SSDA SUSTAINABILITY REPORT

Blessed Carlo College

Corner of Lignum Road & Kiely Road, Moama NSW 2731

Ref: SY222051-00
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PREPARED FOR
Clarke Hopkins Clarke
3/78 Campbell Street
Surry Hills, NSW 2010

Sustainability Report

Revision Schedule

Date	Revision	Issue	Prepared By	Approved By
09.09.2022	1	Preliminary Issue	E. Chan	R. McShane
14.09.2022	2	SSDA Issue	E. Chan	R. McShane

Northrop Consulting Engineers Pty Ltd

ACN 064 775 088 | ABN 81 094 433 100

Level 11, 345 George Street, Sydney NSW 2000

02 9241 4188 | sydney@northrop.com.au | www.northrop.com.au

Table of Contents

EXECUTIVE SUMMARY

This Sustainability Report outlines how the proposed development of the Blessed Carlo College at Moama NSW 2731 meets the Secretary's Environmental Assessment Requirements (SEARs) as a state significant development of SSD-24262975.

The project is targeting the following sustainability objectives:

- The inclusion of considered materiality and waste reduction measures, futureproofing and use of low carbon materials, energy and water efficiency, and technology such as renewable energy, to demonstrate alignment to industry best practice frameworks.
- The inclusion of climate change adaption and mitigation measures within the building design.
- Alignment to the best practice ESD standards outlined within the Government Architect of New South Wales (GANSW) Environmental Design in Schools Manual.
- The consideration of the CSIRO's climate projections for the site location and design measures to create adaptable spaces.

Specifically, the report details how the project has addressed these objectives through incorporation of the following key measures.

- Material selection and glazing to reduce solar heat gain
- On site solar photovoltaic system
- Rainwater harvesting
- Opportunities for cross-ventilation
- High levels of daylighting
- Operable windows for mixed-mode space conditioning
- Low VOC materials
- Ability to achieve a minimum 4 Star Green Star Design & As-Built rating

Through the inclusion of the above and the sustainability initiative outlined within this report the project clearly addresses sustainability within the design and adequately equips the project for its long-term operation thereby addressing the project SEARs.

1. Introduction

Northrop has been engaged to provide input to the development of the Blessed Carlo College at Moama NSW 2731 to meet the requirements outlined by the Department of Planning within the project SEARS.

Blessed Carlo College is preparing a State Significant Development Application (SSDA) to support a development of a new school campus comprising of primary and senior facilities and buildings to assist in the achievement of the educational mission of the school.

1.1 Overview

This Sustainability Report has been prepared by Northrop for Blessed Carlo College. It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD-24262975) for the development of Blessed Carlo College at the corner of Lignum Road & Kiely Road, Moama NSW 2731. The site is legally described as Lot 76 DP751159.

The proposal seeks consent for the development for a new catholic school for K-12 students for 390-400 students and approximately 50 staff members. The development will involve the establishment of 5 new school and administrative buildings, 2 outdoor basketball courts, an outdoor playing field and on-grade carpark.

The purpose of this Sustainability Report is to outline the project approach to sustainable design and detail how the project proposes to meet the Secretary's Environmental Assessment Requirements (SEARs).

1.2 Site Description

Blessed Carlo College is bounded by Lignum Road to the west and Kiely Road to the north.

