

**Blackwattle Bay**  
**State Significant Precinct**

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# **Attachment 32:**

## **Ecologically Sustainable Development Report**

June 2021



# Ecologically Sustainable Development Report

Blackwattle Bay State Significant Precinct



# Ecologically Sustainable Development Report

Blackwattle Bay State Significant Precinct

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## Quality Information





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## Executive Summary

AECOM Australia Pty Ltd (AECOM) have been engaged by Infrastructure NSW to prepare an Ecologically Sustainable Development (ESD) Report for the proposed Blackwattle Bay development (formerly known as Bays Market District).

The ESD Report will be submitted as part of the State Significant Precinct (SSP) Study for the proposed redevelopment of the Precinct.

The Blackwattle Bay SSP investigation area is located less than 2 km west of Sydney's CBD. The land area is located within the City of Sydney local government area (LGA). The water area is within the Sydney Harbour Catchment.

The purpose of this ESD Report is to assess the ESD initiatives and opportunities within the Precinct Plan for the Precinct. It demonstrates how the planning and design process for the Precinct has incorporated sustainability design initiatives and seeks to ensure appropriate recommendations are made for future initiatives.

The ESD Report also demonstrates how the SSP Study Requirements have been met and includes recommendations for further investigations and opportunities in future design, construction and operation.

In addressing the SSP Study Requirements, the following approach was undertaken:

- Identify Existing Environment Context - The Existing Environment Report established a base case for ESD in Blackwattle Bay, including the sustainability and regulatory context applicable to the site.
- Develop and Test Sustainability Targets and Initiatives - The context of the site informed the identification and development of sustainability targets and initiatives included in this Report. These targets and initiatives are aimed to meet the existing and future community and environmental needs.
- ESD Recommendations and Framework Assessment - The targets are used in conjunction with the established site context to provide ESD recommendations and identify initiatives for the Precinct Plan and recommendations for future design investigation. The proposed Precinct Plan has also been assessed through an ESD framework that demonstrates compliance with a nationally recognised rating system - the Green Star Communities National Framework.

Based on the context and ESD analysis conducted and detailed in this report, there are several opportunities for innovative sustainability initiatives to be investigated and implemented in the development of Blackwattle Bay.

The nature of the development requires a flexible and adaptive approach to planning. The ESD Framework Assessment identifies and measures sustainability performance and provides recommendations to guide future planning, design, construction and operation of the precinct. This approach seeks to ensure that sustainability technologies are selected through achieving targeted outcomes and encourages the use of the most cost-effective and applicable technology available at the time to achieve the outcomes.

## 1.0 Introduction

Blackwattle Bay offers an extraordinary opportunity to reconnect the harbour, its surrounding neighbourhoods and the city; to showcase Sydney's living culture and stories of Country; to build an inclusive and iconic waterfront destination that celebrates innovation, diversity and community.

This Ecologically Sustainable Development (ESD) Report has been prepared by AECOM on behalf of Infrastructure NSW (INSW) to form part of the Blackwattle Bay State Significant Precinct Study (SSP Study). The SSP Study seeks a rezoning for new planning controls for Blackwattle Bay, located on the south-western side of Pyrmont.

Blackwattle Bay presents a significant opportunity for urban renewal across 10.4 hectares of predominantly government owned land located approximately 1km from the Sydney CBD. NSW Government is also investigating the delivery of a Metro Station in Pyrmont and has recognised the potential to transform the Pyrmont Peninsula with a new 20-year vision and planning framework through the Pyrmont Peninsula Place Strategy.

In 2015 the NSW Government recognised The Bays Precinct as one of the highest potential urban transformation sites in Australia with the release of The Bays Precinct, Sydney Transformation Plan. Following this, the Minister for Planning identified the renewal of Blackwattle Bay and the broader Bays Precinct as a matter of State planning significance and to be investigated for rezoning through the State Significant Precinct (SSP) process. Study Requirements for the Blackwattle Bay (formerly known as 'Bays Market District') investigation area were issued by the Minister on 28 April 2017.

A critical part of Blackwattle Bay's revitalisation and vision has been the NSW Government's decision to relocate the Sydney Fish Market (SFM) from its existing location on Bank Street to the head of Blackwattle Bay. This was sought through a State Significant Development Application (SSDA) process and approved in June 2020. The new SFM was designed alongside the baseline Blackwattle Bay studies to ensure that key aspects of the project are consistent with the vision and principles for Blackwattle Bay.

The outcome of the Blackwattle Bay State Significant Precinct process will be a new planning framework that will enable further development applications for the renewal of the Precinct, connected to the harbour and centred around a rejuvenated SFM. The framework will also provide for new public open spaces including a continuous waterfront promenade, community facilities, and other compatible uses.

This report provides a comprehensive investigation of the sustainability context and opportunities within the Study Area to address a part of the Study Requirements and support the development of a new planning framework for Blackwattle Bay.

### 1.1 Purpose

The purpose of this ESD Report is to assess the ESD initiatives and opportunities within the Precinct Plan for the Precinct. It demonstrates how the planning and design process for the Precinct has incorporated sustainability design initiatives and seeks to ensure appropriate recommendations are made for future initiatives. The ESD Report also demonstrates how the SSP Study requirements have been met and includes recommendations for further investigations and opportunities in future design, construction and operation.

There are several regulatory, market and industry drivers that will influence the design, construction and operation of the Precinct. Considering ESD and sustainability measures early in the planning phase can identify potential opportunities to improve the ESD outcomes for the Precinct. Early consideration of sustainability and resilience requirements and initiatives also helps to mitigate emerging risks.

The ESD Report is informed by the broader sustainability policy and regulatory context, as well as the sustainability guidelines and policies from the City of Sydney Council, and includes a review of relevant strategies, policies, market drivers and guidelines to gain an understanding of the contextual background necessary for the consideration of ESD in the Precinct.



It is recommended this Report is read in conjunction with the Blackwattle Bay Urban Design Report and other technical reports that inform the precinct Study.

## 1.2 Blackwattle Bay State Significant Precinct

The Blackwattle Bay SSP Investigation Area ('Study Area') encompasses the land and water area, known as Blackwattle Bay, between Bank Street and the Glebe foreshore shown in Figure 1. The land is located within the City of Sydney local government area (LGA).

The land within the Study Area is approximately 10.4 hectares (ha) in size. It is largely government owned land containing the SFM (wholesale and retail), recreation and boating operations and facilities. There are three privately owned sites including a concrete batching plant operated by Hymix, seafood wholesaler Poulos Brothers and private developer Celestino which owns further wholesaling facilities. The Blackwattle Bay land area wraps around the southern and eastern edges of Blackwattle Bay and is bounded by Bridge Road to the south and Bank Street to the east. The Western Distributor motorway / Anzac Bridge viaduct is located adjacent to the eastern boundary before traversing over the northern section of the site. The water area of Blackwattle Bay is approximately 21 hectares.



**Figure 1: Blackwattle Bay Study Area**



### 1.3 The Proposal

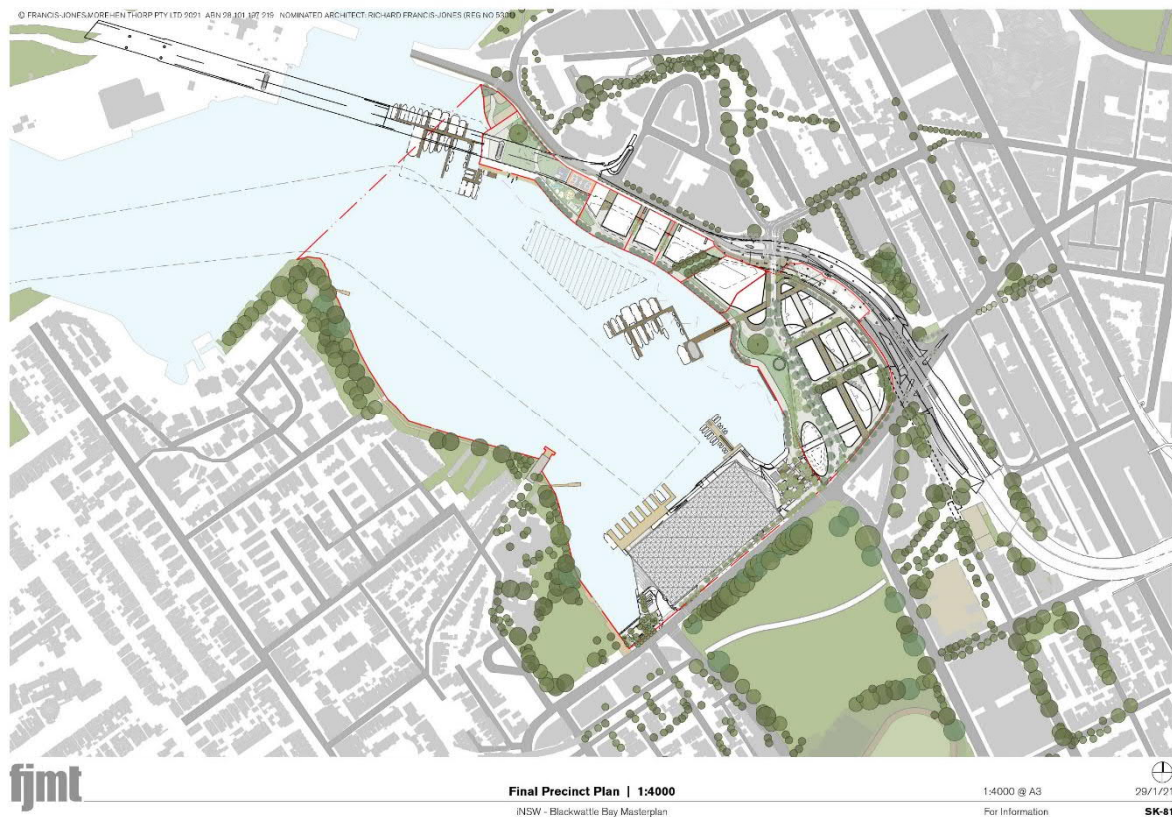
The SSP Study is proposing to rezone Blackwattle Bay with a new planning framework and planning controls to enable its future urban renewal.

The rezoning proposal is based on the Blackwattle Bay Precinct Plan ('Precinct Plan') which provides a conceptual layout to guide the development of planning controls for the precinct and has informed this report. The Precinct Plan is shown in Figure 2. The Precinct Plan provides overarching guidance about how the area should be developed based on community and stakeholder input, local character and place, current and future demographics, economic and social trends, cultural and environmental considerations, and urban renewal aspirations and needs regarding land use, community recreation, transportation, housing, and jobs. Key characteristics of the Precinct Plan include:

- New homes, jobs and services close to the CBD including:
  - 5,636 jobs / or approximately 5,600 jobs
  - 2,795 residents /or approximately 2,800 residents
  - 1546 dwellings
- A continuous waterfront promenade – the missing link in an otherwise 15km foreshore walk from Woolloomooloo to Rozelle
- New active transport connections to bring the neighbourhood closer to the harbour through new and improved pedestrian and cycling links
- Improved public transport options and minimised vehicle usage strategies including:
  - Minimising car parking spaces with limited on-street parking.
  - Ferry wharf
  - Opportunity for buses to service through site link
  - Connections to the existing light rail
  - Access to a future Sydney Metro West Station in Pyrmont
- New parks and green space with 30,000 m2 of new open space
- An authentic, and world class new SFM at the heart of Blackwattle Bay
- An authentic place that builds on Indigenous and industrial stories and celebrating the local character.

Once the Study Area is rezoned and the new planning controls are in place, future development will need to seek development approval through the relevant approval pathway. This will include detailed development proposals and further associated environmental, social and economic assessments.

The rezoning proposal responds to the Study Requirements issued for Blackwattle Bay (formerly Bays Market District) by the Department of Planning and Environment in April 2017.



**Figure 2: Precinct Plan**

## 1.4 Vision and Principles

Principles for a future Blackwattle Bay were formed through extensive community consultation in August 2017. These were further developed in 2019, together with a vision for the precinct. Both are provided below. These have guided the development of the Precinct Plan and will continue to guide future development proposals within the Study Area.

Vision:

*“Blackwattle Bay offers an extraordinary opportunity to reconnect the harbour, its surrounding neighbourhoods and the city; to showcase Sydney’s living culture and stories of Country; to build an inclusive and iconic waterfront destination that celebrates innovation, diversity and community.”*

Principles:

1. Improve access to Blackwattle Bay, the foreshore and water activities for all users
2. Minimise additional shadowing to Wentworth Park and Glebe Foreshore (in mid-winter) and create new places with comfortable conditions for people to enjoy.
3. Pursue leading edge sustainability outcomes including climate change resilience, improved water quality and restoration of natural ecosystems.
4. Prioritise movement by walking, cycling and public transport.
5. Balance diverse traffic movement and parking needs for all users.
6. Link the Blackwattle Bay precinct to the City, Glebe Island and White Bay and other surrounding communities and attractors.
7. Mandate Design Excellence in the public and private domain.

8. Integrate housing, employment and mixed uses to create a vibrant, walkable, mixed use precinct on the city's edge.
9. Maintain and enhance water uses and activities.
10. Allow for co-existence and evolution of land uses over time.
11. A place for everyone that is inviting, unique in character, socially inclusive and affordable.
12. Expand the range of recreational, community and cultural facilities.
13. Plan for the future community's education, health, social and cultural needs.
14. Deliver development that is economically, socially, culturally and environmentally viable.
15. Embed and interpret the morphology, heritage and culture of the site to create an authentic and site responsive place.
16. Foster social and cultural understanding and respect to heal and grow relationships.

## 1.5 SSP Study Requirements

On 28 April 2017 the Minister issued Study Requirements for the Precinct. This report considers and addresses the following requirements as they relate to ecologically sustainable development.

We note that ESD requirement 16.2 is primarily addressed as part of the *Water, Riparian Land, Flooding and Stormwater Study* prepared by Cardno (2021). The remainder of the Climate Change Adaptation requirements are addressed through the Climate Change Adaptation Plan prepared by AECOM.

Table 1: Study Requirements

Study Requirement		Report Section
<b>Ecologically Sustainable Development (ESD)</b>		
16.1	Provide an Ecologically Sustainable Development Report which details how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated, specifically:	Whole Report
	<ul style="list-style-type: none"> <li>identify performance benchmarks to allow sustainability to be considered in site planning, building design and in the construction and operational phases of development to achieve best practice sustainability outcomes; and</li> </ul>	Section 5.1
	<ul style="list-style-type: none"> <li>commitment to compliance with a nationally recognised rating system (e.g. Green Star – Communities).</li> </ul>	Section 5.1 Section 7.1
16.2	Provide an Integrated Water Cycle Management Strategy that considers water, waste water and stormwater. The Strategy must consider water sensitive urban design and any future water conservation measures, including water efficiency and reuse, following appropriate best practice and guidelines and priorities meeting non-potable water demands with recycled water or harvested stormwater.	Addressed in <i>Water, Riparian Land, Flooding and Stormwater Study</i> (Cardno).  Refer also to Section 5.2.2 Section 6.1.2
16.3	Identify options to achieve a minimum of 50% renewable energy for the precinct, by maximising on-site generation and renewable energy generated off site.	Section 6.1.1
16.4	Identify and implement waste management strategies to achieve NSW Government's Waste Avoidance and Resource Recovery Strategy 2007 (WARR) and compliments the NSW Government's Waste Less, Recycle More initiatives and EPA waste and recycling programs. Include measures to ensure effective operational waste management,	Section 6.1.3

	for example adequate space within buildings for waste infrastructure, off-street storage for collection and accessibility for waste collection vehicles. Identify both building and precinct scale solutions.	
16.5	Prepare the required design provisions, in collaboration with CoS and DPE, which are able to be integrated into Sydney DCP 2012 if required.	Section 6.4
<b>Climate Change Adaptation</b>		
17.1	Undertake a sustainability assessment of the proposal, reflecting the directions outlined in the 'NSW Climate Change Policy Framework', October 2016, and the draft Central District Plan "Creating an efficient Central District" to achieve net-zero carbon emissions by 2050. Investigate options for achieving both net zero buildings and a net zero precinct.	Section 6.1.1
17.5	Demonstrate consideration of the Urban Green Cover in NSW Technical Guidelines (OEH, 2015)	Section 6.1.1 Appendix A
17.6	Demonstrate compliance with BASIX is achievable and investigate opportunities to deliver beyond-compliance BASIX scores: Energy 40 and Water 60 for residential buildings (6+ storeys).	Section 5.1 Section 6.1.1

This ESD Report will also consider several State and local planning documents and strategies, including many outlined in the ESD Requirements 1. Vision, Strategic Context and Justification, as so far as these are relevant to the scope and output of the ESD Report.

## 2.0 Methodology

AECOM was engaged by Infrastructure NSW (INSW) to prepare an ESD Existing Environment Report for the proposed Blackwattle Bay development. The purpose of the Existing Environment Report was to inform the ESD Report (this Report) to be submitted as part of the SSP Study for the proposed redevelopment of the Precinct.

This ESD Report leverages the Existing Environment Report's findings to identify sustainability targets and initiatives for investigation and implementation in the site. In addressing the SSP Study Requirements, the following approach was undertaken.

### **Identify Existing Environment Context**

The Existing Environment Report provided context to enable the selection of sustainability measures in the ESD Report. This included reviewing relevant strategies, policies, market drivers and guidelines applicable to the Blackwattle Bay Precinct and characterising the existing site sustainability context. It also identified high-level sustainability opportunities and constraints in the urban renewal process for Blackwattle Bay. It was informed by previous work including Energy, Water and Waste Context Analysis undertaken by AECOM (2017) and workshops held between UrbanGrowth NSW (now Infrastructure NSW) and City of Sydney representatives in 2017. These workshops covered integrated water cycle management strategy options (September 2017) and waste and resource recovery strategy options (October 2017).

The ESD Report has leveraged this analysis to outline the most up-to-date sustainability context for the Precinct, detailed in Sections 3.0 and 4.0, and Appendixes A and B.

### **Develop and Test Sustainability Targets and Initiatives**

The context of the site informed the identification and development of sustainability targets and initiatives included in this Report through identifying priority areas of influence and impact that would need to be addressed in the planning, design, construction and operation of the Precinct. These targets and initiatives are aimed to meet the existing and future community and environmental needs. This process involved a multidisciplinary collaborative workshop with INSW, the design team and key consultants, such as utilities, stormwater and resilience consultants to determine the applicability of suggested initiatives and targets. These targets were subsequently presented to and workshoped with the Project Working Group (PWG), including representatives from INSW, the Department of Planning, Industry and the Environment (DPIE), Transport for NSW (TfNSW) and the City of Sydney, for consideration in this ESD Report.

### **ESD Recommendations and Framework Assessment**

The targets were used in conjunction with the established site context to provide ESD recommendations and identify initiatives for the precinct plan and recommendations for future design investigation. The proposed precinct plan was also assessed through an ESD framework that demonstrates compliance with a nationally recognised rating system - the Green Star Communities National Framework. This framework also identified opportunities for further sustainability initiatives in the Precinct.



### 3.0 Sustainability Context Analysis

Establishing a picture of the policy and market context for the Blackwattle Bay precinct requires an assessment of the international, national, state and local policy and regulatory drivers from an ESD perspective. This includes the relevant legislation, government policies, strategies, targets and goals as well as industry standards. This section provides a brief and high-level assessment of the relevant regulatory drivers that will inform or influence the sustainable development outcomes for the precinct. A more detailed analysis of the regulatory and market factors is found in **Appendix A**.

**Table 2: Sustainability Context Analysis**

Driver	Brief Description	Brief Implications
<b>International and National Policy Context</b>		
<b>United Nations Sustainable Development Goals</b>	In 2015, the United Nations General Assembly passed a resolution on the global agreement of 17 Sustainable Development Goals (SDGs) to form a roadmap for global development efforts to 2030 and beyond.	While non-binding, for Australia the 2030 UNSDG Agenda will be highly influential in shaping commitments, development cooperation and finance flows as well as global government and private sector reporting.
<b>Paris Agreement – United Nations Framework Convention on Climate Change</b>	The Paris Agreement sets out a global action plan to reduce the impacts of climate change by limiting global warming to below 2°C and pursue efforts to keep warming below 1.5°C above pre-industrial levels. To limit global average temperature increase to 1.5°C requires all sectors of the economy to achieve net zero emissions by 2050.	Australia has set a target to reduce emissions by 26-28% below 2005 levels by 2030. The planning and development of the Blackwattle Bay precinct will occur under the carbon emissions trajectory set by Australia's involvement in the Paris Agreement.
<b>National Energy Productivity Plan (NEPP)</b>	The NEPP aims to improve Australia's energy productivity by 40% by 2030. To meet the 40% target, a doubling of the rate of energy productivity improvement compared to business-as-usual is required.	The NEPP does not mandate any development to achieve certain energy productivity targets. However, it acts as guidance for energy efficiency and energy productivity measures that could be considered for the Blackwattle Bay precinct.
<b>Australia's Renewable Energy Target (RET)</b>	The RET is a legislated target designed to ensure the increased uptake of renewable energy in Australia, and in the process reduce overall GHG emissions. The current target is for 23.5% of Australia's energy, the equivalent of 33,000 GWh of electricity, to come from renewable sources such as wind, solar, and hydroelectric by 2030.	The RET is not directly relevant to Blackwattle Bay, however it sets out the overall trajectory on renewable energy uptake from a policy perspective. The RET also enables any on-site renewable generators to claim certificates to improve its overall business case, which may present an option for on-site generation in Blackwattle Bay.
<b>National Construction Code</b>	The Code sets the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia. The NCC is published in three volumes. Volumes 1 and 2 are the Building Code of Australia, and Volume 3 is the Plumbing Code of Australia.	Of relevance to Blackwattle Bay is Section J under Volume 1. Section J detailed Energy Efficiency requirements and was updated in May 2019 to drive a reduction in energy consumption of commercial buildings by a potential 35%. Section J is of importance as it will drive building energy efficiency and have an impact on the net carbon position of the entire precinct.
<b>Climate Active Carbon Neutral Standard</b>	Climate Active is a partnership between the Australian Government and Australian businesses to drive voluntary climate action. It is the new iteration of the National Carbon Offset Standard which has been available since 2010.	Climate Active certification is available for organisations, products, services, events, buildings and precincts. The certifications most applicable to the Blackwattle Bay are the buildings (delivered through NABERS National Administrator or the Green Building Council of Australia) and precincts certifications

<b>Sustainability Rating Tool – NABERS</b>	NABERS is a national rating system that measures the environmental performance and impacts of Australian office buildings and tenancies, shopping centres, hotels, data centres and apartment buildings in terms of energy efficiency, water usage, waste management and indoor environmental quality at the operational stage.	NABERS is mandated for commercial floor space within the development where the office space is greater than 1,000 m <sup>2</sup> via the Commercial Building Disclosure program. There may be opportunity to consider other NABERS benchmarking and monitoring for water, waste and indoor environment to enable effective benchmarking and reporting if considered appropriate.
<b>Sustainability Rating Tool - NatHERS</b>	The Nationwide House Energy Rating Scheme (NatHERS) rates the energy efficiency of a home on a 10-star rating system. NatHERS primarily focuses on the potential heating and cooling energy use, centred on thermal comfort of the building's inhabitants.	NatHERS will provide greater opportunity for the reduction of energy used in buildings for thermal comfort as well as provide means for better future-proofing from climate change and related temperature increases.
<b>Sustainability Rating Tool – Green Star Communities and Green Star Buildings</b>	Green Star is an internationally recognised rating system that delivers independent verification of sustainable outcomes throughout the life cycle of the built environment. The Green Star – Communities rating tool evaluates the sustainability attributes of the planning, design and construction of large-scale development projects at a precinct, neighbourhood and/or community scale. Green Star – Buildings (previously Design & As-Built) evaluates sustainability in the design and construction of buildings only.	Green Star is designed to be a voluntary rating tool to incentivise better practice within the property development industry. The Study Requirements for Blackwattle Bay require commitment to compliance with a nationally recognised rating system, such as GBCA's Green Star – Communities rating tool.
<b>NSW Policy Context, Controls and Guidelines</b>		
<b>Environment Planning and Assessment Act (1979) and Regulation (2000)</b>	The <i>Environmental Planning and Assessment Act 1979</i> includes objects that are guiding principles that need to be considered by planning authorities, such as councils and Local Planning Panels, when making decisions under the Act, as well as definitions and requirements. The <i>Environmental Planning and Assessment Regulation 2000</i> defines in clause 7(4) of Schedule 2 the principles of ecologically sustainable development (ESD).	The redevelopment of Blackwattle Bay is subject to the requirements set under the <i>Environmental Planning and Assessment Act 1979</i> (EP&A Act) and the regulations supporting the Act. The SSP Requirements for the precinct specifically reference the ESD principles set out in the clause 7(4) of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> .
<b>NSW Climate Change Policy Framework</b>	The Framework outlines the NSW Government's long-term objectives to achieve net-zero emissions by 2050 and to create a more climate resilient NSW. It includes actions to implement emissions savings policies, lead by example, assess and manage climate change risk to government assets and services and to support households, communities and businesses.	The development of Blackwattle Bay should be aligned with the Framework policy directions, where relevant, particularly regarding boosting energy productivity and reducing climate change impacts.
<b>Net Zero Stage 1 Plan: 2020-2030</b>	The Plan is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. It aims to support actions to deliver a 35 per cent cut in emissions by 2030 (compared to 2005 levels). These actions include initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.	The development of Blackwattle Bay should be aligned to the focus areas of the Plan, particularly where there are opportunities to contribute to the state-wide ambitions for increased energy efficiency, electric vehicles and organic waste management.
<b>NSW Electricity Strategy</b>	The NSW Electricity Strategy aims to provide a "pathway for a reliable, affordable and sustainable electricity future" and to encourage over \$8 billion of new private investment in the NSW electricity system; deliver coordinated Renewable Energy Zones;	The Strategy takes a state-wide approach, however it should be considered in the context of the increased population and electricity demand in Blackwattle Bay. Energy efficiency measures and onsite



	save energy during peak demand; develop new electricity generators; and set a target to boost NSW's energy resilience.	renewable energy may be initiatives that can be implemented in Blackwattle Bay to compliment the Strategy.
<b>Technical Guidelines for Urban Green Cover in NSW</b>	The Technical Guidelines (2015) are part of the NSW Government intent to minimise and accommodate the impacts of climate change to communities, health services and local infrastructure. It includes a range of strategies such as vegetated and reflective roofs, green walls, street plantings, permeable and reflective road surfaces, and cool open spaces and parks.	The Guidelines are meant for integration in strategic plans, development control plans, public domain guidelines or urban design studies and can inform the use of green strategies in Blackwattle Bay. The approaches are mostly low cost and can provide ecosystem services such as stormwater management, clean air and habitat for wildlife.
<b>Building Sustainability Index (BASIX) SEPP</b>	BASIX is a sustainability planning instrument that sets energy, thermal comfort and water design standards for all residential dwelling types in NSW. It drives energy and water use efficiencies through specific design strategies and prescriptions for lighting, heating, cooling and ventilation for energy, and potable water use and non-potable water replacement rates for water.	The BASIX targets will influence overall electrical and potable water demand in Blackwattle Bay. This will ensure an extent of futureproofing from climate change and related temperature increases. However, achieving increased BASIX Energy scores will need to be balanced with implementing the most sustainable technologies.
<b>SEPP 65 and the Residential Apartment Design Guideline</b>	The SEPP 65 promotes better apartment design across NSW through the establishment of a consistent approach to the design and assessment of apartments and the way they are assessed by councils. The ADG explains how to apply SEPP 65's design principles and provides guidance on overall apartment building design.	The SEPP and the ADG will guide the apartment design within Blackwattle Bay to drive sustainable design for the benefit of the residents, as well as reduce energy and water demand and reduce waste generation.
<b>NSW Waste Avoidance and Resource Recovery Strategy 2014-2021</b>	The WARR Strategy provides a framework for waste management to increase recycling across municipal, commercial/industrial and construction and demolition waste streams; divert waste from landfill; better manage problem wastes, reduce litter and illegal dumping.	Although a state-wide strategy, the wastes produced in the renewal of Blackwattle Bay will contribute to NSW's overall waste generation. Increased recycling and diversion from landfill of these wastes from Blackwattle Bay should align to the state-wide approach.
<b>NSW 20 Year Waste Strategy (Draft)</b>	Released in May 2020 for public consultation, the Draft Strategy seeks to establish policies and actions to generate less waste, develop a circular economy, improve collection and sorting, improve waste and recycling infrastructure and create end markets.	It is expected that the Strategy will be released in 2021, however the principles driving the development of the Strategy should be considered in the development of Blackwattle Bay.
<b>Waste Less, Recycle More</b>	The NSW Environmental Protection Authority's (EPA) Waste Less, Recycle More initiative provides funding programs and seeks to encourage local communities to think differently about waste avoidance, recycling, littering and illegal dumping; deliver waste infrastructure; drive innovative regulatory approaches to protect the environment; and support investment in new waste programs.	The Blackwattle Bay SSP Study Requirements stipulate that the waste management strategies identified for the precinct compliment the Waste Less, Recycle More initiatives and EPA waste and recycling programs.
<b>Better Practice Guide for Resource Recovery in Residential Developments (2019)</b>	The Guide was released by the NSW EPA to assist local planners, architects, urban designers, developers and other professionals to incorporate better waste and recycling management design practices in residential developments and is centred on four waste and resource recovery design principles.	The Guide only applies to residential developments, and does not cover commercial, retail or industrial premises. As such, the Guide can be referenced during the design of Blackwattle Bay's residential buildings to ensure the best waste management outcomes are realised.
<b>Regional and Local Policy Context, Controls and Guidelines</b>		

