The engineer in his own way is an artist too - and not just a dead fish with a slide rule.
Jørgen Varming

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SUSTAINABLE DESIGN

STEENSEN VARMING

b

Jindabyne Education Campus
Sustainable Development Plan
Schematic Design

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Document Revision and Status

Date	Rev	Status	Notes	Checked	Approved
30/07/21	00	For Review	For Schematic Design	JP	JP
12/11/21	01	Final Schematic Design		JP	JP

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1.0 Introduction

This Sustainable Development Plan (ESD Consultant Report) accompanies an Environmental Impact Statement (EIS) pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) in support of an application for a State Significant Development (SSD No 15788005). The SSDA is for a new education campus at Jindabyne, comprising of a new primary and high school, located at the Jindabyne Sport and Recreation Centre (JSRC).
This report addresses the Secretary's Environmental Assessment Requirements (SEARs), notably: SSD-15788005.

1.1 Proposal

The proposed development is for the construction of the Jindabyne Education Campus comprising a new primary school and a new high school at Jindabyne (the proposal). The proposal is located within the JSRC located at 207 Barry Way (the site) and will accommodate approximately 925 students with the capacity for expansion in the future.
The new primary school will be located generally in the northern portion of the site whilst the new high school will to the south of the site. While the schools are inherently separate identities, with separate student entries, opportunities for integration are provided in a central shared plaza with co-located school administration facilities, as identified in Figure 1 below. This outdoor learning space is activated by the school canteen (shared) and separate core facilities including the primary school hall and library, and the high school gym and library, and provides opportunities for shared community use.
The new primary school will provide for a Core 21 school. This will comprise of 20 home base units and 2 support learning units, administration and staff facilities, covered outdoor learning area (COLA), hall, staff and student amenities, out of school care facilities, library and special programs. Landscaped areas include active and passive open space play areas, and a games court.
The new high school will provide for a stream 2 high school. This is to comprise of 20 general/specialised learning spaces and support learning units, administration and staff facilities, covered outdoor learning area (COLA), hall, staff and student amenities, library, an agricultural learning unit. Landscaped areas include active and passive open space play areas, a sports field and multipurpose games courts.
A new access driveway is proposed off Barry way Road along the western boundary of the site and includes car parking, bus and private vehicle drop-off zones, and delivery zones.

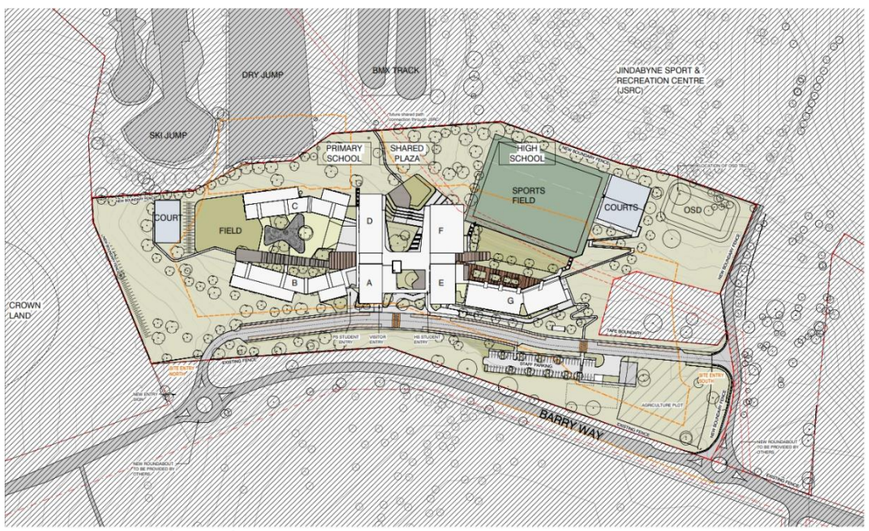

Figure 1 Proposed site plan. Source DJRD

1.2 Site Description

The site of the proposed new education campus at Jindabyne is located within the western extent of the existing JSRC at 207 Barry Way (101 DP1019527). The site is located within the Snowy Monaro Regional Council local government area and is approximately 2.2km south of the Jindabyne town Centre. A site aerial is provided in Figure 2.
The site is approximately 9ha in size, containing a former golf course and three existing workers cottages which were occupied during the construction of the Snowy Hydro Scheme. The majority of the site is undeveloped and contains maintained grasslands and scattered trees. Much of the surrounding land comprises remnant grassland, woodland and agricultural land.
As identified above, the site is within the existing JSRC which is a high performance and community sport centre located directly east of the site. The JSRC has a range of sporting facilities including a synthetic running track, cycling track, netball and tennis courts, fitness and indoor sports centres, and sporting ovals, as well as other services and accommodation facilities. The newly constructed BMX track is located directly east of the site with the new ski jump currently under construction to the northeast.
TAFE NSW have recently lodged a development application for a Connected Learning Centre (CLC) and Mobile Training Unit (MTU) which is proposed to the south of the site. The CLC and MTU will utilise interactive, digitally enabled, flexible, and multipurposed learning environments to provide high-quality training and learning experiences accommodating a maximum of 20-25 students and 3 teachers.
The surrounding locality is generally rural in character with other land uses also including the Jindabyne Aero Club located to the west of the site on Tinworth Drive, an industrial area to the southwest and the Jindabyne Community recycling centre is located east of the JSRC.

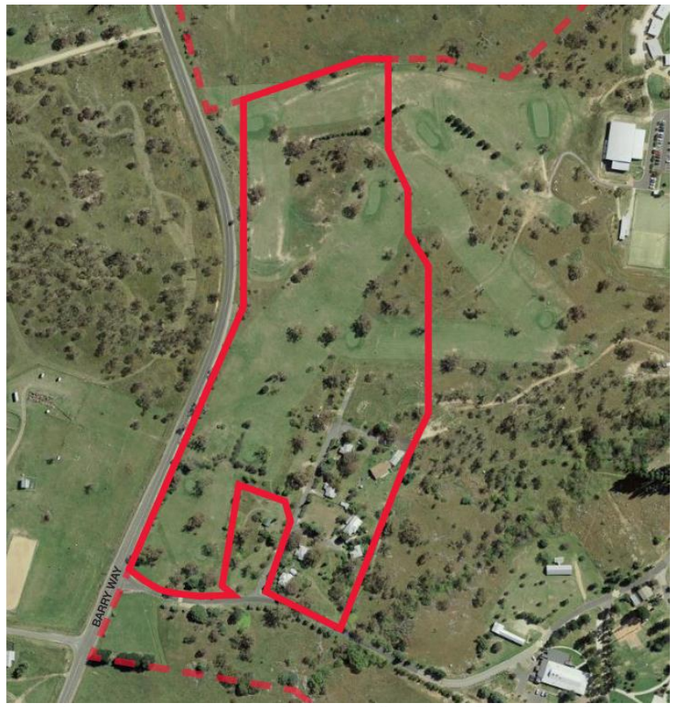

Figure 2: Site aerial - new education campus within the Jindabyne Sport and Recreation Centre.
Source: DJRD

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1.3 General

This report has been developed to support the sustainability strategy development for the Jindabyne Education Campus. The information presented has been developed to support:

- Schematic Design Development for the campus
- Sustainable Development Plan update
- Green Star 4 Star Rating formal certification

The pages below will outline the main Environmentally Sustainable Design (ESD) objectives for the development, and sustainable design principles, inclusive of our design philosophy, with reference to code and best practice design standards. This report should be read in conjunction with the architect's design reports and the other consultant's schematic reports.

We have also included a section reviewing some references for using the building as a teaching tool. Given we are at the early stage of the project, there are opportunities for including features or developing the design to explicitly show the sustainability strategies that we include. This section outlines opportunities that have been discussed at this stage and could be considered further for inclusion within the project.

1.4 Project Specific Sustainability Requirements and Drivers

The diagram below outlines the key sustainability requirements and drivers for this project.

FEDERAL

National Construction Code of Australia (NCC) 2019
- Thermal Performance of Building Fabric; and
- Building Services (lighting, HVAC, DHW, Lifts and energy monitoring requirements)

STATE

State Significant Development Conditions
- Use of an 'Sustainability' Framework (such as Green Star) or approved equivalent
- Climate Adaptation requirements
- Water Sensitive Urban Design

NSW Government Resource Efficiency 2019
- Minimum energy ratings for appliances, Design and As-built rating or designed to the standard, Renewables, Fuel efficiency standards for new light vehicles, Purchase a min. 6% Green Power, Clean Air Emission Standards for generators, water, gas and electricity consumption data collection for reporting, Water and Waste measures included in the GREP.