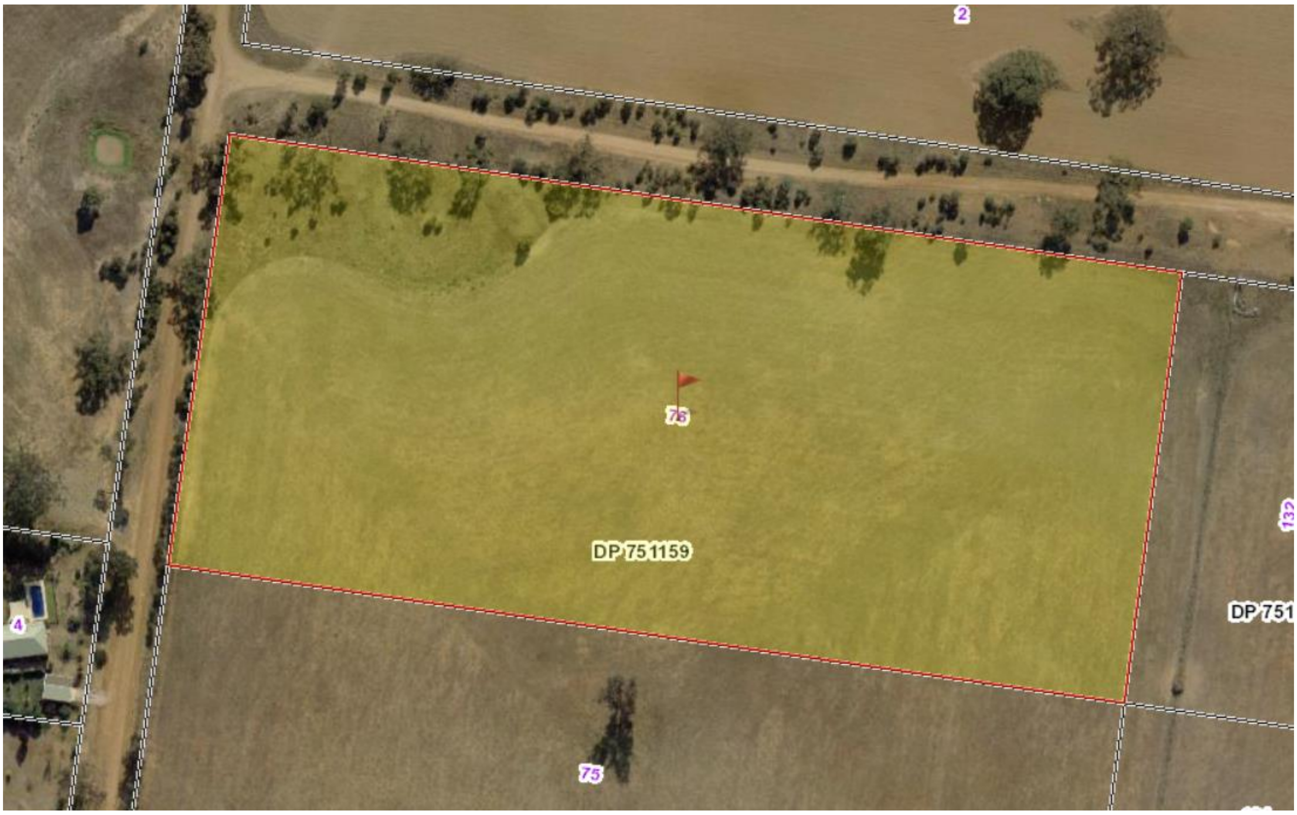

Figure 1 Blessed Carlo College Site (location of proposed site highlighted)

1.3 Response to Secretaries Environmental Assessment Requirements (SEARs)

This sustainability report is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD-24262975. This table identifies the SEARs and relevant reference within this report.

Item 6 (ESD) of the SEARs lists three requirements and two specific inclusions which are outlined below, alongside is listed where the response to each can be found within this report.

Item	Action to Address the Requirement	Report Location
Identify how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) would be incorporated in the design and ongoing operation of the development.	This ESD report details how the project aims to address the ESD Principles and their incorporation into the design and ongoing operation of the project through the incorporation of the GANSW sustainability design recommendations and through a gap analysis against holistic industry sustainability.	Section 2 & 3
Demonstrate how the development would be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact.	The project is including significant design strategies using passive design measures to reduce energy consumption for the thermal comfort of occupants.	Section 2, 3 & 4
Demonstrate how the development will minimise the consumption of resources, energy and water (including water sensitive urban design) and design in accordance with GANSW Environmental Design in Schools Manual.	The project is being assessed against the GANSW Environmental Design in Schools Manual and against the Green Building Council's holistic sustainability rating system against a best practice rating level.	Section 2 & 3
Provide an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	The development will exceed sustainability standards across the industry by incorporating Green Star framework to achieve 4 Star Green Star Design & As-Built equivalent design.	Section 4
Provide a statement regarding how the design of the development is responsive to the NARCliM projected impacts of climate change	The development will design to incorporate strategies to manage increasingly volatile climate situations. This report will produce outcomes for design to reduce the impact of these climate outcomes.	Section 5

2. Sustainability Initiatives

The following section describes how ESD principles (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) are being incorporated in the design and ongoing operational phases of the project. These initiatives illustrate how the project addresses the following;

