CUNDALL

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100 Mount Street

ESD Report

1003778

Prepared for:

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DRAFT	Initial issue for comment	27 July 2011
A	Revised to address project team comments	1 August 2011
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The success and realisation of the proposed initiatives will be dependent upon the commitment of the design team, the development of the initiatives through the life of the design and also the implementation into the operation of the building. Without this undertaking the proposed targets may not be achieved.

Contents

Executive Summary

This report outlines the key Ecologically Sustainable Design (ESD) initiatives for the proposed commercial development at 100 Mount Street, North Sydney NSW.

In the early stages of the project design, a series of sustainability vision workshops were held in order for the project team to set a vision for the project that met the objectives of the owner, design team and prospective tenants. The project team committed to the development of a strategic delivery framework that would measure the building's total environmental impact rather than just operational energy usage.

During concept design development, each design option was considered in terms of total life-cycle impact, including embodied energy and water, value of material resources and likely future trends. The design will be evaluated at key project stages to ensure that the best outcome is achieved in terms of total carbon and environmental footprint.

The design represents a significant improvement on the previously approved scheme, in terms of sustainability, particularly in terms of facade performance, with embodied energy on the facade greatly reduced, and a western core arrangement minimising excessive solar heat gains and glare from low-an;e afternoon sun.

The development is being designed to exceed minimum requirements in terms of Ecologically Sustainable Design (ESD), and is targeting the following green building ratings:

- 5-Star Green Star Office Design and As-Built (v3) rating;
- 5-Star NABERS Energy base building rating.

The Green Star rating scheme awards an environmental performance rating based on a range of environmental indicators, including management, indoor environmental quality, energy, transport, water, ecology, materials and emissions to land, water and air. Key strategies that have been adopted cover a broad range of environmental performance criteria, including:

- Energy conservation including high efficiency chilled beam air-conditioning, low energy lighting design and solar panels will provide a preheat for domestic hot water;
- An innovative closed-cavity facade system with automated internal blind for solar control, which rejects excess heat gains, provides good daylight with minimal glare, and has a carbon footprint significantly lower than other design options incorporating a large number of fixed external shading elements;
- Mains potable water conservation is ensured through high-efficiency fittings and fixtures as well as rainwater capture and storage for reuse;
- Provision of a high quality indoor environmental quality for occupants, a thermally comfortable environment with good air quality and low levels of indoor pollutants;
- Environmentally responsibly material selection and diversion of waste from landfill during construction and operation;
- Low-emissions transport alternatives will help reduce private car use;
- Investigating the potential for on-site, low-carbon energy generation such as tri-generation, photovoltaics or an alternative technology.

The design response to sustainability is explained in more detail in the following sections.

1 Introduction

This report outlines the key Ecologically Sustainable Design (ESD) initiatives for the proposed development at 100 Mount Street, North Sydney, which is committed to a high level of environmental performance. The scope and systems described herewith cater for these performance requirements, and will be further developed through the detailed design stage.

The development is being designed to exceed minimum requirements in terms of Ecologically Sustainable Design (ESD), and is targeting the following green building ratings:

- 5-Star Green Star Office Design and As-Built (v3) rating;
- 5-Star NABERS Energy base building rating.

The project is also required to comply with the Building Code of Australia Section J for Energy Efficiency. These commitments are outlined in more detail in the following sections.

2 Ecologically Sustainable Design (ESD) Approach

2.1 Sustainability Vision

In the early stages of the project design, a series of sustainability vision workshops were held in order for the project team to set a vision for the project that met the objectives of the owner, design team and prospective tenants. The vision would allow the project to prepare for potential future scenarios rather than simply reacting to events as they occur.

The project team committed to the development of a strategic delivery framework that would measure the building's total environmental impact rather than just operation energy usage. During concept design development, each design option was considered in terms of total life-cycle impact, including embodied energy and water

2.2 Objectives

The project team has agreed on the following principles and practices, to be applied throughout the project as a framework for decision-making with regards to sustainability, providing clear parameters to the design team and ensuring proposals are selected in line with the project sustainability vision.

- Reducing greenhouse gas emissions through energy efficiency of infrastructure, building services and building façades;
- Providing a high quality internal and external environments in terms of internal air quality, light and comfort;
- Reducing potable water use and flows to sewer;
- Improving quality of stormwater, minimising peak runoff quantities and preserving natural waterways;
- Minimising embodied energy and embodied water in construction;
- Minimise natural resource consumption, waste, pollution and toxicity during construction and operation;
- Preserving the high ecological value of the site and surrounds;
- Engaging and respecting the community and contributing where possible;
- Implementing ESD solutions that reduce operating costs for residents and patrons.

2.3 Evaluation Principles

Sustainability initiatives will be evaluated in accordance with the following principles.

- **Future-proofing & adaptability** - Design into the future 2015+, Maximise design flexibility to enable adaption to future technology;
- **Operational Certainty** – Ensure operational performance certainty and verify sustainability outcomes over the long-term;
- **Design Quality** - Maximise connection and passive use of the natural environment to enhance the quality of facilities that support the development of building social and community networks (e.g. daylight to change rooms; mid-level green/social café);
- **Visible/communicable strategies** - Provide key or iconic visual sustainability elements that engage visitors, staff and residents;
- **Cost-benefit assessment** methodology will be the overarching framework for assessment, taking into account a "shadow carbon tax" will be incorporated to inform investment decisions. Place an emphasis on opportunities which lower total occupancy costs over the long-term;
- **Community Contribution** – proposed initiatives will be considered in the context of the surrounding community and adjacent development.