NSW Government Architect Office (GAO)
- Environmental Design Guide for Schools
- GANSW Environmental Design in Schools Manual

NSW Department of Education
- Educational Facilities Standards and Guidelines (EFSG) - Design Guide
- DOE Key sustainability pillars:
  - Climate Action – Net Zero Emissions
  - Give back more than we take
  - Unlocking Individual Potential
  - Resilience

Schools Infrastructure NSW (SINSW)
- DfMA Guidelines
- Federal and State legislation on ESD
- 1987 Brundtland Report
- UN Sustainable Development Goals

PROJEOT

Jindabyne Education Campus
- EFSG Compliance
- GS 4 Star – Design & As Built v1.3 Certification
- Building as a teaching tool

1.5 Schematic Stage Development

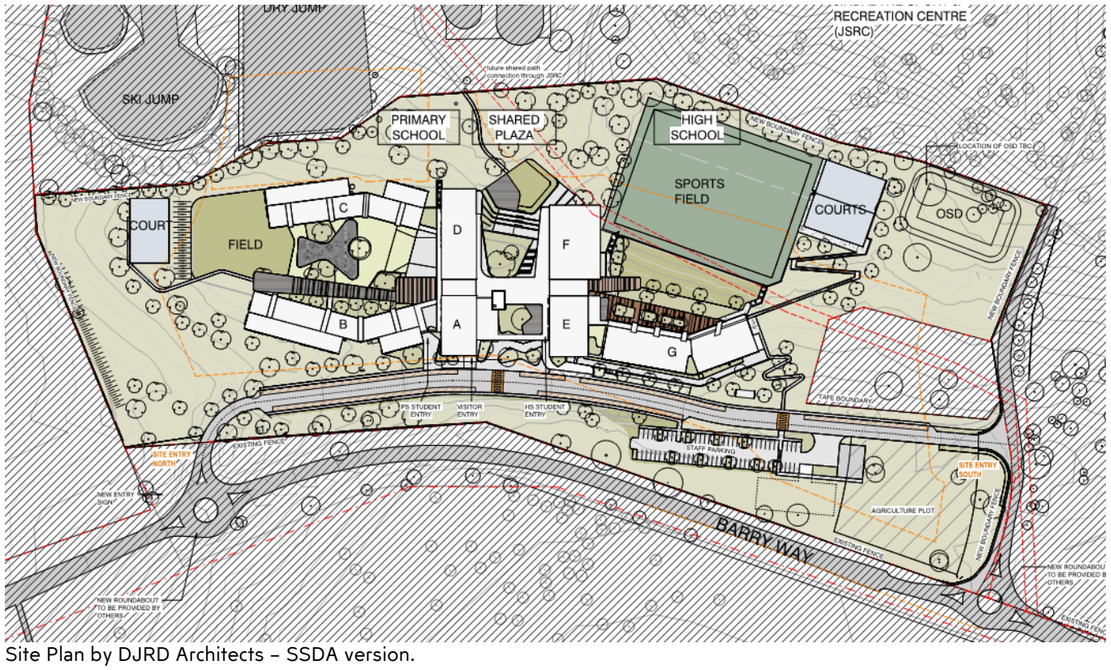
A second ESD Workshop was coordinated with the Design Team at this stage to inform the Sustainable Development of the project.
The key outcomes of that workshop were the following:

- Overview and discussion of preliminary targeted strategies
- EFSG ESD strategies reviewed (Appendix A)
- 54 Green Star Credits are currently being targeted (Appendix B)
- Feasibility of including 5% EV infrastructure in parking areas under review
- Acoustic Credits identified as high risk until Acoustic Consultant is Engaged.
- Transport Plan under development
- Operational credits and credits involving approved CIR's by GBCA to be confirmed by SINSW

In addition, the following have been reviewed in relation to the relevant ESD goals and strategies for the project:

- EFSG Guidelines
- DfMA (MoMC) Guidelines
- DJRD SSDA Design drawings
- Green Star Design & As Build v1.3
- Consultant input

The schematic design currently being assessed is the following:



Site Plan by DJRD Architects – SSDA version.

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1.6 ESD Risk Register

The following table incorporates the risks identified from an ESD perspective for this project

Project Phase	Risk Description	Mitigation Control
Design	Higher energy performance demands from NCC 2019.	Early review and agreement of energy strategy between architects and services engineers to ensure strategy can achieve targets and all design elements are captured in cost plan. Design teams to carry out analysis to check feasibility.
Design	EFSG to achieve NCC +10% without accounting for renewables	Coordination with Services Teams and Architects. This will require good performing glazing and insulation + high performance services (HVAC + Lighting + equipment + controls)
All	Green Star Registration date of the project. If Version 1.3 is targeted must be by registered before Dec 17th, or more onerous version will apply to project. Registration is most appropriate at Schematic Design stage on which to baseline the design to compare to later	Incorporate cost allowance for design uplift that will be required, or complete Schematic Design and register the project before 17th of Dec 2021
Design	Infrastructure and larger items - Important to discuss and agree on infrastructure & larger items early. Items could include Rainwater harvesting systems, Water Sensitive Urban Design (WSUDs) features, Grey water treatment, energy strategy infrastructure (geothermal boreholes / PV panels / other renewable energy options), cycle storage and EOT facilities, Electric Vehicle charging infrastructure.	Early review and agreement and inclusion of items in cost plan. Design teams to carry out analysis to determine size and feasibility of different options.
Design	Early engagement of relevant consultants to achieve ESD requirements. Possible specialist consultants that require early input (during concept / SD stages) include (depending on wider credits targeted) Life Cycle Assessment consultant, Climate Change Adaptation Assessment, Independent Commissioning Agent, Acoustic Consultant.	Engage relevant consultants early, so that strategies are embedded into design and cost plan at an early stage
Design	Many ESD strategies will require compliance during construction stages. Contractors must therefore be contractually tied to achieve necessary requirements and carry out ongoing monitoring and reporting against each target.	ESD consultant to provide detailed specifications outlining requirements for each credit. Contractor must then take on responsibility and appoint suitably qualified staff to implement requirements during construction stage.
Design	General design stage ESD requirements - make sure all design teams are aware of requirements and incorporate strategies within their designs so that the cost plan represents a compliant design.	Ongoing coordination with design teams to check strategies are embedded into design.
All	Changes in Legislative and Government policy.	Qualify impact of change and work with (Finance / Procurement / Legal) to implement required changes.
Design	Desktop Ecology Report indicates potential Critically Endangered Species may be present on site. This may represent a high risk for some of the GS Ecology Credits targeted.	Ecologist field study report required to confirm.

1.7 Schematic Design: Deliverables Table

The table below provides an overview of the Sustainable Development (SD) Deliverables for the schematic design stage and Steensen Varming comments on how each item has been actioned so far, with reference to where relevant items have been developed in this report.

Phase 3 - SCHEMATIC DESIGN	
Activities & Deliverables	**Comments & Reference in Report**
Prepare technical advice to the architect and consultants on how the schematic design can achieve the sustainability targets, initiatives and requirements identified for the project. **Deliverables**: Letters of advice as required	Assistance has been provided during DTM and advice has been provided on project-specific strategies to be included in the design at this stage. Discussions with other consultants involved have been undertaken to clarify strategy requirements to be embedded in the design.
Convene one workshop with the project team to communicate ESD requirements, targets and initiatives and to provide advice.	An ESD workshop was coordinated on 23/07/21 with SINSW and the Design Team. The key outcomes of the workshop are presented in section 1.3 of this report and all updates on strategies targeted are reflected in the ESFG Scorecard and Green Star scorecard included in Appendices A and B.
Coordinate for modelling relevant to schematic design to be used as a tool to improve building design. Modelling reports and letters of advice based on modelling inputs	Modelling and reports will commence upon review of proposed plans and consultant reports for Schematic Design. This has been agreed with the project team.
Predictive energy and greenhouse gas emissions modelling in line with the National Construction Code (NCC) Section J JV2 or JV3 modelling requirements, and with the inclusion of designed mechanical systems	JV3 modelling is currently under development. The targeted outcome is for the building to achieve a 10% energy reduction improvement over minimum requirements of NCC 2019
Predictive indoor air quality (optional) Deliverables: Indoor air quality modelling report	Indoor air quality modelling will not be undertaken however, the proposed mechanical system includes CO2 sensors to monitor air quality indoors. The remote location of the site reduces the risk of air pollution around the building and immediate surroundings.
Predictive daylight factor or illuminance and daylight glare modelling. Modelling to be conducted / coordinated by the ESD consultant. The ESD consultant is expected to work closely with the design team and advise on glazing position, ratios and specifications such as transparency, colour and reflectivity. The ESD consultant is also expected to advise on blind solutions based on modelling. Evidence of this advice needs to be developed. Deliverables: Daylight modelling report	Preliminary daylight modelling has been undertaken to provide advice on window distribution and proposed shading. Those recommendations are included in Section 6.4.3. A comprehensive daylight modelling report will be prepared for key primary spaces of the school. Modelling will be benchmarked as per Green Star D&AB v1.3 and EFSQ requirements.
Whole-of-building, whole-of-life life cycle assessment (optional item). LCA should inform material selection and the ESD consultant is expected to facilitate this process. Deliverables: LCA report and associated advice	LCA Report will not be undertaken however, material selection will be guided by the Green Star requirements for Life Cycle Impacts for Concrete and Steel. This will be further discussed with DfMA supplier once the design progresses.

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Ensure that all material risks from the natural hazard and climate change risk assessment have been addressed at schematic design.	A climate change risk assessment workshop was held on 28/07/21. Risks identified have been discussed with the Project Team. Ongoing development of climate risk management strategies.
Provide input as required for the development application process.	Relevant ESD information required for the SSDA application has been provided.
The ESD consultant must ensure that the final schematic design option is in line with the ESD targets and initiatives from the Sustainable Development Plan and meets the requirements from the ESD schedule. Deliverables: Updated ESD Schedule & Sustainable Development Plan	This document includes the updated ESD schedule & Sustainable Development Plan for the project. It addresses the status of deliverables regarding the EFSG ESD requirements as well as the tracking of strategies to achieve a formal Green Star 4 Star certification. This is developed further in Section 6 and Appendices A & B

1.8 Project Response to SEARS

The following table summarizes how the SEARS (SSD-15788005) requirements have been adressed in the project and where can the responses be found in this report.