<b>Greater Sydney Commission's Eastern City District Plan</b>	The Precinct falls within the Eastern City District Plan area and the Plan sets out the NSW Government's vision, priorities and actions for the Eastern District. The District is characterised by a high concentration of jobs, good road and public transport connectivity and high levels of interaction between business and people.	The Eastern City District Plan includes Planning Priorities and their corresponding objectives and strategies. Several of these are of relevance for consideration during the planning of the Precinct.
<b>Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005</b>	The Plan provides a framework to maintain, protect and enhance the catchment, foreshores, waterways and islands of Sydney Harbour. The government is currently reviewing the Plan and proposes to merge it into a single State Environment Planning Policy (SEPP) (Environment).	The Plan does not apply to Blackwattle Bay as it is overridden by SEPP (State and Regional Development) 2011. However, it is important to recognise the planning principles to be used by councils for the preparation of planning instruments.
<b>Sydney Development Control Plan (DCP) 2012</b>	The Sydney DCP is a consolidation of the previously separate DCPs and policies in force within the City of Sydney LGA. The Sydney DCP does not apply to Blackwattle Bay as it is overridden by SEPP (State and Regional Development) 2011.	The Blackwattle Bay precinct is surrounded by land that is bound by the Sydney DCP. To enable connection with the surrounding urban fabric, considerations will be made to the general provisions in the Sydney DCP in recognition that the Blackwattle Bay precinct will interface with the broader LGA.
<b>Pymont Peninsular Place Strategy</b>	The Pymont Peninsular Place Strategy proposes a 20-year vision and planning framework to guide development and renewal in Pymont. The Strategy includes 10 Directions and five 'big moves' for Pymont and envisions the area as sub-precincts that each support the implementation of the Strategy in different ways and to recognise the unique characters of the areas in Pymont.	The Strategy includes key sustainability directions and Blackwattle Bay is one of the sub-precincts with 20 place priorities for the area identified. Precinct-scale sustainability solutions and the implementation of green building facades and rooftop gardens are highlighted as particularly relevant for this Report from the Blackwattle Bay sub-precinct priorities.
<b>City of Sydney City Plan 2036</b>	In March 2020, the City of Sydney released the final City Plan 2036: City of Sydney Local Strategic Planning Statement. It sets out the 20-year land use planning vision and reinforces the links between the NSW Government's strategic plan, including the GSC Regional and District Plans, the City's Community Strategic Plan, Sustainable Sydney 2030, and the planning controls that guide development in the City of Sydney.	The City Plan includes 13 priorities, objectives and several actions to achieve the vision and guide future planning controls. Several of the priorities are relevant to the approach to ESD in Blackwattle Bay.
<b>City of Sydney Sustainable Sydney 2030</b>	Sustainable Sydney 2030 is the overarching program for the development of the city to 2030 and beyond. The strategy ties together several plans covering the economy, carbon neutrality, green infrastructure, renewable energy, decentralised water, sustainable transport, light rail and car sharing. City of Sydney is currently reviewing the strategic plan and planning for Sydney 2050.	Several of the targets in Sustainable Sydney 2030 are relevant to development in Blackwattle Bay, including achieving carbon neutrality, increasing renewable energy, reducing potable water use and increasing tree canopy cover.
<b>City of Sydney Environmental Action Strategy and Action Plan</b>	The Action Plan falls under the Sustainable Sydney 2030 strategy and sets out the short- and medium-term priorities and actions for its local government area. By 2021, the City of Sydney is committed to reducing emissions in its operations by 44% from 2006 levels. Across the LGA, the City of Sydney has also set targets for 50% renewables by 2030, 70% reduction in 2006 greenhouse gas emissions levels by 2030 and net-zero emissions by 2050.	The Action Plan includes several areas of impact. The areas of impact most relevant to Blackwattle Bay include: excellence in new building design; Low-carbon city; Water sensitive city; and Zero waste city.





<b>City of Sydney Climate Change Adaptation Plan</b>	The Climate Change Adaptation Plan is a supporting document to the Environmental Action Plan. It outlines the key projected climatic changes that may affect the City and its residents. It also outlines several adaptation measures to address these risks, as applicable to the LGA.	The Adaptation Plan and the measures included within it will inform the development of Blackwattle Bay and the climate change and adaptation considerations for the precinct. This is further addressed in the Climate Change and Resilience Assessment (AECOM 2020).
<b>Resilient Sydney – A strategy for City Resilience 2018</b>	The Strategy is a 5-year plan with 5 directions and 35 actions to achieve the vision of Sydney as a metropolis that is connected, inclusive and resilient. The Strategy was developed with participating councils of metropolitan Sydney, including the City of Sydney.	The directions and actions in the Strategy will inform the future resilience planning for Blackwattle Bay and will be a component of the climate change and resilience risk assessment.
<b>City of Sydney Leave Nothing to Waste Strategy and Action Plan</b>	The Action Plan sets targets and strategies for residents, business operations and construction and demolition activities in the local government area away from landfill.	The City of Sydney controls domestic and public recycling and waste management. The target will inform the approach to waste management in Blackwattle Bay.
<b>City of Sydney Guidelines for Waste Management in new Developments</b>	The City of Sydney has produced Guidelines for Waste Management in New Developments which falls under other sustainability policies. The Guidelines aim to assist architects, designers, developers, planners, consultants, builders and building managers to manage a building's waste outputs. The Guidelines provide specific advice depending on development type and include provisions to address space, access and amenity requirements, safety, waste services and waste management systems.	The principals and practices presented in the Guidelines are relevant for consideration in the design for waste management in new buildings in Blackwattle Bay. In particular, the Guidelines detail waste and recycling requirements for multi-unit residential developments with shared waste and recycling bins. This includes space for waste segregation and storage within individual dwellings and within the residential building and the design of waste disposal chute systems.
<b>City of Sydney Urban Forest Strategy</b>	The City of Sydney's Urban Forest Strategy (2013) is the City's plan to increase the City's 'urban forest', including strategies to protect and maintain existing trees, to increase the tree canopy cover in streets, parks and private property, and to increase diversity of trees in the area. The document sits under the City of Sydney's Environmental Action Plan 2016-2021 and underpins the City's commitment to deliver a "Green, Global and Connected City".	The outcomes and targets in the Strategy inform the urban forest planning for Blackwattle Bay and inform the approach to green infrastructure and tree canopy targets in this Report.





## 4.0 Sustainability Trends and Drivers





There are several contextual, market and industry drivers that will influence the overall sustainability outcomes of the Blackwattle Bay precinct. These come from emerging market innovations, price trends, supply constraints, climate change or policy changes that present either potential opportunities or emerging risks. Examining these external forces early in the planning process helps to address risks and to capitalise on opportunities to implement the latest sustainability technologies and initiatives. The trends are grouped into Energy and Emissions Trends, Water Trends and Waste Trends as these are the key focus areas of the ESD Report.

This section provides a brief and high-level overview of the macro trends that may influence the selection of sustainability initiatives during the development of the precinct and guides the recommendations made in this ESD Report. A more detailed analysis of the regulatory and market factors is found in **Appendix B**.

**Table 3: Sustainability Trends and Drivers**

Driver	Brief Description		Brief Implications
Energy and Emissions Trends			
	Climate Change	Climate change is already affecting NSW. Climate system modelling shows that NSW is forecast to continue to warm this century - warming is projected to average about 0.7°C in the near future (2020–2039), increasing to about 2.1°C in the longer term (2060–2079). To better prepare for the increase in extreme events, Sydney is a member of the 100 Resilient Cities initiative pioneered by the Rockefeller Foundation.	Considerations such as increased tree canopy cover (every 10 per cent increase in tree canopy can reduce land surface temperatures by 1.13°C) and green infrastructure such as green roofs, planting a variety of vegetation species to increase roughness of the urban landscape and low emissivity and high albedo (reflectivity) materials/coatings should be considered in the planning of the Precinct.
	Electricity Prices	Analysis of residential electricity price trends by Australian Energy Market Commission showed that between 2018-19 to 2021-22 there is expected to be a decrease in residential electricity prices by 8.3 per cent which equates to an average annual saving of \$107 per dwelling.	This decrease in electricity cost means that there is increased opportunity to explore the full, or at least increased, electrification of buildings.
	Building Electrification	Building electrification involves transitioning from gas to electricity for space and water heating and cooking appliances in buildings to eliminate a building's direct greenhouse gas emissions. In Greater Sydney, energy use in buildings continues to be the largest contributor to greenhouse gas emissions. The City of Sydney is currently developing performance standard pathways to net zero energy buildings for use in planning controls in collaboration with other industry stakeholders.	Electrification is necessary for achieving net zero buildings (without using carbon offsets) as it is possible to decarbonise electricity consumption, unlike gas. To meet the NSW Government's net-zero goal, gas use will need to decline by 80 per cent by 2050. Consideration of electrifying systems that provide hot water, heating, ventilation and air-conditioning (HVAC) and cooking should be made in the development of the Precinct.
	Renewable Energy Generation	At the end of 2019, 11.1 GW of new renewable energy generation was under construction or financially committed. AEMO expects that residential, industrial and commercial consumers are expected to continue to invest heavily in distributed PV, as well as in battery storage and load management, with distributed energy generation capacity expected to double or triple by 2040. The advancement in solar PV technology is due to the increasing efficiency (the amount of solar energy that can be converted into electricity) of PV in research under	The trend of decreasing solar cost is likely to continue and it is recommended that the opportunity for rooftop solar be incorporated into the design of the Precinct to help achieve the minimum 50 per cent renewable energy for the precinct, as required by the Study Requirements. This is to provide advantages such as energy independence, risk mitigation against the potential for electricity price increases, reduction in greenhouse gas emissions and to help meet the target of exceeding BASIX Energy requirements.

		laboratory conditions and the efficiency increases in PV that can be mass produced at an affordable price. Since 2012, the solar installation prices in Sydney have dropped approximately 60 per cent.	
	Grid Decarbonisation	There have been several notable trends that have driven the decreases in the grid carbon intensity: policies that support renewable energy, a reduction in demand, carbon pricing from mid-2012 to mid-2014, closure of coal power stations and increasing deployment of renewable resources. The Draft 2020 Integrated System Plan by AEMO outlines how Australia's grid can be managed under several different transition scenarios. The Plan recognises that even if the pace of the change differs, all scenarios trend to the decarbonisation of the electricity grid and an increase in renewable energy.	The Precinct will be developed under a grid decarbonisation scenario, regardless of the pace of this change. As such, the decarbonisation of the grid should be factored into demand and generation models for on-site renewable energy and other renewable energy arrangements.
	Green Infrastructure	Green infrastructure is a crucial element to increase the liveability of our cities, particularly as Sydney's population continues to grow. Green infrastructure describes green space in the private and public realm and includes parks, private gardens, street trees, native remnant vegetation and more engineered systems such as rain gardens and green roofs. Green infrastructure elements can provide many positive benefits to urban cities such as increased biodiversity, improved air quality, stormwater control, enhanced connection to nature for residents, enhanced property values and provides shade to reduce cooling loads in summer.	Considerations should be made to include green infrastructure in the Precinct, prioritising native, low water use vegetation to align to BASIX water targets. Incorporating green roofs and walls could also improve the thermal performance of buildings and reduce cooling loads, as well as improve the amenity of the Precinct. Further investigation in the detailed design phase is recommended to quantify the energy savings of green roofs to estimate their contribution to energy targets.
	Electric Vehicle Uptake	Driven by the price reduction of lithium-ion batteries due to mass production, electric vehicles (EVs) have gone from concept to a significant market disruptor. While EVs only made up less than 1 per cent of market share for new vehicles in Australia, this rate has been increasing slowly over the last 10 years. Additionally, forecasts show EVs reaching 100 per cent of new sales in the next 25 years. Installing EV charging infrastructure is likely become a requirement in NSW as the ACT has committed to requiring all multi-unit and mixed-use developments to install EV charging infrastructure. Whilst capacity is increasing, future-proofing of the precinct can occur, by ensuring lead-in infrastructure required for any future retrofitting of EV related infrastructure is provided.	Given that the proliferation of EVs is within the Precinct's design life, considerations should be made for EV charging infrastructure. However, this needs to be carefully managed with the impact of peak demand on electrical infrastructure. There is potential for EV charging behaviour to contribute to daily peak periods requiring costly augmentation of infrastructure. This can be managed by staggering of charging throughout the day or night to coincide with off-peak periods through demand management.
	Transport Trends	Rapid innovation is transforming the way we travel, the transport modes we use to travel and the way the different modes of transport operate. Cheaper, more flexible and more reliable technologies are accelerating the automation of buses, trains, cars and trucks. Data sharing and mobile technology are enabling smarter, cheaper and faster ways to plan trips and travel, with ridesharing, car share, hire car and smart parking being some examples.	Flexibility should be incorporated to cater for future trends and technologies such as electric vehicles, the use of drones for parcel delivery and driverless vehicles. Blackwattle Bay will not only be a hub for the local community and residents but, with the new Sydney Fish Market, it will also be a key tourist destination. In order to determine and prioritise the best options for sustainability transport in and near the development, the input from a site-specific traffic and transport assessment is recommended.

	Active Transport	The positive health, environmental and community benefits of active transport, as an alternative to private vehicle use, is increasingly being recognised as a priority. The need for more sustainable active transport is acknowledged by encouraging of walking and cycling, while ensuring easy access and accessibility for everyone. Sustainable transport strategies to respond to these trends include enhancing amenity and lowering traffic speeds for increased walking, providing secure bicycle storage and connected bike paths for higher uptake of cycling, and pedestrianising streets for achieving private car-free development, where only public and special-purpose transport is allowed.	Blackwattle Bay fronts onto several Regional and Local completed and planned bike networks. Additionally, temporary cycleways have been installed in the city as part of a response to COVID-19, with one location proximate to Blackwattle Bay, at Pyrmont Bridge Road. Considering the Precinct's location and proximity to the Sydney CBD, active transport is forecast to be a popular option for residents, workers and visitors. The Precinct is also within walkable access from three light rail stops: Fish Market, Glebe and Wentworth Park. The provision of secure bike parking, such as bike racks or bicycle cages, will be included in the Precinct. Additionally, the street reservation will consider strategies to make walking and cycling trips pleasant and safe.
<b>Water Trends</b>			
	Water Consumption	Despite a growing population, potable water demand in Sydney remains lower than it did before mandatory restrictions were introduced in late 2003, coinciding with the Millennium Drought. The total reduction in demand is due to declining water demand per person, from increased water efficiency in homes and an increased public awareness about water scarcity and drought.	Sydney Water notes that changes to the mix of dwellings with population growth will impact water demand and where water savings will come from in the future, this includes particularly reducing the outdoor consumption of water as the proportion of BASIX compliant houses increases over time. As the population increases and rainfall becomes less predictable due to climate change, measures to decrease water consumption will provide better reliability in the face of stresses or shocks. This highlights the necessity of water saving measures in the Precinct, such as rainwater tanks, native and/or low water use landscaping and high WELS rated appliances and water fixtures.
<b>Waste Trends</b>			
	Waste and Recycling Rates	Total waste generation in NSW has fallen slowly since it peaked in 2010-11, however it has only reduced by 4 per cent. Recycling rates have also moved slowly, in 2014-15 (the latest available data) the proportion of waste diverted for recycling was 63 per cent, compared to 62.5 per cent in 2012-13. Waste generation rates are linked to population growth and increased economic activity. By 2021, it is expected nearly 20 million tonnes of waste will need to be processed a year in NSW. Globally, foreign markets have restricted the import of Australian mixed recycling material meaning there are increased benefits if the Precinct is able to effectively manage the waste generated by the new population and divert waste from landfill.	The City of Sydney has ambitious targets to divert 90% of waste from landfill (with a minimum of 35% as source-separated recycling). Therefore, well-designed waste separation at the Precinct will be critical to achieving this target. Consideration of closing the nutrient loop should also be investigated as this Precinct represents an opportunity to compost food waste and use that fertiliser for landscaping or a communal vegetable garden.
	Circular Economy	The circular economy is underpinned by three main principles: to design out waste and pollution; to keep products and material in use; and to regenerate natural systems. Since there has been a lot of progress in the energy and water use of buildings, including the widespread adoption of solar power and efficient fixtures/appliances, the next frontier in ecologically sustainable development is the embodied energy of materials used for building and designing for the end of life of a building.	It is estimated that 80 per cent of environmental impacts are determined at the design stage and therefore there is a significant opportunity to create a Precinct that considers these principles. Considerations should be made to design the Precinct in a way that considers its future disassembly to increase the circularity potential of the buildings from the start, as well as to use materials that are recycled rather than from virgin resources.

## 5.0 Sustainability Targets and Planning

### 5.1 Sustainability Targets

Several ESD targets have been developed to inform planning controls with the aim of achieving sustainable outcomes in Blackwattle Bay. These targets have been collaboratively developed in line with:

- Statutory requirements;
- Local and state policy;
- INSW programs and policy;
- Best-practice sustainability frameworks; and
- With a view to achieving feasible best-practice for buildings and precincts.

For each target a 'minimum goal' is nominated to outline minimum commitments for master planning and planning approvals. It is recommended that the goals are used to guide tendering options for development and where the tenderers offer increased sustainability ambitions, provide a point of sustainability differentiation among developers/tenderers.

**Table 4: Sustainability Targets for the Site**

Target	Minimum Goal	Target Source	Comment (where required)
Green Star Communities precinct rating	5 star		Version 1.1
Green Star Buildings	5 star	GSC	Version 1
BASIX Energy targets		BASIX SEPP, SSP, CoS,	BASIX targets are expressed as a percentage reduction over NSW benchmarks
Detached houses, semi or terrace houses and townhouses	50		
Low rise (3 storey units)	45		
Mid rise (4-5 storey units)	35		
High rise (6 storey units or higher)	25		
NABERS Energy rating for office and retail buildings	6 star	CoS	
Net-Zero Carbon Precinct	100% by 2050		% reduction in carbon emissions (baseline to be determined)
Precinct powered by renewable energy	50%	SSP	% of total estimated demand provided by renewable energy from off-site and/or on-site sources
NABERS Water rating for office and retail buildings	5 star		
BASIX Water targets		BASIX SEPP, CoS	BASIX targets are expressed as a percentage reduction over NSW benchmarks
Residential buildings other than high-rise	40		
High-rise residential	40		
Public open space irrigation with recycled water	100%		
Operational waste diverted from landfill	70%	CoS, NSW WARR	
Construction & demolition waste diverted from landfill	80%	GSC, CoS, NSW WARR	Excludes waste that is not normally sent to landfill, e.g. hazardous waste, soil from excavation, etc.
Climate change and resilience risks addressed through design	All high and extreme risks addressed	GSC	
Tree canopy cover	60% to streets 30% to parks	SSP, CoS	% of individual areas



	30% to private property		
Electric vehicle parking	10%		Measured as parking yield per parking lot as EV charge station 'turn key' ready at development completion.

Source Abbreviation	Document
BASIX SEPP	BASIX State Environmental Planning Policy
GSC	Green Star – Communities v1.1
SSP	State Significant Precinct Study Requirements
CoS	City of Sydney Requirement and/or Target
NSW WARR	NSW Waste and Resource Recovery Target

## 5.2 Delivery and Implementation

To facilitate the delivery of sustainability initiatives, it is important for an effective governance framework and process of continual review to provide a best-for-project approach that delivers optimal sustainability outcomes.

Many of the recommendations and initiatives outlined in this ESD Report, particularly those relating to building energy and water use, will require further consideration in design development. Where this is the case, this ESD Report has sought to prescribe minimum compliance targets and has recommended the adoption of sustainability frameworks to ensure adoption of the most effective initiatives.

### 5.2.1 Green Star Communities

Developed by the Green Building Council of Australia (GBCA), Green Star – Communities provides a governance framework that is transparent, accountable and adaptable and it is recommended this is adopted to inform decision making and design development. The Green Star – Communities governance category rewards projects that achieve coordinated and transparent approaches, commitment to implementation, stakeholder engagement and sustainable cultures and behaviours.

The GBCA has started a Future Focus program to upgrade and reimagine the Green Star rating tools. It is noted that by the time the Precinct may be at an appropriate planning stage for Green Star, the Future Focus tools may be out for use or piloting.

As the Future Focus equivalent of the current tools represent the most up-to-date frameworks for assessing sustainability in the GBCA suite of tools, it is recommended that NSW consider piloting the Future Focus tool in the Precinct. This will ensure the latest standard of sustainability governance is applied. In this instance, an equivalent or higher Green Star Communities rating should be investigated with the release of the updated rating tool. The ESD Targets for the Precinct already include a target for the updated Green Star Buildings rating, which has replaced Green Star Design and As-Built.

Should the Future Focus tool be used for the assessment of sustainability in the Precinct, it is recommended that an appropriate equivalent Star rating is targeted. This is because a 5 Star Green Star Communities Future Focus rating may be a much greater rating than a 5 Star Green Star Communities version 1.2 that is currently targeted for the Precinct.

### 5.2.2 Integrated Water Cycle Management Plan

The purpose of the Integrated Water Management Plan is to set the strategic direction and implementation approach for water cycle management across the Study Area and will deliver the following outcomes:

- Protect and improve the health of Blackwattle Bay and extended waterways.
- Increase local water harvesting and 'fit-for-purpose' reuse and avoid and limit potable water use where possible.

- Provide water management that achieves environmental and community outcomes including the management of stormwater to enhance the hydrology, minimise downstream impacts and enhance liveability by retaining water within the public domain.
- Enhanced liveability and urban amenity with connections between the community, waterways and open spaces that are resilient to future climatic conditions.

The identified strategies to achieve these objectives include:

- Integration of water sensitive urban design (WSUD) and water efficient practices within the precinct
- Implement strategically prioritised Water Sensitive Urban Design, such as large-scale raingardens in the public domain, which deliver multiple social and environmental benefits
- Engaging with the community around adopting water sensitive behaviours and solutions
- Appropriate design measures to mitigate local flood risk where possible

Section 6.1.2 below outlines water initiatives and 6.3.2 identifies targets for the precinct, however in the next stage of planning and design this will be further explored, together with an implementation plan which will outline the structural and non-structural actions to achieve those targets. Action items will focus on:

- An integrated approach to water management
- Increase demand management and alternative water sources
- Providing appropriate stormwater management solutions

The *Cardno Water, Riparian Land, Flooding and Stormwater Study* provides further information on precinct water management.

### 5.2.3 Staging

Staging of construction will be important to mitigate environmental and social impacts and ensure provision of amenities when the first residents move into the Precinct. Staging will need to ensure that core services are maintained during construction when access to areas of the Precinct will be blocked or limited.

Infrastructure NSW will be developing a staging and disposal strategy subsequent to this SSP study process, which will incorporate the staging of services and amenities.

## 6.0 Sustainable Design Integration

### 6.1 Sustainability Initiatives

This Section outlines the key sustainability initiatives and design opportunities that are recommended for investigation and implementation in Blackwattle Bay. The benefits, challenges, key considerations and how the initiatives contribute to the Precinct targets are outlined for each initiative.

The initiatives are organised in the same categories as the sustainability drivers and trends in Section 4.0: Energy and Emissions; Water; and Waste and reference the drivers and trends using the icons next to each driver.

## 6.1.1 Energy and Emissions Initiatives

### Passive Design



Passive design responds to the local climate and site conditions to maintain comfortable conditions within a building while minimising resource use. It takes advantage of available energy sources, such as sunlight and wind, to provide cooling, heating, ventilation and lighting.

Passive design reduces or eliminates the need for auxiliary heating and cooling which accounts for about 22 per cent of energy use on the average household. It also reduces usage of electric lighting which accounts for about 9 per cent of total annual use in a typical home.

Elements of passive design strategies include consideration of building orientation, layout, shading, thermal mass, natural ventilation, insulation, window placement and design, and sky-lighting.



**Table 5: Benefits and Challenges of Passive Design**

Benefits	Challenges
<ul style="list-style-type: none"> <li>Can lower energy use whilst improving and maintaining acceptable human comfort levels.</li> <li>Relatively low to no cost to implement as passive design seeks to take advantage of existing site conditions.</li> <li>Alignment with prevailing winds can enable natural ventilation and reduce artificial ventilation requirements.</li> <li>Optimises penetration of natural daylighting to reduce indoor lighting energy use and improve human comfort and experience.</li> <li>May help manage the impacts of urban canyons and public domain shading.</li> </ul>	<ul style="list-style-type: none"> <li>Requires consideration very early in design. Once building forms, shapes and sizes are locked in, there is very little scope for adjustment.</li> <li>Needs careful modelling to manage trade-off with energy consumption, e.g. excessive daylighting can lead to unwanted solar gain and increased cooling loads or overshadowing of public domain areas.</li> <li>May impose constraints on floor plate sizes and requires careful material selection to ensure desired outcomes.</li> </ul>

### Key considerations and planning

Whilst there are many benefits to passive design, it must be carefully considered as improper application can increase energy consumption rather than reduce it. For instance, the placement of large westerly windows to improve natural daylighting can introduce unwanted solar heat gain into the building in the afternoon, particularly in summer. This can increase annual cooling load by approximately 10-20 per cent (indicative), which is typically larger than the reduced lighting loads, resulting in a net-increase in energy consumption.