2.4 Comparison with Approved Scheme

The proposed development represents a significant improvement in terms of sustainability, over the previously approved scheme, particularly with regards to facade design and embodied carbon:

- The new scheme has a greater proportion of net lettable area to gross floor area, resulting in more usable building space and a lower environmental footprint per building occupant;
- The revised Western core configuration blocks low-angle afternoon sun, which is generally very difficult to control and often causes excess solar gains and thermal discomfort. A solid Western facade reduces the need for extensive shading devices and minimised the embodied carbon of the facade;
- An innovative double-skin facade with automated louvre blind provides exceptional solar control without external shading elements being required. Previously a large number of aluminium fixed shading elements were required to achieve an acceptable facade performance;
- The proposed development is committed to assessing sustainability in a more holistic manner than that expressed previously. Relative environmental footprint will be a significant factor in decision-making throughout detailed design and procurement.

3 Regulations and Environmental Ratings

3.1 BCA Section J for Energy Efficiency

The development is required to comply with the BCA Section J for Energy Efficiency. The building is being design with a high-performance facade and high-efficiency HVAC and electrical services

In order to take into account the complexities of the facade and building design, an alternative verification model will be undertaken during design development.

3.2 NABERS Energy

The National Australian Building Environmental Rating Scheme (NABERS) is a suite of tools designed to allow for buildings of a similar type to be rated in terms of its operational sustainability. The NABERS suite includes energy, water, waste and indoor environment quality.

100 Mount Street is committed to achieving a 5-Star NABERS Energy rating for the Base Building.

The NABERS Energy tool is a rating of the performance levels of a building in relation to CO_2 emissions per m² per year. Emission are normalised for Net Lettable Area, occupancy hours and location, and then used to calculated a star rating. Five stars is currently the highest available rating, and represents exceptional building energy performance.

3.3 Green Star

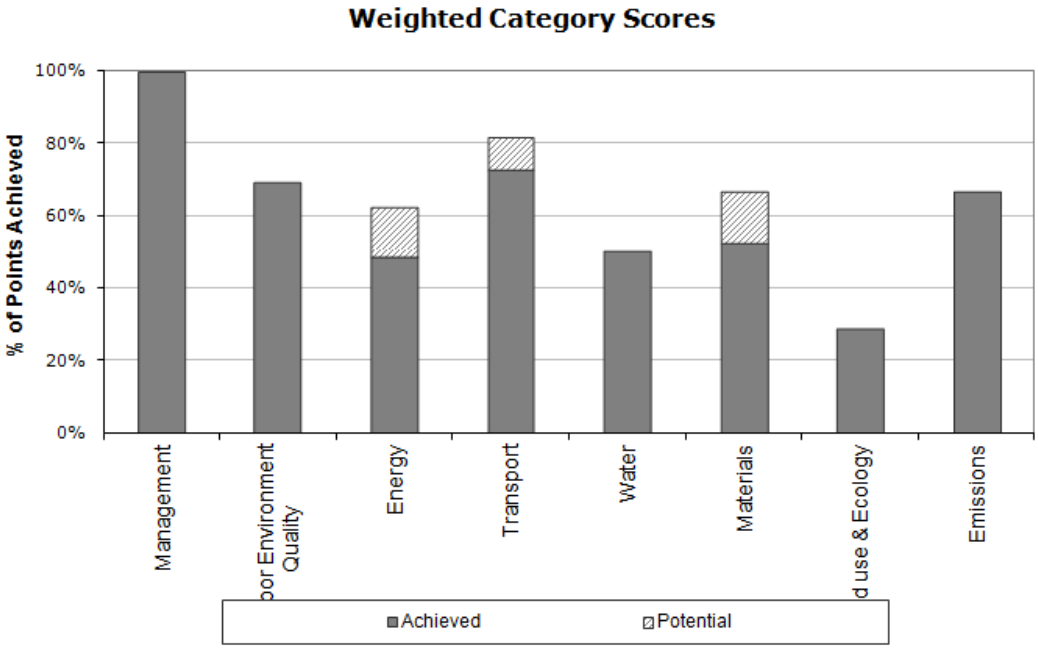
The proposed development is committed to achieving a 5-Star Green Star v3 rating for both design and delivery, which is considered 'Australian Excellence'.

Green Star is a comprehensive sustainability design tool which assesses the environmental impact of a building over a range of environmental indicators, from management and ecology to energy and water use, material selection and waste production. Categories are weighted according to their perceived environmental importance, which varies between building sectors and across States.

Points are awarded in the following categories:

Management	Water Conservation
Indoor Environmental Quality	Ecology
Energy Conservation	Materials
Transport	Emissions
	Innovation

A 5-star Green Star rating requires a total of 60 weighted credit points to be achieved in the aforementioned categories. Sufficient weighted credits have been selected to achieve this rating, with additional points identified for further development during the detailed design stage. Based on the proposed design response the predicted performance in each respective environmental category is graphically depicted in the figure overleaf.