SEARs Requirements	Project Response and reference in Report
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 phases of the development.	The selection of ESD strategies for the project has been aligned with the ESD principles from clause 7 (4) ■ Refer to section 1.7 and Appendices A & B
Identify proposed measures to minimise consumption of resources, water (including water sensitive urban design) and energy.	Measures to minimize the consumption of resources have been discussed with the design team and included into the project. Goals, targets, and strategies are being considered for the project to achieve resource conservation, ■ Refer to Sections 6,5, 6.6, 6.7
Identify how the future development would be designed to consider and reflect national best practice sustainable building principles to improve environmental performance and reduce ecological impact. This should be based on a materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.	Best practice sustainable building principles have been considered for the design. A hierarchy approach was undertaken to ensure passive measures were considered first to reduce demand, followed by efficiency of supply and reuse of resources. Waste reduction, low-carbon materials, energy, water efficiency and resilience have all been considered for the design. Their corresponding strategies are presented in detail in the following sections of this report. ■ Refer to Sections 5, Section 6 and Appendices A & B
Identify how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools Manual (GANSW, 2018).	The GANSW Environmental Design in Schools Manual has been considered as part of the performance requirements for this project. This manual also shares goals and targets with the EFSG and Green Star both of which have been considered for this project. ■ Refer to 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.	An assessment against the Green Star Design and As Built v1.3 has been undertaken. The project aims to achieve a 4 Star Rating. ■ Refer to Section 5 and 6 and Appendix A
Provide a statement regarding how the design of the development is responsive to the NARCliM projected impacts of climate change.	Initial advice to achieve a resilient design has been provided considering the NARCliM climate change projections. Climate Change Risk Matrix included in Appendix C ■ Refer to Sections 4.4 and 4.5.
Provide an Integrated Water Management Plan detailing any proposed alternative water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design.	An Integrated Water Management plan is being developed. ■ Refer to Section 6.6

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1.9 Project Response to SEARS clause 7 (4)

The ESD initiatives proposed for Jindabyne School Campus aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building. The project utilises a resource hierarchy approach, with emphasis on avoiding, then reducing the use of energy, water, materials etc.

The outcome of the resource hierarchy 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 and the four key principles listed below. Where these principles align around the goals of a particular strategy being considered for the project, it has been noted in the ESD Scorecard included in Appendix A.

- The precautionary principle
    - If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
    - Decisions should be guided by :
    - (i) Careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and;
    - (ii) An assessment of the risk-weighted consequences of various options.

- Inter-Generational Equity
    - The present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,

- Conservation of Biological Diversity Ecological Integrity
    - Conservation of biological diversity and ecological integrity should be a fundamental consideration,

- Improved Valuation, Pricing and Incentive Mechanisims
    - Environmental factors should be included in the valuation of assets and services, such as:
    - (i) Those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
    - (ii) The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
    - (iii) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

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2.0 Performance Requirements & Standards

2.1 Importance of Healthy and Sustainable Schools

Research has demonstrated clear connections between the quality and sustainability of a school with the health, wellbeing and performance of staff and students. Children are growing, their organs are developing, and they breathe more air relative to their body size than adults. As a result, they sustain greater health problems and risks than adults from toxics and pollutants common in schools.

The costs of poor indoor environmental and air quality in schools, including higher absenteeism and increased respiratory ailments, have generally been "hidden" in sick days, lower teacher and staff productivity, lower student motivation, slower learning, lower tests scores, increased medical costs, and lowered lifelong achievement and earnings.

The large majority of schools are presently not built to optimise health and comfort, but rather to achieve a minimum required level of design performance at the lowest possible cost. They are not designed with the objective to create healthy and productive study and learning environments. This has traditionally been attributed to a shortage of funds, through which schools typically suffer from inadequate maintenance, and experience degradation of basic systems such as ventilation, air quality and lighting quality, as well as poor control over pollutants.

In providing a learning environment for staff and students, schools offer the ability to embed sustainability principles at a young age. They also form a central part of the community and have the ability to influence the wider public through demonstration of positive and inclusive solutions and environments.

As an education facility, Jindabyne Education Campus, has the opportunity to achieve high quality spaces to promote comfortable and productive learning. The key concepts that will be addressed as part of this scope to support the functional demand of the building, i.e. a learning / teaching environment, include:

- **The promotion of natural daylight** – There is a direct correlation between access to daylight and student performance, attention, productivity and general wellbeing;
- **Excellent Indoor Air Quality (IAQ)** – In a similar manner to daylight, there is proven correlation between student performance, occupant wellbeing, student attendance and staff retention. Principle strategies include:
    - Increased levels of outside air through the promotion of mixed mode or natural ventilation strategies, and increased outdoor air allowances;
    - Mould prevention through the avoidance of thermal bridges, condensation and effective strategies in ventilation, odour and pollution control;
    - Low pollutant emitting materials selections such as low VOC paints, adhesives, sealants, composite woods etc.
- **Excellent Thermal, Visual and Acoustic comfort:**
    - Thermal comfort: To ensure teachers, students and administrators are not subject to unacceptable extremes in temperature as they teach, learn and work;
    - Visual comfort: To ensure the quality of light is supportive of visual tasks such as reading and presenting. In design for natural daylight, consideration must be given to daylight uniformity, penetration depth, solar heat ingress and glare control;
    - Acoustic comfort: To ensure effective communication can be achieved at all times. Noise from ventilation systems is eliminated, external and internal disruptive noise affecting classrooms is also minimised. The design should aspire to reduce sound reverberation levels to 1.5 seconds or less, HVAC noise to 45dBA or less (40dBA ideal);
- **Resource conservation (energy, water and waste)** - In delivering on the functional demands of an educational building (high levels of daylight, thermal comfort, visual comfort, and IAQ), incurs resource use through the optimisation of these attributes. These are to be supported with minimal consumption of energy and water resources, or the generation of waste and pollution in demolition, construction, and operation of the building. Our approach to resource conservation is based on applying a "hierarchy" methodology as outlined in the following sections.
- **The creation of an integrated community resource** - The school can play a role within the local community through the use of shared facilities (library's, auditoriums, sport facilities and open spaces);
- **The development of the building and surrounds as a teaching tool** – Students develop greater knowledge retention, understanding and awareness, when they have the opportunity to interact directly with their environment through the mediums of touch, sight and feel, compared to the traditional textbook learning.

2.2 Reference Documents and Guidelines

Codes, regulations, standards and guidelines are considered as part of ESD; they are carefully utilised in informing and guiding the design processes, and in determining both mandatory and target performance parameters for the Indoor Environmental Quality (IEQ). Several Australian and International school regulation systems have been assessed and compared. Although not strictly required to design with the NSW Department of Education guidance, it sets out best practise and key minimum performance requirements based on experience, cost analysis, measured performance etc, that should be addressed. Requirements and targets central to environmentally sustainable performance for Jindabyne Education Campus arise out of, but are not limited to, the following key regulations:

- Environmental Planning and Assessment Act 1979,
- Environmental Planning and Assessment Regulation 2000,
- National Construction Code, and
- Relevant Local Environment Plans (LEPs) and State Environmental Planning Policies (SEPPs) & planning controls.
- Compliance with Sustainable Development initiatives outlined in the SINSW Education Facility Standards and Guidelines (EFSGs)
- SINSW Sustainability Strategy & Action Plan
- NSW Premier Priorities
- NSW Government Resource Efficiency Policy (GREP)
- NSW School Asset Strategic Plan
- NSW climate change framework
- INSW Building Momentum, State Infrastructure Strategy 2018-2018
- Sustainability directions in Greater Sydney Commission regional and district plans
- Commonwealth Department of Environment and Energy 'Sustainable Procurement Guide' for sustainable procurement of services
- Local government documents
- SINSW (Schools Infrastructure NSW): Draft thermal comfort and indoor air quality interim performance brief;
- UK BB-101;
- Europe Sinphone Guidelines;
- USA LEED for Schools;
- USA Environmental Protection Agency (EPA);
- ANSI/ASHRAE Standard 55-2010 for comfort conditions;
- CHPS Best Practices Manual.
- DfMA

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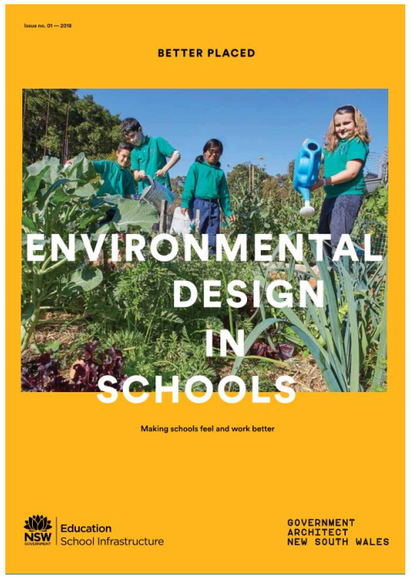
2.3 GANSW Considerations

GANSW has developed a series of Manuals to assist school communities and project teams in planning projects and embed sustainability initiatives in schools. The key manuals considered for this project are:

- Government Architects NSW: Better Placed Design Guide for Schools (2018
- Government Architects NSW: Environmental Design in Schools (2018).



These practical manuals include a series of design and ESD recommendations which have been included within the key strategies selected for Jindabyne Education Campus. Most of the strategies have a clear alignment with the EFSG and Green Star requirements, as they all share key priorities around high indoor environmental quality, energy reduction and resource conservation.

Where these three documents align around the goals of a particular strategy, it has been noted in the ESD Scorecard included in Appendix A. The summary below provides an overview of the key ESD recommendations from the GANSW Manuals.
The strategies highlighted are those being considered for the project but not fully captured within Green Star/EFSG. These will be explained in more detail in the table below.