The proposed Precinct Plan demonstrates consideration of passive design, including a building layout plan that allows for natural airflow across the site and incorporates building height variation. The solar access to the Precinct has also been modelled and the detailed design should ensure northerly orientation of daytime living areas, where feasible, for passive heating. Sufficient north-facing glass can be a challenge to accommodate in narrow precincts. Indicative access to residential towers has also been considered in the Precinct Plan, and detailed design will need to further consider the design of openings to allow for passive cooling, as well as the details for building facades and shading structures.

If implemented correctly, the above passive design initiatives can assist in meeting and exceeding the Green Star, BASIX Energy and NABERS targets proposed for the Precinct by reducing heating, cooling, and lighting loads in buildings.

## Energy Efficiency



Energy efficiency measures are improvements that reduce energy consumption while maintaining the same level of functional output.

Achieving energy efficiency may require a combination of initiatives to reduce energy use and peak demand. Selection of the best initiatives may require energy demand modelling and feasibility analysis. Initiatives may include, but are not limited to, effective insulation (also an element of passive design); efficient and smart lighting (for example LED lights and light sensors); efficient heating, ventilating and air conditioning (HVAC) systems; thermal zoning; appropriate material selection; highly energy efficient rated appliances.

Energy efficiency measures enable electricity reductions in both common property and individual apartments. However, the extent to which energy use is reduced depends on the initiatives incorporated. Energy efficiency will also assist in the implementation of on-site renewables, such as solar PV, as the efficiency measures reduce the amount of energy required to be generated from on-site renewables energy systems.



Table 6: Benefits and Challenges of Energy Efficiency

Benefits	Challenges
<ul style="list-style-type: none"><li>Significantly reduces energy use and associated carbon emissions.</li><li>Can reduce impact on peak electricity demand.</li><li>Reduced energy consumption and peak demand can defer need for electricity infrastructure augmentation.</li><li>Low to moderate upfront costs.</li><li>Short to medium term payback periods.</li></ul>	<ul style="list-style-type: none"><li>Final efficiencies depend on how systems are operated.</li><li>Some initiatives may have increased maintenance requirements.</li></ul>

### Key considerations and planning

Integration of energy efficiency measures in buildings will be essential to achieving the BASIX Energy targets proposed for the Precinct, with comprehensive implementation of energy efficiency measures providing opportunities toward exceeding the minimum requirements. Utilising ratings systems such as BASIX, NatHERS and Green Star rating tools can help to achieve the most appropriate energy efficiency measures, either standalone or in combination with other initiatives.

There are a variety of energy efficiency and optimisation measures available on the market; from efficient appliances through to integrated energy systems. However, their effectiveness and life cycle benefits depend on the appropriate application of the initiative. Building-specific energy efficiency measures should be determined at the detailed design stage.

Additionally, the infrastructure required for distributed energy and microgrids, which support energy efficiency through the efficient management of energy supply, should be evaluated for feasibility in further Precinct planning and detailed design.

## Building Electrification



Building electrification requires transitioning from gas to electricity for space and water heating and cooking appliances. This works to eliminate a building's direct GHG emissions and is necessary for achieving net-zero buildings and net-zero precincts without using carbon offsets, unlike gas.

At present, mains natural gas has lower carbon intensity than NSW grid electricity for thermal end-use purposes. However, this is expected to change over the next 20 to 30 years as large-scale renewables continue to come online in the electricity network and drive grid decarbonisation and as more unconventional sources of gas are explored.

Building electrification works best in partnership with other initiatives including energy efficiency gains, on-site solar PV and sourcing grid renewable energy. However, the extent to which the emissions reduction benefit is realised depends on the electricity source and requires renewable energy to achieve the aim of a net-zero precinct and net-zero buildings.



**Table 7: Benefits and Challenges of Building Electrification**

Benefits	Challenges
<ul style="list-style-type: none"> <li>• When powered with renewable electricity, it is a key enabler for the precinct to become net-zero.</li> <li>• Potential to use heat pumps which provide air conditioning and heating more efficiently.</li> <li>• Can reduce capital cost due to not installing gas infrastructure and electrical heat pumps can provide both air conditioning and heating which avoids the need to use separate infrastructure for these purposes.</li> <li>• Can lead to reduced operational costs, depending on electricity prices.</li> <li>• May reduce health hazards from indoor air pollution associated with gas appliances.</li> <li>• Removes consideration of the volatility of gas prices.</li> <li>• Induction cooking elements reduce the risk of fire and fire-related accidents from gas burners.</li> <li>• Induction cooktops are approximately 50 per cent more efficient at heating than a gas stove.</li> </ul>	<ul style="list-style-type: none"> <li>• Emissions benefit requires the electricity to be from renewable sources</li> <li>• Gas in apartments and retail (cooking) may be more appealing and familiar. This may impact saleability.</li> <li>• May not be suitable for non-residential buildings as these may include restaurant/café infrastructure that still rely on gas technology.</li> <li>• Can have the potential to negatively impact BASIX score achievement under current system due to update delays.</li> </ul>

### Key considerations and planning

Building specific electrification measures will be determined at the detailed design stage. However, the master planning stage can enable building electrification through the consideration of utilities servicing as well as providing opportunity for on-site renewable energy. Future demand calculations with more detailed building design can be used to demonstrate the requirements for building electrification.

### On-site Renewable Energy – Solar Photovoltaics (PV)





Solar photovoltaics (PV) can be rooftop mounted, integrated into building materials (BIPV), or applied in public spaces. Solar PV converts sunlight into electricity which can be consumed locally or exported into the grid.

Solar PV installations are increasingly considered standard amongst best practice precincts and buildings. PV systems reduce the grid electricity used in a building and assist in managing peak demand. The extent to which grid energy is reduced depends on the PV array size and associated operational losses such as shading, ambient temperature and wiring resistance.



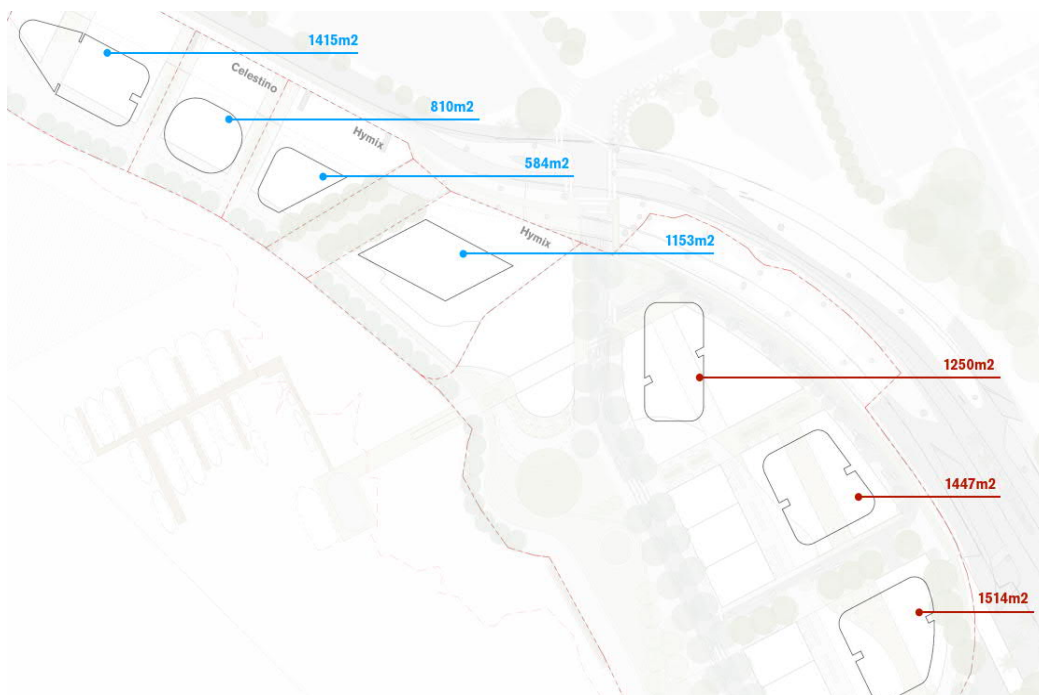
**Table 8: Benefits and Challenges of Solar PV**

Benefits	Challenges
<ul style="list-style-type: none"> <li>• A renewable source of energy with no greenhouse gas emissions.</li> <li>• Appropriate for the climate.</li> <li>• Very low maintenance requirements, if appropriately designed (tilt &gt; 10° for self-cleaning).</li> <li>• Long asset lifetime (solar PV cells &gt; 25-year lifetime).</li> <li>• High scalable system sizes due to modularity of PV panels.</li> <li>• Fast payback periods for roof-mounted PV (~5 years) and increasingly viable payback periods for more novel applications of PV technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Does not generate electricity in the evening.</li> <li>• Operational effectiveness should consider the impact of shading on the solar PV collecting surface, such as from nearby buildings, trees, or clouds.</li> <li>• Moderate to significant spatial requirements and placement considerations needed. With limited roof space available, there is a need to balance competing demands such as community gardens.</li> <li>• Relatively high upfront capital cost, though this is decreasing over time.</li> <li>• Tricky for strata blocks due to metering requirements, roof space availability, long cable runs and mix of stakeholders involved.</li> </ul>

### Key considerations and planning

While solar PV automatically generates renewable electricity during sunshine hours, consideration is required regarding the placement and technology adopted to ensure optimal operation. During the planning stage, key considerations include identifying potential locations for solar installations and ensuring surrounding structures allow solar access.

As demonstrated in Figure 3, the Precinct Plan identifies approximately 8,173 m<sup>2</sup> of privately owned roof top space that may be feasible for solar PV panels, assuming 50 per cent of the roof area on the towers is available for PV (note the area in red is currently government owned). This will be explored further during detailed design. Incorporating solar PV panels can assist in meeting and exceeding several targets set for the precinct, including Green Star Buildings, BASIX Energy, NABERS Energy, Net-Zero Carbon Precinct and the 50% renewable energy target for the precinct.



**Figure 3: Indicative Solar PV Space on Tower Roofs**

However, there may be opportunity to further explore attaching solar panels to shading areas of the buildings, utilising BIPV technologies, or employing novel public space PV, such as in the form of public lighting.

The Study Requirements identify the need to outline options to achieve a minimum of 50 per cent renewable energy in Blackwattle Bay. It is likely that off-site renewable energy will be required to contribute to meeting this target. It is recommended energy modelling is undertaken to determine the feasibility and cost implications of employing both on-site and off-site renewable energy, as well as the appropriate balance between the sources.

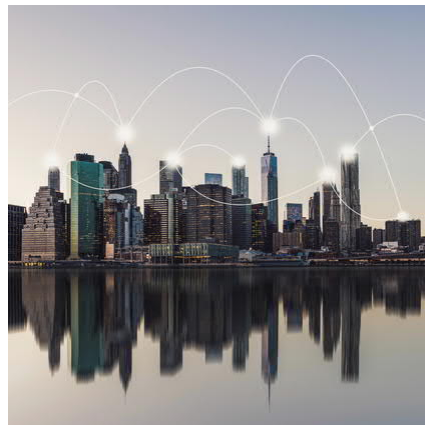
During design, space available for the PV system should be considered and allocated with consideration to competing uses, including community uses and chillers. Roof top structural stability (if roof-mounted) should also be assessed. System sizing should be estimated in development of the final Precinct Plan and confirmed during detailed design. Additionally, the infrastructure required for the use of distributed energy and microgrids, to support renewable energy systems, should be evaluated for feasibility in further site planning and detailed design.

### Microgrids (Embedded Network)

Microgrids are localised electricity grids within a precinct. They are still connected to the local distribution network but also have privately owned generators that produce electricity. They can act as stand-alone supply sources that enable the precinct to operate in isolation from the local distribution network.

A precinct-scale microgrid may enhance the benefits of on-site generation. This is because the energy can be contained within the precinct instead of being exported to the grid.

A microgrid can also control the 'type' of electricity that enters the precinct for use. For example, the microgrid operator can purchase only GreenPower electricity, or engage into a power purchase agreement to ensure that the precinct is serviced only by zero-carbon electricity.





**Table 9: Benefits and Challenges of Microgrids**

Benefits	Challenges
<ul style="list-style-type: none"> <li>Compliments on-site generation technologies, such as solar PV</li> <li>Provides resilience benefits associated with blackouts.</li> <li>Potential to incentivise the microgrid operator to also reduce energy use on the network (energy as a service rather than as a kWh).</li> <li>May flatten peak demand and reduce the need for mains infrastructure upgrades.</li> </ul>	<ul style="list-style-type: none"> <li>Limited market experience in microgrid operation.</li> <li>Increases the complexity of precinct electrical infrastructure.</li> <li>Requires an energy services company to operate and maintain the microgrid.</li> <li>Cost of installation and operation may affect affordability in the precinct.</li> </ul>

### Key considerations and planning

The ownership and governance of a microgrid will depend on the preferred divestment approach for the site, which is yet to be determined. Options include requiring the developer to establish the precinct as an embedded network (microgrid) and to operate the microgrid, with ownership of the infrastructure. This is the approach taken by Frasers Property Australia at their Midtown Project in North Ryde, Sydney. Other alternatives include using an energy services company (ESCO) to establish and run the microgrid.

Central governance of a precinct microgrid is preferred to maximise efficiencies, however this will be subject to engaging an ESCO typically at the DA phase during planning for site development. Where unable to establish a governance framework across multiple building users and owners, an alternative would be to fragment the system and have multiple operators across the precinct.

### Power Purchase Agreements (PPAs)

Purchasing renewable energy works much the same as purchasing any kind of electricity from a utility provider, however the electricity source can be up to 100 per cent renewable.

PPAs are long term agreements for energy buyers to purchase electricity generated by off-site renewables. Purchase of off-site renewable electricity via PPAs may potentially be a cheaper and more viable option than on-site generation as the generation assets are not owned by the precinct. Alternatively, they can be used to compliment the on-site generation if it does not meet the targeted level. While PPAs do not reduce energy use, they procure electricity generated by off-site renewables and therefore reduce or eliminate energy emissions.

**Table 10: Benefits and Challenges of PPAs**

Benefits	Challenges
<ul style="list-style-type: none"> <li>Can enable electricity on-site to be 100 per cent renewable.</li> <li>Does not require on-site renewable energy generating infrastructure which can free up that space for other uses including communal uses.</li> <li>Can be used to guarantee a supply of renewable energy that on-site renewable energy may not guarantee. This can also enable buyers to hedge against future energy cost risks.</li> <li>It may be possible to secure lower renewable energy prices below typical retail offers with PPAs.</li> </ul>	<ul style="list-style-type: none"> <li>Potentially increased energy costs in the short to medium term (compared to non-renewable electric sources).</li> <li>Fixed term PPAs may lead to buyers paying more than the retail price if electricity prices decline over the medium to long term.</li> <li>Staging of the development may impact the feasibility of a PPA across the entire Precinct.</li> </ul>

## Key considerations and planning

Financial considerations and staging of PPAs are key to ensuring affordable access to renewable energy for the Precinct. Depending on the stage of the development and improvements in decarbonising the grid, fixed-term PPAs may lead energy buyers to paying more than the retail price for renewable energy, if renewable electricity prices decline or the grid becomes substantially more decarbonised during finalisation of the development.

Additionally, if off-site renewable energy is to be procured through a mechanism such as a PPA for the majority of the Precinct's renewable power component, it is recommended that modelling is undertaken to determine the feasibility and cost implications of both on-site and off-site renewable energy procurement.

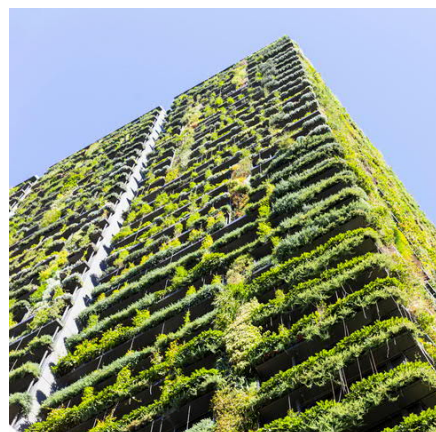
## Green Infrastructure



Green infrastructure plays a critical role in the health and wellbeing of the population and urban ecosystem, with tangible economic benefits demonstrated by an increasing body of research.

Adequate green infrastructure provision may include tree preservation, enabling schemes for green roofs and vertical gardens and maximising opportunities for incorporation of native vegetation plantings.

Trees have a positive effect on reducing energy usage from buildings as they shield paved surfaces and buildings from the sun. In addition, vegetation can assist in mitigating heat island effect, as well as several significant other benefits including air pollution filtration, shade, supporting urban fauna, reducing stormwater pollution and improving the amenity and aesthetics of the urban environment.



**Table 11: Benefits and Challenges of Green Infrastructure**

Benefits	Challenges
<ul style="list-style-type: none"> <li>• Reduce total and peak energy demand.</li> <li>• Mitigate urban heat island effect.</li> <li>• Tangible economic benefits, including property value premiums, lower stormwater management expense, improved public health benefits.</li> <li>• Reduce volume of stormwater runoff and lessens demand on storm drains.</li> <li>• Provide local habitat and boost ecosystem health</li> <li>• Provide amenity, liveability outcomes and aesthetics.</li> <li>• Green roofs can prevent noise infiltration and may offer hail protection.</li> </ul>	<ul style="list-style-type: none"> <li>• Potentially increased spatial provision for green infrastructure elements.</li> <li>• Potentially require ongoing maintenance cost.</li> <li>• May compete with other infrastructure for space.</li> <li>• Trees can compete with building and solar PV systems for solar access (depending on location and height).</li> <li>• Green roofs require deep soil on rooftops which may increase structural design requirements.</li> <li>• Inappropriate plants and species selection can damage underground infrastructure.</li> </ul>

## Key considerations and planning

In general, trees and green infrastructure can provide a cooling effect on buildings and public domain. This benefit can directly reduce energy use for cooling in local buildings. The extent to which energy use is reduced depends on the amount, location and orientation of trees.

Best practice green infrastructure implementation for energy efficiency benefits includes shielding the northern and western facades with deciduous trees which avoid extreme solar thermal loads in summer but not in winter when passive heating from the sun is desirable.

Figure 4 outlines the opportunities for green roofs for Blackwattle Bay, with the green shading representing areas of potential green roofs. This initiatives corresponds well to the priorities for Blackwattle Bay in the Pyrmont Peninsular Place Strategy.



Figure 4: Green Roof Plan (Source: FJMT)

Figure 5 details the urban forest strategy plan developed for Blackwattle Bay, indicating the minimum tree canopy coverage over different parts of the Precinct as well as the suggested distribution of trees by mature canopy size.

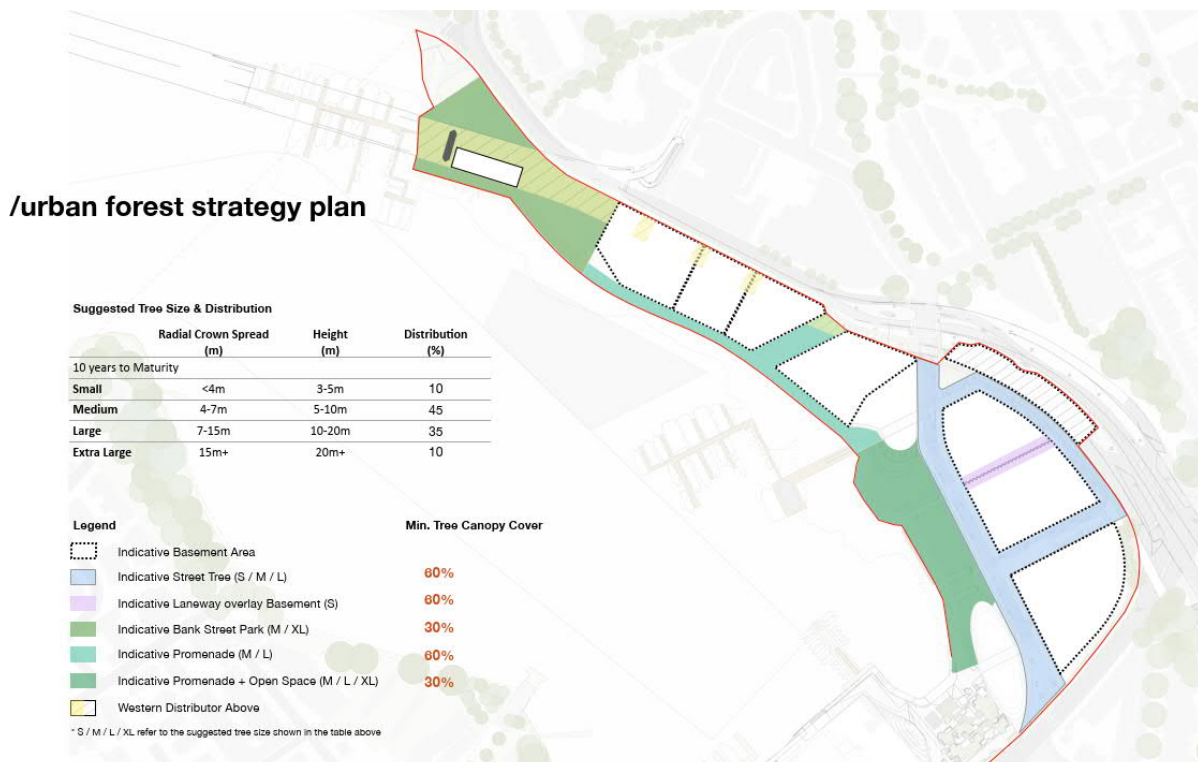


Figure 5: Urban Forest Strategy Plan (Source: FJMT)

Opportunities to connect vegetation and planting at the Precinct to the Sydney Green Grid should be explored for improved habitat connectivity, enhanced biodiversity and ecological resilience.

Specific tree species selection should be determined during detailed design to maximise shading potential in public spaces and to provide cooling benefits to buildings during warmer months and considering the advices from the Technical Guidelines for Urban Green Cover in NSW and the Government Architect's Greener Places Strategy. Given the proximity to the Bay, salinity should be included in the species considerations. A detailed Urban Forestry Strategy with recommendations has been developed as part of the SSP study requirements.

## Cool Materials



Cool roofs and pavements use naturally light-coloured materials or additives to reflect solar radiation which, unlike conventional roofs and pavements, help to prevent the urban heat island effect and reduce the need for cooling. Conventional dark pavements may contribute to urban heat islands as they absorb 80–95 per cent of sunlight and warm the surrounding air. Cool materials allow reflection of solar radiation by up to 85 per cent, effectively reducing the thermal load on the building.

According to the 'Cooling Western Sydney' study conducted by Sydney Water, the CRC for Low Carbon Living and UNSW while green infrastructure is effective for cooling urban environments, the most effective urban heat mitigation technologies use a combination of cool materials in conjunction with water-based technologies, such as fountains.



**Table 12: Benefits and Challenges of Cool Materials**

Benefits	Challenges
<ul style="list-style-type: none"> <li>• Potential to reduce the urban heat island effect</li> <li>• Can increase resilience to heat waves</li> <li>• May reduce energy demand from buildings</li> <li>• May reduce energy bills and therefore increase affordability</li> <li>• Offers improvements for indoor thermal comfort</li> <li>• Extends service life of roofs</li> <li>• Lowers peak electricity demand</li> </ul>	<ul style="list-style-type: none"> <li>• May cause unwanted glare to neighbouring properties</li> <li>• May require additional cleaning / maintenance</li> </ul>

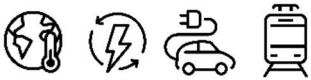
### Key considerations and planning

Measures to mitigate the effects of extreme heat events and urban heat island effect are important for the Precinct, as it is in a dense urban environment, however the Precinct also benefits from the cooling provided from air coming off Blackwattle Bay. Opportunities to deliver cool pavements in the public domain should be explored in combination with shading structures (i.e. awnings), green infrastructure and water-based cooling technologies.

Cool roof materials or green roofs should be prioritised, in balance with competing demands, such as rooftop solar PV and reducing water consumption. Consideration of cool materials are typically identified at detailed design stage.



## EV Charging Infrastructure



Electric vehicles (EVs) are propelled by electric motors powered by electricity. There are four main types of EVs, battery electric vehicles that are solely powered by electricity; hybrid electric vehicles that are powered by a combination of fuel and electricity; fuel cell electric vehicles that use a fuel cell instead of a battery and are typically fuelled by hydrogen; and non-plug in hybrid EVs that use regenerative braking to recharge the battery.

By 2040, EVs are projected to account for 70 to 100 per cent of new vehicle sales and at least 30 per cent of the vehicle fleet in Australia. However, the lack of access to charging infrastructures has been identified as a major barrier by people looking to purchase an EV vehicle.



Table 13: Benefits and Challenges of EV Charging Infrastructure

Benefits	Challenges
<ul style="list-style-type: none"><li>• Reduces locally produced air emissions and therefore reduces air pollution.</li><li>• Eliminates greenhouse gas emissions from vehicles if charged using renewable energy.</li><li>• Can provide benefits to the grid if appropriately managed.</li><li>• May provide back to the grid electricity when demand is high.</li></ul>	<ul style="list-style-type: none"><li>• Can affect peak demand.</li><li>• If EV charging is uncoordinated, additional generation and network investment is required and can increase the total electricity system costs.</li></ul>

### Key considerations and planning

Considerations for the provision of electric vehicle charging infrastructure needs to be carefully managed with the impact of peak demand on electrical infrastructure. There is potential for EV charging behaviour to contribute to daily peak periods requiring costly augmentation of infrastructure. This can be managed through initiatives such as staggering of charging throughout the day or night to coincide with off-peak periods. The Utilities and Infrastructure Servicing Report (AECOM, 2020) has considered the implications of EV charging for 100 charging spots in Blackwattle Bay providing an indicative peak demand of 315 kVA.

Due to the nature of the Precinct, it is expected that the infrastructure would be a mix of dedicated AC circuit (single phase or three phase) with hardwired EV supply equipment charging infrastructure in public areas as it allows for charging in shorter dwell locations, such as public parking areas, and dedicated AC circuit single phase with hardwired EV supply equipment charging infrastructure in longer dwell locations, such as the carparks within residential buildings.

During detailed design, opportunities to extend the implementation of EV charging facilities beyond the 10 per cent target should be explored. To date EVs make up around 0.2 per cent of total vehicle fleet in Australia which has one of the lowest rates of EV ownership in the OECD. However, as the uptake of EV vehicles increases, the business case for increased EV parking may change and infrastructure associated with the future extension of charging facilities should be well considered at the outset so the opportunity is not designed out.

### Active Transport



Cheaper, more flexible and more reliable technologies are accelerating the automation of buses, trains, cars and trucks. Data sharing and mobile technology are enabling smarter, cheaper and faster ways to plan trips and travel, with ridesharing, car share, hire car, on-demand public transport and smart parking as key examples.

