during construction

Driver	Requirements	Section	Design Response
Adopted Bankstown Master Plan, Objective 6.5	• Reduce the impacts from development on the environment	• Responsible construction and operations practices - see Section 5.2.3	• Environmental management system to manage environmental impacts on site during construction • Environmental management plan to cover the scope of construction activities • At least 90% of construction and demolition waste to be diverted from landfill • Certified waste contractors and certified waste processing facilities to handle construction and demolition waste • Construction and demolition waste management plan • Retail / Hotel will be designed with sufficient dedicated space to accommodate separate bins for general waste and the following designated recycling streams: - Paper/Cardboard Recycling - Commingled Recycling - Organics Recycling - General Waste • Retailers/hotel operator will be responsible for the separation of general waste and recyclables within their tenancy and bringing these materials to the Loading Dock for disposal at specified times throughout the trading day • BTR apartments will be designed to accommodate separate bin housings in kitchens for general waste and recycling streams • Waste chutes and chute rooms will be provided in Towers B and C • Tenancy leases will require compliance with the site's materials separation systems, and an ongoing tenant education program will be implemented • Cleaning contracts requiring monitoring contamination of recycling streams and condition of bins and compactor equipment, and providing feedback on ongoing performance. • Specific targets for diverting operational waste from landfill to resource recovery outcomes will form part of the contract between the development and its private waste contractor. The following targets will be set for the development: - Year 1: 50% diversion - Year 2: 55% diversion - Year 3: 60% diversion • To evaluate performance, the development will implement a monthly reporting system, based on the Better Buildings Partnership (BBP) Operational Waste Guidelines



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