2.3.1 Environmental Design in schools

Provides guidance on environmental design strategies such as:

- **Use passive cooling and heating**
  - Include operable windows
  - Use fans to move air around
  - Use air conditioning efficiently
- **Re-design learning experiences**
  - Create noisy and quiet spaces
  - Bring plants into the classroom (biophilia)
  - Expose building services
- **Communicate careful use of resources**
  - Find ways to save more
  - Display data
- **Control heat gain**
  - External / internal / natural shading
  - Glazing films to reduce heat gain
- Combine water sensitive design
  - Greywater tanks
  - Water efficiency
- Improve your energy efficiency
  - Select the right insulation
  - Prevent air leaks
  - Include solar panels
- Encourage physical activity
  - Encourage walking and cycling through active travel plans
- Learn outdoors
  - Covered outdoor learning areas
  - Soft Landscaping with native plantings
- **Share environmental knowledge**
  - Learning about our natural and cultural environment
  - Learning from the community
  - Community gardens
- Share community assets
  - Open schools as public spaces outside school hours
- Contribute to the local environment
  - Capturing run-off
  - Cooling air temperature (heat island effect)
  - Supporting biodiversity
- Understand the importance of trees for heating, cooling, and shading,

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2.3.2 Design Guideline for schools

Provides guidance on how to meet the Education SEPP Design Quality Principles through a series of Design Considerations. Key ESD design considerations include:

- Context, built form and landscape
  - Respect and respond to its physical context and natural environment.
  - Consider interpretation of Aboriginal cultural heritage within the design of buildings.
  - Retain existing built form and vegetation where significant.
  - Optimize access to nearby transport, public facilities, and local centres.
- Sustainable, efficient and durable
  - **Be responsive to local climate including sun, wind and aspect**
  - **Select materials and approaches to detailing that are robust and durable.**
  - Integrate landscape, planting, and Water Sensitive Urban Design (WSUD) principles.
  - Minimise reliance on mechanical systems.
  - Include initiatives to reduce waste, embodied energy and emissions, through passive design principles and the use of advanced energy production systems.
  - Maximise opportunities for safe walking, cycling and public transport access.
- Accessible and inclusive
  - Encourage access for members of the community to shared facilities after hours.
- Health and Safety
  - Design facades that optimise fresh air intake and access to daylight.
  - Provide covered areas for protection from sun and rain.
  - Provision of bike parking and end of journey facilities.
- Amenity
  - Ensure access to sunlight, natural ventilation, and visual outlook wherever possible.
  - Facilitate flexible learning by providing access to technology.
  - **Seek opportunities for buildings and outdoor spaces to be learning tools in themselves.**
  - Minimise the negative impacts of overshadowing and wind on surrounding built form and open space, and on school grounds.
  - Locate buildings away from noisy roads and other noise sources to ensure acoustic levels within teaching and learning spaces are acceptable.
  - Where spaces must be located alongside noise sources, arrange built form to ensure dual aspect that will allow for natural ventilation away from the noise source.
- Whole of life, flexible and adaptive
  - **Allow for future adaptation**
  - Take a whole-of-life approach when considering cost and consider wider public benefits over time.
  - Provide capacity for multiple uses, flexibility and change of use over time.
  - Respond to the findings of a site appraisal including in-ground conditions, contamination, flora and fauna, flooding, drainage and erosion, noise, and traffic generation.
- Aesthetics
  - Provide capacity for multiple uses, flexibility and change of use over time.
  - Create engaging and attractive environments.

The table below provides additional information about certain strategies listed above which are being considered for the project but that are not fully captured within the Green Star/EFSG Strategy Scorecard presented in Appendix A.

Guide	N	Strategy	Project Response
GANSW Better Placed Environmental Design in Schools (EDiS) Design Guide for Schools (DGfS)	**1**	Passive cooling and heating	Operable windows will promote passive cooling through natural ventilation. External shading will prevent unwated heatgains during summer Optimized building fabric will reduce heat loss
	2	Re-design learning experiences	Acoustics will be addressed as per GS and EFSG requirements Exposing the building services could be considered as part of the building as a teaching tool initiative.
	3	Communicate careful use of resources	Several initiatives are being considered to use the building as a teaching tool such as, exposed services, native landscaping areas to educate about local flora and fauna, signage, and live data display of building performance to create an understanding of the building's resource consumption and encourage resource conservation.
	4	Control Heat Gain	The building is oriented in an North South axis, resulting in large areas of the facade being exposed towards East and West. This desition was made as a result the strong prevailing Western Winds which required the building to be used as a wind buffer for the external play areas. To control heat gain, external shading, internal blinds and optimized WWR will be implemented.
	5	Share Environmental Knowledge	Consultation with Aboriginal Community members will be undertaken.
	6	Be responsive to local climate including sun, wind and aspect.	Workshops during the Masterplan were undertaken to identify site specific opportunities and constrains considering climate, prevailing winds, noise sources, orientation and opportunities for passive strategies.
	7	Select Materials and approaches to detailing that are robust and durable	As part of the EFSG requirements, it is recommended that a whole of life approach should be undertaken for all the material selection for the project. It is expected that the Design Team will incoporate this in their proposed system designs.
	8	Seek opportunities for buildings and outdoor spaces to be learning tools in themselves	It was discussed during the ESD workshops to aim to use the building as a teaching tool. This can be achieved by incorporating different learning elements throughout the space embedded in the building which can educate occupants about sustainable principles and building operation. This is detailed in Section 3 of this report.
	9	Allow for future adaptation to accommodate demographic changes, new teaching and learning approaches and the integration of new technologies	Design flexible spaces which can adapt over time was another key consideration. This can be achieved through the use of the DFMA modular pods and good design.

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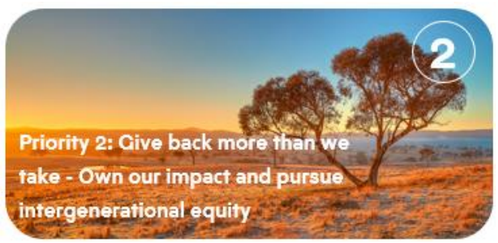
2.4 Educational Facilities Standards and Guidelines (EFSG) ESD Considerations

The EFSG guidelines have provided the base for the Sustainability Development Plan for the project. Key considerations from the guidelines include climate action, energy consumption reduction, use of sustainable resources, selection of efficient systems, high levels of Indoor Environmental Quality, ecological conservation, community engagement and resilience. The guidelines have provided direction and specifications which will be embedded in the project to achieve the ESD goals.

2.4.1 Sustainability Initiatives

The table below provides an overview of the key Sustainability initiatives from the EFSG and other resources considered to meet the project's sustainability goals. The strategies have been grouped to align to SINSW sustainability priorities. Details of how the sustainability initiatives selected for the project have been addressed is provided in Sections 5 and 6.

- DG62 Power
- DG65 Special Electrical Systems
- DG65 Controls
- SG951 Energy conservation: Lighting
- SG933 Energy efficiency appliances and equipment, solar PV systems,



- DG01 Whole of life considerations
- DG40 and SG671 Sustainable materials: low VOC
- DG48 Hazardous Materials
- DG48 Waste management
- DG53 Water
- DG53 Roof water harvesting, tank storage
- DG66 Photovoltaic-Solar Power Generator
- DG90 Ecological Conservation
- DG95 Stormwater
- SG185 Sustainable materials: Timber
- SG811 and SG812 Water conservation: water efficient appliances
- SG821 Stormwater management
- Provision of bubblers and taps to encourage water drinking and less waste
- Environmental management
- Aboriginal employment (NSW Gov Aboriginal Procurement Policy and DOE RAP)
- Inclusive employment (NSW Gov Diversity and Inclusion Strategy 2018-2022)
- Increasing SME participation in government procurement (NSW Gov. SME and Regional Procurement Policy)
- Additional learning opportunities (DFMA)
- Joint/community use (Master Planning Guidelines)
- Aboriginal participation
- Skills development and training

- DG02.08 Climate Change Adaptation
- Stakeholder engagement is required for all capital projects via technical stakeholder groups and broader community consultation. (Green Star - Communities v1.1)
- An independent design review is undertaken on all SINSW projects by an independent technical stakeholder group and the EFSG and Design Advisory teams at SINSW. (Green Star - Communities v1.1)
- SINSW has commissioning procedures (EFSG 65.18, PV Inverter Commissioning Manual, DG64.04, DG63.06, DG65.03, SG812, SG933, SG1011)
- SINSW Commissioning and Temporary Schools Program reviews the design and commissioning.
- Local employment and materials (NSW Government Small and Medium Enterprise and Regional Procurement Policy)

- DG05 Air Movement
- DG06 Accessibility
- DG07 Sun Control
- DG11 Acoustics
- DG55 Cooling Policy
- DG63 Lighting
- Encouragement of healthy lifestyles and wellbeing (Rapid Transport Assessment)
- Improve nutrition through provision of canteen (DOE Nutrition in Schools Policy)
- Planting of food plants (GA Environmental Design in Schools)
- Promote physical activity through the provision of quality open space (EFSG)
- Healthy places that provide adequate open play space provision, wayfinding, and improved public spaces. (GS - Communities v1.1)
- Access to fresh food is provided on all SINSW projects through the healthy canteen program. Some projects also include productive landscape. (Green Star - Communities v1.1)
- Safe places, it is an EFSG requirement for projects to incorporate crime prevention through environmental design (CPTED) principles. (Green Star - Communities v1.1)
- Safe and inclusive sanitation (GAO Design Guide for Schools)
- Elimination of racism (DOE Anti-Racism Policy)
- Consideration of the aboriginal cultural history for the site to reflect and incorporate into the design considerations (Government Architect – Designing With Country)
- Recognition of indigenous heritage and communities (Masterplan Report) in school design (Government Architect – Designing With Country)
- Culture, heritage and identity, which is assessed and interpreted as part of the SINSW development process. (Green Star - Communities v1.1)
- The design of schools should respond to and enhance the positive qualities of the setting, landscape and heritage, including Aboriginal cultural heritage. (SEPP Schedule 4, Design Quality Principle 1)

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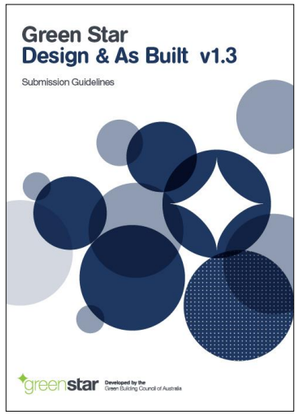
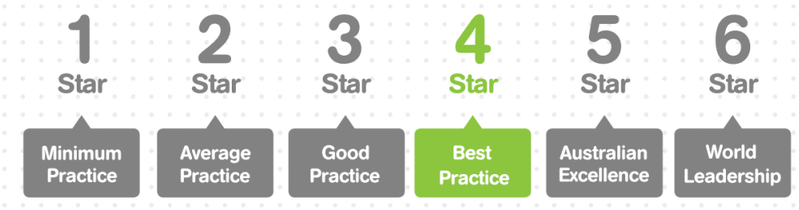
2.5 Green Star Design & As-built v1.3

The Jindabyne Education Campus project is targeting a certified 4 Star Green star Design and As-built v1.3 Rating.
A 4 Star Green Star rating is considered 'Australian Best Practice' level.





