IGS INTEGRATED GROUP SERVICES

Ecologically Sustainable Design (ESD) Report

20 Avon Rd, Pymble NSW

29th May 2025

VALUE | INNOVATION | TRUST

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Document Control

Revision	Date	Author
1.0	10 December 2024	B. Shojaei
2.0	25 February 2025	B. Shojaei
3.0	26 March 2025	B. Shojaei
4.0	29 May 2025	B. Shojaei

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1. Executive Summary

IGS has been commissioned by Pymble Ladies' College (the College) to prepare this Ecologically Sustainable Design (ESD) assessment report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs) and in support of the preparation of an Environmental Impact Statement (EIS) and State Significant Development Application for the proposed Secondary Innovation Precinct (SIP) and Campus Commons (SSD- 79146716) to the Department of Planning, Housing and Infrastructure (DPHI).

This report has been prepared with reference to architectural plans prepared by 3XN and dated May 2025.

The principles of ecologically sustainable design will be an integral consideration throughout this development. This report summarises the ESD provisions for the development which demonstrate commitment to environmental sustainability.

The sustainability targets for the development will be achieved in an integrated and staged approach through minimising the need for energy consumption (via passive measures) and then consumption optimisation (energy efficiency) and use of renewable resources where required.

The initiatives presented in this report demonstrate a wide range of measures which will result in high levels of environmental performance and also improvement of occupants' health, productivity, comfort, and satisfaction.

Aiming at leading practice in energy and environmental targets, the project architect and building services design team will maximise energy efficiency in an integrated and staged approach as described in Table 1 below.

Table 1. Sustainability Approach

Load Reduction (Minimising the need for resource consumption e.g., energy, water, and material)	Passive Design
	Building fabric improvements
	Maximise use of natural lighting
	Maximise use of natural ventilation
	Maximise use of native plants and species
Optimising resources consumption (energy, water & materials)	High efficiency Heating, Ventilation and Air Conditioning
	High efficiency lighting
	High efficiency hot water systems
	High efficiency appliances
	Commissioning and tuning of building services post completion
	High efficiency building control, automation and BMS
Indoor Environmental Quality	Thermal Comfort
	Acoustic comfort
	Effective Daylighting / Natural Lighting
	Natural Ventilation
	Volatile Organic Compounds (VOC) & Formaldehyde Minimisation
Material	Maximise separation and recycling of demolition and construction materials.
	Minimise use of Ozone Depleting materials
	Avoid specifying materials with environmentally sensitive content
	Participation in waste minimisation training for contractors and sub-contractors.
	Waste minimisation plan to reduce site waste to landfill.
Transport Efficiency	Sustainable transport measures & bicycle racks

Use of renewable resources (renewable energy and rainwater harvesting)	Application of Solar Energy & Heat Pump technology
	Rainwater harvesting
Land use and Ecology	Maintaining and improving the ecological value of the land
Emissions	Insulation products with low Ozone Depletion Potential
	Refrigerants with Ozone Depletion Potential of zero
	Stormwater Management
	Light Pollution: Minimise light beams directed upwards or outside the buildings.

Benchmarking and compliance requirements:

The development will meet and outperform the following regulatory sustainability requirements:

- Standard Secretary's Environmental Assessment Requirements (SEARs) – ESD requirements
- NCC Section J – Energy Efficiency

Sustainability benchmarks beyond the minimum requirements

Although not seeking formal rating certification, where feasible, the design team will also consider the sustainable design principles based on the following sustainability tool.

- Green Star Buildings Tool – Green Building Council of Australian. 5 Star Design Aspiration.

2. Introduction

IGS has been commissioned by Pymble Ladies' College (the College) to prepare this Ecologically Sustainable Design (ESD) assessment report in accordance with the technical requirements of the Secretary's Environmental Assessment Requirements (SEARs) and in support of the preparation of an Environmental Impact Statement (EIS) and State Significant Development Application for the proposed Secondary Innovation Precinct (SIP) and Campus Commons (SSD- 79146716) to the Department of Planning, Housing and Infrastructure (DPHI).

This report has been prepared with reference to architectural plans prepared by 3XN and dated May 2025.

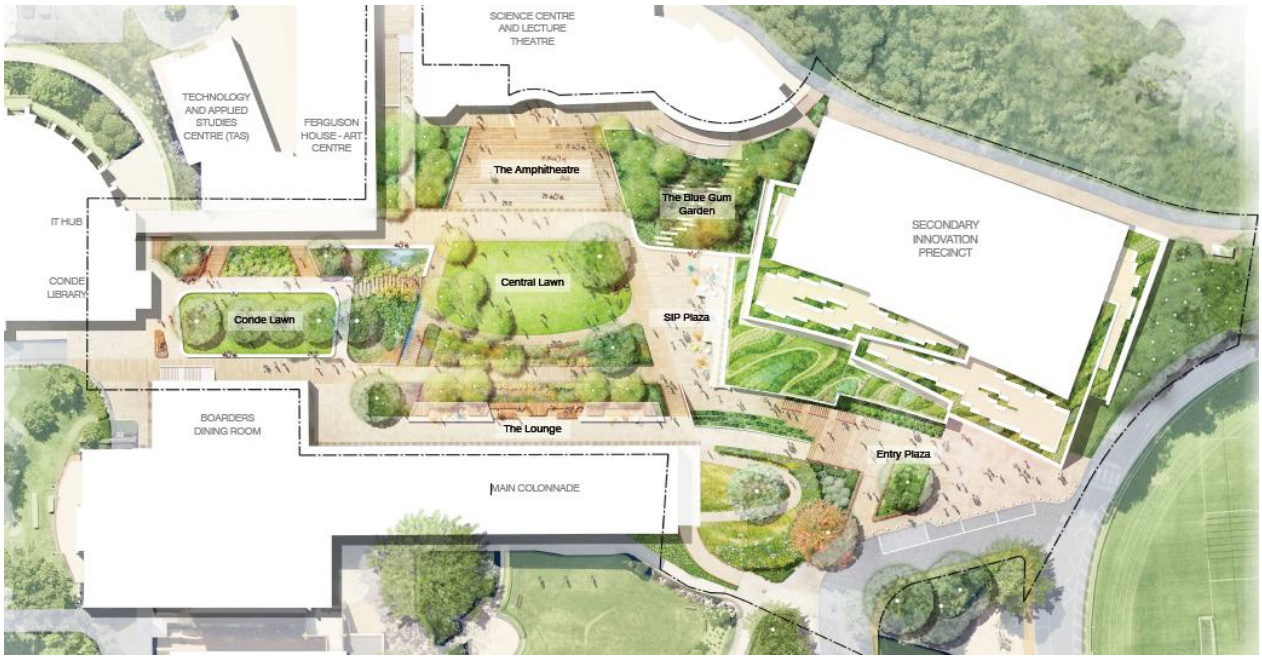
2.1 Description of the Site and Locality

The site is located at 20 Avon Road, Pymble, within the Ku-Ring-Gai Local Government Area (LGA). The site comprises multiple parcels of land and is legally described as:

- Lot 1 Deposited Plan 69541
- Lots 11- 17 Deposited Plan 7131

The site and proposed work areas are identified in the figures below.

Source: Urbis



Source: TCL

Key features of the site are as follows:

- The site accommodates the existing Pymble Ladies' College which accommodates Kindergarten to Year 12 students.
- Vehicular access to the College is provided via separate ingress and egress driveways on the northern and western sections of Avon Road.
- Pedestrian access is provided through multiple gates along Avon Road.
- The project area that is subject to this SSDA is located at the entrance to the College west of the oval.
- The project area slopes down from south to north with a fall from RL 124.50 at the southern corner to RL 116 at the north west corner.

Key features of the locality:

The development context surrounding the site is a leafy suburban environment, predominantly made up of detached residential properties set within expansive gardens and along avenues lined with mature trees.

Recent developments of moderate-scale residential apartment buildings occur closer to the railway corridor. Two storey commercial establishments are located near to Pymble train station, specifically along the Pacific Highway and on the northern flank of the railway line.

- The site is located approximately 19km north west of the Sydney Central Business District.
- The College is situated approximately 200m from Pymble train station, situated on Pacific Highway and Pymble town centre.

The immediately surrounding locality is described as follows:

- **North:** Avon Road and Pacific Highway (approximately 400m).
- **East:** Residential uses, accommodating a mixture of dwelling houses and residential flat buildings.
- **South:** Avondale Golf Course.
- **West:** Avon Road, beyond which is a residential area characterised by detached dwelling houses.

3. Project Description

3.1 Brief Description

The project comprises demolition of several existing buildings and the construction of the Secondary Innovation Precinct, associated landscaping and Campus Commons at the Pymble Ladies College. The SIP is a five-storey building that will consolidate STEM based learning opportunities within the College.

3.2 Detailed Description

The proposal seeks development approval for the Secondary Innovation Precinct (SIP) and Campus Commons at Pymble Ladies' College. The development comprises:

- Demolition of the existing Isabel Harrison, Dorothy Knox, John Vicars and Robert Vicars Buildings.
- Tree removal.
- Excavation of the basement level.
- Construction of the new five storey SIP building of RL 146.98m and including:
    - General Learning Spaces.
    - STEM teaching spaces.
    - Senior student facilities.
    - Function spaces.
    - Food and beverage facilities.
    - Associated amenities.
    - Storage and building services.
- 1 loading space within the basement (for service vehicles) accessible from the existing rear vehicle service road.
- Minor kerb realignment of the existing access road to the east of the SIP.
- Landscaping on the outdoor terraces and surrounding the building.
- The project also includes the Campus Commons, a significant garden lawn and amphitheatre connecting the SIP precinct to the rest of the campus.

4. Benchmarking

Benchmarking and compliance requirements:

The development will meet and outperform the following regulatory sustainability requirements:

- Standard Secretary's Environmental Assessment Requirements (SEARs) – ESD requirements
- NCC Section J – Energy Efficiency

Sustainability benchmarks beyond the minimum requirements

Although not seeking formal rating certification, where feasible, the design team will also consider the sustainable design principles based on the following sustainability tool.

- Green Star Buildings Tool – Green Building Council of Australian. 5 Star Design Aspiration.

4.1 Response to SEARs

The ESD SEAR's report is required by the Secretary's Environmental Assessment Requirements (SEARs). Table 2 identifies the SEARs and relevant reference within this report.

Table 2. SEARs Relevant References.

SEARs Items	Project Response
Identify how ESD principles (as defined in section 193 of the EP&A Regulation) are be incorporated in the design and ongoing operation of the development.	The sustainability targets for the development will be achieved in an integrated and staged approach through first minimising the need for energy consumption (via passive measures) and then consumption optimisation (energy efficiency) and use of renewable resources where required. The outcome of this staged approach is to ensure the school aligns with the ecological sustainable development principles of Clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. Refer to section 4.1 Resource Conservation for the proposed ESD initiatives.
Demonstrate how the development will meet or exceed the relevant industry recognised building sustainability and environmental performance standards, and integrate environmental design strategies in accordance with the Environmental Design in Schools Manual.	The development has a 5 Star Green Star design aspiration (without formal certification) utilising the Green Building Council of Australia's (GBCA) Design and As-built rating tool. A 5 Star Green Star rating is considered 'Australian excellence' level. Green Star rating tools include the following nine separate environmental impact categories, Management; Indoor Environment Quality; Energy; Transport; Water; Materials; Land Use and Ecology; Emissions, and Innovation. Refer to Section 5 for the targeted sustainability measures including energy and water conservations measures.
Demonstrate how the development minimises greenhouse gas emissions (reflecting the Government's goal of net zero emissions by 2050) and consumption of energy, water (including water sensitive urban design) and material resources.	Ongoing GHG emissions of the development has been considered in the design of the school. Section 5, and Appendix D (Net Zero Emission Assessment Report) provide building performance measures considered to reduce resource consumption and carbon emissions.

If Chapter 3 of SEPP (Sustainable Buildings) 2022 applies: • demonstrate how the development has been designed to address the provisions set out in Chapter 3.2(1). • provide a NABERS Embodied Emissions Material Form to disclose the amount of embodied emissions attributable to the development in accordance with section 35BA of the EP&A Regulation. • provide a net zero statement (as defined in section 35C of the EP&A Regulation) that includes: ○ evidence of how the development will either be fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035. ○ details of any renewable energy generation and storage infrastructure implemented and any passive and technical design features that minimise energy consumption. ○ estimations of annual energy consumption for the building and number of emissions relating to energy use in the building (if information is available).	The development follows the general sustainability requirements for an aspirational target of a 5 Star Green Star. A detailed Emissions Assessment has been prepared for the development. Please refer to Net Zero assessment report provided in Appendix D of this report. This provides: ○ evidence of how the development will be either fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035. ○ details of the proposed renewable energy generation and storage infrastructure (minimum 110 kW Solar PV). ○ estimations of annual energy consumption for the building and the volume of emissions relating to energy use in the building. Furthermore, a NABERS Embodied Emissions Material Form has been provided in Appendix E of this report. A climate adaptation study has been undertaken to identify the climate risks in response to the projected impacts. Actions and design strategies have been identified to lower the impacts and the associated risk levels. The climate change adaption plan is provided in section 6 of this report. The plan is based on NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.

4.2 National Construction Code (NCC) Section J

Section J of the NCC sets regulations for energy efficiencies for all types of buildings with respect to the building's construction, design, and activity.

The objective of the NCC Section J is to reduce the greenhouse gas emissions. Section J requires that a building, including its services, must have features to the degree necessary that facilitate the efficient use of energy.

The NCC offers two compliance methods that differ in complexity and flexibility. The two compliance methods are:

- Deemed-to-Satisfy (DTS) Compliance.
- J1V3 – Verification using a referenced building.

The Deemed-to-Satisfy Provisions in Section J of the NCC 2022 include the following 8 components.

- Part J1 - Energy efficiency performance requirements.
- Part J2 - Energy efficiency.
- Part J3 - Elemental provisions for a sole-occupancy unit of a Class 2 building or a Class 4 part of a building.
- Part J4 - Building Fabric relates to the building fabric and minimum thermal performance for constructions according to climate zone for roofs, ceilings, roof lights, walls, glazing and floors.
- Part J5 – Building Sealing – Provisions to reduce the loss of conditioned air and restrict unwanted infiltration to a building.

- Part J6 - Air-Conditioning and Ventilation – Requirements to ensure these services are used and use energy in an efficient manner.
- Part J7 - Artificial Lighting and Power – Requirements for lighting and power to ensure energy is used efficiently within a building.
- Part J8 - Heated water supply and swimming pool and spa pool plant – Restrictions for hot water supply design except for solar systems within climate zones 1, 2 and 3.
- Part J9 - Energy monitoring and on-site distributed energy resources.

The development will meet and outperform the NCC energy efficiency requirements of Part J4 report will be prepared once the design is further progressed.

4.3 Green Star

Green Star is an environmental rating tool developed by the Green Building Council of Australia (GBCA) that has a holistic approach over a wide range of issues that covers a range of sustainability impact areas. There are various Green Star tools developed to suit a range of different building types including:

- Green Star Buildings.
- Design and As-Built.
- Office Interiors.
- Performance.
- Communities.

Green Star rating tools use Stars to rate performance:

- Legal compliance: The building is compliant with legislation (National Construction Code 2019 or later)
- Good Practice: The building meets the Minimum Expectations of good practice energy and water efficient, good indoor environment quality and built to operate well.
- 4 Star reflects a Best Practice environmental performer. It builds on the Minimum Expectations to deliver a building that is
- either climate positive or a higher performer in energy, water, and health related issues (15 out of 100 points)
- 5 Star demonstrates Australian Excellence by being a high environmental performer that addresses social issues relevant to the building owner (35 out of 100 points)
- 6 Star showcases World Leadership. It has been built to be a highly efficient building fully powered by renewables that addresses a significant number of environmental and social issues and contributes to the community (70 out of 100 points).

The diagram in Figure 1 below details the ratings awarded by Green Star Buildings.

Figure 1. The ratings awarded by Green Star Buildings.

Green Star rating tools include eight separate environmental impact categories, as shown Figure 2 and Figure 3 follows.

Figure 2. Environmental impact categories list used in Green Star rating tools.

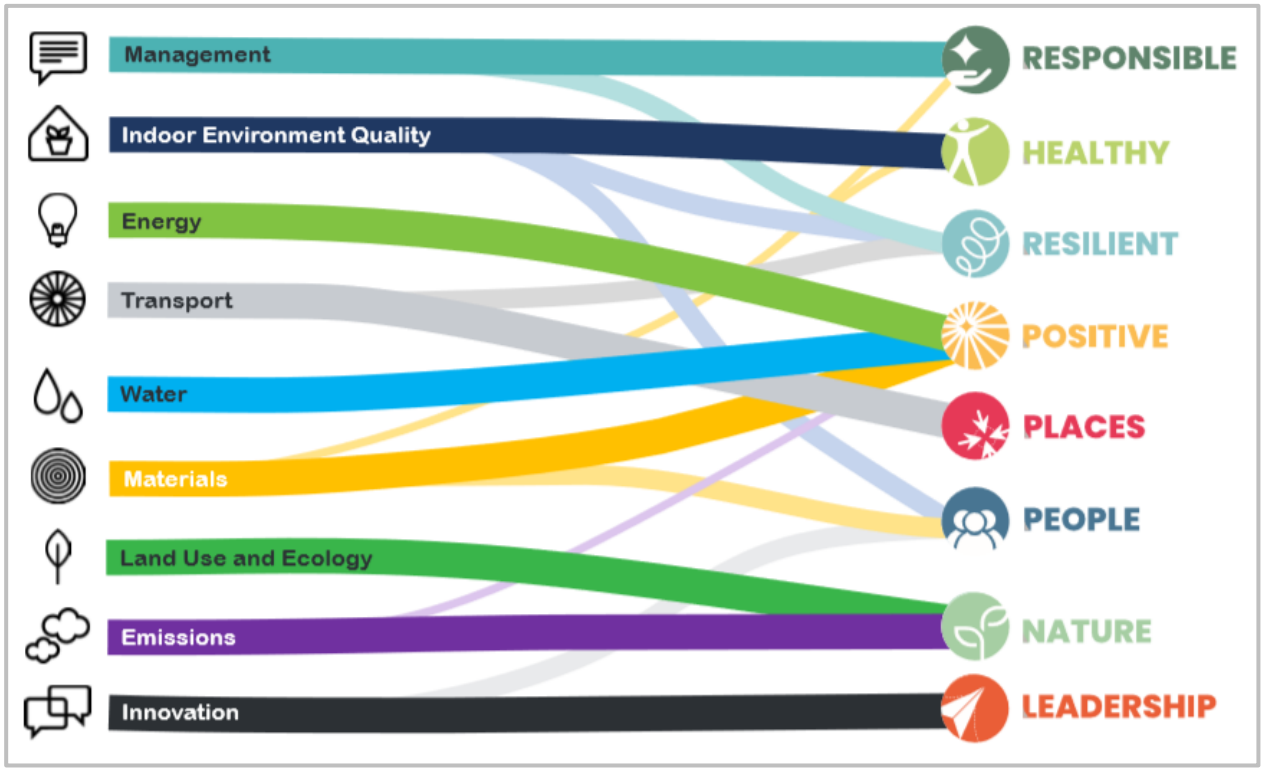


Figure 3. Eight separate environmental impact categories chart used in Green Star rating tools.

Although not seeking formal rating certification, where feasible, the design team will also consider the sustainable design principles based on the following sustainability tool.

5. Development Location

The development is located in Pymble NSW which is within the NCC climate zone 5 (Warm temperate). The climate zone map of the development is depicted in Figure 4.

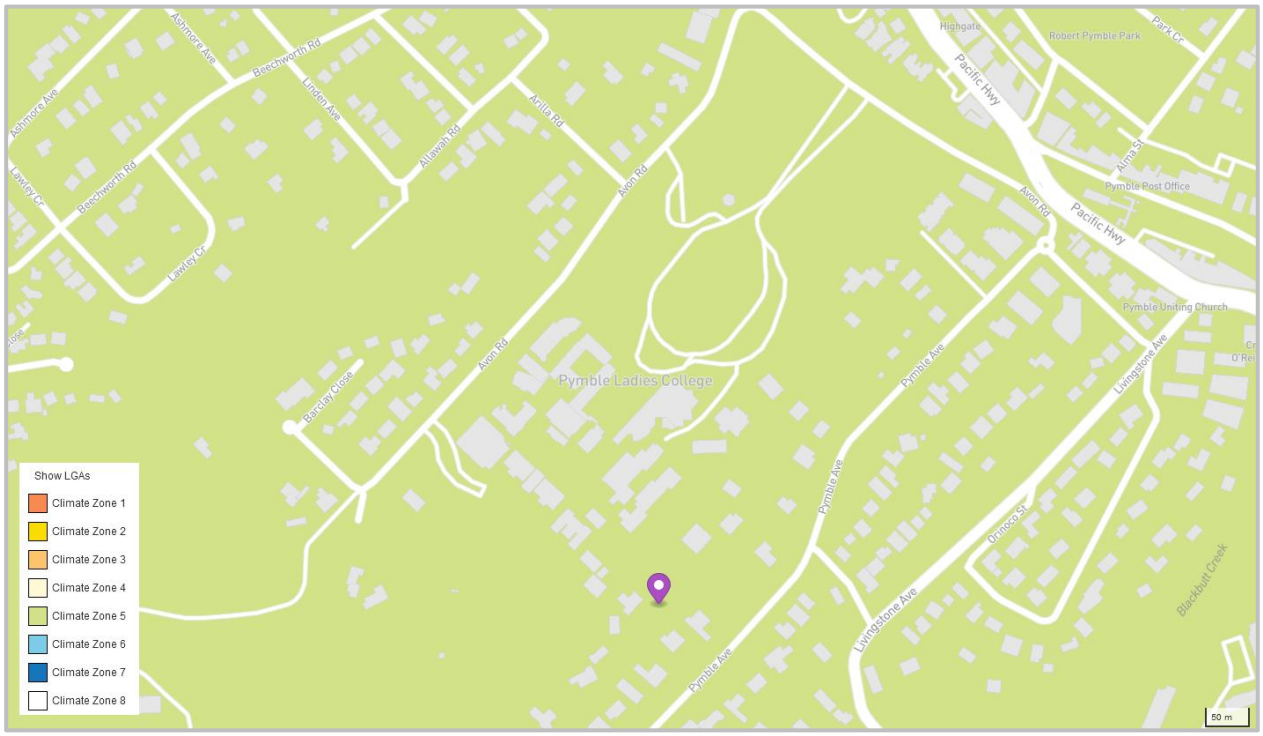


Figure 4. Climate zone map.

5.1 Information Used in Review

Our review is based on the following preliminary architectural drawings by 3XN Architects (Table 3).

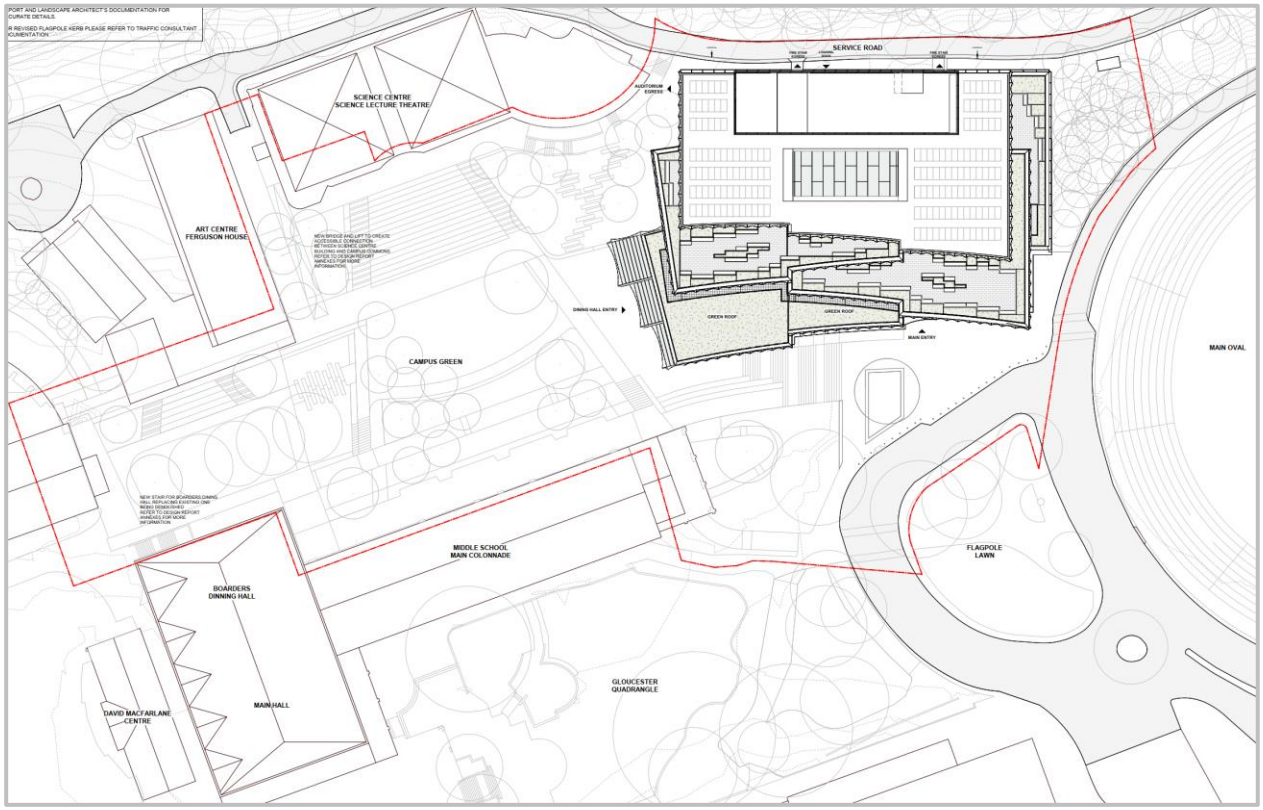
Table 3. Architectural drawing list.

Drawing title	Drawing number
Cover Sheet	AR-SIP-DA-A00-1000
Location Plan	AR-SIP-DA-A00-1001
Site Plan - Proposed	AR-SIP-DA-A01-1001
Ga Plan - Basement 01	AR-SIP-DA-A02-10B1
Ga Plan - Lower Ground Level	AR-SIP-DA-A02-10LG
Ga Plan - Ground Floor	AR-SIP-DA-A02-1000
Ga Plan - Level 01	AR-SIP-DA-A02-1001
Ga Plan - Level 02	AR-SIP-DA-A02-1002
Ga Plan - Level 03	AR-SIP-DA-A02-1003
Ga Plan - Plant Level	AR-SIP-DA-A02-1004
Ga Plan - Roof Level	AR-SIP-DA-A02-1005
Elevation - West	AR-SIP-DA-A06-1000
Elevation - North	AR-SIP-DA-A06-1001
Elevation - South	AR-SIP-DA-A06-1002
Elevation - East	AR-SIP-DA-A06-1003
Section - North / South 01 - Atrium	AR-SIP-DA-A07-1000
Section - North / South 02 - Auditorium	AR-SIP-DA-A07-1001
Section - East / West 01 - Building Cores	AR-SIP-DA-A07-1002

5.2 Architectural Drawings

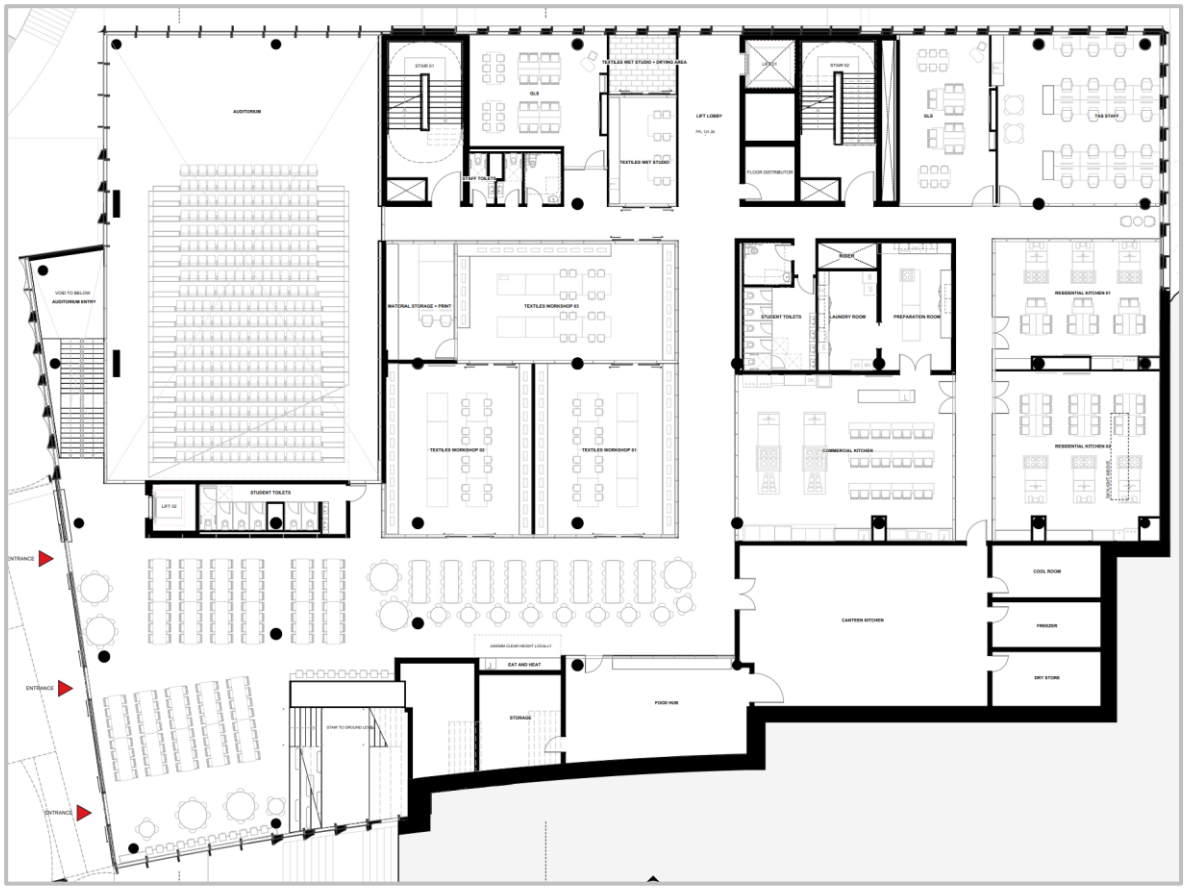
Selected architectural plans and elevations for the proposed development are provided below.

