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Cockle Bay Park Redevelopment

State Significant Development, Development Application (SSD DA) Appendix O - Environmentally Sustainable Design (ESD) Assessment

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Contents

1 Introduction

This report has been prepared to accompany a detailed State Significant Development (SSD) Development Application (DA) (Stage 2) for a commercial mixed-use development, Cockle Bay Park, which is submitted to the Minister for Planning and Public Spaces pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The development is being conducted in stages comprising the following planning applications:

- Stage 1 – Concept Proposal setting the overall 'vision' for the redevelopment of the site including the building envelope and land uses, as well as development consent for the carrying out of early works including demolition of the existing buildings and structures. This stage was determined on 13 May 2019, and is proposed to be modified to align with the Stage 2 SSD DA.
- Stage 2 – detailed design, construction, and operation of Cockle Bay Park pursuant to the Concept Proposal.

2 The Site

The site is located at 241-249 Wheat Road, Sydney to the immediate south of Pyrmont Bridge, within the Sydney CBD, on the eastern side of the Darling Harbour precinct. The site encompasses the Cockle Bay Wharf development, parts of the Eastern Distributor and Wheat Road, Darling Park and Pyrmont Bridge.

The Darling Harbour Precinct is undergoing significant redevelopment as part of the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) including Darling Square and the W Hotel. More broadly, the western edge of the Sydney CBD has been subject to significant change following the development of the Barangaroo precinct.

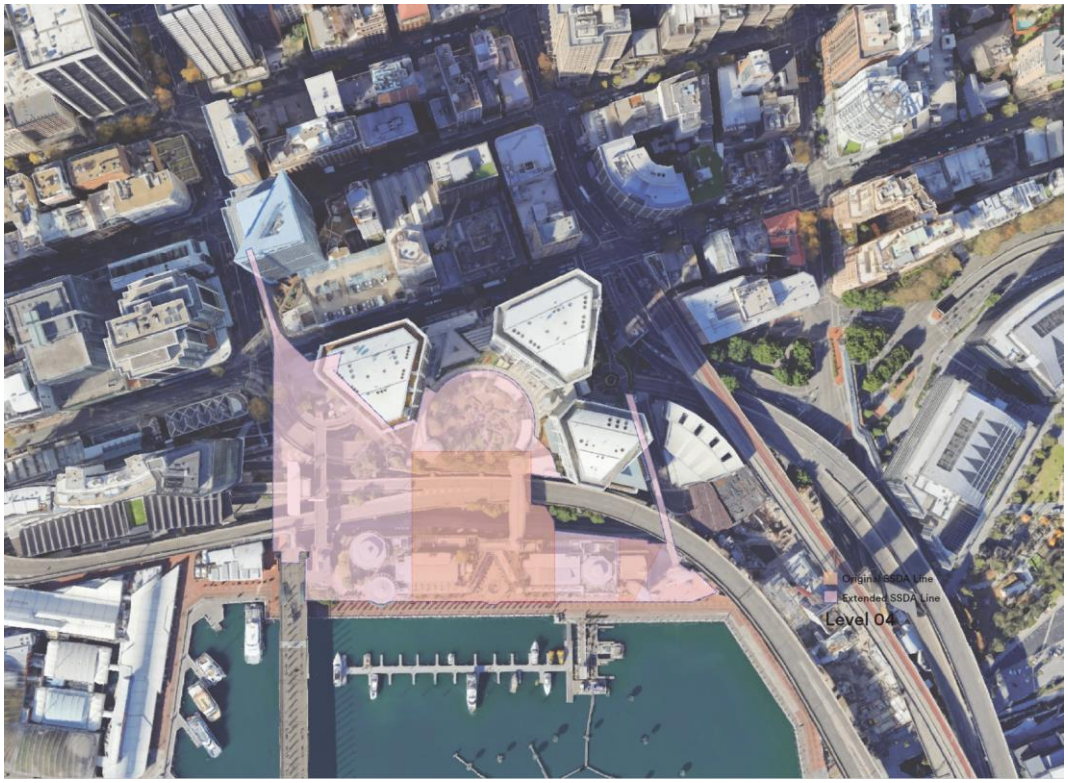

Figure 1: Location Plan

This report has been prepared in response to the Secretary's Environmental Assessment Requirements (SEARS) dated 12 November 2020 for SSD-9978934. Specifically, this report has been prepared to respond to those SEARS summarised in Table 1.