The Green Star rating tool is a framework developed by the Green Building Council of Australia (GBCA) and is categorised in 9 sustainability categories which are:

- Management
- Indoor environment quality
- Energy
- Transport
- Water
- Materials
- Land Use and Ecology
- Emissions
- Innovation

Refer to Section 5.0 for a Green Star pre-assessment indicating the points targeted and opportunities and Section 6.0 for further details in relation to the sustainability measures incorporated in the project.

2.6 SINSW Umbrella Projects (Pre-approved approaches)

Schools Infrastructure NSW has gained approval and conditional approval of alternative pathways in demonstrating credit points under the Green Star Design and Asbuilt v1.3 tool for projects **within the Schools Infrastructure NSW v1.3 Umbrella (GS-6039DA)**.The alternative pathways are essentially inherent SINSW governance and design processes normally undertaken, however highly align with the intent of Green Star credits, and hence have been approved as alternate methods of achieving compliance with specific credits.
It is recommended that Jindabyne Education Campus intend to target all pre-approved credits for as listed in the following table. Note this table is providing a summary of the approved approaches. The relevant approved GBCA documents should be fully reviewed to ensure all the compliance conditions are met.

Item	Description
FAQ-F-00101	The registered Green Star project must demonstrate a relationship to, and a role in delivering, the action items within the organisational RAP
GBCA_R-14412 Acoustic Separation and Comfort	Approved - Schools Infrastructure NSW v1.3 Umbrella project may target one (1) point under credit criterion 10.3 Acoustic Separation from Green Star - Design & As Built v1.3 by demonstrating sound reduction index (Rw) from 30 to 35 for glazed operable walls between enclosed spaces only. The approval is on the basis that the sound reduction index (Rw) of 30 for a glazed operable wall meets the functional requirements of the space. All other areas within the project are required to meet the compliance requirements of the Submission Guidelines.
GBCA_R-14417 Services and Maintainability EFSG	Approved conditionally. Projects may target one (1) point under credit 2.1 Services and Maintainability Review using an alternative approach where design elements tailored to services and maintainability are incorporated throughout the Educational Facilities Standards & Guidelines (EFSG) on the following condition; ▪ Demonstrate that there is a process in place to verify that the project has been delivered as per the EFSG, that any issues identified have been rectified and that any actions have been incorporated into the design intent report/ OPR
GBCA_R-14422 ICA	Approved. Projects may target credit criterion 2.4 Independent Commissioning Agent using the Commissioning and Temporary Schools Program Team in lieu of engaging a dedicated independent commissioning agent for each project on the following condition; Demonstrate that the Commissioning and Temporary Schools Program team is separate from the design team
GBCA_R-14426 Sustainable Transport	Approved. Projects may target ten (10) points under credit 17 Sustainable Transport- Performance Pathway using the SINSW Schools Transport Assessment process detailed by Green Star; Aim: To reward SINSW projects that undertake a transport assessment as per the 'Transport Assessment: Template' and create a project specific School Transport Plan
GBCA_R-14427 Innovation - DFMA	Approved. Projects may target one (1) point under 30B Market Transformation in Green Star - Design & As Built for seeking to integrate sustainability in the approach 'Design for Manufacture and Assembly' (DfMA). It is recognised that sustainability is a key issue in the supply chain that can be addressed through DfMA
GBCA_R-14474 Site Ownership	Projects may use a statement acknowledging the length of time that the school has been in operation in lieu of providing the date of site purchase or option contract (previous condition of the site) and evidence of the site that existed at this time. Where projects are new developments, a copy of the Development Application (DA) approval may be supplied as evidence.
GBCA_R-14476 Innovation - Integrating Healthy Environments	This request is approved. Projects may target one (1) point under Innovation Challenge Integrating Healthy Environments, providing the Healthy Canteen Policy research report in lieu of a community analysis report.
GBCA_R-14478 Innovation - Community Benefits	This request is approved. Projects within the Schools Infrastructure NSW v1.3 Umbrella (GS-6039DA) may target one (1) point under Innovation Challenge Community Benefits, using the Schools Infrastructure policy 'Community Use of School Facilities' and the 'Share Our Spaces' program guide in lieu of a Needs Analysis Report.
GBCA_R-14537 Innovative Technology or Process - Dashboard	Approved. Projects may target one (1) point under credit criterion 30A Innovative Technology or Process for the Principal's Dashboard initiative. This dashboard allows the school Principal to track maintenance, energy, water and solar usage, and spend data against student numbers, GFA and other measures to compare asset performance on a monthly or annual basis against itself or other schools.
GBCA_R-14538 Innovation - Universal Design	Approved. Projects may target one (1) point under Innovation Challenge Universal Design, providing the Education Facilities Sustainable Guidelines (EFSG) in lieu of a needs analysis report. The GBCA acknowledges that the schools have been designed to ensure that students who have accessibility requirements have access to the everyday learning environment that all students have and are not separated from their peers.

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2.7 NCC Compliance

The works shall generally be designed in accordance with Statutory Regulations the recommendations/requirements of the National Construction Code and relevant consultant reports such as the fire engineering report.

The building shall be designed in general accordance with the guidance of the National Construction Code (NCC) 2019, and in accordance with Australian Standards current at the time.

2.8 Summary of key sustainability considerations at each stage of the process

Sustainability Management	Site & Environment	Planning & Microclimate	Health & Wellbeing	Energy	Water Demand	Transport	Materials & Waste	Community & Economy	Smart Tech & Infrastructure
Concept Masterplan									
Integrated Design / Stakeholder Engagement	EIA / Brownfield Redevelopment Protect Existing Habitats & Features	Land Uses / Amenities	Green Infrastructure	District Energy Considerations / Energy Centre	District Water Considerations / Blackwater Treatment	Public Transport Integration		Community Infrastructure Investment	
Detailed Masterplan									
Implementation Plan / Design Review	Site Remediation / Habitat creation / Stormwater Plan / Climate Adaptation	Microclimate Design Shading Heat Island Effect	Fresh Food & Production Air & Noise Planning	Passive Design Renewable Energy	Demand Reduction	Accessibility / Walking & Cycling / Reduce car use / Smart mobility	Centralised Waste Management / Energy from Waste	Culture, Heritage & Identity	Flexible Smart Infrastructure Networks
Infrastructure & Building Design									
Disaster Management / CSR / Sustainable Buildings	Environmental Management / Soil Erosion Plan	Active Frontages Natural Surveillance	External Lighting / Daylight Access / / Air quality	Street lighting & Urban realm power demand / Building Efficiencies	Efficient Supply / Fit for Purpose / Drinking water / Water features / Sewer separation	Low-Emitting Vehicles / Car Pooling & Sharing	Fewer Raw Materials / LCA / Local / Recycled / Waste Planning		High speed broadband / Smart buildings and Infrastructure
Future Phases / Operation									
Ongoing assessment of operational performance	Ongoing monitoring of environment	Ongoing landscape maintenance	Indoor environmental quality monitoring / Smoking ban	Demand side management / Commissioning / Energy Metering & Monitoring	Demand side management / Water Metering & Monitoring	Monitoring & Optimisation of Transport Modes		Community plan / Education and Skills / Incentive Schemes / Affordability / Local employment	Smart applications and management Data Accessibility & Remote access

Summary of key sustainability considerations at each stage of the project

The engineer in his own way is an artist too - and not just a dead fish with a slide rule.
Jørgen Varming

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

Copenhagen
London
Sydney
Hong Kong
New York

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3.0 Building as a Teaching Tool

This section provides some examples for designing the school as a teaching tool. During the DTM and ESD workshop, this has been identified as desired outcome for this project. The ideas included within aim to increase awareness of sustainability issues, and educate students about natural systems and the environment. Students spend a considerable time at school, and therefore can gain more knowledge if given the resource is made available and apparent. Having onsite teaching resource that can illustrate how systems work is an effective teaching aid. Studies show schools that engaging students through different means correlates to improved test results in all areas.

Approach
Diverse types of 'human' behaviour requires different ways of presenting information. For better absorption of sustainable features of the building, it is recommended to use a mixed approach. The options can include visual; participating, signage, collection and display of building data, exposure of building systems, tactile experience inside and outside of the building, sound and music in spaces, social and individual spaces, gardens where students can participate, all of which can help improve awareness of sustainability issues.

The diagrams below summarise four commonly used pedagogical approaches to incorporate building features for education purposes.