Site Plan

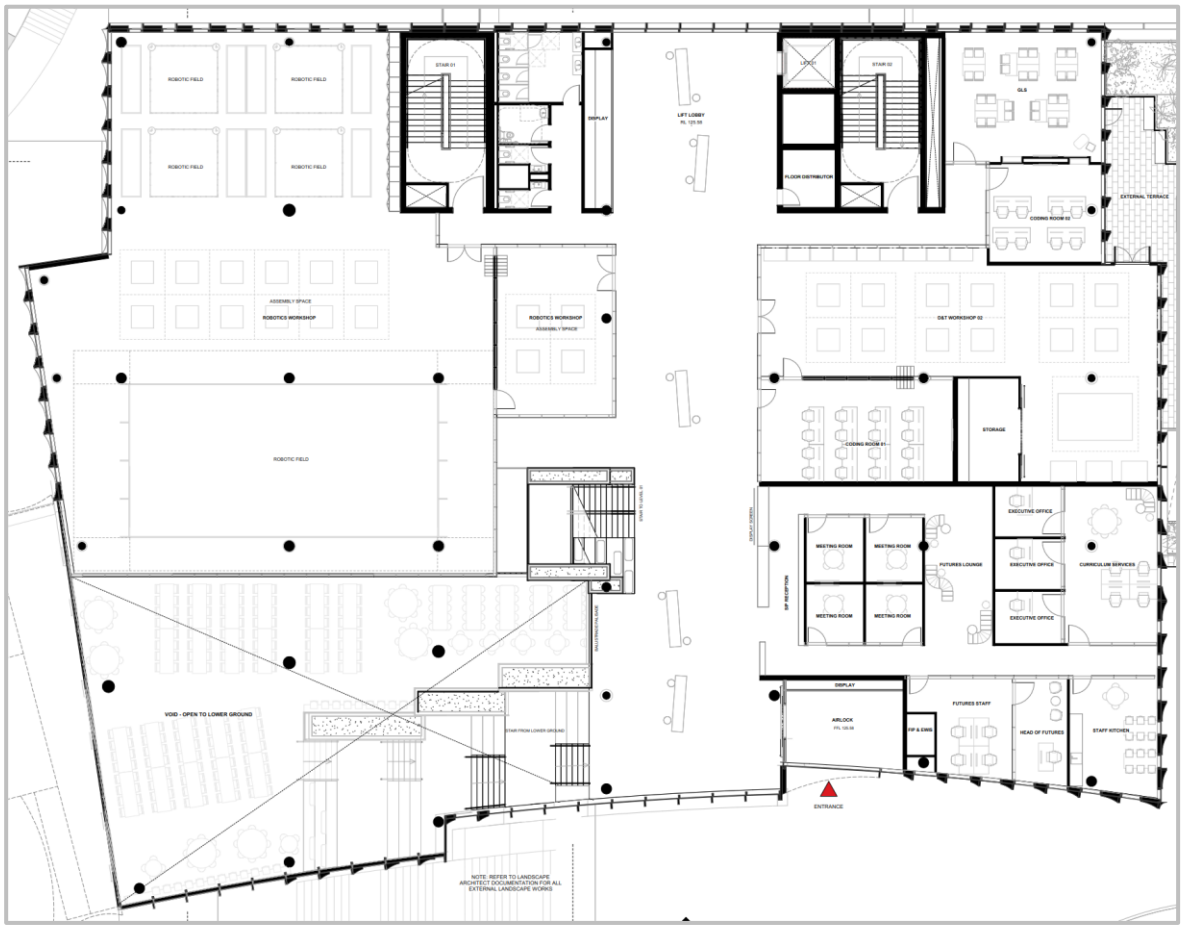


Basement 01 – Floor Plan

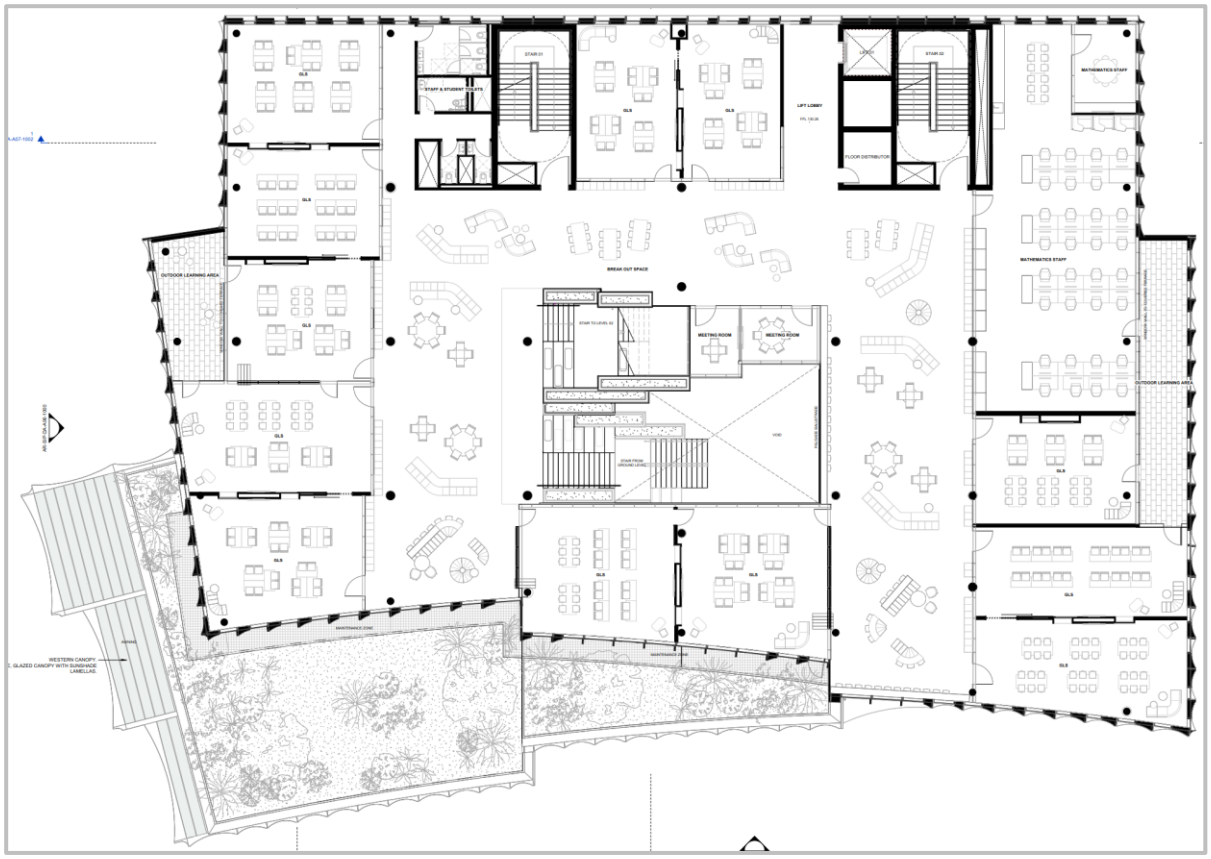
Lower Ground – Floor Plan



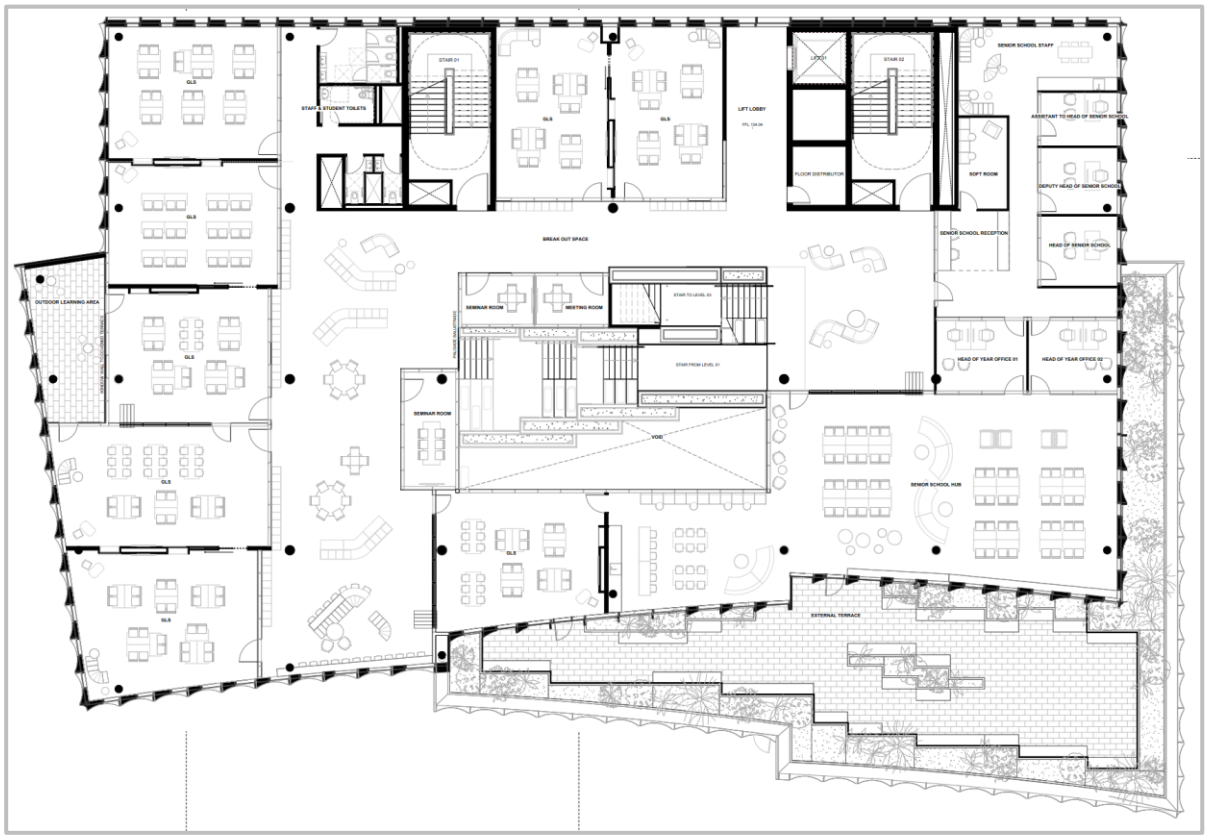
Ground – Floor Plan



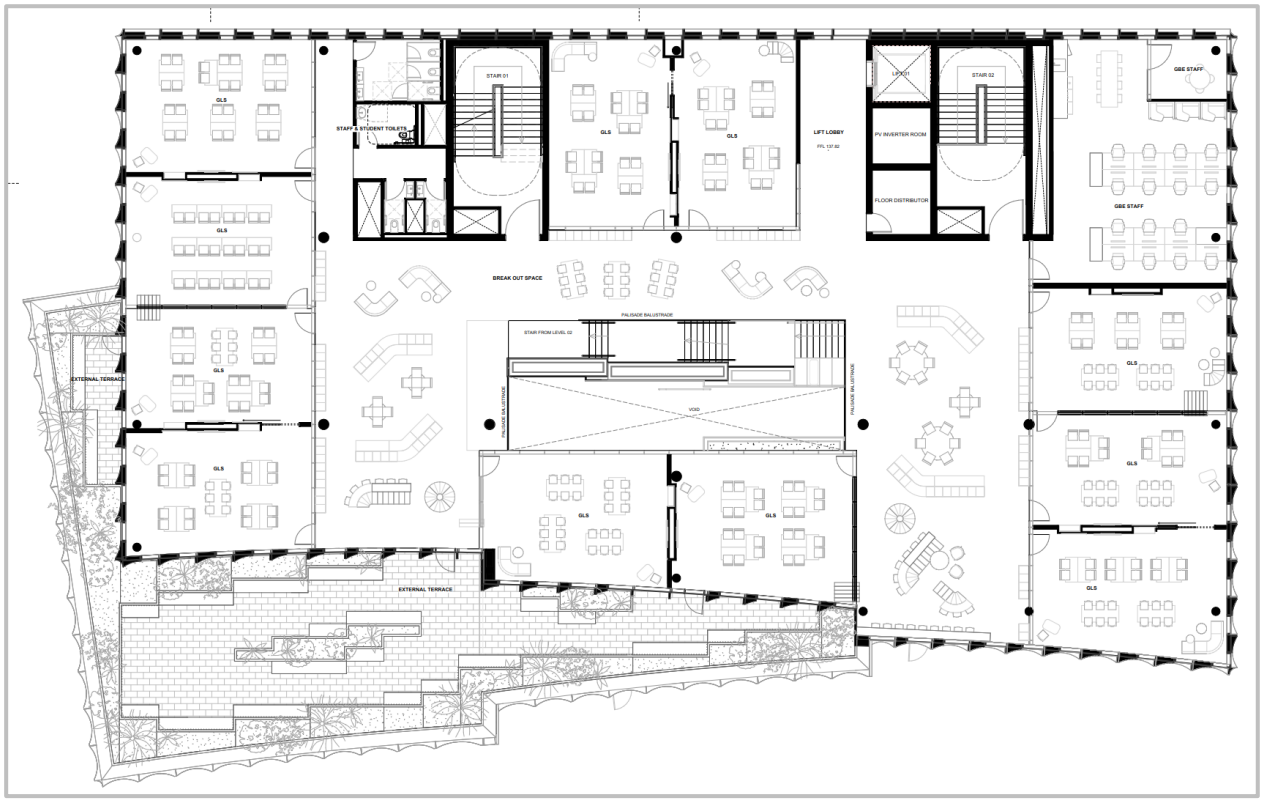
Level 01 - Floor Plan



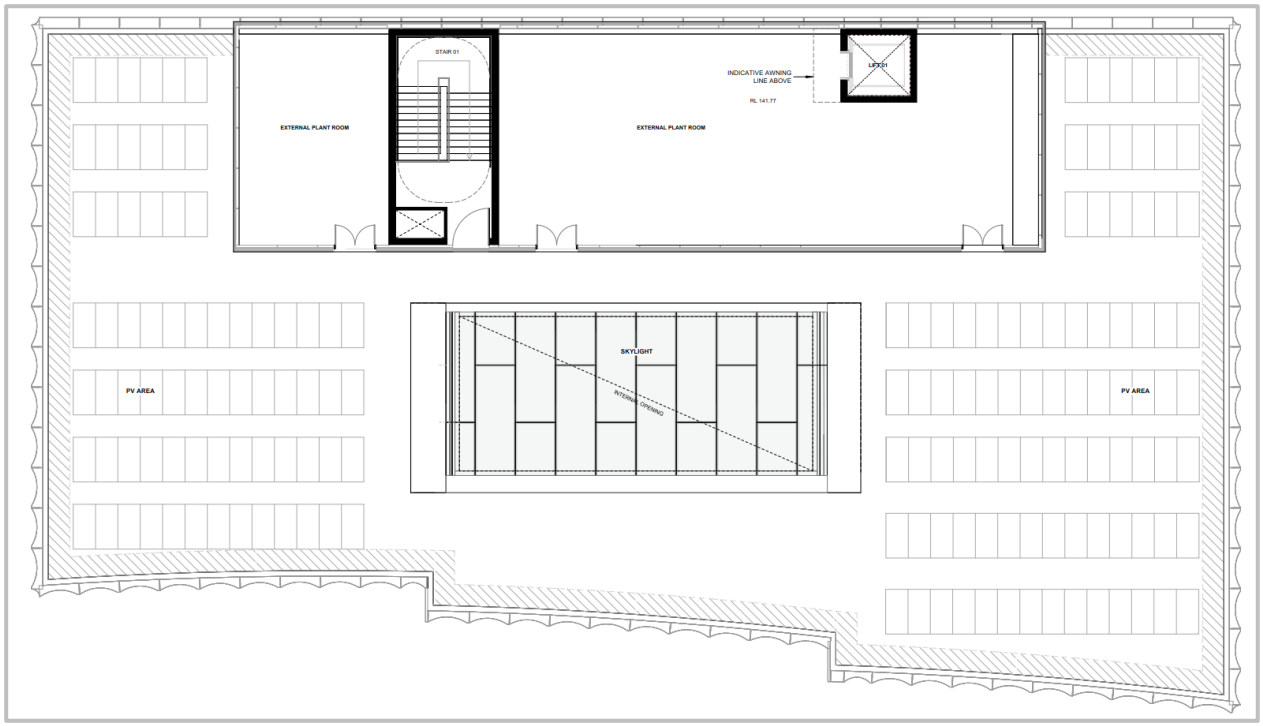
Level 02 - Floor Plan



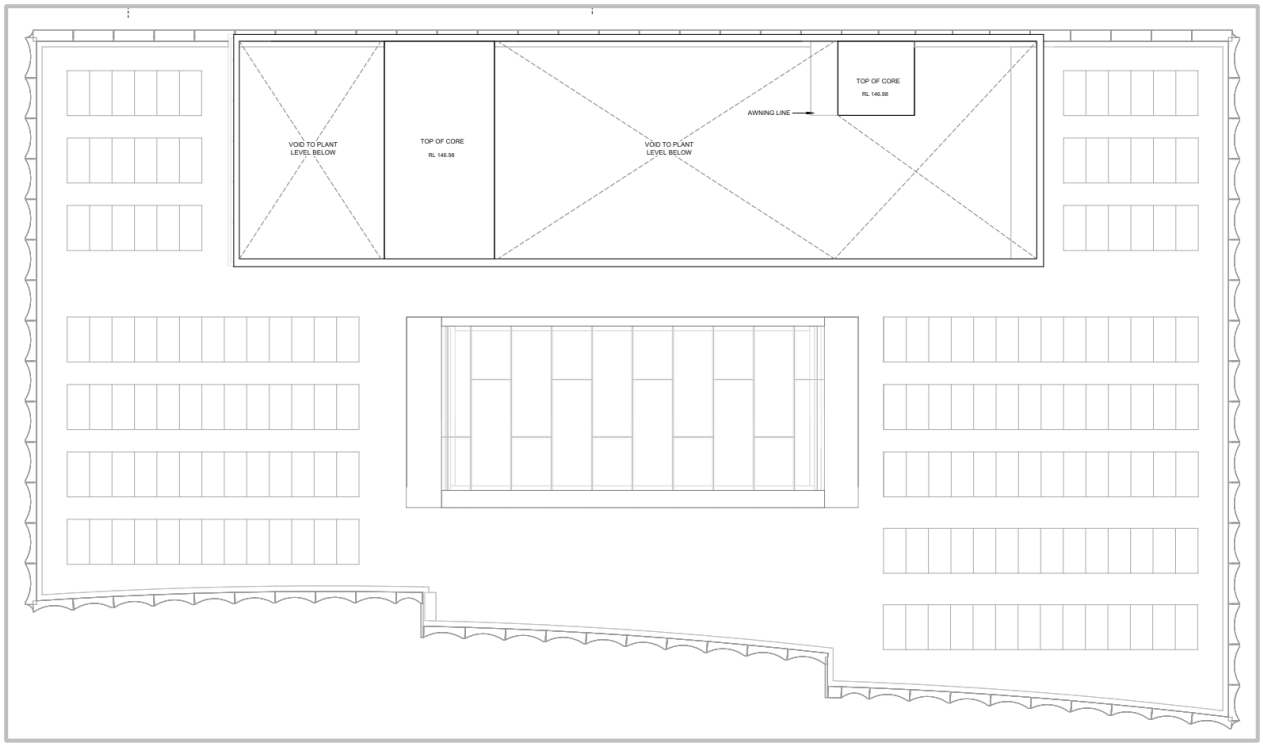
Level 03 - Floor Plan



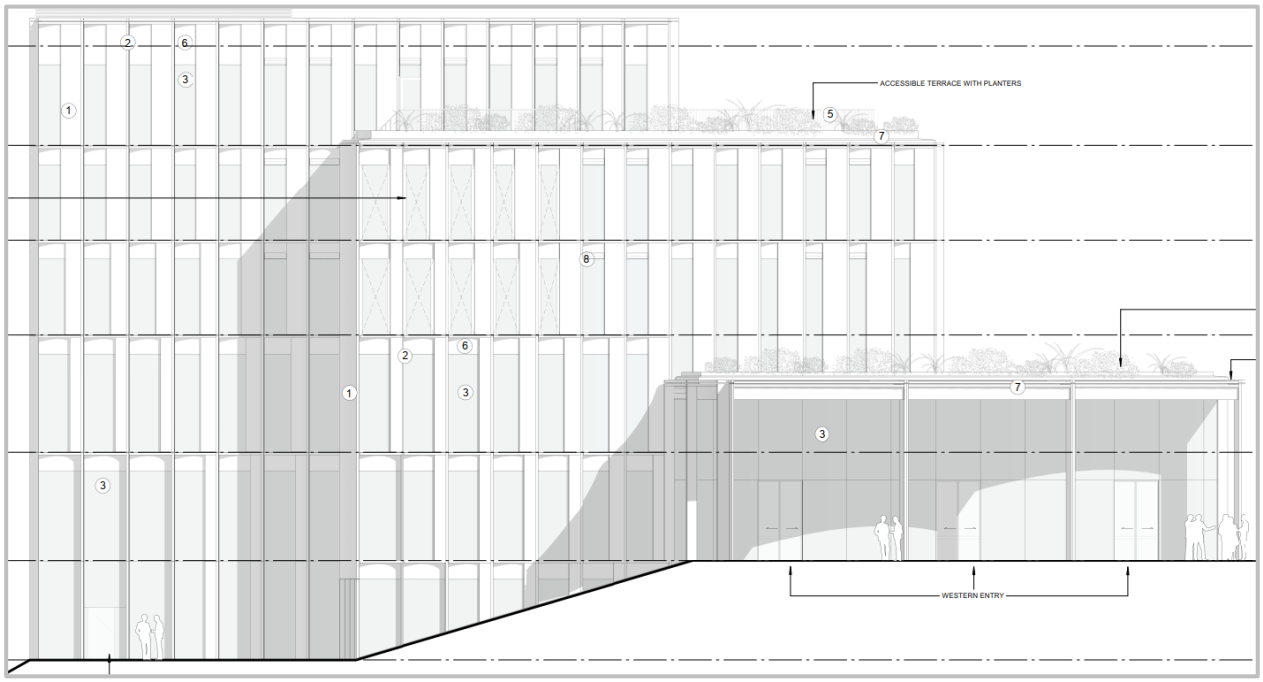
Plant - Floor Plan



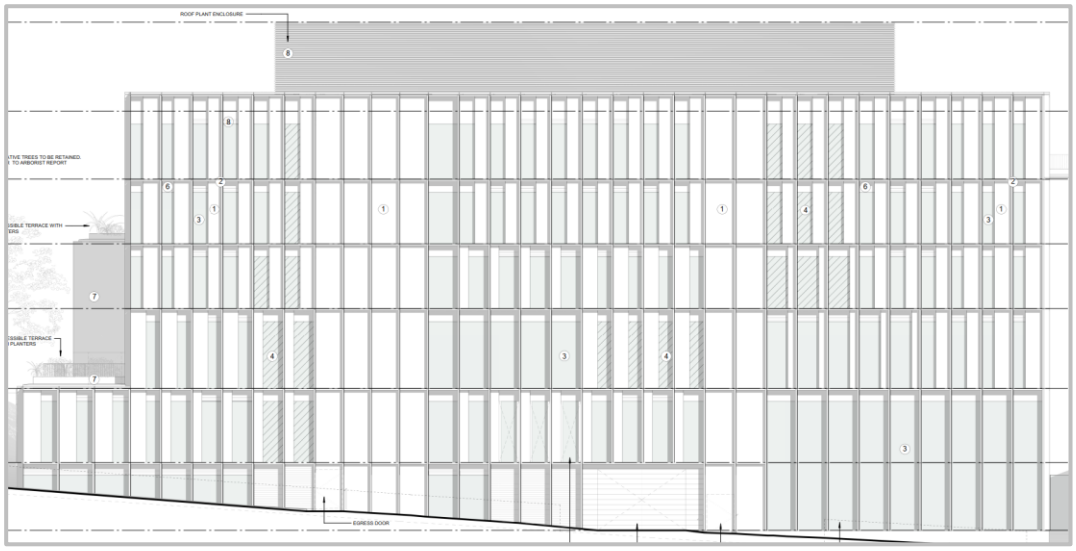
Roof Plan



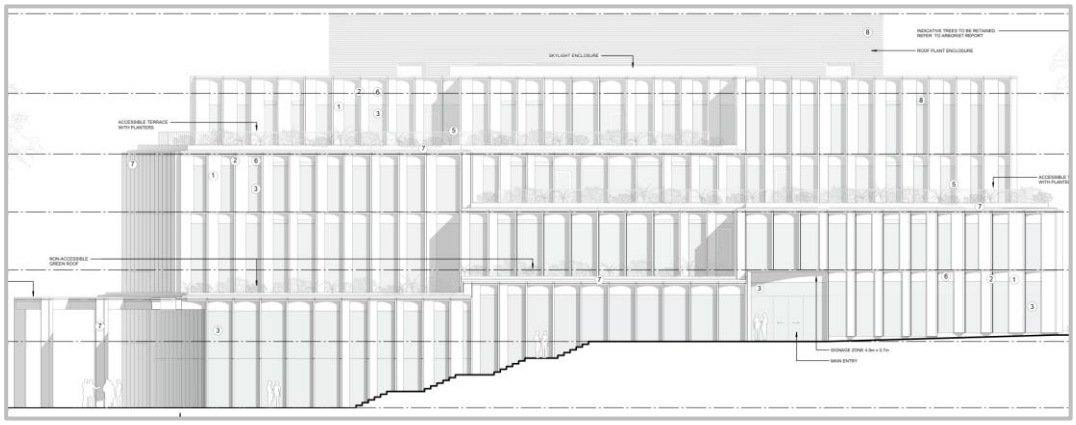
West Elevation



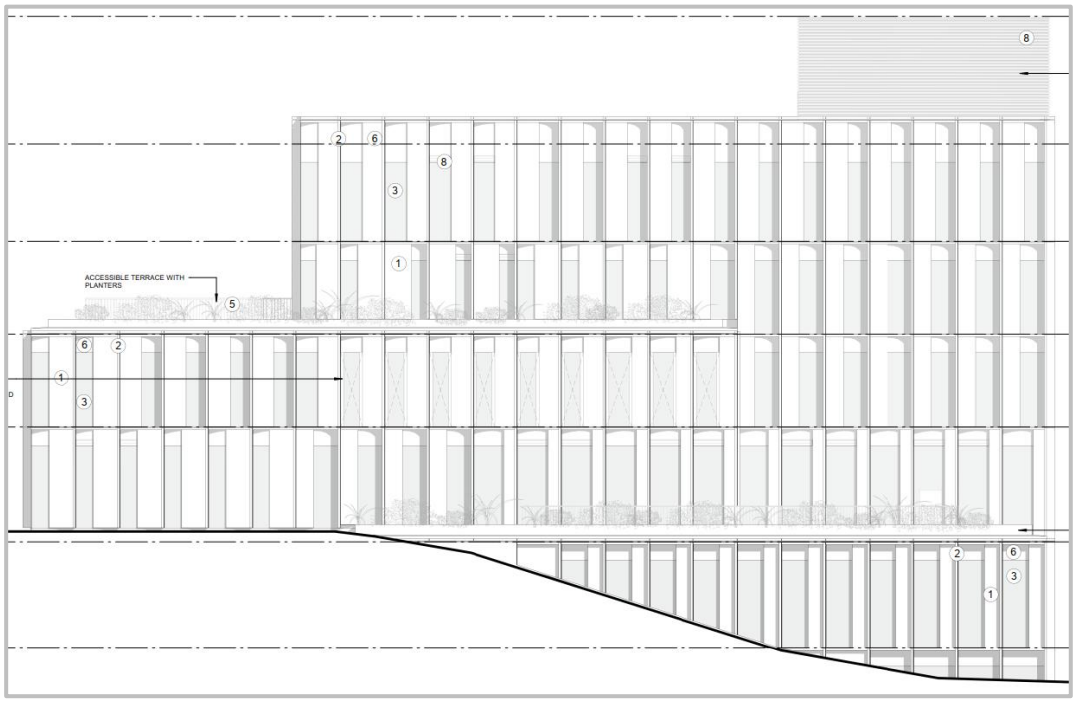
North Elevation



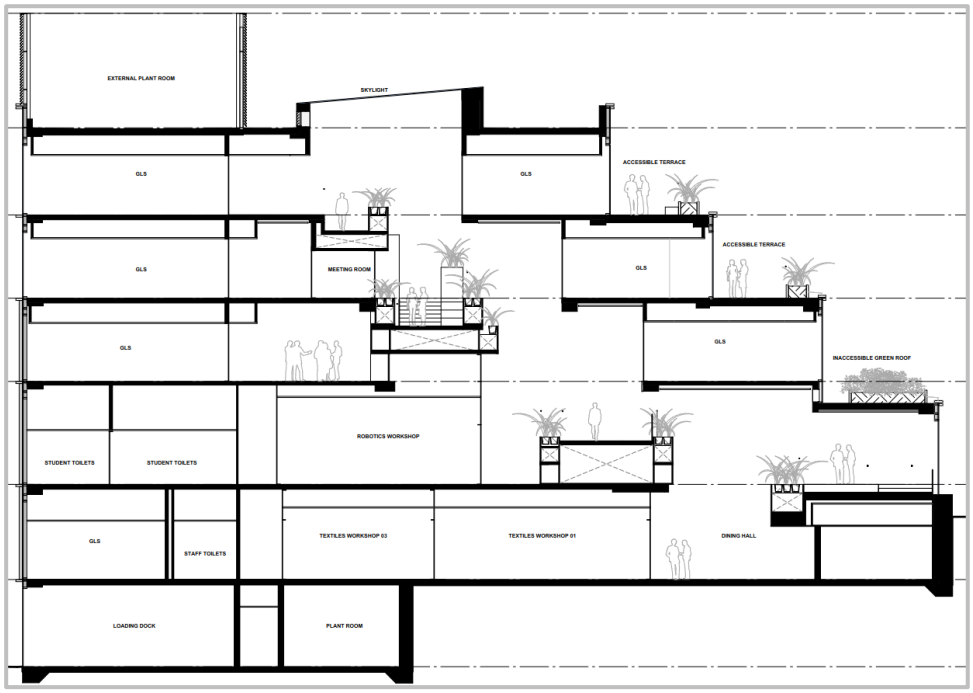
South Elevation



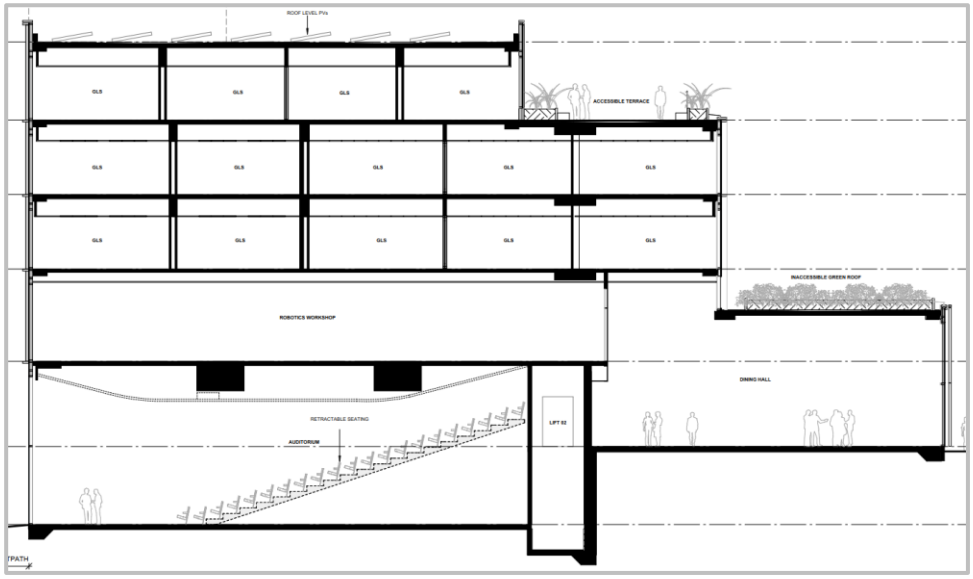
East Elevation



Cross Section - Atrium



Cross Section - Auditorium



Building Cores Section

6. Ecologically Sustainable Design (ESD) Initiatives

The principles of ecologically sustainable development are an integral consideration in design and construction of proposed development and also in assessing its benefits and impacts.
The design team will focus on a wide range of ESD strategies which will result in high levels of environmental performance and an increment on occupant's health, productivity, comfort and satisfaction.

6.1 Integrated Design Approach

The integrated design process is a process by which all of the design variables that affect one another are considered together and resolved in an optimal fashion. Often referred to as holistic design, this approach considers the development as a whole with the emphasis on integrating the different aspects of building's design.

6.2 Greenhouse gas emission reduction

Greenhouse gas emission reduction is achieved in a staged approach:

- First, reduction in overall energy consumption through demand reduction, passive design and energy efficiency, then;
- Reduction in electricity and gas utility consumption by utilising waste products, rainwater harvesting and renewable energy technologies (where feasible).

The integrated response to energy proposed for this project is summarised below:

1. Load Reduction and Passive Design.
2. System Efficiency.
3. Capture Waste.
4. Renewable Energy (where feasible).

Energy consumption will be reduced through the efficient design of lighting, air-conditioning and ventilation systems, as well as energy efficient water heating and renewable energy technologies (where feasible). The development will consider Greenhouse gas emission reduction in design and operation through utilising energy conservation measures suitable for the development.
The following sections of the report outline the sustainability initiatives that will be considered and further developed by the design team during the detailed design stages.

6.3 Management

The initiatives under the management category promote the adoption of environmental principles from project inception, design, and construction phases to the operation of the building and its systems.

This category aims to highlight the importance of a holistic and integrated approach to constructing a building with good environmental performance. The following measures are some of the initiatives targeted within the management category and are subject to further design development. These initiatives aim to reduce environmental impacts at construction and operational stages as well as to maximise building performance at commissioning.

6.3.1 Environmental Ratings and Involvement of a GSAP

Environmental rating schemes such as Green Star (Australia), LEED (US), Living Building Challenge (US) or BREEAM (UK) are used to create a marketable environmental credential based on achievement of a recognised benchmark. Ratings can be useful for marketing to the occupants and for demonstrating ESD achievement for planning submissions.

Green Star is the most recognised rating scheme in Australia, with hundreds of certified buildings, mostly office buildings. The new Green Star – Design and As-Built chosen as an appropriate benchmark for the project.

Green Star includes a range of categories under which credits are available. Points are scored under each credit, and the total score is used to determine a final rating; 45-59 points for 4 Star, indicating Best Practice, 60-74 points for 5 Star, indicating Australian Excellence; and 75 or more points for 6 Star, indicating World Leadership. The categories are as follows:

- Management.
- Indoor environment quality.
- Energy.
- Water.
- Transport.
- Materials.
- Land use and ecology.
- Emissions.
- Innovation.

A Green Star Accredited Professional (GSAP) is involved as part of the design and construction to prepare the necessary ESD guidelines.

6.3.2 Commissioning Clauses

Commissioning of building systems to a high standard, with independent oversight, will ensure that a quality process is followed and provide an outside review of the practicalities of the design. An extended building tuning period should be undertaken following defects liability period to ensure that systems are performing as intended, taking into account different seasonal variables, and that any need for recommissioning is identified and carried out.

To adopt commissioning and handover initiatives that ensure that all building services can operate to optimal design potential, such as:

- Where possible, comprehensive pre-commissioning, commissioning, and quality monitoring to be contractually required to be performed for all building services (BMS, mechanical, electrical and hydraulic).

6.3.3 Building Tuning

After handover, the building owner is expected to implement tuning of all building systems and undertake full re-commissioning 12 months after practical completion.

6.3.4 Building User's Guide

To produce a Building User's / Occupant's Guide, information management that enables building users / occupants to optimise the building's environmental performance during its operation.

6.3.5 Environmental Management Plan

The contractor is expected to adhere to a comprehensive Environmental Management Plan (EMP) for the works. Contractors are recommended to be ISO 14001:2004 certified. Environmental management plans and systems should be implemented to ensure that demolition and construction activities appropriately manage and mitigate environmental impacts.

6.3.6 Waste Management System

To encourage and facilitate effective waste management once the development is in operation, sufficient spatial provision will be made to allow for the effective separation of waste from recycling. Dedicated waste recycling rooms allow space for the separation and storage of recyclable waste during the building's operation, allowing for the following waste streams to be separated:

- Glass.

- Cardboard.
- Paper.
- Organics.
- Plastics.
- Metals.

Waste management solutions are varied and dependant on the extent of commitment of the end user. Recycling, reuse, and composting are examples of waste management options.

6.3.7 Environmental Management and Maintenance

Effective environmental and waste management will be implemented throughout the demolition, construction, and operational stages of this development.

The EMP shall include a Waste Management Plan, specifying recycling targets for demolition and construction waste. It is recommended that construction and demolition contracts stipulate a minimum 90% target for diversion of waste from landfill. This may be achieved through recycling or reuse.

- Identification of appropriate waste sub-contractors for recycling, costs of collection and timing of collection service.
- Participation in waste minimisation training for contractors and sub-contractors.
- Published waste minimisation plan to reduce site waste to landfill.

Provision of separate waste skips for cardboard, timber, metal, soft plastic, polystyrene, insulation, concrete, glass, and bricks.

6.4 Indoor Environmental Quality (IEQ) Initiatives

Indoor Environmental Quality initiatives consider the wellbeing of occupants, addressing factors such as heating, ventilating and air conditioning (HVAC), lighting, indoor air quality and building attributes, all of which contribute to good indoor environmental quality.

The following measures are some of the initiatives targeted within the IEQ category for further consideration and development during detailed design.

- Improvement of outside air rate by providing at a rate greater than AS1668.2 requirements. Air-conditioning system will be installed with carbon dioxide monitoring and control to ensure sufficient outside is delivered to occupants.
- Optimisation of the air quality by improving air change effectiveness
- Maximisation of natural lighting level to the building occupants
- Minimisation of the contribution and levels of Volatile Organic Compounds (VOCs) via the use of low VOC paints, adhesives and sealants, carpets, and flooring.
- All engineered wood products to be used in the development will have low formaldehyde emission.
- High efficiency lighting system with suitable luminance levels to avoid causing discomfort and strain for the occupants. All fluorescent luminaries are to be installed with high frequency ballasts to avoid discomfort caused by low frequency flicker.
- External Views: The design allows unobstructed external views for the majority of occupied spaces.
- Internal noise level at an appropriate level to ensure the occupants' satisfaction and wellbeing.

6.4.1 Thermal Comfort

Thermal comfort can be provided by passive and mechanical means. Passive design initiatives will be considered before the design of the mechanical systems to reduce operational energy costs, with potential reductions in the air conditioning size and ongoing maintenance.

Thermal comfort is a function of the following factors:

- Radiant temperature (45% of net comfort effect).
- Air temperature and humidity (35% of net comfort effect).
- Air movement, clothing, and activity (20% of net comfort effect).

Passive heating and cooling design strategies which will improve occupant thermal comfort include:

- Roof insulation not only reduces heat gain and loss, but will also moderate radiant temperatures from the walls, floor, and ceiling.
- Building facades with high performance glazing and window frames will have a combination of external shading and high-performance glass to reduce heat transfer and radiant temperatures in proximity to the windows.

Indoor areas will be designed to be protected from excessive summer solar radiation, reducing radiant heat loads on the space, but still providing enough daylight during appropriate times of the year to improve comfort levels.

The approximate annual Dry-bulb temperature and comfort range for the site is shown in Figure 5:

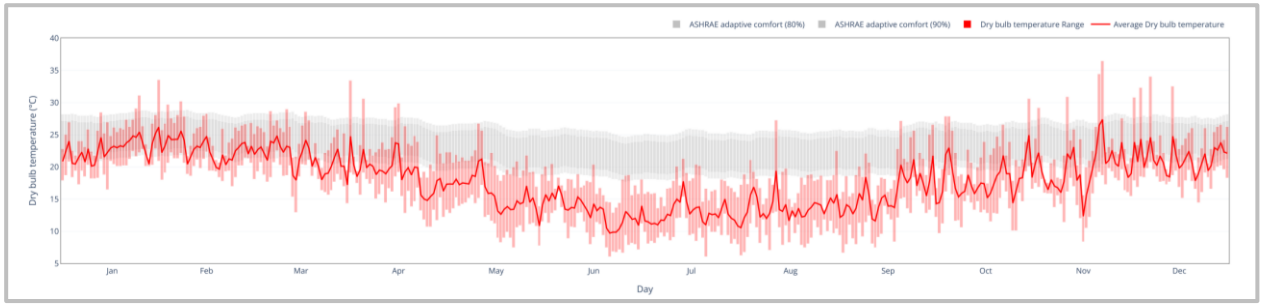


Figure 5. Annual Dry-bulb temperature and comfort range

6.4.2 Effective Daylighting / Natural Lighting

Daylighting is the architectural and services design to allow maximum daylight penetration into a building whilst minimizing heat gain and thereby reducing indoor lighting loads.

The level of natural light in the building is primarily determined by the extent and type of glazing, and the depth of the building floor plate. Extent of glazing must be optimised to allow maximum daylight, views, and winter sun, while minimising uncomfortable glare and excessive solar heat gains in summer. Glazing should be selected with a high Visual Light Transmission to maximise daylight penetration.

Daylighting strategies will be considered to allow effective control of indoor lighting levels whilst minimising power consumption for the building. High level of architectural input regarding design, orientation and external shading will be considered to effectively maximise natural lighting for the building.

Daylighting strategies combined with dimmable lighting systems will allow high control of indoor lighting levels whilst minimising power consumption for the building.

6.4.3 Volatile Organic Compounds (VOC) & Formaldehyde Minimisation

To ensure long term comfort of occupants, all due care will be taken to minimise VOC and formaldehydes used within the building. Maintaining VOC limits below the recommended levels will assist in reducing any potential detrimental impacts on occupant health arising from products which may emit volatile pollutants.

VOCs are commonly found in carpets, paints, adhesives, and sealants uses in construction and extensive exposure to VOC's can cause Sick Building Syndrome effects (eye, nose and skin irritation, headaches lethargy etc.).

Formaldehydes are found within composite wood products and extensive exposure can cause irritation to eyes, nose, and throat, lead to skin ailments and respiratory system ailments such as asthma.

Where possible, contamination of indoor air by common indoor pollutants will be minimised in this development by careful material selection, including:

- Use of low-VOC and water-based paints rather than oil-based paints, stains, or sealants, reducing indoor air contamination and consequent side-effects including sick-building syndrome and respiratory problems.
- Selection of low-VOC carpets and adhesives.
- Selection of low formaldehyde composite wood products, avoiding the carcinogenic effects of formaldehyde off-gassing.

6.5 Energy Conservation Initiatives

It is essential to ensure the building is designed and built to minimise energy consumption and reduce or eliminate greenhouse gas emission to the atmosphere. Energy performance is considered by the design team as a crucial issue.

The energy conservation initiatives aim to reduce the overall energy consumption for the project directly contributing to greenhouse gas emissions and energy production capacity.

Greenhouse reductions are achieved in a staged approach:

- Reduction in overall energy consumption through demand reduction and energy efficiency.
- Reduction in electricity and gas utility consumption by utilising waste products and renewable energy technologies.

Several strategies will be assessed and put in place to minimise energy consumption.
The integrated energy strategies being considered for the development include items which are listed in Table 4 below:

Table 4. The integrated energy strategies.

Load Reduction (Minimising the need for energy consumption)	Passive Design
	Building fabric improvements
	Maximise use of natural lighting
	Maximise use of natural ventilation
Optimising energy consumption	High efficiency Heating, Ventilation and Air Conditioning
	High efficiency LED lighting with occupancy controls
	High efficiency hot water systems
	High efficiency appliances
	Commissioning and tuning of building services post completion
	High efficiency building control, automation and BMS
Use of renewable resources (renewable energy and rainwater harvesting)	Application of Solar Energy & Heat Pump technology

6.5.1 Passive Design

The development will utilise passive design to minimise the amount of air-conditioning required and therefore significantly reduce the building's energy consumption and greenhouse performance. A building's form, fabric and orientation will have the biggest influence on its thermal comfort and environmental performance. The following factors will be considered in the detailed stages of the design:

- Orientation.
- Shading.

- Structure.
- Insulation.
- Glazing.

Climate data for the site

The following indicative site information data can be used to inform the design team (Figure 6).

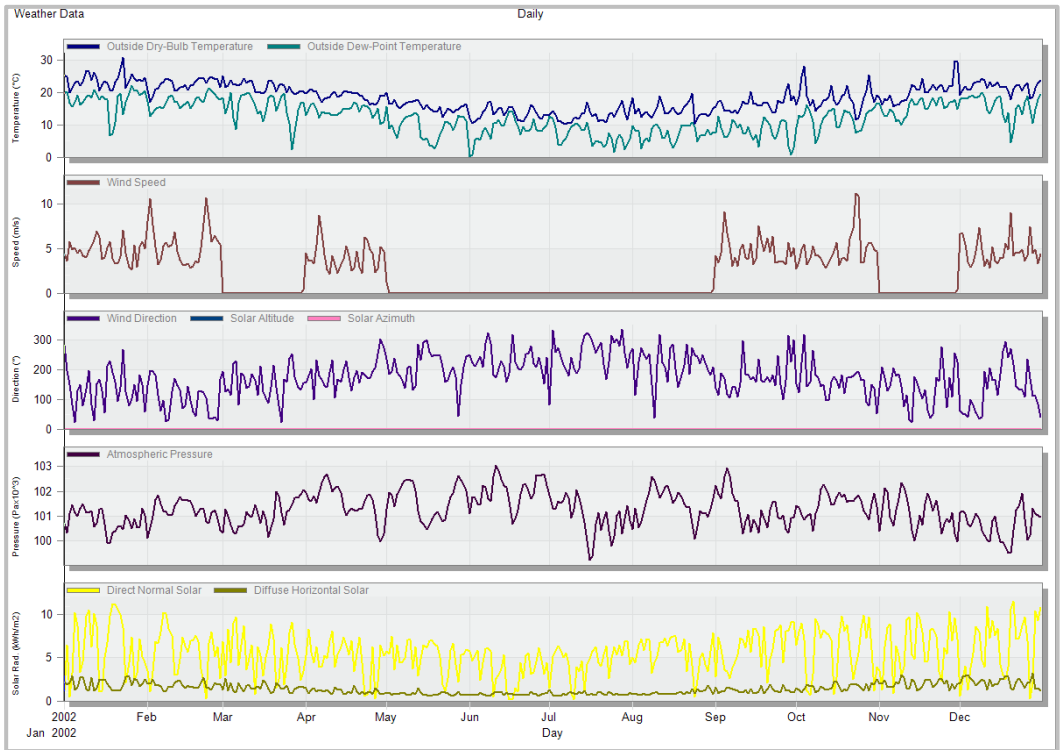


Figure 6. Climate data for the site.

Wind data based on the nearest weather station

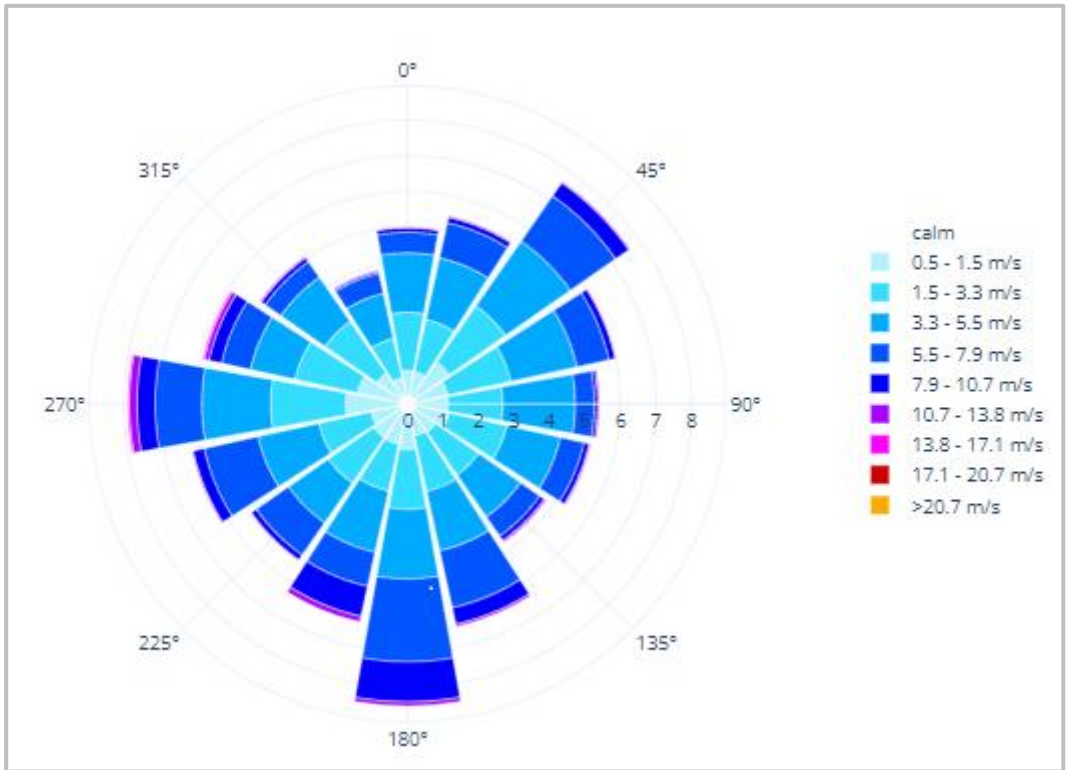


Figure 7. Wind data based on the nearest weather station

Sun path and temperature chart for the site

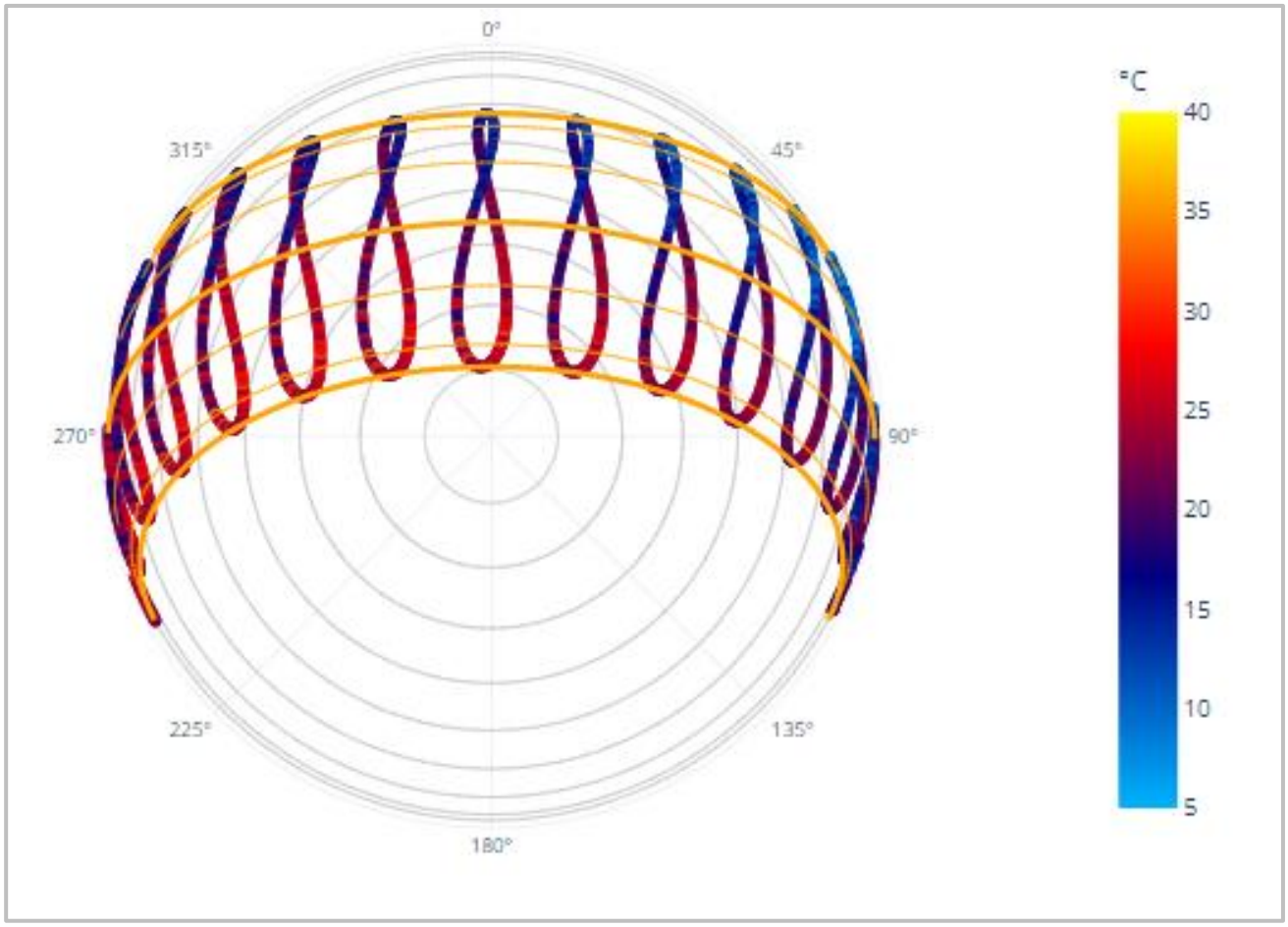


Figure 8. Sun path and temperature chart for the site.

6.5.2 Building Envelope

The building envelope will be designed to reduce heating and cooling requirements through passive design principles. The role of the building envelope is to block solar gains from penetrating the building fabric in summer while optimising daylight and minimising glare. The glazing performance and shading configuration for each orientation will be optimised to ensure that thermal comfort is achieved, and solar gains are adequate for the efficient operation of the mechanical system.

5.6.2.1. Insulation

The building envelope will be treated with the required levels of thermal insulation to reduce heat gains in hot days and to minimise heat losses in cold days through conduction. This will have significant impact on reducing energy consumption.

Insulation reduces the heat transfer between the internal and external conditions. Adequate insulation will be allowed for the ceilings, floors, and walls to reduce the heating and cooling load of the building and to reduce the ongoing operational costs. This has a twofold saving through a smaller mechanical system capacity along with operating energy consumption reduction.

All insulations installed are required to meet NCC and AS/NZ 4859.1 and the builder is required to ensure compliance, during construction.

5.6.2.2. Glazing and Window Framing

Adequate performance glass will be provided to reduce excessive heat gains in hot conditions, reducing the frequency of air conditioning use.

The following glazing parameters will be considered:

- U-Value: a measure of how much heat is passed through the glass.
- Solar Heat Gain Coefficient (SHGC)
- Visible Light Transmission (VLT): the percentage of visible light transmitted by the glass.

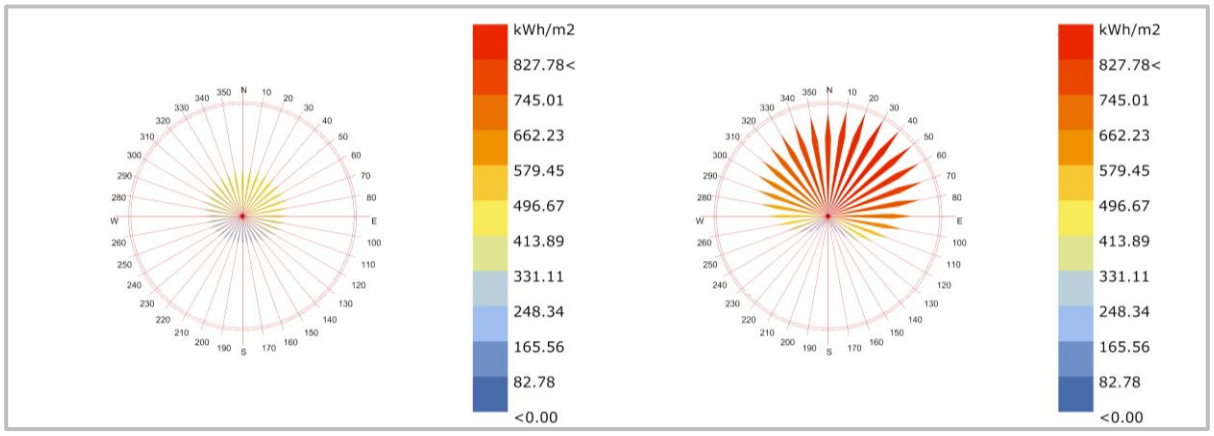
Where possible, the glazing will have a low SHGC to avoid heat gains in the summer, and a low U-value to reduce losses in the winter through the glass. The performance of the proposed glazing systems (glass and frame) is required to comply with NFRC100-2001 conditions and using the tested AFRC values.

Consideration will be given to incorporating effective shading features into the design to avoid the necessity for low shading coefficients in the glass, which usually also decrease the visible light transmission (VLT) of the glass. To maximise the natural daylight within the building, VLT should be as high as possible.

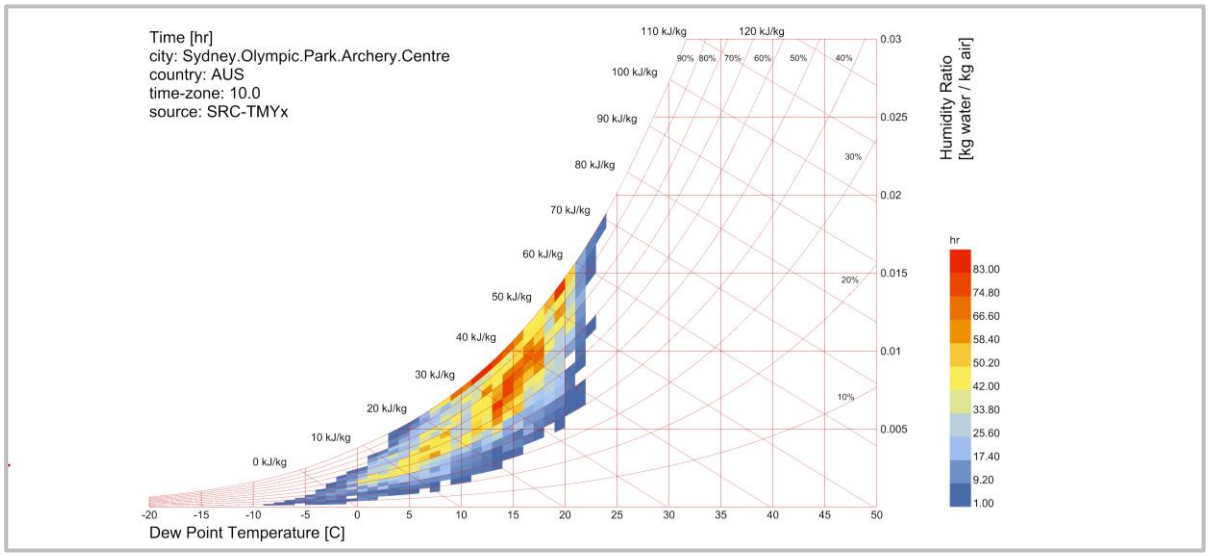
Glazing properties will be specified in conjunction with the shading arrangement on each orientation to control solar loads imposed on the mechanical systems, ensuring thermal comfort, optimising daylight penetration, and preventing glare. This strategy will effectively minimise direct solar loads whilst maximising daylight penetration and access to views.

To reduce heat losses in cold days, especially at night, the use of blinds will limit the contact between the internal air and the glass, therefore reducing heat losses by conduction.

Solar Radiation Rose



Psychrometric Chart



6.5.3 Energy Efficient Systems and Services

The mechanical and electrical design for the buildings will be developed to minimise the need for plant equipment and will be designed to be responsive to the immediate climatic conditions. Energy consumption will be reduced through the efficient design of lighting, air-conditioning, hot water, and ventilation systems. The following energy efficiency initiatives will be further investigated and where feasible incorporated in the building services design.

5.5.3.1. Efficient Artificial Lighting

Lighting efficiency is important in maintaining low energy consumption for reuse projects. Lighting consumption for a facility such as this could account between 15-25% of the estimated energy use of the facility.

High efficiency lighting and effective control initiatives such as daylight and movement sensors will be considered to reduce artificial lighting energy consumption and allow maximum advantage to be taken of natural lighting.

Lighting power density is required to meet AS1680 and NCC requirements. Energy efficiency for the internal lighting throughout the building is required to be in accordance with NCC energy efficiency requirements and the following.

- High quality LED lighting.
- Lighting control system based on smart zoning, occupancy profiles and operational hours, dimming controls and timers.

Photoelectric (PE) / Photodiode sensors or similar controls to detect when external lighting should switch on and off to reduce the energy consumption associated with external lighting where possible.

No external lighting is to be installed such that any direct light beam results into the night sky either generated from within the site. The path of any direct light's angle of incidence that is directed to the sky must be obstructed by a non-transparent surface and the lighting design and is to comply with AS4282 'Control of the Obtrusive Effects of Outdoor Lighting.

5.5.3.2. Efficient Heating, Ventilation & Air-Conditioning (HVAC)

Heating and cooling of the building accounts for a large portion of the building's energy use throughout the year. Selection of highly efficient HVAC equipment with high performance levels not only minimises energy consumption, but also reduces operational energy costs.

The design of the mechanical services will be to industry Best Practise Standards. An emphasis will be placed on providing low energy Heating Ventilation Air Conditioning (HVAC) systems and strategies. To ensure the energy efficient performance of HVAC systems specified and installed mechanical plant will be of high quality and supplied by leading industry manufacturers.

The energy efficiency of HVAC system is required to meet the minimum requirements of the National Construction Code (NCC), Green Star provisions where feasible and relevant Australian Standards including but not limited to AS1668.1, AS1668.2, AS 1682 and AS3666.

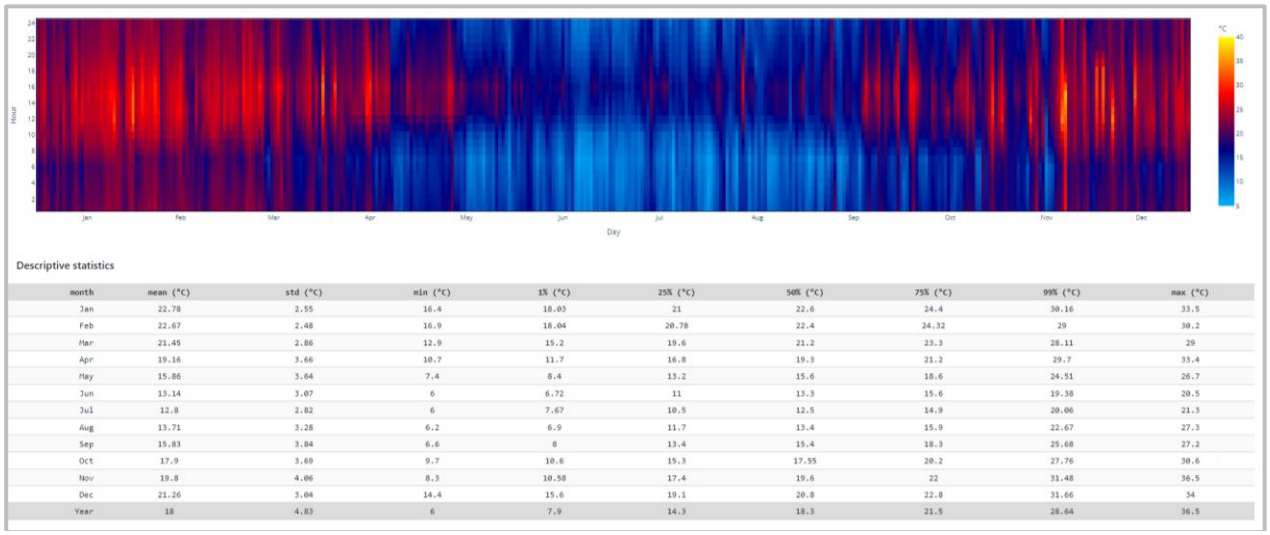
The following energy initiatives will be further considered in the detailed design phase:

- The air conditioning strategy is optimized to reduce energy consumption and maximize efficiency. For example, by moderating the amount of fresh air relative to the number of people in the space, through the use of CO2 detectors. The system will be zoned to increase the flexibility in the use of different spaces and reduce overall consumption.
- Variable speed drives will be provided to fans and pumps where feasible.
- Full outside air cycle will be provided to all air handling systems.
- Building commissioning and building tuning to be undertaken to ensure that the building systems function as required to achieve energy efficiency design targets.
- All refrigerant plant will be specified such that the refrigerant type has Zero Ozone Depletion Potential (ODP).

Common area ventilation systems are to include variable speed modes where appropriate and are to be linked to light switches where feasible to limit the extent of operation and improve energy efficiency of these areas.

The Mechanical services will be designed to satisfy the minimum Green Star and NABERS requirements.

Heatmap Chart based on the data from the nearest weather station is depicted in Figure 9 below:

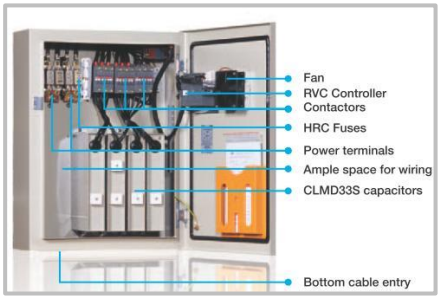


Descriptive statistics

month	mean (°C)	std (°C)	min (°C)	1% (°C)	25% (°C)	50% (°C)	75% (°C)	99% (°C)	max (°C)
Jan	22.78	2.55	16.4	18.03	21	22.6	24.4	30.16	33.5
Feb	22.67	2.48	16.9	18.04	20.78	22.4	24.32	29	30.2
Mar	21.45	2.86	12.9	15.2	19.6	21.2	23.3	28.11	29
Apr	19.16	3.66	10.7	11.7	16.8	19.3	21.2	29.7	33.4
May	15.86	3.64	7.4	8.4	13.2	15.6	18.6	24.51	26.7
Jun	13.14	3.07	6	6.72	11	13.3	15.6	19.38	20.5
Jul	12.8	2.82	6	7.67	10.5	12.5	14.9	20.06	21.3
Aug	13.71	3.28	6.2	6.9	11.7	13.4	15.9	22.67	27.3
Sep	15.83	3.84	6.6	8	13.4	15.4	18.3	25.68	27.2
Oct	17.9	3.69	9.7	10.6	15.3	17.55	20.2	27.76	30.6
Nov	19.8	4.06	8.3	10.58	17.4	19.6	22	31.48	36.5
Dec	21.26	3.04	14.4	15.6	19.1	20.8	22.8	31.66	34
Year	18	4.83	6	7.9	14.3	18.3	21.5	28.64	36.5

Figure 9. Heatmap Chart.

5.5.3.3. Power Factor Correction



To reduce maximum kVA demand on the electricity grid and lower the demand charges, power factor correction units will be provided at the main switch board(s) in accordance with the NSW Installation and Service Rules.

The power factor correction units proposed will improve the power to a factor of 0.98 or higher.

5.5.3.4. Monitoring & reporting

To enable effective monitoring and tracking of energy and water consumption, sub-metering will be considered for systems with major energy use, to help identify areas of inefficiency with potential for improvement.

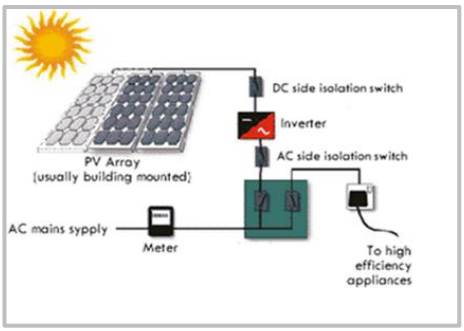
Metering is to be provided throughout the building and central services for all major building plant and equipment. An effective monitoring system is to be provided to monitor energy and water consumption throughout the building as required.

Ongoing reporting may allow the manager of the facility to set goals for energy consumption reductions and attributed energy costs to particular uses. By monitoring energy, losses and wastage can be identified, therefore improving the overall performance of the building in operation. This initiative is subject to further design development and review.

5.5.3.5. Hot Water Systems

High efficiency heat pump hot water systems will be used to provide the Hot Water demands for the buildings.

6.5.4 Renewable Energy – Solar Photovoltaic (PV) System



Photovoltaic (solar PV) is a common and widely accepted technology to generate electricity onsite. The generated electricity can be harnessed and used to power any number of devices. It is proposed that the PV panels are mounted on the roof where they will be out of sight and produce the optimum energy output.
PV modules have a very long lifetime with many manufacturers guaranteeing an output of at least 80% of manufactured capacity for 20 years. Another benefit of PV is that it can be installed in various system sizes and the modular design of the systems allows retrofitting of additional panels if required in the future.

There are generally three types of solar panels available: mono-crystalline (proposed for this development), poly-crystalline and amorphous. Each of these have their advantages and disadvantages and efficiencies range from 6% for amorphous to 19% for mono-crystalline

A 110kW Solar PV system has been nominated for the development. The expected renewable energy generation by the overall 110kW system is approx. 100 MWh per annum.

5.6.4.1. Solar PV - System Components

The Photovoltaic (PV) system may consist of the following main components or of equal capacity (Table 5).

Total nominal power: **110 kW**

Approx. roof space requirements: **688 m^2**

Table 5. Solar PV components information.

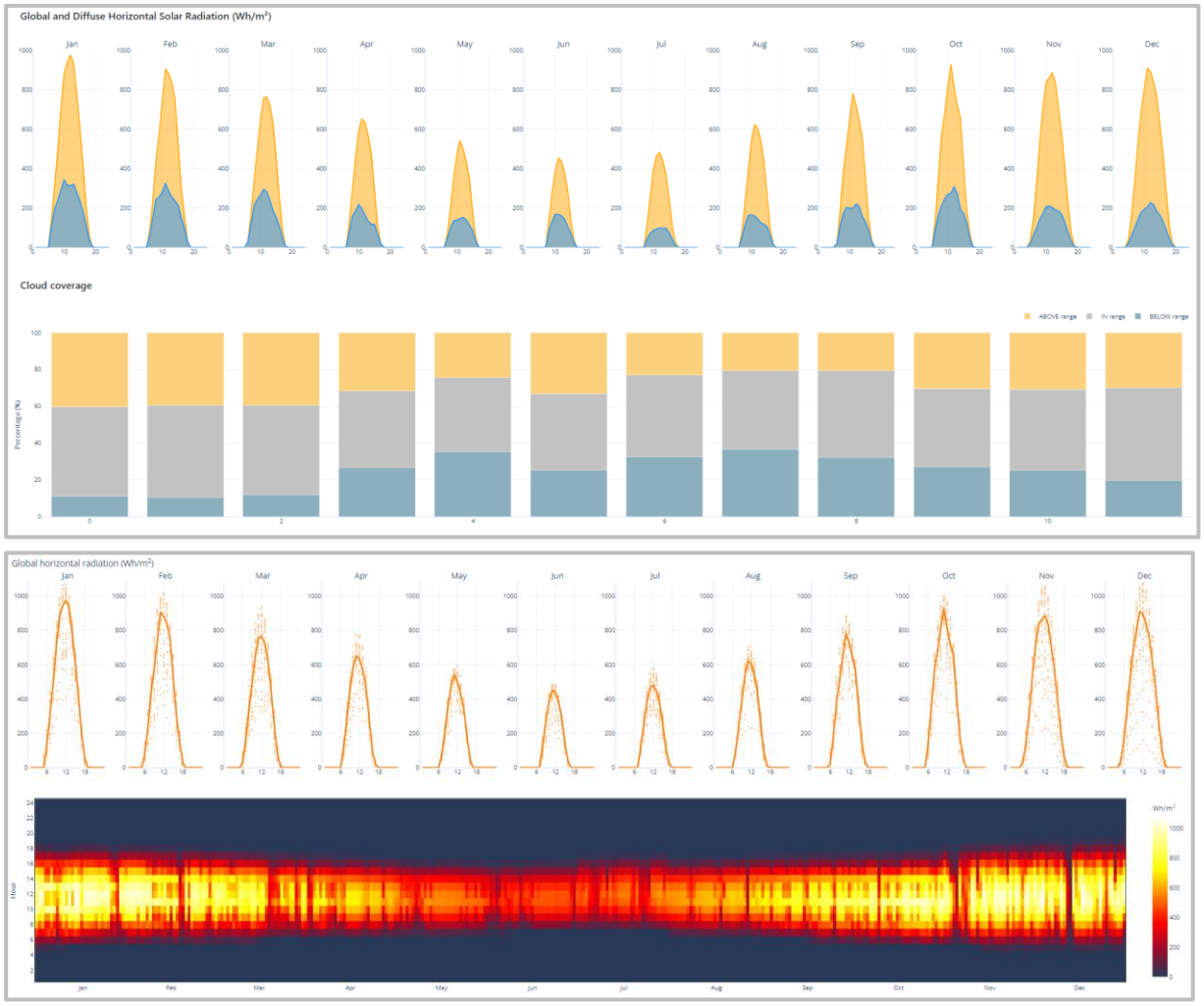
Components	Brand, Model & Quantity
PV Inverter	Sungrow – Quantity: (1)x 90 kW or equivalent
PV Panels	Trina - TSM-600-DEG20C – capacity: 600W - Quantity: 184 Approx.
Battery storage	the system to be sized during the detailed design stage, based on the final PV capacity as well as the electrical design for lower reliance on electrical network due to maximum demand constraints.
PV mounting frame and system balance	Quantity: depending on the requirements and final design

Table below summarises the estimated annual Renewable Energy generation for the proposed Solar PV (110kW).

Annual energy generation based on full 7 days per week (with battery)	**100,598 kWh**
Annual energy generation based on 5 days per week.	**71,855 kWh**

The exact sizing, configuration and final design will be completed during the design stage. Please refer to Appendices for technical data sheets of the proposed PV system.

5.6.4.1.1. Solar Radiation and Cloud Coverage for the site



5.6.4.1.2. Solar PV - Projected energy generation based on 110 kW system

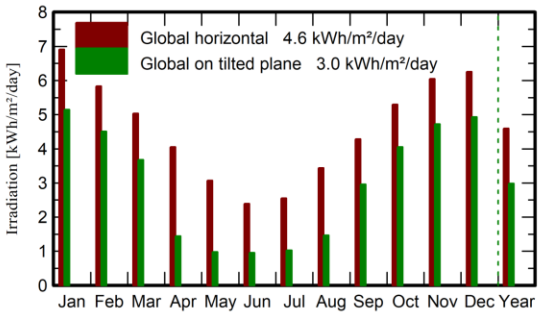
Grid system presizing

Geographical Site		Situation	
Sydney/Clontarf		Latitude	-33.82 °S
Australia		Longitude	151.27 °E
		Altitude	11 m

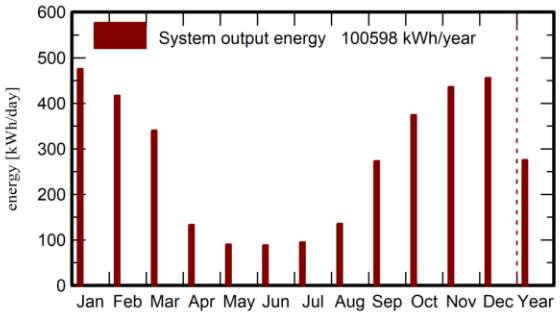
System summary

Nominal power	110 kWp	Total area	688 m²
Module type	Standard	Supports for modules	Facade or tilted roof
Technology	Monocrystalline cells	Ventilation property	Free air circulation

Weather data and incident energy



System output



	Horizontal global kWh/m²/day	Coll. plane kWh/m²/day	System output kWh/day	System output kWh
Jan.	6.91	5.14	475.5	14741
Feb.	5.83	4.51	416.8	11671
Mar.	5.03	3.68	340.3	10548
Apr.	4.05	1.44	133.6	4007
May	3.07	0.98	90.44	2804
June	2.39	0.95	88.19	2646
July	2.55	1.03	94.84	2940
Aug.	3.44	1.47	135.5	4201
Sep.	4.28	2.96	273.6	8207
Oct.	5.30	4.05	374.6	11612
Nov.	6.05	4.72	436.3	13090
Dec.	6.25	4.93	455.8	14131
Year	4.59	2.98	275.6	100598

6.6 Transport sustainability measures

The use of transport (both private and commercial) is a major contributor to environmental pollution and the excessive consumption of natural resources. The following sustainable transport principles are recommended.