Throughout the project, appropriate documentation will be collected to demonstrate that the chosen sustainability initiatives are incorporated into the design and delivery of the building. The project is targeting the following Green Star ratings:

- 5-Star Green Star Office Design (v3) rating;
- 5-Star Green Star Office As-Built (v3) rating;

The proposed strategies will achieve the targeted rating of 5-Stars. A Green Star design submission can typically be produced after 90% detailed design documentation, at which point sufficient detail will be available. The As-Built submission must be made after Practical Completion, and the NABERS Energy rating assessed 12 months post-occupancy.

4 Key Sustainability Strategies

Key sustainability initiatives have been divided into the following categories and described in greater detail in the following sections.

Management	Water Conservation
Indoor Environmental Quality	Ecology
Energy Conservation	Materials
Transport	Emissions

4.1 Management

The following strategies will be implemented to ensure that the design, construction and operation of the proposed development will be managed in the most sustainable manner, and will assist the building to perform as efficiently as intended.

Item	*Management Strategies*
Green Star Accredited Professional	A Green Star accredited professional will be appointed to provide ESD advice for the project throughout design development.
Commissioning – Clauses 	Comprehensive pre-commissioning, commissioning and quality monitoring of building services installations will be undertaken in accordance with the Chartered Institution of Building Services Engineers (CIBSE) Commissioning Codes. The following documentation/information will be contractually required to be transferred to building management staff: - Documentation of the design intent; - As-installed details; - Commissioning reports; - Training of building management staff. This will ensure that optimum comfort control, building services performance and operational efficiency is achieved.
Building Tuning	A commitment will be made to a 12 month commissioning / building-tuning period after handover, comprising of quarterly reviews and re-commissioning at the end of 12 months occupation
Independent Commissioning Agent	An independent commissioning agent (ICA) will be engaged to give advice, monitor and verify all system commissioning, and report to the owner and contractors on progress.
Building User Guide	In recognition of effective handover being critical to the success of a building in achieving its environmental aspirations, a simple and concise building users' guide will be developed to inform and educate tenants and building users on how to capture and promote strong on-going environmental performance.

Item	*Management Strategies*
Environmental Management	Prior to construction, an Environmental Management Plan (EMP) will be developed to regulate the environmental impacts of the development during construction. This will identify potential environmental impacts and strategies to mitigate these impacts, as well as outlining methods for auditing and tracking the impacts and responsible parties. The EMP will be developed in accordance with Section 4 of the NSW Environmental Management System guidelines (1998). It will be used to set out guidelines and polices in the environmentally responsive operation of the various different facilities, providing a statement on the development's Environment Policy and its objectives as well as a series of key environmental performance indicators and targets for improvements, as well as the tracking of on-going performance based on predicted environmental performance benchmarks (i.e. waste, energy, water, etc). In addition, Laing O'Rourke hold valid ISO141001 Environmental Management System (EMS) accreditation, which will be implemented at the site.
Construction Waste Management 	The EMP will include a Waste Management Plan, specifying recycling targets for demolition and construction waste. A minimum of 80% construction waste will be diverted from landfill. Preference should be given to prefabricated materials, in order to reduce the amount of on-site construction waste. The construction contract could include commitments for the following: • Establishment of a waste management area on site for the sorting and segregation of waste. • Identification of appropriate waste sub-contractors for recycling, costs of collection and timing of collection service. Provision of separate waste skips for cardboard, timber, metal, soft plastic, polystyrene, insulation, concrete, glass and bricks; • Participation in waste minimisation training for contractors and sub-contractors; • Published waste minimisation plan to reduce waste to landfill; • Construct to allow for easy disassembly, so that components can continue to be used at the end of a building's lifetime.
Strategic Sustainability Delivery Framework	A strategic delivery framework will allow the project to track key initiatives throughout the project and will be used to embed critical performance requirements into contractual deliverables.
Operational Review and Budget	An operational review strategy and training program will ensure continuous performance post final completion.