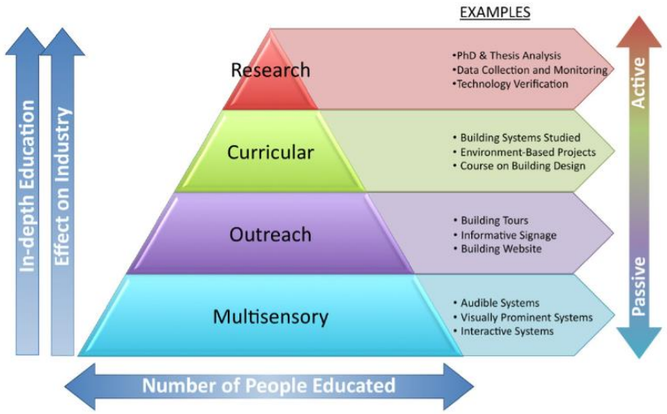


Figure 9 Preliminary qualitative analysis of the benefits of different teaching strategies

The MOCR framework ("Building as Teaching Tools: A Case Study to Determine Best Practice that Teaches Environmental Sustainability" C. Schiller.)

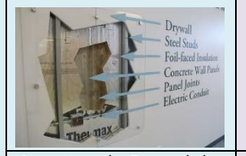
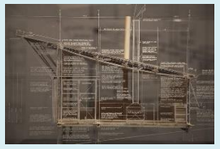
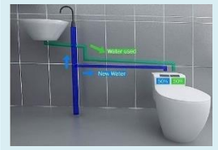
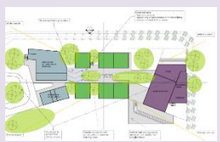
Multisensory – to transfer knowledge through sensory experience;
Outreach – to share information and engage community;
Curricular – to utilize physical and natural environments in learning;
Research – to analyse building performance and human impact.

Examples of Sustainable Education Design Ideas
The following table provides some examples of design ideas for incorporated educational information into the building design. The table is split into subcategories, based on the type of Multisensory ideas that could be considered:

- **Visual** – opportunity to witness usually hidden details, analyse and understand principles behind them.
- **Participatory / Interactive –** to engage users to participate and being part of the living building, to help find interest in learning and exploring;

As the design progresses, it is recommended that the wider sustainablity framework and associated targets are aligned with physical design features that can help engage students and provide passive education on sustainability.

Visual **Participatory**

Energy	Water	Site	Structure/Materials	Technology
Exposed Building 	Water collection system as a part of design 	Graphical presentation of sustainable features (ex. Ecological site mapping with annotations) 	Description of Building Structure 	Adaptive information 
Integrated within design Building Systems 			Annotated 3D model of the site /building/ elements/ systems 	Application of virtual and augmented reality 
Coloured Mechanical Systems for more attractive look and easier identification of elements 	Revealing Hidden Systems with Annotations 	Public/school garden to for kids to participate in growing process 	**Waste** Waste separation 	
Open and annotated with lights plant room 	Playground with use of rainwater 	Tours of Facilities 	Encouragement to avoid littering 	**Space** Small group and individual study spaces 
Building Data 	**Transport** Attractive bicycle parking to encourage 	Website Information 		

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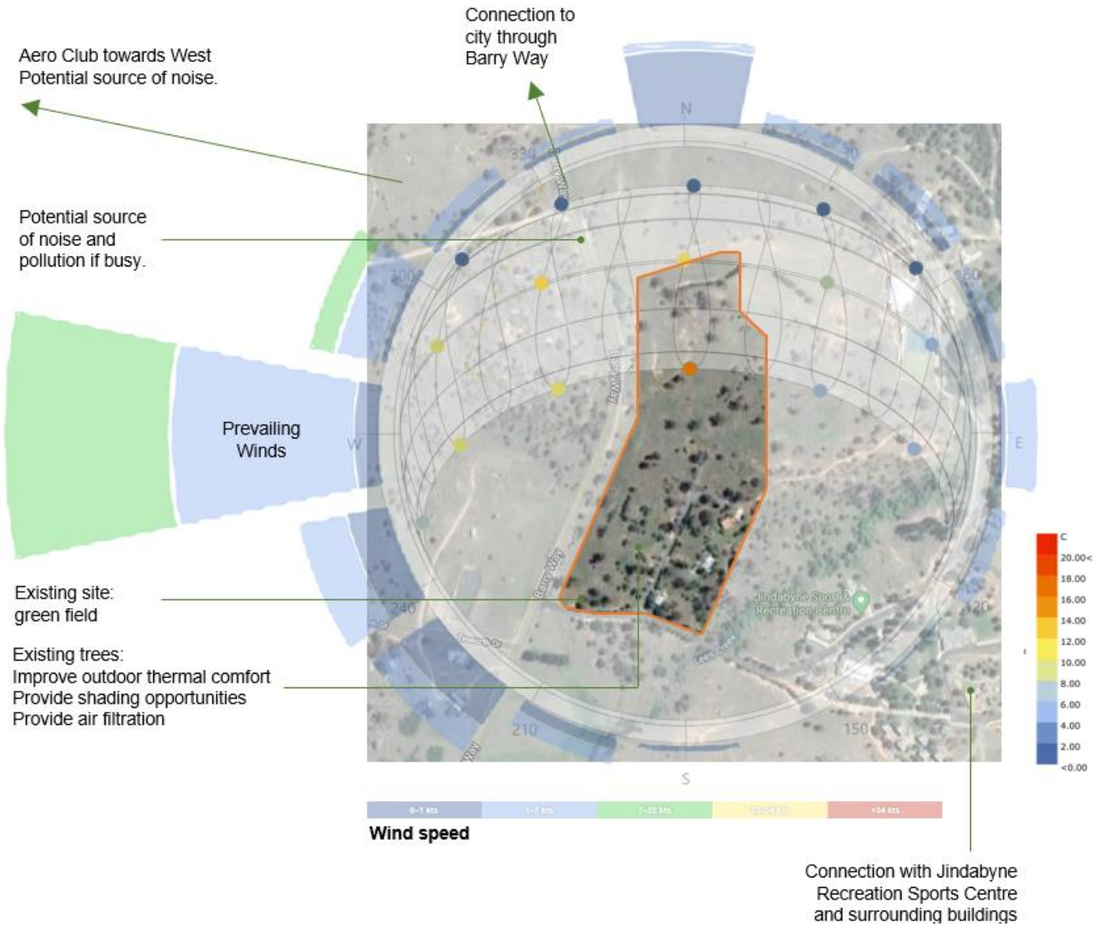
4.0 Site and Climate Review

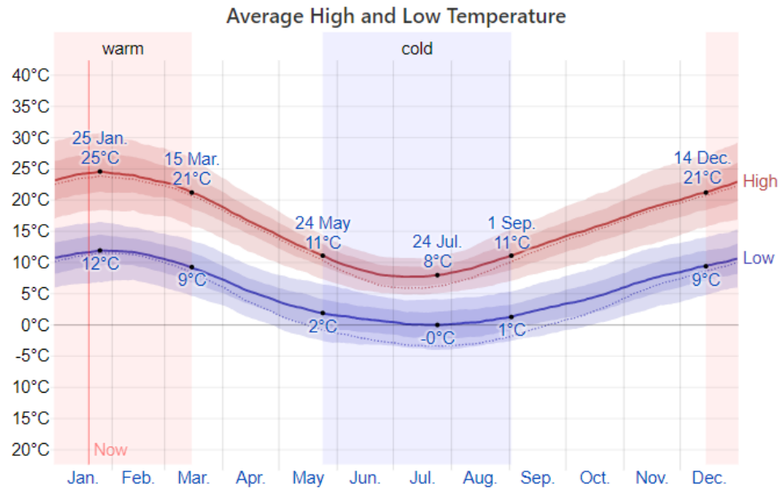
4.1 Site Overview

This section provides an overview of the main climate considerations of the site. The Jindabyne Education Precinct is in southern NSW, at an altitude of approx. 1,000m above sea level. The climate is sub-alpine, with cool temperate characteristics. This section provides an overview of climate conditions for the site.



4.2 Temperature

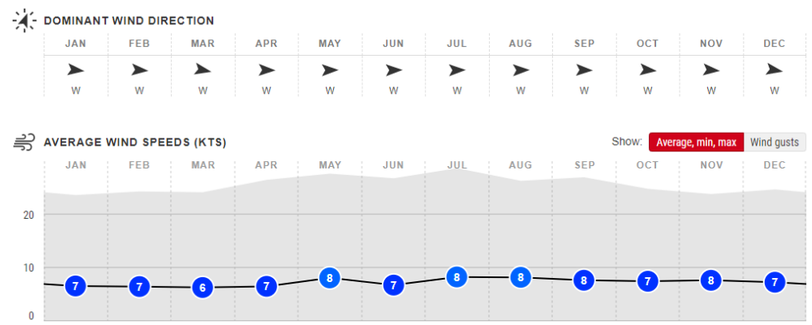
As shown in the graph below, the average temperatures show that the climate is comfortable during summer and cold during winter. Summer averages range from 25°C-9°C, Winter averages range from 11°C-0° *(Graphs from Weatherspark.com)*



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

4.3 Wind

The annual wind distribution is shown below, using Perisher Valley weather data. The graphs show that wind direction is consistent throughout the year, with strong Westerly prevailing wind direction. Considering wind speed, the graphs show that it is fairly strong and consistent throughout the year. *(Graphs from Windfinder.com)*



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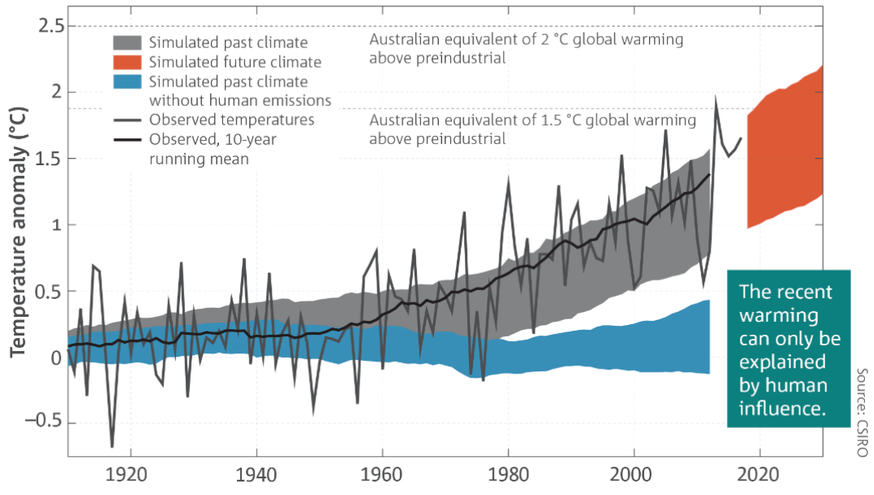
4.4 Climate Change Considerations

A high-level assessment of possible Climate Change impacts has been carried out during this stage to assess how the public realm design and services strategy will respond to future expected climate conditions. A Climate Change Risk workshop was held with the project team to discuss the climate change risks identified, assess their risk level and mitigation strategies. The risk register matrix is included in Appendix C. An overview of predicted future conditions and the project's response is presented below.