Active transport is likely to be a popular option for residents if they are staying in the local area. New technologies are also supporting increased active transport in cities. Share e-bikes are becoming more common. Self-emitting pavements can provide cycleways that charge in the sun and glow in the dark, reducing the need for additional lighting.



Table 14: Benefits and Challenges of Active Transport

Benefits	Challenges
<ul style="list-style-type: none"><li>• Reduces traffic in the area.</li><li>• Reduces greenhouse gas emissions.</li><li>• Provides health and wellbeing benefits, including reduced air pollution and increased levels of physical activity.</li></ul>	<ul style="list-style-type: none"><li>• Promoting active transport may require a comprehensive and coordinated approach with other precinct-owners or managers in the area.</li><li>• Reduced car parking may be less attractive to</li></ul>

#### Key considerations and planning

Encouraging active transport requires the design of safe cycle paths and pedestrianised areas but also providing supporting infrastructure. The provision of secure cycling parking, such as bike racks or bicycle cages, should be included in the Precinct. Further, the street reservation as part of the development should consider strategies to make walking and cycling trips pleasant and safe, taking advantage of the natural environment.

Strategies to reduce car ownership are also recommended to compliment active transport initiatives. This may include having separately titled car parking places within residential buildings, which may also increase the affordability of those apartments, and reducing the amount of car parking available in public areas.

#### 6.1.2 Water Initiatives

### Water Efficiency Measures and Fixtures



Water efficiency measures are improvements that reduce water consumption while maintaining the same level of functional output. Integration of water efficiency measures in buildings will be essential to achieving the BASIX water targets proposed for the Precinct, with comprehensive implementation of water efficiency measures providing opportunities toward exceeding the minimum requirements. Initiatives include increasing the WELS ratings for fixtures and appliances such as: showerheads, toilets, kitchen and bathroom taps, washing machines and dishwashers.

The *Urban Water Supply Options for Australia* Report from the Water Services Association of Australia concluded that of all the water supply options, water efficiency was the cheapest. Although this is from a water utility perspective, the same principles apply to a precinct scale.





**Table 15: Benefits and Challenges of Water Efficiency Measures**

Benefits	Challenges
<ul style="list-style-type: none"> <li>Significantly reduces water demand.</li> <li>Can reduce impact on peak water demand.</li> <li>Reduced water consumption and peak demand can defer need for water infrastructure augmentation.</li> <li>Payback times in the short term.</li> <li>Low to moderate upfront costs.</li> <li>Reducing water use has associated energy savings from water heating and pumping.</li> </ul>	<ul style="list-style-type: none"> <li>Final efficiencies depend on how systems are operated.</li> </ul>

### Key considerations and planning

Installing water fixtures and appliances with higher WELS ratings is common throughout the industry because of BASIX requirements and is recommended at the Precinct. Key considerations for water efficiency include:

- User comfort – for showerheads this is an issue as the highest rated fixtures often impact on the user experience.
- Innovation – for toilets a vacuum system can be installed that can save up to 80% of water compared to a traditional gravity toilet. A vacuum system was installed in Melbourne Water's head office in 2013.
- Reusing water within a building – water can be reused for a different purpose such as using water from the bathroom sink to flush the toilet.
- Water-efficient irrigation systems to maintain soil and vegetation health

There is the possibility of a hot water recirculation system where the water in the hot water pipes is circulated back to the water heating system until the hot water at the fixture reaches the set temperature, however this is not common.

### Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) features are typically evaluated on their ability to improve water quality, increase attenuation, reduce stormwater flows and provide urban design benefits. WSUD measures commonly include rainwater tanks, raingardens, sediment basins, constructed wetlands, vegetated swales and porous pavements.

Implementation of WSUD measures enables effective stormwater flow and quality management, however the only WSUD practice that has a direct impact on potable water use is the use of rainwater.

**Table 16: Benefits and Challenges of WSUD**

Benefits	Challenges
<ul style="list-style-type: none"> <li>Can improve local habitat and ecosystem health.</li> <li>Mitigates urban heat island effect.</li> <li>Urban greening and vegetation can improve amenity.</li> <li>Minor improvement in flood and drought resilience.</li> <li>Improves stormwater quality through treatment before discharging to the environment.</li> <li>Attenuates regular, low flow stormwater events which reduces in-stream erosion.</li> </ul>	<ul style="list-style-type: none"> <li>Requires appropriate spatial provision.</li> <li>Requires ongoing maintenance of WSUD elements such as landscaping and vegetation management.</li> </ul>

- Reduces burden on stormwater drainage infrastructure.

### Key considerations and planning

Best practice WSUD will require initiatives to be implemented that can improve waterway health downstream in accordance with relevant guidance. Primary water sensitive initiatives relevant to the Blackwattle Bay include:

- Carefully designed and constructed rain gardens and bioretention systems that reduce the volume and velocity of stormwater flows, and remove harmful pollutants, before discharging to Blackwattle Bay
- Reuse of locally harvested stormwater to establish and maintain landscape within the public domain
- Use of permeable landscaping and carefully planned streetscapes that allow water from minor rain events to 'passively irrigate' public domain
- Raingardens and green roofs for buildings (where possible) to slow and filter run-off

Specific WSUD measures will be determined based on hydraulic assessments and incorporated into the Precinct's design, leveraging the Stormwater Concept Plan developed by Cardno and appended to the *Water, Riparian Land, Flooding and Stormwater Study* (Cardno, 2021). These measures will need to be designed for ease of maintenance and will be specifically determined during detailed design.

### Rainwater Harvesting



Rainwater harvesting and storage can assist in reducing potable water demand and managing the impacts of stormwater flow on waterway health. Rainwater harvesting also assists in reducing pollutant loading to waterways as part of a stormwater treatment train.

Rainwater collection reduces the operational costs for potable water infrastructure by reducing potable water consumption, however water mains infrastructure is still sized assuming all demand is met by potable water. The extent to which potable water consumption is reduced depends on rainfall patterns and the size of the rainwater tanks.

Rainwater harvesting is typically preferred at a precinct scale over other water alternatives, such as stormwater, because it has better water quality. Rainwater tanks can be installed centrally to collect water from the roofs of the whole Precinct or distributed for each building. Where water tanks are installed for individual buildings, these can assist in meeting and exceeding the BASIX water targets proposed for the precinct.



Table 17: Benefits and Challenges of Rainwater Harvesting

Benefits	Challenges
<ul style="list-style-type: none"> <li>• Rainwater harvesting has minimal treatment requirements compared to other recycled water sources such as stormwater.</li> <li>• Rainwater tanks scalable to building recycled water demand.</li> <li>• Reduces potable water demand.</li> <li>• Reduces local flooding and scouring of creeks.</li> </ul>	<ul style="list-style-type: none"> <li>• Spatial requirements for rainwater tanks.</li> <li>• Rainwater tanks are more energy intensive than mains potable water due to pumping requirements.</li> <li>• Cannot be used to replace all potable water demand.</li> <li>• There may be costs associated with additional riser space required for 'third pipe'.</li> </ul>

- Reduces pollutant loading to creeks and assists in achieving stormwater pollutant load reduction targets for the development.
- Water is not subject to water restrictions, locking in liveability benefits of greening (if there is adequate storage).

### Key considerations and planning

Rainwater has the potential to be used in the Precinct for activities such as toilet flushing, washing clothes, hot water systems, and garden irrigation. Installation of recycled water piping in buildings and public domain will be required to enable rainwater to be used in dwellings and/or for irrigation. To appropriately incorporate rainwater harvesting and reuse, adequate spatial provision should be considered in the development of the final Precinct Plan.

A detailed water balance study will need to establish supply and demand quantities for rainwater at the Precinct, also considering measures to reduce demand for irrigation. However, the *Water, Riparian Land, Flooding and Stormwater Study* (Cardno, 2021) indicates that the total runoff from roads within the study area indicates there is significant potential to collect and harvest rainwater for use within buildings. Demand profiles and sizing of rainwater tanks will be completed during design when apartment types/numbers have been determined to detail the best approach for each building, however it is anticipated that the buildings will include rainwater tanks.

Any shortfalls in rainwater supply will require potable water to be supplied directly to the rainwater tank. However, there is the potential for rainwater/stormwater harvested outside the Precinct site to be piped into the Precinct to complement demand. This involves removing the water out of the main stormwater pipe and providing storage and treatment within the Precinct. It is noted however that this can have cost implications to allow for adequate storage and treatment of the water and has spatial requirements to accommodate the storage and treatment systems.

Smart tanks are an emerging technology option which have telemetry controls for increased visibility over tank levels. They also allow for release of flows prior to rainfall events to increase capture volumes and reduce flood impacts during the event allowing tanks to perform multiple functions. In some instances, smart rainwater tanks can reduce stormwater runoff by 25 percent.

### Onsite Water Recycling Systems

On-site water recycling systems allow reuse of wastewater from the Precinct or from sewer mining. Wastewater must be treated to recycled water standards before it can be reused due to the potential health risks.

The treatment process to produce recycled water from wastewater is much more energy intensive than that of mains potable water, especially at the building or precinct scale.



**Table 18: Benefits and Challenges of Onsite Water Recycling System**

Benefits	Challenges
<ul style="list-style-type: none"> <li>• Reduces potable water consumption.</li> <li>• Reduces pressure on wastewater infrastructure.</li> <li>• Improves water supply resilience.</li> <li>• Water is not subject to water restrictions, locking in liveability benefits of greening.</li> <li>• Recycled effluent has slightly higher amounts of phosphorous and nitrogen compared to potable water which should mean less fertiliser input for irrigation.</li> <li>• Is more cost effective at a precinct rather than building scale due to economies of scale.</li> </ul>	<ul style="list-style-type: none"> <li>• Potentially high spatial requirements required for water recycling system.</li> <li>• Wastewater treatment is more energy/carbon intensive than mains potable water.</li> <li>• Wastewater treatment infrastructure has specialised maintenance requirements.</li> <li>• Recycled effluent has limitations for irrigation on some locations depending on soil type, dampness or presence of shallow water.</li> <li>• High upfront capital investment.</li> <li>• Requires approval from relevant bodies.</li> </ul>

- There may be costs associated with additional riser space required for 'third pipe'.

### Key considerations and planning

Feasibility of on-site water recycling systems depends on several factors, including:

- Short, medium and long-term economic feasibility;
- How it relates to other targets, including affordability;
- Extent to which it provides resilience benefits to the development;
- GFA uptake/land use and associated opportunity costs;
- Environmental benefits in comparison to alternative options;
- Energy consumption and carbon and methane emissions.

On-site water recycling systems are not likely to be feasible in Blackwattle Bay due to space constraints and anticipated high capital costs which may not align with the overall business case for the development. However, the area identified in the draft Precinct Plan for potential centralised services may provide a feasible location for an onsite water recycling system (refer to Figure 6).



**Figure 6: Potential centralised services location (in red) under Western Distributor (Source: FJMT Studio)**

It is noted that the sustainability benefits of on-site water recycling systems are ambiguous and may result in a net disadvantage due to their high energy and carbon intensity. Another challenge is the pricing mechanism that was introduced by IPART in January 2018, which has made it more difficult to provide recycled water in residential developments. A building or precinct scale water recycling system cannot exist in isolation because it still relies on access to Sydney Water's drinking water system and sewage system (for disposal of solids). The pricing mechanism changed how recyclers were charged by Sydney Water from a wholesale or "non-residential" rate to a pricing framework that left it open to Sydney Water to negotiate a price for services on a case-by-case basis. This decreased the certainty around pricing and may affect the economic feasibility of the scheme.



### 6.1.3 Waste Initiatives

Waste management design initiatives have not been embedded into the Precinct Plan at this stage of design. These initiatives are primarily incorporated during detailed design. However, there are several initiatives the project team have considered for further investigation.

#### Construction and Demolition Waste Reduction

Resource recovery and waste management will need to be considered throughout the demolition and construction of the Precinct. A crucial component of construction and demolition waste management is source separation and segregation of component parts to assist with effective recycling, reuse or disposal.



The following initiatives are recommended for consideration:

##### Demolition Phase

- Identify opportunities for beneficial reuse on-site of soils generated from any excavation works
- Identify suitable areas for sorting and segregating demolition waste to ensure efficient recycling and reuse and to avoid cross-contamination
- All demolition waste unable to be reused on-site should be sent to a licenced recycling facility or waste disposal facility with delivery receipts retained
- Investigate opportunities to reuse the waste at adjacent Precincts or projects, such as reusing soil for rehabilitation in the local area

##### Construction Phase

- Identify construction techniques that avoid and minimise waste generation, such as precast elements
- Identify suitable areas for sorting and segregating construction waste to ensure efficient recycling and reuse and to avoid cross-contamination
- Adopt packaging take-back schemes with suppliers and reduce packaging waste across procurement and the supply chain
- All construction waste unable to be reused on-site should be sent to a licenced recycling facility or waste disposal facility with delivery receipts retained

##### Key considerations and planning

Construction waste management is typically defined during detailed design and through the appointment of the construction contractor(s).

A Waste Management Plan should be developed during detailed design to cover demolition, construction and operation of the Precinct, in line with the requirements from the City of Sydney. At this stage, opportunities to increase the 80 per cent landfill diversion target should be explored, as it is anticipated there may be a change in state policy targets as well as an increased investment in recycling facilities.

Identification of areas for sorting and temporary storage of various waste streams at the detailed design stage will facilitate waste management and recycling during the demolition and construction phases.

#### Operational Waste Minimisation and Improved Recycling



During detailed design, several opportunities can be considered to influence better waste management in the operation of the Precinct.

These opportunities will help contribute to a circular economy and contribute to increased precinct recycling and waste avoidance.



### **Co-located, separate waste chutes for taller buildings**

For taller developments, garbage chutes can be located on all or most floors to allow for convenient disposal of waste and recycling. Separate recycling chutes should be co-located with regular waste chutes to reduce contamination of recyclable material. The chutes must be easily accessible and include clear signage and educational posters for residents on what is permitted in each chute.

### **Waste and recycling rooms**

Easily accessible waste and recycling rooms in apartment buildings should be designed to improve the collection and management of household waste. The rooms should allow for sufficient space for manoeuvrability of bins and to increase opportunities to sort waste for recycling. These areas should be well ventilated and screened from view and be easily accessible for people with disability or limited movement. Temporary storage areas should also be provided for large and bulky items to prevent illegal dumping in public areas. As the buildings are proposed to include both retail and residential, waste rooms for retail tenants should be separate from residential waste rooms to prevent overloading.

### **Apartment waste separation**

To reduce waste generation rates and increase separation of recyclable material at the source, the apartment design and fit out can include built-in small, separated waste bins to hold two days' worth of waste and recycling.

### **Recycling in the Public Domain**

Recycling and waste bins should be provided in the public domains to discourage littering and promote source separation of recyclable materials. Where feasible, a three-bin configuration (one waste, two recycling) should be provided. Educational material and signage should also be provided to demonstrate what is appropriate waste for each bin to avoid contamination.

### **On-site organic waste disposal**

Alternative organic waste disposal and treatment options minimise the impact of organic waste releasing methane in landfill and contributing to landfill levels. On-site organic waste treatment and collection options should be considered during detailed design.

Composting and worm farms can be incorporated into the detailed design of open space areas or private rooftop areas. Small organics only bins can be provided in apartments to allow for the easy collection and separation of organic waste, for disposal in the on-site composting facilities.



## 6.3 Initiative Alignment

### 6.3.1 SSP and Green Star Communities National Framework Principles Alignment

This Section has been included to indicate where the suggested initiatives meet the SSP Requirements, support achievement of the targets and aligns to the Green Star Communities National Framework principles.

The following matrix demonstrates where the initiatives seek to meet the intention of the SSP Requirements and the Green Star Communities National Framework principles. The Green Star Communities National Framework is used in Section 7.0 to provide a framework assessment of sustainability for Blackwattle Bay.

**Table 19: SSP and GSC National Framework Alignment**

	SSP Requirements						GSC National Framework			
	Ecologically Sustainable Development 16.1	Ecologically Sustainable Development 16.2	Ecologically Sustainable Development 16.3	Ecologically Sustainable Development 16.4	Ecologically Sustainable Development 16.5	Climate Change Adaptation 17.1	Climate Change Adaptation 17.5	Climate Change Adaptation 17.6	Enhanced Liveability	Create Opportunities for Economic Prosperity
									Foster Environmental Responsibility	Embrace Design Excellence
									Demonstrate visionary leadership and strong governance	
<b>Initiatives</b>										
Passive Design	✓				✓	✓		✓	✓	✓
Energy efficiency	✓	✓			✓	✓		✓	✓	✓
Building electrification	✓	✓			✓	✓		✓	✓	✓
Solar PV	✓	✓			✓	✓		✓	✓	✓
Microgrids	✓	✓			✓	✓		✓	✓	✓
Power Purchase Agreements	✓	✓			✓	✓		✓	✓	✓
Green Infrastructure	✓				✓		✓		✓	✓
Cool Materials	✓				✓		✓		✓	
EV Charging Infrastructure	✓				✓	✓		✓	✓	✓
Active Transport	✓				✓	✓		✓	✓	✓
Water Efficiency Measures	✓	✓			✓			✓	✓	✓
Water Sensitive Urban Design	✓	✓			✓			✓	✓	✓
Rainwater Harvesting	✓	✓			✓			✓	✓	
Onsite Water Recycling Systems	✓	✓			✓			✓	✓	✓
Construction and Demolition Waste Reduction	✓			✓	✓			✓	✓	
Operational Waste Minimisation	✓		✓	✓				✓	✓	

### 6.3.2 Target Alignment

The following table outlines the initiatives that may contribute to achieving the targets set for Blackwattle Bay. In many instances, a combination of initiatives will be required to achieve the targets, in addition to other measures.

**Table 20: Target and Initiative Alignment**

Target	Minimum Goal	Supporting Initiatives
Green Star Communities precinct rating	5 star	Passive Design Energy Efficiency Solar PV Green Infrastructure Cool Materials Active Transport Water Efficiency Measures Water Sensitive Urban Design
Green Star Buildings	5 star	Passive Design Energy Efficiency Building Electrification Solar PV Green Infrastructure Cool Materials Active Transport EV Charging Infrastructure Water Efficiency Measures Water Sensitive Urban Design
BASIX Energy targets		Passive Design Energy Efficiency <i>Building Electrification*</i> Solar PV Microgrids PPAs
Detached houses, semi or terrace houses and townhouses	50	
Low rise (3 storey units)	45	
Mid rise (4-5 storey units)	35	
High rise (6 storey units or higher)	25	
NABERS energy rating for office and retail buildings	6 star	Passive Design Energy Efficiency Solar PV Microgrids PPAs
Net-Zero Carbon Precinct	100% by 2050	Passive Design Energy Efficiency Building Electrification Solar PV Microgrids PPAs EV Charging Infrastructure Active Transport
Precinct powered by renewable energy	50%	Energy Efficiency Building Electrification Solar PV Microgrids PPAs
NABERS Water rating for office and retail buildings	5 star	Water Efficiency Measures Rainwater Harvesting Onsite Water Recycling Systems
BASIX Water targets		Water Efficiency Measures Rainwater Harvesting Onsite Water Recycling Systems
Residential buildings other than high-rise	40	
High-rise residential	40	
Public open space irrigation with recycled water	100%	Water Sensitive Urban Design Rainwater Harvesting Onsite Water Recycling Systems
Operational waste diverted from landfill	70%	Operational Waste Minimisation
Construction & demolition waste diverted from landfill	80%	Construction and Demolition Waste

Target	Minimum Goal	Supporting Initiatives
Climate change and resilience risks addressed through design	All high and extreme risks addressed	Passive Design Green Infrastructure Cool Materials Active Transport Water Sensitive Urban Design Onsite Water Recycling Systems
Tree canopy cover	60% to streets 30% to parks 30% to private property	Green Infrastructure Water Sensitive Urban Design Onsite Water Recycling Systems
Electric vehicle parking	10%	EV Charging Infrastructure

\* The BASIX Tool is currently designed to preference gas infrastructure over electrification in buildings. However, it is anticipated that future updates to the BASIX tool will remove this preference. As such, Building Electrification has been provisionally included as an initiative that supports meeting the BASIX Energy Target.

## 6.4 Planning Recommendations

From the initiatives outlined and assessed, the following commitments are recommended at this strategic precinct planning stage:

- Planning Controls
  - Achieve a 5 Star Green Star – Communities rating (based on version 1.1 submission guidelines or equivalent rating in the updated Green Star – Communities Future Focus tool).
  - Achieve a 5 Star Green Star – Buildings rating for selected buildings (based on version 1 submission guidelines).
  - Achieve a minimum BASIX Energy target of 25 and minimum BASIX Water target of 40.
  - Explore opportunities to deliver beyond compliance targets for BASIX Energy and BASIX Water.
  - Achieve a NABERS Energy rating of 6 Stars and NABERS Water rating of 5 Stars.
  - Maximise opportunities for the installation of solar PV systems, where other renewable energy procurement alternatives are not implemented.
  - At least 60 per cent to streets, 30 per cent to parks and 30 per cent to private property of the Precinct streets, parks and private property must be covered by tree canopy when the trees reach maturity.
  - Incorporate water sensitive urban design measures to enable effective stormwater flow and quality management. Stormwater to be treated to achieve good practice pollutant load reduction targets.
  - Minimise paved areas and maximise stormwater infiltration.
  - Maximise apartment access to external clothes drying facilities.
  - Explore opportunities to improve precinct waste management.
- Management Alternatives/Initiatives:
  - Investigate feasibility of off-site renewable energy procurement for the majority of the Precincts renewable power requirements, it is recommended that modelling is undertaken to determine the feasibility and cost implications of both on-site and off-site renewable energy procurement.
  - Consider a microgrid operator to manage energy efficiency and renewable energy operations.

- Specify outcomes through procurement, rather than specific technologies to recognise that technologies will change and improve.
- Develop a Waste Management Plan to cover demolition construction and operation of the Precinct.
- Planning and design to prioritise waste avoidance and waste management practices with the waste management hierarchy.
- Design Considerations:
  - Considering designing the buildings (at least all residential buildings) to be powered by 100 per cent electricity (no gas infrastructure).
  - Consider the incorporation of passive design measures, including natural ventilation and solar heat gain.
  - For thermal comfort within the development, consider designing building layout and residential units to achieve thermal comfort conditions through passive design measures, to minimise the need for active and mechanical systems.
  - Consider modelling energy demand to ensure provision for future electric vehicle charging infrastructure can be accommodated.
  - Consider opportunities to deliver cooling materials and structures.
  - Consider opportunities to implement green roofs, where feasible, with attention given to the rooftop structural requirements.
  - Selection of drought-tolerant, low water use vegetation in gardens and green roofs to reduce irrigation needs.
  - Provision of high efficiency water fixtures (4, 5, 6-star WELS), inclusion of high-water efficiency appliances as part of apartment package, or offering financial incentives for residents to purchase high efficiency appliances.
  - Consider spatial provision for rainwater harvesting tanks and pumps and/or onsite water treatment facilities.
  - Consider the requirements of the Apartment Design Guidelines for waste management including adequate waste storage facilities to facilitate source separation and recycling.
  - Consider alternative waste disposal options, such as composting to be incorporated in community and communal open spaces.
  - Provide waste and recycling bins, with educational signage, in the public domain to reduce littering and promote recycling.
  - Consider opportunities to provide space for on-site organic waste treatment options, such as compost bins and worm farms.

## 7.0 Sustainability Framework Assessment

### 7.1 Framework Assessment

In considering how to effectively demonstrate an alignment with the ESD principles outlined above, the project team have sought to align the design response against the Green Star Communities National Framework principles:

- Enhance liveability
- Create opportunities for economic prosperity
- Foster environmental responsibility
- Embrace design excellence
- Demonstrate visionary leadership and strong governance

The Green Star Communities National Framework is considered by the industry as one of the best practice frameworks for integration of sustainability in urban developments, and in this case, it has been applied to demonstrate a practical alignment of the design with the ESD principles as defined within the Regulation. As such, identified sustainability initiatives have been framed against the Green Star Communities National Framework.