4.2 Indoor Environmental Quality

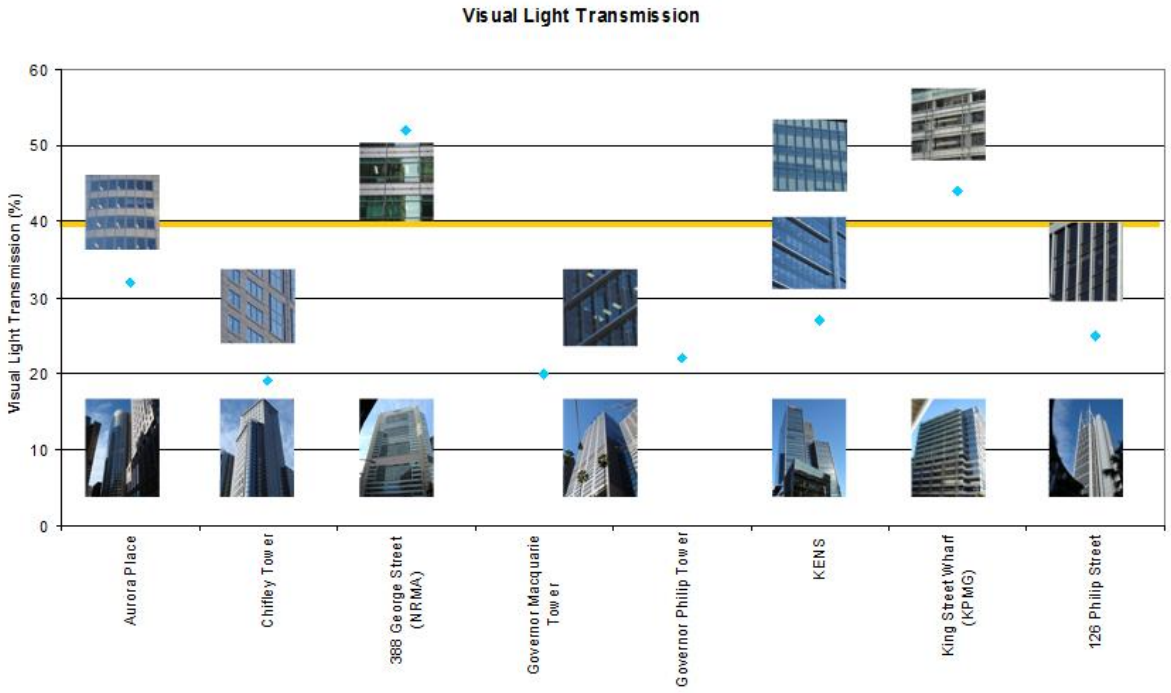
Indoor Environmental Quality (IEQ) affects occupant amenity and comprises thermal comfort, indoor air quality, views, daylight, visual and acoustic quality. These factors are outlined below with respect to the concept application, and will be developed further during detailed design.

Item	*Strategies to improve IEQ*

Daylight, glare and views

Daylight levels have been a key consideration during the design process. Decisions regarding the optimum design solution will take into account daylight availability, in conjunction with considerations of views, glare, thermal comfort and heat loads.

A double-skin facade system will deploy cavity blinds to block all direct sun, minimising heat gains and glare. This allows a much lighter glass to be used while still achieving a high thermal performance for the facade. This greatly improves daylight during times when it is desirable to open the blinds. A Visual Light Transmission of 57% can be achieved, which is extremely rare in Australian office buildings. A comparison of VLT in some of Sydney's prominent office buildings is shown inthe graph below:



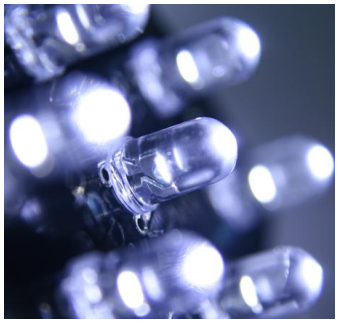
The blinds could be controlled using software that tracks the sun's progress throughout the day, ensuring the blinds are retracted whenever there is no direct sun on the facade. Daylight sensors would ensure that the blinds can also be raised on overcast days or closed when light levels are too high, in order to minimise glare discomfort.

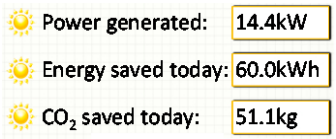
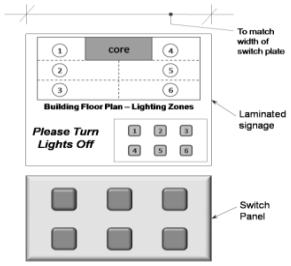
At least 60% of office NLA will have good access to external views in accordance with the Green Star Office v3 criteria.

Item	*Strategies to improve IEQ*
Air quality 	***CO_2 Control*** CO_2 monitoring will be provided, with outside air supply rates adjusted based on CO_2 contamination levels within the space, in order to minimise energy consumption while maintaining an excellent air quality for building occupants. **Dedicated exhaust riser** A local exhaust riser will be provided for printing and photocopying to ensure that exhaust air is not recycled to other enclosures of different use. The dedicated exhaust will be specified to no less than 0.2 L/s/m^2 for 100% of the office NLA, and to have a capacity of 0.5 L/s/m^2 for 100% of the NLA on each floor.
	***Reduced off-gassing of finishes and joinery*** Contamination of indoor air will be removed at source through: - Specification of appropriate finishes such as low-VOC carpets, paints, adhesives and sealants; - Non-toxic internal material selections; - Low-formaldehyde joinery and engineered wood products.
Acoustic Quality	Internal noise will be restricted to acceptable levels in accordance with Australian Standard AS/NZS 2107:2000, including general building and services noise;
Thermal Comfort	Thermal comfort of occupants will be improved by the following design initiatives: - A double-skinned facade with high thermal performance and retractable blinds to prevent direct solar heat from penetrating through the facade. This will ensure that occupants seated at the perimeter will not suffer from radiant overheating through the glass; - A chilled beam system will provide excellent comfort conditions over the office floor-plate; - A Western core protects the building from late-afternoon, low angle sun which could cause discomfort to occupants seated on the perimeter of this elevation.

4.3 Energy Reduction

Energy consumption can be reduced through the efficient design of lighting, air-conditioning and ventilation systems, as well as water heating and other services. The following table outlines the specific initiatives that will reduce services energy consumption at 100 Mount Street. Further initiatives are detailed in Section 6, which outlines how the 5-Star NABERS Energy base building rating will be achieved by the building.