- The precautionary principle – through the implementation of environmental management and building maintainability, the project attempts to incorporate adaptability and resilience into the project design. The concept behind the precautionary principle is to create spaces that can both; accommodate for changes, which may eventuate in the future, and avoid the risk of serious or irreversible damage to the environment.
- Inter-generational equity to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations – through the inclusion of zero ozone depleting refrigerants, best practice PVC and low impact paints, sealants and adhesives, alongside a focus on providing greater vegetation and support for the buildings connection with nature, the project demonstrates a strong commitment to the preservation of environmental health, diversity and productivity of the local area.
- Conservation of biological diversity and ecological integrity – through the planting of native vegetation, improvement of stormwater runoff from the site and use of integrated landscaping, the project will act to improve, conserve and support the local biological diversity and integrity.
- Improved valuation, pricing and incentive mechanisms - the project has involved significant input from the Quantity Surveyor who will be involved throughout the entire design process to ensuring that the project both remains on budget and effectively considers environmental factors in the valuation of assets and services. Furthermore, the project has looked more broadly and considered the economic cost benefits that will stem from the project both short and long term, these are included within the economic analysis provided as part of the project submission.

Through the inclusion of the above and the sustainability initiative outlined within this report the project clearly addresses the ESD Principles as defined in clause 7(4) of schedule 2 of the Environmental Planning and Assessment Regulation 2000. Further details of the general sustainability initiatives are outlined below.

2.1 Energy Efficiency:

Energy efficiency has been considered throughout the project schematic design and will continue to heavily influence the design development process with the following improvements already considered as part of the design process.

2.1.1 Natural Ventilation of Circulation Spaces

Most circulation areas within the project will be able to operate as naturally ventilated spaces exploiting the buildings design to promote flow of air. The building will make use of operable windows to provide opportunities for natural cross-ventilation and for mixed-mode space conditioning.

2.1.2 Improved building fabric and glazing performance

The building envelope comprises several different façade types, with the proposed scheme using a combination of building materiality and glazing to lower solar heat gains throughout summer while maintaining good access and views to outdoors as well as daylighting throughout of the building. The operable windows and doors on the façade also contribute strongly to the natural ventilation strategy allowing for minimal use of space conditioning across the year.

The use of high-performance glazing and building materials will assist the projects targets for energy efficiency, acoustic separation, and thermal comfort. Additionally, the selection of pale roofing and façade elements will help to limit heat gain throughout the school's operational periods falling within summer. It is noted that school holidays generally occur over the hottest periods of summer, and this provides the design some flexibility in optimising for the shoulder seasons.

2.1.3 Mixed Mode HVAC

The mechanical systems are to be mixed mode to account for opportunities to use the operable windows, cross ventilation, and adaptive thermal comfort approach to the site. Space conditioning will still be provided to accommodate heating and cooling during peak periods across the year, but the systems design will be to minimise its use when external conditions are able to meet the occupant comfort needs.

To accommodate potential future needs, the HVAC systems will also look to include full outside air supply systems and a simplified economy cycle, which will reduce heating and cooling demands during periods where outdoor air supply can meet the loads within a space.

2.1.4 Improved outdoor air provision

The project will aim to improve the outdoor air provided to regularly occupied spaces. This will minimise CO2 build up and improve cognition for the building occupants.

2.1.5 Onsite Renewable Energy

The project has been designed to utilise available roof space to include an on-site solar photovoltaic system providing energy production onsite to both reduce energy costs and provide educational outcomes for students and staff.

2.1.6 Passive Design Measures

A focus has been placed on good passive design within the building and shading systems for the project. Examples of this includes the following:

- Incorporation of structures to shade harsh summer sun.
- Strong use of thermal mass to regulate temperatures.
- Follow passive ventilation principles to create a comfortable learning environment.

2.2 Indoor Environment Quality

Indoor environment quality is always an important consideration in Education projects. The following initiatives have been considered as part of the building design:

2.2.1 Daylight Access

The design of the building aims to allow excellent daylight penetration into both internal and external spaces. This access to daylight throughout the building will both minimise energy used for lighting and will improve occupant connection to their external environment.

2.2.2 Access to views

Access to external views allows the switch between short and long focal lengths reducing eye strain for students. There is significant evidence to support that eyestrain and related health problems can be significantly reduced in situations where the eyes can be refocussed periodically on a distant object. This is easier to achieve where there is a nearby window with a view.

The overall design of the project promotes the provision of views to all classrooms where students are expected to concentrate for extended periods of time.