Table 1: SEARS requirements

Item	Description of Requirement	Section Reference (this report)
11	**Ecological Sustainable Development** The EIS must: • detail how the design, construction and ongoing operation of the proposed development addresses the principles of ESD (clause 7(4) of Schedule 2 of the Regulation)	3
11 (cont'd)	• demonstrate how future buildings will meet or exceed minimum building sustainability and environmental performance standards (including NABERS and standards in the National Construction Code), and outline proposed measures to contribute to achieving the NSW Government's goal of net zero emissions by 2050 (Net Zero Plan, Stage 1: 2020 – 2030)	3, 4, 5
11 (cont'd)	• demonstrate how the proposal incorporates integrated water cycle management and	6.4

	water sensitive urban design principles and practices	
11 (cont'd)	• identify and assess additional design measures to further improve the environmental performance of the development, such as measures to reduce carbon emissions during construction, inclusion of building-integrated photovoltaics (BiPV), green roofs and walls, rainwater or stormwater harvesting measures and waste reduction and recycling measures.	6

This report has also been prepared in response to the following Stage 1 (SSD 7684) conditions of consent summarised in Table 2.

Table 2: Concept approval of Conditions of Consent

Item	Description of Requirement	Section Reference (this report)
C16	**Environmental Performance** Future Development Application(s)shall demonstrate the incorporation of Ecological Sustainable Development principles in the design, construction and ongoing operation phases of the development consistent with the ESD Development Application Design Report, Issue 3 prepared by ARUP dated 21 August 2017, including the following minimum environmental standards: a) 5 star NABERS Energy based b) 4 star NABERS Water based c) 6 Star Green Design and As Built rating.	5
C17	**Environmental Performance** Future Development Application(s) shall consider improvements on the minimum environmental standards (Condition C16) and endeavour to achieve following stretch environmental standards: a) 5.5 star NABERS Energy based b) 4.5 star NABERS Water based (for the commercial office component) c) Incorporation of dual reticulation recycled water system to reduce pressure on existing water/wastewater infrastructure.	5

3 Overall ESD Strategy

To address the SEARS, the project is developing a comprehensive ESD strategy reflected in a 6-Star rating target under Green Star Design & As Built third-party certification. This target performance is considered World Leadership level by the Green Building Council of Australia (GBCA).

Buildings contribute 40% of energy-related CO_2 emissions annually, therefore there is an urgent need to further reduce their environmental impact. The development will exceed the requirements of Section J to target a 5.5 Star NABERS Energy rating in operation. This will be based on a multi-tiered strategy including a high-performance envelope to avoid energy use for conditioning; efficient services to reduce energy demand for conditioning; all-electric design to avoid CO_2 emissions generated on site; on-site renewable generation; and lastly purchase of energy from off-site renewable generation. These aspects all contribute to achieving the NSW Government's goal of net zero emissions by 2050.

The project will make use of the roof area at both tower and podium roofs to harvest and store rainwater for cooling tower use, as well as of the large site area to implement water sensitive urban design principles to reduce pollutants before discharge. The landscaping will also contribute to climate resilience and community health and well-being by minimising Urban Heat Island effect. The project will further develop and implement a Climate Adaptation Plan as part of the registered Green Star rating process.

This document outlines the ESD strategies that have been considered within the building's design. The following areas are the focus of the design team:

- Energy – Incorporate energy efficient designs and technological strategies to reduce energy use and greenhouse gas emissions. Design the building to be future ready for fully electric operation, with energy provided by on-site renewable generation and Green Power.
- Materials – Use low environmental impact materials in the building design, guided by life cycle assessment of material impacts. Minimise waste directed to landfill through better efforts of waste separation, encourage recycling and reuse of materials.
- Water – Reduce consumption of potable water and install water efficient systems. Consider water reuse and treatment technologies. Incorporate pipework for capability for future connection to recycled water mains in the Sydney CBD (purple pipe).
- Climate Resilience – Design considering the building's urban heat impact and future-proof against climate change.
- User experience – Maximise the building's indoor environmental quality to ensure occupant comfort, considering thermal comfort, visual comfort, and indoor air quality, to ensure lasting attractiveness and usability.
- Transport – Encourage sustainable transport options to and from the site.
- Environmental benchmarking – achieving Green Star and NABERS ratings.