- Improve amenity for active transport users (pedestrians and cyclists), with attention paid to the needs of specific user groups likely to have a greater reliance on active transport such as youths, office employees, and nearby community groups.
- Promote nearby cyclist facilities to enhance the uptake of cyclists to the site.
- Integrate transport initiatives into community engagement and communication strategies.

Given the site location of the development, the occupants will be able to take advantage of local public transport networks and available facilities around the site such as retail shops.
The following measures are some of the initiatives recommended to reduce dependence on motorised vehicles, encouraging walking, cycling and the use of mass public transport.

- **Cyclist facilities:** provision of bicycle racks; where possible adequately sized and fully equipped secure cyclist facilities with change room and showers are to be provided to promote the use of cycling to work.
- **Public Transport:** The building is close to public transport with a number of bus routes served; building occupants are encouraged to use mass transport to travel to work.
- **Trip Reduction:** The development is located adjacent to several local amenities, reducing the need for trips.
- **Fuel efficient vehicles:** encouraging the use of more fuel-efficient vehicles by providing adequate parking spaces at prime parking spot solely dedicated for use by small cars, car-pool participants or other alternative fuel vehicles and EV charging points.

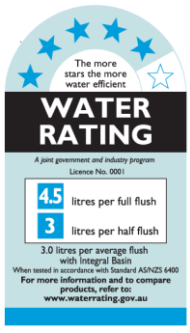
6.7 Water Conservation and Management Initiatives

The water conservation category aims to reduce the overall water potable consumption and provide effective mechanisms for recycling of water uses on site.

The approach to water efficiency for the development will focus on reducing water demand through conservation measures and water reuse systems. Water conservation strategies proposed for this project include:

- Reducing the potable water consumed within the development through demand management.
- Substituting mains water required to meet this demand by utilising alternative sources such as rainwater.

6.7.1 Demand Management



Strategies to minimise consumption include water-efficient fittings and fixtures, water-efficient appliances and low-water use air-conditioning and irrigation systems. In order to reduce the overall water consumption for this development, the following initiatives will be considered.

All water fixtures to be installed to the building are to be water efficient and where possible outperform the minimum requirements. The following criteria are provided as a guide and subject to further design development (Table 6).

Table 6. Recommended minimum water efficiency performance

Water Fixtures	Hand wash basins – 5 Star WELS;
	Kitchen taps (where provided) – 5 Star WELS
	Showerheads (where provided) – 4 Star WELS or higher
	Toilets – 4 Star WELS or higher
Appliances	Dishwashers (where provided) – 5 Star WELS or higher
Air Conditioning	Minimise use of water-cooled systems
Landscape Irrigation (where applicable)	Native and water efficient species
	Sub-surface irrigation
	Rainwater usage for landscape

6.7.2 Landscape Selection

The use of native, drought-resistant planting will be considered to reduce water consumption used in irrigation. Sub-soil irrigation systems should be considered where non-native species are selected.

The landscape design shall enhance Biodiversity in terms of Landscape Area and Diversity of Species

6.7.3 Rainwater collection and recycling

In order to reduce the impacts of stormwater runoff from the site, the following stormwater management strategies will be considered:

- Rainwater captures from rooftops for reuse in building reducing stormwater runoff as well as mains potable water use.
- The use of permeable surfaces to be considered where suitable, allowing stormwater to seep directly into the earth and reducing stormwater flows off-site.

Collecting rainwater from roof runoff is a common way to recycle water. In addition to saving potable water, it allows preparation for times of low rainfall, so landscapes will be maintained throughout the year. It also reduces loads on storm water systems because roof runoff is not flushed into the drains. Rainwater will be collected from roof runoff and piped to storage tanks and will be used on site.

Ultra-violet (UV) treatment is the disinfection process of passing water by a special light source. Immersed in the water in a protective transparent sleeve, the special light source emits UV waves that can inactivate harmful microorganisms. This method of treatment is growing in popularity because it does not require the addition of chemicals.
Harvested water will be considered to supplement non-potable water uses such as common area landscape irrigation.

This strategy will assist to significantly reduce the potable water consumption for the facility.

6.7.4 Water consumption monitoring and reporting

Where practical, it is recommended that all major water uses within the building to be provided with water meters. This includes central services, rainwater tanks, irrigation systems, potable water, non-potable water sources.

Water monitoring will assist to identify abnormal usage patterns usually associated with leaks, helping to reduce the considerable water lost in this way. In addition, it would also allow to measure and verify the impact of any water efficiency measures implemented in the facilities.

6.8 Materials

This category aims to reduce the consumption of natural resources and encourage the reuse of materials. The various environmental and human health impacts arising from building materials are reduced when special attention is given to the selection of ecologically preferable materials.
To minimise the environmental impact of the development, preference will be given to environmentally responsible materials during the selection process, according to the following principles:

- Avoidance of ecologically sensitive products (such as scarce minerals and old-growth forest).
- Selection of materials with a low embodied energy and high recycled content.
- Low toxicity material selection.
- Low impact on the indoor environment.
- Durability, flexibility, and recyclability.
- Emissions in manufacture and composition, including greenhouse gases and ozone depleting substances.
- Waste reduction.
- Provisions for appropriate recycling storage space that facilitates recycling.

The targeted initiatives will reduce embodied energy and environmental impacts caused by the whole life cycle of building materials.

6.8.1 Reuse and Conservation of materials

Where possible reuse the building material to conserve embodied energy and water. By conserving the building fabric or structure the waste volumes are significantly reduced for the development.

6.8.2 New Materials

Material specifications for the project will consider elements of sustainability that relate to the following factors of durability, embodied energies, renewable sources content, ease of manufacturing, ability to be recycled / reused / reconditioned, maintenance, local availability, VOC content, emission production, affordability, and toxicity.
Where feasible the materials specified for this project are to consider the above environmental measures through a comparison between different product types and manufacturers where possible. The design team is to adopt this approach in assessing suppliers and products for the development.

Interiors finishes will consider the concentration of Volatile Organic Compounds with products for adhesives, paints, carpets, and floor sealants. The design team will work with suppliers and contractors to identify opportunities to reduce the level of VOC’s within products and finishes.

6.8.3 Materials with Ozone Depletion Potential

Selection of insulation will be targeted to minimise Ozone Depletion Potential (ODP).

6.8.4 Operational Waste Minimisation

To encourage and facilitate effective waste management once the facility is in operation, sufficient spatial provision will be made to allow for the effective separation of waste from recycling. Dedicated waste recycling rooms allow space for the separation and storage of recyclable waste during the building’s operation, allowing for the waste streams to be separated:

- Glass.
- Cardboard.
- Paper.
- Organics.

- Plastics.
- Metals.

Waste management solutions are varied and dependant on the extent of commitment of the end user. Recycling, reuse, and composting are examples of waste management options.
The following waste streams have currently been identified:

- Office waste.
- Paper and cardboard.
- Plastics.
- PET bottles and containers, cans, and glass.
- Compostable material.
- Grease and fats.
- Cigarette butts.
- Light tubes.
- Toxic or hazardous materials.
- Foam.
- Cleaning products and other substances going down drains.
- Composting of organic waste from the restaurant, for re-use within the Greenhouse.

6.8.5 Timber

Where possible, timber will be supplied from sustainable sources including Forestry Stewardship Council (FCS) certified plantation timbers and recycled products. No timber (either solid or veneer form) will be sourced from rainforests or old-growth forests.

6.8.6 PVC Minimisation

PVC is being phased out in the European Union, as there is widespread evidence to its harmful environmental impact, particularly during disposal or fire. PVC is used in almost all electrical and data cabling and for drainage pipework. Alternatives to PVC products will be used where feasible:

- HDPE and polypropylene pipe work instead of PVC pipe for water supply and drainage systems.
- Linoleum and other natural products instead of vinyl floor coverings.
- Composite materials for electrical cabling.

6.9 Land Use and Ecology

This initiative refers to improvements through Reuse of Land or Change of Ecological Value. The site has been previously built on, and is not a Greenfield. The new development will aim to provide a significant landscaped area with vegetation and permeable surfaces to assist in WSUD.

6.10 Emissions

In addition to the reduction in greenhouse emissions as a result of lower on-site energy usage, emissions to land, air and water will be minimised. The following measures are some of the initiatives targeted within the emissions category:

- Where available, thermal insulation products should be selected which have a low Ozone Depletion Potential in their manufacture and composition, reducing the impacts of insulation on the atmosphere.
- Where feasible, refrigerants will have an Ozone Depletion Potential of zero; and integrated refrigerant leak detection will ensure early identification of leaks.
- Estimated wastewater discharge to sewer will be significantly reduced relative to a standard building through the implementation of water efficiency measures.

- Watercourse Pollution: Design that minimises stormwater run-off to and the pollution of the natural watercourses.
- Light Pollution: No light beam will be directed upwards or outside the building. External lighting will be in accordance with AS 4282-1997. This will assist to minimise interference and disturbance to neighbouring properties and wildlife.

7. Climate Change Adaptation

7.1 NARCliM Climate Change Projections

The information provided in this section of the report follows the climate change projections based on the NSW and ACT Regional Climate Modelling (NARCliM) project. NARCliM is a multi-agency research partnership between the NSW and ACT governments and the Climate Change Research Centre at the University of NSW. NSW Government funding comes from the Office of Environment and Heritage (OEH), Sydney Catchment Authority, Sydney Water, Hunter Water, NSW Office of Water, Transport for NSW, and the Department of Primary Industries.

Climate change projections are presented for the near future (2030) and far future (2070), compared to the baseline climate (1990–2009). The projections are based on simulations from a suite of twelve climate models run to provide detailed future climate information for NSW and the ACT.

The climate change projections are made for the following 5 parameters:

1. Temperature extremes.
2. Hot days.
3. Cold nights.
4. Rainfall.
5. Fire weather.

Reference: https://climatechange.environment.nsw.gov.au/
NSW Office of Environment and Heritage (OEH)

7.1.1 Temperature

Pymble NSW is expected to experience an increase in all temperature variables (average, maximum and minimum) for the near future and the far future

- Maximum temperatures are projected to increase by 0.7°C in the near future and up to 1.9°C in the far future. Spring will experience the greatest change in maximum temperatures, increasing by up to 2.2°C in the far future. Increased maximum temperatures are known to impact human health through heat stress and increasing the number of heatwave events.
- Minimum temperatures are projected to increase by 0.6°C in the near future up to 2°C in the far future. Increased overnight temperatures (minimum temperatures) can have a considerable effect on human health.

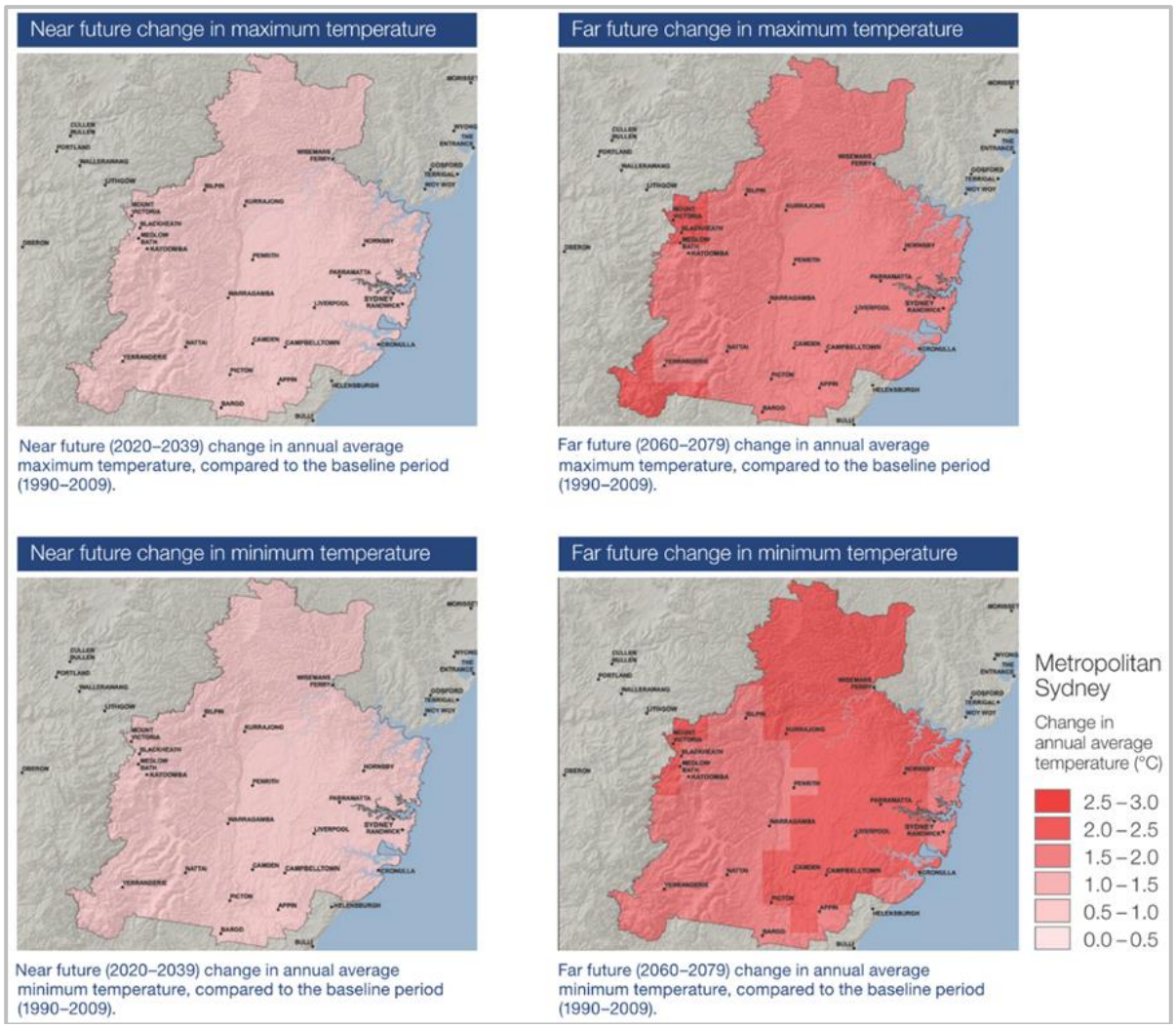


Figure 10. Annual average temperature – Sydney variation map.

7.1.2 Hot days (days per year above 35°C)

Currently Pymble NSW experiences fewer than 10 days above 35°C each year due to its proximity to the coast. Seasonal changes are likely to have considerable impacts on bushfire danger, infrastructure development and native species diversity.

- The facility is expected to experience more hot days in the near future and in the far future.
- These increases in hot days are projected to occur mainly in spring and summer although in the far future hot days are also extending into autumn.

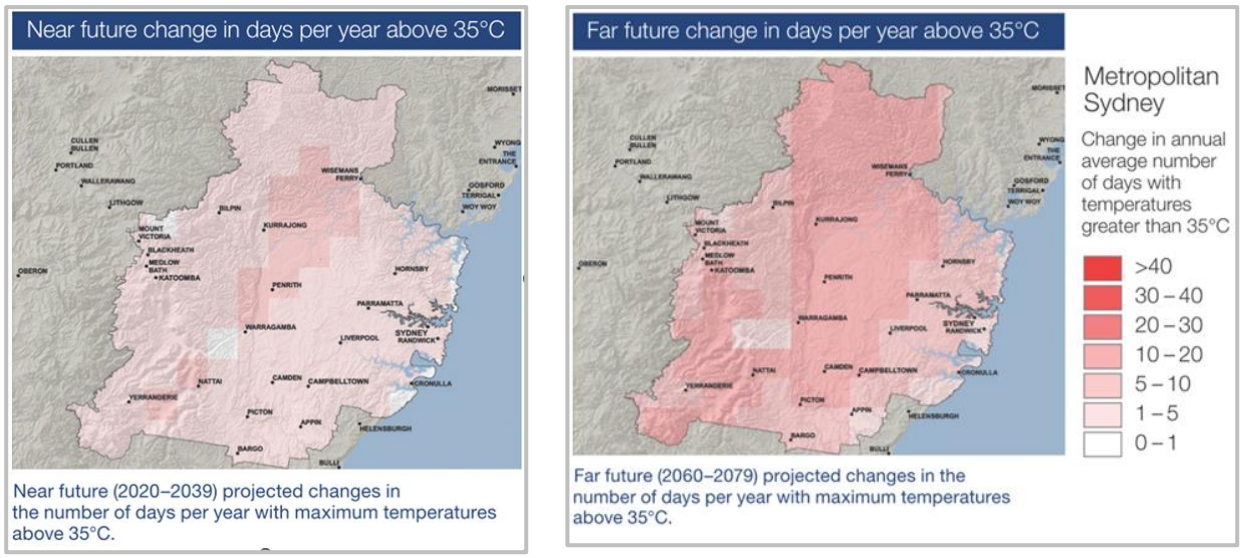


Figure 11. Change in annual average number of days with temperatures greater than 35°C – Sydney variation map.

7.1.3 Cold nights (days per year below 2°C)

Most of the emphasis on changes in temperatures from climate change has been on hot days and maximum temperatures, but changes in cold nights are equally important in the maintenance of our natural ecosystems and agricultural/horticultural industries. For example, some common temperate fruit species require sufficiently cold winters to produce flower buds.

- The greatest decreases are projected to occur in the south-west and in the Blue Mountains, with decreases of up to 20 nights by 2030 and more than 40 fewer cold nights by 2070.
- NARCliM projections suggest that Pymble NSW will not see a considerable decrease in cold nights (see the white areas in the map).

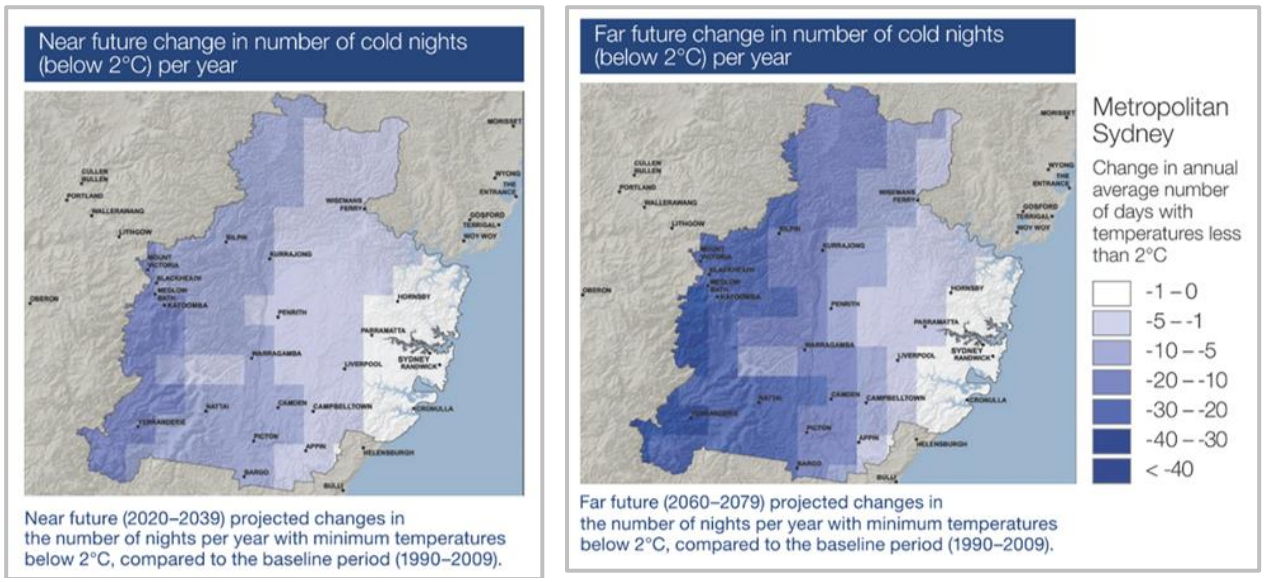


Figure 12. Change in annual average number of days with temperature less than 2°C – Sydney variation map.

7.1.4 Rainfall

Changes in rainfall patterns have the potential for widespread impacts. Seasonal shifts can often impact native species' reproductive cycles as well as impacting agricultural productivity, for example crops that are reliant on winter rains for peak growth. The majority of models (8 out of 12) agree that autumn rainfall will increase in the near future and the far future (7 out of 12). Rainfall is projected to increase in autumn.

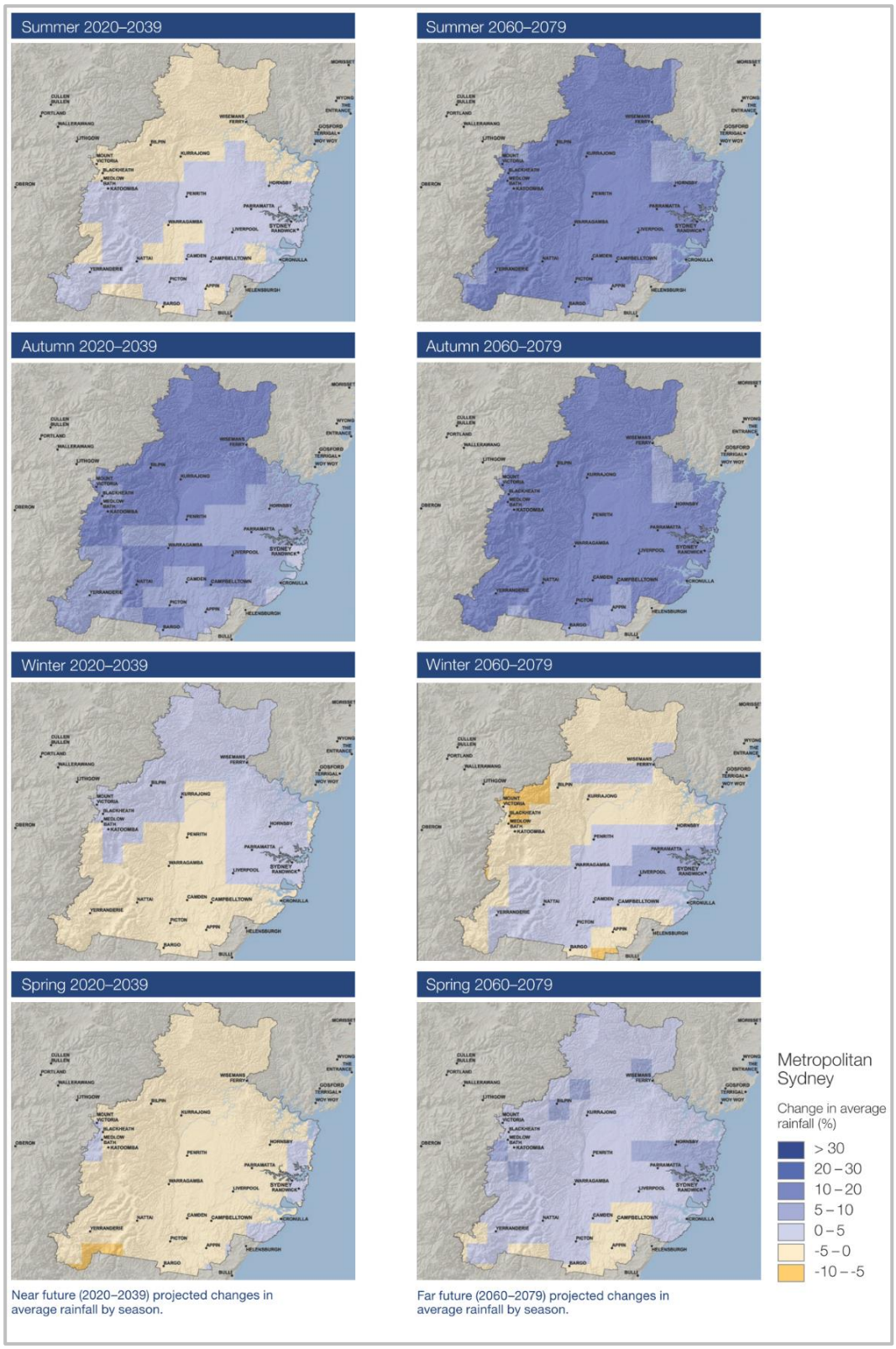


Figure 13. Change in average rainfall (%) – Sydney variation map.

7.1.5 Fire weather

The Bureau of Meteorology issues Fire Weather Warnings when the FFDI (Forest Fire Danger Index) is forecast to be over 50. High FFDI values are also considered by the Rural Fire Service when declaring a Total Fire Ban.

Projected regional climate changes

- Metropolitan Sydney is expected to experience an increase in average and severe fire weather in the near future and the far future.
- The increases are projected mainly in summer and spring in the far future. These changes are projected in prescribed burning periods (spring) and the peak fire risk season (summer).
- The majority of models (7 out of 12) project an increase of severe fire weather in spring in the near future, with a greater confidence in the increase in the far future.

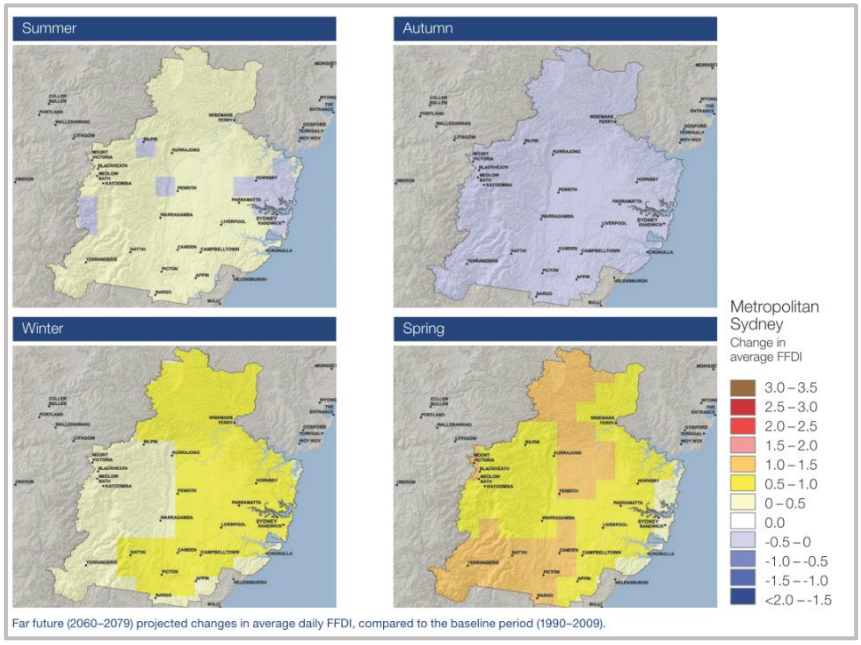


Figure 14. Change in average FFDI – Sydney variation map.

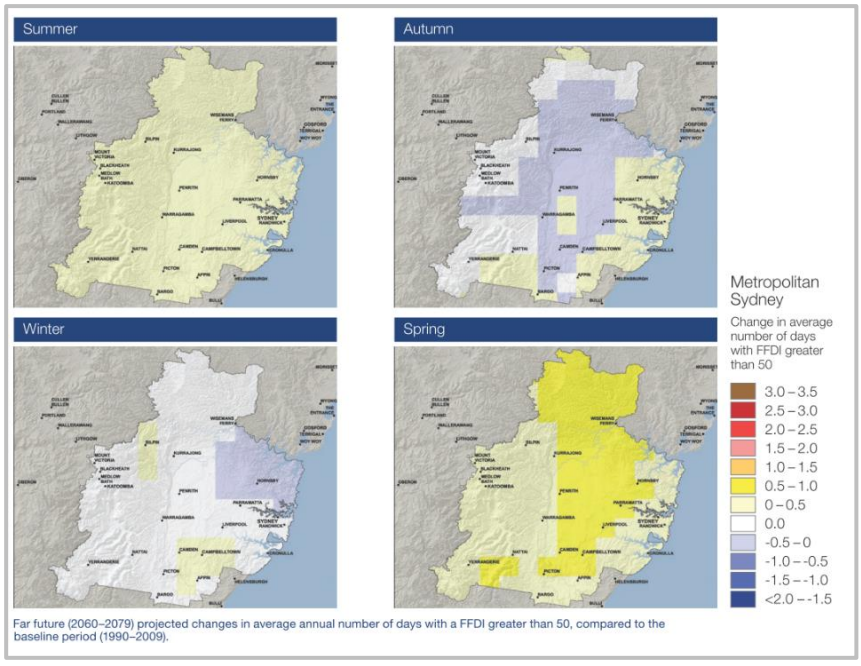


Figure 15. Change in average number of days with FFDI greater than 50 – Sydney variation map.

7.2 Climate Change Adaptation Plan

The climate change adaptation plan (CCAP) follows the ISO31000 Risk Management Process.

The plan involves three key steps to develop risks and mitigation strategies collaboratively with key project stakeholders.

1. Review of the development and context.

2. Risk analysis.
3. Mitigation Strategies.

7.2.1 Risk Assessment Framework

To assess risks systematically, a likelihood scale was used to determine how likely a risk was to occur, followed by consequence assessment. The first stage of the assessment is to define the likelihood of a given risk. The likelihood level can be described as the frequency or probability for a risk to occur.

Table 7. Risk likelihood matrix.

Likelihood	**Almost Certain** expected in most circumstances.
	Likely will probably occur in most circumstances.
	Possible might occur at some time.
	Unlikely could occur at some time.
	Rare may occur, only in exceptional circumstances.

Table 8. Example Consequence Scale and Success Criteria (AGO 2007).

	Public Safety	**Local Economy and Growth**	**Community and Lifestyle**	**Environment and Sustainability**	**Financial /Time Program/Budgets**
Catastrophic	Large numbers of serious injuries or loss of life	Precinct decline leading to widespread business failure	The area is considered very unattractive, moribund, and unable to support its community	Major widespread loss of environmental amenity and progressive irrecoverable environmental damage	Loss or increased cost of 50% or greater of annual budget.
Major	Isolated instances of serious injuries or loss of lives	Precinct stagnation such that businesses are unable to thrive	Severe and widespread decline in services and quality of life within the community	Severe loss of environmental amenity and a danger of continuing environmental damage	Loss or increased cost of 25%-50% of annual budget.
Moderate	Small numbers of injuries	Significant general reduction in precinct economic performanc e	General applicable decline in services	Isolated but significant instances of environmental damage that might be reversed with intensive efforts	Loss or increased cost of 10%-25% of annual budget
Minor	Serious near misses or minor injuries	Isolated areas in precinct decline	Isolated but noticeable examples of decline in services	Minor instances of environmental damage that could be reversed	Loss or increased cost of 5% to 10% of annual budget
Insignificant	Appearanc e of a threat but no actual harm	Minor shortfall to forecast growth	There would be minor areas in which the region was unable to maintain its current services	No environmental damage	Loss or increased cost of less than 5% of annual budget

Risk likelihood and consequence were then combined using the risk assessment matrix in Table below, leading to the systematic development of a risk rating used to prioritise risk management strategies.

Table 9. Example Risk matrix:

Show	**Matrix Score**				
Risk Rating Number + Name	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	High	Critical	Critical
Likely	Medium	Medium	High	Critical	Critical
Possible	Low	Medium	Medium	High	Critical
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

Risk management strategies listed in Table 10 aim to reduce risk levels by reducing either likelihood or consequence of the risk, or both. The objective is to develop cost-effective options for treating/controlling each identified risk and minimise its impact to the project.

Table 10.. Risk management.

Show	**Matrix Score**				
Risk Rating Number + Name	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	High	Critical	Critical
Likely	Medium	Medium	High	Critical	Critical
Possible	Low	Medium	Medium	High	Critical
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	High

7.2.2 Risk Assessment outcomes

The design team will investigate the appropriate mitigation measures as part of the detailed design stage.

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increase in hot days	Accelerated structural material fatigue and degradation of facades leading to increased maintenance and repair costs	Rare	Catastrophic	High	Select materials which have a higher temperature tolerance if required. Review material datasheets for in-service temperature range and allow for increase in peak temperatures.	Rare	Moderate	Low
Increase in hot days	Brownouts/ Blackouts leading to failure of critical electrical equipment	Possible	Major	High	Ensure that existing plans to add to backup generation based on demand is followed through. Consider use of Solar Energy with Battery Energy Storage Systems (BESS).	Possible	Minor	Medium
Increased rainfall variability	Parapet roof retains water due to blockage in syphonic drainage system leading to structural failure.	Possible	Major	High	Check the design includes overflow outlets in parapet. Add to design if required.	Rare	Major	Medium
Increased rainfall variability	Parapet roof retains water due to insufficient capacity in the syphonic drainage system leading to structural failure.	Possible	Major	High	Overflow systems in place in the form of overflow slots. The capacity of these can be increased if required to allow for increased rainfall intensity.	Rare	Major	Medium

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increased rainfall variability	Onsite Water Detention Tank (OSD) cannot deal with increased flows leading to overflow and flooding of adjacent areas.	Possible	Major	High	If necessary, overflow system to be provided. Hydraulic engineers to check if systems can manage the increased flows and implement further measures if required.	Rare	Major	Medium
Increased rainfall variability	Overland flow of water leads to pooling around the electrical infrastructure, causing electrical failure and power outage.	Possible	Catastrophic	Critical	Primary storm water drainage system to be designed to cater for a minimum of a 100-year storm. System to also have full backup of either piped overflow or overland flow designed to a higher storm intensity.	Rare	Major	Medium
Increased intensity of storm events	Mechanical plant on the roof (if any) are damaged by extreme hail event leading to failure of ventilation system.	Possible	Major	High	Consider options for protecting the mechanical plant in design. Implement if required.	Rare	Major	Medium

Climate variable	Risk Statement	Likelihood	Consequence	Level of Risk	Adaptation actions	Residual Likelihood	Residual Consequence	Residual level of Risk
Increased intensity of storm events	Severe hail blocking roof drains causing increased water ingress into building envelope and potential structural impacts, leading to increased maintenance costs	Possible	Major	High	Screen outlets with hail guards. Planned overflow slots should allow rain to overflow for all but the most severe hail events.	Rare	Major	Medium
Increased intensity of storm events	Airborne debris causing damage to exterior building elements and increased maintenance costs.	Possible	Major	High	Check wind load thresholds in engineering for façade and glazing. If required, adopt heat treated glazing for greater impact strength.	Rare	Major	Medium
Increased intensity of storm events	Wind driven rain penetrates the building, creating slip hazards for public circulation spaces.	Likely	Moderate	High	Consider in design and highlight risk for building managers. Include wet weather management plan in facilities management contract.	Rare	Moderate	Low
Increased fire weather	Smoke ingress into facility via HVAC system causing increased health risks for the occupants.	Almost certain	Major	Critical	Evacuation plan to be developed by FM company, including use of link to nearby hospitals for particularly vulnerable occupants. Consider use of non-latching outside air smoke detectors to shut down outside air systems in the event of a bushfire situation.	Almost certain	Insignificant	Medium

7.2.3 Recommendations

Many of the potential risks to the building are already addressed by existing design features of the building or are being explored as an immediate consequence of this process. All those identified through the workshop and subsequent discussions as requiring additional action are set out in table below, along with responsibility for those actions.

This information should be added to the overall project risk register, with actions implemented and recorded, and subsequently reported in the Green Star documentation.
Summary of adaptation actions required to achieve revised risk rating is presented in Table 11.
The design team will investigate the appropriate mitigation measures as part of the detailed design stage.

Table 11. Adaptation Actions Required to Achieve Revised Risk Rating.

Risk Statement	Initial Risk	Residual Risk	Action requiring implementation	Design / Operations	Proposed Responsibility
Brownouts/Blackouts leading to failure of critical electrical equipment.	High	Medium	Where possible, Solar PV with Battery Energy Storage System (BESS).	Design and operations	Electrical Engineer
Accelerated structural material fatigue and degradation of façades, leading to increased maintenance and repair costs	High	Low	Review material datasheets for in-service temperature range and allow for a nominal tolerance on peak temperatures based on today's values. Select materials which have a higher temperature tolerance if required.	Design	Façades Engineer, Structural Engineer
Water restrictions during prolonged droughts leading to inability to deliver core services.	High	Low	Develop a Drought Management Plan. Water restrictions would likely be signposted well in advance. Consider alternative water supply.	Operations	Facilities Manager
Parapet roof retains water due to blockage in symphonic drainage system leading to structural failure.	High	Medium	Check the design includes overflow outlets in parapet. Add to design if required.	Design	Hydraulic Engineer
Parapet roof retains water due to insufficient capacity in the symphonic	High	Medium	Check whether capacity of overflow slots and drainage system is sufficient to allow for increased rainfall intensity. Increase either/both if required.	Design	Hydraulic Engineer, Architect

drainage system leading to structural failure.					
Onsite Water Detention Tank (OSD) cannot deal with increased flows leading to overflow and flooding.	High	Medium	Ensure secondary overflow system provided and check if systems can manage increased flows. Implement further measures if required.	Design	Civil Engineer
Overland flow of water leads to pooling around electrical infrastructure, causing electrical failure and power outage.	Critical	Medium	Primary storm water drainage system to be designed to cater for a minimum of a 100- year storm. System to also have full backup of either piped overflow or overland flow designed to a higher storm intensity. Consider other feasible mitigation measures as required.	Design	Hydraulic Engineer, Architect, Electrical Engineer
Mechanical plant on the roof (if any) are damaged by extreme hail event leading to failure of ventilation system.	High	Medium	Consider options for protecting the mechanical plant in design. Implement if required.	Design	Mechanical Engineer
Severe hail blocking roof drains causing increased water ingress into building envelope and potential structural impacts, leading to increased maintenance costs	High	Medium	Screen outlets with hail guards.	Design	Hydraulic Engineer
Airborne debris causing damage to exterior building elements and increased maintenance costs -	High	Medium	Check wind load thresholds in engineering for façade and glazing. Adopt heat treated glazing for greater impact strength if required.	Design	Façades Engineer, Structural Engineer

particularly discussed potential increase in wind loadings due to CC.					
Wind driven rain penetrates the building, creating slip hazards for public circulation spaces.	High	Low	Consider in design and highlight risk for building managers. Include wet weather management plan in facilities management contract.	Design and operations	Architects and Facilities Manager
Smoke ingress into facility via HVAC system causing increased employee health risks	Critical	Medium	Evacuation plan to be developed by FM company, including use of link to nearby hospitals for particularly vulnerable occupants. Consider use of non-latching outside air smoke detectors to shut down outside air systems in the event of a bushfire situation.	Design and operations	Mechanical Engineer, Facilities Manager, Owner

8. Conclusion

The proposed development at 20 Avon Rd, Pymble NSW, embodies comprehensive Ecologically Sustainable Design (ESD) principles aimed at significantly reducing environmental impact and enhancing occupant wellbeing. Through an integrated and staged approach, the project prioritizes load reduction via passive design measures, energy efficiency optimization, and the incorporation of renewable energy sources. Key initiatives include high-performance building envelopes, maximized natural lighting and ventilation, efficient HVAC and lighting systems, photovoltaic energy generation, and rigorous water conservation practices.

The project aligns with regulatory standards and outperforms benchmarks set by the National Construction Code (NCC) Section J and State Environmental Planning Policies (SEPP 2022). It fully satisfies the Secretary's Environmental Assessment Requirements (SEARs), ensuring compliance with key sustainability criteria. While formal certification is not pursued, the development aspires towards a 5-Star Green Star performance level, reflecting Australian excellence in sustainability.

Furthermore, the project proactively addresses climate change adaptation through strategies tailored to projected regional impacts, ensuring long-term resilience and functionality. Overall, this development represents a best-practice approach, setting a robust foundation for sustainable operation and providing significant environmental, social, and economic benefits for its users and the broader community.

9. Disclaimer

This report is prepared using the information described above and inputs from other consultants. Whilst IGS has endeavoured to ensure the information used is accurate, no responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact IGS for detailed advice which will take into account that party's particular requirements.

Computer performance assessment provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warrantee of building performance in practice can be based on simulation results alone. IGS and its employees and agents shall not be liable for any loss arising because of, any person using or relying on the Report and whether caused by reason or error, negligent act or omission in the report. The draft assessment has been prepared indicatively and using the limited architectural and building services design with the view to conduct a detailed assessment once the design is further developed.

Performance of the completed building may be significantly affected by the quality of construction; the quality of commissioning, ongoing management of the building, and the way the building is operated, monitored, and maintained.

APPENDIX A - TECHNICAL DATASHEETS FOR SAMPLE PV PANELS (600 W)

Vertex

BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG20C.20

PRODUCT RANGE: 580-600W

600W MAXIMUM POWER OUTPUT

0~+5W POSITIVE POWER TOLERANCE

21.2% MAXIMUM EFFICIENCY

High customer value

- Lower LCOE (Levelized Cost of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components
- Higher return on Investment

High power up to 600W

- Up to 21.2% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection

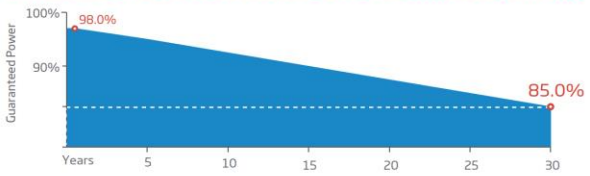
High reliability

- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load

High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



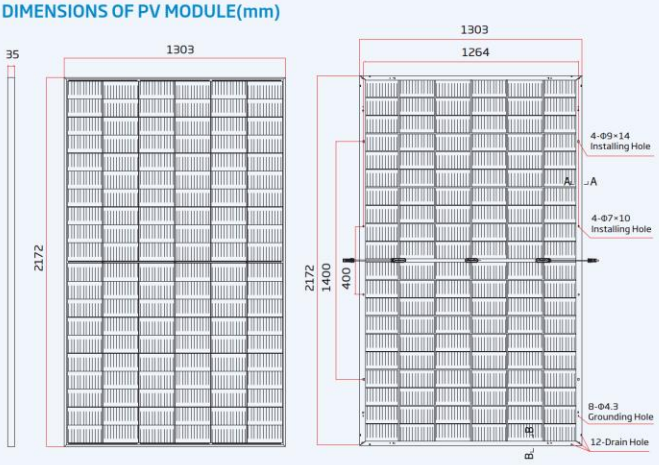
Comprehensive Products and System Certificates

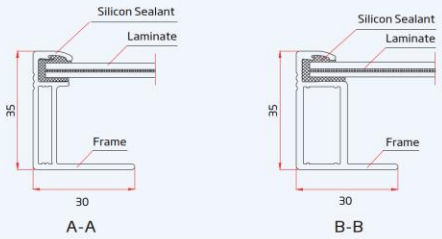
IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

Trinasolar

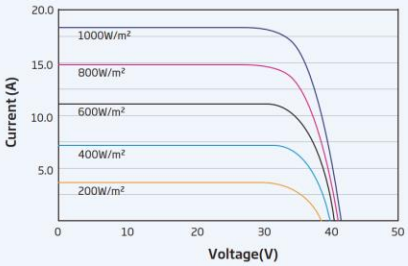
Vertex BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

DIMENSIONS OF PV MODULE(mm)

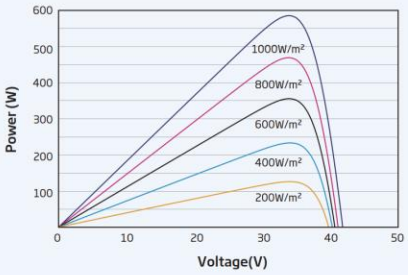




I-V CURVES OF PV MODULE(590 W)



P-V CURVES OF PV MODULE(590 W)



ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	580	585	590	595	600
Power Tolerance-PMAX (W)			0 ~ +5		
Maximum Power Voltage-VMPP (V)	33.8	34.0	34.2	34.4	34.6
Maximum Power Current-IMPP (A)	17.16	17.21	17.25	17.30	17.34
Open Circuit Voltage-VOC (V)	40.9	41.1	41.3	41.5	41.7
Short Circuit Current-ISC (A)	18.21	18.26	18.31	18.36	18.42
Module Efficiency η m (%)	20.5	20.7	20.8	21.0	21.2

STC: Irradiance 1000W/m2, Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -PMAX (Wp)	621	626	631	637	642
Maximum Power Voltage-VMPP (V)	33.8	34.0	34.2	34.4	34.6
Maximum Power Current-IMPP (A)	18.36	18.41	18.46	18.51	18.55
Open Circuit Voltage-VOC (V)	40.9	41.1	41.3	41.5	41.7
Short Circuit Current-ISC (A)	19.48	19.54	19.59	19.65	19.71
Irradiance ratio (rear/front)			10%		

Power Bifaciality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	439	443	447	451	454
Maximum Power Voltage-VMPP (V)	31.5	31.7	31.9	32.0	32.2
Maximum Power Current-IMPP (A)	13.93	13.97	14.01	14.06	14.10
Open Circuit Voltage-VOC (V)	38.5	38.7	38.9	39.1	39.3
Short Circuit Current-ISC (A)	14.68	14.72	14.76	14.80	14.84

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	120 cells
Module Dimensions	2172×1303×35 mm (85.51×51.30×1.38 inches)
Weight	35.3 kg (77.8 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	EVA/POE
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	35mm(1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 280/280 mm(11.02/11.02 inches) Length can be customized
Connector	MC4 EVO2 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT(Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of VOC	- 0.25%/°C
Temperature Coefficient of ISC	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

12 year Product Workmanship Warranty

30 year Power Warranty

2% first year degradation

0.45% Annual Power Attenuation

(Please refer to product warranty for details)

PACKAGING CONFIGUREATION

Modules per box: 25/36 pieces

Modules per 40' container: 549 pieces

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_EN_2021_B

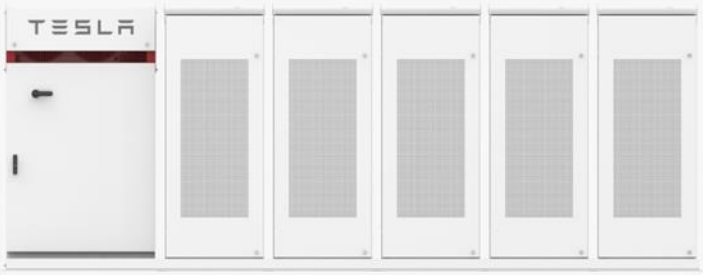
www.trinasolar.com

APPENDIX B - TECHNICAL DATASHEET FOR TESLA POWERPACK (ENERGY STORAGE OPTION)

POWERPACK

Tesla has been building integrated battery systems in cars for over 10 years. The same degree of expertise, quality control and technological innovation has informed our process of developing high-performance energy storage systems.

The Powerpack system scales to the space, power and energy requirements of any site from 210 kWh to 100 MWh+.



Powerpack System Includes an Inverter and DC Battery Packs

FULLY INTEGRATED SYSTEM

A complete energy storage system including DC batteries, bi-directional inverter, and a Powerpack controller with intelligent software. This turnkey system is designed to maximize savings and prolong battery life.

OPTIMIZATION SOFTWARE

Powerpack systems have the most advanced battery technology and dispatch optimization software to quickly learn and predict a facility's energy patterns. Tesla's proprietary storage dispatch software can charge and discharge autonomously to maximize customer value.

ENHANCED SYSTEM SAFETY

Powerpack's battery architecture consists of a low voltage battery with a DC/DC converter for added electrical isolation and safety. It also has an integrated liquid cooling / heating system for thermal safety and enhanced performance and reliability.

APPLICATIONS

PEAK SHAVING
Discharge at times of peak demand to reduce expensive demand charges

EMERGENCY BACKUP
Powers a facility when the grid goes down

CAPACITY FIRMING
Smooth out the intermittency of renewables by storing and dispatching when needed

LOAD SHIFTING
Shift energy consumption from one point in time to another

MICROGRID
Build a localized grid that can disconnect from the main power grid

TRANSMISSION & DISTRIBUTION SUPPORT
Supply power at a distributed location to defer the need to upgrade aging infrastructure

DEMAND RESPONSE
Discharge or charge in response to signals from a demand response administrator

ANCILLARY SERVICES
Provide service to the grid in response to signals sent

TESLA

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POWERPACK SPECIFICATIONS
4hr System

- 1 Powerpack includes 16 battery pods
- Each pod has an isolated DC/DC inverter and thermal control system
- Sensors to monitor cell-level performance in real-time
- Standard configuration:
  i. 4 hour discharge duration

ELECTRICAL

AC Voltage	380-480VAC 3-phase
Nominal Frequency	50 & 60 Hz
Continuous Discharge Duration	4 hours
AC Energy available per Powerpack[1]	210 kWh
Inverter Sizes	Scalable from 50kW - 653kW
Roundtrip[1] System Efficiency	89%

[1]Net energy delivered at 25°C (77°F) including thermal control.

REGULATORY

Lithium-Ion Cells	NRTL listed to UL 1642
System	NRTL listed to UL 1973, 9540, 1741 IEEE 1547 Compliant to grid codes and safety standards of all major markets. Full list provided upon request.

MECHANICAL AND MOUNTING

Enclosure	IP67 (Pod) NEMA 3R / IP35 (Powerpack) NEMA 4 / IP66 (Inverter)
System Area Requirements	50kW / 210kWh: 95ft² / 8.9m² 100kW / 420kWh: 127ft² / 11.8m² 250kW / 1050kWh: 221ft² / 20.5m² 500kW / 2100kWh: 377ft² / 35m²
Powerpack Unit Dimensions	L: 51.5" (1308mm) W: 32.4" (822mm) H: 86" (2185mm)
Weight	2160 kg / 4765 lbs
Inverter Dimensions	L: 39.9" (1014mm) W: 49.4" (1254mm) H: 86.3" (2192mm)
Weight	Up to 1200 kg / 2645 lbs
Operating Ambient Temperature	-22°F to 122°F / -30°C to 50°C

COMMUNICATIONS

Protocol	Modbus TCP DNP3 Rest API

TESLA

TESLA.COM/ENERGY

Tesla's software for behind the meter Powerpack applications, called Opticaster, is designed to maximize economic benefit for customers. Opticaster now operates in more than 100 commercial and industrial stationary energy storage systems, resulting in tens of thousands of hours of field experience in a vast range of grid-connected and off-grid applications. With each of Tesla's 120,000+ electric vehicles operating its proprietary battery system software, Tesla's experience in this realm is unparalleled.

The robust data set accumulated through Tesla's field experience informs the development and continuous improvement of Tesla's global fleet of vehicles and energy storage systems. Tesla's software logic for behind the meter energy storage applications is a culmination of this vast experience and is the focus of this paper.

Opticaster is an integral component of Powerpack system. At every stage of project maturity, Opticaster is used to optimize Powerpack system size to achieve maximum financial returns for customers. During operation, it forecasts and optimizes the dispatch of stored electricity to reduce electricity bills and perform grid services.

This paper illustrates the applications Tesla's Opticaster performs, and explores three layers of functionality that define its operation: forecasting, optimization, and real-time control.

SYSTEM SIZING

System modeling enables customers to evaluate the benefits of adding a Powerpack system. Based on a simple set of customer data, such as utility rate structures and historical load data, Opticaster leverages its core optimization and forecast abilities to perform detailed simulations, which determine an optimal system size and application set for any customer. Figure 1 illustrates commonly modeled functions and applications:

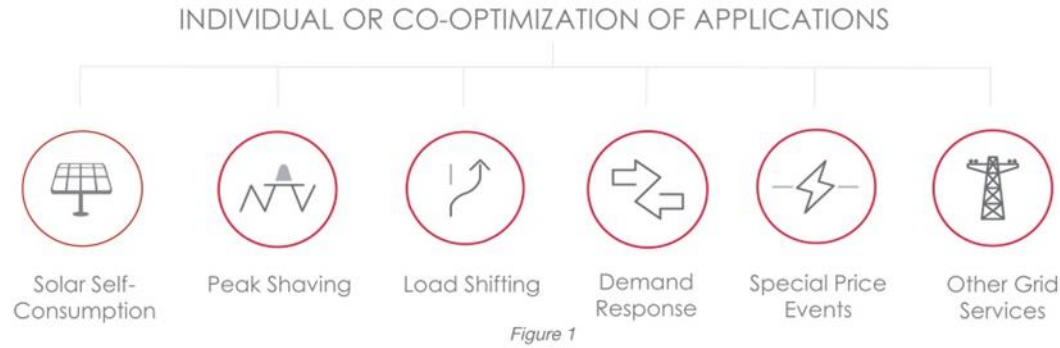

Figure 1

To ensure the greatest probability for customer savings and revenue, Tesla simulates multiple scenarios for each customer. Each scenario provides a probability for economic benefit by testing multiple customer load behaviors against an array of Powerpack sizes and applications.

APPLICATIONS

Commercial electricity bills are usually comprised of demand charges and energy charges. Opticaster automatically optimizes both weighted by their respective costs.

Demand charges typically make up the greatest portion of commercial electricity bills, and can be reduced by discharging an on-site Powerpack system during the customer's period of peak demand. Through peak shaving / demand charge management, Opticaster automatically forecasts customers' site peak and discharges Powerpack batteries to reduce demand charges.

To reduce energy charges, Opticaster charges Powerpacks when the site demand or utility energy prices are low, then dispatches electricity to the customer when prices are high. Figure 2 demonstrates a combination of peak shaving and energy load shifting in an application called **tariff optimization.**

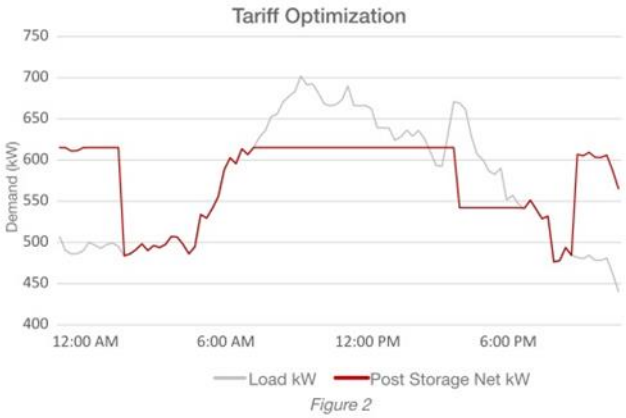

Figure 2

Commercial customers may also use solar panels to offset the electricity their site consumes from the local grid. For these customers, an on-site Powerpack system stores the solar electricity generated during the day for use during peak demand times through an application called **solar self-consumption.**

In solar self-consumption, Opticaster maintains system parameters to ensure optimal performance: maximum solar export power, percentage of battery to charge from solar, maximum and minimum site power level, utility interconnection rules, and other requirements that qualify the customer for government incentives. This flexible approach maximizes economic benefit for customers.