2.2.3 Material selection

Materials selection for the project aims to improve the internal environment of the site with materials with low volatile organic compound and formaldehyde content preferred to help minimise respiratory issues for building occupants.

Maximum TVOC limits for paints, adhesives and sealants are detailed in the table below:

Table 1 Maximum TVOC Limits for Paints, Adhesives and Sealants

Product Category	Max TVOC content in grams per litre (g/L) of ready to use product
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

All engineered wood products used in the building will meet the relevant limits specified in the table below as per the specified test protocol or have product specific evidence that it contains no formaldehyde.

Table 2 Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	Emission Limit/Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L

JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m²hr (at 3 days)
ASTM D6007	≤0.12mg/m³
ASTM E1333	≤0.12mg/m³
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

2.3 Water Efficiency

A strong focus has been put on the effective management of water within the building with the following initiatives being included in the design in all areas throughout the project:

2.3.1 Water Sensitive Urban Design

In line with the aim of the SEARs, the project is incorporating a focus on water sensitive urban design with the external landscape design assisting to minimise water use for irrigation. Vegetation surrounding the site, assists in the reduction of site stormwater discharge and in the management of the project's broader impact on urban stormwater flows. Onsite stormwater detention and treatment has been included within the projects design to minimise the impacts on council stormwater systems. Rainwater tank is also proposed to be utilised for irrigation, helping to reduce potable water consumption. The proposed water sensitive urban design measures and controls, including alternative water supplies, potable and non-potable water usage, are detailed in the Integrated Water Cycle Management Report dated 09.09.2022 by Jones Nicholson as part of the SSDA submission.

2.3.2 Water Efficient Fixtures and Fittings

Water efficient fixtures and fittings will reduce the water consumption of the site. As an indication, the following should be targeted:

- Wash hand basin taps 6-star WELS
- General taps 6-star WELS
- Toilets dual flush 4-star WELS
- Urinals 0.8L per flush 6-star WELS
- Shower heads 7-9L per minutes 3-star WELS

3. Government Architect NSW Design Guide

The Government Architect NSW (GANSW) provides strategic design leadership in architecture, urban design and landscape architecture. In order to improve school design and incorporate the seven objectives for the design of the built environment set out in Better Placed: An integrated design policy for the built environment of NSW, the GANSW has produced the Environmental Design in Schools guide. This document considers the following objectives;

- Better Fit – A project that is contextual, local and of its place
- Better Performance – A project that is sustainable adaptable and durable
- Better for the community - A project that is inclusive connected and diverse
- Better for people - A project that is safe, comfortable and liveable
- Better working - A project that is functional, efficient and fit for purpose
- Better Value - A project that creates and adds value
- Better look and feel - A project that is engaging, inviting and attractive

The guide sets out a process for assessment which includes three basic steps these are as follows with general strategies to address the goals of the design guide outlined in the following sections;

- Understand the project surroundings;
- Understand how our surroundings effect people
- Adopt strategies that will benefit people.

In order to demonstrate environmental design has been achieved in accordance with this guide the project team provide the following discussion outlining how the project has included a strong focus on passive, biophilic and environmental design.

3.1 Ventilation Strategy (Air)

Good air quality in schools can improve student and staff wellbeing and performance, the project aims to incorporate mixed mode systems and natural ventilation where viable increasing the outdoor air provided to lower CO_2 build-up and pollutant levels.

3.1.1 Natural Ventilation Opportunities

Increasing the natural ventilation of the space is a method used to passively cool and ventilate the space and minimise the use of mechanical air conditioning systems and thus an effective way to minimise energy consumption in the building. Ensuring that windows are openable and designed to capture prevailing winds into classroom spaces will help to ensure that the natural ventilation can be maximized.

By specifically providing openings on multiple sides of the buildings or at low and high levels the window design will promote the flow of air though the spaces bringing in fresh air and passive heating and cooling.

Where feasible the project will look to also provide window coverings, which can be used to block out unwanted summer sun (east-facing windows in the morning, and west-facing windows in the afternoon). In winter, these can also be closed window coverings at the end of the day to help rooms stay warmer overnight.

3.1.1.1 Site conditions

For the site location in Moama, predominant winds are from the south and south-west. This has been considered within the ventilation strategies. Natural ventilation and therefore passive cooling opportunities have been optimised using multidirectional building elements and into the built spaces.