4 Section J Compliance – NCC 2019

The building will achieve compliance with the National Construction Code (NCC) Volume 1, 2019. Section J of the NCC outlines performance requirements so that the building and its services facilitate the efficient use of energy.

During the detailed design stage, the architectural design will be continually assessed to develop thermal requirements for all the aspects of the building's envelope, such as glazing performance, opaque walls, shading, roofs and floors and demonstrate compliance with NCC Section J.

5 Rating Targets

5.1 NABERS Energy

The development is being designed to achieve the required NABERS Energy rating of 5 Stars for the office component, with a target to achieve 5.5 Stars in operation. A NABERS Energy Commitment Agreement is currently under consideration.

Design strategies to achieve the targeted NABERS Energy performance are noted under 6.1 and 6.2.

5.2 NABERS Water

The development is being designed to achieve the required NABERS Water rating of 4 Stars for office component. The design will continue to be reviewed during the next stages in order to consider the possibility to achieve 4.5-Star NABERS Water for the commercial component of the development.

Design strategies to achieve the targeted NABERS Water performance are noted under 6.4.

5.3 Green Star Rating

The project is registered with the Green Building Council (GBCA) under the Green Star Design & As Built v1.3 rating tool and is being designed to a Green Star 6-Star rating. Formal certification will be achieved after completion of construction.

The Green Star strategy currently targets points as per the summary in Table 3, however credits may be added, removed or substituted in the further design development while retaining the target rating of 6 Stars.

Table 3: Green Star Design & As Built v1.3 strategy - points targeted

CATEGORY	CODE	CREDIT	POINTS AVAILABLE	POINTS TARGETED
Management			**14**	**14**
Green Star Accredited Professional	1.1	Accredited Professional	1	1
Commissioning and Tuning	2.0	Environmental Performance Targets	-	Complies
	2.1	Services and Maintainability Review	1	1
	2.2	Building Commissioning	1	1
	2.3	Building Systems Tuning	1	1
	2.4	Independent Commissioning Agent	1	1
Adaptation and Resilience	3.0	Implementation of a Climate Adaptation Plan	2	2
Building Information	4.1	Building Information	1	1
Commitment to Performance	5.1	Environmental Building Performance	1	1
	5.2	End of Life Waste Performance	1	1
Metering and Monitoring	6.0	Metering	-	Complies
	6.1	Monitoring Systems	1	1
Responsible Construction Practices	7.0	Environmental Management Plan	-	Complies
	7.1	Environmental Management System	1	1
	7.2	High Quality Staff Support	1	1
Operational Waste	8A	Performance Pathway: Specialist Plan	1	1
Indoor Environment Quality			**17**	**11**
Indoor Air Quality	9.1	Ventilation System Attributes	1	
	9.2	Provision of Outdoor Air	2	1
	9.3	Exhaust or Elimination of Pollutants	1	1
Acoustic Comfort	10.1	Internal Noise Levels	1	1
	10.2	Reverberation	1	1
	10.3	Acoustic Separation	1	
Lighting Comfort	11.0	Minimum Lighting Comfort	-	Complies
	11.1	General Illuminance, Glare Reduction	1	1
	11.2	Surface Illuminance	1	
	11.3	Localised Lighting Control	1	
Visual Comfort	12.0	Glare Reduction	-	Complies
	12.1	Daylight	2	1
	12.2	Views	1	1
Indoor Pollutants	13.1	Paints, Adhesives and Sealants, Carpets	1	1
	13.2	Engineered Wood Products	1	1
Thermal Comfort	14.1	Thermal Comfort	1	1
	14.2	Advanced Thermal Comfort	1	1
Energy			**22**	**21**
	15D.0	Conditional Requirement: NABERS Pathway	-	Complies
	15D.1	NABERS Energy GHG Emissions Reduction	20	20
	15D.2	Off-Site Renewables		
	15D.3	Transition Plan, Fuel Switching, On-Site Storage		
	16B	Modelled Performance Pathway: Reference Building	2	1
Transport			**10**	**5**
Sustainable Transport	17A	Performance Pathway	10	5
Water			**12**	**5**
Potable Water	18A	Potable Water - Performance Pathway	12	5
Materials			**17**	**11**
Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	6	3
	19A.2	Additional Reporting	4	2
Responsible Building Materials	20.1	Structural and Reinforcing Steel	1	1
	20.2	Timber	1	1
	20.3	Permanent Formwork, Pipes, Flooring, Blinds, Cables	1	1
Sustainable Products	21.0	Product Transparency and Sustainability	3	2
Construction and Demolition Waste	22.0	Reporting Accuracy	-	Complies
	22B	Percentage Benchmark	1	1
Land Use & Ecology			**5**	**2**
Ecological Value	23.0	Endangered, Threatened or Vulnerable Species	-	Complies
	23.1	Ecological Value	3	0
Sustainable Sites	24.0	Conditional Requirement	-	Complies
	24.1	Reuse of Land	1	1
	24.2	Contamination and Hazardous Materials	0	0
Heat Island Effect	25.0	Heat Island Effect Reduction	1	1
Emissions			**4**	**3**
Stormwater	26.1	Stormwater Peak Discharge	1	1
	26.2	Stormwater Pollution Targets	1	1
Light Pollution	27.0	Light Pollution to Neighbouring Bodies	-	Complies
	27.1	Light Pollution to Night Sky	1	0
Microbial Control	28	Legionella Impacts from Cooling Systems	0	0
Refrigerant Impacts	29.0	Refrigerants Impacts	1	1
Innovation			**10**	**10**
Market Transformation	30B	Commissioning and Tuning (Air Permeability Rates)	2	1
		Indoor Pollutants (Ultra Low VOC paints)	1	1
		Sustainable Transport (No New Car Parks on Site)	1	1
		Stormwater (Stormwater Pollution Targets)	2	1
Innovation Challenge	30D	Marketing Excellence	1	1
		Occupant Engagement	1	1
		Reconciliation Action Plan	1	1
		Financial transparency	1	1
		High performance site offices	1	1
Global Sustainability	30E	Global Sustainability	1	1
Total			**TOTAL AVAILABLE**	**TOTAL TARGETED**
			101+10	**82**