System	*GHG Emissions Reduction Strategies*
Energy Efficiency 	A minimum 5-Star NABERS Energy rating will be achieved for the base building. Key strategies to achieve the nominated NABERS rating include a high-performance façade, highly efficient services and consideration of low-carbon on-site energy generation. Energy efficiency strategies will include (but not be limited to): - Chilled beam air-conditioning and high efficiency chillers; - Variable Speed Drives (VSD) for fans/pumps where justified; - Economy cycle whenever possible; - Low power densities for internal lighting: At least 95% of lighting is being designed to achieve a lighting power density less than 2W/m2 per 100 lux; - Natural ventilation of public domain spaces. Heating of the public domain will be provided by waste heat or solar thermal energy. Efficiency controls will be provided including timers and motions sensors in car parks, common areas and infrequently used areas such as plant rooms.
High-performance facade 	Facade solar heat gains (and therefore AC energy) will be minimised by a combination of high performance glazing and double-skin facade system with an automated retractable blind, which will be programmed to deploy whenever direct sun hits the facade. The blinds could be controlled using software that tracks the sun's progress throughout the day, ensuring the blinds are retracted whenever there is no direct sun on the facade to maximise daylight and reduce lighting energy requirements.

System	GHG Emissions Reduction Strategies
Energy Sub-metering 	Separate sub-metering will be provided for all major energy uses greater than 100kVa, as well as separate sub-metering for tenant light and power on each floor. This will assist with identifying areas of inefficiency with potential for improvement To encourage and recognise the installation of energy sub-metering to facilitate ongoing management of energy consumption.
Lighting Zoning 	Lighting will be zoned so that the size of individual switched lighting zones does not exceed 100m^2 for 95% of the office NLA, with clearly labelled and accessible switching. All individual or enclosed spaces will have individual switches. To encourage and recognise lighting design practices that offer greater flexibility for light switching and automated control which make it easier to light only occupied areas.
Vertical Transportation	Vertical transport will demonstrate high operational efficiency in both stand-by and travel mode. Lift shaft and motor room lighting best-in-class efficient and on motion control/PIR sensors and off after hours. Lift car lighting will be LED or equivalent efficiency and on occupancy sensors 100% of the time to ensure they are off when standing-by, fans should have occupancy control.
Low carbon/renewable energy technologies 	During detailed design, the design team will investigate the provision of low-carbon on-site energy generation in order to reduce greenhouse gas emissions and peak electrical demand. Solar thermal panels will provide a preheat for domestic hot water uses (with gas boost). Possible other sources of low-carbon energy could include trigeneration, photovoltaic energy, geothermal or fuel cells.

System	GHG Emissions Reduction Strategies
Education 	Promotion of sustainability through education and information enables tenants of buildings and consumers to make more informed decisions. Educational initiatives could include the following: - A "building dashboard" reporting on electronic information boards, for building and sustainability real-time information; - Incorporation of sustainability, cultural and community interpretation into finishes, design, features, art and furniture; Way-finding which incorporates green travel, community and services signage and information;
Future-proofing	The building will be designed to be adaptable and flexible, allowing change of use, future efficiency upgrades and ease of refurbishment. Plant rooms and risers should allow for future low-carbon technology upgrades.

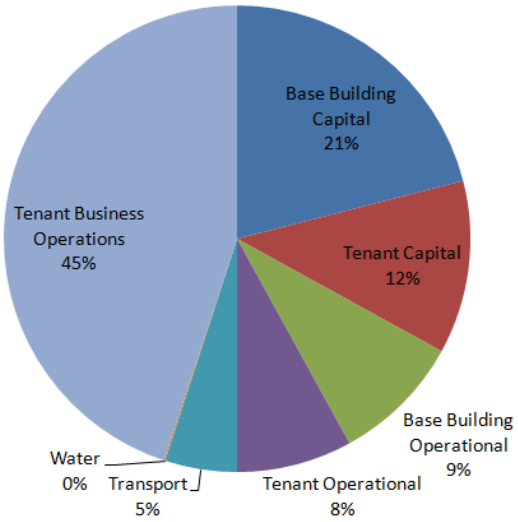
4.4 Water

Mains/potable water consumption will be minimised as much as possible on-site, initially through demand management, then using alternative sources such as rainwater or treated wastewater.

System	Water-saving Strategies
Fittings & Fixtures 	All fittings are best-practice water rated with options on control to minimise total consumption (all areas tenants; common areas, landscaping, cooling towers, retail areas, basement, garbage rooms). The following minimum efficiency ratings will be applied: • Wash hand basin and kitchen taps - 5-Star or better; • WC's – 4-Star or better; • Showerheads – 3-Star or better; • Efficient cleaners taps; • Low-flush urinals (0.8L/flush) or better.
Alternative Water Sources	Rainwater will be harvested and stored on the roof for use in cooling tower make-up, reducing potable water consumption.