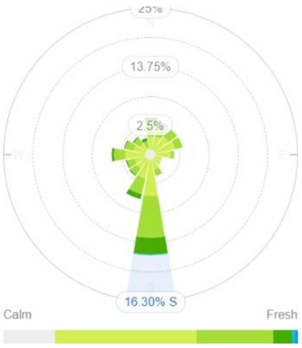

Figure 2 Wind rose for the site

3.2 Comfort Strategy (Comfort)

Good learnings spaces need to be comfortable across the year for staff, students, and visitors. In order to ensure that the proposed buildings achieve this, the project has proposed a mixed mode ventilation strategy that can provide conditioning when required and natural, or mechanically assisted, ventilation when external conditions are favourable. Additional to this, the design of the buildings has focused on good passive design elements including the following;

3.2.1 Passive Solar Design & External Shading

The project design incorporates a strong focus on the use of optimised glazing and window shading to exploit the suns relative position in the sky. This allows solar heat gains through winter while blocking the majority of heat entering the building throughout the summer period.

The incorporation of the proposed outdoor sitting areas also provides shaded external spaces to support both reduction in heat islanding across the school and shaded areas for outdoor learning.

3.2.2 Thermal Mass

Thermal mass is the ability of a material to absorb and store heat energy for use during cooler times. The project has included the use of building materials to capture energy throughout the day and release this at night minimizing the internal temperature variation across the day.

3.2.3 Natural Shading devices

The external landscaping incorporates the use of vegetation to help reduce the temperature of prevailing breezes and provided shaded areas to support the use of external areas across the year.

3.3 Lighting Strategy

Daylight and natural light can minimise electricity usage, however direct sunlight can also bring unwanted heat gain should be balanced across the year.

3.3.1 Daylight Access

The current design of the site aims to maximize daylight penetration into both internal and external spaces. This access to daylight throughout the building will both minimise energy used for lighting and will improve occupant connection to their external environment.

In educational environments research also indicates that students in classrooms with access to natural light perform better in all academic fields, have longer attention spans and achieve better health outcomes than those without ready access to daylight.

3.4 Water

Taking responsibility for water usage is key to its preservation and the project will incorporate quality management of water throughout the construction and operation of the building. Details of the water efficiency measures proposed can be found in Section 2.3. Additional element is included below around rainwater capture and storage.

3.4.1 Rainwater tanks for rainwater harvesting

A rainwater capture and storage system will be considered for installation. Space provisions have been proposed within the design to accommodate this system.

3.5 Energy

Simple strategies like turning off lights and adjusting air-conditioning set points over the year will assist with operational energy use. Details of the energy efficiency measures being considered in the design can be found in Section 2.1. further measures are detailed below:

3.5.1 Improved building fabric and glazing performance

The building envelope comprises a number of different façade types, with the proposed scheme using a combination of glass, screens and shading devices to achieve low solar heat gains while providing views and daylighting into learning and circulation spaces.

The use of high-performance glazing and building materials will also assist to maximise the projects energy efficiency while managing acoustic and thermal comfort considerations.

3.5.2 Photovoltaic (PV) Energy Systems

The project will include the installation of solar PV system for each building, which will provide onsite renewable energy and will reduce the sites electricity consumption from the grid.

3.6 Landscape

Through planting native vegetation and promoting improved interaction with the natural environment, the project will improve the site's ecology and minimise the ongoing environmental impact of the project. The project is currently implementing the following:

- Preserving the existing trees on the northern boundary of the site
- Native vegetation endemic to the local area
- Implement sustainable water and energy practices in the design
- Use tree planting to increase canopy coverage, creating opportunities to reduce heat island effects
- Implement planting suited to site characteristics e.g., introduction of new native trees to supplement the existing trees along the northern boundary

Additionally, landscaping plays an important part in the education of students around local biodiversity and natural systems.

3.7 Materials

The construction of buildings consumes a large number of resources, and measures have been taken within the design to maximize the expected lifespan of the installed fixtures and finishes. This will assist in project longevity and help to minimise waste going to landfill.

Additional to this the development has been designed to be adaptable with spaces easily altered and structural elements kept to the external elements of the building. This will enable the building to be easily altered to meet changing needs over time and minimise the potential need to demolish and rebuild in the future.