Figure 3 shows an example of Opticaster commanding Powerpacks to charge from solar during the day, then discharge to shave the customer's evening peak.

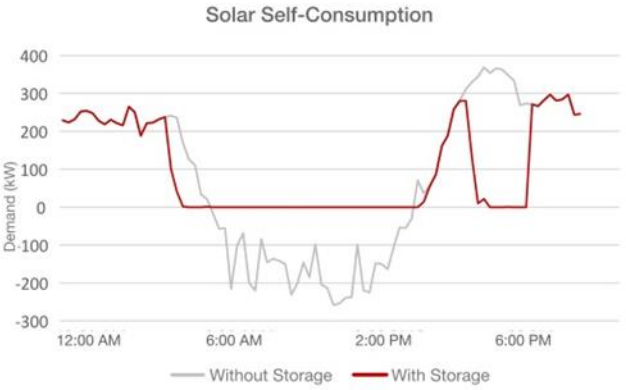

Figure 3

To secure multiple revenue streams for customers, Opticaster also supports **demand response (DR)** and other special price events such as critical peak pricing in PG&E and TUoS in the U.K.. Figure 4 shows an example of a DR event, during which the algorithm commands the Powerpack system to precisely meet the DR commitment of 50 kW below the baseline.

Figure 4

Through a combination of peak shaving and load shifting applications, customers reduce demand charges and energy charges on-site. By also participating in a DR program, customers add a layer of revenue that increases financial returns. Figure 5 depicts a customer co-optimizating all applications, which includes tariff optimization where Powerpacks charge during the night and discharge to keep the maximum peak below 410 kW at all time, and demand response where Powerpacks discharge to reduce the load well below the demand response baseline.

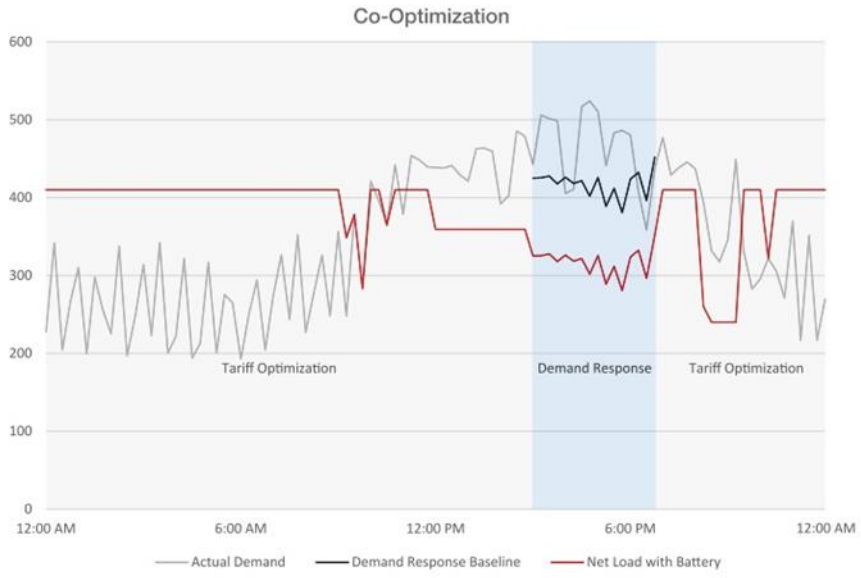

Figure 5

OPERATION

Opticaster's operation takes three major steps: demand forecast, optimization, and real-time operation.

Accurately forecasting customer demand is critical to overall system performance. To produce a customer demand forecast, Opticaster considers a robust set of variables including load profiles, solar profiles, holiday schedules, and temperature data. In addition, on-site electric and solar meters feed data into the system's data set to update the demand forecast continuously.

Continuous updates of demand forecast occur every couple of minutes. As shown in Figure 6, the forecast of the peak load gets increasingly accurate as it moves forward in time. The data retrieved between each new forecast become new input for the optimization model explained next.

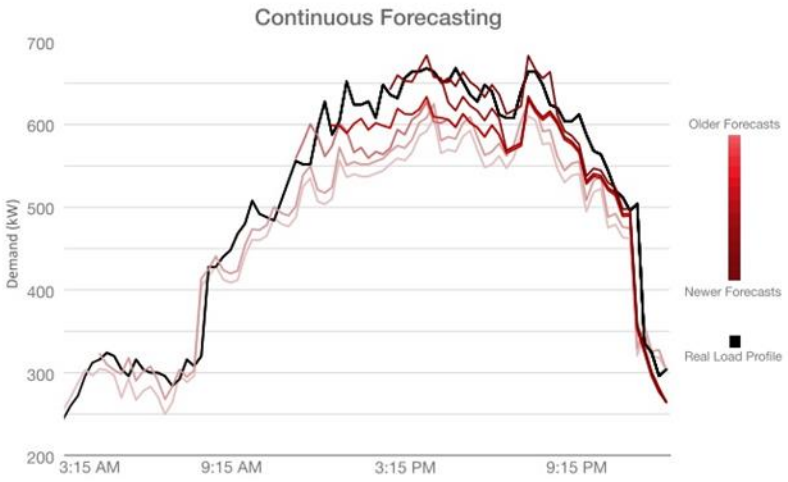

Figure 6

Based on the forecasted demand, utility rate structure, and battery state, Opticaster's optimization module autonomously develops a charge/discharge schedule that maximizes customer savings while satisfying other non-monetary requirements. These schedules are updated with the same frequency as demand forecasts.

Then the real-time operation module translates the charge/discharge schedules to the instantaneous power commands that control Powerpacks. It monitors the real-time demand from the site and ensures that optimal charge/discharge schedules are satisfied.

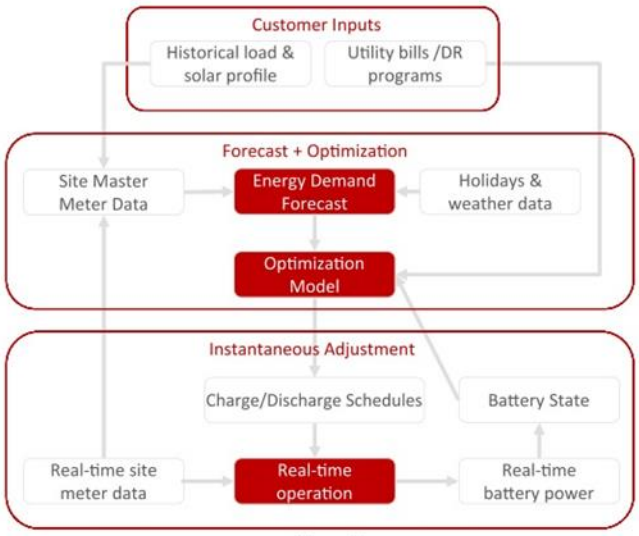

Figure 7

Every new version of Opticaster is benchmarked against Tesla's performance at existing sites to ensure constant improvement. Opticaster's combination of forecasting, optimization, and real-time controls makes it the most capable software solution on the market for managing advanced energy storage applications. Scalable to the power and energy requirements of any site, Powerpack systems provide a complete solution for a breadth of commercial and utility applications. To determine if energy storage is right for your site, please email powerpack@tesla.com.

APPENDIX C – GREEN STAR REQUIREMENTS AND SCORECARD

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party: Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
RESPONSIBLE																											
Industry Development	The development facilitates industry transformation through partnership, collaboration and data sharing.	1.0	**Credit Achievement:** The building owner or developer appoints a Green Star Accredited Professional, discloses the cost of sustainable building practices to the GBCA, and markets the building's sustainability achievements.	1	1	N/A	**CREDIT ACHIEVEMENT** The project must comply with all criteria listed below: • Green Star Accredited Professional; • Financial transparency; and • Marketing sustainability achievements **Green Star Accredited Professional** At least one Green Star Accredited Professional (Green Star AP) must be engaged as part of the project team from the time of registration or within one month following. A Green Star AP must be contractually engaged as part of the core project team for the duration of the project. The role of the Green Star AP can be fulfilled by one, or multiple individuals. **Financial transparency** The project team must complete, and include in the submission, the Green Star Financial Transparency Disclosure Template. The template assists the project team to submit the cost of sustainable building practices of the project including design, construction and documentation to the GBCA. The project team must provide the project's financial data in Excel format with the project's Green Star submission, not as a PDF. The Disclosure Template is available on the GBCA website. Project teams must use the latest available version. **Marketing sustainability achievements** To achieve this criterion: • The project's marketing team must complete the Green Star Case Study Template. The template seeks information on the sustainability initiatives that the building targeted to enable it being featured on the GBCA's website; • The project team must detail how the building will detail its sustainability achievements to its stakeholders. The stakeholders are defined as the typical building occupants and visitors; and • The Green Star Certification achieved for the project must be prominently displayed in a location that is visible to the public or visitors.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Green Star Financial Transparency Disclosure Template submitted in excel format • Green Star Case Study Template • Evidence to support claims made in the submission **Suggested evidence:** **Green Star Accredited Professional** • Letter of appointment from the client or head contractor confirming the appointment of a Green Star AP in the project, including the scope of works; • Sample Meeting minutes demonstrating input from the Green Star AP; and • Letter from the Client confirming that the Green Star AP satisfactorily fulfilled their engagement responsibilities as per the scope of works and requirements of this credit **Financial Transparency** • Statement or report from quantity surveyor, project manager or Green Star AP from the project, supporting the costs outlined in the Disclosure Template **Marketing sustainability achievements** • Developed samples of the marketing material; • Samples of information on the benefits of sustainability in a public and prominent way; and • Plans or photographs showing the location where the Green Star certification will be prominently displayed;	x	x								x						x	**Green Star Accredited Professional** The Green Star AP must be enrolled in the Green Building Council of Australia's Continuous Professional Development (CPD) program and must have valid credentials for the duration of their engagement (schematic design through to certification). **Multiple Green Star APs** In some cases, the role of the Green Star AP can be fulfilled by different individuals throughout the project. This is acceptable provided each Green Star AP individually meets the requirements of this credit (apart from the workshop requirement) and this role has been fulfilled continually from schematic design to practical completion. **Multiple project roles** In some cases, the Green Star AP's employer may also be engaged in other roles on the Green Star project. This does not constitute a conflict of interest where individuals are able to perform each role independently to meet the requirements of each credit. For example, an organisation may fulfil the role of both Green Star AP and Independent Commissioning Agent (ICA) where separation exists between the individual roles. In this case, project teams should demonstrate that there is no conflict of interest by including relevant discussion in the Submission Template.
Responsible Construction	The builder's construction practices reduce impacts and promote opportunities for improved environmental and social outcomes.	2.0	**Minimum Expectation:** • The builder or head contractor has an environmental management system in place to manage its environmental impacts on site; • The builder diverts at least 80% of construction and demolition waste from landfill;and • The head contractor provides training on the sustainability targets of the building.	Nil	To Comply	N/A	**MINIMUM EXPECTATION** The project must comply with all criteria below: • Environmental management system; • Environmental management plan; • Construction and demolition waste; and • Sustainability training **Environmental management system** The builder or head contractor (responsible party) must have a formalised systematic and methodical approach to planning, implementing and auditing in place during construction. • For projects valued at less than $10 million, the responsible party must have an Environmental Management System (EMS) that complies with either the NSW Environmental Management System Guidelines or another recognised standard. • For projects valued at over $10 million, the responsible party must have an Environmental Management System (EMS) certified to a recognised standard such as AS/NZS ISO 14001, BS 7750 or the European Community's EMAS. The EMS can be stand-alone or part of an integrated management system and must be valid for the duration of construction activities **Environmental management plan** The Environmental Management Plan (EMP) must be project specific and cover the scope of construction activities. It must be implemented from the start of construction and include all works within the project scope. **Construction and demolition waste** Projects must divert at least 80% of construction and demolition waste from landfill. A Disclosure Statement is required from waste contractors and processing facilities outlining how the company and their reporting aligns with the Green Star Construction and Demolition Waste Reporting Criteria. **Sustainability training** The head contractor must provide the following training to 95% of all contractors and subcontractors present on site for at least three days: • Information on the sustainable building certification(s) sought, including: – the sustainability attributes of the building and their benefits; – the value of certification; and – the role site worker(s) play in delivering a sustainable building.	**Submissions for this credit must contain**: • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** • An auditor report showing compliance with the EMS. An auditor report for the organisation, rather than the site, can suffice. If it is for the organisation, the builder or head contractor must confirm effective use of the EMS on the particular site; • Demolition or Site Drawings indicating the structures on site at time of purchase, extent of demolition and retained structure and façade; • Cumulative waste report generated from the monthly waste reports provided by the waste contractor over the entire duration of construction and demolition works; • Disclosure statement outlining how the contractor or facility aligns with the Green Star Construction and Demolition Waste Reporting Criteria; and • Evidence of training materials and register of attendance. **Credit Achievement** • Compliance Verification Summaries from waste contractor(s) and waste processing facilities as detailed in the Green Star Construction and Demolition Waste Reporting Criteria document; • Demolition or Site Drawings indicating the structures on site at time of purchase, extent of demolition and retained structure and façade; and • Cumulative waste report generated from the monthly waste reports provided by the waste contractor over the entire duration of construction and demolition works.	x	x				x	x	x	x		x			x			**MINIMUM EXPECTATION** **Environmental management plan** The NSW Environmental Management Systems Guidelines contains requirements of EMPs which is considered best practice. **Environmental management system** A formalised Environmental Management System (EMS) is a process that can be used to identify, manage, audit and reduce environmental impacts, and generate reports on environmental performance progress. It should provide a systematic and methodical approach to preventing impacts, and when they occur to planning, implementing and reviewing an organisation's response. The management system may be integrated with other management systems (such as occupational health and safety, risk registers etc.) to give a 'whole of business' approach. All formalised EMS should follow the basic stages of high-level commitment, identification of impacts, review, target setting, action planning, monitoring and reporting. The process is to be frequent and ongoing. **Calculating waste** To calculate the amount of waste diverted from landfill, the project team is required to report the total amount of waste generated and the total amount of waste diverted from landfill, and report on the proportion diverted as a percentage. **CREDIT ACHIEVEMENT** **Volume to weight conversion** Waste contractors are often required to determine the weight of waste material streams from visual inspections of a load's volume for the purpose of reporting the estimated weights of material types removed from site (e.g. timber, steel, plasterboard, concrete, carpet). The conversion factors in the **Table Page 44** may be used to convert measurement of waste types from volume to weight.
			Credit Achievement: 90% of construction and demolition waste is diverted from landfill, and waste contractors and facilities comply with the Green Star Construction and Demolition Waste Reporting Criteria.	1	1		**CREDIT ACHIEVEMENT** **Construction and demolition waste diversion** Projects must divert at least 90% of construction and demolition waste from landfill. • Green Star Buildings Responsible Construction The waste contractors and waste facilities must comply with the Green Star Construction and Demolition Waste Reporting Criteria																	
Verification and Handover	The building has been optimised and handed over to deliver a high level of performance in operation.	3.0	**Minimum Expectation:** The building has been commissioned and will be tuned. The building was set up for optimum ongoing management due to its appropriate metering and monitoring systems. The project team create and deliver operations and maintenance information to the facilities management team at the time of handover. Information is available to building users on how to best use the building.	Nil	To Comply	N/A	**MINIMUM EXPECTATION** The project must comply with all criteria listed below: • Metering and monitoring • Commissioning and tuning • Building information **Metering and monitoring** The building must have accessible energy and water metering for all common uses, major uses, and major sources. The meters must be connected to a monitoring system capable of capturing and processing the data produced by the meters. The meters and monitoring systems must: • Provide continual information (up to 1-hour interval readings); • Be commissioned and validated per the most current 'Validating Non-Utility Meters for NABERS Ratings' protocol, or National Measurement Institute (NMI) standards; • Be capable of identifying inaccuracies in the meter network and producing alerts. Inaccuracies are defined as those over meter tolerances based on their metering accuracy class (e.g. 'Class 1' meters shall not have inaccuracies of more than 1% due to metering accuracy class); and • Be sufficient to support future achievement of a NABERS rating. **Commissioning and tuning** The project team must perform the following prior to construction: • Set environmental performance targets; and • Perform a services and maintainability review During construction and practical completion: • Commission the building; and • Engage building tuning service provider After practical completion: • Tune the building over the next 12 months **Environmental performance targets and information** At design, the project team must set and document environmental performance targets for the project outlining: • The targets for the project energy and water consumption for all nominated building systems; • Metering diagrams for energy and water, and expectations relating to the monitoring of energy and water, as well as indoor environment quality, in operation; • Descriptions of the functions, intended operation and maintenance requirements of nominated building systems; and • Design airtightness targets as described in the Energy Use credit. Examples of common methods for demonstrating compliance with this is through the development (early in the design phase) of a design intent report or an owner's project requirements (OPR) document. **Services and maintainability review** Before construction, the project team must conduct a services and maintainability review of the building. The review must include the head contractor, the owner's representative, the commissioning agents, the design consultant and the facilities manager, where possible. The review must address the following: • Commissionability; • Controllability; • Maintainability; • Operability; and • Safety of all systems. The services and maintainability review and its outcomes must be summarised in a 'Service and Maintainability Report'. It must be signed off by all involved parties. **Building commissioning** During construction and before practical completion, all building systems must be commissioned per a recognised commissioning standard (CIBSE or ASHRAE commissioning guides). A commissioning specification must be included in the construction documentation listing requirements for each system. Airtightness must be considered as part of the commissioning process during the following stages: • Schematic design: review of design including an air barrier system schematic; • Design Development: review for tightness including air barrier continuity on building plans, sections and details. Scope of work and necessary coordination between trades and responsibilities must be considered; • Construction: A plan for stages of commissioning for air tightness must be defined and included in the project timeline; and • The building must undertake an airtightness test in accordance with AS/NZS ISO 9972:2015 Thermal performance of buildings determination of air permeability of buildings - Fan pressurisation method. **Building systems tuning** The owner or developer must contractually commit to a tuning process that includes quarterly adjustments and measurements for at least the first 12 months after occupation. The commitment must include: • A building tuning manual or plan; • A description of the building tuning team; and • Confirmation the owner has engaged parties to tune the nominated systems The building tuning team must include:	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** **Metering and Monitoring** • Drawings showing the location of all energy and water meters in the project and the associated energy and water uses; • Letter of confirmation from the contractor/metering provider/manager demonstrating that the metering systems are continually and automatically monitored by a system that is able to produce alerts if any inaccuracies are found; • Copy of Monitoring Strategy document specific to the building; and • Automatic monitoring system data sheet describing the systems features and capabilities. **Commissioning and Tuning** • Service and Maintainability Report where the service and maintainability review is summarised; • Extract(s) from the Commissioning Report demonstrating that comprehensive pre-commissioning activities and commissioning activities have been performed; • Building Tuning Commitment or contract demonstrating that there is a requirement for a building tuning process; • Whole building airtightness testing report detailing of test methodology, air flow rates, details of airtightness considerations from schematic design through to construction and statement that the target air permeability from the energy model has been achieved; and • Signed confirmation from the testing practitioner and main contractor that the results have been sighted. **Building Information** • Owner's project requirements document, or an equivalent document, defining the nominated building systems; • Operations and maintenance information; • Building log book; and • Building user information. **Credit Achievement**	x	x			x	x	x	x	x		x			x			**MINIMUM EXPECTATION** **Airtightness testing** The airtightness test should be carried out either across a sample area, or the whole building. For sample area testing, the test should carried out on either 2,000m2 or 10% of the building's total envelope area, whichever is greater. The sample areas tested should include the uppermost occupied floor of the building, and be representative of the external envelope construction, including different façade types and building geometries. Air tightness commissioning is encouraged to be undertaken at various stages of the project, such as: • Pre-design phase: the process of commissioning for airtightness begins at the project inception, when broad expectations and goals for performance are defined; • At schematic design phase: review must be completed. This may include creation of an air barrier system schematic, definitions of space conditioning requirements, and delineation of the extent of the conditioned building envelope. This process should fit in the same timeline with other such building envelope commissioning steps, such as definition of fire separations in the buildings; • Design development phase: review for air tightness must be completed. This includes plan reviews for air barrier continuity on building plans, sections, and details. Constructability and construction sequence must be considered. Costs of completion of the air barrier system must be considered. Scope of work and necessary coordination between trades and responsibilities must be considered. A plan for stages of commissioning for air tightness must be defined and included in the project timeline; • Construction phase: builder and mechanical contractor statements of understanding and commitment of resources and personnel necessary for, and commitment to assist with, airtightness test preparation, regardless of scale of planned testing. Tests must be carried out according to the commissioning plan; • Verification phase: extra points for Credit Achievement and Exceptional Performance will be awarded for whole-building air tightness results that reach normal practice or best-practice levels of air tightness; • Verification phase: the aim of the airtightness testing is to verify the air permeability assumptions in the Energy Model as detailed in credit Energy Use. The project team are required to ensure that the testing verifies the as-built

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party: Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
			Credit Achievement: An independent level of verification is provided to the commissioning and tuning activities through the involvement of an independent commissioning agent, or through a soft landings approach that involves the future facilities management team. For large projects, both must occur.	1	1		• The facilities manager; • The owner's representative and the independent commissioning agent (ICA, if applicable); • The head contractor; and • The services design professionals **Building information** **Operations and maintenance information** The project team must provide operations and maintenance information for all nominated building systems to the building owner (or designated representative). This means: • Appropriate content for all nominated building systems has been developed and provided; • The appropriate user group has access to the information they require to deliver best practice environmental outcomes; and • Guidance on keeping information up to date is provided to the facilities management team in these documents. **Building log book** The project team must develop a building log book to present to the building owner (or designated representative) before practical completion of the project. The building log book must: • Be developed in line with CIBSE TM31: Building Log Book Toolkit; • Cover all nominated building systems; and • Include links or references to all relevant operations and maintenance information. **Building user information** Building user information is a source of up-to-date, relevant information for the building user. Building user information must be able to be updated and edited by the facilities management team, or other appropriate stakeholder groups, to ensure it remains current and relevant to users throughout the life of the building. All building user information must be available to the building owner and facilities management team at the time of practical completion. **CREDIT ACHIEVEMENT** There are two pathways available. • A soft landings approach, that involves the facilities management team; and • The involvement of an ICA in the commissioning and tuning process For buildings with a Total Building Services Value of over $20m, both requirements must be met. For all others, one path will suffice. **Soft landings approach** The soft landings approach is described in 'The Soft Landings Framework Australia and New Zealand' published by CIBSE ANZ, based on the BSRIA guide. **Independent commissioning agent** An ICA must be appointed to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases. The specified commissioning requirements must be overseen by a qualified independent commissioning professional(s). The ICA is defined as a person who is: • An advocate for, and reports directly to, the project owner; • Independent of any consultant, contractor or sub-contractor organisation that has been involved in the design or installation of the nominated systems; and • A registered professional engineer or qualified technician with demonstrated knowledge on nominated systems commissioning and has previous experience with the commissioning process of at least 2 projects similar in scope. The qualified ICA role can be fulfilled by one or multiple persons, if all meet the requirements laid out above. It can also be fulfilled by a person who is part of the client's organisation, if the person is qualified to do so. An independent commissioning company may also meet these requirements.	**Soft Landings** • Evidence of implementation of BSRIA framework. **Independent Commissioning Agent** • CV of the Independent Commissioning Agent detailing the qualifications and experience relevant to the project; • Letter from building owner confirming the appointment of an ICA; and • Evidence of implementation of BSRIA framework.																			performance of the façade system. Should there be a discrepancy, the project is required to address this as part of the commissioning process; and • Whilst the requirement of this credit is to conduct the test, but not meet specified targets, the below serve as guidelines: – Should test to at least 50 Pascals – Should aim to achieve leakage target: suggest permeability 3.0 m3·h-1·m-2
Operational Waste	Operational waste can be separated and recovered in a safe and easy manner.	4.0	**Minimum Expectation:** The project team must demonstrate the building is designed to allow effective management of operational waste by: • Separating waste streams; • Providing a dedicated and adequately sized waste storage area; and • Ensuring easy and safe access to waste storage areas for both occupants and waste collection contractors.	Nil	To Comply	Waste Storage	**MINIMUM EXPECTATION** The project must meet all criteria listed below: • Separation of waste streams; • Dedicated waste storage area; and • Sign-off by waste specialist and/or contractor. **Separation of waste streams** The building must provide bins or storage containers to building occupants to enable them to separate their waste. These bins must be labelled and easy to access, and evenly distributed throughout the building. They must also allow for separating the following as a minimum: • General waste going to landfill; • Recycling streams to be collected by the building's waste collection service, including: – paper and cardboard – glass, and – plastic; and • One other waste stream representing at least 1% of the total annual operational waste (by volume) of the building. This may include collecting any of the following waste types: organics, e-waste, batteries etc. Any other single waste stream (except food waste) that represents more than 5% of total annual operational waste (by volume) must also be accounted for. **Dedicated waste storage area** A dedicated area, or areas, for the storage and collection of the applicable waste streams must be provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle. The calculations used to demonstrate that the area provided is adequately sized to handle the recyclable waste streams specified must be based on: • Forecasted waste generated by occupants; and • Collection frequency for each waste stream. The storage area(s) must have easy and safe access by collection vehicles. This includes driveway access to the building, any onsite roads and loading docks, and the storage areas themselves providing safe and easy access for bins to be emptied into collection vehicles. **Signoff by waste specialist and/or contractor** A waste specialist and/or contractor must sign-off on the designs to confirm they are adequately sized and located for the safe and convenient storage and collection of the waste streams identified.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Site Plan and/or architectural plans highlighting the location of relevant waste facility areas, demonstrating: – Separation of waste streams; – Dedicated waste storage area; and – Access to waste storage area • Calculations used to demonstrate that the dedicated waste storage area provided is adequately sized; and • Details on how the dedicated waste collection areas meet best practice guidelines, in line with third-party best practice guidelines.	x	x	x																**Off-Site recycling** Where recyclable waste is taken off-site to be sorted and hence equipment for the different recyclable waste streams will not be provided, the building must demonstrate that the waste will be sorted into the streams required by the credit through a contract for the waste to be removed and sorted. **Third-party best practice guidelines** The City of Sydney's Guidelines for Waste Management in New Developments is a recognised third-party best practice guideline that may be used to calculate waste generation rates and justify access arrangements. Alternative guidelines may be used provided they achieve similar or better outcomes. **Collecting waste streams** These streams may be collected in separate bins or in the same bin where commingled recycling is available. Commingled recycling is permissible to the extent that is accepted by the waste collection service. For example, if glass and plastic are collected as commingled recycling, then paper and cardboard are still required to have a separate recycling bin or container.
~~**Responsible Procurement**~~	~~The procurement process for all products, materials, and services for the building's design and construction follows best practice environmental and social principles~~	~~5.0~~	~~**Credit Achievement:**~~ ~~The building's design and construction procurement process follows ISO 20400 Sustainable Procurement – Guidance and at least one identified supply chain risk and opportunity is addressed.~~	~~1~~	0	Site-wide	~~**CREDIT ACHIEVEMENT**~~ ~~The project must meet both criteria below:~~ ~~• Risk and opportunity assessment~~ ~~• Responsible Procurement plan~~ ~~**Risk and opportunity assessment**~~ ~~The project team must undertake a risk and opportunities assessment of its supply chain to identify environmental and social risks and opportunities. The risk assessment must consider risks and opportunities further down the supply chain, such as in the extraction, manufacture or transport of key materials. The risk and opportunity assessment must address at least the following issues:~~ ~~• Human rights;~~ ~~• Labour practices;~~ ~~• The environment;~~ ~~• Fair operating practices;~~ ~~• Consumer issues; and~~ ~~• Community involvement and development.~~ ~~The project must provide a narrative on how it has actively addressed one risk and one opportunity.~~ ~~**Responsible procurement plan**~~ ~~The project must develop and implement a plan to mitigate and manage identified risks and drive implementation of identified opportunities. This can be part of an organisational plan or a stand-alone plan. The plan must:~~ ~~• Identify environmental and social procurement project-level objectives reflecting the risks and opportunities assessment;~~ ~~• Identify targets related to environmental, social and economic objectives in the supply chain and a measurement process for tracking these;~~ ~~• Stipulate clear actions to mitigate and address at least one risk and one opportunity identified in its supply chain;~~ ~~• Establish clear governance structures to ensure implementation of the plan including roles and responsibilities for implementation and monitoring of all procurement and contracts; and~~ ~~• Establish monitoring requirements on site as well as internal reporting requirements to measure impacts and outcomes as well as benefits realised.~~ ~~Contracts must require data collection, monitoring and reporting; and a framework for incentivising the achievement of plan.~~	~~**Submissions for this credit must contain:**~~ ~~• Submission Summary via the online portal~~ ~~• Evidence to support claims made in the submission~~ ~~**Suggested evidence:**~~ ~~• Extract from supply chain risk and opportunity assessment; and~~ ~~• Responsible procurement plan~~	x	x																	~~**ISO 20400 Sustainable Procurement – Guidance**~~ ~~ISO 20400: Sustainable Procurement – Guidance provides guidance to organisations, independent of their activity or size, on integrating sustainability within procurement. The procurement process must include community involvement and development, consumer issues, fair operating practices, the environment, labour practices, and human rights. The standard also addresses~~ ~~organisational requirements at the middle management level, including the governance that should be in place, people management and training, stakeholder engagement, prioritisation, reporting and grievance processes. The last section sets out the procurement process itself, including planning, sourcing and contract management. It is expected that the head contractor and sub-contractors follow the ISO 20400 guidelines to manage procurement risk in their supply chains to meet the requirements of this credit. It is not expected that all organisations downstream in the supply chain follow the ISO 20400 guidelines.~~ ~~**Procurement scope**~~ ~~The Responsible Procurement credit deals specifically with the building's design and construction procurement processes. It does not deal with operational procurement decisions; however, it is encouraged that these processes also follow ISO 20400 Sustainable Procurement – Guidance.~~
Responsible Structure	The building's structure is comprised of responsibly manufactured products.	6.0	**Credit Achievement:** 80% of all structural components (by cost) meet a Responsible Products Value score of at least 10.	3	3	Site-wide	**CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** Scores for each product can be calculated by using the Responsible Products Value table. Scoring is cumulative, rewarding each initiative achieved. A product can be compliant with one or more initiative and each adds to the product's total score. Examples of recognised initiatives that are present in the Responsible Products Value (RPV) table are: • Industry specific environmental product declarations (EPD); • Product specific environmental product declarations (EPD); • ISO14001 certification; • Climate Active Carbon Neutral Certification; • Chain of custody certification; and • Third-party product certification schemes.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Receipts confirming purchase of stated products; and • Evidence that claimed products constitute 60% of all structural components		x		x															**Responsible Products Value table** The Responsible Products Value table presents the various schemes that contribute towards the Responsible Products Value score, and their relevant weighting. The list of schemes may be updated over time. The responsible products table is available on our website. **Example of how to calculate the Responsible Products Value** **Calculating the RPV of a product** A concrete mix used in the building meets the following: • The concrete mix has Climate Active Certification (a) • The concrete mix is manufactured in a plant with ISO14001 certification (b) • The concrete mix has a publicly available product specific EPD (c) To calculate the total RPV, the value of each initiative is added (a+b+c). Calculating the RPV in a product where one or multiple components have an RPV, but the final product does not When calculating the RPV score of a product that has a number of components, and where only one of these complies, the item should be broken down into its key major components (approximately those that make up 80% of the mass of the item in question). An approximate estimate will suffice. Each item is assigned an RPV score and multiplied by the key component makeup, and the total RPV is calculated by adding up these values. For example, in a chair with three key components (timber, foam, fabric), the following would apply: • Timber (60%) with an RPV of 10 = 6 • Foam (20%) with RPV of 0 = 0 • Fabric (20%) with RPV of 12 = 2.4 The chair would have an RPV of 8.4
			Exceptional Performance: In addition to the Credit Achievement, one of the following is met: • 10% of all products in the structure (by cost) meet a Responsible Products Value score of at least 15; OR • 30% of all products in the structure (by cost) have an average Responsible Products Value score of at least 12.	2	2																						

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party: Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
Responsible Envelope	The building's envelope is comprised of responsibly manufactured products.	7.0	**Credit Achievement:** 60% of all building envelope components (by cost) meet a Responsible Products Value score of at least 10.	2	0	Site-wide	**CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** The envelope is defined as the elements that surround a building such as the façade, and all façade components such as external shading and insulation, suspended slabs, as well as roofing systems. Scores for each product can be calculated by using the Responsible Products Value table. Scoring is cumulative, rewarding each initiative achieved. A product can be compliant with one or more initiatives and each adds to the product's total score. Examples of recognised initiatives that are present in the Responsible Products Value (RPV) table are: • Industry specific environmental product declarations (EPD); • Product specific environmental product declarations (EPD); • ISO14001 certification; • Climate Active Carbon Neutral Certification; • Chain of custody certification; and • Third-party product certification schemes.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Receipts confirming purchase of stated products; and • Evidence that claimed products constitute 60% of all building envelope components		x	x																**Responsible Products Value table** The Responsible Products Value table presents the various schemes that contribute towards the Responsible Products Value score, and their relevant weighting. The list of schemes may be updated over time. The responsible products table is available on our website. **Example of how to calculate the Responsible Products Value** **Calculating the RPV of product** A concrete mix used in the building meets the following: • The concrete mix has Climate Active Certification (a) • The concrete mix is manufactured in a plant with ISO14001 certification (b) • The concrete mix has a publicly available product specific EPD (c) To calculate the total RPV, the value of each initiative is added (a+b+c). **Calculating the RPV in a product where one or multiple components have an RPV, but the final product does not** When calculating the RPV score of a product that has a number of components, and where only one of these complies, the item should be broken down into its key major components (approximately those that make up 80% of the mass of the item in question). An approximate estimate will suffice. Each item is assigned an RPV score and multiplied by the key component makeup, and the total RPV is calculated by adding up these values. For example, in a chair with three key components (timber, foam, fabric), the following would apply: • Timber (60%) with an RPV of 10 = 6 • Foam (20%) with RPV of 0 = 0 • Fabric (20%) with RPV of 12 = 2.4 The chair would have an RPV of 8.4
			Exceptional Performance : In addition to the Credit Achievement, one of the following is met: • 10% of all products in building envelope (by cost) meet a Responsible Products Value score of at least 15. OR • 25% of all products in the building envelope (by cost) have an average Responsible Products Value score of at least 12.	2	0																						
Responsible Systems	The building's mechanical, hydraulic, transportation and electrical systems are comprised of responsibly manufactured products.	8.0	**Credit Achievement :** 20% of all active building systems (by cost) meet a Responsible Products Value score of at least 6.	1	0	Site-wide	**CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** Active building systems are characterised by energy and movement, and include all mechanical, hydraulic, transportation and electrical systems present in the building. Passive systems such as a façade shading device are not included. Scores for each product can be calculated by using the Responsible Products Value table. Scoring is cumulative, rewarding each initiative achieved. A product can be compliant with one or more initiatives and each adds to the product's total score. Examples of recognised initiatives that are present in the Responsible Products Value (RPV) table are: • Industry specific environmental product declarations (EPD); • Product specific environmental product declarations (EPD); • ISO14001 certification; • Climate Active Carbon Neutral Certification; • Chain of custody certification; and • Third-party product certification schemes.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Receipts confirming purchase of stated products; • Evidence that claimed products constitute 20% of all building systems; and Alternate documentation can also be used by project teams to demonstrate compliance.		x		x	x	x	x	x	x										**Responsible Products Value table** The Responsible Products Value table presents the various schemes that contribute towards the Responsible Products Value score, and their relevant weighting. The list of schemes may be updated over time. The responsible products table is available on our website. **Example of how to calculate the Responsible Products Value** **Calculating the RPV of product** A concrete mix used in the building meets the following: • The concrete mix has Climate Active Certification (a) • The concrete mix is manufactured in a plant with ISO14001 certification (b) • The concrete mix has a publicly available product specific EPD (c) To calculate the total RPV, the value of each initiative is added (a+b+c). **Calculating the RPV in a product where one or multiple components have an RPV, but the final product does not** When calculating the RPV score of a product that has a number of components, and where only one of these complies, the item should be broken down into its key major components (approximately those that make up 80% of the mass of the item in question). An approximate estimate will suffice. Each item is assigned an RPV score and multiplied by the key component makeup, and the total RPV is calculated by adding up these values. For example, in a chair with three key components (timber, foam, fabric), the following would apply: • Timber (60%) with an RPV of 10 = 6 • Foam (20%) with RPV of 0 = 0 • Fabric (20%) with RPV of 12 = 2.4 The chair would have an RPV of 8.4
			Exceptional Performance: In addition to the Credit Achievement, one of the following is met: • 5% of all active building systems (by cost) meet a Responsible Products Value score of at least 11. OR • 15% of all active building systems (by cost) have an average Responsible Products Value score of at least 8.	1	0																						
Responsible Finishes	The building's internal finishes are comprised of responsibly manufactured products.	9.0	**Credit Achievement :** 60% of all internal building finishes (by area) meet a Responsible Products Value score of at least 7	1	1	Site-wide	**CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** Internal finishes include flooring, plasterboard, paints, ceilings, partitions, doors, internal windows or similar. Where a component faces two spaces (e.g. a door), it is counted once for each space. Joinery used as part of a wall finish may be counted, e.g. wall-mounted lockers. Loose furniture is not included. Scores for each product can be calculated by using the Responsible Products Value table. Scoring is cumulative, rewarding each initiative achieved. A product can be compliant with one or more initiatives and each adds to the product's total score. Examples of recognised initiatives that are present in the Responsible Products Value (RPV) table are: • Industry specific environmental product declarations (EPD); • Product specific environmental product declarations (EPD); • ISO14001 certification; • Climate Active Carbon Neutral Certification; • Chain of custody certification; and • Third-party product certification schemes.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Receipts confirming purchase of stated products; and • Evidence that claimed products constitute 60% of all building finishes Alternate documentation can also be used by project teams to demonstrate compliance.		x	x																**Responsible Products Value table** The Responsible Products Value table presents the various schemes that contribute towards the Responsible Products Value score, and their relevant weighting. The list of schemes may be updated over time. The responsible products table is available on our website. Example of how to calculate the Responsible Products Value **Calculating the RPV of product** A concrete mix used in the building meets the following: • The concrete mix has Climate Active Certification (a) • The concrete mix is manufactured in a plant with ISO14001 certification (b) • The concrete mix has a publicly available product specific EPD (c) To calculate the total RPV, the value of each initiative is added (a+b+c). **Calculating the RPV in a product where one or multiple components have an RPV, but the final product does not** When calculating the RPV score of a product that has a number of components, and where only one of these complies, the item should be broken down into its key major components (approximately those that make up 80% of the mass of the item in question). An approximate estimate will suffice. Each item is assigned an RPV score and multiplied by the key component makeup, and the total RPV is calculated by adding up these values. For example, in a chair with three key components (timber, foam, fabric), the following would apply: • Timber (60%) with an RPV of 10 = 6 • Foam (20%) with RPV of 0 = 0 • Fabric (20%) with RPV of 12 = 2.4 The chair would have an RPV of 8.4
			Exceptional Performance: In addition to the Credit Achievement, one of the following is met: • 10% of all internal building finishes (by area) meet a Responsible Products Value score of at least 12. OR • 20% of all internal building finishes (by area) have an average Responsible Products Value score of at least 9.	1	0																						
TOTAL				17	9																						
HEALTHY																											
			Minimum Expectation : Pollutants entering the building are minimised, and a high level of fresh air is provided to ensure levels of indoor pollutants are maintained at acceptable levels.	Nil	To Comply		**MINIMUM EXPECTATION** The project must comply with all criteria below: • Ventilation system attributes; • Provision of outdoor air; and • Exhaust or elimination of pollutants. **Ventilation system attributes** **Separation from pollutants** The building ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 or AS 1668:2012 (whichever is greater) regarding minimum separation distances between pollution sources and outdoor air intakes. Windows, doors, openings, vents, grilles, and skylights are all considered outdoor air intakes for purposes of this credit and must be modelled taking into account their free area. **Cleaning ductwork** All new and existing ductwork that serves the building must be cleaned prior to occupation in accordance with a recognised Standard. This includes all ductwork in the base building that serves the building from the air handling unit(s) to the supply vents. If no ductwork exists, these requirements are deemed to be met. **Provision of outdoor air** There are three pathways projects can pursue to demonstrate compliance, as described below: **Comparison to Industry Standards** For this option, outdoor air must be provided to each space in the nominated area at a rate greater than the minimum required by AS 1668.2:2012 by 50%. To demonstrate compliance, the HVAC system must be clearly sized to accommodate the increased outdoor air rates. The project must use the design occupancy, where known, rather than the default occupancy when calculating the required rates. The design occupancy is to be determined by the project team – any assumptions made must be justified within the Submission. Where the occupant density is unknown, projects must utilise the occupancy rates prescribed within Table A1 Appendix A of AS 1668.2:2012. **Performance based approach** For this option, the system must be capable of providing enough outdoor air to maintain carbon dioxide (CO2) levels at, or less than 800ppm within each space in the nominated area, at all times during the design occupancy period. The system must continuously measure the concentration of CO2 within the breathing zone of each space during occupancy hours. The system must then adjust the amount of outdoor air to each space (up to the maximum design outdoor air quantity) to ensure that CO2 levels are maintained below the stipulated ppm threshold. **Zoning the system** CO2 sensors shall be located so that they provide accurate representative readings of the CO2 concentrations in occupied spaces. A sensor shall be installed in each enclosed space. At a minimum, CO2 sensors should be located with (and as regularly as) temperature sensors and monitor an area no greater than 500m2. **Modifying the air quality threshold** The nominated CO2 thresholds are applicable to most spaces. If appropriate, the project may nominate alternative thresholds from ASHRAE 62.1:2013. The justification must be accompanied																				**Relevant Standards** Standards for the 'Ventilation System Attributes' criterion include:

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
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GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

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Clean Air	Pollutants entering the building are minimised, and a high level of fresh air is provided to ensure levels of indoor pollutants are maintained at acceptable levels.	10.0	**Credit Achievement:** The building's ventilation systems allow for easy maintenance, and high levels of outdoor air are provided.	2	0	All Regularly Occupied Spaces	with documentation from a recognised Standard or peer reviewed research. **Natural ventilation and Residential buildings** For this option, project teams must demonstrate how they have deployed a best practice strategy to reduce and eliminate mould. **Exhaust or elimination of pollutants** It must be demonstrated that pollutants from printing and photocopying equipment, cooking processes and equipment are limited from the nominated area by either: • Removing the source of pollutants; or • Exhausting the pollutants directly to the outside. For the first option, sources of pollutants, such as printing or photocopy equipment, kitchen stoves or vehicles, must be compliant with minimum emissions standards or not be present within the nominated area. For the second option, specified sources of pollutants shall be exhausted directly to the outside of the project in accordance with a recognised Standard, and/or physically separated from occupants. **CREDIT ACHIEVEMENT** **Ventilation system attributes** Any mechanical ventilation system within the building, whether existing or new, must provide adequate access to both sides of all moisture and debris-catching components for maintenance within the air distribution system. Where it can be demonstrated that it is not possible to provide adequate access for cleaning and maintenance purposes [for example, ducted split system fan coil units (DX split/VRF/VRV)], the following conditions are applicable: • Design teams may provide access to the upstream side of fan coil units where the coils are protected by a filter rated at MERV 8 or higher and: – Provide heating only; or, – Provide cooling only with the coil assembly no more than 4 rows deep; or, – Provide dual heating/cooling with the coil assembly no more than 4 rows deep • For fan coil units or air handling units located within a ceiling void, in addition to the above criteria, the project team must fully demonstrate safe access for cleaning and maintenance. This may include: – Access panels in unit / ductwork is in close proximity to the coil to be cleaned. – Access panels in the ceiling below the unit is in close proximity to the unit / ductwork access panel. – The upstream surface of the coil must be accessible within 1m of the ceiling panel. **Provision of outdoor air** **Comparison to Industry Standards** For this option, outdoor air must be provided to each space in the nominated area at a rate greater than the minimum required by AS 1668.2:2012 by 100%. To demonstrate compliance, the HVAC system must be clearly sized to accommodate the increased outdoor air rates. The project must use the design occupancy, where known, rather than the default occupancy when calculating the required rates. The design occupancy is to be determined by the project team – any assumptions made must be justified within the Submission. Where the occupant density is unknown, projects must utilise the occupancy rates prescribed within Table A1 Appendix A of AS 1668.2:2012. **Performance based approach** For this option, the system must be capable of providing enough outdoor air to maintain carbon dioxide (CO2) levels at, or less than 700ppm within each space in the nominated area, at all times during the design occupancy period. The system must continuously measure the concentration of CO2 within the breathing zone of each space during occupancy hours. The system must then adjust the amount of outdoor air to each space (up to the maximum design outdoor air quantity) to ensure that CO2 levels are maintained below the stipulated ppm threshold. Zoning the system: CO2 sensors shall be located so that they provide accurate representative readings of the CO2 concentrations in occupied spaces. A sensor shall be installed in each enclosed space. At a minimum, CO2 sensors should be located with (and as regularly as) temperature sensors and monitor an area no greater than 500m2. Modifying the air quality threshold : The nominated CO2 thresholds are applicable to most spaces. If appropriate, the project may nominate alternative thresholds from ASHRAE 62.1:2013. The justification must be accompanied with documentation from a recognised Standard or peer reviewed research. **Natural ventilation** For this option, the nominated areas must be provided with good access to outdoor air, appropriate for the activities and conditions in the space. The naturally ventilated space must meet the requirements of AS 1668.4:2012 under all likely weather conditions. Projects must justify how the nominated area will perform as a naturally ventilated space in these conditions.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Mechanical drawings for each ventilated space; • Extract from the ventilation system specification for each system; • Extracts from the Environmental Management Plan that specify ventilation cleaning; and • Extract from the Commissioning Report demonstrating that the HVAC and CO2 monitoring systems are operating as intended. For naturally ventilated areas, this is only relevant where automation systems and the like are included.	x	x	x		x			x	x													• AIRAH HVAC 2010 Hygiene Best Practice Guideline. • ASHRAE Standard 62.1:2013, Section 5. • ACR 2006 Assessment, Cleaning and Restoration of HVAC Systems. • SMACNA IAQ Guidelines for Occupied Buildings under Construction. Standards for the 'Provision of Outdoor Air' criterion include: • AS1668.2:2012 The use of ventilation and air-conditioning in buildings - Mechanical Ventilation in buildings. • AS1668.4:2012 The use of ventilation and air-conditioning in buildings - Natural Ventilation of buildings. • ASHRAE 62.1:2013 Ventilation for Acceptable Indoor Air Quality. **Ventilation** In the case of natural ventilation, wind pressure, thermal buoyancy and ceiling fans are the only available sources of pressure to drive outdoor air movement. Where the supply and removal of air in an occupied space are provided by means other than openings in the façade, non-powered ventilators, solar chimneys or infiltration processes, the primary ventilation mode is considered to be mechanical ventilation; As per AS 1668.4-2012, failure to ensure adequate outdoor air ventilation through the minimum permissible openable openings, at all times, and adequate air movement through the enclosure may result in contaminant levels reaching concentrations that may cause adverse health effects; and The intent of the Clean Air criteria is the provision of fresh air to the occupied areas. Energy efficiency (and by extension thermal comfort) are considered in the Energy Use credit.
Light Quality	The building provides good daylight and its lighting is of high quality.	11.0	**Minimum Expectation :** The building provides adequate levels of daylight and good lighting levels suitable for the typical tasks in each space.	Nil	To Comply	All Regularly Occupied Spaces	**MINIMUM EXPECTATION** The project must comply with all criteria below: • Provide lighting comfort; • Address glare; and • Provide adequate daylight. **Lighting comfort** Lighting within the building must meet the following criteria: • All lighting must be flicker-free; • Light sources must have a minimum Colour Rendering Index (CRI) average R1 to R8 of 85 or higher, and have a CRI R9of 50 or higher; • Light sources must meet best practice illuminance levels for each task within each space type with a maintained illuminance that meets the levels recommended in AS/NZS 1680.1:2006 series applicable to the project type and including maintenance; • The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS/NZS1680.1:2006, with a maintenance factor method as defined in AS/NZS 1680.4.; and • All light sources must have a minimum of 3 MacAdam Ellipses. **Glare** Glare from light sources must be limited within the nominated area. Three options are provided for demonstrating compliance with this requirement; a performance method, and two prescriptive methods. A combination of methods can be used to demonstrate compliance to suit different spaces. **Prescriptive method 1** Bare light sources must be fitted with baffles, louvers, translucent diffusers, ceiling design, or other means that obscures the direct light source from all viewing angles of occupants, including occupants looking directly upwards. Alternatively, for LED luminaires the Unified Glare Rating (UGR), as estimated from the manufacturers data sheets for a standard room, must not exceed the maximum values listed in Table 8.2 of AS/NZS 1680.1:2006. **Prescriptive method 2** Where the nature of the tasks, layout and surface reflectance in a space are not known (e.g. shell and core) the lighting system must comply with the Luminaire selection system as detailed in Clause 8.3.4 of AS/NZS 1680.1:2006. **Performance method** The Unified Glare Rating (UGR) calculated for the lighting on a representative floor must not exceed the maximum values listed in Table 8.2 of AS/NZS 1680.1:2006. The UGR rating must be calculated in accordance with the procedure outlined in Clause 8.3.3 of AS/NZS 1680.1:2006. **Daylight** This Minimum Expectation aims to ensure the building is providing daylight access to building occupants through solutions that exceed the typical relevant federal, state, or local regulations. The project team is required to show how the building's design: • Maximises the number of occupants that are in or near daylit areas during their daily activities for all building types; • Ensures regularly occupied spaces are in reasonable proximity to glazed façades, windows or skylights; • Controls or mitigates glare in the daylit spaces; • Maximises daylight to spaces that prioritise learning, healing, and living: – For schools, how all classrooms have access to a view and daylight – For hospitals, how all patient areas have access to a view and daylight – For apartments, how in 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight. • Provides building occupants with unrestricted access to daylit indoor common spaces. As part of the submission, the project team is required to submit: • A narrative describing the building's daylight, view and glare control strategy; • A simple calculation of the amount of space that has adequate daylight as a proportion of the primary areas of the building; and • An assessment against the five requirements above. Where the above requirements are unable to be met, the project team must: • Outline the barriers to achieving the requirements and the measures taken to mitigate loss of daylight quality for occupants. **CREDIT ACHIEVEMENT** There are two parts to this credit: • Artificial lighting; and • Daylight For the Credit Achievement, at least one part must be met by the building. A combination of paths is acceptable. **Artificial lighting** This criterion applies to all regularly occupied areas in the building. Areas that are either transient or accessed intermittently such as corridors, storage, back of house or plant rooms can be excluded. Spaces can be excluded if the use of the space (for example, a laboratory) justifies specific light conditions – a Technical Question must be submitted to the GBCA for confirmation. Compliance is required to be demonstrated across 95% of the nominated area for this credit to be achieved. The artificial lighting solution must address the quality of light in the space, provide highlights and contrast, and seek to avoid excessive lighting or overly uniform solutions. • The walls within the field of view of occupants in regularly occupied spaces must have an average surface reflectance value of 0.70 and an average surface illuminance of at least 50% of the horizontal illuminance levels required for task. This requirement does not apply to green walls or to coloured/patterned/biophilic feature walls that make up less than 20% of the field of view of the occupants; and • Vertical illuminance in workspaces: ensure that 50% of the horizontal task illuminance reaches the average eye height for 90% of primary spaces using vertical illuminance calculation grid. The illuminance values must be calculated in accordance with AS/NZS 1680 series for the relevant task. Where unknown, a conservative estimate can be used. The lighting solution should provide for highlights of colour and contrast across multiple spaces. The contrast between spaces should not exceed the maximum luminance ratios as defined in AS 1680.1 Table 3.2 for visual task, immediate surrounds and general surrounds. **Daylight** For non-residential buildings, at least 40% of the principle averaged across the building must receive high levels of daylight with no less than 20% on any floor or tenancy (whichever is smaller). For residential buildings, 60% of the combined living and bedroom area of each apartment unit must comply with the daylight requirements. Kitchens are not included in the calculations. The daylight levels must also be present in at least 20% of the area of each bedroom and living area. Residential buildings and hospitality buildings must provide room blackout blinds or curtains to all bedrooms. If blinds or curtains are part of a packaged décor, all blinds offered for the bedroom décor must be blackout blinds. **EXCEPTIONAL PERFORMANCE** To claim Exceptional Performance, both criteria under the Credit Achievement must be achieved.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Daylight modelling report or manual calculations; • Lighting Drawings; • Architectural Drawings; • Lighting Specifications/Schedules; • Product Data Sheets; and • Isolux Plot Drawings	x	x	x		x			x	x													**MINIMUM EXPECTATION** **Exclusions to the CRI** There are no exclusions to the CRI requirement for internal lighting. Exterior lighting not using LED may seek to justify an exemption in accordance with AS1158 via a Technical Question. **Space and activity types** Guidance for lighting levels for different space types and activity types are listed in AS/NZS 1680.1:2006. Where recommended maintained illuminance values for a particular space are not specified, the values to be used must relate to the closest type of task as defined in AS/NZS 1680.1:2006 Table 3.1. **Glare control for daylight** Tinted glazing, fixed shading devices, or blinds and screens are acceptable methods of managing glare. **Daylight access** For non-residential buildings, it is anticipated, but not required, that at least 20% of the primary spaces per floor or tenancy (whichever is smaller) would receive access to high levels of daylight. The simple calculation of the percentage of space with adequate daylight can be demonstrated using either the guidance in the credit criteria below for daylight calculations OR by calculating the primary floor area that is within 4m of a façade with a window to wall ratio of at least 50% plus the area that is within 45 degrees line of sight to a skylight (excluding double counting of floor areas that achieve both). **CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** **Calculating daylight** There are two options for calculating daylight: • Manual calculations: Calculations must comply with the GBCA's Green Star Daylight and Views Hand Calculation Guide. • Daylight autonomy: High Levels of daylight are deemed to have at least 160 lux due to daylight during 80% of the nominated hours.
			Credit Achievement : The building provides either best practice Artificial Lighting or best practice access to daylight.	2	2																					
			Exceptional Performance: The building provides both best practice Artificial Lighting and best practice access to daylight.	2	0																					