System	*Water-saving Strategies*
Landscape 	The use of native, drought-resistant planting will be encouraged to reduce water consumption used in irrigation. Sub-soil irrigation systems with moisture sensors should be considered where non-native species are selected.
Cooling Towers	Cooling towers should be designed to have 6 cycles of concentration or greater, reducing water consumed in air-conditioning by up to 50%, as well as reducing chemical use in treatment. Cooling towers will be maintained to minimise water loss through leaks, overflow, evaporation, bleed, drift and splash. Refer to the Best Practice Guidelines for Cooling Towers (Sydney Water, 2007) and Water Efficiency Guidelines (DEH 2006) for further guidance.
Fire System Test Water	Fire test & maintenance drain-down water will be captured and stored for reuse on-site. Isolation valves or shut-off points will be provided to each floor for floor-by-floor testing.
Metering 	Water metering will be provided to all major water uses within the building, with connections to the BMS ensuring immediate and effective monitoring of water consumption and leakages for simple rectification. In addition, this will allow water efficiency measures to be monitored and tracked;
Education	Publicise water-saving initiatives and provide education for tenants.

4.5 Materials

Item	*Materials Strategies*
Preferred Eco-content  	Ecologically sensitive products (such as scarce minerals and old-growth forest) will be avoided; Preference will be given to materials with a high recycled content and preferred source, including: - Where timber is used, it will preferentially be sourced from reclaimed or FSC stock. As a minimum, at least 95% of timber must be sourced from either re-used, post-consumer recycled, FSC or AFS- certified timber. - A proportion of Portland cement will be replaced with fly ash or other industrial waste products, and recycled aggregate will be used. Wherever feasible, PVC and steel will be sourced from a Green Star certified source.
Embodied Carbon	Embodied carbon comprises a major proportion of the total carbon footprint of a building. An analysis of total carbon and environmental footprint will be undertaken at key design stages to ensure that design options are considered in terms of life-cycle impact and embodied energy/water. A typical carbon footprint breakdown for an office building in North Sydney is shown in the graph below. Embodied or 'capital' energy is clearly a major component of total carbon footprint. **30-year Office Carbon Footprint** 

Item	*Materials Strategies*
Durability & Product Stewardship	Material selections should be durable, flexible and recyclable. Selected manufacturers should implement comprehensive Environmental Management Plans to minimise the impact of their operations; Modular components and mechanical fixings will allow for ease of disassembly at the end of the building's life.
Emissions & Toxicity 	Specify materials with a low emissions content including low-VOC and low formaldehyde content, in order to avoid contaminating the indoor air. Where alternative materials are available at comparable quality, performance and cost, the following materials should be avoided in construction: • Asbestos; • Cadmium; • Chlorinated Polyethylene and Chlorosulfonated Polyethlene; • Chlorofluorocarbons (CFCs); • Chloroprene (Neoprene); • Formaldehyde (added); • Halogenated Flame Retardants; • Hydrochlorofluorocarbons (HCFCs); • Lead (added); • Mercury; • Petrochemical Fertilizers and Pesticides; • Phthalates; • Polyvinyl Chloride (PVC) and • Wood treatments containing Creosote, Arsenic or Pentachlorophenol.

Item	*Materials Strategies*
Ozone Depleting Materials 	Thermal insulation products will be preferred which have a zero Ozone Depletion Potential in their manufacture and composition, reducing the impacts of insulation on the atmosphere (at least 90%); At least 95% of refrigerants by volume will have an Ozone Depletion Potential of zero; and integrated refrigerant leak detection will ensure early identification of leaks.
Material Sourcing	Localised manufacturing will be supported, reducing transport emissions and providing greater security of supply.
Waste Management 	A dedicated storage area will be provided in the basement for the separation and storage of recyclable waste during operation, allowing for the following waste streams to be separated: - Glass; - Paper; - Plastics, - Cardboard; - Organics. - Metals. Throughout project design, operation and construction, principles of resource recovery will be applied, so that materials and products are recovered and reused where possible, reducing landfill and saving money. Some strategies that could be adopted include: • Innovative waste separation and collection strategies to allow materials to be isolated for reuse; • Purchasing policy should minimise waste from products and packaging and encourage the use of products which have minimum environmental impact; • Manufacturers and suppliers will be encouraged to take full responsibility for the life cycle impact of products including ownership at end of life.

4.6 Emissions

Item	*Strategies*
Refrigerant ODP & GWP and Insulant ODP 	All refrigerants will be selected to avoid the use of ozone depleting substances. A leak detection and recovery system will ensure that any refrigerants leaks will be promptly detected and rectified. All insulation will be selected to avoid the use of ozone depleting substances in both their manufacture and composition. This covers insulation in the following uses: • Services including; refrigerant pipe-work, ductwork, hot & cold water pipes, water tanks, etc. • Building fabric including; walls, roofs, floor, window frames, doors, cavity closures and lintels.
Watercourse Pollution	Post-development peak 1.5 year Average Recurrence Interval (ARI) event discharge from the site will not exceed the pre-development peak 1.5 year ARI event discharge; All stormwater leaving the site will be treated/ filtered to specified standards, including an 80% reduction in suspended solids, a 90% reduction in gross pollutants and a 45-60% reduction in total nitrogen and phosphorus (respectively), minimising pollution of natural watercourses.
Reduced Flows to Sewer	High efficiency fittings and fixtures result in predicted flows to sewer being reduced by 50%.