4. Green Building Council of Australia Framework

4.1 Overview

The Green Building Council of Australia's provides an internationally recognised system to assess sustainable outcomes throughout the life cycle of the built environment. It was developed by the Australian Building Industry through the Green Building Council of Australia (GBCA), which is now the nation's leading authority on sustainable buildings and communities. Although the Project is utilizing the Government Architects to benchmark the project to Industry Best Practice Sustainability there are a number of initiatives covered by the Green Star tool that are additional to the requirement of the GANSW Environmental Design in School Manual.

This project has incorporated the design principals of a 4 Star (Best Practice) Green Star Design & As Built Rating. This section provides a summary of elements drawn from the Green Star tool being considered at the development. The Green Star system incorporates ESD principles across nine major categories:

- Management
- Indoor Environmental Quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

4.2 Management

The Management category promotes the adoption of environmental principles from project inception, design, and construction phase, to commissioning, tuning and operation of the building and its systems. The following credits are currently being considered for incorporation;

4.2.1 Green Star Accredited Professional

The appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.

4.2.2 Commissioning and Tuning

Implement commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.

4.2.3 Adaptation and Resilience

Encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.

4.2.4 Building Information

Develop and ensure provision of building information that facilitate understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable optimised performance.

4.2.5 Commitment to Performance

Practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.

4.2.6 Metering and Monitoring

Implement effective energy and water metering and monitoring systems.

4.2.7 Responsible Building Practices

Apply best practice formal environmental management procedures during construction.

4.2.8 Operational Waste

Employ Waste management plans that facilitate the re-use, upcycling, or conversion of waste into energy.

4.3 Indoor Environment Quality

The credits within the Indoor Environmental Quality category promote the provision of high-quality interior spaces within projects. These spaces are recognised based upon their Air Quality, Lighting, Acoustic and Thermal Comfort. The following credits are currently being incorporated:

4.3.1 Indoor Air Quality

Provide high quality air to occupants.

4.3.2 Acoustic Comfort

Provide appropriate and comfortable acoustic conditions for occupants.

4.3.3 Lighting Comfort

Deliver well-lit spaces that provide a high degree of comfort to users.

4.3.4 Visual Comfort

Design and implement well-lit spaces that provide high levels of visual comfort to building occupants.

4.3.5 Indoor Pollutants

Safeguard occupant health through the reduction in internal air pollutant levels

4.4 Energy

The 'Energy' category aims to facilitate reductions in greenhouse gas emissions by facilitating efficient energy usage and encouraging the utilisation of energy generated by low-emission sources. The project is targeting the following elements:

4.4.1 Greenhouse Gas Emissions

Deliver energy efficient buildings and the reduction of greenhouse gas emissions associated with the use of energy in building operations.

4.4.2 Peak Electricity Demand Reduction

Reduce peak demand load on the electricity network infrastructure.

4.5 Sustainable Transport

Sustainable transport criteria aim to provide design and operational measures that reduce the carbon emissions arising from occupant travel to and from the project, when compared to a benchmark building. In addition, it also promotes the health and fitness of commuters, and the increased accessibility of the location. The project is targeting the following credits

4.5.1 Sustainable Transport

Implement design and operational measures to reduce carbon emissions arising from occupant travel to and from Blessed Carlo College.

4.6 Water

The aim of the category is to encourage building design that minimises potable water consumption in operations. The potable water credit will be considered for implementation as follows;

4.6.1 Sanitary Fixture Efficiency

As an indication, the following WELS ratings are considered for water fixtures:

- Wash hand basin taps 6-star WELS
- General taps 6-star WELS
- Toilets dual flush 4-star WELS
- Urinals 0.8L per flush 6-star WELS
- Shower heads 7-9L per minutes 3-star WELS

4.6.2 Heat Rejection Water

A waterless heat rejection system is proposed on site, eliminating water usage for the purposes of air conditioning system.

4.6.3 Landscape Irrigation

Rainwater supported drip irrigation with moisture sensor override is to be considered to minimise potable water used for the project irrigation.

4.7 Materials

The aim of the materials category is to encourage projects that include building materials that are responsibly sourced or have a sustainable supply chain. The following area are being proposed for consideration in detail design stage of the project.

4.7.1 Life Cycle Impacts

Reduce Portland cement content in all concrete by replacing it with supplementary cementitious materials.

4.7.2 Responsible Building Materials

Include materials that are responsibly sourced or have a sustainable supply chain.