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																									Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Hydraulic Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	
Acoustic Comfort	The building provides acoustic comfort for building occupants.	12.0	**Minimum Expectation:** An Acoustic Comfort Strategy is prepared to describe how the building and acoustic design aims to deliver acoustic comfort to the building occupants.	Nil	To Comply	All Regularly Occupied Spaces	**MINIMUM EXPECTATION** An Acoustic Comfort Strategy must be prepared describing how the building design will deliver acoustic comfort to the building occupants. The following Acoustic Comfort criteria are to be addressed: • Quiet enjoyment of space; • Functional use of space; • Control of intrusive or high levels of noise; • Privacy; • Noise Transfer; and • Speech intelligibility. The Acoustic Comfort Strategy is to include: • A summary of the Standards, legislation, guidelines and other requirements that apply to the project; • The proposed performance metrics for each of the Acoustic Comfort criteria relevant to the different uses within the building and whether this exceeds minimum legislative or best practice guidelines; and • Description of how the design solution is intended to achieve the proposed performance metrics. The strategy must be prepared by a qualified acoustic consultant during the design stage and the design solutions described in the strategy must be incorporated into the Contract Documents. **CREDIT ACHIEVEMENT** The project must comply with all criteria below: • Internal noise levels; • Acoustic separation; • Impact noise transfer through floors; and • Reverberation control (non-residential spaces only). **Internal noise** Internal ambient noise levels in the nominated areas must be no less than 5 dB below the lower range value and no greater than the upper range value relevant to the activity type in each space as recommended in AS/NZS 2107. **For residential buildings** In residential dwellings the internal ambient noise levels can exclude those services under the direct control of the occupant such as air-conditioning units and switchable exhaust fans (e.g. toilet, kitchen hoods and laundries). **For buildings with sleeping areas** In buildings with sleeping areas (e.g. residential, hotel, hospitals, etc), to achieve the Internal Noise performance requirements of this credit, noise levels must not exceed recommended Sleep Disturbance criteria as defined in the NSW EPA Road Noise Policy 2011: • Up to two noise events per night: maximum internal noise levels below 70 dB LAmax; and • All other events: maximum internal noise levels below 55 dB LAmax **Measuring noise levels** Noise measurements and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107. Noise measurements must account for all internal and external noise including noise arising from building services equipment, noise from outdoor sources such as traffic, speech masking, and (where known) noise from industrial process. Occupancy noise is excluded. For open plan spaces compliance must be demonstrated by doing 1 measurement per 100 m2. Every floor of the building is to be tested. For enclosed rooms, 10% of the enclosed roorms are to be tested. These need to be representative of the spaces within the building and reflect the range of external noise impacts on the building. The selection of representative spaces must be justified and must consider how the spaces are considered to be the most conservative with respect to both internal, and external noise sources. The acoustic compliance report must include mark-up plans of where the tests were conducted. For naturally ventilated buildings the internal noise requirements must be achieved with all windows/openings closed. The acoustic consultant should also provide the results of measurements when the windows/openings are open to no less than 10% of the minimum natural ventilation area required for the ventilation design of the building and describe how the project has been designed to minimise external noise intrusion in this configuration. These measured noise levels do not need to meet the internal noise level criteria. **Acoustic separation** The project must address noise transmission between enclosed spaces within the nominated area. There are two ways to demonstrate compliance: • Privacy; or • Sound insulation. **Privacy** **For residential:** • All walls and floors (excluding riser walls) separating enclosed spaces must exceed the minimum NCC requirements by 5 points (excluding impact noise – refer impact noise transfer credit); • Party walls separating open plan kitchens (where joinery units are fixed) from another open plan kitchen/living room shall be discontinuous in construction (discontinuous in accordance with the National Construction Code); and • Entry doors must have perimeter and threshold seals. **For all other spaces:** The sound insulation between internal spaces complies with: Dw + LAeqT > X. Where: Dw = Weighted sound level difference measured between two spaces; LAeqT = Indoor ambient noise level in the space adjacent to the enclosed space. X = 75 except for: • X = 60 for any partition with a door, • X = 80 for walls/partitions separating areas with elevated privacy requirements (e.g. meeting rooms, classrooms, wards, etc.) The sounds tests from which Dw is derived must be measured in accordance with ISO 16283-1. **Sound insulation** The partition between the spaces should be constructed to achieve a weighted sound reduction index (dB Rw) of: • At least 45; for all partitions separating enclosed spaces which are: – Fixed without a door; and/or – Glazed partitions without a door* • At least 40, for all partitions fronting a room (from an open plan area); • At least 35 (in composite with door and partition) for all partition types that contain a door; and • At least 50 through floors between occupied spaces **Impact noise transfer** Impact noise transfer measured in accordance with ISO 16283-2 through a floor where: • Floors are located above nominated areas; or • Adjacent spaces belonging to different tenancies which share a floor must not exceed dB LnT,w: – 55 for floors above residential accommodation spaces – 60 for all other spaces **Reverberation** The reverberation time in the nominated area must be not exceed the maximum for the intended use recommended in AS/NZS2107. This criterion does not apply to residential spaces.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** • Acoustic Comfort strategy. **Credit Achievement** • Detailed Drawings detailing the acoustic design features relevant to this credit. • Report by a qualified acoustics consultant confirming credit compliance. • Extracts from the commissioning report detailing relevant measured noise levels and target noise levels.			x	x	x											x						**MINIMUM EXPECTATION** **Qualified acoustic consultants** A Member or Fellow of the Australian Acoustical Society (MAAS, FAAS) or qualified staff member within an Association of Australasian Acoustical Consultants (AAAC) member firm. Alternative options can be considered through a Technical Question. **Performance metrics** The proposed performance metrics may include the following parameters which are typically used to design acoustically comfortable spaces inside buildings. Each parameter may contribute to more than one of the Acoustic Comfort Issues: • Control of external noise intrusion; • Control of internal noise sources; • Background noise masking; • Acoustic separation of spaces; and • Control of reverberation. Reference Standards The following Standards and Guidelines are examples of those expected to be referenced in the Acoustic Comfort Strategy report. The acoustic consultant will identify which apply to this project based on building type, location and client requirements. • National Construction Code (for residential); • AS/NZS 2107; • Association of Australasian Acoustical Consultants (AAAC) Guidelines (www.aaac.org.au); • Relevant State Government Guidelines and Legislation; and • Client's acoustic requirements (if applicable).
			Credit Achievement The building is designed and tested to achieve minimum acoustic performance requirements aligned with the Acoustic Comfort Strategy.	2	2																														
Exposure to Toxins	The building's occupants are not directly exposed to toxins in the spaces they spend time in.	13.0	**Minimum Expectation:** The building's paints adhesives, sealants, carpets, and engineered wood products are low or non-toxic. Occupants are not exposed to banned or highly toxic materials in the building.	Nil	To Comply	All Regularly Occupied Spaces	**MINIMUM EXPECTATION** The project must comply with all criteria below: • Paints, adhesives, sealants, and carpets; • Engineered wood products; and • Banned or highly toxic materials. **Paints, adhesives, sealants, and carpets** At least 95% of internally applied paints, adhesives, sealants (by volume) and carpets (by area) must meet stipulated 'Total Volatile Organic Compounds (TVOC) Limits' below. Compliance can be demonstrated in the following ways: • The product(s) are certified under a recognised Product Certification Scheme. The certificate must be current at the time ofpurchase; • The product(s) are tested in a laboratory; or • There are no paints, adhesives, sealants and carpets in the building at practical completion. **Page 91-92 Table** **Engineered wood products** Either no new engineered wood products are used in the building, or at least 95% (by area) of all engineered wood products meet specified formaldehyde emission limits, as per the following paige. Where there are engineered wood products, compliance to emission limits can be demonstrated in two ways: • The product(s) are certified under a recognised Product Certification Scheme. The certificate must be current at the time of purchase; and/or • The product(s) are tested in a laboratory. Formwork, car parking applications, and non-engineered wood products (such as milled timber) are excluded from the credit. **Page 92-93 Table** **Lead, asbestos and PCBs** A comprehensive hazardous materials survey must be carried out on any existing buildings or structures on the project site, in accordance with the relevant Environmental and Occupational Health and Safety (OH&S) legislation. Where the survey identified asbestos, lead or PCBs in any existing buildings or structures, the materials must be stabilised, or removed and disposed of in	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** • Extracts from contract specifications for adhesives and sealants; • Specifications that demonstrate emission levels or formaldehyde contents; • Safety Data Sheets that demonstrate the compliant emission levels or formaldehyde content; • Product VOC test certificates that demonstrate emission levels or formaldehyde contents; • Product certificates that demonstrate certification under a recognised product certification scheme or recognised standard; • Invoices and proof of purchase to demonstrate costs of compliant materials; • Bill of Quantities from Quantity Surveyor or Cost planner, demonstrating material costs; and			x	x	x		x	x	x	x	x	x									**MINIMUM EXPECTATION** **Paint and adhesives testing methods** The following VOC test methods are relevant to paints: • ISO Method 17895 (2005), for a material with a presumed VOC content <1%; • ISO Method 11890-2 (2006), for a material with a presumed VOC <15%; • ISO Method 11890-1 (2007), for a material with a presumed VOC content >15%; and • ASTM D3960, which is comprised of four individual testing procedures that measures TVOC (D2369) as well as density (D1475) and water content (D4017). Exempt compounds (D4457) must not be subtracted in the calculation of VOC content.The testing method for adhesive and sealants is the ASTM D3960 as detailed for paints. For more information on ASTM D3960 refer to South Coast Air Quality Management District Rule 1168. **Theoretical TVOC calculations** Where TVOC content for the individual items is known, a theoretical calculation based on the subtotal of the known VOC values of the product's raw material components is acceptable. This is not relevant to carpets and engineered wood products where experimental testing is required. The calculations must include the following: • Numerical TVOC results expressed in grams/litre of product; and • Statement that the results have been obtained based on the subtotal of the known TVOC values of the product's raw inpredients.

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GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																							Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	
			Credit Achievement: On-site tests verify the building has low Volatile Organic Compounds (VOC) and formaldehyde levels.	2	2		accordance with best practice guidelines; or the survey concluded that no hazardous materials were found in any existing buildings or structures on the project site. **CREDIT ACHIEVEMENT** A test must be undertaken to verify that the TVOC and formaldehyde levels are within the concentration limits **Page 94 both tables** The required samples are determined by whichever is larger between occupied areas or floors. At least three samples are to be taken per floor. These must be representative of where the occupants are likely to spend a majority of their time. Testing must be conducted: • Under designed project conditions. For example, for naturally ventilated spaces, the windows should be open during testing; • At a minimum, the lowest (that is, the ground floor entrance) and highest floors must have measurements taken, as well as floor with the highest estimated occupants; • In areas representative of the regularly occupied spaces on the floor; and • Before 12pm. Samples must be taken through an active collection method in accordance with the following standards: • ISO 16000-6; • ASTM D5197; or • EPA TO-17. Testing must take place after practical completion and prior to occupants moving into the building.	• Hazardous materials survey. **Credit Achievement** • On-site VOC test results; and • As built drawings showing the location of the test samples.																								**Lead, asbestos and PCBs** In the case of a refurbishment, this credit element is deemed to be satisfied if the existing building on the project site began construction after 1 January 2005. This includes projects that are refurbishments or building extensions of existing buildings for which construction started after 1 January 2005. The use of the hazardous materials targeted by this credit element have been banned in Australia for several years, so this topic presents no environmental benefit to new buildings. **Relevant Standards and Legislation** **Page 96 Table**
Amenity and Comfort	The building provides internal amenities that improve occupant experience of using the building.	14.0	**Credit Achievement:** The building has dedicated amenity rooms to act as parent room, a relaxation room, or an exercise room.	2	2	Site wide	**CREDIT ACHIEVEMENT** The building includes one or several rooms designed to promote either inclusivity, mindfulness or exercise for staff or occupants. For a room(s) to qualify, it must be classified as per below: • Parent room. • Relaxation, meditation, or prayer room. • Exercise room. The room size to be provided must be as follows: • The size of the room is calculated at a ratio of 1m² per every 10 occupants or staff; and • The room must be no smaller than 10m2. Building occupancy is determined by the project team and must be consistent with other credits in the submission. The room(s) must be accessible to all staff and building occupants. The room must be separate from bathrooms, showers, lockers, and active facilities. All amenities and/or infrastructure necessary to use the room(s) for its intended purposes must be provided (for example, including a sink or bench for a parent room). In addition, the room(s) must meet the following: • Credit Achievement for the Light Quality credit; • Credit Achievement for the Acoustic Comfort credit; and • The 'Equal access to the building' criterion of the Design for Inclusion credit. These amenity rooms are for staff or regular building occupants. Examples of building occupants are: • Facilities management staff • Building tenants • Residents in an apartment building • Staff in shops in a shopping centre • Workers in an industrial setting • Staff in hospitality buildings, tourism centres, or conference facilities Amenity rooms provided for the primary purpose of visitor enjoyment, even if staff can use them, are not acceptable alternatives, unless the room sizes have been designed to account for visitor numbers too. Examples of visitors include: • People who shop in shopping centre or shops • Delivery drivers • Hotel occupants • Conference attendees	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • A narrative describing the various rooms. • As build drawings showing the location and size of the rooms. • Evidence that all necessary equipment for the room type has been provided. • Evidence that the rooms comply with the Light Quality and Acoustic Comfort credits. • Evidence that the room complies with the 'Equal access to the building' criterion of the Design for Inclusion credit.		x	x																			**Types of spaces** If a project would like to claim a different type of room that provides a unique amenity to occupants, a Technical Question must be submitted to the GBCA. **Multi-functional rooms** Rooms can be dedicated to one purpose or can be a multi-functional room that caters to several of these at once. If rooms are multi-functional, then all necessary equipment for the types of uses must be provided. Rooms should be designed and built based on the needs of the demographics of the building users. The rooms should also be sized and spaced to suit the needs of the building users. It is recommemended that where multiple rooms are designed, a diverse range of room types be provided. **Design Guidelines** Below are relevant guidelines that provide useful insights and design principles for parent and first aid rooms. **Parenting room** • https://aushfg-prod-com-au.s3.amazonaws.com/download/RDS_PAR_4.pdf • https://aushfg-prod-com-au.s3.amazonaws.com/download/RLS_PAR_3.pdf **Quiet or religious rooms** •https://www.diversitybestpractices.com/sites/diversitybestpractices.com/files/import/embedded/anchors/files/_attachments_ articles/rr_quietroomsbestpractices.final_.feb2015_0.pdf
Connection to Nature	The building fosters connection to nature for building occupants.	15.0	**Credit Achievement:** The building provides views, includes indoor plants, and incorporates nature-inspired design.	1	1	All Regularly Occupied Spaces	**CREDIT ACHIEVEMENT** The project must comply with all criteria below: • Views • Plants • Nature-inspired design **Views** At least 60% of primary spaces occupied for more than two hours must have a clear line of sight to a high quality internal or external view. All floor areas within 8m from a compliant view meet this credit criterion. **Plants** Indoor plants must be provided in the nominated spaces. One or more plants in pots with a soil surface area totalling at least 500cm² for every 15m² of the primary spaces is required. An ongoing maintenance plan must be established to ensure plant health is maintained. The contract must include: • A 2-year contract with a plant maintenance contractor to enact the plan; • A schedule of plants within the nominated space; • Service intervals; • Policy regarding the maintenance of soil moisture, pH and nutrients; • Diseased plant replacement policy; and • Cleaning requirements and commitments. **Nature-inspired design** Five additional nature-inspired design interventions must be provided in alignment with the following principles: • Elements that provide differing natural sensory experiences; • Elements that reflect natural and cultural patterns and forms; • Using natural materials; and • Natural motifs and art.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Drawings showing access to views and/or line-of-site showing that no obstructions exist. • As build drawings showing the location of plants in the space. • Extracts from the ongoing management plan for plants. • Narrative of the five nature-inspired design features, along with evidence to support claims. • Evidence of how occupants can interact with nature (e.g. site plans showing green roofs).		x	x							x										**Relationship with Biodiversity Enhancement credit** Biodiversity Enhancement focuses on external landscaping that promotes biodiversity (i.e. diverse, resilient etc). This credit instead deals with internal planting, with green roofs an exception. The credits are not mutually exclusive and can be used in conjunction with one another. For example, should an accessible green roof comply with the requirements of the Biodiversity Enhancement credit, it can be used towards compliance in both credits. External landscaping that is captured as part of the Biodiversity Enhancement credit may only claimed in this credit under the 'Views' criterion (that is, as a high-quality external view). **Views** The line-of-sight shall be measured by extending a perpendicular line from the view, be it a window, opening or internal view. A line at 45° can be used at the corners of the view. The thickness of the external walls must be considered in the calculations. Internal or external columns can be ignored. A high-quality internal view is defined as a view towards an area that is landscaped or contains a water feature, or an atrium. A landscaped area must contain either high plant density, xeriscape gardens or arid climate landscaping. The landscaping may be horizontal or vertical. **Plants** If a space is completely enclosed on all sides and smaller than 25m2, such as a meeting room, this space can be excluded. The use of plants in enclosed areas cannot contribute towards achieving the required number of plants in areas neighbouring this space. Plants within an open plan space should be distributed throughout as far as possible. An ongoing maintenance plan must be established to ensure plant health is maintained. While this credit deals with indoor plants specifically, green roofs or internal green walls are deemed to comply with the credit. A green roof may only contribute 50% towards compliance with the credit and must be accessible to building occupants. This ensures that planting is still provided internally, where occupants spend most of their time. Nature-inspired design Using design elements to connect people to nature builds on the other aspects of this credit. Project teams can demonstrate this through design drawings, specifications and a narrative supporting the principles listed in the credit. The 'Biophilic Design Guidebook' by the Living Building Institute, as referenced below, contains design principles that can be used as a guide when developing these design strategies and responses.
			Exceptional Performance: ~~5% of the building's floor area or site area (whichever is greater) is allocated to nature in which occupants can directly engage with.~~	1	0		**EXCEPTIONAL PERFORMANCE** ~~Occupants can interact with nature either inside the building, or externally through a green wall or roof garden.~~ ~~At least 5% of the building's floor area or site area (whichever is greater) must be allocated to this opportunity.~~ ~~The allocated area must be accessible and have the necessary infrastructure to allow the activity to occur (for example water source/ taps for irrigation, storage area for tools and equipment).~~																						
TOTAL				14	9																											
RESILIENT																																
Climate Change Resilience	The building has been built to respond to the direct and indirect impacts of climate change.	16.0	**Minimum Expectation:** The project team completes the climate change pre-screening checklist. The project team communicates the building's exposure to climate change risks to the applicant.	Nil	To Comply	Site-wide	**MINIMUM EXPECTATION** Project team members must consider potential impacts from climate change when completing the checklist including, but not limited to: • Direct damage or failure of project components; • Accelerated deterioration of project components or reduced design life; • Reduced operating capacity; • Climate hazard impacts to surrounding areas (e.g. impacting access and egress); • Impacts to the health and wellbeing of building occupants and other relevant stakeholders; and • Indirect risks from impacts to other interdependent systems and services (e.g. transport networks, power, water, telecommunications). Both historic and future data must be used when completing the checklist. All rows and columns must be completed. The Minimum Expectation is achieved on completion of the checklist and doesn't require identified risks to be treated. The checklist must be signed off by a member of the project leadership team and shared with key project stakeholders, including the client/building owner. If the Credit Achievement for this credit is met, requirements of this assessment are considered to have been met **Page 108 Climate Change Checklist Table** **CREDIT ACHIEVEMENT** ~~**Climate change risk and adaptation assessment**~~ ~~A suitably qualified professional must undertake a climate change risk and adaptation assessment and author a report. The suitably qualified professional must:~~ ~~• Perform the assessment using the information from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report1 Representative Concentration Pathway 8.5 (RCP 8.5).~~ ~~• Perform the assessment using two timescales that are relevant to the project's anticipated lifespan: one medium-term timescale between 2040 to 2050; and one long-term timescale between 2070 to 2090.~~ ~~• Identify the primary and secondary climate change variables relevant to the project and each risk.~~ ~~• Define and include the consequence and likelihood tables and risk matrix used to assess climate risks.~~ ~~• Assess risks in consultation with multidisciplinary representatives from within the project team and a selection of relevant external stakeholders.~~ ~~• Develop a risk register of 'extreme' or 'high' risks to the building and surrounding infrastructure, and the treatment options.~~ ~~• Communicate the results of the assessment to the leads of all design disciplines.~~ ~~The author must ensure the assessment:~~ ~~• Aligns with the Australian Standard AS 5334:2013 Climate change adaptation for settlements and infrastructure; and~~ ~~• Follows the principles of risk management outlined in the Australian and New Zealand Standard AS/NZ ISO 31000:2009 Risk Management.~~ ~~**Managing risks**~~ ~~The project team must ensure risks are addressed as follows:~~ ~~• All risks rated as 'Extreme' must be addressed through specific design responses;~~ ~~• All risks rated as 'High' must be addressed through design or future operational responses; and~~ ~~• Regardless or risk rating, at least two risks identified in the assessment must be addressed by specific design responses.~~	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Climate change risk assessment. • Risk assessment criteria, including the likelihood and consequence tables, risk matrix, RCP and timescale, and any assumptions significant in the development of the assessment. • Details of the adaptation responses. • Evidence the assessment was communicated to design leads. ~~• Project risk register, highlighting the 'high' or 'extreme' identified climate change risks.~~		x	x							x										**Staging** The Climate Change Resilience risk assessment should be undertaken as early during the project's design phase as possible, such as in the concept or schematic design phase, to allow maximum benefit and opportunity to inform design decisions and implement appropriate and meaningful adaptation responses. **Risk Assessment** Priority should be given to corporate enterprise risk management or project-specific risk assessment criteria to enable climate change risks to be incorporated into the project's broader risk management processes. **Relevant external stakeholders** Examples of relevant external stakeholders include known tenants, government officials, emergency services, and utilities, or as determined by the Suitably Qualified Professional. **Internal consistency** Care should be taken when adapting multiple variables in the climate change risk assessment to ensure the scenarios are internally consistent, and not necessarily looking at the worst-case individual climate variables and simply combining them together. Some combinations of variables may not be simulated by climate models (e.g. a higher temperature scenario may always be associated with being wetter for a location, so designing to a worst case (highest) temperature with worst case (lowest) rainfall would be inconsistent as it represents an improbable future). The climatechangeinaustralia.gov.au website has publicly accessible tools to check for consistency and regional prediction data. **Base Building vs Tenant Scope** By undertaking the climate change risk and adaptation assessment during project design, opportunities to incorporate adaptation responses in the base building can be maximised, thereby improving the resilience of the building for tenant use. Additional non-physical adaptation responses, including emergency management plans and information on how to cope during extreme climate events, should be communicated to tenants and used to inform relevant tenant agreements (e.g. agreements with tenants to mandate use of blinds and shading to reduce thermal load, reduce energy consumption and reuse water to reduce reliance on mains supply). **Review process** The assessment should be reviewed and updated whenever the climate change science that informs the scenarios for assessment is updated.
			Credit Achievement: ~~The project team develops a project-specific climate change risk and adaptation assessment for the building.~~ ~~Extreme and high risks are addressed.~~	1	0																								

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DOCUMENT REVISION: 2.0 DATE: 25/02/2025

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20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

IGS INTEGRATED GROUP SERVICES

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party: Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
Operations Resilience	The building can respond to acute shocks and chronic stresses that can affect its operations over time.	17.0	**Credit Achievement :** - The project team undertakes a comprehensive review of the acute shocks and chronic stresses likely to influence future building operations. - The building's design and future operational plan addresses any high or extreme system-level interdependency risks. - The building's design maintains a level of survivability and design purpose in a blackout.	2	0	Site-wide	**CREDIT ACHIEVEMENT** **Comprehensive Risk Assessment** The suitably qualified professional authoring the operations resilience assessment must: • Identify a set of clear resilience objectives and performance goals for the building; • Collaborate with key internal and external project stakeholders, including community representatives, to identify and confirm the relevant acute shocks and chronic stresses likely to impact the functionality of the building and its ability to meet performance goals; • Identify and confirm the interdependent infrastructure systems, networks, services and assets the building relies on; • Identify key areas of system vulnerability, specifically how those may be affected by the identified shocks and stresses that may impact the building through reduced capacity and/or functionality; • Outline response procedures in the event of an identified shock event impacting the building and the local community; and • Consult with relevant authorities with regards to evacuation procedures and emergency actions. As a minimum, the following shocks and stresses must be addressed in the assessment: **Shocks** • Failure of critical infrastructure (power, water and digital); • Health pandemic; • Water security; • Geological hazards (landslides, earthquakes, tsunamis); and • Direct attack (cyber and physical) **Stresses** • Ageing infrastructure; • Rising cyber dependency; • Increasing energy costs; and • Lack of transport accessibility and availability **Managing risks** The project team must ensure risks are addressed as follows: • All risks rated as 'Extreme' must be addressed through specific design responses. • All risks rated as 'High' must be addressed through design or future operational responses. • Regardless of risk rating, at least two risks identified in the assessment must be addressed by specific design responses. **Addressing power loss** The project team must perform an assessment of the building's survivability in the case of a blackout. The building must then be designed to account for its design purpose and provide a measure of survivability for the likely occupants. The project team must identify: • The design purpose of the building, and the potential for the building to be occupied in the case of a blackout. • The needs of occupants in such a situation. This may include the building being used by the community as refuge in the case of a blackout. • The servicing needs of that building to ensure the occupants are safe during the blackout. • The appropriate duration that the building can maintain its design purpose during the blackout. • How the building can remain safely habitable after a blackout (specifically fire systems, ventilation, temperature, water pumping and vertical transportation). • How the building will be able to operate in island mode, with consideration to loss of internet services for the Building Management System or for situations where the building is being powered on site.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Operations resilience assessment. • Details of how shocks and stresses have been assessed. • Risk assessment criteria, including the likelihood and consequence tables, and any assumptions significant in the development of the assessment. • Details of the adaptation responses. • Assessment of the building's survivability during a blackout with design responses.	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	**Staging** The Operations Resilience risk assessment should be completed as early during the project's design phase as possible, such as in the concept or schematic design phase, to allow maximum benefit and opportunity to inform design decisions and implement appropriate and meaningful responses. **Climate Change Resilience** There is a strong link between this credit and the Climate Change Resilience credit, and it is encouraged that these are done in parallel, ideally within the same risk assessment. If the Climate Change Resilience credit has been completed, the climate-related shocks and stresses addressed in the credit do not need to be repeated for this credit. However, if the Climate Change Resilience credit has not been completed, climate-related shocks and stresses will form part of the assessment for this credit, with appropriate physical and non-physical responses identified. Refer to the Climate Change Resilience credit for examples of climate-related shocks and stresses. **Project scope** For the Operations Resilience credit, the relationship between the base building and tenanted spaces may be affected where a tenant is particularly impacted by a shock or stress that is not otherwise identified or prioritised by the building. The project should consider where such a scenario may occur and identify potential risks to the core function of the building, or building's ability to cater to the needs of the tenant where extraordinary conditions exist. For example, if a tenant requires uninterrupted power supply, the building will need to consider if an appropriate response can be formulated to meet this requirement, and how this will affect the core function of the building.
Community Resilience	The building contributes to improving the resilience of the community.	18.0	**Credit Achievement:** The project team undertakes a needs analysis of the community, identifies shocks and stresses that impact the building's ability to service the community, and develops responses to manage these.	1	0	Site-wide	**CREDIT ACHIEVEMENT** The project team must develop a community resilience plan that: • Defines its surrounding local community, and the groups which rely on or interact directly or indirectly with the building. In addition to considering tenants and visitors, this must identify key vulnerable communities; • Identifies resilience objectives and goals associated with servicing the community; • Identifies social considerations affecting the community; • Identifies acute shocks and chronic stresses that impact the project's function and ability to service the community (including climate-related shocks and stresses if the Climate Change Resilience credit is not targeted); • Demonstrates how the development of actions (physical and non-physical responses) to manage the impact from shocks and stresses is in response to the outcomes of community engagement; • Shows how the two most significant impacts identified are dealt with specifically through the building's design; and • Identifies how material shocks and stresses identified for the building may impact on these stakeholders by considering clear set of social indicators (see Guidance section). The project team must undertake at least one community capacity building activity prior to or during construction. A suitably qualified professional must author the community resilience plan.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Community resilience plan. • Overview of the community capacity building activity.	x																		**GUIDANCE** **Social considerations** The below are examples of social considerations that projects may identify as potential stresses facing the community: • Support and improve community wellbeing and social cohesion; • Improve community health and wellbeing to counter increasing instances of chronic illness, lifestyle diseases and the demand on health services and infrastructure; • Minimise the impacts associated with rising energy costs; • Provide opportunities for local employment, skills development, training and education; • Support the provision of, and access to, public and active transport modes; and • Reduce dependency on energy, power, digital and transport networks and build redundancy in the event of failure or disruption **Physical and non-physical responses** The implementation of responses may form part of design of the building (physical), or include further stakeholder engagement during construction, or defer to the operation phase (non-physical). The physical and non-physical responses must be prioritised based on self-assessment (e.g. based on standard assessment criteria such as cost, ease of implementation, effectiveness towards achieving intended outcome, delivery of co-benefits etc.). **Community resilience frameworks** This credit is focused on community resilience and thus community resilience frameworks can be a useful resource when working through the credit. Various tools, frameworks and guidelines exist that either aim to address community impacts beyond a project footprint or are established at the community or city scale. These tools document principles and processes for addressing community level risks associated with disaster and building capacity to respond. Examples includes the UN Office of Disaster Risk Reduction, and 10 Essentials for City Resilience. **Community engagement** The level of effectiveness of this credit will be influenced by the level of engagement with the community, therefore community engagement throughout the project life cycle is recommended. For the project to deliver the best results, early engagement should be sought. Community members for residential buildings may include residents, nearby residents, local community and interest groups, staff, regular visitors or users of facilities accessible to the public. For commercial and mixed-use premises this can also include tenant businesses, customers, staff, and nearby residents who may be affected by the development. While this credit only requires one community engagement activity, it is encouraged that projects engage with their community on several occasions.
Heat Resilience	The building reduces its impact on heat island effect.	19.0	**Credit Achievement :** At least 75% of the whole site area comprises of one or a combination of strategies that reduce the heat island effect.	1	1	Site-wide	**CREDIT ACHIEVEMENT** The strategies that can be used to reduce the heat island are: • Vegetation; • Green roofs; • Roofing materials, including shading structures, having the following: – For roof pitched <15°– a three-year SRI of minimum 64; or – For roof pitched >15°– a three-year SRI of minimum 34. • Unshaded hard-scaping elements with a three-year SRI of minimum 34 or an initial SRI of minimum 39; • Hardscaping elements shaded by overhanging vegetation; and • Water bodies and/or water courses. The area of the site that is shaded by permanent structures (e.g. part of a car park to the south of a tall building) during the summer solstice are also deemed compliant.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Site Plan highlighting all relevant areas as referenced within the area schedule; • Area Schedule listing the areas of each of the relevant site elements and where relevant, the SRI values and referencing plan drawings for the site; and • Supplier Documentation material data sheet for compliant roofing and hardscape materials.	x	x	x	x						x		x						**Selection of hardscape materials** Hardscape paving materials are defined as all materials in roads, plazas, paths and open unshaded car parks. Typical initial SRI values are provided below for reference. These typical SRI values are provided as a guide only and cannot be used to demonstrate compliance with this credit. • Grey concrete: 35 • White concrete: 86 • Standard white paint: 100 • Standard black paint: 5 • New asphalt: 0 Project-specific SRI values must be identified for the materials used in the project. Where the three-year Solar Reflectance Index (SRI) for products is not available, use the following: • For roof pitched <15° – an initial SRI of minimum 82; or • For roof pitched >15° – an initial SRI of minimum 39. **Solar hot water and Photovoltaic panels** Although these roof structures have low SRI values, given the nature of their function, they provide a source of low-emission energy production which results in flow-on sustainability benefits. These features are to be excluded from the calculation of site area percentages for both compliant and non-compliant areas. The surface area in plan view covered using solar hot water or photovoltaic panels should be subtracted from the total site area of the project. At least 75% of the remaining site area must meet the compliance requirements for this credit to be claimed. **Shaded at summer solstice** This is an accepted pathway because the sun tracks North in the Southern hemisphere, causing buildings to cast shadows to the South. Any areas that are shaded by the building at summer solstice can be included in the calculation as the shadows will be the shortest on this day. **Overhanging vegetation** For overhanging vegetation to qualify, it must provide shading all year round. Vegetation that provides seasonal shading cannot count towards compliance. **Green roof** Only areas of the roof that are covered by plants or vegetation (either through landscaping or planter boxes) may contribute towards the compliant areas. In the case of planter boxes, evidence of their installation or purchase must be provided at the time of submission. **Skylights** Project teams may exclude the skylights from the calculations of the area when assessed in a plan view. Glazing over an atrium or void qualifies as a skylight. These features are to be excluded from the calculation of site area percentages for both compliant and non-compliant areas. **Translucent polycarbonate roof sheeting** Translucent polycarbonate roof sheeting can be excluded from the calculation of site area percentages. The surface area in plan view covered by translucent roof sheeting may be subtracted from the total site area of the project for both the compliant and non-compliant areas. This is on the following condition(s): • The translucent roof area is to comprise no more than 20% of the overall roof area. • At least 75% of the remaining site area must meet the compliance requirements for this credit to be claimed. • The project team must demonstrate how the translucent roof sheeting has other flow-on sustainability benefits that make it equivalent to solar hot water and photovoltaic panels.

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IGS INTEGRATED GROUP SERVICES

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																				Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	
Grid Resilience	The building contributes to the functioning of the grid as it transitions to a higher level of renewable energy capacity.	20.0	**Credit Achievement :** The building meets one or several of the following: • Provides active generation and storage systems; • Has the infrastructure to deliver an appropriate demand response strategy; or • Has reduced its electricity consumption through passive design.	3	0	Site-wide	**CREDIT ACHIEVEMENT** The project meets one or a combination of the paths outlined below: • Active generation and storage systems; • Demand response; and • Passive design solutions Where active generation and storage systems and demand response management are jointly used, the overall reduction must be 10% of the building's total electrical load. **Active generation and storage systems** The building has the capacity to reduce its electricity peak demand by 10% of the building's annual peak electricity demand for at least a one-hour period. The peak demand reduction can occur through thermal storage solutions (such as chilled water storage systems), by electricity storage solutions (batteries), or through renewable on-site generation. Where the electricity demand reduction is achieved by using on-site generation or electricity storage: • The system (generation or storage) must incorporate switch gear and transfer switches to enable it to operate in the event of grid outage or grid demand response event. This means that the system should be able to work in either: • A long-term paralleling with the grid mode, such that the generator can export back to the grid; or; • Island mode to power the building, or to power critical building systems. • The building must have approvals in place with the electricity utility company to operate as a peak reduction system and to have the capacity to become part of a network load demand system or to operate in island mode should it be required. Unless a separate agreement exists with the network operator, the generator must not export more than 30% of electricity generated to the grid during peak solar generation periods. That is, the building should be consuming, storing, or transferring through a micro-grid to other buildings, most of the available excess electricity being generated. For this pathway, the building management system (BMS) must include a demand management dashboard that shows the peak demand target, current, historical demand, alongside the critical performance characteristics. The BMS must also have the capacity to accept external control signals to enable signing up to current or future demand response programs. The active demand management strategies must also be tested and commissioned prior to occupancy, assuming a full load profile on a peak day. **Demand response** The demand response strategy must show how at least 10% of the building's annual peak electricity demand is being shed without affecting occupant amenity (comfort, lighting, movement) as outlined in credits Light Quality and Amenity and Comfort for at least 4 hours. This pathway relies on the building having the plan and infrastructure to manage demand responses, which includes: • Ensuring the building's automated management system has forward predictive capabilities (based on potential weather events outside standard design days, or predictions by the network operator) to alert building management to a potential event; • Having a demand management dashboard that shows the peak demand target, current, historical demand, the demand shedding priorities and enabling button alongside the critical performance characteristics (usually comfort temperature); • Having the building management system provide an automated way to start their load shedding strategy and enable communication to relevant parties; • Having the ability for the building's automated management system to accept external control signals to enable signing up to current or future demand response programs; and • This pathway also relies on ensuring the demand response strategy is tested, and that occupants and the building management system are aware what the implications are. This means: – Including load shedding responses in the scope of work for the commissioning activities. – Including the load shedding strategy in the relevant building management manuals and training. – Introducing a communication strategy to outline to occupants how they will be impacted on the day of a potential event. – Where the building is tenanted, introducing language in leasing contracts outlining the load shedding strategies and what impacts these may have on tenants. Occupant amenity is defined as maintaining a similar level of operation as when the building is not load shedding. **Passive design solutions** For this criterion to be awarded, the building must achieve the below: • The building's facade demonstrates a 10% improvement over a reference building modelled to Section J requirements of the National Construction Code 2019, or the version of the code applicable to the building's construction, whichever is later. The calculation must follow either Method 2 in the wall/glazing calculator or use a JV3 model; and • The building is mostly naturally ventilated (that is, the building has no mechanical cooling or heating for 80% of the building's occupiable area); and • The building's occupiable area is less than 3,000sqm. Buildings that don't meet this criterion that have are passively designed, should contact the GBCA for alternative paths. This path does not apply to industrial buildings or data centres.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Active generation and storage systems** • Energy model demonstrating the buildings peak energy demand; • Description of active generation or storage systems or technologies; • Overview of the buildings BMS; and • Evidence of approval with utility provider or evidence that no more that 30% of generated electricity is exported. **Demand response** • Description of the plan or infrastructure to manage demand response; and • Evidence that the system has been implemented into building commissioning processes and tested. **Passive design solutions** • Energy model showing the building's façade demonstrate a 10% improvement over reference buildings; • Mechanism drawings or other showing how the building is mostly naturally ventilated; and • As built drawings showing the occupiable spaces.		x				x														**Applicability** This credit is applicable to the energy modelling of Class 2 to 9 buildings. Refer to the Energy Consumption and Greenhouse Gas Emissions Calculation Guidelines for details on how to complete the modelling calculation, including definitions. **Issues related to this credit** This credit aims to address the following issues related to enabling the ongoing transformation of the grid. The credit aims to encourage two approaches to this interaction: • Managing demand; • Managing a building's capabilities to provide energy to the grid, or to adjust the building's demand in response to the needs of the grid at a point in time; There are five key components to this credit: • The degree to how much the building is impacting on the grid during peak times or similar shocks; • The capacity for the building to contribute to increasing the amount of renewable energy into the grid; • The opportunity for the building to provide short or on-demand flexibility to manage its energy consumption; • Aligning supply of unscheduled generation (wind, solar) and demand for energy; and • The opportunity for the building to increase the grid's resilience during its peak. If alternative solutions exist that address two or more of these components, project teams are encouraged to contact GBCA to develop an alternative path. **Peak demand reduction** Project teams are encouraged to review demand response, load shifting and onsite energy storage solutions to meet this credit. Energy storage solutions may be electricity storage (for example, batteries) or thermal storage (for example, chilled water tanks). The term "electricity demand reduction" has been referenced in this credit. Other terms, such as "peak lopping" or "peak shaving" are used interchangeably with "electricity demand reduction" and essentially deliver the same outcome. **Onsite energy generation** This element of the credit aims to optimise energy generation onsite with the demand profile, either through demand-response, sizing of renewables or using onsite energy storage solutions such as batteries. The purpose is not to unnecessarily reduce renewable energy generation. The intent is to encourage the availability of renewable energy at times of peak demand. The 30% energy export has been calculated to allow for weekend energy export assuming there is no energy used onsite during that same period. **Micro-grids** As the aim of this credit is for the building to work with the wider grid, a building connected to a micro-grid can use the flexibility and capacity of the micro-grid to optimise the building's impact on the wider grid. The inclusion of micro-grids recognise precinct scale energy masterplans where some buildings have significantly higher renewable energy generation potential than it can use, such as industrial buildings. This allows buildings to export locally in a micro-grid that is designed to support the volume of energy trading, without impacting the wider electricity network. **Onsite diesel generation and net zero** This credit does not recognise the use of diesel generators to encourage managing grid interactions. While diesel generators may be an effective way to manage grid interactions, this credit is aiming to provide a best practice approach to delivering its outcome. As diesel generators are typically found in buildings, this outcome is not considered beyond standard practice. However, noting that diesel generators can be used to achieve the goals of this credit, we recommend scheduling the regular generator start up and loading as part of the maintenance schedules to coincide with peak demand reduction events to get maximum use of the burnt fuel. We also recommend that you review the content of this credit and consider how your generator can support grid decarbonisation. However, this will not be rewarded. **Base building vs tenancy** For the Grid Resilience credit, the base building should consider the relationship with the tenanted spaces and how tenant operations may have an impact on the base building peak demand, both in terms of magnitude and timing. However, we note the credit is only going to be scored on managing base building services. In cases where tenancy or process loads were included in the peak energy calculations, the project team should detail in their submission that this is the case, and note that the profile of the building shown for this credit may differ from that shown in the Energy Use credit. **Future opportunities** While this credit is concerned at this time with the resilience of the grid during specific events, there is the opportunity to develop solutions that assist the grid on an on-going basis. This could take shape of hosting significant battery or thermal storage to help modulate grid interactions, or other similar solutions, particularly at the precinct level. We expect future updates to this credit to move in this direction.
TOTAL				8	1																								
POSITIVE																													
Upfront Carbon Emissions	The building's upfront carbon emissions from materials and products have been reduced and offset.	21.0	**Minimum Expectation:** The building's upfront carbon emissions are at least 10% less than those of a reference building.	Nil	To Comply	Site-wide	Upfront carbon emissions are those from modules A1 to A5 as defined in EN 15978. **MINIMUM EXPECTATION** **Reducing upfront carbon emissions** The building's upfront carbon emissions reductions must occur through good design and material selection. Carbon offsets purchased against the building's upfront carbon emissions from construction cannot be used to show compliance against the 20% reduction in the Credit Achievement or the Exceptional Performance. The reduction targets for the Minimum Expectation, Credit Achievement, or Exceptional Performance do not include demolition works. However, to claim the Credit Achievement and Exceptional Performance, demolition works must be offset. Calculating upfront carbon emission reductions To demonstrate compliance, project teams can either: • Model the proposed and reference buildings following the methodology of the Life Cycle Impacts credit; or • Complete the Upfront Carbon Emissions Calculator. Project teams seeking to achieve the Exceptional Performance must use the Life Cycle Assessment pathway. **Exclusions** • Demolition works are excluded from the Minimum Expectation. **CREDIT ACHIEVEMENT** **Reducing upfront carbon emissions** The building's upfront carbon emissions reductions must occur through good design and material selection. Carbon offsets purchased against the building's upfront carbon emissions from construction cannot be used to show compliance against the 20% reduction in the Credit Achievement or the Exceptional Performance. The reduction targets for the Minimum Expectation, Credit Achievement, or Exceptional Performance do not include demolition works. However, to claim the Credit Achievement and Exceptional Performance, demolition works must be offset. **Calculating upfront carbon emission reductions** To demonstrate compliance, project teams can use either: • Model the proposed and reference buildings following the methodology of the Life Cycle Impacts credit.; or • Complete the Upfront Carbon Emissions Calculator Projects must document a reduction in upfront carbon according to the materials and products in the scope **Offsetting demolition works** Demolition works must be captured and offset. Where an existing building less than 30 years old has been fully or partly demolished for construction, an embodied carbon calculation must be done for the demolished portion and these emissions offset. Where the existing building is between 30 to 50 years old, the contribution must be calculated and discounted at 10% for every two additional years past year 30. In the absence of available data, the existing building can be assumed to follow modern code-compliant construction techniques for the purposes of this calculation. **EXCEPTIONAL PERFORMANCE** In addition to meeting the Credit Achievement, the developer, applicant, or building owner must offset all remaining upfront carbon emissions from Modules A1 – A5. Project teams seeking to achieve the Exceptional Performance must use the Life Cycle Assessment pathway.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission • Life Cycle Assessment report (if pathway used) • Upfront Carbon Emissions Calculator (if pathway used) **Suggested evidence:** • Bill of quantities showing materials used. • Documentation as per Life Cycle Impacts credit (if pathway used).		x	x	x	x	x	x	x	x	x	x		x					x	**Project scope** In tenanted buildings, upfront carbon emissions from tenant fitouts are considered in the sector-specific credit Tenant Emissions. **Pathways to demonstrate compliance** Life Cycle Assessment (LCA) If a project team has completed a LCA in accordance with the Life Cycle Impacts credit, results from that assessment can be used to demonstrate compliance with this credit. In this case, the project team shall report on the global warming potential impact of modules A1 - A5. This result shall be entered into the GBCA Upfront Carbon Emissions Calculator. The calculator will show the percentage reduction. Simple carbon calculation The GBCA Upfront Carbon Emissions Calculator can be used to calculate the reduction in the building's upfront carbon emissions. **Low-carbon or carbon neutral products and design** All claims of carbon in products must be accompanied by 3rd party verified data, such as in Environmental Product Declarations (EPD). The following can be used to contribute towards compliance with the credit: **Carbon Neutral Products** Products certified under the Climate Active Carbon Neutral Standard can contribute toward compliance. If a project seeks to use a different Standard, a Technical Question must be submitted to the GBCA justifying its equivalency. Additional schemes will be added once they become available and added as a FAQ on the GBCA's website. Environmental Product Declarations (EPDs) EPDs used for the Responsible Products credits may be used to demonstrate compliance. If a product with an EPD is used that is not claimed in the Responsible Products credits, the complying EPD and proof of use of the product must be included in the submission. **Offsets** Residual upfront carbon emissions beyond the Credit Achievement reduction target, and carbon emissions from demolition works, may be offset through verified offset schemes. Acceptable offset schemes are listed in the Renewables and Offsets in Green Star Guide. **Upfront carbon emissions calculator** The calculator provides a simplified methodology for calculating the upfront carbon emissions of a building. It calculates the Modules A1 to A3 upfront emissions associated with at least the following materials: • Concrete (total); • Steel, structural and reinforcement; • Structural timber and frames; • Internal and external glass and glazing, including framing; • Façade materials and cladding; • Masonry (brickwork and blockwork) and stone including grout; • Pipes and conduits, including plastic and metal; • Internal wall and ceiling lining including plasterboard, fibre-cement, timber cladding; • Roofing including tiles and sheet metal; and • Floor coverings for example, carpets, ceramic tile and floor panels Materials used in the calculator must capture at least 90% of physical materials and 90% of financial value of building products. Any material not listed above that may be significant to the project's upfront carbon emissions must be captured.
			Credit Achievement: – Net Zero Path – The building's upfront carbon emissions are at least 20% less than those of a reference building.	3	3																								
			Exceptional Performance: The building's upfront carbon emissions are at least 20% less than those of a reference building, and all remaining emissions from Modules A1 – A5 are offset.	3	0																								