Table 21: ESD Framework Assessment

Theme	Principle	Reference Scheme / Site Plan Outcomes (to be implemented)	Recommendations and Options (for future consideration and design)
Enhance Liveability	<b>Providing diverse and affordable living</b> <ul style="list-style-type: none"> <li>Providing a diversity of dwellings, buildings and facilities that reflect the broad socio-economic needs of the community</li> <li>Access to local services such as transport, food, health and conveniences</li> </ul>	<ul style="list-style-type: none"> <li>The FJMT Studio Precinct Plan Design aims to ensure diversity in urban form, types and heights, with buildings ranging from 4 to 43 storeys.</li> <li>The buildings include a mix of retail (including food services), commercial and residential that will provide a range of dwelling types as well as facilities to serve the community.</li> <li>The site is close to public transport including ferries, light rail, buses and potentially a future metro.</li> <li>The design includes several access routes to facilitate active transport, including dedicated cycle lanes and shared cycle and pedestrian lanes.</li> <li>Infrastructure NSW is aiming to provide 10% affordable housing on NSW government owned land and 5% for private landowners.</li> </ul>	<ul style="list-style-type: none"> <li>Consider the applicability of some dwellings delivered via a Build to Rent Model for the Precinct for private dwellings.</li> <li>Investigate options to separate car parking spaces from the property title to provide owners with the option of not acquiring a car parking space as a default to reduce the cost of the property and the allocation of car spaces between different land uses within mixed use buildings</li> <li>Recommend implementing car share only spaces throughout the Precinct to reduce the burden of car ownership.</li> <li>Seek to ensure a mix of services is provided within the Precinct, or serviced within walking distance of the precinct, such as food retail and health services by providing retail GFA (note that the tenancy profile is determined by market forces).</li> </ul>
	<b>Creating healthy, safe and secure communities</b> <ul style="list-style-type: none"> <li>Enabling and promoting healthy and safe communities through partnerships and effective planning, urban design and landscape architecture that support physical activity and social engagement</li> <li>Providing opportunities for and raising the awareness of healthy activities within the community</li> </ul>	<ul style="list-style-type: none"> <li>The Precinct Plan Design demonstrates consideration of Crime Prevention Through Environmental Design (CPTED) strategies for maintaining active street edges with retail provided in all buildings, providing several primary urban connections and identifying extensive overlooking of all public open spaces from all proposed buildings. All public areas are visible from at least one street and there is end-to-end visibility available in the streets.</li> <li>There is a mixture of roads, pedestrian and cycle paths with shared paths linking the communities with the wider region.</li> <li>Cycleways have been identified around the edge of the Precinct and facilitate connections to and extensions of surrounding cycleways.</li> <li>Around 30,980 m<sup>2</sup> of open space and 17,690 m<sup>2</sup> of public domain (together making up half the proposed site area) is proposed, providing for</li> </ul>	<ul style="list-style-type: none"> <li>Consider enabling the establishment of neighbourhood-watch style community organisation.</li> <li>Define bicycle parking spaces locations in public domain and bicycle parking space requirements in private domain. Consider the use of basement car parking for secure storage.</li> <li>Consider provision for further enhancement of active living within the precinct, such as exercise stations in public spaces.</li> <li>Consider wayfinding strategies to direct the residents to active living and active transport opportunities in the wider precinct.</li> </ul>



	<p>healthy and active living. This includes the Bank St Open Space with inclusive playground area, court and possible skatepark proposed. Other recreational areas are sized to provide a range of uses and green space.</p> <ul style="list-style-type: none"> <li>• The Precinct is proximate to (walking and/or cycling distance) to Wentworth Park, which provides sporting fields, dog walking facilities and other outdoor activity areas.</li> <li>• Fresh food retail provided through the new Sydney Fish Market with retail opportunities throughout the Precinct providing additional potential areas for fresh food retailers.</li> </ul>	
<p><b>Fostering inclusiveness and cohesiveness</b></p> <ul style="list-style-type: none"> <li>• Providing diverse and inclusive environments for all ages, abilities, cultures and socio-economic backgrounds of the community</li> <li>• Facilitating community cohesion by developing a shared vision, embracing diversity and tolerance, respecting each other's rights and responsibilities and reflecting these values in the built environment</li> <li>• Engaging stakeholders in the evolution of their communities, from policy to ongoing revitalisation, evaluation and adaptive management</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of open spaces throughout the precinct to provide access for all residents as well as visitors. The Bank St Open Space includes several playground elements to cater for a diversity of abilities and interests and other public realm spaces will provide different experiences for residents, workers and visitors.</li> <li>• Diversity in community meeting places planned, including parks and residential (private) community spaces (such as internal gardens and green roofs).</li> <li>• The Precinct is proximate to several social meeting places including local shops, hospitality, pet-friendly areas and services.</li> </ul>	<ul style="list-style-type: none"> <li>• Further consideration of street design to achieve compliance with the Disability Discrimination Act at detailed design stage.</li> <li>• Further consideration of the play spaces and recreation in line with the NSW Everyone Can Play Guidelines at detailed design stage.</li> <li>•</li> </ul>
<p><b>Building community adaptability</b></p> <ul style="list-style-type: none"> <li>• Building capacity to adapt to changing community and individual needs and expectations whether influenced by the economy, environment, culture or other life circumstances</li> <li>• Creating opportunities for a diversity of uses and activities that enable communities to meet future challenges.</li> </ul>	<ul style="list-style-type: none"> <li>• Canopy coverage over paved surfaces serves as a cost-effective means of mitigating urban heat island effects – street trees provide areas of respite for pedestrians.</li> <li>• Critical assets and access to underground areas will be located above the flood planning level.</li> <li>• Climate change risk assessment completed to identify key risks and provide adaptation actions.</li> </ul>	<ul style="list-style-type: none"> <li>• Develop a detailed climate adaptation plan for the Precinct in response to projected future climate scenarios during detailed design as per Green Star – Communities (v1.1) guidelines (Credit 4 to enhance climate change resilience.</li> <li>• Develop a Community Resilience Plan that is specific to the community as per Green Star – Communities (v1.1) guidelines (Credit 4) to enhance climate change resilience for each building. The Plan needs to address preparation, during- and post- disaster communication, safety, and response. It can potentially be provided as part of a welcome pack for new residents.</li> <li>• Safe evacuation routes must be designated for units between the flood planning level and the</li> </ul>

			<p>PMF. Vulnerable residents such as those with mobility difficulties or difficulty in responding to stressful situations to be located above the PMF level to enable a passive shelter in place response.</p> <ul style="list-style-type: none"> <li>Consider designing the underground car parks in a way to allow them to be repurposed in the future when private car ownership drops.</li> </ul>
<b>Create opportunities for economic prosperity</b>	<b>Promote education and learning</b>	<ul style="list-style-type: none"> <li>Providing opportunities for the community to access a variety of education and learning systems</li> </ul>	<ul style="list-style-type: none"> <li>Local cycleways, pedestrian access and public transport services provide connection to nearby schools, training facilities and universities.</li> <li>The playground design in the Bank St Open Space offers opportunities for education and learning for children with different types of play identified including wet and dry playgrounds.</li> </ul>
	<b>Enhancing employment opportunities</b>	<ul style="list-style-type: none"> <li>Creating diverse employment opportunities that meet the needs of local and regional communities and facilitating access to them</li> <li>Encouraging the production and procurement of local goods and services</li> </ul>	<ul style="list-style-type: none"> <li>Around 131,332 m<sup>2</sup> GFA of non-residential space identified for retail, office, hotel/serviced apartments, creating a diverse offering of employment opportunities.</li> <li>Local cycleways and public transport networks facilitate connection to employment opportunities.</li> </ul>
	<b>Attracting investment</b>	<ul style="list-style-type: none"> <li>Providing key infrastructure that enables community and business connectivity</li> <li>Enabling ongoing sustainable and ethical investment in local business opportunities</li> <li>Establishing a business case, inclusive of externalities, for green infrastructure systems and jobs and providing a commitment to implementation</li> </ul>	<ul style="list-style-type: none"> <li>Around 131,332 m<sup>2</sup> GFA of non-residential space identified for retail, office, hotel/serviced apartments offer employment opportunities and attract investment into the non-residential areas.</li> <li>The Precinct is well connected to the local area and will attract property investment. The proximity to the new Sydney Fish Market development will also attract investment.</li> </ul>
	<b>Encouraging innovation</b>	<ul style="list-style-type: none"> <li>Encouraging business and community innovation through initiatives that recognise and reward local excellence</li> <li>Facilitating new business opportunities to enhance competitiveness and innovation</li> </ul>	<ul style="list-style-type: none"> <li>Around 131,332 m<sup>2</sup> GFA of non-residential space identified will create new opportunities.</li> <li>The Precinct Plan provides opportunities for innovative design, particularly with consideration of sustainability initiatives such as renewable power and centralised services.</li> </ul>

	<b>Promoting efficiency and effectiveness</b>	<ul style="list-style-type: none"> <li>Applying lifecycle impact management approaches to encourage resource efficiency and reduced lifecycle costs</li> <li>Investing in infrastructure that creates greater urban management efficiencies</li> </ul>	<ul style="list-style-type: none"> <li>This ESD Report includes several recommended initiatives that promote resource efficiency, including energy, water and waste management.</li> <li>On-site renewable energy opportunities have been identified in the Precinct Plan with approximately 8,173 m<sup>2</sup> privately owned roof top space that may be feasible for solar PV panels, however this will require further investigation and modelling during detailed design.</li> <li>The location of potential centralised Precinct services, such as onsite recycled water, has also been identified in the Precinct Plan, and will require further investigation and modelling during detailed design.</li> </ul>	<ul style="list-style-type: none"> <li>Undertake energy demand calculations and PV modelling to determine the appropriate level of on-site vs off-site renewable energy.</li> <li>Explore options to use of decentralised technologies including micro-grids and recycled water identified to reduce energy use and potable water demand.</li> <li>Optimise the size and spatial configuration of rooftop elements, such as building plant and lift overruns, to maximise open spaces for community use and/or solar PV.</li> <li>Consider mounting solar PV systems on awnings above rooftop communal areas and/or building plant and equipment to maximise on-site renewable energy generation potential.</li> </ul>
<b>Foster environmental responsibility</b>	<b>Enhancing our natural environment</b>	<ul style="list-style-type: none"> <li>Protecting, valuing, restoring and enhancing our natural and cultural heritage assets, both water and land-based</li> <li>Promoting biodiversity through the provision of habitats, spaces and environments across the community and urban areas</li> <li>Reducing greenhouse gas emissions, contaminants and other pollutants to land, water and atmosphere</li> <li>Minimising the risk from extreme natural events and impacts of climate change</li> </ul>	<ul style="list-style-type: none"> <li>Proposed development on already developed land in an urban area, offering opportunities for environmental enhancement from the baseline. Improved amenity and environmental initiatives can improve community awareness of environmental issues and a sense of community pride and ownership of green infrastructure.</li> <li>An increased tree canopy is proposed to create sense of place and improve microclimate conditions.</li> <li>Water Sensitive Urban Design (WSUD) measures detailed in <i>Water, Riparian Land, Flooding and Stormwater Study</i> prepared by Cardno to detain and treat runoff from development areas prior to discharge include filtration (bioretention or cartridge systems such as tree pits and raingardens), gross pollutant traps, and water harvesting.</li> <li>Water quality targets are provided in the <i>Water, Riparian Land, Flooding and Stormwater Study</i> prepared by Cardno.</li> </ul>	<ul style="list-style-type: none"> <li>Consider green roofs and walls to provide additional greenery, moderate the urban heat island effect and filter rainwater.</li> <li>Consider additional opportunities to enhance the waterway environment, such as 'artificial reefs' or similar structures for aquatic biodiversity.</li> </ul>
	<b>Reducing ecological footprint</b>	<ul style="list-style-type: none"> <li>Promoting environmentally efficient systems for water and wastewater management and reuse; sustainable energy generation and distribution; and waste management and recycling</li> </ul>	<b>Energy</b> <ul style="list-style-type: none"> <li>Passive design measures enabled through the consideration of the Precinct building orientation and form.</li> <li>On-site renewable energy opportunities have been identified from the available roof space with</li> </ul>	<ul style="list-style-type: none"> <li>Consider designing the precinct to be 100 per cent electric for residential buildings at a minimum.</li> <li>Consider appropriate glazing options to improve thermal comfort and reduce heating and cooling loads.</li> </ul>

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| <ul style="list-style-type: none"> <li>• Encouraging greater resource efficiency within a life cycle context</li> <li>• Reusing and retrofitting existing sites and buildings</li> <li>• Providing sustainable transport opportunities and encouraging their use</li> <li>• Promoting food security and sustainable food production</li> <li>• Educating communities on their individual and collective impacts by making resource savings and consumption data explicit within the built environment.</li> </ul> | <p>approximately 8,173 m<sup>2</sup> privately owned roof top space identified that may be feasible for solar PV panels, however this will require further investigation and modelling during detailed design.</p> <ul style="list-style-type: none"> <li>• Commitment to explore opportunities to deliver beyond compliance targets for BASIX Energy proposed in planning controls.</li> </ul> | <ul style="list-style-type: none"> <li>• Consider designing hallways and common areas to maximise natural ventilation to reduce overall HVAC energy consumption.</li> <li>• Consider the provision of real-time smart metering to all residential units and commercial tenants to understand energy usage patterns and reduce accordingly.</li> <li>• Provision of high energy efficiency appliances in residential apartments or offering financial incentive for residents to purchase high efficiency appliances.</li> <li>• Consider the use of high emittance/albedo materials in paving and building design to reduce solar heat gain.</li> <li>• Consider measures for peak electricity load shifting through building energy reduction measures.</li> <li>• Consider design of balconies (where relevant) to enable residents to air-dry laundry.</li> <li>• Consider designing buildings to enable future retrofitting of new technologies such as building integrated PV.</li> <li>• Consider the use of natural materials and features in public spaces to reduce embodied carbon.</li> <li>• Consider use of low-embodied carbon materials such as recycled materials or timber products.</li> <li>• Investigate opportunities to encourage procurement of local materials to contribute to the local economy as well as reduce the associated transport costs and emissions.</li> </ul> |
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| <p><b>Water</b></p> <ul style="list-style-type: none"> <li>• WSUD measures provided to detain and treat runoff from development areas prior to discharge.</li> <li>• Commitment to explore opportunities to deliver beyond compliance targets for BASIX Water proposed in planning controls.</li> <li>• A location for potential centralised services, such as onsite recycled water treatment, has been identified in the Precinct Plan under the Western Distributor.</li> </ul> |  | <ul style="list-style-type: none"> <li>• Consider the selection of drought-tolerant or zero-irrigation species vegetation to reduce irrigation requirements.</li> <li>• High efficiency (4, 5, 6-star WELS rated) water fixtures to reduce potable water consumption.</li> <li>• Explore opportunities for rainwater harvesting tanks to meet BASIX Water Requirements. Rainwater can be used to irrigate public open spaces and green roofs/walls. Further consideration should be given in the use of recycled rainwater in toilet flushing and laundry</li> </ul> |
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			uses. This would require a water balance study to ascertain the recycled water demand.
		<b>Waste</b> <ul style="list-style-type: none"> <li>Street and road design have been considered to allow the safe navigation of large garbage trucks. The street design allows garbage trucks and other service vehicles to enter the precinct area from Bank Street and circulate through Park Street, Gipps Lane, Bank Lane and Gipps Street, exiting out to Bridge Road, all in a one-way direction with no turning across traffic. The truck movements would only cross the dedicated cycle paths at the signalised intersections. Interfaces with pedestrians are generally minimised although the lanes and Gipps Street are intended to be shared spaces with very low vehicle speeds.</li> <li>The Precinct Plan identifies basement parking. This can enable centralised waste collection and access, with spaces to be sized appropriately in line with the City of Sydney requirements and to allow source-separation of waste and recycling.</li> </ul>	<ul style="list-style-type: none"> <li>Consider provision of separated, but co-located residual waste and recycling chutes in buildings to encourage recycling.</li> <li>Ensure residential and retail waste disposal rooms separate to avoid overloading issues.</li> <li>Determine the appropriate provision of waste and recycling bins in the public domain to reduce littering and encourage recycling with education material available to educate public space users on waste management.</li> </ul>
		<b>Transportation</b> <ul style="list-style-type: none"> <li>Opportunities for sustainable transport routes are outlined in the Precinct Plan, including ferries, cycleways and pedestrian access.</li> <li>Cycleways have been identified throughout the Precinct and can connect into the wider bicycle network.</li> <li>Assessment of electrical infrastructure requirements have accounted for the potential impact of electric vehicle charging infrastructure in max demand (for specific calculation references, refer to Blackwattle Bay Utilities and Infrastructure Servicing Report, AECOM 2020)</li> </ul>	<ul style="list-style-type: none"> <li>Bicycle parking space locations in public domain to be defined and bicycle parking space locations in private domain to be identified during detailed design. Consideration of the use of basements for secure storage in the future, when fewer car spaces may be required.</li> <li>Consider the provision of capacity within infrastructure to accommodate and support the uptake of electric vehicles. Ideally, charging infrastructure could potentially be made available to all parking spots, particularly car-share only parking spots in the future.</li> </ul>
<b>Embrace Design Excellence</b>	<b>Adopting effective planning practices</b> <ul style="list-style-type: none"> <li>Establishing an integrated planning framework for delivering a shared design vision in collaboration with all partners</li> </ul>	<ul style="list-style-type: none"> <li>Several master planning options were developed to optimise the layout and appropriate land use mixture.</li> <li>Community consultation is also a key part of the planning process to ensure community feedback is captured in the precinct. Precinct plan scenarios</li> </ul>	<ul style="list-style-type: none"> <li>Consider encouraging developers through incentives to increase performance on sustainability measures.</li> </ul>

<ul style="list-style-type: none"> <li>Planning for considered density, mixed use, connectivity and the protection of valuable land uses such as agriculture</li> <li>Defining specific design outcomes which are clear and measurable</li> </ul>	<p>were tested with the community through consultation.</p> <ul style="list-style-type: none"> <li>Planning controls will be set to achieve desired sustainability outcomes for the development.</li> </ul>	
<p><b>Encouraging integrated design</b></p> <ul style="list-style-type: none"> <li>Understanding the context of a community, precinct or site and its relationship with neighbouring areas as well as the region as a whole in creating a sense of place</li> <li>Responding to land, water and climatic based planning and design constraints and opportunities</li> <li>Creating coherent urban structure and connectivity between places</li> <li>Providing effective connectivity between transport, communication, social and physical infrastructure systems</li> </ul>	<ul style="list-style-type: none"> <li>Buildings within the precinct will target achievement of 5 star Green Star – Design &amp; As-Built rating which will interface with the Green Star – Communities (v1.1) rating, NABERS and BASIX.</li> <li>Positioning of recreational and public open space responds to the opportunity to use the natural environment of the Bay.</li> <li>Integration of non-residential and residential space demonstrates integrated design.</li> <li>The Precinct Plan includes integration between the built environment and the green open space to enhance cohesiveness and community amenity.</li> </ul>	<ul style="list-style-type: none"> <li>Consider opportunities to integrate the built form with green infrastructure design such as green walls and roofs.</li> <li>Further consideration may also be given to biophilic design opportunities.</li> </ul>
<p><b>Maintaining flexible and adaptable approaches</b></p> <ul style="list-style-type: none"> <li>Creating opportunities to retrofit and revitalise existing communities, precincts, places and buildings</li> <li>Providing for development and planning flexibility and adaptability that supports continuous improvement of the built environment</li> <li>Adapting effectively to changing climatic and other environmental and physical conditions so that people's comfort, health, safety and well-being are enhanced</li> </ul>	<ul style="list-style-type: none"> <li>Several master planning options were developed to optimise the layout and appropriate land use mixture. Around 131,332 m<sup>2</sup> GFA of non-residential space identified offers flexibility to include community space and provides flexibility in the type of commercial and retail services offered.</li> </ul>	<ul style="list-style-type: none"> <li>Consider design to enable potential for dwelling merging and de-merging so dwellings that are more responsive to changing housing needs.</li> <li>Consider design of underground car parks to allow car parking spaces to be reconfigured into bicycle parking/storage space in the future, to respond to changing transport needs, or to be repurposed in the future when private car ownership drops.</li> <li>Develop a detailed community adaptation plan during detailed design to improve community resilience in response to acute shocks and chronic stresses.</li> </ul>
<p><b>Creating desirable places</b></p> <ul style="list-style-type: none"> <li>Reinforcing a sense of place, community identity and local character within design</li> <li>Creating a sense of connection with nature</li> <li>Encouraging a high quality, integrated and safe public realm that meets the needs of the local community</li> <li>Providing quality built form and landscapes that are responsive to climate and context</li> </ul>	<ul style="list-style-type: none"> <li>The public realm is integrated throughout the Precinct and incorporates CPTED principles in the design.</li> <li>Around 30,980 m<sup>2</sup> of open space and 17,690 m<sup>2</sup> of public domain (together making up half the proposed site area) is proposed. This includes the Bank St Open Space with inclusive playground area, court and possible skatepark proposed. Other recreational areas are sized to provide a range of uses and green space.</li> </ul>	<ul style="list-style-type: none"> <li>Consider opportunities to embed public art in the Precinct and for the interpretation of cultural elements.</li> <li>Investigate implementation of materials that are aesthetically pleasing and environmentally sensitive (such as FSC certified timber) and materials that reduce the urban heat island effect.</li> </ul>



	<ul style="list-style-type: none"> <li>Conserving and celebrating cultural heritage and archaeological assets across landscapes, places and sites</li> <li>Creating functional, vibrant, stimulating and memorable places that evolve for people to live, work and play</li> </ul>	<ul style="list-style-type: none"> <li>Aesthetic appeal of the space is enhanced by the proposed street planting, green open spaces and foreshore interaction with the Bay.</li> <li>Canopy coverage over paved surfaces serves as a cost-effective means of creating amenable spaces.</li> </ul>	
	<b>Promoting accessibility</b> <ul style="list-style-type: none"> <li>Locating higher densities close to public transport and services to encourage active transport, promote public health and enhance public transport use</li> <li>Encouraging accessibility, diversity and mixed use development to reflect local values and meet both local and metropolitan needs.</li> </ul>	<ul style="list-style-type: none"> <li>All streets will have a paved path for ease of pedestrian access and safe access for persons with disabilities.</li> <li>The Precinct facilitates connections to broader public transport network, including ferries, buses and light rail.</li> </ul>	<ul style="list-style-type: none"> <li>Consider opportunities to promote accessibility and diversity in the design of residential buildings and dwellings.</li> </ul>
<b>Demonstrate visionary leadership and strong governance</b>	<b>Establish coordinated and transparent approaches</b> <ul style="list-style-type: none"> <li>Facilitating coordinated approaches among cross sectoral stakeholder interests</li> <li>Establishing transparent and accountable decision making processes through inclusion and provision of information</li> <li>Establishing practical standards of responsibility, resource allocation and programming that is accessible to stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>The design has undergone in-house review and also review by the Design Advisory Group, Project Working Group and Project Review Panel. The design review panels include members from the City of Sydney, Department of Planning, Industry and Environment, and the NSW Government Architects Office.</li> <li>The finalised preferred plan for the Precinct will go on public exhibition.</li> <li>The Project Working Group includes representatives from NSW Government and the City of Sydney providing a coordinated approach to planning.</li> </ul>	<ul style="list-style-type: none"> <li>Consider additional methods of incorporating community feedback in future design processes.</li> </ul>
	<b>Build a commitment to implementation</b> <ul style="list-style-type: none"> <li>Developing practically enforceable standards of ownership, accountability and delivery</li> <li>Incorporating performance evaluation, feedback and support mechanisms that provide opportunities for continual improvement</li> </ul>	<ul style="list-style-type: none"> <li>Planning controls will be set based on the recommendations made in this ESD report and other specialist consultant reports and will form the conditions for approval for future developers.</li> </ul>	<ul style="list-style-type: none"> <li>Engage Green Star Accredited Professionals (GSAP) to lead and facilitate the Green Star – Communities (v1.1) rating process.</li> <li>Set responsibility for achieving the desired sustainability outcomes during future development phases.</li> <li>Consider including initiatives identified in the ESD Report as future considerations and recommendations in this table in the evaluation of property development tenderers.</li> </ul>
	<b>Engaging with stakeholders</b> <ul style="list-style-type: none"> <li>Building a shared vision with stakeholders across community, industry and government</li> </ul>	<ul style="list-style-type: none"> <li>Engagement will continue through the planning and development phases with key stakeholders, including the City of Sydney, and the community.</li> </ul>	<ul style="list-style-type: none"> <li></li> </ul>

<ul style="list-style-type: none"> <li>Monitor progress towards this vision by building community capacity, assessing performance and encouraging ownership and leadership in realising that vision</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities have been identified to enhance community culture, heritage and identity during the Precinct Planning Stage via specialist studies and ongoing consultation at various levels</li> </ul>	
<p><b>Fostering sustainable cultures and behaviours</b></p> <ul style="list-style-type: none"> <li>Raising awareness among stakeholders and providing education and learning opportunities that enable more sustainable practices</li> <li>Encouraging sustainable behaviours and systems for monitoring environmental data, sharing information and allowing for continual improvement mechanisms</li> </ul>	<ul style="list-style-type: none"> <li>Active transport encouraged through cycleways identified throughout the Precinct and can connect into the broader bicycle network to foster more sustainable behaviours.</li> <li>Around 30,980m<sup>2</sup> of open space and 17,690 m<sup>2</sup> of public domain (together making up half the proposed site area) is proposed that can help promote a connection to the natural environment.</li> </ul>	<ul style="list-style-type: none"> <li>Bicycle parking spaces locations in public domain to be defined and bicycle parking space locations in private domain to be identified. Consideration of the use of basements for secure storage in the future, when fewer car spaces may be required.</li> <li>Consider provision for further enhancement of sustainable cultures within the precinct, such as EV car parking, community solar, organics recycling etc.</li> <li>Provision of community garden facilities can provide an opportunity for education.</li> </ul>
<p><b>Encouraging and rewarding innovation</b></p> <ul style="list-style-type: none"> <li>Providing open access information sharing to enable innovation to be enhanced</li> <li>Recognising and rewarding leadership in innovation and excellence</li> </ul>	<ul style="list-style-type: none"> <li>All residential units proposed to have access to high-speed internet connection as part of the National Broadband Network (NBN).</li> </ul>	<ul style="list-style-type: none"> <li>Consider Wi-Fi 'hot spot' access throughout public areas of the Precinct.</li> <li>Ensure the appropriate spatial provisions are made to not preclude future technologies from being implemented, such as building integrated PV or EV charging facilities.</li> </ul>

## Image Sources

All images used in Section 6.0 have been sourced Royalty Free from Getty Images at <https://www.gettyimages.com.au/> or are taken from the FJMT Blackwattle Bay Precinct Plan.

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# Appendix A

## Sustainability Policy and Regulatory Context

## Appendix A Sustainability Policy and Regulatory Context

### International and National ESD Policy Context, Controls and Guidelines

#### United Nations Sustainable Development Goals

In 2015, the United Nations General Assembly passed a resolution on the global agreement of 17 Sustainable Development Goals (SDGs) to form a roadmap for global development efforts to 2030 and beyond. While non-binding, for Australia the 2030 Agenda will be highly influential, shaping commitments, development cooperation and finance flows as well as global government and private sector reporting.

In 2018, Australia delivered its first Voluntary National Review on Australia's implementation of the Sustainable Development Goals. It features several case studies of projects around Australia that detail how they are contributing to Australia's progress against the SDGs.



Figure 7: United Nations 17 Sustainable Development Goals (Source: UNSDG)

SDGs identified as having particular relevance to the Blackwattle Bay precinct include:

- SDG 6 - Clean Water and Sanitation
- SDG 7 - Affordable and Clean Energy
- SDG 11 – Sustainable Cities and Communities
- SDG 12 - Responsible Consumption and Production
- SDG 14 – Life Below Water

#### Paris Agreement – United Nations Framework Convention on Climate Change

The Paris Agreement formed by United Nations Framework Convention on Climate Change members, sets out a global action plan to reduce the impacts of climate change by limiting global warming to below 2°C and pursue efforts to keep warming below 1.5°C above pre-industrial levels. To limit global average temperature increase to 1.5°C requires all sectors of the economy to achieve net zero emissions by 2050. Australia has set a target to reduce emissions by 26-28% below 2005 levels by 2030.

The planning and development of the Blackwattle Bay precinct will occur under the carbon emissions trajectory set by Australia's involvement in the Paris Agreement. This has been reflected in the SSP requirements to identify options for 50% renewable energy on the project and identifications of pathways to net zero carbon emissions by 2050.

#### National Energy Productivity Plan

The National Energy Productivity Plan (NEPP) aims to improve Australia's energy productivity by 40% by 2030. The energy market is undergoing rapid disruptive changes with new technologies, new customer expectations, rising prices, falling demand and pressure from climate change impacts. Energy supply has moved away from predictable patterns and energy markets have struggled to forecast and plan for this change. The inability to plan effectively has resulted in inefficient investment which has led to higher costs for customers.

Over recent years, Australia's energy productivity has improved, growing at around 1.8% per annum over the last decade. However, Australia is still lagging behind other countries such as Japan, Germany and the UK. To meet the 40% target, a doubling of the rate of energy productivity improvement compared to business-as-usual is required.

The NEPP itself does not mandate any particular development to achieve certain energy productivity targets. However, it acts as general guidance for energy efficiency and energy productivity measures that could be considered for the Blackwattle Bay precinct.

### **Australia's Renewable Energy Target**

The Renewable Energy Target (RET) is a legislated target designed to ensure the increased uptake of renewable energy in Australia, and in the process reduce overall GHG emissions. The current target is for 23.5% of Australia's energy, the equivalent of 33,000 GWh of electricity, to come from renewable sources such as wind, solar, and hydroelectric by 2020.

The RET allows both large-scale power stations and small-scale systems to create certificates for every megawatt-hour of energy they generate. Certificates are purchased by electricity retailers and surrendered to the Clean Energy Regulator to meet the retailers' legal obligations under the RET. This creates a market that provides financial incentives to both large-scale renewable energy power stations and the owners of small-scale renewable energy systems.