6 ESD Initiatives

With the aim of leading practice in sustainability targets, the project design will integrate the principles of ecologically sustainable development, as defined in Clause 7(4) of Schedule 2 of the Regulation (Environmental Planning and Assessment Regulation 2000, 2014). These principles involve:

- Preventing damage to the environment;
- Ensuring inter-generational equity;
- Conserving biological diversity and ecological integrity; and
- Including environmental impact in the valuation of assets and services.

Applying these principles to the context of the proposed building, the design team will focus on the following strategies:

- Energy efficient systems and building design
- Water strategies to minimise potable water consumption and address stormwater management
- Encouraging sustainable transport modes
- Climate change resilience
- Efficient waste management
- Environmental benchmarking – achieving a Green Star rating

6.1 Building Envelope

The thermal role of the envelope is to block solar and heat gains from penetrating the building fabric while optimising daylight levels and minimising glare.

Tower

The tower façade incorporates vertical opaque panels along with horizontal and vertical shading elements to limit solar heat loads, which helps reduce the energy required for air conditioning systems in line with NCC 2019 Section J as well as peak heat loads driving the sizing of the mechanical cooling system.

The design also incorporates solar control glazing that blocks a large part of the invisible heat radiation while allowing a larger percentage of visible light through; however, there are physical limits to this ‘selective’ transparency, and if large areas of glazing were in theory implemented and required to reduce heat radiation significantly, they would potentially result in the need to be darker in the visible spectrum. Solid insulated façade elements, being substantially more efficient at blocking heat radiation and providing insulation, relax the requirement for the glazing performance and allow the use of a high performing and highly transparent glass. The amount of solid area in the design for the Cockle Bay Park tower has been set to allow solar control glazing at a ‘sweet spot’ in manufacturing technology offering the best ratio between transmitting visible light into the office space, addressing potential for occupant glare and blocking heat radiation.

Arranging the solid area vertically rather than shrinking the vision zone to a narrower band still allows tall floor to ceiling windows under current energy regulation which provide view of sky and water deeper into the tower floors.

In addition, external shading is applied to fully glazed panels to reduce annual cooling energy.