4.7 Transport

Item	*Strategies*
Cycling Facilities 	Cyclist facilities will be provided to 10% of building staff (at a rate of 1 person per 15m^2 NLA), including secure bicycle storage racks, showers and lockers. Cyclist facilities will also be provided for visitors. Clearly signposted, secure bicycle facilities with good access and path networks will encourage residents and visitors to cycle, improving health and reducing greenhouse gas emissions from transport.
Small Car Parking Spaces	At least 10% of parking spaces will be sized and labelled for small cars, and 5% for motorbikes/mopeds. 80% of these will be provided in a preferred location and clearly signposted.
Public Transport	Excellent connections are provided to public transport networks including trains, buses and ferries.
Future-proofing 	Provision will be made for future incorporation of electric charging points, potentially allowing for connection to future solar electricity system for zero-emissions charging
Education	A comprehensive transport plan will be made available to all staff and visitors, outlining alternative forms of transport to private vehicle use.

5 Achieving the Green Star Rating

The proposed Green Star strategy is outlined in the following table, showing credits that have been identified to achieve a 5-Star rating, as well as a number of credits identified to provide a safety margin. During detailed design, the specific credits claimed may be modified, provided that the 5-Star Green Star rating is maintained.

Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Management				
Green Star Accredited Professional	Man-1	2	2	0
Commissioning Clauses	Man-2	2	2	0
Building Tuning	Man-3	2	2	0
Independent Commissioning Agent	Man-4	1	1	0
Building Users' Guide	Man-5	1	1	0
Environmental Management	Man-6	2	2	0
Waste Management	Man-7	2	2	0
	TOTAL	12	12	0
Indoor Environment Quality				
Ventilation Rates	IEQ - 1	3	1	0
Air Change Effectiveness	IEQ - 2	2	2	0
Carbon Dioxide Monitoring and Control	IEQ - 3	1	1	0
Daylight	IEQ - 4	3	1	0
Daylight Glare Control	IEQ - 5	1	1	0
High Frequency Ballasts	IEQ - 6	1	1	0
Electric Lighting Levels	IEQ - 7	1	1	0
External Views	IEQ - 8	2	1	0
Thermal Comfort	IEQ - 9	2	2	0
Individual Comfort Control	IEQ - 10	2	0	0
Hazardous Materials	IEQ - 11	0	na	0
Internal Noise Levels	IEQ - 12	2	2	0
Volatile Organic Compounds	IEQ - 13	3	3	0
Formaldehyde Minimisation	IEQ - 14	1	1	0
Mould Prevention	IEQ - 15	1	0	0
Tenant Exhaust Riser	IEQ - 16	1	1	0
	TOTAL	26	18	0
Energy				
Conditional Requirement	Ene -	-	-	0
Greenhouse Gas Emissions	Ene - 1	20	8	3
Energy Sub-metering	Ene - 2	2	2	0
Lighting Power Density	Ene - 3	3	2	1
Lighting Zoning	Ene - 4	2	2	0
Peak Energy Demand Reduction	Ene - 5	2	0	0
	TOTAL	29	14	4

Title	Credit No.	Points Available	Points Achieved	Points to be Confirmed
Transport				
Provision of Car Parking	Tra - 1	2	0	0
Fuel-Efficient Transport	Tra - 2	1	0	1
Cyclist Facilities	Tra - 3	3	3	0
Commuting Mass Transport	Tra - 4	5	5	0
	TOTAL	11	8	1
Water				
Occupant Amenity Water	Wat - 1	5	3	0
Water Meters	Wat - 2	1	1	0
Landscape Irrigation	Wat - 3	1	1	0
Heat Rejection Water	Wat - 4	4	0	0
Fire System Water Consumption	Wat - 5	1	1	0
	TOTAL	12	6	0
Materials				
Recycling Waste Storage	Mat - 1	2	2	0
Building Reuse	Mat - 2	6	0	0
Reused Materials	Mat - 3	1	0	0
Shell and Core or Integrated Fit-out	Mat - 4	2	0	2
Concrete	Mat - 5	3	3	0
Steel	Mat - 6	2	2	0
PVC	Mat - 7	2	2	0
Timber	Mat - 8	1	1	0
Design for Disassembly	Mat - 9	1	1	0
Dematerialisation	Mat - 10	1	0	1
	TOTAL	21	11	3
Land Use & Ecology				
Conditional Requirement	Eco -	0	-	0
Topsoil	Eco - 1	0	na	0
Reuse of Land	Eco - 2	1	1	0
Reclaimed Contaminated Land	Eco - 3	2	0	0
Change of Ecological Value	Eco - 4	4	1	0
	TOTAL	7	2	0
Emissions				
Refrigerant ODP	Emi - 1	1	1	0
Refrigerant GWP	Emi - 2	2	0	0
Refrigerant Leaks	Emi - 3	2	2	0
Stormwater	Emi - 5	3	3	0
Discharge to Sewer	Emi - 6	4	2	0
Light Pollution	Emi - 7	1	1	0
Legionella	Emi - 8	1	0	0
Insulant ODP	Emi - 4	1	1	0
	TOTAL	15	10	0
Total weighted points:		**60**		**6**

6 Achieving the NABERS Energy Rating

The National Australian Building Environmental Rating Scheme (NABERS) is a voluntary performance based rating system. NABERS rates a buildings performance on the basis of its measured operational impacts on the environment.