Australia's climate has seen gradually increasing average temperatures over the past century, with an increase of just over 1°C since 1910. Most of this increase has occurred since 1950 and 8 of Australia's top ten warmest years on record have occurred since 2005. It has also seen an increase in the number of extreme temperature days (days where temperatures exceed the 99th percentile of each month from 1910-2017).

This trend is predicted to continue, and the extent of the warming will be based on global emissions scenarios. The current projections (source: climatechangeaustralia.gov.au) are as follows:
Near future (2030): Projected warming of 0.5-1.4°C (against 1986-2005 average)
Long term (2090):

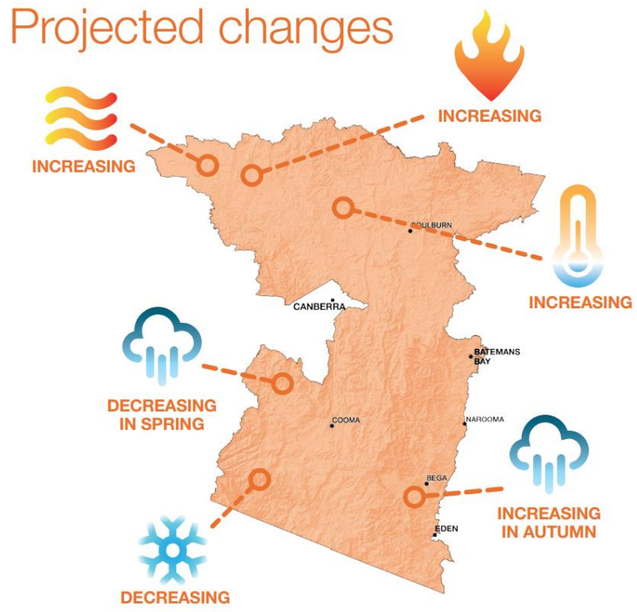
- High emission scenario – warming of 2.8-5.0°C
- Intermediate scenario – warming of 1.3 – 2.6°C



4.5 NARCliM projected impacts of climate change

To assess the climate projections for the region, the NSW and ACT Regional Climate Modelling (NARCliM) project has been considered. Jindabyne is included within the South East and Tablelands area, which given the diverse topography of the region results in a large range of climates.
NARCliM Climate change projections are presented for the near future (2030) and far future (2070), compared to the baseline modelled climate (1990–2009). The projections are based on simulations from a combination of twelve climate models run to provide detailed future climate information for NSW and the ACT considering temperature, hot days, cold nights, rainfall, and fire weather.

While all projections will be considered, given the life span of the project projections for the far future (2070) will be considered in more detail. The diagram below summarizes the main trends regarding climate change projections for the area:



Projected temperature changes	
Maximum temperatures are projected to increase in the near future by 0.5–1.0°C	Maximum temperatures are projected to increase in the far future by 1.8–2.5°C
Minimum temperatures are projected to increase in the near future by 0.4–0.7°C	Minimum temperatures are projected to increase in the far future by 1.4–2.3°C
The number of hot days will increase	The number of cold nights will decrease
Projected rainfall changes	
Rainfall is projected to decrease in spring and winter	Rainfall is projected to increase in summer and autumn
Projected Forest Fire Danger Index (FFDI) changes	
Average fire weather is projected to increase in summer and spring	Number of days with severe fire weather is projected to increase in summer and spring

Source: NARClim Climate Change projection Summary

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The table below provides a closer look at the climate change trends for the near and far future and provides some guidance on the confidence on the climate models. The confidence in the models is based on how much do the models agree on certain results and trends. In most cases, the trend (increase/decrease) is similar for most models, but the results span across a wide range, creating less confidence in the projections. Model agreement is what will determine how much can the results be trusted.

Criteria	Current (BOM)	Near Future (2030)	Far Future (2070)	Confidence in climate projection model
Temperature	Mean maximum temperature 18.2°C	Max. temperatures to Increase by 0.7°C	Max. temperatures to Increase by 2.1°C (Average) Spring and summer will experience the greatest change by increasing by up to 2.4°C Change in annual average maximum temperature between (2.0°C and 2.5°C)	Near future: High confidence – all models agree temperature will increase. Far future: medium confidence – all models agree but show a wider result range.
	Mean minimum temperature 4.1°C	Min. temperatures to Increase by 0.6°C Change in annual average minimum temperature between (1.0 and 1.5)	Min. temperatures to Increase by 2.0°C Change in annual average minimum temperature between (1.5 and 2.0)	Near future: high confidence. Far future: medium confidence – all models agree but show a wider result range.
Hot Days (Days per year above 35C)	10 hot days per year	15-20 hot days per year	20-30 hot days per year	Near future: high confidence. Far future: high confidence
Cold Nights (Nights per year below 2C)	Wide range. 10 cold nights per year in the coastal area and 200 cold nights in the Snowy Mountains.	10-20 fewer cold nights per year	Over 40 fewer cold nights per year	High confidence. All models agree that the region will see a decrease in cold nights for both near and far future
Rainfall	Currently experiences considerable rainfall variability across the region and from year-to-year Average: 529.5mm	Projections span both drying and wetting scenarios for: ■ Summer –18% to +20% ■ Autumn –12% to +38% ■ Winter –12% to +10% Spring rainfall will decrease 1% to –17%	Projections span both drying and wetting scenarios for: ■ Summer –8% to +33% ■ Autumn –6% to +45% ■ Winter –20% to +11% Spring rainfall will decrease –2% to –19%	High confidence rainfall will decrease in spring. Low confidence in the projections for summer autumn and winter
Fire Weather (Changes in number of days a year FFDI over 50 – Severe)	1.1 a year	■ Annual +0.1 ■ Summer + 0.1 ■ Autumn 0 ■ Winter 0 ■ Spring 0	■ Annual +0.5 ■ Summer + 0.2 ■ Autumn 0 ■ Winter 0 ■ Spring +0.3	Low confidence. General trend agrees that FFDI will increase but there is wide range of results.

The table below shows a high-level review of climate change risks and a review of how the design can address these risks. It is recommended that a detailed workshop and review by a Climate Risk Consultant is arranged, so that all likely risks and their relative impacts can be identified, assessed, and actioned.

Climate Impact	Risk	Response / Design Considerations
Increase in **hailstorms**	■ Blocking gutters / Damage to buildings / Injury to visitors	■ Maintenance management plan / predictive maintenance / Visitor Management Plan ■ **Passive design optimisation** to reduce impact of extreme temperatures
Increase in **extreme hot days and average temperatures**	■ Stress on electricity network / **blackouts** ■ Increased **internal temperatures** ■ Greater **energy consumption** ■ Higher **peak loads** ■ Accelerated **degradation of materials** ■ **Heat Stress effects on human health**	■ **Back-up power** (Generators / PV) ■ **Redundancy** built into cooling capacity ■ **Thermal Storage** – manages peak loads ■ **Durable materials** selection ■ **Mechanical System** to be able to respond to extreme temperatures
Increased **drought duration**	■ Restrictions to **water supply** ■ **Damage to landscape** and higher maintenance costs	■ **No water-based heat rejection** to be used ■ **On-site efficiency measures** to reduce potable water demand ■ **Drought resistant planting** selection
Increased **fire weather**	■ **Smoke from bushfires** causing health impacts ■ **Damage to powerlines** impact supply	■ **Back-up power** systems & **onsite generation** ■ **Filtration** for air intakes into buildings
Increased **rainfall variability And flooding**	■ Damage to buildings, landscape, and infrastructure. ■ Flooding impacts	■ **Sustainable urban drainage** features will capture, treat, store stormwater, and reduce outflow. ■ **Predictive / forecast management** of water storage
Increased **storm intensity**	■ Blowing debris causing property damage and safety risks ■ Interruption of waste collection services	■ **Durability** of materials selection ■ **Predictive management** planning in even of large storm events
Snow extreme events	■ Damage to buildings, and infrastructure. ■ Movement across site	■ **Design** of roofs and circulation spaces considering snow management. ■ **Predictive management** planning in even of large snow-storm events

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5.0 Sustainability Strategies Overview

The table below provides an overview of possible strategies that have been discussed during the concept design stage of the project. All strategies could be explored further to improve the sustainability of the precinct. Those that require higher or additional capital expenditure or space when compared against a minimum EFSG compliant building are highlighted. The strategies align with the achievement of Green Star 4 Stars certification target.