In September 2019, the Clean Energy Regulator announced that the target for the large-scale renewable energy target had been achieved ahead of schedule. However, the target stays the same from 2020 to 2030. For smaller scale systems, financial incentives were provided over a 15-year deeming period until 2016. From 2017, the deeming period was reduced to 14 years and will continue to reduce by one year, every year until the scheme ends in 2030. For eligible solar hot water and air source heat pumps, financial incentives are provided over a 10-year deeming period. From 2022, the deeming period reduces by one year every year until the scheme ends in 2030.

While the RET is not directly relevant to Blackwattle Bay, it sets out the overall trajectory on renewable energy uptake from a policy perspective. The RET also enables any on-site renewable generators to claim certificates to improve its overall business case, which may present an option for on-site generation in Blackwattle Bay.

### **National Construction Code**

The National Construction Code (NCC) is an initiative developed by the Coalition of Australian Governments to incorporate all on-site building and plumbing requirements into a single code.

The Code sets the minimum necessary requirements for safety, health, amenity and sustainability in the design and construction of new buildings (and new building work in existing buildings) throughout Australia. It is a standardisation of technical provisions for building work and plumbing and drainage installations whilst allowing for variations in climate and geological or geographical conditions.

Although developed at the national level, administration of the NCC is the responsibility of Australian States and Territories, which provide the legal framework to support the design and construction of buildings.

The NCC is published in three volumes. Volumes 1 and 2 are the Building Code of Australia, and Volume 3 is the Plumbing Code of Australia. Of particular relevance to Blackwattle Bay is Section J under Volume 1. Section J detailed Energy Efficiency requirements and was updated in May 2019 to drive a reduction in energy consumption of commercial buildings by a potential 35%. These updates include changes to commercial building energy efficiency requirements including new verification methods for demonstrating compliance with the relevant performance requirements in NABERS and Green Star ratings. New heating and cooling load limits using the NatHERS compliance pathway for



residential buildings have also been introduced. Section J is of importance in Blackwattle Bay as it will drive building energy efficiency and have an impact on the net carbon position of the entire precinct.

### **Climate Active Carbon Neutral Standard (formerly National Carbon Offset Standards)**

Climate Active is a partnership between the Australian Government and Australian businesses to drive voluntary climate action. It is the new iteration of the National Carbon Offset Standard which has been available since 2010. These voluntary standards set rules for measuring, reducing, offsetting and reporting emissions required to make carbon neutral claims.

Climate Active certification is available for organisations, products, services, events, buildings and precincts. The certifications most applicable to the Blackwattle Bay Precinct are the buildings (delivered through NABERS National Administrator or the Green Building Council of Australia) and precinct certifications. These may be used to contribute to the net-zero precinct target.

## **National Sustainability Certification and Rating Tools**

There are several rating tools available to assess the sustainability performance of buildings and precincts that are relevant to the Estate. NABERS and NatHERS are government initiatives while Green Star is an industry developed rating tool.

### **National Australian Built Environment Rating Systems (NABERS)**

NABERS is a national rating system that measures the environmental performance and impacts of Australian office buildings and tenancies, shopping centres, hotels, data centres and apartment buildings in terms of energy efficiency, water usage, waste management and indoor environmental quality at the operational stage.

NABERS is mandated for commercial floor space within the development where the office space is greater than 1000 m<sup>2</sup> via the Commercial Building Disclosure program. This requires all buildings on sale or lease to have and disclose the achieved NABERS Energy rating. There may be opportunity to consider other NABERS benchmarking and monitoring for water, waste and indoor environment to enable effective benchmarking and reporting if considered appropriate. NABERS ratings for Apartment Buildings and Office Buildings may be considered for use if appropriate for the precinct.

### **Nationwide House Energy Rating Scheme (NatHERS)**

The Nationwide House Energy Rating Scheme (NatHERS) rates the energy efficiency of a home on a 10-star rating system. NatHERS primarily focuses on the potential heating and cooling energy use, centred on thermal comfort of the building's inhabitants. NatHERS is built into the BCA and for multi-residential units must:

- Collectively achieve an average energy rating of not less than 6 stars; and
- Individually achieve an energy rating of not less than 5 stars.

NatHERS will provide greater opportunity for the reduction of energy used in buildings for thermal comfort as well as provide means for better future-proofing from climate change and related temperature increases.

### **Green Building Council of Australia (Green Star)**

Green Star is an internationally recognised rating system that delivers independent verification of sustainable outcomes throughout the life cycle of the built environment. It is designed to be a voluntary rating tool to incentivise better practice within the property development industry.

The Green Star – Communities rating tool evaluates the sustainability attributes of the planning, design and construction of large-scale development projects at a precinct, neighbourhood and/or community scale. It provides a rigorous and holistic rating across five impact categories: Governance; Liveability; Economic Prosperity; Environment; and Innovation. The Study Requirements for Blackwattle Bay require commitment to compliance with a nationally recognised rating system, such as GBCA's Green Star – Communities rating tool. The GBCA is in the process of updating the Green Star – Communities rating tool as part of their 'Future Focus' Program. It is likely that this rating will be released before the end of 2022.

Green Star – Buildings is the newly released update to the Green Star – Design & As-Built rating tool. Green Star – Buildings evaluates sustainability in the design and construction of buildings only. It assesses the sustainability outcomes of new buildings or major refurbishments across eight impact categories: Responsible; Healthy; Resilient; Positive; Places; People; Nature; and Leadership. On the site, the new Sydney Fish Market building is targeting a 6 star Green Star Design & As-Built v1.2 rating under the previous rating scheme.

## NSW ESD Policy Context, Controls and Guidelines

### Environment Planning and Assessment Regulation 2000

The redevelopment of Blackwattle Bay is subject to the requirements set under the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the regulations supporting the Act. The SSP Requirements for the precinct specifically reference the ESD principles set out in the clause 7(4) of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, namely:

- a the **precautionary principle**, namely, 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. In the application of the precautionary principle, public and private decisions should be guided by:
  - i careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
  - ii an assessment of the risk-weighted consequences of various options,
- b **inter-generational equity**, namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,
- c **conservation of biological diversity and ecological integrity**, namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
- d **improved valuation, pricing and incentive mechanisms**, namely, that environmental factors should be included in the valuation of assets and services, such as:
  - i polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
  - ii the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
  - iii environmental goals, having been established, 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.

### NSW Climate Change Policy Framework

The Framework outlines the NSW Government's long-term objectives to achieve net-zero emissions by 2050 and to create a more climate resilient NSW. The aim of the Policy Framework is to: "*maximise the economic, social and environmental wellbeing of NSW in the context of a changing climate and current and emerging international and national policy settings and actions to address climate change*".

This Framework includes actions to implement emissions savings policies, lead by example, assess and manage climate change risk to government assets and services and to support households, communities and businesses.

The Policy Framework is supported by key policy directions, as follows:

- Create a certain investment environment by working with the Commonwealth to manage transition

- Boost energy productivity, put downward pressure on household and business energy bills
- Capture co-benefits and manage unintended impacts of external policies
- Take advantage of opportunities to grow new industries in NSW
- Reduce risks and damage to public and private assets in NSW arising from climate change
- Reduce climate change impacts on health and wellbeing
- Manage impacts on natural resources, ecosystems and communities

The development of the Blackwattle Bay precinct should be aligned with the above policy directions, where relevant. Through sustainable design integration, renewable energy and energy efficiency measures can boost energy productivity and lower energy bills, reduce climate change impacts on health and wellbeing, as well as grow the sustainability industry in NSW through improving workforce capability.

### Net Zero Stage 1 Plan: 2020-2030

The Net Zero Plan Stage 1: 2020-2030 is the foundation for NSW's action on climate change and goal to reach net zero emissions by 2050. The Plan directly supports the NSW Climate Change Policy Framework and outlines the NSW Government's plan to grow the economy, create jobs and reduce emissions over the next decade.

The Plan aims to support actions to deliver a 35 per cent cut in emissions by 2030 (compared to 2005 levels). These actions include initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

The Plan sets out how the NSW Government will support those solutions to 2030, with four priority areas for action:

1. Drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living
2. Empower consumers and businesses to make sustainable choices
3. Invest in the next wave of emissions reduction innovation to ensure economic prosperity from decarbonisation beyond 2030
4. Ensure the NSW Government leads by example

The NSW Government expects the following reduction in carbon emissions by 2030 from these priority areas:

**Table 22: Net Zero Stage 1 Plan Emissions Reduction Predictions**

Priority	Carbon emissions reduced by 2030 (Mt / year)
Priority 1 – Drive uptake of proven emissions reduction technologies	27.7
Priority 2 – Empower consumers and businesses to make sustainable choices	1.6
Priority 3 – Investing in the next wave of emissions reduction technology	1.4
Priority 4 – Government leading by example	5.1
<b>Total forecast carbon emissions reduction by 2030</b>	<b>35.8</b>

### NSW Electricity Strategy

The NSW Electricity Strategy aims to provide a “*pathway for a reliable, affordable and sustainable electricity future*” and to encourage over \$8 billion of new private investment in the NSW electricity system; deliver coordinated Renewable Energy Zones; save energy during peak demand; develop new electricity generators; and set a target to boost NSW's energy resilience.

Renewable Energy Zones are delivered in line with the aims of the NSW Transmission Infrastructure Strategy to unlock a pipeline of large-scale renewable energy and storage projects. The zones will deliver significant amounts of new energy supply, increase energy affordability and reduce emissions.

The NSW Government intend the Strategy to:

1. Improve the efficiency and competitiveness of the NSW electricity market by reducing risk, cost, Government caused delays and by encouraging investment in new price-reducing generation and energy saving technology;
2. Prompt Government to act if there is a forecast breach of the EST which private sector projects are unlikely to address. This should be done in a way that minimises costs to consumers and taxpayers and does not give rise to moral hazard risk; and
3. Ensure that there are appropriate powers available for Government to analyse and respond to electricity supply emergencies, if they arise.

The Strategy sets out 10 actions that will support a competitive electricity market with more resilient supplies. The actions were chosen to support an efficient, competitive and low-cost electricity market and making it easier to invest in clean energy; avoid electricity emergencies caused by capacity constraints; and having a strong emergency response to electricity system failures.

The Strategy also outlines NSW's Energy Security Target position: *"AEMO forecasts the 1-in-10-year peak demand for the summer of 2019-20 to be 14,373 MW. 57 The firm supply rating for each of the two largest generating units in the State is 680 MW. Accordingly, the EST is 15,733 MW. NSW's firm capacity for 2019-20 is estimated at 15,545 MW. Therefore, this places NSW 188 MW short of its EST. In this respect, the State's capacity shortfall on its EST is expected to be addressed by the summer of 2021, with additional projects providing further capacity increases through to 2022-23"*.

Whilst the Strategy takes a state-wide focus, it should be considered in the context of the increased population and electricity demand across the Precinct. Energy efficiency measures and onsite renewable energy may be initiatives that can be implemented in the Precinct to compliment the Strategy, and in line with the planning requirements to achieve a minimum 50 per cent renewable energy for the Precinct.

### **Technical Guidelines for Urban Green Cover in NSW**

The NSW Government has produced *Technical Guidelines for Urban Green Cover in NSW* to provide advice on best practice urban green cover strategies. Green cover includes a range of strategies that integrate green permeable and reflective surfaces in urban areas, helping to reduce the impacts of the urban heat island effect. The purpose of the Guidelines is to help NSW communities increase their resilience to climate change and increased temperatures in urban environments.

Produced in 2015, the Guidelines recognise the need for urban environments to withstand the projected increase in urban temperatures and extreme heatwaves, storms and localised flooding. The Guidelines include a number of green cover strategies, such as: vegetated and reflective roofs, green walls, street plantings, permeable and reflective road surfaces, and cool open spaces and parks. These are generally low-cost approaches to cooling urban environments that provide concurrent ecosystem benefits and services such as stormwater management, air quality improvements and habitat for local fauna.

### **Building Sustainability Index (BASIX) SEPP**

The SSP requirements identify performance benchmarks for sustainability to be considered in site planning, building design and in the construction and operational phases of the development to achieve best practice sustainability outcomes. BASIX controls are prescribed under a State Environmental Planning Policy (SEPP), which is implemented under the EP&A Act. It is a statutory requirement for all residential developments in NSW worth \$50,000 or more, including new constructions and renovations.

BASIX mandates sustainability standards in residential developments. It is one of the most stringent energy and water planning tools for residential developments within Australia. BASIX is a sustainability planning instrument that sets energy and water design standards for all residential dwelling types in NSW.

BASIX drives energy and water use efficiencies through specific design strategies and prescriptions for lighting, heating, cooling and ventilation for energy, and potable water use and non-potable water replacement rates for water. It assesses potable water use, energy use and thermal performance of the building. BASIX targets were revised in June 2017. Table 23 and Table 24 below provide the current minimum statutory BASIX targets for residential developments in Sydney, NSW.

**Table 23: Statutory BASIX Energy Targets**

<b>Building Type</b>	<b>BASIX Target</b>
Detached and semi-detached	50
Low-rise (3-storey units)	45
Mid-rise (4-5 storey units)	35
High-rise (6-storey units and higher)	25

**Table 24: Statutory BASIX Water Targets**

<b>Building Type</b>	<b>BASIX Target</b>
All (detached, semi-detached, low-rise, mid-rise, high-rise)	40

BASIX energy and water targets will influence overall electrical demand at the Blackwattle Bay site, with an increase in BASIX targets implying decreased demand and more thermally efficient building envelopes and services required at later stages of development. This will ensure an extent of future-proofing from climate change and related temperature increases.

### **SEPP 65 and the Residential Apartment Design Guide**

The State Environmental Planning Policy No 65 – Design Quality of Residential Apartment Development (SEPP 65) (2015) promotes better apartment design across NSW through the establishment of a consistent approach to the design and assessment of apartments and the way they are assessed by councils. SEPP 65 provides guidance on features for apartment buildings through several key design criteria relating to the sustainability performance of the development including:

- Bicycle and car parking
- Solar and daylight access
- Natural ventilation
- Apartment size and layout
- Universal design
- Energy efficiency
- Water management and conservation
- Waste management
- Building maintenance

The Residential Apartment Design Guide can provide guidance, in subsequent stages of the development, on overall apartment building design within the precinct to drive sustainable design for the benefit of the residents as well as reduce energy and water demand and waste generation.

### **NSW Waste Avoidance and Resource Recovery Strategy 2014-2021**

The NSW Waste Avoidance and Resource Recovery (WARR) Strategy 2014-2021 provides a framework for waste management and aligns with the NSW Government's waste reforms set out in 'NSW 2021: A Plan to make NSW number one'.

The vision set by the WARR Strategy is to “enable all of the NSW community to improve environment and community well-being by reducing the environmental impact of waste and using resources more efficiently”.

The WARR Strategy is underpinned by the ‘*Waste Less, Recycle More*’ funding initiative. *Waste Less, Recycle More* has provided investment into significant new recycling and waste infrastructure, litter programs, education programs and illegal dumping reduction actions across the state.

The WARR Strategy’s key objectives and targets are to: increase recycling across municipal, commercial/industrial and construction & demolition waste streams; divert waste from landfill; better manage problem wastes; reduce litter and illegal dumping. The Strategy includes several targets, outlined in Table 25.

**Table 25: NSW WARR Strategy Targets**

<b>WARR Strategy 2014-21 Targets</b>	
Avoidance and reduction of waste generation	
By 2021–22, reduce the rate of waste generation per capita	
Reduce household chemicals, e-waste, organics and support collection for safe disposal and recycling drop-off facilities	
<b>Increase recycling</b>	<b>Divert from landfill</b>
<ul style="list-style-type: none"> <li>▪ Municipal solid waste from 52% (in 2010–11) to 70%</li> <li>▪ Commercial and industrial waste from 57% (in 2010–11) to 70%</li> <li>▪ Construction and demolition waste from 75% (in 2010–11) to 80%</li> </ul>	<ul style="list-style-type: none"> <li>▪ By 2021–22, increase the waste diverted from landfill from 63% (in 2010–11) to 75%</li> </ul>

Under the Blackwattle Bay SSP Study Requirements, identification and implementation of waste management strategies in alignment with the WARR Strategy is required. The sustainability targets for the new Sydney Fish Market development includes a target of 90% of construction and demolition waste to be diverted from landfill through waste minimisation, reuse and recycling and a target to divert 80% of operational waste from landfill.

### **Waste Less, Recycle More**

The Environmental Protection Authority’s (EPA) Waste Less, Recycle More initiative provides funding for business recycling, organics collections, market development, managing problem wastes, new waste infrastructure, local councils and programs to tackle illegal dumping and litter. The program seeks to encourage local communities to think differently about waste avoidance, recycling, littering and illegal dumping, deliver conveniently located, value-for-money waste infrastructure to make it easier to ‘do the right thing’, and drive innovative regulatory approaches to protect the environment and support investment in new waste programs.

The Blackwattle Bay SSP Study Requirements stipulate that the waste management strategies identified for the precinct compliment the Waste Less, Recycle More initiatives and EPA waste and recycling programs.

### **Better Practice Guide for Resource Recovery in Residential Developments**

The Better Practice Guide for Resource Recovery in Residential Developments (2019) was released by the NSW EPA as a guide to assist local planners, architects, urban designers, developers and other professionals to incorporate better waste and recycling management design practices in residential developments. It applies only to residential developments, and does not cover commercial, retail or industrial premises. As such, the Guide can be referenced during the design of the Blackwattle Bay residential buildings to ensure the best waste management outcomes are realised.



The Guide provides information on how to make the collection of waste and recycling convenient and safe for all involved, how to improve the performance of waste collection systems and how to minimise the visual amenity impact of such systems. The Guide includes four waste and resource recovery design principles:

1. **Environmental and sustainability best practice:** Developments meet requirements for long-term sustainability and best practice when:
  - a. systems are designed to maximise waste separation and resource recovery
  - b. innovative and best practice waste management collection systems and technologies are supported where appropriate
  - c. flexibility in design allows for future changes in waste generation rates, materials collected and methods of collection
2. **Effective waste and resource management:** Developments achieve effective waste and resource management when:
  - a. waste services can occur in a safe, seamless and timely manner
  - b. access to waste disposal and resource recovery services are safe and convenient for all residents
  - c. functional and adequate storage spaces are provided for all waste and recycling streams, including temporary storage areas for bulky materials like cardboard boxes and oversized household waste.
3. **Clean, safe and healthy living environments:** Developments protect and enhance the quality of life for the community when:
  - a. negative impacts on amenity for residents, neighbours and the public, such as visually unpleasant waste storage areas, bad odours and noise from waste collection are minimised
  - b. illegal dumping and litter from bins are minimised through good planning and installation of adequate storage and waste recovery infrastructure
  - c. safe and easy access to waste and resource recovery storage areas is provided for residents, building managers and collection contractors.
4. **Affordability:** Developments allow residents to engage in cost-effective waste services when:
  - a. careful design and construction prevents costly retrofits
  - b. flexibility in design allows for the collection of all waste and recycling streams to be cost-effective for residents.

## Regional and Local ESD Policy Context, Controls and Guidelines

### Greater Sydney Commission's Sustainability Profile for Greater Sydney and The Eastern City District Plan

The Greater Sydney Commission (GSC) is an independent organisation formed to coordinate and align the planning to shape Greater Sydney in a 'one government' approach. The aim is to give rise to a productive, liveable and sustainable Sydney. The GSC is underpinned by an environmental, social and economic commissioner with a focus on planning for improved futures across the triple bottom line.

The GSC's Sustainability Profile for Greater Sydney was released in 2017 to provide supporting information on the environment, climate and biophysical system of Greater Sydney. It characterises the sustainability of Greater Sydney through three key themes:

- A city in its landscape
- An efficient city

- A resilient city

These themes are integrated into the GSC's Greater Sydney Region Plan and District Plans and inform the planning priorities outlined in the Plans. Blackwattle Bay falls within the GSC's Eastern City District Plan. The Eastern City is characterised by high concentrations of jobs, good road and public transport connectivity and high levels of interaction between business and people. The corridor contributed two-thirds of the State's economic growth over the 2015-16 financial year.

The Eastern City District Plan includes several sustainability planning priorities. Of these priorities the most relevant to Blackwattle Bay are:

- Planning Priority E14. Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways.
- Planning Priority E16. Protecting and enhancing scenic and cultural landscapes.
- Planning Priority E18. Delivering high quality open space.
- Planning Priority E19. Reducing carbon emissions and managing energy, water and waste efficiently.
- Planning Priority E20. Adapting to the impacts of urban and natural hazards and climate change.

Planning priority E14 is particularly relevant to Blackwattle Bay as it is a waterfront location, situated within the Sydney Harbour catchment. Through this planning priority, the Greater Sydney Commission emphasises the necessity and importance of improved waterway health and enhanced community access to the Sydney Harbour foreshore.

### **Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005**

The Sydney Regional Environment Plan (Sydney Harbour Catchment) provides a framework to maintain, protect and enhance the catchment, foreshores, waterways and islands of Sydney Harbour. The Sydney Regional Environmental Plan (Sydney Harbour Catchment) does not apply to Blackwattle Bay as it is overridden by SEPP (State and Regional Development) 2011. However, it is important to recognise the planning principles to be used by councils for the preparation of planning instruments. The NSW Government is currently reviewing the Plan and proposes to merge it into a single State Environment Planning Policy (SEPP) (Environment).

### **The Sydney Development Control Plan 2012 (Sydney DCP 2012)**

The Sydney DCP 2012 is a consolidation of the previously separate DCPs and policies in force within the City of Sydney LGA. The Sydney DCP 2012 does not apply to Blackwattle Bay as it is overridden by SEPP (State and Regional Development) 2011. However, the Blackwattle Bay precinct is surrounded by land that is bound by the Sydney DCP. To enable connection with the surrounding urban fabric, considerations will be made to the general provisions as detailed in the Sydney DCP 2012 in recognition that the Blackwattle Bay precinct will interface with the City of Sydney LGA.

There are several general provisions that will have a measurable effect on the physical quality of the environment in Blackwattle Bay.

### **Pymont Peninsular Place Strategy**

The Pymont Peninsular Place Strategy was released in late 2020. It provides a 20-year vision and planning framework to guide development and renewal in Pymont through to 2041.

The Strategy includes 10 Directions and five 'big moves' for Pymont and broke the area into sub-precincts to support the implementation of the Strategy and to recognise the unique characters of the areas in Pymont. Relevant directions include a focus on greener public spaces and experiences to increase the tree canopy cover and provide better places; prioritising public and active transport; and building a sustainable future through adaptive and resilient built environments. Additionally, the fourth 'big move' is to create a low carbon, high performance precinct focused on the provision of multi-utility hubs and integrated models of car parking.

Blackwattle Bay is one of the sub-precincts and 20 place priorities for the area have been identified. Of particular relevance to this Report are the following priorities:

- Investigate a multi-utility hub for sustainable precinct-scale solutions such as integrated parking, electric vehicle charging, battery storage, recycled water and organic waste systems, or bike facilities.
- Encourage green building facades and rooftop gardens in the new development.

### City of Sydney Sustainable Sydney 2030

Sustainable Sydney 2030 is the overarching program for the development of the city to 2030 and beyond. The overall themes within the strategy are 'Green', 'Global', and 'Connected'. The strategy ties together several plans covering the economy, carbon neutrality, green infrastructure, renewable energy, decentralised water, sustainable transport, light rail and car sharing. Some of the key targets relevant to development in Blackwattle Bay are:

- Reduce carbon emissions within the Sydney LGA by 70% on 2006 levels by 2030, and by 2050 achieve carbon neutrality
- 50% of electricity demand met by renewable sources
- Zero increase in potable water use from 2006 baseline
- Total canopy cover increased by 50% from 2008 baseline

The City of Sydney is currently reviewing the Sustainable Sydney 2030 strategic plan and planning for Sydney 2050, including an extensive public consultation process. It is expected that the revised 2050 Plan will be out for public consultation by March 2020 and finalised by June 2020.

### City of Sydney City Plan 2036 – Local Strategic Planning Statement

In March 2020, the City of Sydney released the final City Plan 2036: City of Sydney Local Strategic Planning Statement following a period of public consultation. The City Plan sets out the 20-year land use planning vision and reinforces the links between the NSW Government's strategic plan, including the GSC Regional and District Plans, the City's Community Strategic Plan, Sustainable Sydney 2030, and the planning controls that guide development in the City of Sydney.

The City Plan includes 13 priorities, objectives and several actions to achieve the vision and guide future planning controls. Several of the priorities are relevant to the ESD Strategy:

- **S1 – Protecting and enhancing the natural environment for a resilience city.** To improve the city's waterways, biodiversity corridors, green spaces and tree canopy to support the environment and a healthy community. Objectives:
  - The City has healthy natural waterways and foreshore environments that can be enjoyed by all; and
  - Waterways, bushland and canopy cover contribute to resilience by reducing urban heat, enhancing biodiversity and improving liveability.
- **S2 – Creating better buildings and places to reduce emissions and waste and use water efficiently.** To develop buildings and places that will be net zero energy by 2050, use water more efficiently, and help reduce waste. Objectives:
  - Greenhouse gas emissions in the built environment are reduced to mitigate climate change;
  - Potable water use is reduced with recycled water systems and rainwater harvesting opportunities maximised to increase resilience in the natural and built environment;
  - Waste is re-used as a resource, reducing landfill and greenhouse gas emissions; and
  - Precincts maximise their positive impact on the environment and increase resilience through precinct-wide sustainable energy, water and waste management systems.
- **S3 – Increasing resilience of people and infrastructure against natural and urban hazards.** To manage the risks to people and infrastructure from flooding and stormwater, contaminated land, noise, and the longer-term implications of sea-level rise. Objectives:

- The City has the capability to respond to and recover from natural and urban hazards, while ensuring communities continue to thrive

The ESD Strategy for the Blackwattle Bay Precinct aims to demonstrate the sustainability targets and initiatives that will work to meet the planning priorities and objectives of the City Plan.

### City of Sydney Environmental Action 2016 – 2021 Strategy and Action Plan

The City of Sydney Environmental Action Plan falls under the Sustainable Sydney 2030 strategy and sets out the short- and medium-term priorities and actions for its local government area. The Action Plan focuses on defining actions to 2021 as part of process toward achieving 2030 environmental targets. It is expected that the work on developing the updated Sustainable Sydney 2050 Plan will include a new Environmental Action Plan, or similar, to extend the targets further into the future.

By 2021, the City of Sydney is committed to reducing emissions in its operations by 44% from 2006 levels. Across the LGA, the City of Sydney has also set targets for 50% renewables by 2030, 70% reduction in 2006 greenhouse gas emissions levels by 2030 and net-zero emissions by 2050.

The Action Plan includes several areas of impact. The areas of impact most relevant to Blackwattle Bay include:

- **Excellence in new building design** – which sets guidance on voluntary standards for excellence in environmental performance in new buildings. The environmental benchmarks and design features suggested were leading-edge practice for the LGA in 2017. Table 26 details these benchmarks, which are higher than compliance requirements.