NABERS provides rating under the following categories:

- Energy
- Water
- Waste; and
- Indoor Environment Quality (IEQ)

The NABERS rating tools provides a simple indication of the environmental performance and allows for comparison against peers and neighbours

The development is being designed to exceed minimum requirements in terms of Ecologically Sustainable Design (ESD), and as such is targeting a minimum 5-Star NABERS Energy rating for the base building.

NABERS Energy (formerly the Australian Building Greenhouse Rating or ABGR) is a rating of a buildings performance in relation to its equivalent emission of CO_2 per m² per year. The scheme has different calculation processes for existing buildings and new/refurbished buildings.

There are three different types of NABERS Office Energy ratings for buildings under the scheme. They are;

- Whole Building Ratings: this is a rating which includes all energy consumed by the building.
- Tenancy Ratings: this is a rating which include for all energy consumed with in the tenant area, i.e. downstream of tenant distribution board.
- Base Building Ratings: this is a rating of all energy consumed as a part of the house systems, but excludes the energy consumed downstream of the tenant distribution board.

Following a specific NABERS Office Energy validation protocol the total carbon dioxide emissions can be determined. The emissions are then normalised to one meter squared of Nett Lettable Area and a 50 hour working week. This normalisation allows for all ratings to be compared to one another.

The normalised emissions are then compared to banded star ratings. The star rating meanings are described below, for a NABERS Energy Base Building rating in NSW:

- **1-Star 'Poor'**: Consumes unnecessary resources or negatively impacts on occupants, many cost effective improvements in many areas.
- **2-Stars 'Below Average'**: Below market average performance, good scope for improvement.
- **3-Stars 'Above Average'**: Current market best practice, very good systems and management, improvement possible.
- **4-Stars 'Excellent'**: Strong performance, efficient use of resources and minimal impact on occupants.
- **5-Stars 'Exceptional'**: Best building performance, integrated design, operation, management and resource source selection.

6.1 100 Mount St NABERS Energy Strategy

Concept energy modelling has been undertaken in order to ensure that the required 5-Star NABERS Base Building energy rating can be achieved. The building simulation model will be used to set contractual design criteria which must be met unless alternative solutions can be demonstrated which present better whole of life outcomes than the nominal performance noted above.

The key design aspects which significantly contribute to the buildings energy performance have been identified as:

- Facade Design:
  - Glazed Area;
  - Glazing Properties;
  - External Shading;
  - Building Fabric Properties.
- Passive Design:
  - Natural Ventilation;
  - Maximised Daylight.
- Building Services Systems:
  - Air-Conditioning System (Type & Efficiency);
  - Air-Conditioning Controls;
  - Lighting Design & controls.
- Ancillary Systems:
  - Vertical Transport
  - Car park Ventilation

To address these key design aspects and ensure that the required 5-Star NABERS Energy rating is achieved for the base building, the following energy performance strategies will be adopted:

- Optimised facade performance including:
  - Maximised glazing areas to allow adequate daylight with effective automated shading to limit solar gains;
  - Double-skin facade incorporating high performance glazing with an automated inter-cavity blind that blocks direct sunlight from entering the building and provides an extremely high performance Shading Coefficient when deployed. A Solar Heat Gain Coefficient (SHGC) of 0.08 can be achieved with the blinds in the horizontal position. A facade with such a high solar control performance is leading the market in Australia;
  - High performance building fabric with insulation.

- Efficient air conditioning system incorporating:
    - Passive chilled beam system; significantly reducing overall HVAC energy consumption;
    - High efficiency chilled water plant;
    - Incorporate 'right-sizing' of plant and equipment, ensuring that design loads are realistic and equipment is not oversized;
    - Variable speed drives (VSD) on fans/pumps where justified in terms of energy savings potential.
- Efficient lighting design including:
    - Maximised daylight through optimised facade design
    - Daylight and occupancy linked lighting control
    - Reduced lighting power densities
- Improved Ancillary Systems:
    - High efficiency vertical transport
    - Car par ventilation with CO_2 monitoring & VSD
    - Reduced car park lighting power densities
- Passive Design:
    - Naturally ventilated public realm spaces
    - Daylight and operable windows for amenities spaces

To achieve the required 5-Star NABERS Energy base building rating a total energy consumption figure of **87kWh/m^2/yr** must be achieved. A safety margin should also be incorporated to ensure that the inevitable operational inefficiencies do not jeopardise the building's ability to achieve the required rating.

Some of the strategies that will contribute to achieving a safe margin for the building rating include:

- Ensure that internal load design criteria actually achieved for lighting, power and occupancy, are used to determine peak demand and HVAC design efficiency;
- Ensure that a building energy management system (BEMS) is provided which has the ability to display public area and tenant real-time energy consumption information;
- Consider increasing temperature set band for reduced HVAC energy;
- Target further improvements in chilled water plant efficiency, pump and fan efficiency;
- Investigate on or offsite low-carbon energy generation such as trigeneration, geothermal, photovoltaics or fuel cells.

7 Conclusion

The proposed development will achieve a high level of environmental performance, which will be verified using established environmental benchmarking and performance rating tools including Green Star ratings during design and construction, as well as a NABERS rating in operation.

The design represents a significant improvement on the previously approved scheme, in terms of sustainability, particularly in terms of facade performance.

The above-mentioned strategies will be further developed during detailed design to ensure the optimum sustainability solution is achieved, that provides value to the development, certainty in operation and tangible benefits for occupants and stakeholders.