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																									Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	
Energy Use	The building has low energy consumption.	22.0	**Minimum Expectation:** The building's energy use is at least 10% less than a reference building.	Nil	To Comply	Site-wide	**Note:** The project team to conduct energy simulation to determine performance and the number of points achievable. **ALL PERFORMANCE LEVELS** Energy use is measured as MJ/m2/year. This credit defines the reference building as a building modelled to Section J requirements of the National Construction Code 2019 or later. If the building's approval is subject to a later code, that building must use the latest version. The results from the energy model must include all energy consumed by base building systems. Consumption from tenant systems such as plug loads, domestic appliances, and manufacturing or process loads are excluded from the calculation. Refer to the Greenhouse Gas Emissions Calculator Guide for more information. **Minimum compliance** The energy model must show the following has been met: • For all buildings, each building's system and façade must comply with the corresponding Section J requirements in the National Construction Code. That is, the building cannot show that their façade, or any system, performs worse than the reference building even if the overall energy use reduction is 10% or more. • For residential buildings, no individual apartment can be less than the larger number of: – The minimum NatHERS rating stated in the code, or – 6.5 star NatHERS rating. **On-site renewables** The Minimum Expectation addresses the energy use from the building's systems and the effect of the building's façade. Therefore on-site renewable energy generation systems connected behind the meter cannot be used to calculate reductions in energy use of the building for the Minimum Expectation. On-site renewable energy generation systems connected behind the meter can be used to calculate reductions in energy use of the building beyond the Minimum Expectation requirement for Credit Achievement and Exceptional Performance.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Energy modelling report; • Extracts from specifications; • Extracts from commissioning reports; • As built drawings of the façade; • Evidence of renewable energy generation on-site (e.g. contracts, as built drawings); and • Schedule identifying all on-site storage systems installed in the building.																												**Alternative pathways for demonstrating compliance** An alternative pathway is provided for Commercial office buildings. Alternative pathways may be released at later stages. Project teams are encouraged to propose their own through a Technical Question. **For commercial office buildings** An alternative pathway to demonstrate compliance is to sign and comply with a NABERS Energy rating Commitment Agreement. This pathway recognises NABERS Energy Commitment Agreements where a NABERS-recognised Independent Design Reviewer has completed a full peer review of the base building design and associated energy performance simulation assessment. The below NABERS Energy Rating Commitment Agreements are accepted: **Page 138 Table** * The modelling margin is inclusive of the modelling margin for the NABERS Commitment Agreement, not in addition to. The scope of the NABERS Energy rating is base building only, and currently applies to Class 5 offices only. The energy performance results shall use reference scenario modelling inputs, not off-axis scenario inputs. Refer to the NABERS Energy Guide to Building Energy Estimation for more information. This pathway may be used to assess the Class 5 component building total GFA. The reference pathway must be used for the modelling of the remainder of the building. **Project scope** For buildings with lettable tenanted spaces, Green Star Buildings expects the building owner/developer to deliver solutions within the lettable area of a building that meets the Green Star credit criteria, not the tenant. Awarding credits for a base building cannot depend wholly on a tenant to be responsible for delivering outcomes. This extends to Cold Shell areas. Cold Shell areas are becoming increasingly common in the Australian market. The rating tool expects that for Cold Shell areas, the base building [services] will enable the tenant to build high quality spaces, meaning the delivery of outcomes is still expected. As such, for tenanted spaces, modelling of energy use can be based on the provision of base building systems to the tenancy and an assumption that minimum NCC requirements will be met. Alternatively, if specified in leasing requirements, Tenancy Fitout Guides or similar, modelling can be based on minimum requirements included in these documents. This guidance would need to identify (including but not limited to) the tenant's allowable internal loads (tenant lighting and equipment power allowances), HVAC system zoning requirements (internal and perimeter zones with independent temperature control), HVAC system type & design capacities, and outdoor air rates. For standalone tenant systems, projects may model based on minimum requirements outlined in leasing agreement documentation as above.
			Credit Achievement : – Net Zero Path – The building's energy use is at least 20% less than a reference building.	3	3																													
			Exceptional Performance: ~~The building's energy use is at least 30% less than a reference building.~~	3	0																													
Energy Source	The building's energy comes from renewables.	23.0	**Minimum Expectation:** The building provides a Zero Carbon Action Plan.	Nil	To Comply	Site-wide	**Net Zero Carbon in Operations Pathway Bonus** This credit is part of the Net Zero Carbon in Operations path in Green Star Buildings (see page 19 in the Introduction). When the pathway is achieved, an additional Leadership Challenge point is awarded to the building for a total of 15 points for this path. **MINIMUM EXPECTATION** **Zero Carbon Action Plan** The project team must develop a Zero Carbon Action Plan for the building. The plan must be signed off by the building owner or developer and included in any operational documents for the building. The Zero Carbon Action Plan must include a target date by when the building is expected to operate as net zero carbon. The Zero Carbon Action Plan must cover all energy consumption, procurement, and generation and cannot rely on procuring renewable fuels as its only solution. It must also include infrastructure provided for tenants or future occupants such as gas installations for cooking. The Zero Carbon Action Plan must be done prior to the tender phase of the project. The plan must: • Quantify the building's scope 1 (including refrigerants) and 2 emissions between now and 2050 without any interventions; • Quantify the building scope 1 (including refrigerants) and 2 emissions in 2050 once all interventions have occurred; • Describe the changes the building is required to undertake to be net zero carbon in operation as the distinct parts of the building's systems reach end of life; • Identify spatial considerations and physical interventions needed to replace fossil fuel using equipment, refrigerants and infrastructure; • Perform a cost analysis of the potential costs and savings if the building was designed to be net zero; and • Be signed-off by the building owner or the developer. It must also outline, if relevant: • A description of energy-consuming electrical, mechanical, or hydraulic systems and any refrigerants used; • Any future spatial requirements or changes to plant rooms stemming from changes to existing building systems; • Any additional capacity built into the building, substations, or building systems to enable any proposed changes. This may include the capacity to accommodate any future additional loads, energy storage or demand response solutions which may occur or be implemented during the life of the building; and • An upgrade or replacement timeline for the distinct systems, or system components, describing the point at which they are to be replaced with the appropriate alternatives. **CREDIT ACHIEVEMENT** All electricity under the control of the building owner or operator must be accounted for and sourced from renewables. Electricity use for tenant loads is excluded from this credit (see Tenant Emissions). Both on-site and off-site renewables are acceptable. Where the project team claims the credit through off-site renewables, the building owner must sign a renewable energy contract. The shortest contract length is: • Five years; or • Where the building is owned and managed by an entity that has signed to the Global Commitment for Net Zero Carbon Buildings managed by WorldGBC, the shortest contract length is three years. Other commitments may be acceptable through a Technical Question. The contract can be part of a corporate power purchasing agreement for a building portfolio. **EXCEPTIONAL PERFORMANCE** ~~This credit addresses the following:~~ ~~• Energy under the control of the building owner or operator; and~~ ~~• Non-electricity energy uses that are not under the building owners' control, such as cooking or heating that uses liquid or gaseous fuels burned on site, with some minor exceptions (see Guidance).~~ ~~Energy use for tenant loads is excluded from this credit.~~ ~~Both on-site and off-site renewables are acceptable.~~ ~~Where the project team claims the credit through off-site renewables, the building owner must sign a renewable energy contract. The shortest contract length is:~~ ~~• Five years; or~~ ~~• Where the building is owned and managed by an entity that has signed to the Global Commitment for Net Zero Carbon Buildings managed by WorldGBC, the shortest contract length is three years. Other commitments may be acceptable through a Technical Question.~~ ~~The contract can be part of a corporate power purchasing agreement for a building portfolio.~~ ~~Should infrastructure in the building that can use fossil fuels to power typical building systems exist, the applicant must show how it will not use fossil fuels during the building's operation.~~	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Zero Carbon Action Plan with supporting evidence; • Signed PPA including extracts on the length of contract; • Evidence that the PPA or on-site generation covers 100% of electricity or energy; and • Public commitment to the Global Commitment for Net Zero Carbon Buildings managed by WorldGBC.	x	x		x	x			x	x	x																**Applicability** This credit applies to all building sectors. For industrial buildings and other building types where the building owner doesn't retain operational control of the site, the scope is all electricity and energy as required to be accounted for in the Energy Use credit. **Exceptions** A small amount of fossil fuels is allowed for cooking or emergency purposes. The total modelled energy consumption from fossil fuels (MJ/m2/annum) cannot be more than 1% of the building's total modelled energy use. In this case, the building applicant must buy carbon offsets equal to 5 years of fossil fuel emissions. See the Renewables and Offsets Guide for more information on acceptable offsets. This credit does not address gas use for manufacturing or research purposes. GBCA encourages project teams to look at how to decarbonise these loads as part of the development of the project. However, as these aren't building loads, these are not eligible for a market transformation claim. **Green Star rating and renewable energy** Where the building's energy use comes from renewables, the Green Star certificate will note that the building's rating is valid provided the procurement of renewable electricity or energy continues. Should the building not continue to be powered by renewables, the building owner can no longer communicate the rating. **Renewable electricity** The building is considered to have all of its electricity considered as renewables if the sum of all renewable energy generated on-site and off-site is equal to, or greater than, the total electricity use of the building annually. **Refrigerants** Synthetic refrigerants are made up of chemicals that have a high global warming potential (GWP). GWP is the relative amount of degradation the refrigerant can cause to global warming. Because of this, refrigerants must be safely disposed at the end of their life at great cost. In the future building owners may be impacted by future requirements for safe disposal which may include increases in penalties that should be considered today. Alternatives to synthetic refrigerants include nature refrigerants such as water, carbon dioxide, ammonia and hydrocarbons. They are currently available and are valid alternatives to current synthetic refrigerants. **Market-based method and the renewable power percentage (RPP)** Project teams can claim the percentage of renewable energy in the grid (the RPP) as published by the Clean Energy Regulator at the date of Practical Completion of the building as off-site renewable energy supply. For further information, refer http://www.cleanenergyregulator.gov.au/RET/Scheme-participants-and-industry/the-renewable-power-percentage
			Credit Achievement : 100% of the building's electricity comes from renewable electricity.	3	3																													
			Exceptional Performance : ~~– Net Zero Path –~~ ~~100% of the building's energy comes from renewables.~~	3	0																													
Other Carbon Emissions	The building's emissions from refrigerants and remaining carbon sources are eliminated or offset.	24.0	**Credit Achievement :** – Net Zero Path – The building owner eliminates or offsets emissions from refrigerants.	2	2 (if required not counted)	Site-wide	**CREDIT ACHIEVEMENT** All refrigerants from building systems or domestic appliances provided by the building must be captured in the credit. This includes where fridges or freezers are provided as part of a fitout package in a residential setting. There are two pathways available: • Eliminates high-GWP refrigerants from the building; or • Offsets 100% of carbon emissions from refrigerants. **Eliminating refrigerants** High-GWP refrigerants must be eliminated from the building. The use of refrigerants with a GWP of 10 or less is considered to comply with the credit. Natural refrigerants in most cases comply with this criterion. **Offsetting refrigerants** Emissions are calculated by multiplying the total refrigerant charge by its Global Warming Potential (GWP) for each type of refrigerant, and adding these together. Where refrigerants are used in the building, adequate access for maintenance and/or replacement must be provided. **EXCEPTIONAL PERFORMANCE** ~~This Exceptional Performance aims to address emissions that have not been addressed by claiming other credits. If other credits have been claimed, the emissions that are to be offset in this credit are lower.~~ ~~The emissions addressed in this credit are:~~ ~~• Emissions from the building's electricity use (as determined in the Energy Use credit) multiplied by the grid coefficient (unless the Energy Source Credit Achievement is met, in which case these emissions are zero);~~ ~~• Emissions from the building's energy use as determined in the Energy Use credit (unless the Energy Source Exceptional Performance is met, in which case these emissions are zero);~~ ~~• Upfront carbon emissions as determined in the Upfront carbon emissions credit (unless the Upfront Carbon Emissions is met, in which case these emissions are zero);~~ ~~• Life-cycle emissions from modules B and C as calculated in Life Cycle Impacts;~~ ~~• Emissions from construction equipment use, and utilities during construction on site; and~~ ~~• Construction waste emissions.~~ ~~The project team must include the above and any other carbon emissions over 1% of the total carbon emissions profile for the building (significant emissions).~~ **~~Alternative calculation method for Exceptional Performance~~** ~~As an alternative path to calculating emissions from items 4 to 6 the building owner can make an additional offset purchase equal to 5 years of modelled operational energy use (from the Energy Use credit), multiplied by the current grid coefficient to cover additional emissions not captured by any other calculation. These are not offsets for future operational use, rather they address emissions related to other carbon sources not already captured.~~	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Confirmation that refrigerants have been eliminated from the building along with supporting documentation (e.g. mechanical as built drawings); • Calculations showing the total refrigerant charge to be offset; • Evidence of purchase of offsets (e.g. contract) clearly showing the length of offset; and • Overview of the remaining carbon emissions and evidence of their offset.				x		x			x																	**Excluded equipment** Where specialty medical or manufacturing equipment exists, project teams should submit a Technical Question to the GBCA if they intend to exclude such equipment from the calculations. **Offsets** Refer to the Renewables and Offsets Guide in Green Star for more information on eligible offsets. **Refrigerants** Synthetic refrigerants are made up of chemicals that have a high global warming potential (GWP). GWP is the relative amount of degradation the refrigerant can cause to global warming. Because of this, refrigerants must be safely disposed at the end of their life at great cost. In the future building owners may be impacted by future requirements for safe disposal which may include increases in penalties that should be considered today. Alternatives to synthetic refrigerants include nature refrigerants such as water, carbon dioxide, ammonia and hydrocarbons. They are currently available and are valid alternatives to current synthetic refrigerants.
			Exceptional Performance: ~~All other emissions not captured in the Positive category are eliminated or offset.~~	2	0																													

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area
Water Use	The building has low water use.	25.0	**Minimum Expectation:** The building installs efficient water fixtures or uses 15% less potable water compared to a reference building. Multi-unit residential buildings use 10% less potable water compared to a reference building.	Nil	To Comply	Site-wide
			Credit Achievement: The building uses 45% less potable water compared to a reference building. Multi-unit residential buildings use 40% less potable water compared to a reference building.	3	3	
			~~**Exceptional Performance:**~~ ~~The building uses 75% less potable water compared to a reference building.~~ ~~Each unit in an apartment building uses 60% less potable water compared to a reference building.~~	3	0	
Life Cycle Impacts	The building has lower environmental impacts from resource use over its lifespan than a typical building.	26.0	**Credit Achievement:** The project demonstrates a 30% reduction in life cycle impacts when compared to standard practice.	2	2	Site-wide
TOTAL				30	14	
PLACES				8		
			Minimum Expectation: The building includes showers and changing facilities for building occupants that are accessible, inclusive and located in a safe and protected space.	Nil	To Comply	

CATEGORY / CREDIT	Requirements	Submission Content
Water Use	**MINIMUM EXPECTATION** There are two pathways for demonstrating compliance with this criterion: • Follow the prescriptive approach that describes fixture and appliance efficiency; or • Show a 15% reduction against a reference building through the GBCA's Potable Water Calculator Either one will suffice to achieve the Credit Achievement. **Sanitary fixture and appliance efficiency** All fixtures and water-using appliances installed within the project's scope must, at a minimum, meet the following WELS ratings: Fixture type WELS rating Taps 6 star Urinals 5 star Toilets 4 star Showers 4 star (below 4.5L/min) Clothes Washing Machine 4 star Dishwashers 5 star **Potable water reduction compared to a reference building** The GBCA's Potable Water Calculator assists in calculating how much more efficient a building is compared to a reference building. It considers fixtures, appliances, and water reuse systems. **CREDIT ACHIEVEMENT** The building uses 45% less potable water compared to a reference building. Multi-unit residential buildings use 40% less potable water compared to a reference building. The Potable Water Calculator must be used alongside the Potable Water Calculator Guide. The building must have infrastructure for recycled water in a district or location where local council or water authorities (or similar) have planned for installation of recycled water infrastructure. ~~**EXCEPTIONAL PERFORMANCE**~~ ~~The building uses 75% less potable water compared to a reference building.~~ ~~Each unit in an apartment building uses 60% less potable water compared to a reference building. The Potable Water Calculator must be used alongside the Potable Water Calculator Guide.~~	**Submissions for this credit must contain:** • Submission Summary via the online portal • Water Use calculator • Evidence to support claims made in the submission **Suggested evidence:** • WELS certificates; • Manufacturer's data; • Drawing(s) for each typical floor showing isolation valves for floor-by-floor testing of the fire sprinkler system, and drawings of the water storage and re-use system(s); • Drawing(s) clearly showing the location of all heat rejection equipment installed on the project; • Drawings showing the landscape design and the irrigation system, listing the name, location, and plant species zone as it appears in the Calculator; • Manufacturer's information showing that the application efficiency for the landscape irrigation system; • Manufacturer's information including backwash volume and frequency of filter cleaning; and • Drawing(s) of process cooling water usage loops.
Life Cycle Impacts	**CREDIT ACHIEVEMENT** The reduction in life cycle impacts must be demonstrated through a whole-of-building, whole-of-life (cradle to grave) comparative Life Cycle Assessment (LCA), as defined by EN 15978. All EN 15978 modules (A to D) must be included in the assessment. The results of the LCA must be entered into the GBCA's Life Cycle Assessment Calculator, which will apply normalisation and weightings to the results to determine compliance with the credit. Results are to be reported in the functional unit of per square metre of Gross Floor Area (GFA). **The reduction must be against the impact categories on page 154 table.** The credit cannot be claimed if the calculated impact in any one category increases the total normalised and weighted score for the project by more than 10%. For all building types, a standard practice reference building as per EN 15978 must be used. The reference building must be a standard practice, code-compliant design, which is fit-for-purpose for the site and operating conditions of the proposed building. **Methodology** **Scope** Whole-of-Building as defined in EN 15978. Refer to section 7.5 'The Building Model'. **System boundary** Cradle to grave, including all life cycle modules (modules A to D) and scenarios as detailed in EN 15978. **Functional unit** Impacts are assessed and reported on a per square metre (m2) project Gross Floor Area (GFA) basis. **Service life of permanent building elements** The service life required by the client or through regulations, whichever is the greater. If no required service life is defined, a default service life of 60 years is to be applied. **Service life of replaceable building and construction elements** Use actual product/material design life, or refer to table 9: Indicative component lifespan of RICS professional standards and guidance, UK Whole life carbon assessment for the built environment (2017). **LCA Data** The selection of data must be based on EN 15978. Data quality shall be reported and peer-reviewed. Use of locally based data, preferably EN15804 compliant Environmental Product Declarations (EPDs), shall take precedence over generic or global data, where available unless it is for imported products. **Quality Assurance** The LCA report must comply with quality assurance requirements by meeting one of two options: **Option A** • The report produced by an LCA Certified Practitioner; and • Subject to organisational quality assurance, which has been certified in accordance with ISO9001. The GBCA LCA Peer Review Checklist is to be completed by an independent professional and included in the submission. **Option B** • The report produced by an Experienced Individual; and • Peer reviewed by an LCA Certified Practitioner or independent Experienced Individual, with a completed GBCA LCA Peer Review Checklist. Refer to the Definitions section for competency requirements.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Life Cycle Impacts calculator • Evidence to support claims made in the submission **Suggested evidence:** • LCA Report; • Peer Review Statement; • LCA practitioner competencies statement or LCACP certificate for practitioner and peer reviewer; • Standard Practice Reference Building Documentation; and • Actual Reference Building Documentation.
PLACES		
	MINIMUM EXPECTATION The project must meet both criteria listed below: • Changing facilities • Accessible, inclusive, and located in a safe and protected place **Changing facilities** The design of the shower facilities must be appropriate to encourage their use. The project team is expected to justify how their location, locker sizes, privacy requirements, and size meet this aim. **Showers** The building must install showers and lockers based on the occupancy of the building: Occupants Showers 0 - 49 1 Unisex 49 – 50 2 100 - 200 4 200+ Additional 1 per 200 occupants above 200 All showers must be at least 900m x 900m to enhance usability. Showers and bathrooms provided to meet statutory accessibility requirements do not count towards the minimum showers required to meet this Minimum Expectation. **Lockers** One locker must be provided for every eight staff occupants. The lockers must be secure and located in the changing rooms. Lockers provided within tenancies, not in changing rooms, do not count toward this credit. **Accessible, inclusive, and located in a safe and protected place** Upon accessing, pedestrians and cyclists must be protected from the elements and other vehicles. Access must be safe, with consideration given to avoiding steep gradients, surface grip levels and visibility around tight corners. Access to the facilities must be well lit between entryway to bike parking, all amenities and lift lobbies and main access points to the building. All regular building occupants must have easy access to lockers, showers, and building entry. Occupants must be able to find the facilities thanks to clear signage throughout the building and access points. **CREDIT ACHIEVEMENT** The building must comply with the criteria below: • Introducing cyclist facilities; • Developing a sustainable transport plan;	

CATEGORY / CREDIT	Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor
Water Use		x					x				x		x					
Life Cycle Impacts	x	x	x	x	x	x	x	x	x	x	x		x		x	x		
PLACES																		

(Responsible Party)

CATEGORY / CREDIT	Guidance
Water Use	**Shared services** This credit rewards projects for reduction in potable water usage due to the use of reclaimed water from on-site rainwater, greywater, blackwater, stormwater or supplied reclaimed water. Bore water is not a suitable replacement for potable water. The Potable Water Calculator allows for the inclusion of the amount of non-potable water that is available from a central or shared service for use within the building.
Life Cycle Impacts	**Upfront Carbon Emissions credit** The results from this credit can be used to demonstrate compliance with the Upfront Carbon Emissions credit. **LCA Data** When conducting the LCA for the project, the following Green Star based inputs shall be consistent with: • Reference Building operational energy benchmarks as used in the Energy Use Calculator for the project for year one energy use; • Reference Building Water usage as used in the Water Use credit (if targeted); and • Product-specific and industry-wide EPDs submitted in response to the Responsible products credits (if targeted). **Emission factors for electricity use** If the building has a design life of 60 years or more, future energy projections assuming decarbonisation of the power supply may be calculated using current state/territory emissions factors and dividing by four. The division by four assumes a linear taper of grid emissions to zero carbon over the first 30 years (divide by two) and then continuing zero carbon emissions for the following 30 years (divide by two again). The same emissions factor is to be applied across the whole life span of the building. If the Energy Source credit is targeted, the emissions factor for the sourced electricity may be applied for the secured contract duration. At the end of the contract and for the remaining lifespan of the building, the standard emissions factor is to be applied. If the design life of the building is shorter, future energy projections must be calculated for both the reference and actual LCA models in accordance with RICS (2017) Section 3.4.2 Future energy projections – Decarbonisation of the energy supply. **Effects of the Zero Carbon Action Plan** The effects of the Zero Carbon Action Plan cannot be taken into account in the LCA model. **Standard practice reference building** This pathway shall be adopted for all building types. The standard practice reference building shall be agreed through consultation with structural, mechanical, electrical and architectural professionals. The Reference Building shall be representative of standard practice for a building of the same characteristics of the project.
PLACES	
	MINIMUM EXPECTATION **Applicability** This Minimum Expectation applies to all building types except residential. **Occupancy rates** When calculating occupancy rates, if the project design occupancy values are available prior to issuing of Tender

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GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																									Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Hydraulic Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor							
Movement and Place	The building's design and location encourages occupants and visitors to use active, low carbon, and mass transport options instead of private vehicles.	27.0	**Credit Achievement :** The building's design and location prioritises walking, cycling, and transport options that reduce the need for private fossil fuel powered vehicles.	3	3	Site-wide	• Reducing private vehicle use; and • Encouraging walkability. **Cyclist facilities** The building's access must prioritise walking and cycling options. This means the building's access must be well lit, weather protected, and separated from vehicles. The building must also include access to cyclist facilities that are separated from the primary vehicle entrance to ensure safety. Cyclist facilities must have signposted access to the changing rooms amenities as per the Minimum Expectation. The cyclist facilities must ensure the cycling equipment is safely secured. The amount of cyclist facilities is to be informed by the Sustainable Transport Plan. In a residential building, the access points must connect to the relevant cycling storage facilities. If these are at a unit level, the project team must show how the access won't be blocked by strata at a later date. **Sustainable transport** The project team must prepare and implement a Sustainable Transport Plan. The requirements or recommendations made in the Sustainable Transport Plan must then be reflected in the design of the building's facilities and ongoing operational processes. As a minimum, the Sustainable Transport Plan must include the following: • A definition of the typical mode share of the development location and development type; • A target mode share for the development that prioritises active and mass transport modes, and recommendations on how to achieve them; • Outline of how other modes of transport (carpooling, electric vehicles, and drop-off points) will be encouraged over private vehicle use; • Identification of future projects which may change or influence mode share (such as planned, or under construction infrastructure) and the year of completion for the new infrastructure; and • Roles and responsibilities for implementing, monitoring, and auditing the Sustainable Transport Plan in the building's operational phase. The transport plan must be prepared by a suitably qualified Transport Planner. The building must include the following: • Car sharing parking spaces must include an electric vehicle connection, regardless whether the vehicles are electric at the time of practical completion; • Infrastructure to allow for future of electric charging to each parking spot in the parking area. This means ensuring the building has EV distribution boards to allow for allow for future connection for EV's. These distribution boards must be located so that no connection requires a cable of more than 50m from the parking bay to the connection. • The building must be fitted with an EV load management system. The EV load management system must be capable of determining how and when the electric vehicles should be charged to minimise building peak power demand whilst ensuring the vehicles are charged. **Reducing private vehicle use** Using the inputs from the Sustainable Transport Plan to complete the GBCA's Movement and Place Calculator, the building's design and location must be shown to reduce emissions from transport, encourage mass transport use, and reduce vehicle kilometres travelled compared to a reference building. The changes must be as follows: • Emission reduction (40%); • Active mode encouragement (90%); and • Vehicle Kilometres Travelled (VKT) reduction (>20%) **Encouraging walkability** The building's design and location must encourage walking to and from a number of amenities. This means designing roads within the building boundary to prioritise pedestrians, and either providing within, or being located close to, a number of amenities. **Roads** If there are roads within the building boundary, the design must prioritise pedestrians over vehicles. Roads should be designed to be low speed (10km/hr). Pedestrians must have the right of way, and road design must encourage this. **Amenity diversity** Occupants should have access to a diversity of amenities across the below eight categories. There must be at least 10 amenities across five categories within 400m radius of the building, as determined by Google Maps or other mapping services. • Grocery: e.g. Convenience stores, supermarkets; • Health and wellbeing – e.g. dentist, doctor, psychologist; • Food and Beverage: e.g. cafes, restaurants, bars; • Retail: e.g clothing, homeware, hardware, book, gift stores; • Bank Services: e.g. banks, credit unions; • Education and Childcare: e.g. Primary, secondary, tertiary or childcare facilities; • Recreation: e.g. movie theatres, fitness centres, swimming pools; • Public facilities: e.g. Libraries, local or state government service centres; and • Outdoor facilities: e.g. Playgrounds, parks	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission • Movement and Place Calculator **Suggested evidence:** **Minimum Expectation** • Transport Drawings showing the provision and location of changing facilities; • As built drawings showing the number and size of showers, and of lockers; and • Site drawings or as built drawings showing how the changing facilities are safe and protected. **Credit Achievement** • Sustainable transport Plan including a site-specific transport assessment; • Site plans showing how pedestrian access has been prioritised; • As build drawings showing the number and location of cyclist facilities; and • Manual calculations showing proximity to amenities.	x	x	x																								**Changing facilities** The design of the shower facilities must be appropriate to encourage their use. The building should consider features such as ironing boards, iron, hanging racks, power points, mirrors, facial lighting and any other facilities to encourage uptake. The project team is expected to justify how their location, locker sizes, privacy requirements, and size meet this aim. **CREDIT ACHIEVEMENT** **Suitably Qualified Transport Planner** The suitably qualified transport planner shall hold a relevant tertiary qualification (including, but not limited to, architecture, engineering, sustainability and planning) and comply with at least one of the following: • Minimum five years' experience in transport planning; • Has co-authored at least five building Sustainable Transport Plan / Green Travel Plans or similar; or • Chartered member of a relevant industry body. **Calculating amenities** Where possible, connections between the building and amenities should have shade and shelter along the route, as well as be well lit and safe. Major obstructions, such as highways, limit an individual's capacity to walk. As such, where those are found, they act as virtual barriers, and, unless the crossing is within the 400 meters, all amenities beyond the obstruction cannot be counted. Amenities that are similar in nature to that of the development cannot be considered for purposes of this credit. For example, an educational project cannot claim a nearby educational facility. Where there are two or more of any one amenity, this will count as only one amenity. For example, three food and beverage shops will only count as one amenity, four convenience stores will only count as one additional amenity, etc.
Enjoyable Places	The building provides places that are enjoyable and inclusive.	28.0	**Credit Achievement :** The building delivers memorable, beautiful, vibrant communal or public places where people want to gather and participate in the community. The spaces are inclusive, safe, flexible and enjoyable.	2	2	Site-wide	**CREDIT ACHIEVEMENT** The project must meet both criteria listed below: • Provide new publicly-accessible spaces that are enjoyable and support community activity and interaction are provided. • Deliver an Activation Strategy to facilitate initiation of placemaking activities. **Publicly accessible spaces** Communal or public space must be provided to the following extent: Building type — Building size (m2) — Communal space requirements (m2) All building types except residential — ≥ 1,000 — 0.25 m2/ occupant or 2.5% of GFA, whichever is greater Residential with mixed use — All — 1.75 m2 / dwelling (minimum of 250 m2) The communal or public space must: • Accommodate community-based activities; • Have capacity and flexibility to operate in multiple modes of usage; • Demonstrate relevance of the space for local people (demographics, social profile, current needs); • Demonstrate the space has been designed for enjoyment; and • Be available to the community to use for free. It must be clearly demonstrated that the spaces are publicly accessible. **Activation strategy** An activation strategy must be provided to ensure placemaking continues after practical completion. The strategy must demonstrate how the future occupants and the wider community can contribute to the place activation, addressing the following: • The target of the activation activities; • How the activation will be funded and managed for the first 12 months of operation, and be sustained beyond those months; • Estimated timing of activation; • Potential suppliers, facilitators or initiators of placemaking activation activity commencement; • How the building occupants and the wider community will be encouraged to initiate activations e.g. communication channels and support network; • Demonstrate how the strategy can be further implemented by the future tenants and occupants; and • Assign roles and responsibilities for implementation of the strategy, including evaluation and monitoring. The strategy must be included as part of the building's handover to ensure implementation in operation.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Site plans showing the size of public or communal spaces; • Letter from the building owner confirming the space is publicly accessible and may be used for free; • An overview of how the public or communal spaces comply with the requirements (e.g. flexible); • A narrative of how the spaces have been designed for enjoyment; and • Activation strategy.	x	x	x																								**Applicability** For multi-unit residential projects, public space may not be desired byresidents. Some developments may provide communal/shared spaces for residents and visitors, but not completely public spaces. This is acceptable for residential projects only. **Existing space** Existing communal space prior to the building cannot be considered. The purpose of this credit is to create new communal spaces. **Design for enjoyment** The building can demonstrate that provided spaces are enjoyable through Design Plans, Landscape Plans and Design Report (or equivalent), which describe and demonstrate: • Application of Crime Prevention Through Environmental Design (CPTED) principles, and design initiatives to support safety; • Inclusive design elements; • Design for people and usage, demonstrating spatial flexibility/adaptability, potential uses/activities in spaces and modes ofoperation, and day and night uses; • Placemaking/Place activation approaches; • Accommodating retail/commercial activity (cafés etc.) and more open public usage; • Providing a range of experiences: refuge, openness and enclosure; • Providing comfort and amenity: seating, shading and shelter from the elements; and • Demonstrate materials and products of high quality and durability. **Scope of credit** The base building provides the foundations of Enjoyable Places. Tenancies can affect the experience and enjoyment of places, through: • The nature of frontages to new places; • Occupation or habitation of places for commercial purposes; and • Activation outcomes (contributing to activity). Tenant engagement is encouraged to fully achieve the desired outcome. However, there are no requirements for tenants for the purposes of this credit. **Enjoyable Places design** Sources to support designing high quality, enjoyable places can be found below: • Government Architect New South Wales: Better Placed https://www.governmentarchitect.nsw.gov.au/resources/ga/media/files/ga/strategy-documents/better-placed-a-strategic-design-policy-for-the-built-environment-of-new-south-wales-2017.pdf • Government Architect New South Wales: Implementing Good Design https://www.governmentarchitect.nsw.gov.au/resources/ga/media/files/ga/discussion-papers/discussion-paper-implementing-good-design-2018-03.pdf • Government Architect New South Wales: Evaluating Good Design https://www.governmentarchitect.nsw.gov.au/resources/ga/media/files/ga/discussion-papers/discussion-paper-evaluating-good-design-2018-03.pdf
Contribution to Place	The building's design makes a positive contribution to the quality of the public environment.	29.0	**Credit Achievement:** The building's design contributes to the liveability of the wider urban context and enhances the public realm.	2	2	Site-wide	**CREDIT ACHIEVEMENT** There are two pathways for demonstrating compliance with this credit: • Urban Context Report and public realm interface design; or • Independent design review Either one will suffice to achieve the Credit Achievement. **Urban context analysis** **Urban Context Analysis** The building must provide an urban context report that outlines the urban context of the development and the design responses. The report must include: • Urban context analysis: – Assessment and analysis of the local setting and wider urban context. This must include physical, social, cultural and economic factors; – Outline any planned changes to the local area (for example if located in a growth zone) and the project's design response to those. This may include Local or State Government's vision for the area; and – Identify any local challenges which the building can contribute to address. • Design responses: – Demonstration of the design responses to the urban context analysis; and – Demonstration that the that the public space is not negatively impacted by the proposed design. **Independent Design review** Design reviews are held at key points in the development of the design. At a minimum, these must occur as follows: • Design Review during concept/schematic design stage, to ensure that proponents can take advantage of the advice offered at a time where the design is flexible	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Urban context analysis** • Extracts from the urban context analysis, or various relevant reports that address requirements from this credit; • As built or site drawings showing how the building responds to the urban context report; and • Architectural drawings showing the public realm interface design. **Design review panel** • Evidence to demonstrate that a design review process has been undertaken; • Details of the panel members and their experience relevant to this credit's requirements; and • A declaration from the project application confirming that the design review panel meets the independency requirements	x	x	x																	x						**Urban context analysis** There are many planning policy documents, design guidelines and other reference documents which provide guidance for responding to context and building frontage. These tend to be at the local government or regional/state government level, so differ from place to place. However, the overarching principles are generally consistent. Examples include: • Better Placed – Integrated Design Policy for the Built Environment of NSW; • Evaluating Good Design (NSW) provides 9 Criteria for 'Better Fit' (page 5); • Central Melbourne Design Guide provides quantified requirements for extent of active frontage and ground-level floor space; and • Urban Design Guidelines for Victoria include a Buildings chapter with guidance for interfaces **Public realm interface** The building con contribute positive to its context by providing well designed active frontages. The building's frontages can be articulated by: • Providing visual and physical permeability on ground level frontages; • Using designs, materials, colour, and details to break long sections to make it attractive to walking; • Having sidewalks around the building to encourage safe walking and cycling activities, as well as provide shading for pedestrians and other activities, particularly with trees; and • Designing entrances to be welcoming and to contribute to the public realm.

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																									Guidance
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							enough to accommodate change without impacting on time and cost constraints; • A subsequent review when the design has been further progressed. This review session will typically occur during design development; and • At building permit stage (after development approval) a further check must take place by the Design Review Panel Chair or delegate, to ensure that the final design reflects approved development application and any relevant conditions related to design quality. **Composition of the Design Review Panel** As a minimum the Design Review Panel must be comprised of one panel chair and two panel members. Members of the panel must: • Possess project-relevant skills and experience; • Be recognised experts in their discipline, with a minimum of 10 years' experience; • Be registered by a relevant professional peak body and be bound by that institutes' code of ethics in relation to objectivity,integrity and accountability; and • Have expertise relevant to this credit.	A declaration from the project application confirming that the design review panel meets the independency requirements. Alternate documentation can also be used by project teams to demonstrate compliance. The key requirement is that evidence is provided to support each claim made within the Submission Summary.																											**Example of negative impacts** Negative impacts that could be captured in the Urban Context Analysis include wind, noise and shade generation, light pollution, and the urban heat island effect. If the Heat Resilience credit has been achieved, it does not need to be included in the Urban Context Report for the purposes of the Contribution to Places credit. **Relationship between Contribution to Place and Enjoyable Places** The key difference between the two credits is that Contribution to Place deals with the surrounding areas of the building, while Enjoyable Places deals with areas on-site. Should projects target both credits, it is encouraged to consider how the building's designs may negatively impact the public spaces provided under the Enjoyable Places credit.
Culture, Heritage and Identity	The building reflects local culture, heritage and identity.	30.0	**Credit Achievement :** The building's design reflects and celebrates local demographics and identities, the history of the place, and any hidden or minority entities. This celebration was arrived through meaningful engagement with community groups early in the design process.	1	1	Site-wide	**CREDIT ACHIEVEMENT** There are two pathways to achieving this credit: • Community led design responses; or • Independent design review. Either one will suffice to achieve the Credit Achievement. **Community led design response** The project team must show that they have undertaken local analysis to identify culture, heritage and identity unique to the project site and area. The project team must undertake community engagement as part of this local analysis. As a result of community engagement, the project must reflect local identity, culture and heritage in the design of the building in a publicly demonstrable way. This can be achieved through: • Community art or placemaking projects; • Selection of suppliers/designers of artwork or cultural elements; • Building elements that tell stories of the past and heritage; and • Spaces and uses that reflect the local identities. **Independent Design Review** Design reviews are held at key points in the development of the design. At a minimum, these must occur as follows: • Design Review during concept/schematic design stage, to ensure that proponents can take advantage of the advice offered at a time where the design is flexible enough to accommodate change without impacting on time and cost constraints; • A subsequent review when the design has been further progressed. This review session will typically occur during design development; and • At building permit stage (after development approval) a further check must take place by the Design Review Panel Chair or delegate, to ensure that the final design reflects approved development application and any relevant conditions related to design quality. **Composition of the Design Review Panel** As a minimum the Design Review Panel must be comprised of one panel chair and two panel members. Members of the panel must: • Possess project-relevant skills and experience; • Be recognised experts in their discipline, with a minimum of 10 years' experience; • Be registered by a relevant professional peak body and be bound by that institutes' code of ethics in relation to objectivity, integrity and accountability; and • Have expertise relevant to this credit.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Community led design responses** • Culture, Heritage and Identity Report outlining key findings of the local analysis and how community engagement activities influenced the design; and • As built drawings, site drawings, architectural drawings showing how the culture, heritage and identity is incorporated into the buildings designs. **Design review panel** • Evidence to demonstrate that a design review process has been undertaken; • Details of the panel members and their experience relevant to this credit's requirements; and • A declaration from the project application confirming that the design review panel meets the independency requirements.	x	x	x																					**Local analysis** It is recommended that projects undertake an analysis of the local community in order to identify culture, heritage and identity unique to the location. This analysis should inform the projects' strategy and design as early as possible, preferably before Development Application (DA). This is to ensure that the research can meaningfully be integrated into the building design rather than being an afterthought e.g. spatial designs or land uses that reflect the local culture and identity is preferable to an add-on graphic design on a façade. The culture, identity and heritage reflected in the building are likely to be those of the past and present. Future users, occupants and the property owner/manager may have different views and the place should be designed so that it can evolve with them. **Community engagement** To achieve meaningful engagement, it is recommended that engagement activities commence as early as possible (i.e before Development Application) so that the community is involved from the beginning of the project. Engaging the community after most of the decisions are made means their input is unlikely to be reflected; and it is more difficult to obtain the community's buy-in. Guidance tools such as the International Association for Public Participation (IAP2), can be used to influence community engagement activities. While it is recognised that demonstrating deep engagement is difficult and relies on qualitative rather than quantitative assessment, there are success factors that can be used to guide the project team during the engagement process. This will be helped by a focus on: • Depth of research on community groups and members to be engaged; • Diversity of individual participants and groups who were engaged; • Rigour in the data collected from community engagement; and • Extent to which community engagement influenced the project. The local community engaged pre-DA and pre-occupation can be different from the actual users or occupants. The purpose of the engagement is not to respond to self-interests of the individuals, but rather to gather data and insights on what is important to the existing community and to build on those values and aspirations. Future users, occupants and the property owner/manager may have different views and the place should be designed so that it can evolve with them. **Culture, heritage and identity report** The Culture, heritage and identity report should include details of the local analysis and outline how community engagement informed key design responses including: • List the various community groups in the area, including hard-to-reach groups, and identify stakeholders by relevant categories (e.g. business, residential, interest groups, government); • How the engagement data influenced the building design and programming, with supporting evidence; and • How decisions were fed back to the community groups that participated in the engagement activities.
TOTAL				8	8																													
PEOPLE																																		
Inclusive Construction Site (Practices)	The builder's construction practices promotes diversity and reduces physical and mental health impacts.	31.0	**Minimum Expectation:** During the building's construction, the head contractor provides gender inclusive facilities and protective equipment. The head contractor also installs policies on-site to increase awareness and reduces instances of discrimination, racism and bullying.	Nil	To Comply	Site-wide	**MINIMUM EXPECTATION** The head contractor must ensure the following is provided, or available, on-site: • Separate gender inclusive bathroom facilities and changing amenities with a high degree of privacy; and • Diverse gender-specific fit-for-purpose personal protective equipment (PPE) for diverse body sizes and types. The head contractor must: • Implement policies to address issues of discrimination, racism, and bullying on-site; • Introduce on-site redress procedures for any relevant breaches, and corrective measures to be put in place should any incident be identified; • Empower a diverse lead team to manage these policies on-site, and • Provide training to all contractors and sub-contractors on these policies (as per below). The head contractor must provide the following training to 95% of all contractors and subcontractors present on site for at least three days: • Information on drug and alcohol awareness and mental health; and • Information on policies implemented on discrimination, racism, and bullying on site. **CREDIT ACHIEVEMENT** The project must comply with both criteria listed below: • Needs analysis; and • Physical and mental health impacts. **Needs analysis** The programs or solutions can be implemented directly by the head contractor or through partnerships with mental and physical health organisations. The responsible party should carry a needs analysis of site workers and contractors to determine appropriate actions. The policies and programs should be relevant to all construction workers on site for the full duration of construction. A mix of programs is acceptable throughout the duration of construction period. • The programs must cover at least 80% of the workforce that have attended the site for more than three days from commencement on site to practical completion. **Physical and mental health impacts** The head contractor must show that they have introduced programs and solutions to address at least five of the following: • Suicide prevention; • Healthy eating and active living; • Reduce harmful alcohol and tobacco consumption and avoid drug use; • Increased social cohesion, community and cultural participation; • Understanding depression; • Preventing violence and injury; • Decreased psychological stress; and • Finding fulfillment at work or mindful meditation. **Evaluating the program's effectiveness** The project must provide an evaluation report to the client and sub-contractors with the following information: • Information on the programs or initiatives that were delivered, including information on dates, attendance, and available languages; and • A review on whether the programs delivered the intended outcomes including recommendations for improving future delivery of these programs.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** • Description of the types of PPE available to construction workers; • Evidence of purchase of appropriate PPE; and • Extracts from relevant policies that address discriminating, racism and bullying. **Credit Achievement** • Extracts of evidence detailing the programs and policies implemented to promote health and wellbeing on site; • Evaluation report of the effectiveness of the training; • Evidence detailing the process to manage training, and track workers trained. Examples of evidence include extracts from the training policy, a report from a third-party provider, or similar; and • Extracts of training such as screenshots, presentation, or similar, showing the information provided as part of training.		x																					**MINIMUM EXPECTATION** **Gender inclusivity** This Minimum Expectation is seeking to remove physical barriers to participation in the construction workforce for different groups, particularly women who represent less than 2% of the construction and building workforce (https://tradeswomenaustralia.com.au/). The provision of gender inclusive bathrooms and changing facilities are a minimum. Should the building's construction identify opportunities to provide additional facilities and gender-specific PPE to celebrate diversity, they should be pursued. Where this is the case, the building may seek an additional point(s) in the Leadership category, under Market Transformation. **CREDIT ACHIEVEMENT** **Criteria definition** When training and policies are developed, consideration should be given to the method and form of delivery to address cultural and anguage barriers.
			Credit Achievement : The head contractor provides high quality staff support on-site to reduce at least five key physical and mental health impacts relevant to construction workers. They must also evaluate the effectiveness of their interventions.	1	1																															

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PROJECT ADDRESS:
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GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

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Indigenous Inclusion	The building celebrates Aboriginal and Torres Strait Islander people, culture and heritage.	32.0	**Credit Achievement :** The building's design and construction celebrates Aboriginal and Torres Strait Islander people, culture and heritage by undertaking one or both of the following: - Playing an active role in the organisational Reconciliation Action Plan; and • Incorporating design elements using the Indigenous Design and Planning principles.	2	0	N/A	**CREDIT ACHIEVEMENT** There are two pathways to meeting this credit: • The building's design and construction played a central role in the delivery of the targets in the project owner's organisational Reconciliation Action Plan (RAP); or • The building's design process followed Indigenous Design and Planning principles. Both require visible and inclusive participation of Aboriginal and Torres Strait Islander throughout the project's life cycle. **Reconciliation Action Plan** To meet this Credit Achievement, the project team must demonstrate that:: • A key member of the Project Team is part of the organisational RAP Working Group; • At least 90% of the RAP targets have been met on the project; and • All implemented actions related to the RAP are publicly reported on the Project's website. **Inclusion of Indigenous design** The project team must demonstrate that the Australian Indigenous Design Charter guiding principles are incorporated in the design of the building including: • How local Aboriginal and Torres Strait Islander communities have been engaged throughout the design development; • How the project has been designed to acknowledge and recognise the Indigenous culture of the site; • How information on the reconciliation and cultural values of the project will be made available to the public, visitors and building tenants in the operational phase of the project's life. At a minimum, the following four principles from the Australian Indigenous Design Charter are to be addressed: • **Indigenous Led**: Ensure Aboriginal and Torres Strait Islander representation in the creation of the design; • **Community Specific**: Ensure respect for the diversity of Aboriginal and Torres Strait Islander culture by following community specific cultural protocols; • **Impact of Design**: Always consider the reception and implications of all designs so that they are respectful to Indigenous culture; and • **Shared Knowledge** (collaboration, co-creation, procurement): Develop and implement respectful methods for all levels of engagement and sharing of Indigenous knowledge (collaboration, co-creation, procurement). The project team must demonstrate engagement has happened from concept design and continues through to operational handover.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Reconciliation Action Plan (RAP)** • Extract from the Reconciliation Australia website demonstrating that the project's RAP is endorsed by Reconciliation Australia; • Extracts from the organisation's Annual Report or website (or similar) demonstrating that the RAP is publicly reported upon; • Reconciliation Action Plan Report (or similar) on the outcomes from the project's RAP demonstrating that at least 90% of the RAP targets have been met in the first reporting cycle; and • Evidence that a key member of the project team is also on the RAP working group **Inclusion of Indigenous Design** • Extract from indigenous engagement strategy; • Evidence of Aboriginal and Torres Strait Islander engagement from concept design throughout the project's life cycle; • As built drawings or photographic evidence of incorporated designs; • Evidence of information being made available to public (e.g. website); and • Comparison against the four principles from the Australian Indigenous Design Charter.																							**Engagement** For meaningful engagement to be undertaken, the nominated representatives should be identified and contacted as early in the design process as possible. Best practice guides do exist. Some examples include: Engaging with Indigenous Australia — exploring the conditions for effective relationships with Aboriginal and Torres Strait Islander communities. National Science an Environment Program: Indigenous Engagement Guidelines. **Australian Indigenous Design Charter (AICD)** The Australian Indigenous Design Charter is a recognised body of researchers from Indigenous Architect and Design Victoria, Design Institute of Australia and Deakin University which have developed a formal protocol on sharing Indigenous knowledge in communication design practice. There are 10 principles developed to ensure the representation of Aboriginal and Torres Strait Islander culture is developed in a respectful manner. These can be incorporated in any form of design ranging from graphics and art to buildings and infrastructure design. For more information on the context, role and protocols of these principles, including definitions, please refer to the original AIDC charter: http://indigenousdesigncharter.com.au/australian-indigenous-design-charter/. **Database for indigenous consultancies** Project teams wanting to engage with qualified consultants such as Stakeholder Engagement Consultants, Aboriginal Artists, Indigenous Specialists, Local Land Officers should consider Supply Nation is a starting point for finding these professionals to provide expertise on appropriate and authentic research, analysis and design services. https://supplynation.org.au/ Local land councils Local Lands Councils represent the local communities and Aboriginal landowners during consultation processes of land use proposals. There are councils in each state which are a key source of information for projects based in these areas. Links are provided below as a starting point for project teams. **Page 185 Table**
Procurement & Workforce Inclusion	The building's construction facilitates workforce participation and economic development of disadvantaged and under-represented groups.	33.0	**Credit Achievement:** Through the implementation of a social procurement strategy, at least 2% of the building's total contract value has been directed to generate employment opportunities for disadvantaged and under-represented groups	2	0	N/A	**CREDIT ACHIEVEMENT & EXCEPTIONAL PERFORMANCE** **Social procurement strategy** The project team must develop and implement a social procurement strategy or plan (this can be part of an overall project procurement plan/strategy). The project team must also include targets and annual reporting requirements in the strategy. **Social procurement strategy** The plan must include: • A description of the project's social procurement and workforce objectives, needs, and targets; • A demographic study of the local region to inform identification of target workforce groups and their skills; • Descriptions of the roles and responsibilities in the implementation and monitoring of social procurement and workforce targets and contracts; • Data collection and reporting templates / tools, including how data from Tier 2 and Tier 3 contractors will be collected; • Monitoring and reporting requirements; and • Reporting requirements for the project director. Projects must report the following at the time of practical completion: • Dollar spent and as a proportion of building contract value; • Supplier(s) engaged; • Where workforce targets are in place, the number of jobs created per target group expressed as Full Time Equivalent; and • Jobs supported. **Employment opportunities strategies** Generation of employment opportunities for disadvantaged and under-represented groups can be achieved: • Directly, through workforce targets; or • Indirectly, through social procurement. A combination of these strategies can be used to achieve the credit, as long as the total dollar spend on the above activities is equal to or greater than Criteria percentage of the building's total contract value. The building's design and construction can contribute to generating employment opportunities for disadvantaged and under-represented groups through the procurement of goods, services and construction by: • Aboriginal and/or Torres Strait Islander businesses; • Social enterprises; and/ or • Disability enterprises. Enterprise providers must be independently certified by third party organisations such as Supply Nation, Social Traders, BuyAbility and government chamber of commerce.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Social Procurement Plan; • Evidence of workforce targets in main contracts and sub-contracts; • Evidence of social procurement targets in main contracts and sub-contracts; and • Evidence that enterprises are independently certified by third party organisation									x	x																**Disadvantaged and under-represented groups** This credit addresses groups such as, but not limited to: • Aboriginal and/or Torres Strait Islander people; • Women in non-traditional roles/ professions; • Apprentices; • Those from a culturally and linguistically diverse (CALD) background; • Long-term unemployed; • Refugees and asylum seekers; • Ex-offenders; and • Disabled. A person who is represented by many groups may contribute more than once. **Eligible construction procurement** The following definition of construction from the Victorian Social Procurement Framework is being used. Dollar spent relates to activities including: any construction, maintenance, rehabilitation, alteration, extension or demolition of any improvements on land. It includes dollars spent on: • Design and construction; • Tendering processes; • Project delivery; and • Contract administration. **Eligible Aboriginal procurement** Eligible spend includes Aboriginal employment, engagement of Aboriginal-owned businesses, education and training, and engagement or consultation with Aboriginal organisations or businesses. **Accreditation organisation(s)** The accreditation organisations (i.e. Supply Nation, Social Traders and BuyAbility for example) provide advisory services to help projects identify opportunities for suitable spend and can provide data demonstrating social impacts. **Workforce targets** When developing targets related to workforce, the project should consider the local conditions as well as the project size. A demographic study will inform targets to be developed. Government sources such as the Australian Bureau of Statistics; the NSW Department of Communities and Justice; and the National Centre for Vocational Education provide useful statistics and data to help develop project specific targets. When developing workforce targets the following principles are recommended: • Allow flexibility in the targets so that they can be adapted depending on the project phase and life-cycle; • Ensure targets and requirements in the Workforce Inclusion Plan can be contractually enforceable; • Provide value to target group and project; and • Ensure they are realistic, and thus while aspirational, can be achieved. Engagement with employer providers is recommended to better understand local supply and development needs. While the following list is not exhaustive, it can be used to guide the project: • Aboriginal Employment Strategy; • Apprentice Employment Network; • Refugee Settlement Program; and • National Association for Women in Construction. Working with the procurement team during the development of the Workforce Inclusion Plan is important, as integration into the overall Procurement Strategy/Plan for the project is the mechanism by which workforce targets can be implemented. **Incorporating targets into contracts** To ensure the successful implementation of the strategy, the project should incorporate social procurement and/ or workforce targets into key contracts. Contracts should state require data collection requirements, monitoring and reporting requirements, and a framework for incentivising the achievement of targets. **Social procurement** Social procurement is being driven at a State level by a number of governments. The Victorian Social Procurement Framework is considered a best practice guide that can be used by projects when developing and implementing their Social Procurement Strategy/ Plan. Other existing guidelines include: • Social Procurement in NSW; and • Insights into Social Procurement: From Policy to Practice. Early engagement with procurement professionals and identified supply chain are important success factors.
			Exceptional Performance: Through the implementation of a social procurement strategy, at least 4% of the building's total contract value has been directed to generate employment opportunities for disadvantaged and under-represented groups.	1	-																														
Design for Inclusion	The building is welcoming to a diverse population and is welcoming to their needs.	34.0	**Credit Achievement:** The building is designed and constructed to be inclusive to a diverse range of people with different needs.	2	2	Site-wide	**CREDIT ACHIEVEMENT** To be compliant, the building's design and construction must be able to be navigated and enjoyed by stakeholders of diverse ages, genders, and abilities (for example physical, sight, sound, mind, spectrum). This applies to common spaces, bathroom facilities and amenities provided within the building. This must include: • Equal access to the building: Provide equitable, appealing, safe, and secure access in a manner that does not segregate or stigmatise users through all principal entrance points and main thoroughfares inside and outside the building; • Diverse wayfinding: Introduce visual, physical, olfactory, and auditory solutions to help individuals navigate the site in a safe and enjoyable manner; and • Inclusive spaces: Introduce internal and external spaces for a diverse range of users, including parents, family restrooms, emergency rooms, quiet rooms and social interaction rooms. These rooms must be accessible to all users. **EXCEPTIONAL PERFORMANCE** The project team must consult with distinct community types to develop a needs analysis that will influence the project during the design phase. The consultation must be undertaken early in the design process and include a balanced cross-section of representation of the target group. The consultation must be considerate and relevant to the project. The consultation process must generate a report that is then used to influence the design of the project. As a result of the needs analysis, the building must show how it aligns with best practice guidelines, such as the Design for Dignity Guidelines: Principals for Beyond Compliance Accessibility in Urban Regeneration. Building solutions that are expected to be included would be assistive technologies, emotional health spaces, acoustic treatments, adaptive strategies, gender, size, and physical appropriate facilities.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Credit Achievement** • As build drawings showing equal access to the building; • Evidence of diverse wayfinding, including photographs; and • As build drawings showing inclusive spaces. **Exceptional Performance** • Extract from consultation plan with disability community; • Evidence, through as built drawings or photographs, of how the outcomes of the consultation have been incorporated into the buildings design; and • Analysis of the building's designs against the Design for Dignity Guidelines: Principals for Beyond Compliance Accessibility in Urban Regeneration or other best practice guidelines.									x	x	x															**GUIDANCE** **Ongoing management** This credit is aimed at providing an accessible building beyond legislative requirements. In addition to the above, it is strongly recommended the following also occur: • Training for the project development team on universal design principles and project goals; • Training for the future building operations and facilities management team on the design features that enable inclusivity, how to maintain them properly, and how to respectfully work with all stakeholders to assist them on their needs; and • Develop policies for the maintenance of the building to ensure a focus on inclusiveness. These policies should include staff training, cleaning procedures, rapid response for maintenance issues, and how to manage emergency situations (for example, how to support the evacuation of different types of disabled person(s) in a fast and safe manner). **Needs analysis** How the needs analysis is completed depends on the project and stakeholders – the end-use, types of users, who is undertaking the analysis and why the analysis is being done. Project teams will need to describe the needs analysis and how this contributed to the project's design solutions. The needs analysis may be formal and extensive, or informal and focused, depending on the project-specific circumstances.
			Exceptional Performance: Engagement with target groups has informed the inclusive design.	1	-																														
TOTAL				9	3																													