4.7.3 Construction and Demolition Waste

Reduce the amount of construction waste deposited into landfill by reusing or recycling building materials.

4.8 Land Use and Ecology

The 'Land Use & Ecology' category aims to reduce the negative impacts on sites' ecological value as a result of urban development and reward projects that minimise harm and enhance the quality of local ecology.

4.8.1 Ecological Value

Improve the ecological value of the development site.

4.8.2 Sustainable Sites

Develop sites that have limited ecological value, re-use previously developed land and/or remediate contaminated land.

4.8.3 Heat Island Effect

Reduce the contribution of the project site to the heat island effect.

4.9 Emissions

The 'Emissions' category aims to assess the environmental impacts of 'point source' pollution generated by projects. Negative impacts commonly associated with buildings include damage to the environment through refrigerant leaks or disturbances to native animals and their migratory patterns as a result of light pollution.

4.9.1 Stormwater

Minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.

4.9.2 Light Pollution

Implement lighting design to minimise light pollution to neighbouring bodies and the night sky.

5. Climate Change Projections

As part of the design review the project has completed a risk assessment for the sites climate adaption risks based on the CSIRO climate change projections for NSW. This risk assessment reviewed the following three elements:

- Consequence: what will be the effect of the development should the impact occur?
- Likelihood: how likely is it that the impact will occur?
- Risk Rating: what is the associated risk of the development when the likelihood of it happening is measured against the possible consequence of the impact?

Key risks posed to the site which will be addressed as part of this process and high-level issues are outlined below with comment on how these are addressed within the current design; further detail will be developed within the projects detailed design development stages.

- Changing Surface Temperatures should be addressed through the following.
  - Use of high reflectivity roofing to minimise heat gain and heat island effects.
  - Integration of solar panels to provide shading to areas of the roof and provide increased power to the site when peak energy use for cooling is required.
  - Incorporation of heating, ventilation, air conditioning (HVAC) systems designed to modulate in the event of changing outside air temperatures. Equipment will be rated to continue operating during higher temperatures.
- An increase in rainfall intensity should be managed through the following.
  - Inclusion of rainwater and stormwater storage systems to modulate flows exiting the site.
  - Ability to provide increased finished floor level (FFL) designed to be 0.50 m above freeboard requirement to account for increased flooding potential at the site.
  - Inclusion of awnings to the entry access points to promote allow continued operation during adverse conditions.
- An increase to wind speed intensity should be addressed through the following.
  - The metal roof design incorporating roof bracing to fasten the roof onto the building structure to account for increasingly strong winds on site and prevent damage to the roof due to prevailing winds.
  - Improved structural integrity to ensure that the building is not significantly impacted in the event of high intensity wind loads.
- Decrease in humidity and increased drought conditions will be addressed through the following.
  - Increased capacity within the fire safety systems to assist in the management of bushfire risk associated with dryer conditions.
  - Additional non potable water supply for irrigation needs and the integration of native and drought tolerant vegetation.

Overall, the current design incorporates significant measures to address key projections for climate change in the near term. The project will incorporate further initiatives to address all high and extreme risks posed to the site during detailed design.

6. Conclusion

This Sustainability Report outlines how the proposed development of Blessed Carlo College meets the Secretary's Environmental Assessment Requirements (SEARs) as a state significant development.

The project is addressing the following sustainability objectives:

- The incorporation of ESD principles into the design and ongoing operational phases of the development.
- The inclusion of measures to minimise the consumption of resources, water (including water sensitive urban design) and energy.
- The inclusion of considered materiality and waste reduction measures, futureproofing and use of low carbon materials, energy and water efficiency, and technology such as renewable energy, to demonstrate alignment to industry best practice frameworks.
- The inclusion of climate change adaption and mitigation measures within the building design.
- Alignment to the best practice ESD standards outlined within the Government Architect of New South Wales (GANSW) Environmental Design in Schools Manual.

Specifically, the project has incorporated the following.

- Material selection and glazing to reduce solar heat gain
- On site solar photovoltaic system
- Rainwater harvesting
- Opportunities for cross-ventilation
- High levels of daylighting
- Operable windows for mixed-mode space conditioning
- Low VOC materials
- Align design to incorporate a 4 Star Green Star Design & As-Built rating framework

Through the inclusion of the above and the sustainability initiative outlined within this report, the project clearly addresses sustainability within the design and adequately equips the project for its long-term operation thereby addressing the project SEARs.