**Table 26: City of Sydney guidance on voluntary standards for excellence in environmental performance in new buildings (as at 2017)**

Energy and Emissions	Water Efficiency
<b>Residential development</b> <ul style="list-style-type: none"> <li>Single dwellings: BASIX 60+</li> <li>Apartments 2-3 storeys: BASIX 50+</li> <li>Apartments 4-5 storeys: BASIX 50+</li> <li>Apartments 6+ storeys: BASIX 40+</li> <li>Green Star Design &amp; As-Built – 5 Stars+</li> </ul>	<b>Residential development</b> <ul style="list-style-type: none"> <li>BASIX 50</li> <li>BASIX 60 where recycled water is available</li> <li>Green Star Design &amp; As-Built – 5 Star+</li> </ul>
<b>Commercial Office</b> <ul style="list-style-type: none"> <li>NABERS Energy Commitment: 6 Stars</li> <li>Premium office – Green Star Design &amp; As-Built – 5 Stars+</li> <li>Non-premium office – Green Star Design &amp; As-Built – 5 Stars+</li> </ul>	<b>Commercial office</b> <ul style="list-style-type: none"> <li>Designed to meet Sydney Water Good Practice standard (w/o cooling towers 0.47kL/m<sup>2</sup>/yr, w/ cooling towers 0.84kL/m<sup>2</sup>/yr)</li> <li>Green Star Design &amp; As-Built – 5 Star+</li> </ul>
<b>Hotels and serviced apartments</b> <ul style="list-style-type: none"> <li>Materially exceed BCA Section J</li> <li>Green Star Design &amp; As-Built – 5 Stars+</li> <li>Gold star LEED (build and construct)</li> <li>Best Practice Earthcheck (planning and design)</li> <li>NABERS Energy Commitment (when available)</li> </ul>	<b>Hotels and serviced apartments</b> <ul style="list-style-type: none"> <li>With cooling tower and laundry (0.43kL/m<sup>2</sup>/yr)</li> <li>Without cooling tower and laundry (0.17kL/m<sup>2</sup>/yr)</li> <li>Green Star Design &amp; As-Built – 5 Star+</li> <li>Gold Star LEED (build and construct)</li> <li>Best Practice Earthcheck (planning and design)</li> <li>NABERS Energy Commitment (when available)</li> </ul>

- **Low-carbon city** – which sets a 2030 target to reduce emissions by 70% below 2006 levels for both City of Sydney operations and across the LGA. Figure 8 demonstrates the identified reductions pathway and focus initiatives for the City of Sydney, including renewable energy:

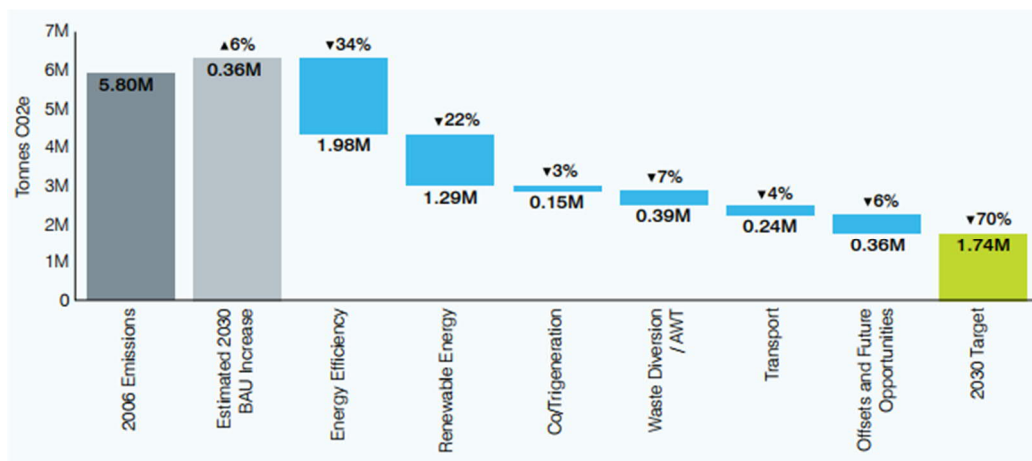


Figure 8: Local government area greenhouse gas emissions (Source: City of Sydney)

- **Water sensitive city** – which outlines the approach to drought-proof the LGA to ensure available water supply when it is hot and dry, as well as improving waterway health. The City of Sydney has set targets for the LGA to have zero increase in potable water use by 2030 from 2006 levels, to achieve a 50% reduction in annual solid pollution load discharged into waterways via stormwater by 2030 and a 15% reduction in annual nutrient load discharged into waterways via stormwater by 2030. Given the proximity of Blackwattle Bay to major waterways, these targets and actions are particularly relevant. **Error! Reference source not found.** demonstrates the estimated contribution of City of Sydney identified water-saving initiatives:

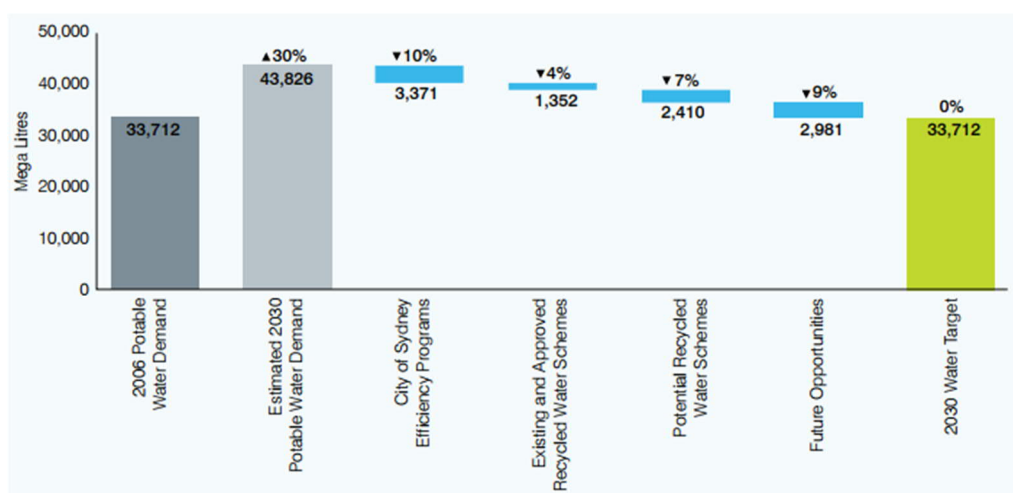


Figure 9: Local government area potable water use (Source: City of Sydney)

- **Zero waste city** – which outlines the City of Sydney's approach to managing waste as a valuable resource and minimising the environmental impact of waste generation and disposal. Of relevance to Blackwattle Bay, the City of Sydney is targeting 70% recycling and recovery of commercial and industrial waste by June 2021, 70% recycling and recovery of residential waste by June 2021, and 80% recycling and recovery of construction and demolition waste by June 2021.

## City of Sydney Climate Change Adaptation Plan

The City of Sydney developed the Climate Change Adaptation Plan as a supporting document to the Environmental Action Plan. The Plan outlines the key projected changes that may affect the City and its residents including increases in: temperature, heatwaves and extreme heat days, frequency of extreme rain events as well as dry spells, air pollution, bushfire conditions and sea levels. It outlines several adaptation measures to address these risks, as applicable to the LGA.

As part of the City of Sydney's participation in the 100 Resilience Cities project, the City produced a Resilience Sydney Report which includes research on the built environment and land use planning to adapt to the possible impacts of climate change.

Since that time, the City of Sydney has declared a climate emergency and have committed to source 100% renewable energy for their (City-owned) electricity needs from 2020 and replace all streetlights with energy efficient LEDs.

### **Resilient Sydney – A Strategy for City Resilience 2018**

The Resilient Sydney Strategy is a 5-year plan with 5 directions and 35 actions to achieve the vision of Sydney as a metropolis that is connected, inclusive and resilient. The Strategy was developed with participating councils of metropolitan Sydney, including the City of Sydney.

The directions are:

1. People Centred. Milestone: To incorporate Sydney's resilience challenges and directions in local government community plans by 2020.
2. Live with our Climate. Milestone: Publish the cool suburbs strategy and action plan with targets to reduce temperatures, improve canopy cover, reduce morbidity and mortality, and monitor economic impacts of extreme heat in 3 years.
3. Connect for Strength. Milestone: Standards for city wide monitoring and reporting of social cohesion aligned to the Scanlon Foundation annual survey of capital cities.
4. Get Ready. Milestone: 100,000 Get Prepared app downloads by the 3rd year (The Red Cross and IAG have developed a free app called Get Prepared to help communities prepare for emergencies).
5. One City. Milestone: 100 organisations make a commitment to supporting implementation of the strategy by 2021.

The directions and actions in the Strategy will inform the future resilience planning for the site and will be a component of the climate change and resilience risk assessment that is recommended to be undertaken during further master planning.

### **City of Sydney Guidelines for Waste Management in new Developments**

Building on the City of Sydney's 2005 Policy for Waste Minimisation in New Developments, the City has produced Guidelines for Waste Management in New Developments which falls under other sustainability policies including the City of Sydney's Sustainable Sydney 2030 Plan, the Environmental Action Plan 2016-2021, and Waste Strategy and Action Plan 2017-2030.

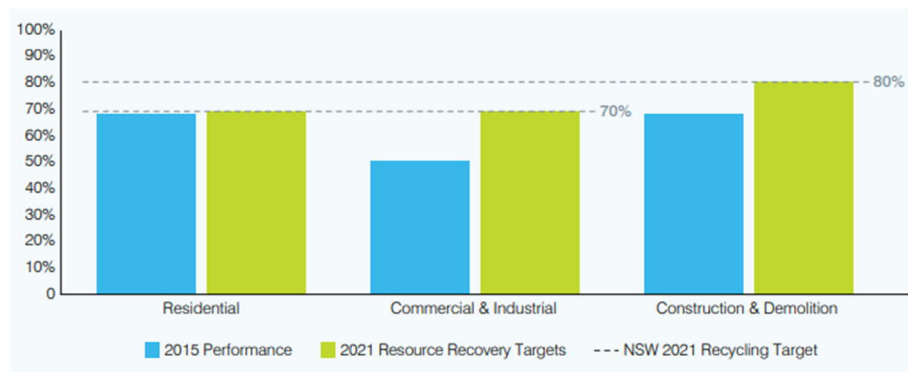
The Guidelines aim to assist architects, designers, developers, planners, consultants, builders and building managers to manage a building's waste outputs. They provide specific advice depending on development type and include provisions to address space, access and amenity requirements, safety, waste services and waste management systems.

The principals and practices presented in the Guidelines are relevant for consideration in the design for waste management in new buildings in Blackwattle Bay. In particular, the Guidelines detail waste and recycling requirements for multi-unit residential developments with shared waste and recycling bins. This includes space for waste segregation and storage within individual dwellings and within the residential building and the design of waste disposal chute systems.

### **City of Sydney Leave Nothing to Waste, Waste Strategy and Action Plan 2017-2030**

The City of Sydney controls domestic and public recycling and waste management. The 'Environmental Action Plan 2016-2021 sets an objective for a "Zero waste city". The strategy reflects the government targets of reduction which can be seen in Figure 10.





**Figure 10: Waste Targets for the City of Sydney compared to NSW Targets (Source: City of Sydney)**

The City of Sydney's targets are further supported by their Waste Strategy and Action Plan 2017-2030 "Leave Nothing to Waste". This Action Plan sets targets and strategies for residents to divert 70% of waste (with a minimum of 35% as source-separated recycling) away from landfill. It also sets targets for businesses and to divert 70% of waste from operating businesses in the local government area away from landfill and 80% of waste from construction and demolition activities in the local government area away from landfill. As part of the Strategy, the City of Sydney has set the objective to expand their waste services to include residential collection of e-waste, textiles and food waste.

### City of Sydney Urban Forest Strategy

The City of Sydney's Urban Forest Strategy (2013) is the City's plan to increase the City's 'urban forest', including strategies to protect and maintain existing trees, to increase the tree canopy cover in streets, parks and private property, and to increase diversity of trees in the area. The document sits under the City of Sydney's Environmental Action Plan 2016-2021 and underpins the City's commitment to deliver a "Green, Global and Connected City".

### Utilities

#### Energy – Ausgrid

Ausgrid are responsible for the energy networks for connections in the Blackwattle Bay precinct. They will be involved with setting the requirements for the energy servicing for the precinct. They will be key stakeholders for any significant energy efficiency, peak reduction and or onsite generation considerations.

Ausgrid will need to understand the overall electricity demand profiles of the precinct in order to develop and maintain the appropriate electricity infrastructure to service the precinct.

If any alternative network or internal distributed energy solutions are to be considered this would also require significant engagement with Ausgrid and the regulators.

#### Energy - Jemena

Jemena own and operate a diverse portfolio of energy and water distribution assets. In NSW, Jemena's gas network distributes natural gas to 1.3 million residential and industrial customers across Sydney, Newcastle, the Central Coast, Wollongong and several regional centres.

Blackwattle Bay is currently serviced by Jemena's gas network and they are a key stakeholder involved in the planning and development of the precinct and energy servicing infrastructure. Jemena will need to understand the impact of connecting the precinct on their gas network servicing capacity. Consideration will need to be given to the carbon intensity of the fuel and the ability of the precinct to progress toward a net-zero carbon emissions by 2050 target.

#### Water - Sydney Water

Sydney Water is Australia's largest water and wastewater service provider with an organisational commitment to enhancing Australian cities' sustainability and lifestyle. With Sydney's populations set to increase by 1.3 million residents in the next 20 years, Sydney Water recognises that population growth, increasing urban density, water security, and climate change will all affect the liveability and resilience of Sydney.

Sydney Water is a key stakeholder involved in the planning and development of the Blackwattle Bay precinct which is within their network jurisdiction. Sydney Water supplies potable water to all areas in Blackwattle Bay from its Prospect and Kurnell Systems and wastewater services through the Bondi Sewerage Treatment Plants.

Sydney Water will need to understand the overall water, stormwater and wastewater needs in order to develop and maintain the appropriate infrastructure to service the precinct. This will include understanding the future growth of the area from recent proximate developments, such as Barangaroo, Western Harbour Precinct, Sydney Convention Precinct, Glebe Redevelopment Project and Former Rozelle Tram Sheds.

# Appendix B

## Sustainability Trends and Drivers

## Appendix B Sustainability Trends and Drivers

### Energy and Emissions Trends

#### Climate Change

Climate change is already affecting NSW – Australia's climate has warmed by 0.9°C since 1910, with the decade from 2010 to 2019 being the hottest on record.<sup>1</sup> The Intergovernmental Panel on Climate Change Fifth Assessment Report states with high confidence that Australia is already experiencing a greater frequency and severity of extreme weather events, an increase in record hot days and a decrease in record cold days. Climate system modelling shows that NSW is forecast to continue to warm this century - warming is projected to average about 0.7°C in the near future (2020–2039), increasing to about 2.1°C in the longer term (2060–2079).

To better prepare for the increase in extreme events, Sydney is a member of the 100 Resilient Cities initiative pioneered by the Rockefeller Foundation. All 33 Sydney metropolitan councils have been involved in developing the Resilient Sydney strategy, which outlines actions to strengthen the ability of Sydney to adapt to climate change. The main risk identified for Sydney in the strategy is extreme heat and an increase in the number of days over 35°C.

Therefore, considerations such as increased tree canopy cover (every 10 per cent increase in tree canopy can reduce land surface temperatures by 1.13°C<sup>2</sup>), planting a variety of vegetation species to increase roughness of the urban landscape, low emissivity and high albedo (reflectivity) materials/coatings, green roofs and vegetation covered pergolas (preferably deciduous) should be considered in the planning of the Precinct.

#### Residential Electricity Prices

The most recent analysis of residential electricity price trends by Australian Energy Market Commission showed that between 2018-19 to 2021-22 there is expected to be a decrease in residential electricity prices by 8.3 per cent in NSW, which equates to an average annual saving of \$107 per dwelling.<sup>3</sup>

This cost reduction has three main drivers in NSW:

1. Wholesale costs are estimated to fall as demand stays constant and an influx of new generation comes onto the market
2. Environmental scheme costs are estimated to fall by 23.3 per cent because of a reduction in the cost of Large Generation Certificates (main mechanism of the Large-scale Renewable Energy Target)
3. Network costs are estimated to fall by 1.8 per cent, driven by a reduction in transmission costs, mainly from TransGrid (the transmission network operator in NSW).

This decrease in electricity cost means that there is increased opportunity for the full, or at least significantly increased from business-as-usual, electrification of buildings, explored in greater detail in the next section.

#### Building Electrification

Building electrification involves transitioning from gas to electricity for space and water heating and cooking appliances in buildings to eliminate a building's direct greenhouse gas emissions. To meet the NSW Government's net-zero goal, gas use will need to decline by 80 per cent by 2050. In Greater Sydney, energy use in buildings continues to be the largest contributor to greenhouse gas emissions.

<sup>1</sup> Annual climate statement 2019 (Bureau of Meteorology)

<http://www.bom.gov.au/climate/current/annual/aus/#:~:text=Australia's%20warmest%20year%20on%20record%3B%20marked%20by%20severe%2C%20protracted%20drought,1.33%20%C2%B0C%20in%202013.>

<sup>2</sup> Technical Guidelines for Urban Green Cover in NSW: <https://climatechange.environment.nsw.gov.au/-/media/NARCLim/Files/Section-4-PDFs/Urban-Green-Cover-Technical-Guidelines.pdf?la=en&hash=C7FCADABE417DD2DF67461F067463054D9408E2F>

<sup>3</sup> Residential Electricity Price Trends (AEMC, 2019): <https://www.aemc.gov.au/sites/default/files/2019-12/2019%20Residential%20Electricity%20Price%20Trends%20final%20report%20FINAL.pdf>

The City of Sydney is developing performance standard pathways to net zero energy buildings for use in planning controls in collaboration with other industry stakeholders. Electrification is necessary for achieving net zero buildings, without using carbon offsets, as it is possible to decarbonise electricity consumption, unlike gas.

Space and water heating can be replaced by a range of electrical options, the most common being air-source heat pumps. For cooking, induction cooktops are the closest in matching the performance of gas cooktops.

There are differing views on the trend of building electrification among industry experts as the price trends and policy settings are uncertain. There are several variables that will influence the growth of building electrification:

- Value placed on the resilience provided through connection to both the gas and electricity network; and
- Freedom associated with the ability to reduce exposure to gas/electricity price increases by full electrification and self-generating electricity.

Consideration of electrifying systems that provide hot water, heating, ventilation and air-conditioning (HVAC) and cooking should be made in the development of the Precinct. It is a solution that offers both whole-of-life cost advantages as well as greenhouse gas emission mitigation (dependent on the decarbonisation on the grid).

The trend has been growing overseas and in Australia. With emissions reduction goals in California, Pacific Gas and Electric Company (PG&E), California's largest combined gas and electric utility, has formally supported ending gas hook-ups in new buildings. In Australia, Mirvac received ARENA funding to build a 'net zero energy' housing estate in Melbourne comprised of 49 townhouses with energy efficient electric appliances, heating, cooling, lighting and hot water systems.

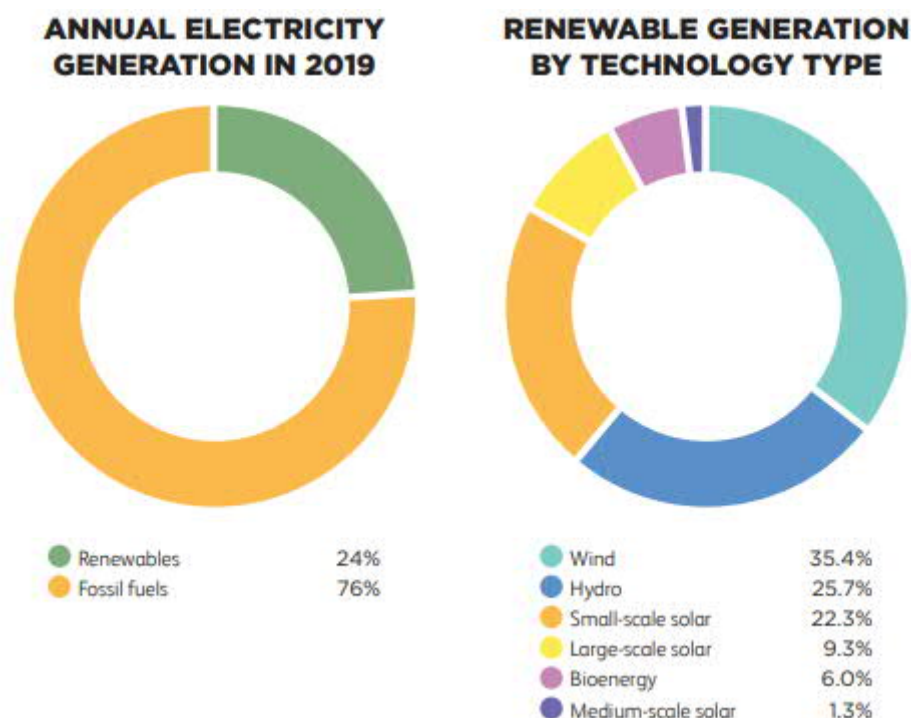
## Renewable Energy Generation

At the end of 2019, 11.1 GW of new renewable energy generation was under construction or financially committed<sup>4</sup>. Wind energy makes up over 35 per cent of Australia's renewable energy generation while small-scale solar systems (up to 100 kW) are responsible for 22.3 per cent of Australia's renewable energy generation, producing 5.3 per cent of Australia's total electricity<sup>5</sup>. Installations of medium-scale solar (100 kW to 5 MW) have grown by more than 700 per cent over the past five years. Medium-scale installations are commonly found on shopping centres, schools and commercial/industrial buildings.

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<sup>4</sup> Clean Energy Council of Australia, <https://www.cleanenergycouncil.org.au/resources/resources-hub/clean-energy-australia-report>

<sup>5</sup> Clean Energy Council of Australia, <https://www.cleanenergycouncil.org.au/resources/technologies/solar-energy#:~:text=Annual%20installed%20capacity%20of%20solar&text=There%20is%20now%20403%20MW,over%20the%20past%20five%20years>



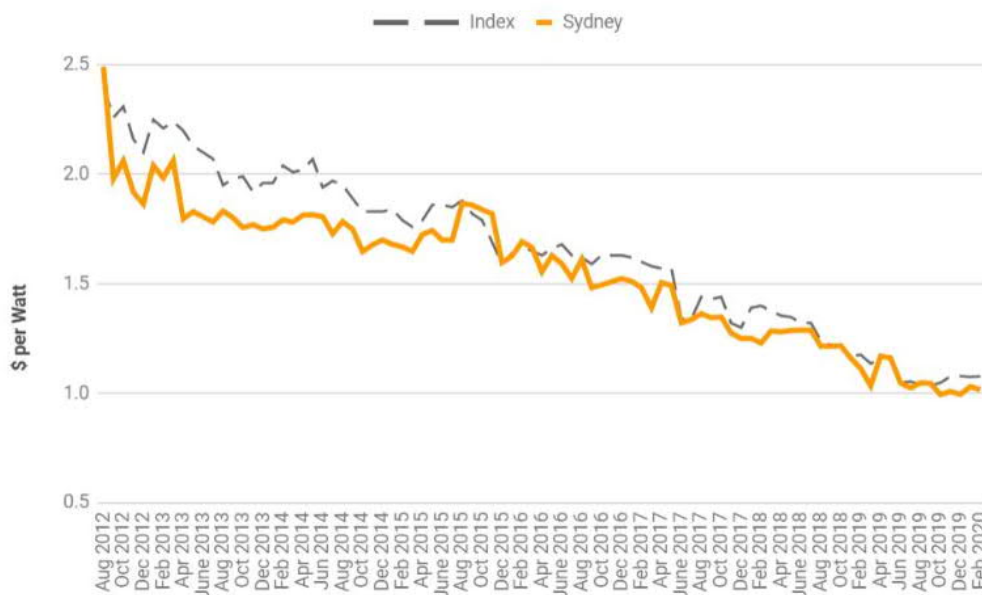
**Figure 11: Energy Generation in Australia 2019 (Source: Clean Energy Council of Australia)**

As of March 2019, NSW has over 3800MW, representing a \$4,714 million investment, of solar projects under construction or financially committed. AEMO expects that residential, industrial and commercial consumers are expected to continue to invest heavily in distributed PV, as well as in battery storage and load management, with distributed energy generation capacity expected to double or triple by 2040<sup>6</sup>.

The advancement in solar PV technology is due to the increasing efficiency (the amount of solar energy that can be converted into electricity) of PV in research under laboratory conditions and the efficiency increases in PV that can be mass produced at an affordable price. Since 2012, the solar installation prices in Sydney have dropped approximately 60 per cent, tracking closely to the national average (refer to Figure 12).

<sup>6</sup> AEMO, 2020 Integrated System Plan, July 2020





**Figure 12: Sydney Solar Prices vs National Average (Source: Solar Choice)**

The trend of decreasing solar cost is likely to continue and it is recommended that the opportunity for rooftop solar be incorporated into the design of the Precinct to help achieve the minimum 50 per cent renewable energy for the precinct, as required by the Study Requirements. This is to provide advantages such as:

- Energy independence reducing the effect of blackouts and providing risk mitigation against the potential for electricity price increases; and
- Reduction in greenhouse gas emissions compared to the current make-up of the grid to help meet the target of exceeding BASIX Energy requirements.

## Grid Decarbonisation

The grid's carbon intensity has fluctuated over the past 13 years (refer to Figure 13). However, there have been several notable trends that have driven the decreases in the grid carbon intensity – policies that support renewable energy, a reduction in demand, carbon pricing from mid-2012 to mid-2014, closure of coal power stations and increasing deployment of renewable resources.

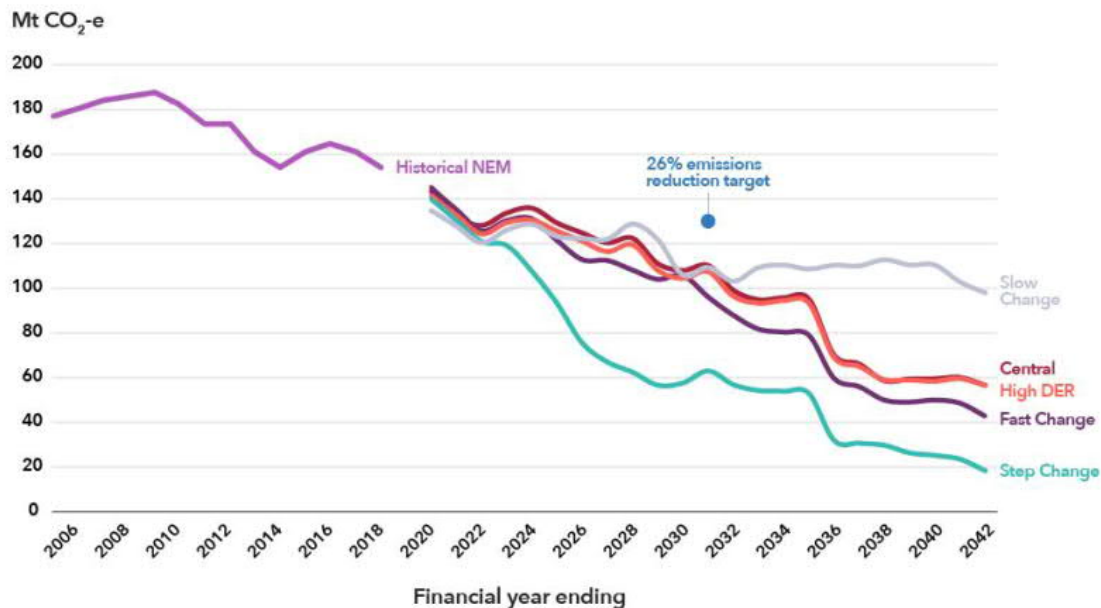


Figure 13: Annual Electricity Sector Emissions to 2042 (Source: AEMO)

The Draft 2020 Integrated System Plan by the Australian Energy Market Operator (AEMO) outlines how Australia's grid can be managed under a number of different transition scenarios (refer also to Figure 13).