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party: Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
NATURE																											
Impacts to Nature	Ecological value is conserved and protected.	35.0	**Minimum Expectation:** The building was not built on, or significantly impacted, a site with a high ecological value.	Nil	To Comply		**MINIMUM EXPECTATION** The Minimum Expectation is met where: • At the date of purchase or option contract, the building, infrastructure, or construction works do not clear: – Old-growth forest, – Prime agricultural land, – Any wetland listed as being of 'High National Importance', – Aspects considered 'Matters of National Significance' listed under the Environmental Protection and Biodiversity Conservation Act (1999) regardless of whether they have been referred to the Federal Environmental Minister for consideration and assessed as a 'controlled action' or not. • If the project site is adjacent to the above, or within 100 meters, or the site contains the above and these are being protected, the construction and future operations of the site takes measures to reduce their impact to the above as follows: – Both the Waterways Protection Credit Achievement and the Credit Achievement for this credit is met, and – The light pollution impacts are managed, and – Where the site is next to a wetland (as above), by also putting in place Wetland Protection Measures. The Minimum Expectation applies to the condition of the site that existed at the date of site purchase or option contract (previous condition of the site). In cases where the site has been owned by the current owner for more than five years (from the project's Green Star registration date), the requirements are applied to the state of the site that existed at least five (but not more than ten years) prior to the project's Green Star registration date. **Managing light pollution impacts** **Light pollution to neighbouring bodies** The project team must demonstrate that all outdoor lighting on the project complies with AS 4282:1997 Control of the obtrusive effects of outdoor lighting. The conditions apply to all boundaries, apart from boundaries with roads. The boundary shall be taken as the site boundary, with no setback and no consideration of the location of adjacent buildings (i.e. worst-case scenario). The following values from Table 2.1 of AS 4282:1997 must be applied: • For Class 2 buildings (residential), the compliance is for columns 4 and 5 as per Table 2.1 of AS 4282:1997; or • For Class 3 to 9 buildings (non-residential), the compliance is as per column 3 as per Table 2.1 of AS 4282:1997. The system must comply with both pre- and post-curfew requirements. **Light pollution to night sky** It must be demonstrated that one of the following specified reductions in light pollution has been achieved by the project. • Control of Upward Light Output Ratio (ULOR); or • Control of Direct Illuminance. This covers all external lighting of a project. In addition to other types of external lighting, for the purposes of this credit, luminaires inside glazed atria and those on the uppermost (uncovered) deck of an outdoor car park are considered external. **Control of Upward Light Output Ratio (ULOR)** For this option, the project team must demonstrate that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation. Project teams must demonstrate that the ULOR provided or calculated in the documentation, is relevant to the as-installed orientation of the luminaire. Control of Direct Illuminance For this option, the project team must demonstrate that direct illuminance from external luminaires on the project produces a maximum initial point illuminance value no greater than: • 0.5 Lux to the site boundary; and • Lux to 4.5 metres beyond the site into the night sky, when modelled using a calculation plane set at the highest point of the building. Calculations shall be in accordance with AS 4282:1997. The calculation plane must cover the area between the site boundary and building façade or vertical service to be illuminated. The horizontal calculation plane shall be set at the top of the building fabric, excluding spires. Calculation plane grid points shall have a 0.5m spacing. All illumination results shall be reported to within 2 decimal places. **Wetland management plan** The site-specific Wetland Management Plan must be prepared by a qualified Ecologist or other qualified professional and include requirements for ongoing quarterly monitoring, annual reporting and management of the wetland ecosystem for a minimum of five years. The plan must be exhibited to the public on the applicant's website, or the local council's offices or library, for a minimum of 24 months. **CREDIT ACHIEVEMENT** The project team must show how ecological values will be protected including: • Documenting the current, future and past ecological values on the site by type and biomass. This includes terrestrial and aquatic ecological values, geologic features and soils (including interaction with living things). When determining biodiversity value, the project must reference local, regional, state and national priorities and strategies; • The proportion of existing vegetated area being retained and the biodiversity value of this area; • Identifying local and regional threats and mitigation requirements; • Listing active management strategies to be employed to protect the integrity of ecological values throughout the project planning, construction and occupancy; • Documenting the community engagement process, and outline risks and opportunities to enhance the site; and • Detailing consultation outcomes with local stakeholders including Aboriginal or Torres Strait Islander groups and environmental groups. Where an ecologist has undertaken an assessment and deemed the area of high biodiversity value, the project must retain at least 50% of this area contiguously. The project team must then provide a narrative as to how the following impacts to nature and the community have been mitigated: • Light and noise pollution (this is met if required for the Minimum Expectation); • Habitat disturbance and connectivity (deemed met if Biodiversity Enhancement and Nature Connectivity credits are achieved); • On-site and downstream water quality (Deemed met if Waterway Protection credit is achieved); • Migratory paths of insects, birds or other species; • Two local issues appropriate to the project site (e.g. pest management and groundwater); and • Consideration must be given to these impacts during demolition, siteworks, construction, or future occupation.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Minimum Expectation** • Extracts from the Development Application. • Zoning Plans. • Light pollution: – As Built drawings indicating the location of all external luminaires and showing the aiming point and mounting orientation of all external luminaires. – Luminaire schedule for all external lighting, nominating the type, lighting distribution and quantity of each luminaire and including the relevant photometric data such as ULOR. – Calculation Plots for all external lighting, showing that all grid points on the calculation plane return compliant Lux values. – Excerpt from lighting control system, or similar, demonstrating automatic deactivation of lights, based on external lux levels, where deactivation is required to achieve compliance. • If triggering the wetland requirements: – Wetland Management Plan – Evidence as per Waterway Protection credit. **Credit Achievement** • Ecological assessment report. • Evidence that 50% of the site has been retained: – Narrative from Ecologist – As built drawings.		x									x	x		x	x			**MINIMUM EXPECTATION** **EPBC Act** Project teams can determine whether the project site is subject to approval under the EPBC Act by referring to their Development Approval documents. **Wetland assessment and protection** For the purposes of this credit, a wetland is considered of 'High National Importance' if it is: • Deemed significant under a state or national register; or • A listed wetland under: – The Ramsar Convention on Wetlands; or – 'A Directory of Important Wetlands in Australia'. Where the project site does not impact on any wetlands of 'High National Importance', the project is deemed to comply with this aspect of the Minimum Expectation and no further action is required. **Light pollution** **Exclusions** Signage related to emergency exits and external emergency lighting that only illuminates in the event of an emergency/power failure are excluded from the requirements of this credit. Lighting related to other safety requirements are also excluded, for example, the lighting of ATMs. External emergency lighting that is integrated into the general external lighting scheme must comply with the requirements of the credit. For example, lights that act as general lighting but have a battery pack to ensure that they also stay on in the event of a power failure must comply. **Control of upward light output (ULOR)** A luminaire with a ULOR as nominated in the manufacturer's data sheet, will have a different ULOR when the mounting orientation of the luminaire is changed. If any external luminaire is mounted in an orientation other than the one nominated by the manufacturer, the ULOR must be recalculated and provided by project teams. **Awnings** Awnings can be used as a means of achieving compliance with the 5% ULOR requirement where a section drawing showing the light output of the luminaire can be provided, and where the awning has the effect of blocking 95% of the output of the lamp above the horizontal. This requirement is not met where it is not clear if the awning is a permanent structure. **CREDIT ACHIEVEMENT** **Relationship to Nature Connectivity and Biodiversity Enhancement credits** Should 50% of the existing site be retained, this may be captured in both the Biodiversity Enhancement and Nature Connectivity credits.
Biodiversity	The building's landscape		**Credit Achievement:** • The building's site includes an appropriate landscape area; • The landscaping includes a diversity of species and prioritises the use of climate-resilient and indigenous plants; and • The project team develops a site-specific Biodiversity Management Plan and provides it to the building owner or building owner representative.	2	0	Site-wide	**CREDIT ACHIEVEMENT** **Landscape area** At a minimum, external landscape in the building, whether horizontal or vertical must be provided at a ratio of either 15% of the site area or at a ratio of 1:500 of the GFA, whichever is larger. Vertical or horizontal landscapes are acceptable. **Diversity of species** Landscape must be shown to be diverse and include multiple species/genus/etc. Greater than 60% of plants must be indigenous and the site must include at least one significant (nesting) tree or equivalent habitat provision per 500m² of landscaped area. No invasive species are allowed, as per the Australian Weeds Strategy 2017 to 2027. There are two pathways to demonstrate diversity in plant selection and climate resilience. **Prescriptive pathway** The landscaping must meet the following plant diversity targets: • 10% plant species; • 20% plant genus; and • 30% plant family. **Performance pathway** An ecologist must assess and verify that the choice of landscaping and biodiversity is diverse and resilient to climate change impacts, thereby increasing the longevity of the landscape. An Ecologist must provide this narrative. **Biodiversity management plan** A suitably qualified professional, such as a qualified ecologist or landscape architect, must prepare the Plan. The plan must outline key actions that need to be undertaken in order to maintain the ecological integrity of biodiversity on the site, whether this is existing or that	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** **Credit Achievement** • Site Plans marked up with landscaping; • Aerial Site Photographs marked up with landscaping; • Biodiversity Management Plan; and • If Ecologist appointed, confirmation of: – No invasive species – Diverse landscaping																	**GUIDANCE** **Relationship with Connection to Nature credit** The Connection to Nature credit in the Healthy category deals specifically with internal plants. The only external planting/landscaping that can be counted is an accessible green roof. Biodiversity Enhancement deals specifically with external landscaping and has a stronger biodiversity focus. Should a green roof be provided, this can contribute towards both credits provided the landscaping requirements are met: that is, diverse plant selection, resilient plants, and no invasive species. The Connection to Nature credit encourages productive plants, which can be both native and non-native. Because Biodiversity Enhancement has a strong biodiversity focus, it requires native plants. This does not mean that the credits are mutually exclusive, and both can be satisfied through a wide selection of plants. **Relationship with Impacts to Nature credit** In the Impacts to Nature credit, an ecologist determines whether existing landscaping is of high biodiversity value. When this is the case, 50% of the landscaping area needs to be retained. When this occurs, it can contribute towards meeting compliance with this credit. The spaces can be counted in both credits and no further landscaping is required

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	Guidance
									Responsible Party																		
Biodiversity Enhancement	enhances the biodiversity of the site.	36.0	**Exceptional Performance:** • A greater area of landscaping is provided; and • The landscaping includes critically endangered and/or endangered plant species native to the bioregion.	2	0	Site-wide	created as part of the development. The following key requirements must be outlined in the biodiversity management plan: • The vision and objectives for the site's biodiversity values; • Roles and responsibilities in the implementation of the Plan; • A description of the biodiversity baseline on-site; • How success and implementation will be measured; • How impacts or threats to biodiversity on site post practical completion will be mitigated; and • Provision for update of the Biodiversity Management Plan where necessary; The Plan must be included as part of the project's handover. **EXCEPTIONAL PERFORMANCE** **Landscape area** As a minimum, external landscape in the building, whether horizontal or vertical must be provided at a ratio of either 30% of the site area or at a ratio of 1:300 of GFA, whichever is larger. Vertical or horizontal landscapes are acceptable. **Diversity of species** Landscape must be shown to be diverse and include multiple species/genus/etc. An ecologist must review, assess and verify how the choice of landscaping and biodiversity is diverse and resilient to climate change impacts, thereby increasing the longevity of the landscape. Greater than 80% of plants must be indigenous and the site must include at least one significant (nesting) tree or equivalent habitat provision per 250m² of landscaped area. No invasive species are allowed, as per the Australian Weeds Strategy 2017 to 2027. The site must preserve, restore and/or support vulnerable ecosystem through planting critically endangered and/or endangered plant species which are native to the bioregion.	– Diverse landscaping – Climate-resilient landscaping. • If no Ecologist appointed: – Evidence of plant diversity (species, genus and family). **Exceptional Performance** • Site Plans marked up with landscaping; • Aerial Site Photographs marked up with landscaping; • Biodiversity Management Plan; and • Ecologist report on: – Landscaping diversity and resiliency – No invasive species – How the site supports vulnerable ecosystems.		x											x	x					for those spaces. The project team must still demonstrate that the landscaping area requirements of this credit are satisfied. **Relationship with Nature Connectivity Credit** One pathway under the Nature Connectivity credit is to incorporate landscaping for 25% of the external site area. It is a requirement for this landscaping to be contiguous. Should this credit be targeted, the landscaping area may be claimed in the Biodiversity Enhancement credit provided the project team can demonstrate the landscaping requirements of the credit: that is, diverse plant selection, resilient plants, and no invasive species. **Indigenous plants** An indigenous plant is one that is found or occurs in a local area or region. A native plant can be one that is found in Australia, whereas an indigenous plant is found in a specific geographic location, such as a city or a local government area. **Landscaping selection** The following resources provide information for the selection of landscaping in line with the credit requirements: • City of Sydney, Urban Forest Strategy, 2013; and • City of Melbourne, Urban Forest Diversity Guidelines, 2011
Nature Connectivity	Wildlife movement is facilitated within and adjacent to the site.	37.0	**Credit Achievement:** The site must be built to encourage species connectivity through the site, and to adjacent sites. If the project sits within a blue or green grid strategy it must contribute to the goals of the strategy.	2	0	Site-wide	**CREDIT ACHIEVEMENT** The site may include any of the following strategies: • **Landscaping:** Where connectivity is being achieved through landscaping, this must be contiguous with existing, restored and new habitats. As a minimum requirement for habitat connectedness, the conservation area must make up at least 25% of the total external area within the building's site boundary. To be eligible, this must be at least 182m²; or • **Infrastructure**: Design features such as a canopy bridge, wildlife tunnels, green roofs, amphibian tunnels and green infrastructure are used to connect nature on site to adjacent natural areas, which are either existing, restored or new. For both pathways, the project is to provide a narrative on how the pathway would support the targeted wildlife species. In addition to the above, if the project sits within a blue or green grid strategy, the project team must demonstrate how its design and landscaping contribute to the goals of the strategy.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Site Plans marked up with landscaping, showing it is contiguous; • Aerial Site Photographs marked up with landscaping, showing it is contiguous; • Report on the types of infrastructure implemented; • A reporting establishing the local species identified that a habitat would need to be provided for; • Report on how designs support targeted wildlife species; and • Drawings detailing that habitat design.		x											x	x					**Building location** It is noted that for buildings located in the CBD the infrastructure pathway may be difficulty to implement. The project team are encouraged to meet this criterion through the landscaping pathway. **Green and blue grids** Projects should contact their local municipality to determine whether the project sits within a wider Green or Blue Grid strategy. **Blue grid** The blue grid is defined as the hydrological grid of a district. The Blue Grid offers an opportunity to use water systems as an interconnected network and improve the water and ecological quality of waterways along the entirety of the hydrological system. As per Sydney Green Grid: Spatial Framework and Project Opportunities, considerations for Blue Grids include: • Permanent Water Bodies; • Wetlands;
Nature Stewardship	Biodiversity is restored beyond the building site.	38.0	**Credit Achievement:** The building owner, as part of the project's development, undertakes activities that protects or restores biodiversity at scale beyond the development's boundary.	2	0	Site-wide	**CREDIT ACHIEVEMENT** To be eligible for the Nature Stewardship credit, the project must meet the Credit Achievement in the Impacts to Nature credit. **Area of restoration or protection** The area of restoration must be equivalent to the total GFA of the development, or site area, whichever is greater. **Location of restoration or protection activities** Land for restoration must be in Australia and restored to equivalent ecological value of the site before any development occurred. The location of the land designated for the offsite restoration must not be in the development boundary. A qualified Ecologist must confirm that the ecological value is equivalent. There are situations where land restoration may occur in a site where the building is located, but not within the development boundary (e.g. a university campus). Project teams are encouraged to contact GBCA to determine whether this site complies. Project teams must ensure that the land being claimed for restoration and protection activities is not being double counted for multiple buildings or other activities. The Certified Assessor reserves the right to query for additional information during assessment. **Activities to protect or restore** Achieving the credit can be done by either: • The project owner protecting or restoring an area offsite themselves; or • The project owner supports an organisation that restores an area on their behalf. In all cases, for the activities above, the project team must show how the action is additional. That is, the action goes beyond any legislated requirements and how it is resulting in an outcome that wouldn't have happened otherwise. There may be other pathways that can be used by building owners to demonstrate that they are restoring or protecting an area outside their development boundary. Project teams are encouraged to contact GBCA to explore these opportunities. **The project owner restores or protects an area themselves** A Restoration or Protection Management Plan (Plan) must be prepared by an experienced ecologist. The Plan must detail how ecological values are to be enhanced and/or restored including: • What site was chosen and evidence of its purchase; • Why the project chose the site, with details on ecological value; • How the site for restoration will be equivalent in ecological value to the site prior to development; • Validation of the offsite restoration approach by a suitably qualified independent ecologist or similar professional; • The timeframes for protection or restoration; and • Commitment to set-aside and manage the site land in perpetuity including on-going funding provision. **Legislated requirements** Where the project is required to purchase biodiversity offsets, invest in land restoration, restore land, or similar, as part of an EPBC action or development approval, or other legislated requirements, these actions cannot be used to demonstrate compliance with this credit.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Offsite Restoration Management Plan; • Evidence of site purchase; • Evidence of formal partnership; • Overview of restoration activities; and • Evidence of funding provisions.	x												x	x					**Offsets** This credit does not replace nor reward formal regulated offset requirements as covered by the Commonwealth's Environmental Protection and Biodiversity Conservation Act 1999 environmental offsets policy, or other state and territory offset regulations. **Development boundary** Refers to the boundary that is being developed as part of the project's development approval. This includes the building or buildings, landscaping, car parking, ancillary infrastructure, or even other buildings within a broader precinct. **Off-site vs. on-site restoration** Actions to enhance biodiversity within the site are addressed by other credits in this category. As the aim of this project is to increase biodiversity in areas outside the site as far as practicable, solutions that enhance the site, or adjacent buildings that are owned or developed by the same entity, are unlikely to be considered for this credit. There may be exceptions, for example where the enhancement is occurring in another area of a precinct or campus (e.g. a waterway restoration activity). However, in such a situation, the Certified Assessor would expect to see how the enhancement is ties to the building seeking certification, how it is being funded, and how it is additional – it wouldn't have happened otherwise. **Restoration activities** The range of possible offsite restoration actions may include the following: • Habitat improvement, restoration or expansion; • Direct threat mitigation; • Installation of artificial structures or habitats; • Ecological recycling or re-use of natural materials; • Re-introduction of species or natural processes; and • Monitoring and benchmarking. **Examples of partner organisations** The below are some example organisations that may be used for the second pathway. • Biodiversity Conservation Trust of NSW; • Bush Heritage Australia; • Greening Australia; • Landcare Australia; • Queensland Trust for Nature; • Nature Foundation SA; • South Endeavour Trust; • Tasmanian Land Conservancy; and • The Nature Conservancy –Australia Program. Other organisations may be used, provided their activities are verified by a third party.
Waterway Protection	Local waterways are protected, and the impacts of flooding and drought are reduced.	39.0	**Credit Achievement:** The building demonstrates an annual average flow reduction (ML/yr) of 40% compared to pre-development levels and meets specified pollutants targets.	2	0	Site-wide	**CREDIT ACHIEVEMENT** **Runoff volume** The development must demonstrate an annual average flow reduction (ML/yr) of 40%. (Note: Reduction in average annual stormwater discharge refers to the average annual reduction in stormwater volume discharged from the development, with treatment, compared with the stormwater volume that would be discharged without treatment) **Water pollution** All runoff discharged from site meets specified pollution reduction targets listed in the table below. Pollutant — Reduction Target (% of the typical urban annual load) — Credit Achievement — Exceptional Performance Total Suspended Solids (TSS) — 85% — 90% Gross Pollutants — 90% — 95% Total Nitrogen (TN²) — 45% — 60% Total Phosphorus (TP)² — 65% — 70% **Environmental Management** Minimise the risk of chemical pollutants and other toxicants entering the stormwater system, including by, but not limited to: • Chemical storage, loading, refuelling or work areas must install bunding, with any spills draining to trade waste or appropriate treatment devices. These areas must have an awning or roofing to separately divert rainfall into the stormwater system. • If a site has more than 200m² of uncovered areas where vehicles are likely to transit and/or park, then hydrocarbon treatment devices must be installed, specified to remove at least 98% of hydrocarbons, sized to treat a 1-in-3 month ARI (4EY) flow. **EXCEPTIONAL PERFORMANCE** **Runoff volume** The development must demonstrate an annual average flow reduction (ML/yr) of 80%. (Note: Reduction in average annual stormwater discharge refers to the average annual reduction in stormwater volume discharged from the development, with treatment, compared with the stormwater volume that would be discharged without treatment) **Water pollution** All runoff discharged from site meets specified pollution (Exceptional Performance) as per the table above.	**Submissions for this credit must contain:** • **Submission Summary** via the online portal • **Evidence** to support claims made in the submission **Suggested evidence:** **Average flow reduction** Calculation/Modelling Report by a suitably qualified professional. The report should describe: • Civil/Hydraulics drawings showing the stormwater collection, storage and treatment facilities and detailing their functional elements; • Hydraulics drawings showing all the capture, storage, piping and discharge route; and • Site plans showing the total areas of uncovered areas where vehicles are likely to transit and/or park (e.g. roads, loading docks, refuelling bays, and car parking, etc). **Pollution Targets** • Independently verified performance certification for each manufactured stormwater treatment device, proving its ability to achieve the pollution reduction targets.		x					x				x					x			**On-site detention (OSD)** Some sites local drainage authorities may require limitation of post-development peak event discharge from the site. This is commonly called On Site Detention (OSD). OSD is not an integrated water management solution for Green Star purposes, but relevant local requirements should also be integrated and included in the design and submission documentation for consistency and buildability. **Typical urban annual load** Typical urban annual load reductions can be estimated using continuous simulation modelling such as MUSIC, SWMM, XPSWMM, or InSite. Where available, relevant guideline values for pollutant concentrations for the catchment land use and surface type should be used. In areas where there are no specific guidelines reference can be made to sources such as Australian Runoff Quality (ARQ, 2006). **Water sensitive urban design** Water-sensitive urban design (WSUD) is a land planning and engineering design approach which integrates the urban water cycle, including stormwater, groundwater and wastewater management and water supply, into urban design to minimise environmental degradation and improve aesthetic and recreational appeal. **Pre-determined infrastructure** It is noted that some local governments may provide pre-determined infrastructure solutions that are 'deemed to comply' with the aim of this credit criterion. If this is the case the project team should submit a Technical Question to have this approach approved. **Climate scenarios** If the project is targeting the Climate Change Resilience credit, the Risk Assessment included in this credit submission should be used to determine the appropriate climate change scenario. If the project is not targeting the Climate change resilience credit, the project may refer to local council flood level guidance. **Modelling** Pollutant export modelling using computer programs such as MUSIC, STORM etc. predict the discharge pollutant loads for the total site area. The results of the simulation must show a comparison against the relevant reduction targets for offsite reductions. **Reduction in average annual stormwater discharge** A reduction in average annual stormwater discharge refers to the average annual reduction in stormwater volume discharged from the development, with treatment, compared with the stormwater volume that would be discharged without treatment. The volume reduction must be achieved through a combination of evaporation, transpiration, harvesting and retention, pervious paving, and other Water Sensitive Urban Design practices.
			Exceptional Performance: The building demonstrates an annual average flow reduction (ML/yr) of 80% compared to pre-development levels and meets specified pollutants targets.	2	0																						
TOTAL				14	2																						
LEADERSHIP																											

GREEN STAR SCORECARD & PATHWAY
TOOL: GREEN STAR BUILDINGS V1
DOCUMENT REVISION: 2.0 DATE: 25/02/2025

PROJECT ADDRESS:
20 AVON RD, PYMBLE NSW

GREEN STAR MINIMUM SCORE REQUIRED FOR 5 STAR - MINIMUM 35
GREEN STAR SCORES TO BE TARGETED FOR 5 STAR: MINIMUM 42 (5 STAR WITH 7 BUFFER POINTS)

Note: details below are provided as a guide only, where required the project team shall refer to the Green Star Buildings V1 for further details.

CATEGORY / CREDIT	OUTCOME	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TO TARGET	Nominated Area	Requirements	Submission Content	Responsible Party																				Guidance
									Building owner	Head Contractor	Project Architect	Structural Consultant	Mechanical Consultant	Electrical Consultant	Hydraulics/Fire Consultant	Mechanical Contractor	BMS / Control Contractor	Electrical Contractor	Hydraulics / Fire Contractor	ESD Consultant	Landscape Consultant / Contractor	Ecologist	Acoustic Specialist	Civil Engineer / Contractor	Urban Planner	Quantity Surveyor	
Market Transformation	Celebrates initiatives or outcomes that are deemed new and break barriers, and in turn inspire others to follow.	40.0	**Credit Achievement:** The project demonstrates: • How a building solution or process is considered leading in their targeted sector,nationally or globally; or • That the technology or process is not commonly used within Australia's building industry; or globally, depending on the context of the innovation claimed.	up to 5			**CREDIT ACHIEVEMENT** Projects can make up to five claims for this credit. Each claim is only worth one (1) point. To claim points, the project team must show that an initiative is innovative by demonstrating that the technology or process is not commonly used within Australia's building industry; or globally, depending on the context of the innovation claimed.	**Submissions for this credit must contain:** • Submission Summary via the online portal • Evidence to support claims made in the submission **Suggested evidence:** • Description of the claim; • Description of how and why the claim is considered leading practice; • Overview of how the claim is aligned with the GBCA's scoring metrics; and • Alternate documentation can also be used by project teams to demonstrate compliance.	x	x	x	x	x	x	x	x	x	x	x						**Leading technology or process** Leadership points in this pathway are more likely to be awarded for projects that: • Employ technologies or strategies that achieve an outcome in Green Star through significant improvement or gains when compared against best practice technologies; • Employ technologies or strategies that are new or adopted from other industries that achieve the relevant Green Star outcome; • The claim is replicable for other buildings to adopt; and • Can clearly justify alignment with the GBCA's scoring metrics: – Control of outcome: the initiative delivers a guaranteed outcome. That is, it is not process-related – Length of impact: the initiative delivers long-lasting impacts – Scale of impact: the scale of impact is significant. For example, the outcome may satisfy multiple UN Sustainable Development Goals – Transformation potential: the initiative has the potential to transform an industry or sector. – Value generation: the initiative can deliver benefits to both stakeholders (e.g. building owner or occupants) as well as the general public. **Assessing market transformation** Leadership points are assessed and awarded at the discretion of the Certified Assessor(s). In reviewing the submission, the Certified Assessor(s) will consider the relative benefits and improvement as compared to other Green Star credits.
Leadership Challenges	Promotes achievements that are considered leading practice in Australia.	41.0	**Credit Achievement:** The project meets a Leadership Challenge developed by the GBCA	Unlimited	1 TBC		**CREDIT ACHIEVEMENT** Projects teams can target as many Leadership Challenges as they wish. Leadership Challenges will be uploaded to the GBCA website as they are developed. All criteria as listed on the Leadership Challenge must be met to claim reward.	As per Leadership Challenge.	x	x	x	x	x	x	x	x	x	x	x						
TOTAL					1																								

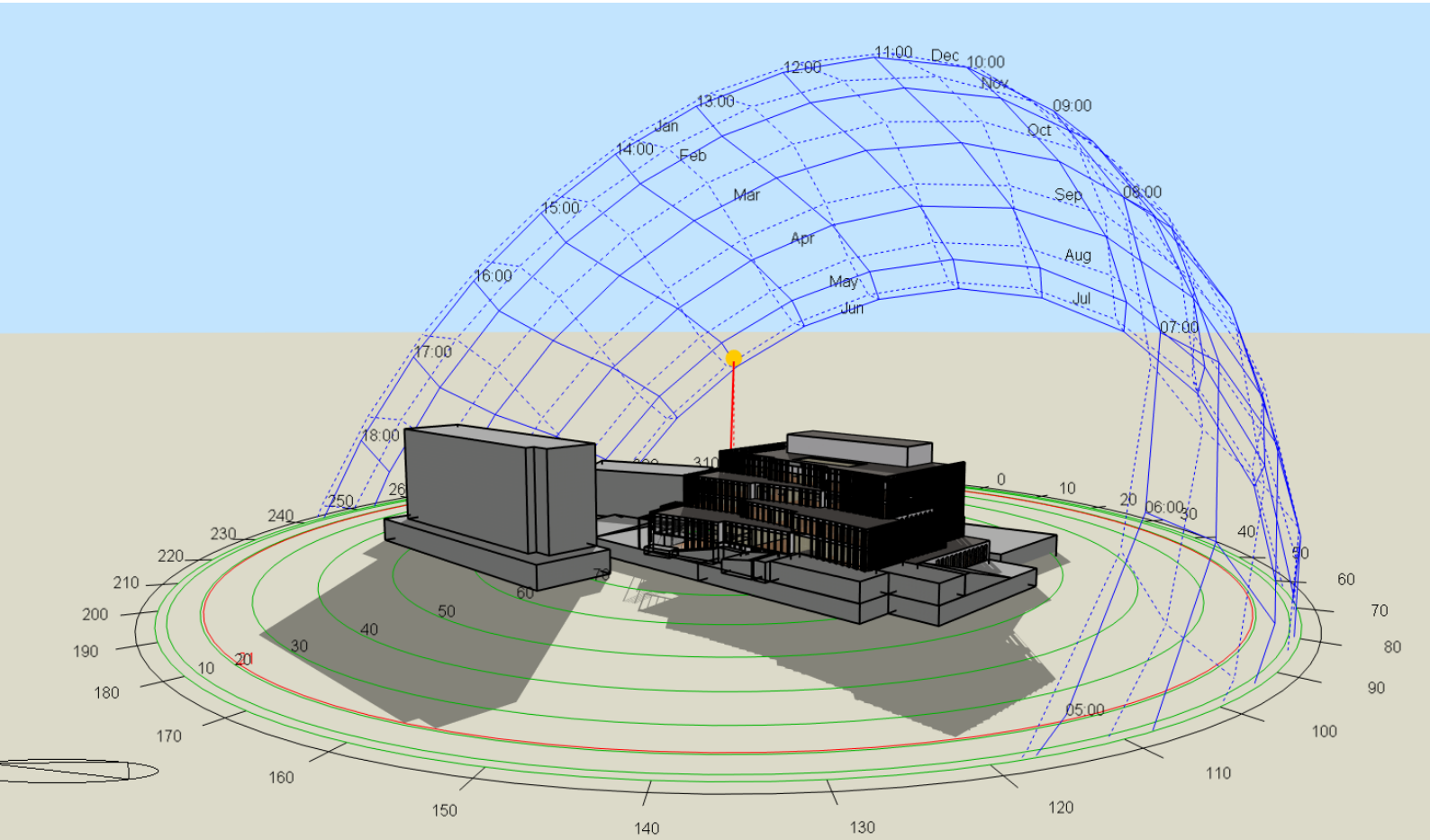
TOTAL POINTS TARGETED:	**42 POINTS**

MINIMUM TOTAL POINTS REQUIRED FOR 5 STAR:	**35 POINTS**	
MINIMUM TOTAL POINTS TO TARGET FOR 5 STAR:	**42 POINTS**	**5 STAR WITH 7 BUFFER POINTS**

- **Legal compliance** – The building is compliant with legislation (National Construction Code – 2019 or later)
- **Good Practice** – The building meets the *Minimum Expectations* of good practice – energy and water efficient, good indoor environment quality, and built to operate well.
- **4 Star** – reflects a *Best Practice* environmental performer. It builds on the *Minimum Expectations* to deliver a building that is either climate positive or a higher performer in energy, water, and health related issues **(15 out of 100 points)**
- **5 Star** – demonstrates *Australian Excellence* by being a high environmental performer that addresses social issues relevant to the building owner **(35 out of 100 points)**
- **6 Star** – showcases *World Leadership*. It has been built to be a highly efficient building fully powered by renewables that addresses a significant number of environmental and social issues, and contributes to the community **(70 out of 100 points)**

APPENDIX D – NET ZERO EMISSION ASSESSMENT REPORT

IGS INTEGRATED GROUP SERVICES



20 Avon Rd, Pymble NSW

Net Zero Emission Assessment Report

25 February 2025

VALUE | INNOVATION | TRUST

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Document Control

Revision	Date	Author
1.0	25 February 2025	B.Shojaei

CONTENTS

1 Executive Summary

Integrated Group Services (IGS) has been engaged to undertake a Net Zero emission assessment report for the proposed development at 20 Avon Rd, Pymble NSW. This energy modelling and Greenhouse Gas Emission assessment has been conducted in accordance with Green Star Buildings V1 Submission Guidelines – Energy Use, Reference Building Pathway in alignment with Section 35C of the EP&A Regulation - Net zero statement for non-residential development under Sustainable Buildings SEPP.

This following reference document was reviewed:

- The Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) part 8: Ecologically Sustainable Development (ESD), Application number: SSD-79146716, Date of issue, 16/01/2025.

Based on the intent of the net zero statement, we have adapted the Green Star Buildings v1 – Credit Energy Use: Reference Building Pathway in order to target the GHG emission of these areas. This credit defines the reference building as a building modelled to Section J requirements of the National Construction Code 2022 or later.

The Reference building model input for the project was developed using DTS specifications from NCC Section-J 2022 for façade (J4) and services (J5- J9). The Proposed building design is also modelled using the above methodology.

Table 1 provides a summary of the predicted annual energy consumption and GHG emissions from the Reference and Proposed building models. The predicted annual energy consumption for the Proposed building design model is 31.51% lower than that of the Reference building design model.

Table 1. Predicted energy consumption and GHG emissions, Green Star Buildings - Reference Building Pathway.

End Uses	**Reference Building**	**Proposed Building**
	Electricity (kWh)	**Electricity (kWh)**
Heating	58,536	47,885
Cooling	281,707	200,126
Air Conditioning Fans	91,966	94,832
Hydraulic Pumps	11,629	11,629
Interior Lighting	143,625	120,806
Exhaust Fans	58,827	58,827
Lifts	13,591	13,591
DHW	6,097	6,097
Miscellaneous loads	19,979	16,614
110kW Solar PV Elec. Generation (without Battery)	-	(-) 100,598
Total	**685,957**	**469,809**
GHG Emissions Factor ($kgCO_2e/GJ$)	236.0	236.0
Total GHG Emissions($kgCO_2e$)	**582,789**	**399,150**
Reduction (%)	**31.51%**	

If Net Zero emission is to be targeted for the assessed areas, the performance and design documentation for the architectural and building services such as Glazing, Insulation, Internal Lighting, HVAC, and Hot Water shall be consistent with the minimum requirements and assumptions used in this report.

To fully achieve Net Zero GHG Emissions (Carbon Neutrality) for the operational energy consumption of the commercial building, the development may offset an annual electricity consumption of approximately 470 MWh per annum. This may be achieved via purchasing Green Power or other means.

2 Methodology

For the Proposed building, a whole building energy simulation analysis has been carried out to demonstrate that the Proposed building design achieves a significant reduction in predicted energy consumption, and a consequent 30% reduction in GHG emissions when compared to a Section-J compliant DTS Reference building.

The proposed development at 20 Avon Rd, Pymble NSW, comprises of a basement level, a Lower Ground Floor, a Ground Floor and 3 storeys above.

For the whole project, the minimum required deemed- to-satisfy (DTS) provisions for Section-J, has been established as per Volume One of NCC 2022.

The Green Star Energy Simulation guide and Volume 1 of NCC 2022 are used to specify minimum performance parameters for façade and services.

While the Proposed building model geometry is the same as the Reference building model, other parameters and design requirements are described in the following sections of the report.

This Net Zero Statement (as defined in Section 35C of the EP&A Regulation) includes:

- Evidence demonstrating how the development will either be fossil fuel-free from the commencement of occupation or will transition to being fossil fuel-free by 1 January 2035.
- Details of any renewable energy generation and storage infrastructure implemented, as well as any passive and technical design features that minimize energy consumption.
- Estimates of the annual energy consumption for the building and the amount of emissions related to energy use in the building.

3 Building Description

3.1 NCC Climate Zone & Building Classification

The climate zone is defined by the BCA as “an area for specific locations, having energy efficiency provisions based upon a range of similar climatic characteristics”.

The proposed development will be located in Pymble NSW which is within the NCC climate zone 5 (warm temperate). The climate zone map of the development is depicted in Figure 1.

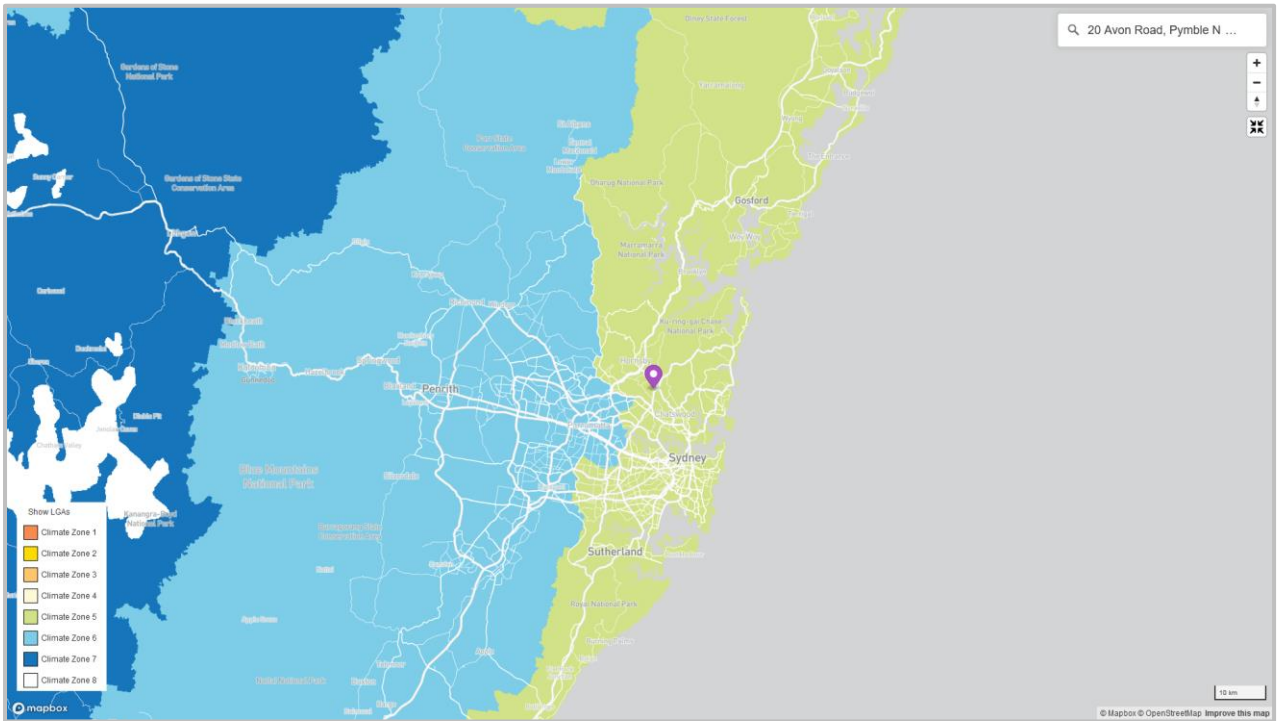


Figure 1. NCC Climate Zone Map.

4 Description of Proposed and Reference Building Models

4.1 Thermal Model Geometry

The proposed development at 20 Avon Rd, Pymble NSW comprises:

- Auditorium, Workshop, Loading dock, Storages and Plant Rooms and in the Basement.
- Kitchens, Canteen, lounge, Classrooms, Workshops and other common areas in the Lower Ground Floor.
- Classrooms, Workshops, Offices, Meeting Rooms, lounge, and other common areas in the Ground Floor and Level 1 to 3.

The building was modelled as per architectural plans and elevations. Figure 2 and Figure 3 provide a representation of various elevations and floors as constructed in the energy simulation model.

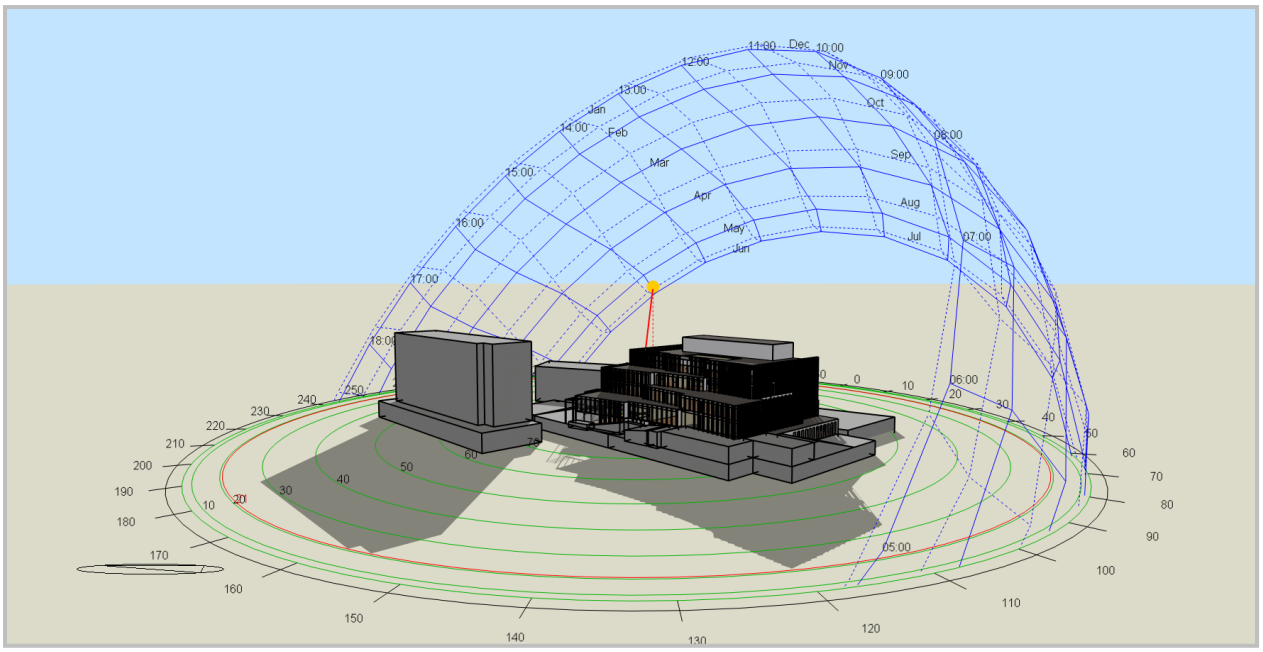


Figure 2. Simulation Model Geometry – Overall View.

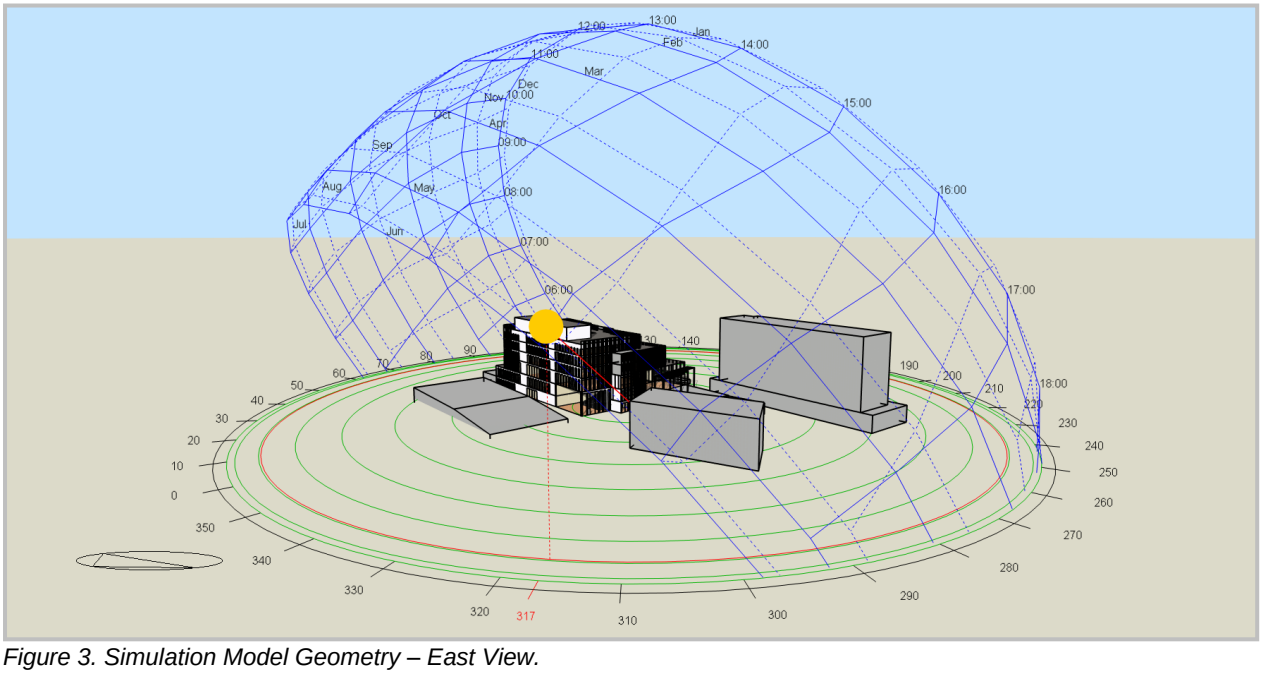


Figure 3. Simulation Model Geometry – East View.

4.2 Reference Drawings

This energy model and consumption estimate, and all inputs and assumptions document herein, are based on the documentation listed below:

- Architectural drawings by 3xn Architects summarized in Table 2:

Table 2. Architectural drawings.

Drawing Title	Drawing No.	Date of Issue
General Project Overview AXO	AR-SIP-A00-1001	15.11.2024
Site Plan - Proposed	AR-SIP-A01-1001	15.11.2024
GA Plans – Basement 01 to Roof Level	AR-SIP-A02-10B1, LG & AR-SIP-A02-1000~ 1005	15.11.2024
Elevations	AR-SIP-A06-1001~1004	15.11.2024
Sections	AR-SIP-A07-1001~1004	15.11.2024
FECA+UCA Area Plans	AR-SIP-A19-1000	15.11.2024
Schedule of Accommodation	AR-SIP-A19-3000	15.11.2024

- Schematic Design Report by ARUP, Reference: SIP-BS-RPT-001, Issue: 25 November 2024.
- 3D IFC model No. 550053 by 3xn architects on date 18.11.2024.
- Energy Use calculation guide Guidance on calculation methods for the Energy Use credit - Version 1, October 2022.
- Green Star Buildings Submission Guidelines – Version 1: Revision B, December 2021.
- NCC 2022 Volume 1. - Section J.
- Riverview Observatory NSW Typical Meteorological Year (TMY) recorded Weather Data.

4.3 Analysis Software

Computer modelling was performed using the Design Builder software to predict the annual mechanical energy consumption requirements for the building. This program uses a dynamic simulation to assess the building envelope response as well as space and surface temperatures, internal loads and energy consumption.

To ensure appropriate results are derived from the software package, ABCB requires that the software conform to appropriate BESTEST validation test or be certified in accordance with ANSI/ASHRAE Standard 140-2001: “Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs”. Design Builder satisfies this requirement.

The Design Builder program models the heat exchange between the air-conditioned space and the external environment to the space, hot or cold bodies in the space including people, lighting, and machines, and the air-conditioning system. The external environment includes the external ambient conditions and adjacent spaces.

The heat exchange analysis includes convection to and from surfaces, radiation exchange to and from the external environment, radiation exchange between the space internal surfaces, conduction through surfaces, and changes in humidity.

The software addressed all the main aspects of thermal modelling such as:

- Energy flow through the building’s envelope, including at adiabatic surfaces and also including thermal storage effects. Accurately modelling the performance of the air-conditioning and ventilation systems, including plant and equipment using their energy input ratios, coefficients of performance, or efficiency at full and part load. Control

strategies, sequencing of plant and equipment, controlled settings and types of controls. Relative humidity range; and Use of different energy types.

The energy consumption outputs from the program were used as inputs to this assessment.

This Energy Simulation analysis has been carried out using the Energy Plus energy simulation developed by the USDOE. Energy Plus development is continually tested using industry standard methods as major builds are completed. Three major types of tests are currently conducted:

a. Analytical tests:
   - HVAC tests, based on ASHRAE Research Project 865
   - Building fabric tests, based on ASHRAE Research Project 1052

b. Comparative tests:
   - ANSI/ASHRAE Standard 140-2011
   - International Energy Agency Solar Heating and Cooling Programme (IEA SHC) BESTEST (Building Energy Simulation Test) methods not yet in Standard 140
   - Energy Plus HVAC Component Comparative tests Energy Plus Global Heat Balance tests

c. Release and executable tests

The BESTEST suites compare the results of multiple simulation programs for a series of load-related attributes.

Therefore, the Design Builder simulation suite complies with the ABCB software protocol. The Design Builder graphic user interface (GUI) has been used to develop the complex building geometry with external shading and to access the power of Energy Plus.

Table 3. Energy simulation analysis software description.

Software name and version	Design Builder v7.0.0.082
Software developer	Design Builder Software Ltd / USDOE
Software validation standard	BESTEST

4.4 Weather Data

Historical hourly local weather data, in the form of twelve months' data, was used to represent the building external ambient data at the building location and to accurately model the dynamic nature of building thermal response. The weather data contains hourly records of radiation, temperature, humidity, sunshine duration and wind speed and direction for a typical meteorological year. Based on the location of the development, the weather data from the closest weather station was used for the simulation of all models (Riverview Observatory NSW, approx. 9.5 km from the site) The weather station distance from site is illustrated in Figure 4 and Table 4 outlines details of the simulation weather file. The Typical Meteorological Year (TMY) weather file represents a year without unusual extremes in temperature or typical average conditions, suitable for energy simulation modelling.

Table 4. Simulation weather file details.

Weather File Property	Value
Location	Riverview Observatory NSW
Weather File Type	Typical Meteorological Year (TMY)

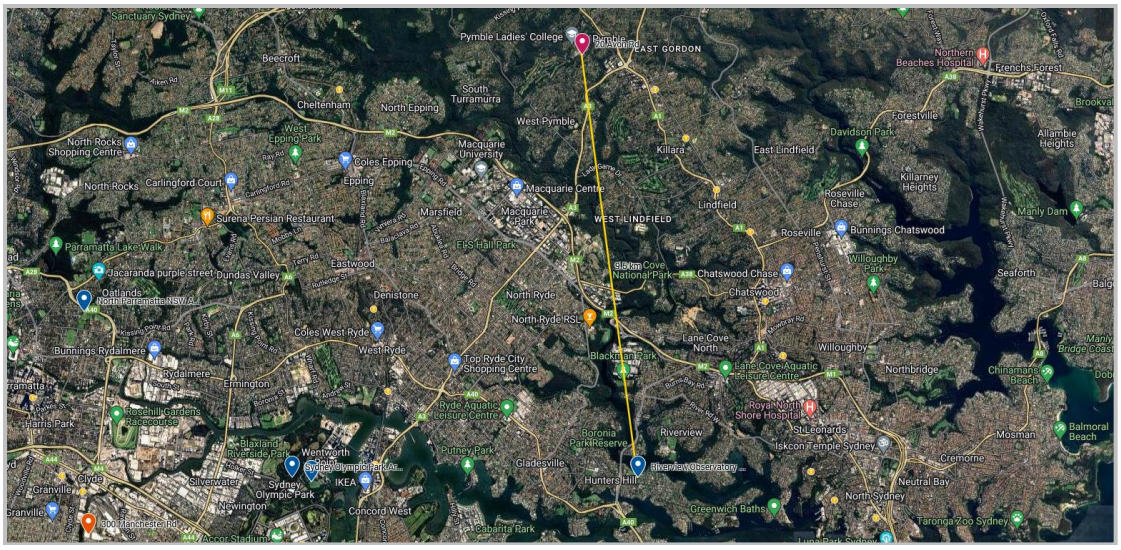


Figure 4. Weather Station distance from site.

4.5 General Modelling Parameters

Table 5 outline the parameters were applied for both the Reference and the Proposed building models developed for this project:

Table 5. General modelling parameters.

Items	Proposed Building	Reference Building
Climate zone	NCC climate zone 5	Same as Proposed Building
Weather data	Riverview Observatory NSW	Same as Proposed Building
Total modelled building gross floor area (GFA)	10,953.7 m^2	Same as Proposed Building
Building Orientation	As per Architectural Drawings	Same as Proposed Building
Heating fuel(s)	Electricity	Same as Proposed Building
Cooling fuel(s)	Electricity	Same as Proposed Building
Infiltration	• 0.7 air changes per hour throughout all zones when there is no mechanically supplied outdoor air; • 0.35 air changes per hour at all other times.	Same as Proposed Building

4.6 Space Summary

Modelling parameters for each of the space types included in the building simulation models are described in the Table 6:

Table 6. Space summary.

SPACE TYPE	Theatre Areas
Occupancy Profiles	NCC Class 9b - Theatre profile
Temperature Control Range	21°C to 24°C
Occupant Density m^2/person	1
SPACE TYPE	**School Canteen Areas**
Occupancy Profiles	NCC Class 6 profile - Cafe
Temperature Control Range	21°C to 24°C

Occupant Density m^2/person	1
SPACE TYPE	**College Areas**
Occupancy Profiles	NCC Class 9b school profile
Temperature Control Range	21°C to 24°C
Occupant Density m^2/person	2
SPACE TYPE	**Office Areas**
Occupancy Profiles	NCC Class 5 office profile
Temperature Control Range	21°C to 24°C
Occupant Density m^2/person	10
SPACE TYPE	**Conditioned Common Areas**
Temperature Control Range	21°C to 24°C
SPACE TYPE	**Conditioned Common Areas -Transitory Occupancy**
Temperature Control Range	18°C to 25°C
SPACE TYPE	**Unconditioned Common Areas**
Temperature Control Range	-
Occupant Density m^2/person	-

4.7 Building Fabric

The constructions input to the Reference and Proposed building models are described below. Table 7 address the opaque fabric of the building model.

4.7.1 Opaque Fabric Components

Table 7. Building Fabric – Minimum Thermal Performance.

Section	Item	Proposed Building	Reference Building
J4D4	**External Roof**	As per Reference Building	Total thermal insulation R3.7 as per NCC 2022 J4D4
J4D6	**External Wall**	As per Reference Building	Total thermal insulation R1.5 as per NCC 2022 J4D6 (DTS Façade Calculator)
	Internal walls	As per Reference Building	Total thermal insulation R1.0 as per NCC 2022 J4D6 (DTS Façade Calculator)
J4D7	**Envelope Floor**	As per Reference Building	Total thermal insulation R2.0 as per NCC 2022 J4D7

4.7.2 Transparent Fabric Components for Reference Building

Table 8 outlines the glazing and thermal insulation levels utilised in the Reference Building simulations. The NCC Section-J glazing calculator has been used to specify just compliant window systems for the Reference building model. To ensure glazing consistency, identical glazing performance has been nominated for all aspects (based on the minimum requirements obtained from NCC Section J DTS Façade Calculator).

Table 8. Transparent fabric components for reference building.