Podium

A large part of the podium is arranged around the Western Distributor and will thus have large areas of insulated solid façade contributing to the overall podium façade performance. Remaining facades will consist of operable and fixed glazed elements to maximise flexible retail use, occupant experience and promote view access to Darling Harbour and solid areas to limit unwanted thermal gains and losses. The configuration of spaces provides a level of self-shading as well as building overhangs providing good shading to facades around the air-conditioned retail areas. Glazing will make use of performance coatings to further mitigate summer solar gains whilst being transparent and allowing views in and out.

External terraces will provide additional shading for the comfort of occupants and as an additional line of defence against glare and heat from the low angle western summer sun.

6.2 Energy

It is essential to ensure the development is designed and built to minimise energy consumption and reduce greenhouse gas emission to the atmosphere. The development targets NABERS Energy ratings for the office component of 5.5 Stars in operation. Strategies being reviewed to achieve this level of performance include:

- A high-performance façade design to reduce solar gain to perimeter areas in tower and podium.
- The use of high efficiency mechanical systems including hybrid chilled beam and variable air volume (VAV) system to provide cooling effectively, with high efficiency chillers performing better than the Minimum Energy Performance Requirements (MEPS).
- On-site renewable energy generation from extensive photovoltaic arrays on tower and podium roof sections as well as pergolas, complemented by use of off-site renewable energy.
- Design allowing for fully electric building operation. Eliminate gas use for base building heating via use of electric heat pumps.
- Low pressure mechanical ductwork.
- Sustainable materials and products with low embodied carbon and efficiency measures used.

6.2.1 Mechanical System

In development of the design, emphasis will be placed on providing an appropriate level of system resilience and quality to ensure efficient operation of the buildings.

The integration between the selected mechanical system and the façade performance plays a fundamental role in delivering high levels of thermal comfort to occupants while optimising energy consumption through building operations.

The commercial tower design incorporates a hybrid HVAC system of chilled beams in perimeter zones combined with a variable air volume (VAV) system.

Tower and podium chilled water will be provided from high efficiency chillers performing better than the Minimum Energy Performance Requirements (MEPS). Alternative heat rejection strategies including geothermal to complement cooling towers are being considered to reduce water usage and increase cooling energy efficiency.

Heating capacity is to be provided by electric heat pumps rather than gas boilers.

6.2.2 Renewable Energy

The project is being designed to allow all building operations to be fully electric and powered by renewable energy.

The area used for on-site renewable energy generation from solar photovoltaic (PV) arrays is maximised to cover available roof area that is not required for building services plant with ventilation requirements such as cooling towers or otherwise provided as publicly accessible area. PV arrays will be installed on both tower and podium roofs as well as integrated into pergola roofs providing shading around publicly accessible areas.

Additional off-site renewable energy is proposed to offset carbon beyond that already achieved through design efficiency and on-site renewables.

6.3 Materials

As buildings become more efficient and the energy that they use comes from an increasingly decarbonised grid, the upfront carbon becomes a larger factor in a building's overall carbon footprint. It is estimated to be responsible for half of the entire carbon footprint of new developments between now and 2050.

The following measures have been considered:

- Life Cycle Assessment will be carried out to guide the design with the aim to reduce cumulative life cycle impacts.
- The building will investigate the use of green concrete with high cement replacement, such as recycled fly ash.
- Dematerialise (materials serve a dual purpose) – pergola roof glazing with translucent PV cells.
- Materials selection will prioritise materials with Environmental Product Declarations providing transparency on impacts, reused or recycled products or product content, and products with third party environmental certification or stewardship programmes.

- PVC will be minimised, and where used will be best practice PVC as defined by the GBCA.
- Paints, sealants, adhesives, carpets and engineered wood products will be specified to minimise indoor pollutant off-gassing.
- All timber will be FSC Certified (or equivalent) as part of the Green Star pathway.
- Selection of refrigerants with low ozone depletion and global warming potential.

6.4 Water

6.4.1 Building Water Strategy

The building design will also consider the efficient use of water through the following strategies:

- Water efficient fixtures and fittings must be used throughout and will exceed the following WELS ratings:
  - 4 Star for toilets,
  - 6 Star for urinals,
  - 6 Star for tapware and
  - 3 Star (7.5L/min or less) for showers.
- Condensate capture and reclaim from tower air handling units.
- Rainwater harvesting from the tower roof and podium roof areas will be used to supplement HVAC cooling tower demands.
- Provision to connect to recycled water mains in the Sydney CBD (purple pipe).
- BMS connected water meters with leak detection systems.