They range from “slow change” (which assumes a slowdown in the energy transition and low support for emission reduction) to “step change” (which assumes both consumer-led and technology-led transitions occur in the midst of aggressive global decarbonisation and strong infrastructure commitments). In this scenario, AEMO outlines a plan to reach approximately 90 per cent renewables by 2040, which would mainly come from large-scale wind and solar supported by smaller-scale distributable solar and dispatchable technologies such as pumped hydro, large-scale batteries and household batteries aggregated in virtual power plants.<sup>7</sup> Even if the pace of the change differs, all scenarios trend to the decarbonisation of the electricity grid and an increase in renewable energy.

## Green Infrastructure

Green infrastructure is a crucial element to increase the liveability of our cities, particularly as Sydney's population continues to grow. Green infrastructure describes green space in the private and public realm and includes parks, private gardens, street trees, native remnant vegetation and more engineered systems such as rain gardens and green roofs.

Green infrastructure elements can provide many positive benefits to urban cities such as increased biodiversity, improved air quality, stormwater control, enhanced connection to nature for residents, enhanced property values and provides shade to reduce cooling loads in summer.

Internationally, there has been an increase in the implementation of green infrastructure. Toronto, Canada, has a green roofs by-law which makes them mandatory for commercial, residential and institutional developments over 2,000 square metres. Additionally, the German building code requires green roofs on all developments with a roof slope of less than 12 degrees.

<sup>7</sup> [https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning\\_and\\_Forecasting/ISP/2019/Draft-2020-Integrated-System-Plan.pdf](https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2019/Draft-2020-Integrated-System-Plan.pdf)



**Figure 14: Green Roof at Bridgepoint, ACT (Source: Junglefy)**

Green infrastructure is a key component of the City of Sydney's Sustainable Sydney 2030 strategy which has the aim of increasing canopy cover in the City of Sydney by 50 per cent by 2030 and by 75 per cent by 2050 from a current baseline of 15 per cent canopy coverage. Part of the aim is to work with private developers to increase the quality and quantity of the City's urban forest on privately owned land and to increase the number of green roofs and walls in the City. It is also part of the Greater Sydney Commission as well as TfNSW's long-term vision of a Green Grid for Greater Sydney - a network of high-quality green areas connecting centres to landscape features and is pivotal for climate change adaptation.

Considerations should be made to include green infrastructure in the Precinct, prioritising native, low water use vegetation to align to BASIX water targets. Incorporating green roofs and walls could also improve the thermal performance of buildings and reduce cooling loads, as well as improve the amenity of the Precinct. Further investigation in the detailed design phase is recommended to quantify the energy savings of green roofs to estimate their contribution to energy targets.

## Electric Vehicle Uptake

Driven by the price reduction of lithium-ion batteries due to mass production, electric vehicles (EVs) have gone from concept to a significant market disruptor. While EVs only made up less than 1 per cent of market share for new vehicles in Australia, this rate has been increasing slowly over the last 10 years.<sup>8</sup>

EVs are likely to be cheaper than internal combustion engine (ICE) vehicles by the mid-2020s<sup>9</sup>, further increasing their market penetration due on falling battery prices and being cheaper to produce once economies of scale are reached. Increased model availability from niche vehicles to electric equivalents of leading ICE models and an increasing differential between electricity and petrol prices will further increase the uptake of EVs.

Forecasting shows that the percentage of EV annual sales is expected to increase substantially although it is dependent on the level of intervention by Australian stakeholders (refer to Figure 15). The "Moderate Intervention" assumes a disjointed mix of policy support mainly at a state level, one example being based on the likelihood of states with net-zero targets adopting policies to increase the uptake of EVs.

<sup>8</sup> Australian Electric Vehicle Market Study (Energeia, 2018) <https://arena.gov.au/assets/2018/06/australian-ev-market-study-report.pdf>

<sup>9</sup> <https://electricvehiclecouncil.com.au/about-ev/key-facts/>

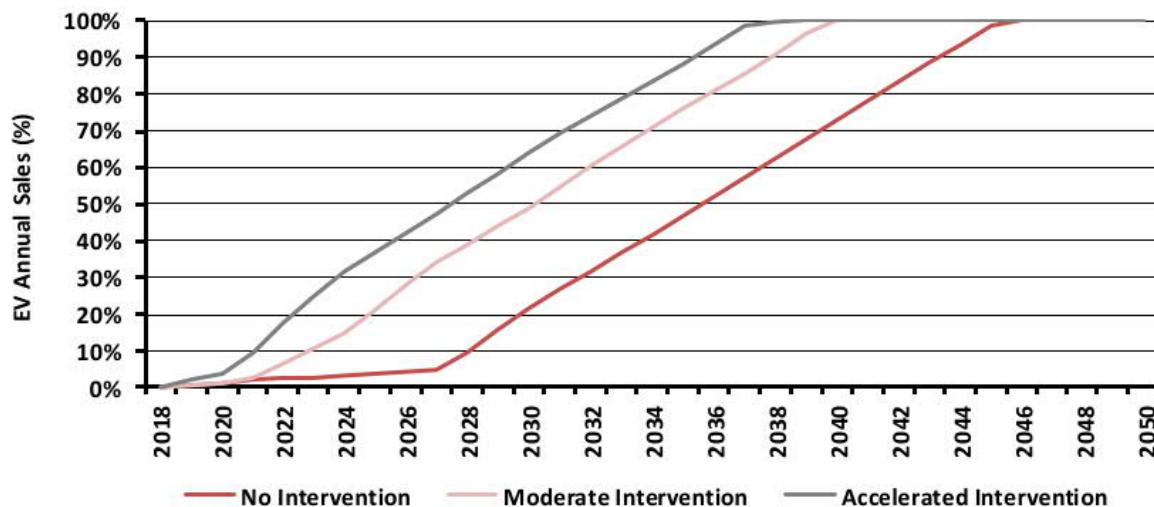


Figure 15: Annual EV Sales (Source: ARENA)

Although the degree of intervention affects the rate of increase in market share, all forecasts show EVs reaching 100 per cent of new sales in the next 25 years. Given that this is within the Precinct's design life, considerations should be made for EV charging infrastructure. Additionally, it is likely that this will become a requirement in NSW as the ACT has committed to requiring all multi-unit and mixed-use developments to install EV charging infrastructure. However, this needs to be carefully managed with the impact of peak demand on electrical infrastructure. There is potential for EV charging behaviour to contribute to daily peak periods requiring costly augmentation of infrastructure. This can be managed by staggering of charging throughout the day or night to coincide with off-peak periods through demand management.

## Transport Trends

Rapid innovation is transforming the way we travel, the transport modes we use to travel and the way the different modes of transport operate. Cheaper, more flexible and more reliable technologies are accelerating the automation of buses, trains, cars and trucks. Data sharing and mobile technology are enabling smarter, cheaper and faster ways to plan trips and travel, with ridesharing, car share, hire car and smart parking being some examples. The Greater Sydney Region Plan and the Future Transport Strategy 2056 outline other key trends and considerations that will be useful in framing a strategy for sustainable transport.

Strategic planning of communities and precincts is shifting the transport mode split towards public and active transport modes, reducing dependency on private vehicles and the need for parking. New transport modes, such as new personalised on-demand transport for short trips, may help to reduce the need for larger transport infrastructure.

Sustainable precinct design needs to be sensitive to current transport trends to enable their incorporation into precinct design. Flexibility should be incorporated to cater for future trends and technologies such as electric vehicles, the use of drones for parcel delivery and driverless vehicles.

Blackwattle Bay will not only be a hub for the local community and residents but, with the new Sydney Fish Market, it will also be a key tourist destination. In order to determine and prioritise the best options for sustainability transport in and near the development, the input from a site-specific traffic and transport assessment is recommended.

## Active Transport

The positive health, environmental and community benefits of active transport, as an alternative to private vehicle use, is increasingly being recognised as a priority for councils in Sydney. The need for more sustainable active transport is acknowledged by encouraging use of walking and cycling, while ensuring easy access and accessibility for everyone.



Sustainable transport strategies to respond to these trends include enhancing amenity and lowering traffic speeds for increased walking, providing secure bicycle storage and connected bike paths for higher uptake of cycling, and pedestrianising streets for achieving private car-free development, where only public and special-purpose transport is allowed.

As part of the Future Transport 2056 Strategy, Transport for NSW has the aim that: “Walking or cycling is the most convenient option for short trips around centres and local areas, supported by a safe road environment and suitable pathways.” There is a significant opportunity to contribute to this aim as 151,700 car trips of less than 5 km are made in the City of Sydney each day.<sup>10</sup>

The City of Sydney has plans to increase the bike network in the city. Figure 16 shows a section of the City of Sydney cycling network, with Blackwattle Bay highlighted in red fronting onto several Regional and Local completed and planned bike networks. Additionally, temporary cycleways have been installed in the city as part of a response to COVID-19. One of the locations is proximate to Blackwattle Bay, at Pyrmont Bridge Road, Pyrmont (already delivered but shown in Figure 16 as planned).

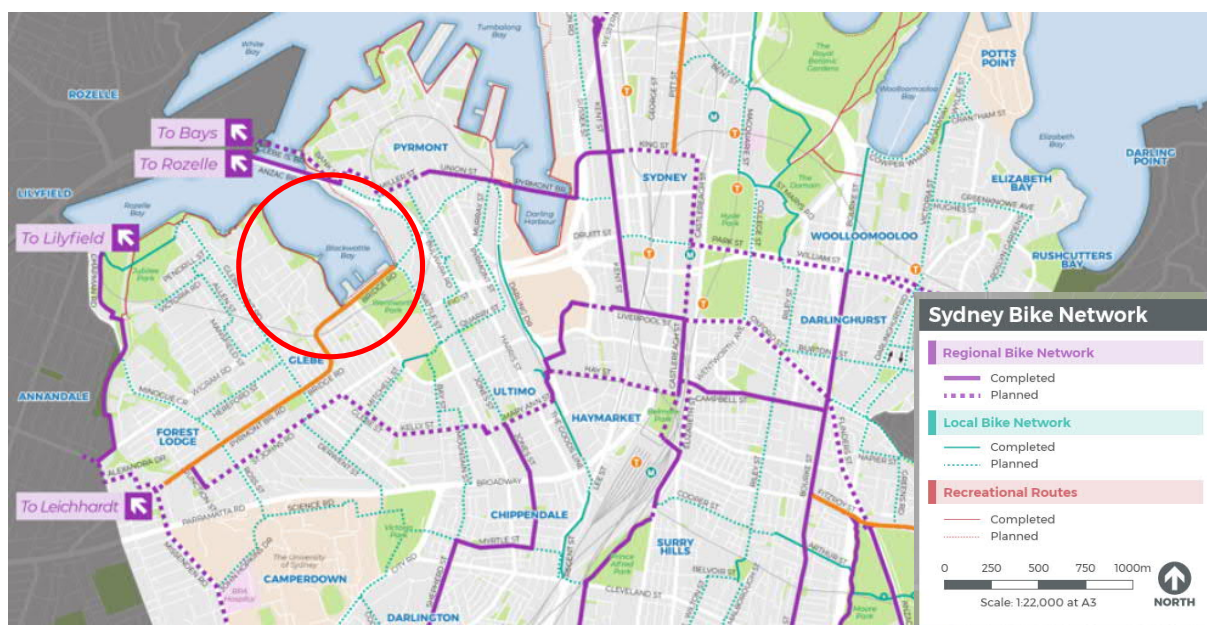


Figure 16: City of Sydney Cycling Map (Source: City of Sydney)

Considering the Precinct’s location and proximity to the Sydney CBD active transport is likely to be a popular option for residents, workers and visitors. The site is also within walkable access from three light rail stops: Fish Market, Glebe and Wentworth Park. The provision of secure bike parking, such as bike racks or bicycle cages, should be included in the Precinct. Additionally, the street reservation should consider strategies to make walking and cycling trips pleasant and safe.

## Water Trends

### Water Consumption

Despite a growing population, potable water demand in Sydney remains lower than it did before mandatory restrictions were introduced in late 2003, coinciding with the Millennium Drought (refer to Figure 17). It is important to note that average weather has a significant impact on potable water consumption with drier weather leading to increased reliance on potable supply as water tanks run out. Water demand is higher in summer due to increased irrigation of outdoor gardens. As we move into

<sup>10</sup>Cycling Strategy and Action Plan 2018-30 (CoS, 2017)

([https://www.cityofsydney.nsw.gov.au/\\_data/assets/pdf\\_file/0018/311382/CyclingStrategyActionPlan2018\\_low-res.pdf](https://www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0018/311382/CyclingStrategyActionPlan2018_low-res.pdf))

warmer periods with less predictable rainfall, this is likely to increase water consumption and impact supply options.

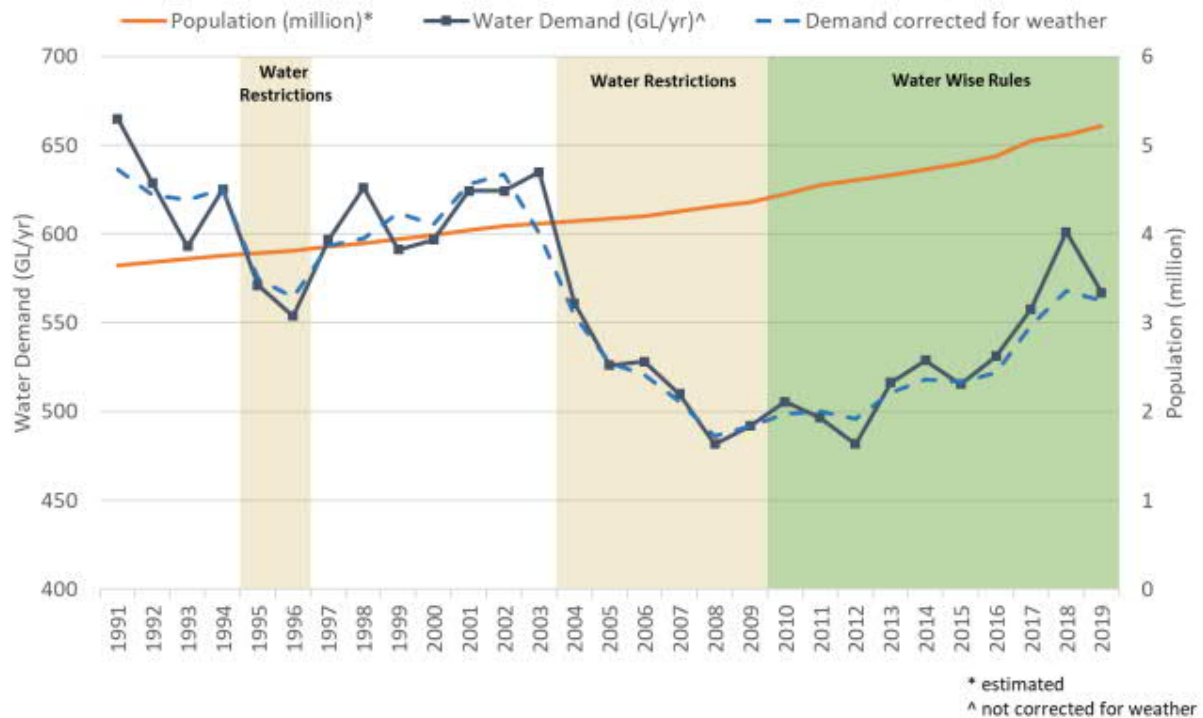


Figure 17: Total Sydney Water Demand (Source: Sydney Water)

The total reduction in demand is due to declining water demand per person, from increased water efficiency in homes and an increased public awareness about water scarcity and drought (refer to Figure 18). In 2014, Sydney Water introduced new rules for the individual metering of units for most new multi-level buildings instead of each unit owner paying a fixed portion of the building's total water use. This is expected to continue to drive water efficiency and behaviour change as people directly pay for the amount of water they use.



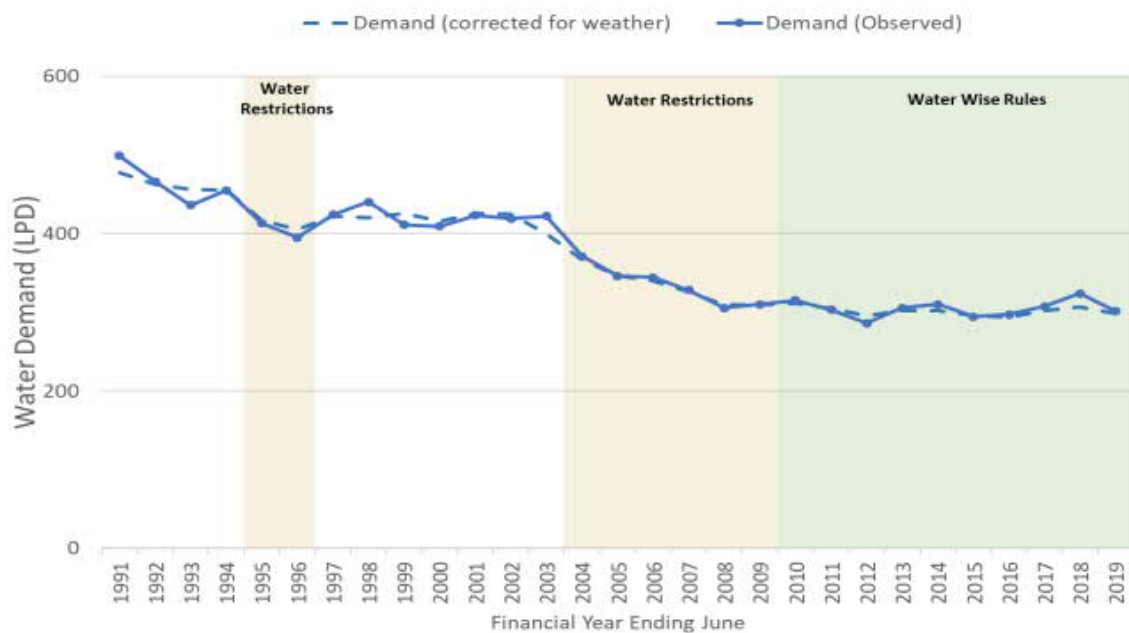


Figure 18: Per Person Sydney Water Demand (Source: Sydney Water)

Sydney Water notes that changes to the mix of dwellings with population growth will impact water demand and where water savings will come from in the future, this includes particularly reducing the outdoor consumption of water as the proportion of BASIX compliant houses increases over time (refer to Figure 19).

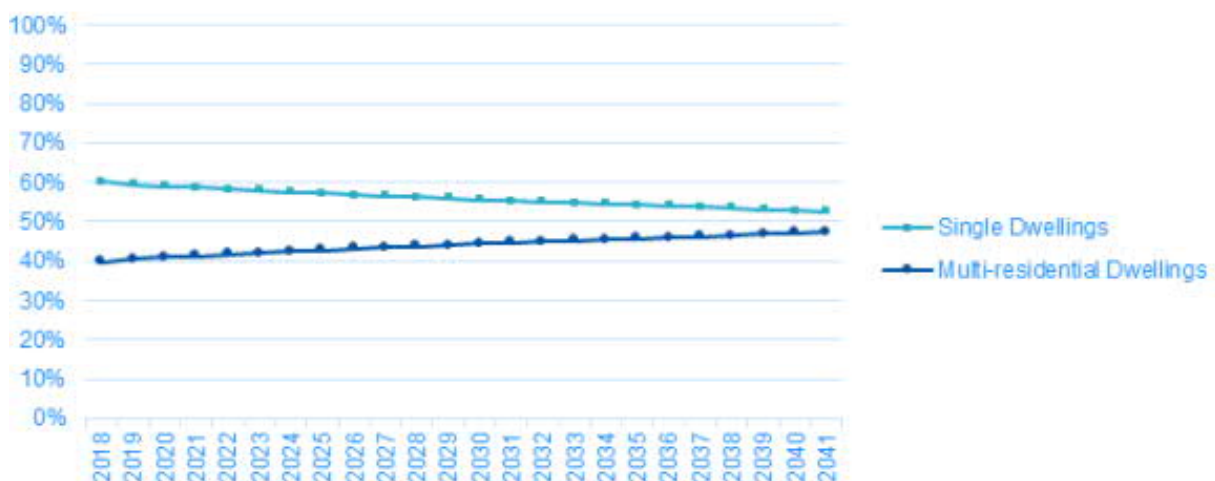


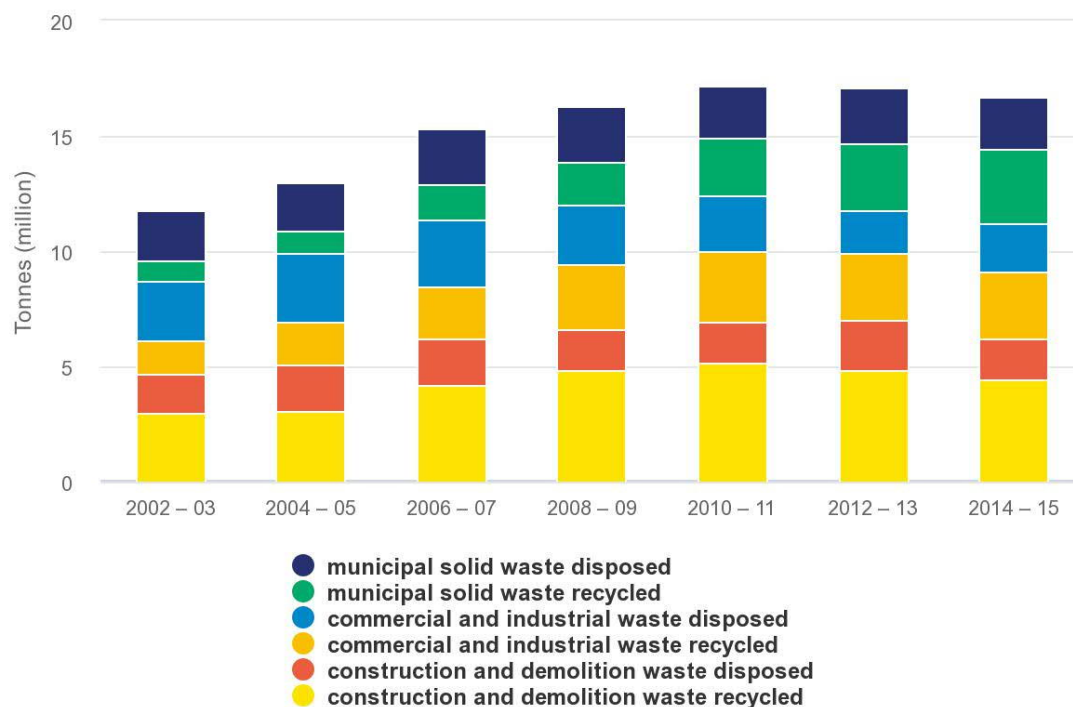
Figure 19: Single and Multi-Residential Dwellings as a Percentage of Total Dwellings (Source: Sydney Water)

Sydney Water continues to invest in water conservation and water supply options that are independent of rainfall such as desalination and recycled water. As the population increases and rainfall becomes less predictable due to climate change, measures to decrease water consumption will provide better reliability in the face of stresses or shocks. This highlights the necessity of water saving measures in the Precinct, such as rainwater tanks, native and/or low water use landscaping and high WELS rated appliances and water fixtures.

## Waste Trends

### Waste and Recycling Rates

Total waste generation in NSW has fallen slowly since it peaked in 2010-11, however it has only reduced by 4 per cent<sup>11</sup>. Recycling rates have also moved slowly, in 2014-15 (the latest available data) the proportion of waste diverted for recycling was 63 per cent, compared to 62.5 per cent in 2012-13. Across all the waste streams (Municipal Solid, Commercial and Industrial and Construction and Demolition wastes) NSW continues to fall below the targets set for 2021 in the NSW Waste Avoidance and Resource Recovery Strategy 2014-2021.



**Figure 20: Waste Disposed and Recycled by Stream in NSW (Source: NSW EPA)**

Waste generation rates are linked to population growth and increased economic activity. By 2021, it is expected nearly 20 million tonnes of waste will need to be processed a year in NSW. Globally, foreign markets have restricted the import of Australian mixed recycling material meaning there are increased benefits if the Site is able to effectively manage the waste generated by the new population and divert waste from landfill. The City of Sydney has ambitious targets to divert 90% of waste from landfill (with a minimum of 35% as source-separated recycling). Therefore, well-designed waste separation at the Precinct will be critical to achieving this target.

Consideration of closing the nutrient loop should also be investigated as this Precinct represents an opportunity to compost food waste and use that fertiliser for landscaping or a communal vegetable garden.

## Circular Economy

The circular economy is underpinned by three main principles: to design out waste and pollution; to keep products and material in use; and to regenerate natural systems.<sup>12</sup> It is a recognition that our current linear economy of “take-make-dispose” produces goods at the expense of the productivity of our ecosystems. The problems associated with the linear economy will increase due to increased demand of raw materials due to population and income growth globally.<sup>13</sup>

<sup>11</sup> NSW EPA State of the Environment Report, <https://www.soe.epa.nsw.gov.au/all-themes/human-settlement/waste-and-recycling>

<sup>12</sup> <https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy>

<sup>13</sup> <https://kenniskaarten.hetgroenebrein.nl/en/knowledge-map-circular-economy/ce-disadvantages-linear-economy/>

Since there has been a lot of progress in the energy and water use of buildings, including the widespread adoption of solar power and efficient fixtures/appliances, the next frontier in ecologically sustainable development is the embodied energy of materials used for building and designing for the end of life of a building. It is estimated that 80 per cent of environmental impacts are determined at the design stage and therefore there is a significant opportunity to create a Precinct that considers these principles.

Considerations should be made to design the Precinct in a way that considers its future disassembly to increase the circularity potential of the buildings from the start. Considerations should be made to embed circular economy principles through the following actions:

- Use as many materials from the existing buildings on the Precinct as possible or from waste products;
- Design connections between materials so they can be mounted and demounted easily for easy, direct re-use (e.g. avoid the use of sealants);
- Track building components in the building's Building Information Modelling (BIM) system. This helps identify when products are due for maintenance and, at the time of dismantling, it becomes easier to assess the quality of the parts by comparing them to the original specifications to repurpose them<sup>14</sup>.

At the end of the building's life, by utilising the higher order value of a material (such as repurposing) there may be monetary value in reselling as opposed to a cost of construction and demolition waste.

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<sup>14</sup> <https://assemblepapers.com.au/2019/04/04/circular-thinking-zero-waste-buildings/>