Level	Reference Building	
	U-Value	SHGC
Basement1	4.07	0.36
Lower Ground Level	5.8	0.66
Ground Floor	3.65	0.34

Level	Reference Building	
	U-Value	SHGC
Level1	3.33	0.33
Level2	3.82	0.36
Level3	3.76	0.34

4.7.3 Transparent Fabric Components for Proposed Building

Table 9 provides these performance parameters applied by space type, to the Proposed building model.

Table 9. Proposed Glazing Selection.

	All Aspects	
	U-Value	SHGC
Glazing Component	5.0	0.5

Definitions for window glazing systems in relation to the NCC are as below:

- U-value, in W/m^2-K, NFRC winter values, for the whole window (glass + framing)
- SHGC = solar heat gain coefficient, dimensionless

4.8 Internal heat loads and occupancy density

The internal heat loads applied to both the Reference and Proposed models are provided in Table 10 The occupancy, lighting and equipment loads have been uniformly distributed throughout the building.

Table 10. Load Details.

Item	Details
People Load	• Dining Room, Restaurant or café: 80 W sensible heat gain and 80 W latent heat gain. An average adjusted metabolic rate from Table 45 of AIRAH-DA09 A heat emission rate from Table 6.3 of CIBSE Guide A. • Other Applications: 75 W sensible heat gain and 55 W latent heat gain. An average adjusted metabolic rate from Table 45 of AIRAH-DA09. A heat emission rate from Table 6.3 of CIBSE Guide A.
Hourly Profile	Based on NCC Specification Table S35C2c, S35C2d, S35C2f, S35C2h and S35C2j.
Internal heat gains for appliances and equipment	Based on NCC Specification 35 Table S35C2l.

4.9 Infiltration Rates

The infiltration rates have been included in both the “reference” and “proposed” models in compliance with Specification 34 of the NCC.

4.10 Shading

All external shading has been incorporated in the model based on the provided architectural drawings.

4.11 HVAC Services

The HVAC systems for both the Proposed Building and Reference Building models were simulated in Design Builder software package. The following temperature bands were adopted for 98% of the plant operation time.

- 18°CDB to 25°CDB for conditioned spaces with transitory occupancy; and
- 21°CDB to 24°CDB in all other conditioned spaces

The mechanical systems for the Reference Building model were simulated with the input parameters in accordance with the DTS Requirements of NCC Part J6.

The heating and cooling COPs for the proposed building's HVAC system are set at 4.5, based on the Schematic Design Report by ARUP (Reference: SIP-BS-RPT-001, Issue Date: 25 November 2024).

Figure 5 demonstrate the HVAC detail applied to the models. The HVAC systems were simulated based on a selected set of monthly design day temperatures and coincident wet bulb temperatures. The part load performance curves adjust the efficiency of the system based on the capacity, as well as the supply air and environmental conditions.

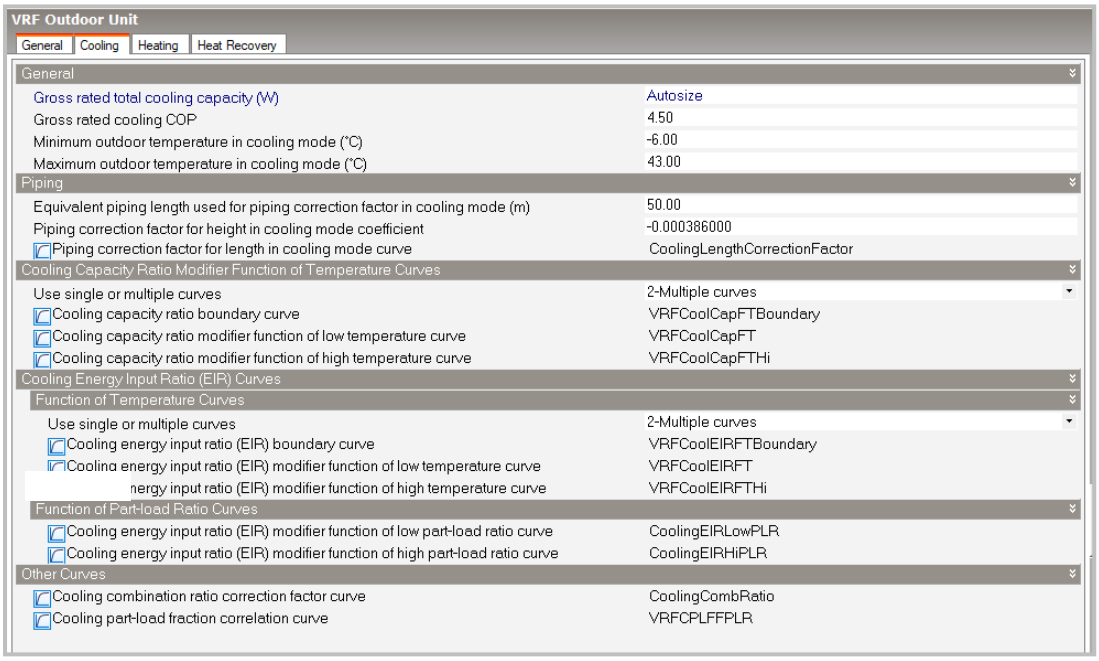


Figure 5. Sample of input data for detailed HVAC modelling – proposed building outdoor unit.

4.12 Internal Lighting System

The Reference building design has been modelled with Illumination power density in accordance with Table J7D3a of NCC 2022. This follows the process methodology detailed in Table 1: Modelling requirements for the Proposed and Reference Project in the Green Star Energy Consumption and Greenhouse Gas Emissions Calculation Guide. However, for the Proposed building design, internal lighting layouts have not been finalised as the project is still pending final development consent. Hence, the Proposed building design has been modelled with industry standard practice lighting systems, with equivalent lighting power densities as listed in the table below. Table 11 provides the Reference and Proposed buildings lighting energy consumption.

Table 11. Internal lighting system - Reference.

	Illumination Power Density (W/m^2)	
	Reference building	**Proposed building**
Auditorium	8.0	6.4
Office	4.5	3.6
Break out space	4.5	3.6
Classroom and workshop	4.5	3.6
Canteen	14.0	11.0
Kitchen	4.0	3.2
Plant	4.0	3.2

	Illumination Power Density (W/m^2)	
	Reference building	**Proposed building**
Corridors	5.0	4.0
Kitchen	4.0	3.2
Loading dock	2.0	2.0
Lobby	5.0	4.0
storage	1.5	1.5
Laundry & Services	1.5	1.5
Stairways	2.0	2.0
Toilet	3.0	2.5
External	1.0	1.0

4.13 Domestic Hot Water

For both the Reference and Proposed Building model, the annual DHW demand was calculated based on Green Star potable water calculator and was used to derive the annual energy consumption for this end use. The end of trip facility hot water consumption is estimated based on Green Star potable water calculator.

The general form of the annual energy calculation is as follows (equation 1):

$$Q_{input} = \frac{q_{DHW} c_p \Delta T}{1000\, \eta_{heater}} (1 + f_{standing} + f_{distribution}) \quad (1)$$

Where Q_{input} is the system total annual energy consumption (kWh), q_{DHW} is the system annual domestic hot water usage (L/annum), cp is the specific heat capacity of water (approximately 4.192 kJ/kg.K), ΔT is the temperature difference between supply and make up water temperatures (K), η_{heater} is the gross thermal efficiency of the water heater (%), $f_{standing}$ is a factor accounting for standing losses in the system, and $f_{distribution}$ is a factor accounting for distribution losses in the system.

Table 12 shows the parameters used in estimation.

Table 12. Parameters used in DHW estimation.

Parameter	Value
Cp	4.192 (kJ/kg K)
ΔT	35°C (60-25)
Standing Factor	0.01 (based on Green Star)
Distribution Factor	0.05 (based on Green Star)

Table 13 shows the domestic hot water energy consumptions required to be included in the model.

Table 13. DHW Energy Consumption.

	Annual consumption	
	Reference Building	**Proposed Building**
Annual DHW Demand (kL/annum)	466	466
Total Energy Use for DHW Heating (kWh/annum)	5,752	5,752
Standing Loss (kWh/annum)	58	58
Distribution Loss (kWh/annum)	287	287
Total annual Consumption (kWh/annum)	6,097	6,097

4.14 Ancillary Mechanical Ventilation Fans

The proposed building design has ancillary mechanical ventilation for the internal areas. The estimated energy calculated by the mechanical ventilation systems are applied to both the proposed and the reference buildings. Table 14 shows the estimated energy consumption of ancillary mechanical ventilation fans.

Table 14. Ancillary mechanical ventilation fans.

	Annual energy consumption (kWh)	
	Reference building	**Proposed building**
Ventilation and exhaust fans	58,827	58,827

4.15 Lifts

The annual energy consumption represented by the lifts were calculated using the equation 4: (adapted from Barney, 2007):

$$E = N\frac{\bar{T}_{trip}}{3600}\dot{Q}_{avg} + \dot{Q}_{standby}T_{standby}D_{standby} \quad (4)$$

Where,

E: annual energy consumption of the lift (kWh/annum).

Table 15 estimates the Lift energy consumption which has been included in the model based on Schematic Design Report by ARUP, Reference: SIP-BS-RPT-001, Issue: 25 November 2024.

Table 15. Lifts energy consumption.

Lift Number	Elevations heigh (m)	Building Lift Energy Calculation
1	20.52	5,577
2	24.48	6,381
3	3.96	1,632
Total Annual Energy Consumption (kWh)	-	**13,591**

4.16 Hydraulic Pumps

Table 16 shows the estimated hydraulic pumps energy consumption which has been included in in both the proposed and the reference buildings. Annual water demands are estimated based on Green Star Potable Water Calculator.

Table 16. Hydraulic Pumps Energy Consumptions.

	Total Flow (kL/Annual)	Max. Pressure (kPa)	Estimated Pump Power (kW)	Annual Energy Consumption (kWh)
Domestic Hot Water Recirculation	466	500	0.3	1,004
Potable Water Pressurisation	1,797	500	1.3	3,871
Non-Potable Water Pressurisation	3,001	500	2.1	6,465
Fire Service	134	500	0.1	289
Total	-	-	-	**11,629**

4.17 Miscellaneous Loads

Table 17 shows the estimated Miscellaneous Loads energy consumptions required to be included in this assessment.

Table 17. Miscellaneous Loads Energy Consumptions.

System	Demand	Annual Miscellaneous Loads Energy Consumption (kWh)	
		Reference Building	Proposed building
BMS, Leak Detection, Fire Alarm, Cable Losses, Security Control Systems	3% of Total Electrical Consumption	19,979	16.614

4.18 NCC Greenhouse Gas Emission Factors

The annual greenhouse gas emissions for the proposed building and the reference building have been calculated using the greenhouse gas emissions factors outlined in Table 18.

Table 18. NCC Greenhouse Gas Emission Factors.

Energy Source	GHG emissions factors ($kgCO_2$-e/GJ)
Electricity	236

4.19 Onsite Energy Generation

JV3 allows the renewable energy generated on-site or the "free" energy derived from another process (e.g. heat from cogeneration) to be deducted from the annual energy consumption of the proposed building. This means that the "annual energy consumption" is the sum of the energy drawn annually from the electrical grid, the gas network or fuel brought in by road transport and not the total of the energy consumed by the services that use energy.

4.19.1 Solar PV

The Photovoltaic (PV) system may consist of the main components or of equal capacity detailed in Table 22.

Total nominal power: 110 kW

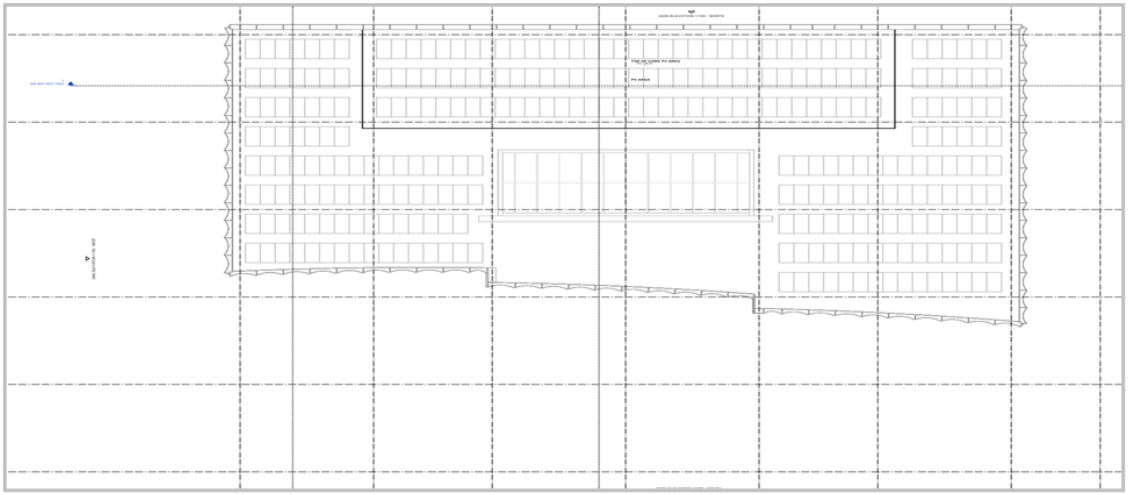
Approx. roof space requirements: 688 m^2

Table 19. Main components of photovoltaic (PV) system.

Components	Brand, Model & Quantity
PV Inverter	Sungrow – Quantity: (1)x 90 kW or equivalent
PV Panels	Trina - TSM-600-DEG20C – capacity: 600W - Quantity: 184 Approx.
Battery storage	the system to be sized during the detailed design stage, based on the final PV capacity as well as the electrical design for lower reliance on electrical network due to maximum demand constraints.
PV mounting frame and system balance	Quantity: depending on the requirements and final design

The minimum onsite Solar PV capacity required for the development is 110kW. The energy generated by the solar PV shall be consumed on site. The exact sizing, configuration and final design will be completed during the design stage.

Roof Plan with approx. Solar PV Space:



4.19.2 Solar PV – Projected Energy Generation for a 110-kW System

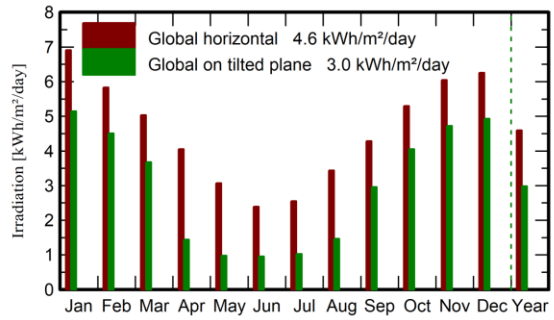
Grid system presizing

Geographical Site		Situation	
Sydney/Clontarf		Latitude	-33.82 °S
Australia		Longitude	151.27 °E
		Altitude	11 m

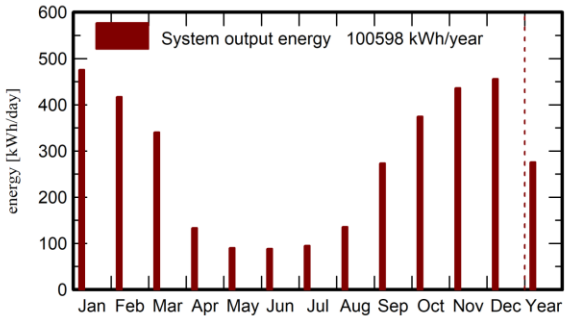
System summary

Nominal power	110 kWp	Total area	688 m²
Module type	Standard	Supports for modules	Facade or tilted roof
Technology	Monocrystalline cells	Ventilation property	Free air circulation

Weather data and incident energy



System output



	Horizontal global kWh/m²/day	Coll. plane kWh/m²/day	System output kWh/day	System output kWh
Jan.	6.91	5.14	475.5	14741
Feb.	5.83	4.51	416.8	11671
Mar.	5.03	3.68	340.3	10548
Apr.	4.05	1.44	133.6	4007
May	3.07	0.98	90.44	2804
June	2.39	0.95	88.19	2646
July	2.55	1.03	94.84	2940
Aug.	3.44	1.47	135.5	4201
Sep.	4.28	2.96	273.6	8207
Oct.	5.30	4.05	374.6	11612
Nov.	6.05	4.72	436.3	13090
Dec.	6.25	4.93	455.8	14131
Year	4.59	2.98	275.6	100598

5 Results

This reduction in GHG emissions has been achieved by higher performance HVAC systems, higher performance lighting Systems and on-site renewable energy generation. The predicted reduction in emissions is achieved without considering improvements to the Reference case for lifts and exhaust fans, and the results may be considered conservative.

Table 20 provides a summary of the energy simulation results for the Reference building design model and the Proposed building design model. These results are developed by using the predicted annual energy consumption numbers from the Energy Plus simulation runs.

The predicted annual greenhouse gas emissions for the Proposed building design model is 31.51% lower than that of the Reference building design model.

This reduction in GHG emissions has been achieved by higher performance HVAC systems, higher performance lighting Systems and on-site renewable energy generation. The predicted reduction in emissions is achieved without considering improvements to the Reference case for lifts and exhaust fans, and the results may be considered conservative.

Table 20. Summary of energy simulation results.

End Uses	Reference Building Electricity (kWh)	Proposed Building Electricity (kWh)
Heating	58,536	47,885
Cooling	281,707	200,126
Air Conditioning Fans	91,966	94,832
Hydraulic Pumps	11,629	11,629
Interior Lighting	143,625	120,806
Exhaust Fans	58,827	58,827
Lifts	13,591	13,591
DHW	6,097	6,097
Miscellaneous loads	19,979	16,614
110kW Solar PV Elec. Generation (without Battery)	-	(-) 100,598
Total	685,957	469,809
GHG Emissions Factor ($kgCO_2e/GJ$)	236.0	236.0
Total GHG Emissions($kgCO_2e$)	**582,789**	**399,150**
Reduction (%)	**31.51%**	

If Net Zero emission is to be targeted for the assessed areas, the performance and design documentation for the architectural and building services such as Glazing, Insulation, Internal Lighting, HVAC, and Hot Water shall be consistent with the minimum requirements and assumptions used in this report.

To fully achieve Net Zero GHG Emissions (Carbon Neutrality) for the operational energy consumption of the commercial building, the development may offset an annual electricity consumption of approximately 470 MWh per annum. This may be achieved via purchasing Green Power or other means.

6 Disclaimer

This report is prepared using the information described above and inputs from other consultants. Whilst IGS has endeavoured to ensure the information used is accurate, no responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact IGS for detailed advice which will take into account that party's particular requirements.

Computer performance assessment provides an estimate of building performance. This estimate is based on a necessarily simplified and idealised version of the building that does not and cannot fully represent all the intricacies of the building once built. As a result, simulation results only represent an interpretation of the potential performance of the building. No guarantee or warrantee of building performance in practice can be based on simulation results alone. IGS and its employees and agents shall not be liable for any loss arising because of, any person using or relying on the Report and whether caused by reason or error, negligent act or omission in the report. The draft assessment has been prepared based on the preliminary building services and architectural design with the view to conduct a detailed assessment once the design is further developed.

The performance and design documentation for Glazing, Insulation, Internal Lighting, HVAC and Hot Water is to be consistent with the recommendations of this report. Any changes to the performance of the above-mentioned components will have a direct effect on the predicted energy use and GHG emissions.

Energy simulation is a powerful analytical tool to test the performance of alternative design solutions. The outcome of each energy simulation run is dependent on a very large number of model input assumptions and the weather data file being used. Variance from the stated input data assumptions will have a direct effect on predicted energy use and greenhouse performance.

APPENDIX E – NABERS EMBODIED EMISSIONS FORM

NSW Government
4 Parramatta Square
Parramatta NSW 2150
nabers.gov.au

NABERS Embodied emissions materials form

New non-residential developments must complete this form

From 1 October 2023, all new non-residential developments must report on embodied emissions using this form in NSW, where the NSW government's State Environmental Planning Policy (Sustainable Buildings SEPP) 2022 applies. You must disclose the amounts of key materials at the development application and construction certificate stages.

More on the Sustainable Buildings SEPP

Embodied carbon emissions are generated across the full life cycle of a building from "cradle to grave". Embodied carbon made up 16% of the whole-of-life carbon footprint of Australia's buildings in 2019 [1]. The purpose of this form is to report on material quantities only, to support project team discussions about potential reduction in emissions from key materials. The form does not include embodied emissions factors. This reporting form will be updated to reflect the NABERS Embodied Carbon tool when it's available in 2024.

Step 1: About the building

In the 'About the building' tab, you will add the location, function, and type of building you are planning to construct. You will also need to add information that describes the building, including gross floor area, number of floors, area of carpark, and more. Collecting this information will allow the NSW Government to compare similar buildings.

Step 2: Quantity of materials

In the 'Quantity of materials' tab, you will add the amounts of materials that you will use to construct your building. You only need to complete those fields relevant to your building. Leave fields that aren't relevant to your building blank. We recognise that there will be uncertainty, particularly at DA stage, so please use your best estimates where information is unknown (e.g., based on past projects).

How much do I need to include?
You must include all parts of the building delivered by the main contractor, covering at least 80% of the total materials bill. For example, if you spent $100,000 on materials, you need to include the material amounts of at least $80,000 of those materials in this form.

Wherever possible, consider materials costs only, not labour, plant or equipment. However, where you cannot split out the materials costs, please simply be consistent in the way the costs are reported throughout the spreadsheet.

Enter the **quantity of materials** (excluding labour, plant, equipment, margins and taxes) for:

(1) Structure (substructure and superstructure) within the envelope of the building. Also include any ancillary buildings that are necessary for the main building to function (for example, plant that is in a separate building).

(2) Envelope (cladding, curtain walls, roofing, windows, doors etc.)

(3) Permanent internal walls and doors. At minimum, this should include all structural walls.

(4) External works (hard landscaping, carparks, etc.) outside of the building envelope.

Enter the **cost of materials** (excluding labour, plant, equipment, margins and taxes) for:

(5) Building services (mechanical, electrical, plumbing, vertical transport, etc.) required to run the core of the building. Exclude special equipment required by a particular tenant.

You must enter the amounts of materials in SI units (commonly known as the metric system). These are generally consistent across the various products on the market. However, you might need to convert the units of some materials (for example, convert volume to kg).

Step 3: Certifier details

In the 'Certifier' tab you will add the details of the person who has entered data, and the person who has certified the accuracy of the data. The certifier must be a quantity surveyor, designer, engineer or NABERS assessor.

Step 4: Attach to approval

Attach this Excel spreadsheet to your development application or construction certificate application.

The data collected in this form will be used by the NSW Government to inform future policy development.

Help!

If you have general questions about reporting on the embodied emissions of your building, you should contact your local council or consent authority.

If you have technical questions about this spreadsheet, please contact NABERS:
nabers@environment.nsw.gov.au

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[1] Green Building Council of Australia, 2021, https://new.gbca.org.au/news/gbca-news/gbca-and-thinkstep-release-embodied-carbon-report/

Step 1: About the building

Fill out blue cells

Building location and site data	Value	Unit	Note	Comment
Building address	20 Avon Rd, Pymble NSW			
Postcode	2073		Required	Postcode of building
Town/city	PYMBLE + 2 other localities		Town/city/suburb/region automated from postcode (may not give exact town name)	Town/city/suburb/region of the building site.
Distance to nearest major city/town	15	km	Enter for rural/regional locations only	Declare the shortest route by road to your site from the centre of your nearest major city (>100,000 people). The route must be traversable by a semitrailer truck.
Project stage	Development Application		Required	Stage of development
New build or major renovation?	New build		Required	
Brownfield or greenfield site?	Brownfield		Required	

Floor area by NCC building classification	Gross (GFA)	Net (NLA/NSA/UFA)	Unit	Note	
Please enter all floor areas relevant to your building. Leave areas blank if not applicable. Please enter Gross Floor Area (GFA) for all building classifications. Please also enter the corresponding net area (Net Lettable Area, Net Sellable Area or Usable Floor Area) where it is commonly used for that building classification.					
Class 1a: Detached residential buildings	0	0	m²	Required for Class 1a: Detached residential houses, townhouses	Gross Floor Area (GFA), as defined by the AIQS Australian Cost Management Manual
Class 1b: Boarding houses and hostels	0	0	m²	Required for Class 1b: Boarding house, guest house, hostel	Net area (Net Lettable Area, Net Sellable Area, Usable Floor Area), as defined by the PCA's Method of Measurement
Class 2: Multi-unit residential buildings	0	0	m²	Required for Class 2: Multi-unit residential, including apartment buildings	
Class 3: Other residential buildings	0	0	m²	Required for Class 3: Other residential buildings	
Class 4: Residential inside non-residential	0	0	m²	Required for Class 4: Residential building inside a non-residential building, e.g., caretaker residence	
Class 5: Office buildings	450	390	m²	Required for Class 5: Office building	
Class 6: Retail buildings	0	0	m²	Required for Class 6: Retail building, e.g., shop, restaurant, café	
Class 7a: Carparks	0	0	m²	Required for Class 7a: Carparks	
Class 7b: Warehouse-type buildings	0	0	m²	Required for Class 7b: Warehouses, wholesalers and storage facilities	
Class 8: Industrial buildings	0	0	m²	Required for Class 8: Industrial buildings, e.g., factories and workshops	
Class 9a: Healthcare buildings	0	0	m²	Required for Class 9a: Healthcare, e.g., hospitals, clinics, day surgeries	
Class 9b: Civic buildings	5,100	4,950	m²	Required for Class 9b: Civic buildings, e.g., theatres, civic centres, train stations	
Class 9c: Aged care and personal care buildings	0	0	m²	Required for Class 9c: Aged care and personal care	
Class 10a: Non-habitable buildings	0	0	m²	Required for Class 10a: Non-habitable buildings including sheds, carports and private garages	
Class 10b: Miscellaneous structures	0	0	m²	Required for Class 10b: Miscellaneous structures, including fences, masts, antennas, retaining walls and swimming pools	
Class 10c: Bushfire shelters	0	0	m²	Required for Class 10c: Bushfire shelters not attached to a Class 1a building	
Total	5,550	5,340	m²	Required: Sum of m² inputs must be more than 0.	

Project information	Value	Unit	Note	
Total cost of project	14,000,000	AUD excl. GST	Required	Include labour, materials, transport, plant, equipment and professional fees. Exclude GST, land, finance, escalation and other costs.
Building design life	30	years	Required	If uncertain, enter 50 years
Estimated envelope life	30	years	Optional	
Estimated replacement cycle for mechanical services	40	years	Optional	
Estimated replacement cycle for vertical transportation	40	years	Optional	

Dimensions of the building and the site	Value	Unit	Note	
Site area	3,280	m²	Required	Total area of site to external boundary.
Shared services or infrastructure	No		Required	Indicate if there are shared services that the building utilises, or shared foundations, basement or podium
Building footprint area	2,590	m²	Required	Total floor area of the ground floor measured to the outside edge of the floorplate.
Typical floor area (if different to building footprint area)	0	m²	Only needed if different to row above	
Typical floor perimeter	0	m	Required	
Area of external carpark (not included in GFA)	0	m^2	Required. Enter 0 if not applicable.	
Area of external hardstand (not included in GFA)	0	m^2	Required. Enter 0 if not applicable.	
Area of other hard landscaping (not included in GFA)	0	m^2	Required. Enter 0 if not applicable.	Include all other impervious areas. For example, patios, paths and driveways (not already included in carparks and hardstands above).
Number of floors/storeys above ground, including ground floor	6	no.	Required	
Number of floors/storeys below ground	1	no.	Required. Enter 0 if not applicable.	
Number of floors/storeys of car parking	0	no.	Required. Enter 0 if not applicable.	
Total height above ground	29	m	Required	Measured from the average finished grade to the highest point of the building, excluding protrusions (lighting rods, masts, chimneys, etc.)

Structural material choices	Value	Unit	Note	
Foundation type	Slab-on-ground		Required	
Frame type (dominant)	Reinforced concrete		Required	
Suspended floor type (typical)	Reinforced concrete		Only needed for multi-storey buildings	
Describe low carbon materials specified in your building (e.g. green concrete, low carbon bricks)	N.A		Required	
Describe recycled content specified in your building (e.g. recycled steel)	N.A		Required	

Step 2: Quantity of materials

Complete all blue cells that are applicable to the building. Leave items that aren't applicable blank.

Fill out blue cells

Material category	Sub-category 1	Sub-category 2	Sub-category 3	Value	Unit of measure	Comment	AIQS ACMM Code	ICMS3 (Level 3 Codes Construction)
Structure								
The structural parts of the building that are below ground (substructure) and above ground (superstructure). This includes fill below the substructure, foundations, basement levels, suspended floors, wall structure, roof structure, stairs, lift shafts and balconies. It excludes external areas such as hardstands, carparks, patios, etc.								
Coverage of structural material spend	-	-	-	80	%	Required. Coverage of spend for structural elements entered below. Minimum requirement = 80%. Exclude head contractor preliminaries and margins.		
Concrete in-situ	≤10 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>10 MPa to ≤20 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>20 MPa to ≤32 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>32 MPa to ≤40 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>40 MPa to ≤50 MPa	-	-	24.0	m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>50 MPa to ≤60 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>60 MPa to ≤80 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>80 MPa to ≤100 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete in-situ	>100 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	01_SB or 02-11	02 or 03
Concrete pre-cast panel	-	-	-		m³	Please enter reinforcing steel in relevant line items below. If not known at DA stage, please make your best estimate. If not known at CC stage, please ask your supplier.	01_SB or 02-11	02 or 03
Concrete block	Hollow core	-	-	20.0	m³	Enter as cubic metres, calculated as (area in m²) * (thickness in mm / 1000). Please include all block fill concrete and all reinforcing steel in relevant line items above/below.	01_SB	02 or 03
Concrete block/brick	Solid	-	-	60.0	m³	Enter as cubic metres, calculated as (area in m²) * (thickness in mm / 1000)	01_SB	02 or 03
Concrete block/brick	Solid AAC	-	-		m³	Solid Aerated Autoclaved Concrete (AAC) block. Enter as cubic metres, calculated as (area in m²) * (thickness in mm / 1000).	01_SB	02 or 03
Mortar	-	-	-		kg		01_SB	02 or 03
Reinforcing steel	Bar & mesh	-	-	5,000	kg	**Include all reinforcing steel bar/mesh in the building's structure in this row.** Usually this is calculated as kg/m³ per concrete element and then summed. Example: 10 m³ of 40 MPa concrete @ 100 kg/m³ + 5 m³ of 50 MPa concrete @ 150 kg/m³ = 1,750 kg reinforcing steel.	01_SB or 02-11	02 or 03
Reinforcing steel	Fibre & strand	-	-		kg	**Include all steel fibre reinforcing and steel strand in the building's structure in this row.**	01_SB or 02-11	02 or 03
Structural steel	Hot rolled structural	-	-		t	Examples include universal beams, universal columns and welded beams	01_SB	02 or 03
Structural steel	Cold formed structural	-	-		t	Examples include C purlins, Z purlins and all light gauge steel framing	01_SB	02 or 03
Structural steel	Other welded structural	-	-		t		01_SB	02 or 03
Structural steel	Plate	-	-		t	Include any allowance for connections here	01_SB	02 or 03
Structural steel	Sheet	-	-		t		01_SB	02 or 03
Stainless steel	-	-	-		t	Primarily for engineered timber structure connections	02_11	02 or 03
Reinforced concrete piles	Concrete	-	-		m³	Please enter reinforcing steel in the line below. If not known at DA stage, please make your best estimate. If not known at CC stage, please ask your supplier.	01_SB	02 or 03
Reinforced concrete piles	Steel reinforcing				kg	If not known at DA stage, please make your best estimate. If not known at CC stage, please ask your supplier.	01_SB	02 or 03
Steel piles	-	-	-		t	Where concrete and reinforcing steel are also used, enter these in the rows above.	01_SB	02 or 03
Timber poles/piles	-	-	-		m³	Where concrete and reinforcing steel are also used, enter these in the rows above.	01_SB	02 or 03
Timber (solid)	Sawn softwood	-	-	30.0	m³		02_11	02 or 03
Timber (solid)	Sawn hardwood	-	-		m³		02_11	02 or 03
Timber (engineered)	CLT	-	-		m³		02_11	02 or 03
Timber (engineered)	Glulam	-	-		m³		02_11	02 or 03
Timber (engineered)	LVL	-	-		m³		02_11	02 or 03
Timber (engineered)	OSB	-	-		m³	Enter as cubic metres, calculated as (area of wall in m²) * (thickness in mm / 1000)	02_11	02 or 03
Fs	Heat cured	-	-		m³	Enter as cubic metres, calculated as (area of wall in m²) * (thickness in mm / 1000)	02_11	02 or 03
Structural Insulated Panel (SIP)	Steel outer	-	-		m²		01_SB	02 or 03
Structural Insulated Panel (SIP)	Aluminium outer	-	-		m²		01_SB	02 or 03
Structural Insulated Panel (SIP)	Engineered timber outer	-	-		m²		01_SB	02 or 03
Fill	-	-	-		t	Include purchased material only. Exclude site-won material.	01_SB	01
Sand & gravel	-	-	-		t	Include purchased material only. Exclude site-won material and sand/gravel in concrete.	01_SB	01
Waterproofing membrane	Bituminous	-	-		m²		01_SB	01 or 02 or 03
Waterproofing membrane	Polyethylene	-	-	900	m²		01_SB	01 or 02 or 03
Other structural (Describe and add unit >>)		-	-			Please enter a description for any structural material that does not fit a predefined classification		
Other structural (Describe and add unit >>)		-	-			Please enter a description for any structural material that does not fit a predefined classification		
Other structural (Describe and add unit >>)		-	-			Please enter a description for any structural material that does not fit a predefined classification		
Envelope								
The skin of the building that separates the internal building from the external environment. This includes the roof cladding, wall cladding, windows, doors and internal/external shading. It also includes insulation and the internal wall lining of envelope walls.								
Coverage of envelope material spend	-	-	-	80	%	Required. Coverage of spend for the envelope items you have entered below. Minimum requirement = 80%. Exclude head contractor preliminaries and margins.		

Roof cladding	Profiled steel	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap in the roofing sheets. This row includes all metal-coated and pre-painted steel sheets where steel is the base metal. Examples include: galvanised steel, zinc-aluminium (zincalume) coated steel and zinc-aluminium-magnesium (ZAM) coated steel, whether painted or unpainted.	05_RF	03 or 04
Roof cladding	Profiled aluminium	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap in the roofing sheets. This row also includes pre-painted aluminium sheets.	05_RF	03 or 04
Roof cladding	Profiled zinc	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap in the roofing sheets. This row also includes pre-painted zinc sheets.	05_RF	03 or 04
Roof cladding	Membrane	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap in the membrane sheets.	05_RF	03 or 04
Roof cladding	Tiles (traditional clay)	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap between the tiles.	05_RF	03 or 04
Roof cladding	Tiles (concrete)	-	-		m²	Enter as m² of roof area. Exclude allowances for overlap between the tiles.	05_RF	03 or 04
Roof cladding	Other (Please describe >>)	Glass	-	15	m²	Please enter a description for any roofing that does not fit a predefined classification	05_RF	03 or 04
Wall cladding	Bricks (heat cured)	-	-		m²	Enter as m² of wall area. Heat-cured bricks use a kiln or furnace to raise the brick temperature above ambient temperature during curing process.	06_EW	03 or 04
Wall cladding	Bricks (air dried)	-	-		m²	Enter as m² of wall area. Air-dried bricks are cured using ambient temperature.	06_EW	03 or 04
Wall cladding	Bricks (under fired)	-	-		m²	Enter as m² of wall area.	06_EW	03 or 04
Wall cladding	Bricks (concrete)	-	-		m²	Enter as m² of wall area	06_EW	03 or 04
Wall cladding	Mortar and render	-	-		kg		06_EW	03 or 04
Wall cladding	Profiled steel	-	-		m²	Enter as m² of wall area. Exclude allowances for overlap in the cladding sheets, offcuts, etc. This row includes all metal-coated and pre-painted steel sheets where steel is the base metal. Examples include: galvanised steel, zinc-aluminium (zincalume) coated steel and zinc-aluminium-magnesium (ZAM) coated steel, whether painted or unpainted.	06_EW	03 or 04
Wall cladding	Profiled aluminium	-	-		m²	Enter as m² of wall area. Exclude allowances for overlap in the cladding sheets, offcuts, etc. This row also includes pre-painted aluminium sheets.	06_EW	03 or 04
Wall cladding	Profiled zinc	-	-		m²	Enter as m² of wall area. Exclude allowances for overlap in the cladding sheets, offcuts, etc. This row also includes pre-painted zinc sheets.	06_EW	03 or 04
Wall cladding	GRC cladding	-	-		m²	Enter as m² of wall area. GRC = Glass Reinforced Concrete.	06_EW	03 or 04
Wall cladding	Timber weatherboards	-	-		m²	Enter as m² of wall area. Exclude allowances for overlap between weatherboards, offcuts, etc.	06_EW	03 or 04
Wall cladding	Fibre cement board	-	-		m²	Enter as m² of wall area. Exclude allowances for offcuts, etc.	06_EW	03 or 04
Wall cladding	Terracotta	-	-		m²	Enter as m² of wall area. Exclude allowances for offcuts, etc.	06_EW	03 or 04
Wall cladding	Brick tiles / veneers	-	-		m²	Enter as m² of wall area. Exclude allowances for offcuts, etc.	06_EW	03 or 04
Wall cladding	Plasterboard	-	-	160	m²	Enter as m² of wall area. Exclude allowances for offcuts, etc. Include both external wall linings and internal wall linings for envelope walls.	12_WF or 06_EW	03 or 04
Wall cladding	Plywood	-	-		m²	Enter as m² of wall area. Exclude allowances for offcuts, etc. Include both external wall linings and internal wall linings for envelope walls.	12_WF or 06_EW	03 or 04
Wall cladding	Other (Please describe >>)		-		m²	Please enter a description for any wall cladding that does not fit a predefined classification	06_EW or 12_WF	03 or 04
Windows & doors	Aluminium frame	Single glazed	-	300	m²	Include all single glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Aluminium frame	Double glazed	-		m²	Include all double glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Aluminium frame	Triple glazed	-		m²	Include all triple glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Timber frame	Single glazed	-		m²	Include all single glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Timber frame	Double glazed	-		m²	Include all double glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Timber frame	Triple glazed	-		m²	Include all triple glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	uPVC frame	Single glazed	-		m²	Include all single glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	uPVC frame	Double glazed	-		m²	Include all double glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	uPVC frame	Triple glazed	-		m²	Include all triple glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Frameless	Single glazed			m²	Include all single glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Frameless	Double glazed			m²	Include all double glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Frameless	Triple glazed			m²	Include all triple glazing, including standard, toughened, laminated and low-E	07_WW or 08_ED	03 or 04
Windows & doors	Other (Please describe >>)		-		m²	Please enter a description for any windows or doors that do not fit a predefined classification	07_WW or 08_ED	03 or 04
Curtain wall	Single skin façade	Glazed panel	Single glazed		m²	Please declare all single-skin façade area in this section. All double-skin façade area should be entered in the next section. Include all single glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Curtain wall	Single skin façade	Glazed panel	Double glazed		m²	Include all double glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Curtain wall	Single skin façade	Glazed panel	Triple glazed		m²	Include all triple glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Curtain wall	Single skin façade	Opaque panel	Aluminium cladding		m²		06_EW	03 or 04
Curtain wall	Single skin façade	Opaque panel	GRC cladding		m²	GRC = Glass-fibre Reinforced Concrete	06_EW	03 or 04
Curtain wall	Single skin façade	Opaque panel	Insulated shadow box		m²		06_EW	03 or 04
Curtain wall	Single skin façade	Opaque panel	Brick cladding		m²		06_EW	03 or 04
Curtain wall	Single skin façade	Opaque panel	Stone cladding		m²		06_EW	03 or 04
Curtain wall	Double skin façade	Glazed panel	Single glazed		m²	Please declare all double-skin façade area in this section. Please declare as the area of the curtain wall and do not enter the inner and outer skins twice. Include all single glazing, including standard, toughened, laminated and low-E.	06_EW	03 or 04
Curtain wall	Double skin façade	Glazed panel	Double glazed		m²	The type of glazing refers to the building's envelope wall, not including the outer skin	06_EW	03 or 04
Curtain wall	Double skin façade	Glazed panel	Triple glazed		m²	The type of glazing refers to the building's envelope wall, not including the outer skin	06_EW	03 or 04
Curtain wall	Double skin façade	Opaque panel	Aluminium cladding		m²		06_EW	03 or 04
Curtain wall	Double skin façade	Opaque panel	GRC cladding		m²	GRC = Glass-fibre Reinforced Concrete	06_EW	03 or 04
Curtain wall	Double skin façade	Opaque panel	Insulated shadow box		m²		06_EW	03 or 04
Curtain wall	Double skin façade	Opaque panel	Brick cladding		m²		06_EW	03 or 04
Curtain wall	Double skin façade	Opaque panel	Stone cladding		m²		06_EW	03 or 04
Curtain wall	Other (Please describe >>)		-		m²	Please enter a description for any curtain wall that does not fit a predefined classification	06_EW	03 or 04

Stick-framed wall system	Aluminium frame	Glazed section	Single glazed		m²	Include all single glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Glazed section	Double glazed		m²	Include all double glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Glazed section	Triple glazed		m²	Include all triple glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Opaque section	Aluminium cladding		m²		06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Opaque section	GRC cladding		m²	GRC = Glass-fibre Reinforced Concrete	06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Opaque section	Insulated shadow box		m²		06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Opaque section	Brick cladding		m²		06_EW	03 or 04
Stick-framed wall system	Aluminium frame	Opaque section	Stone cladding		m²		06_EW	03 or 04
Stick-framed wall system	Steel frame	Glazed section	Single glazed		m²	Include all single glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Steel frame	Glazed section	Double glazed		m²	Include all double glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Steel frame	Glazed section	Triple glazed		m²	Include all triple glazing, including standard, toughened, laminated and low-E	06_EW	03 or 04
Stick-framed wall system	Steel frame	Opaque section	Aluminium cladding	700	m²		06_EW	03 or 04
Stick-framed wall system	Steel frame	Opaque section	GRC cladding		m²	GRC = Glass-fibre Reinforced Concrete	06_EW	03 or 04
Stick-framed wall system	Steel frame	Opaque section	Insulated shadow box		m²		06_EW	03 or 04
Stick-framed wall system	Steel frame	Opaque section	Brick cladding		m²		06_EW	03 or 04
Stick-framed wall system	Steel frame	Opaque section	Stone cladding		m²		06_EW	03 or 04
Stick-framed wall system	Other (Please describe >>)		-		m²	Please enter a description for any wall system that does not fit a predefined classification	06_EW	03 or 04
Wall louvre system	Aluminium	-	-		m²		06_EW	03 or 04
External shading system	Aluminium frame	Aluminium cladding	-	30	m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	GRC cladding	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000). GRC = Glass-fibre Reinforced Concrete.	06_EW	03 or 04
External shading system	Aluminium frame	Terracotta cladding	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	Stone cladding	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	Pre-cast concrete	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	Timber	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	Glass (opague)	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Aluminium frame	Steel	-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
External shading system	Other (Please describe >>)		-		m²	Please enter as m² of shaded area = linear metres * (width in mm / 1000)	06_EW	03 or 04
Roller doors	Steel profile	-	-	150	m²	Please note unit is square metres, not quantity	08_ED	03 or 04
Roller doors	Hardwood over steel	-	-		m²	Please note unit is square metres, not quantity	08_ED	03 or 04
Roller doors	Softwood over steel	-	-		m²	Please note unit is square metres, not quantity	08_ED	03 or 04
Revolving doors	Glass/aluminium/steel	-	-		no.		08_ED	03 or 04
Fire-rated doors	Engineered timber	-	-	2	no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	08_ED	03 or 04
Fire-rated doors	Steel	-	-		no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	08_ED	03 or 04
Fire-rated doors	Aluminium/glass	-	-		no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	08_ED	03 or 04
Insulation	Glass wool / fibreglass	-	-	3,400	m²	Please include both wall and ceiling insulation	05_RF or 06_EW	03 or 04
Insulation	Stone wool	-	-		m²	Please include both wall and ceiling insulation	05_RF or 06_EW	03 or 04
Insulation	Polyester	-	-		m²	Please include both wall and ceiling insulation	05_RF or 06_EW	03 or 04
Insulation	Expanded polystyrene	-	-		m²	Please include both wall and ceiling insulation	05_RF or 06_EW	03 or 04
Insulation	Other (Please describe >>)		-		m²	Please include both wall and ceiling insulation	05_RF or 06_EW	03 or 04
Other (Please describe and add unit >>)		-	-			Please enter a description for any envelope material that does not fit a predefined classification		
Other (Please describe and add unit >>)		-	-			Please enter a description for any envelope material that does not fit a predefined classification		
Other (Please describe and add unit >>)		-	-			Please enter a description for any envelope material that does not fit a predefined classification		

Permanent internal walls and doors

Walls and doors within the building that are either structural or designed to be permanent.

Coverage of material spend on permanent internal walls and doors					%	Enter the % coverage of spend for the items you have entered below. There is no minimum requirement: enter what you know. This should include all structural walls. Exclude head contractor preliminaries and margins.		
Interior wall (permanent)	Steel (light framing)	-	-	2.40	t		09_NW	03 or 04
Interior wall (permanent)	Timber framing	-	-		m³		09_NW	03 or 04
Interior wall (permanent)	AAC panel (reinforced)	-	-		m²	Panels of autoclaved aerated concrete (AAC) with reinforcing steel. E.g., Hebel.	09_NW or 12_WF	03 or 04
Interior wall (permanent)	Concrete-filled steel panel	-	-		m²	Panels made from a steel sheet outer with an aerated concrete core. E.g., Speedpanel.	09_NW or 12_WF	03 or 04
Interior wall (permanent)	Plasterboard	-	-	6,300	m²	Enter as single-layer equivalent. If using 2 layers, multiply the area by 2.	09_NW or 12_WF	03 or 04
Interior wall (permanent)	Plywood	-	-		m²	Enter as single-layer equivalent. If using 2 layers, multiply the area by 2.	09_NW or 12_WF	03 or 04
Interior wall (permanent)	Fibre cement sheet	-	-		m²	Enter as single-layer equivalent. If using 2 layers, multiply the area by 2.	09_NW or 12_WF	03 or 04
Interior wall (permanent)	Insulation	-	-	7,400.0	m²		09_NW or 12_WF	03 or 04
Interior wall (permanent)	Glass	-	-		m²		09_NW or 12_WF	03 or 04
Interior wall (permanent)	Other (Please describe >>)		-		m²	Please enter a description for any internal wall that does not fit a predefined classification	09_NW or 12_WF	03 or 04
Internal door (permanent)	Aluminium/glass	-	-		no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	11_ND	03 or 04
Internal door (permanent)	Timber/glass	-	-		no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	11_ND	03 or 04
Internal door (permanent)	Timber solid lightweight	-	-	50	no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	11_ND	03 or 04
Internal door (permanent)	Fire resistant	-	-	30	no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	11_ND	03 or 04
Internal door (permanent)	Steel	-	-		no.	Please enter as single-leaf equivalent. For double-leaf doors, multiply the quantity by 2.	11_ND	03 or 04
Internal door (permanent)	Other (Please describe >>)		-		no.	Please enter a description for any internal door that does not fit a predefined classification	11_ND	03 or 04
Other (Please describe and add unit >>)		-	-			Please enter a description for any material that does not fit a predefined classification		

Other (Please describe and add unit >>)		-	-			Please enter a description for any material that does not fit a predefined classification			
Other (Please describe and add unit >>)		-	-			Please enter a description for any material that does not fit a predefined classification			

Services

					Unit of measure				
Building services included within the main building contract. If the building components that are the subject of the development application or the construction certificate are base building only, then only enter these items. If you cannot split services by type, please enter them all in the "Other services" category at the bottom. Enter all values as material costs in dollars.									
Mechanical services	-	-	-	1,940,000	AUD excl. GST	Where possible, enter material costs excluding labour, plant, equipment, margins and taxes	28_SS	05	
Vertical transportation	-	-	-	555,000	AUD excl. GST	Where possible, enter material costs excluding labour, plant, equipment, margins and taxes	28_SS	05	
Electrical services	-	-	-	1,000,000	AUD excl. GST	Electrical services including the main power supply, backup generators, security and communications. Excluding solar installations. Where possible, enter material costs excluding labour, plant, equipment, margins and taxes.	26_LP	05	
Solar photovoltaic installations	-	-	-	220,000	AUD excl. GST	Where possible, enter material costs excluding labour, plant, equipment, margins and taxes	26_LP_LPGP	05	
Plumbing/hydraulic services	-	-	-	832,000	AUD excl. GST	Where possible, enter material costs excluding labour, plant, equipment, margins and taxes	18_PD and 19_WS	05 or 06	
Fire services				2,940,000	AUD excl. GST	Where possible, enter material costs excluding labour, plant, equipment, margins and taxes	25_FPSS04 or 39 XWAW_03 or 41_XF	05	
Other services (Please describe)		-	-		AUD excl. GST	Please group all other services here, meaning that coverage will always be 100% for services. Enter only the material costs (excluding labour, plant, equipment, margins and taxes).	29_SS or multiple		

External works

The materials associated with hard landscaping and outbuildings on the site but outside the building envelope. This includes hardstands, carparks, driveways, covered walkways, decks, patios, awnings, fences, gates, etc. Soft landscaping should be excluded.									
Coverage of spend on external works	-	-	-	80	%	Required. Coverage of spend for external works (excluding soft landscaping) entered below. Minimum requirement = 80%. Exclude head contractor preliminaries and margins.			
Asphalt	-	-	-		t		33_XR	07	
Concrete in-situ	≤10 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Concrete in-situ	>10 MPa to ≤20 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Concrete in-situ	>20 MPa to ≤32 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Concrete in-situ	>32 MPa to ≤40 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Concrete in-situ	>40 MPa to ≤50 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Concrete in-situ	>50 MPa	-	-		m³	Please enter reinforcing steel as part of "Reinforcing steel" below	33_XR or 34_XN or 35_XB or 36_XL	07	
Pavers, bricks and blocks	Concrete	-	-	220	m²		33_XR	07	
Pavers, bricks and blocks	Clay	-	-		m²		33_XR	07	
Reinforcing steel	Bar & mesh	-	-		kg	**Include all reinforcing steel bar/mesh in the external works in this row.** Usually this is calculated as kg/m³ per concrete element and then summed. Example: 10 m³ of 40 MPa concrete @ 100 kg/m³ + 5 m³ of 50 MPa concrete @ 150 kg/m³ = 1,750 kg reinforcing steel.	33_XR or 34_XN or 35_XB or 36_XL	07	
Reinforcing steel	Fibre & strand	-	-		kg	**Include all steel fibre reinforcing and steel strand in the external works in this row.**	33_XR or 34_XN or 35_XB or 36_XL	07	
Structural steel	-	-	-		t		02_11	07	
Structural aluminium	-	-	-		t	Includes structures, louvre systems, etc.	35_XB	07	
External roof/wall cladding	Polycarbonate	-	-		m²	Enter as profiled polycarbonate sheet that would ordered, including allowance for overlap	35_XB	07	
External roof/wall cladding	PVC	-	-		m²	Enter as profiled PVC sheet that would ordered, including allowance for overlap	35_XB	07	
External roof/wall cladding	Bitumen sheet	-	-		m²	Enter as bituminous sheet that would ordered, including allowance for overlap	35_XB	07	
External roof/wall cladding	Steel profile	-	-		m²	Enter as profiled steel sheet that would ordered, including allowance for overlap	35_XB	07	
Fill	-	-	-		t	Include purchased material only. Exclude site-won material.	33_XR or 34_XN or 35_XB or 36_XL	07	
Sand & gravel	-	-	-		t	Include purchased material only. Exclude site-won material and sand/gravel in concrete.	33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (solid)	Sawn softwood	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (solid)	Sawn hardwood	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (engineered)	CLT	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (engineered)	Glulam	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (engineered)	LVL	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Timber (engineered)	OSB	-	-		m³		33_XR or 34_XN or 35_XB or 36_XL	07	
Fabric (awning/sunshade)					m²		35_XB or 36_XL	07	
Other (Please describe and add unit >>)		-	-			Please enter a description for any external works that does not fit a predefined classification			
Other (Please describe and add unit >>)		-	-			Please enter a description for any external works that does not fit a predefined classification			
Other (Please describe and add unit >>)		-	-			Please enter a description for any external works that does not fit a predefined classification			

Step 3: Certifier details

Fill out blue cells

The material quantities must be determined through an itemised list of building materials (such as a bill of quantities) and certified by a quantity surveyor, designer, engineer or NABERS Assessor.

Person that completed this form	Value	Note
Name	Behrooz Shojaei	Required
Company	IGS - Integrated Group Services	Required
ABN	68163019029	
Profession	Senior ESD Engineer	Required
Qualification or registration	Professional Engineer - Inst. Engineers Australia Senior ESD Engineer - 20 years of experience NABERS, Green Star Accredited Engineer.	Required

Person that certified the details in this form	Value	Note
Name	Behrooz Shojaei	Required
Company	IGS - Integrated Group Services	Required
ABN	68163019029	
Profession	Senior ESD Engineer	Required
Qualification or registration	Professional Engineer - Inst. Engineers Australia Senior ESD Engineer - 20 years of experience NABERS, Green Star Accredited Engineer.	Required

Confirmation of certification	Value	Note
Are 80% of material costs captured for the building's structure, envelope and external works?	Yes	Required
If no - why not?	-	

Additional comments from data provider

Additional comments of certifier

Attach this Excel spreadsheet to your development application or construction certificate application.