The development is being designed to achieve the required NABERS Water rating of 4 Stars for office component. The design will continue to be reviewed during the next stages in order to consider the possibility to achieve 4.5-Star NABERS Water for the commercial component of the development.

6.4.2 Water Sensitive Urban Design (WSUD)

Water Sensitive Urban Design encompasses all aspects of urban water cycle management, including water supply, wastewater, and stormwater management. WSUD is intended to minimise the impacts of development upon the water cycle and achieve more sustainable forms of urban development.

This will involve the consideration and potentially a combination of one or more elements, such as:

- Rain gardens
- Permeable outdoor finishes
- Rainwater harvesting and storage supplementing cooling tower water
- Proprietary stormwater treatment devices
- Gross pollutant traps

6.5 Transport

The use of motorised transport (both private and commercial) has been a major contribution to environmental pollution and the excessive consumption of natural resources.

The development has the opportunity to create an environment where pedestrian access is prioritised and the use of sustainable modes of transport is stimulated by, for example:

- Encouraging walking and cycling by ensuring provision of bicycle facilities for building users and visitors and end of trip facilities for regular occupants. While cycling facilities are provided below DCP rates, a holistic transport strategy will be developed that considers the merits of the overall mix of transport modes provided for under the relevant Green Star credit and will contribute to achievement of the Green Star rating target.
- Site near public transport networks including trains, buses, ferry and major transport focal points with clear signposting and links to public transport locations.
- No additional precinct car parking (other than service vehicle space in loading dock and drop-off).

6.6 Resilience

As the effects of climate change accelerate, there is greater need for buildings with long design life to be adaptable to these impacts on the local environment. A thorough understanding should be developed by the design team to understand potential climate-related risks. These may include:

- Damage or failure of building and system components
- Reduced operational capacity
- Hazardous conditions to surrounding areas (e.g. affecting access and egress)

To capture this information and guide design, a Climate Change Adaptation and Resilience Plan will be produced.

These assessments will be made with reference to the climate change projections developed by CSIRO for the Sydney Metropolitan area. Strategies have been and will be developed that ensure resilience to such impacts and will be incorporated to building and systems design. Key climate change considerations include:

- Extreme heat waves
- Increased frequency of heat days
- Extreme flooding
- Harsh wind conditions

The project makes a large proportion of site area available as landscaped and vegetated public space, which will contribute to limit the Urban Heat Island effect and improve the local microclimate. The landscaping will further consider light coloured paving with high solar reflectance index to support this.

6.7 Waste

The project design will encourage improved waste management initiatives during construction and operation, with a focus on encouraging increased rates of recycling.

An effective operational waste management plan has been developed, considering methods for source separation. It requires as a minimum:

- Diversion of at least 80% of construction and demolition waste from landfill
- Segregated waste bins

Further operational strategies including a ban on single use plastic items, compostable packaging requirements for on-site retailers and provision of a food and beverage waste sorting station will be considered further in the development of the design.

7 Conclusion

An ESD strategy has been developed to align with the SEARS assessment, while also complying with NCC 2019 Section J requirements.

The project's commitment to achieving a Green Star rating will provide a clear framework on which best practice sustainable building principles can be applied to the further design, construction and ongoing operations of the development. The NABERS Energy and Water targets set clear levels of performance expectation for the operation of the development that further guide the design. The strategy will ensure the building is high performing environmentally, reduces local ecological impact, minimises energy use and greenhouse gas emissions, and implements climate resilience measures.

These strategies will be realised through focused ESD initiatives involving building design that considers optimised building envelope, renewable energy generation, waste management, and climate change projections. In addition, the initiatives will design for sustainable operations, such as efficient mechanical systems, reduced potable water usage, and sustainable modes of transport.

The strategies have been developed to achieve the NABERS Water and Green Star targets set out in Stage 1 (SSD 7684) Condition of Consent C16 as well as the stretch target for NABERS Energy in Condition C17, with the further stretch targets in Condition C17 to be further considered in the coming design phase.