Key principles	Cost / Space Impact	Early-stage consideration
Education and community	**$**	■ **Use the precinct design features as an educational tool for all**
		■ Integration of community spaces and facilities
	m²	■ **Visible equipment and signage (e.g. water capture & recycling)**
		■ Inspirational sign of the building sustainability features and key savings
	$	■ **Real-time display of water and energy performance, air and water quality.**
		■ Sustainability walking tour including back of house
		■ Community space
Site and Environment	**$+m²**	■ Avoid development on areas of high ecological value
		■ Enhance ecological value of the site
		■ Mitigate and offset any negative impacts from development of greenfield site
		■ Creation of a new park for school and community use
		■ Selection of endemic native species with high ecological value
	$+m²	■ Access to outdoor space
		■ Light pollution reduction
		■ **Water Sensitive Urban Design for Stormwater management onsite**
Transport	**$+m²**	■ **Provision of cycle storage and facilities (for 7.5% of occupants & 5% of visitors)**
	$+m²	■ **Electric vehicle infrastructure (either 15% for low emissions or 5% with EV charging)**
Energy		■ Optimised façade performance (WWR, SHGC, U-value, light transmittance, shading)
		■ Optimised building massing and orientation
		■ Optimised façade performance (WWR, SHGC, U-value, light transmittance, shading)
	$	■ **Efficient equipment**
	$	■ **High performance Blinds**
	$+m²	■ **Rooftop PV**
	$+m²	■ **Building Integrated PV**
	$+m²	■ **Geothermal Energy – Ground Source Heat Pumps**
	$+m²	■ **Other On-Site Renewables – bio-gas / solar hot water / etc.**
	$+m²	■ **Off-site renewables**
Water	**$+m²**	■ **Water recycling (rainwater, greywater and blackwater)**
		■ Reduce water use with the selection of efficient fittings and irrigation system
	$	■ **No cooling towers or cooling tower water use reduction strategies**
Material and waste		■ Reduce the use of materials
	$	■ **Use of materials with low embodied carbon**
		■ Design for deconstruction
		■ Operational waste strategy
		■ Selection of timber materials where possible
		■ Use of cement replacement and low impact concrete
	$	■ **Selection of materials with Environmental Product Declaration (EPDs)**
		■ Selection of stone paving with low environmental impact
		■ Responsible sourcing
		■ Segregation of operational waste
Health and wellbeing	**$+m²**	■ **High level of air filtration**
	m²	■ **Increased outdoor air supply**
	$	■ **Water filtration**
		■ Drinking water dispenser and bottle refill
	$	■ **Glare control – blinds**
		■ Daylight and views
		■ Thermal comfort
		■ Lighting comfort
	$	■ **Acoustic comfort**
	$	■ **Biophilia and beauty (planting, artwork)**
		■ Outdoor place of respite
	$	■ **Testing and display of air and water quality**
	$	■ **Outdoor water features**
	$	■ **Low VOCs materials**
	$	■ **Fitness facilities and place of respite**
	$	■ **Provision of healthy food**
Resilience	**$**	■ **Climate change adaptation**
		■ Hazard assessment
		■ Space flexibility and adaptability
		■ Selection of robust materials
		■ Reduce heat island effect with green infrastructure, light colour hardscape and roof finishes
Sustainability Management & Optimization	$	■ **Advanced metering strategy**
	$	■ **Integrated smart technology to optimise all strategies, including energy, water, waste.**
	$	■ **Free wifi to pupils, staff and visitors**
		■ High speed connectivity

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5.1 Review of Schematic Design Option

The following diagrams provide a review of the schematic design option, against the recommended strategies listed above.

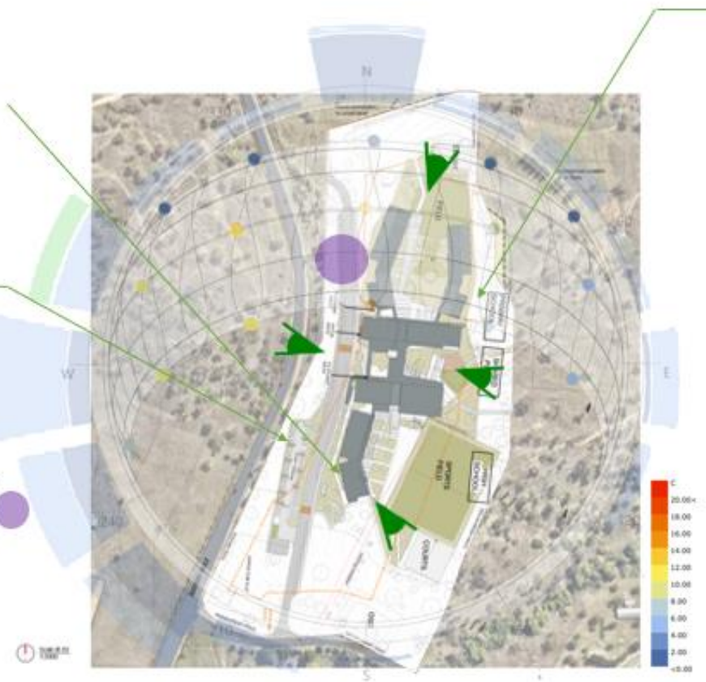
Building massing
Orientation of High School building may expose East and West facades to glare.
Narrower buildings can support Cross Ventilation
Consider the topography of the site for the building placement to reduce site fill outs.
Buildings are aligned along western edge to help provide shelter in outdoor play spaces from strong westerly prevailing winds.

Control Noise and Air Pollution
Potential noise source from road and internal bus road. Landscaping could be used as a buffer for noise and pollution.
Aero Club nearby (West) potential noise source to be considered.

Biodiversity & Ecology
Landscaping opportunity to include native plants and increase biodiversity on site
New road proposed over Critically Endangered Ecological Communities (CEEC) – Cool Temperate Grassy Woodlands
s
Denser layout may allow for energy savings.
Existing trees to be retained where possible

Sustainable Transport
- Cycle parking and facilities to be provided for staff and students.
(secure bicycle parking and EoT facilities)
- Consider space for EV vehicles w/chargers to reduce pollution and encourage EV use.

Distance to city centre (JJ Connors Oval)
1.8 km (48m ↑)
10' Cycle



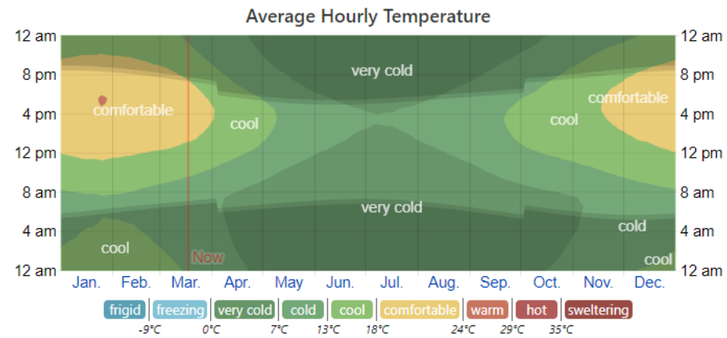
Sustainable urban drainage features
Swales / biofiltration / rain gardens throughout landscaping
- Improve biodiversity
- Control stormwater quantities and quality
- Rainwater harvesting for irrigation
- Reduce air and noise pollution from road
- Allow space for rainwater tanks
- Permeable paving

Building Materials
Design Building massing to allow for sustainable material selection
Sustainably sourced materials
Healthy materials with low harmful chemicals
High performance building envelope

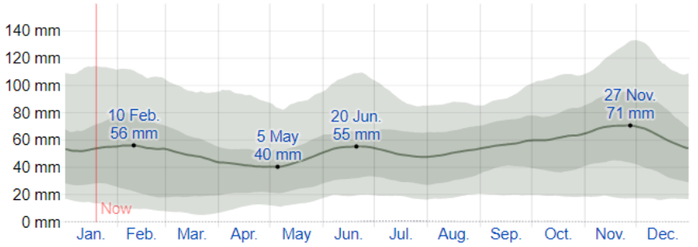
Roof PV

Health and Well-being
- Buildings provide views out over landscape
- Greenery improves shading and biodiversity
- Building façade design required to control glare, especially on NW edge

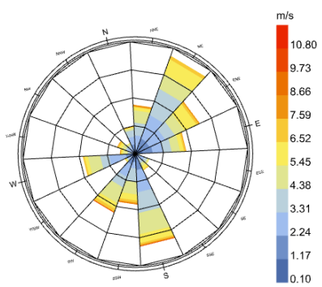
Thermal Comfort
Winter - Potential for passive and active solar heating strategies, retention of internal heat gains and high performance of the building envelope.
Summer - Potential for natural ventilation



The average hourly temperature, color coded into bands. The shaded overlays indicate night and civil twilight.

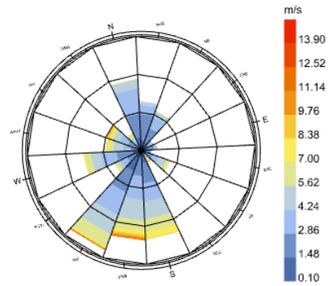


The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average liquid-equivalent snowfall.



Wind Speed (m/s)
city: Thredbo Village
country: AUS
source: RMY
period: 1/1 to 3/1 between 0 and 23 @1
Calm for 18.06% of the time = 260 hours.
Each closed polyline shows frequency of 4.2% = 50 hours.

Summer Prevailing Winds



Wind Speed (m/s)
city: Thredbo Village
country: AUS
source: RMY
period: 5/1 to 7/1 between 0 and 23 @1
Calm for 36.42% of the time = 542 hours.
Each closed polyline shows frequency of 5.3% = 50 hours.

Winter Prevailing Winds

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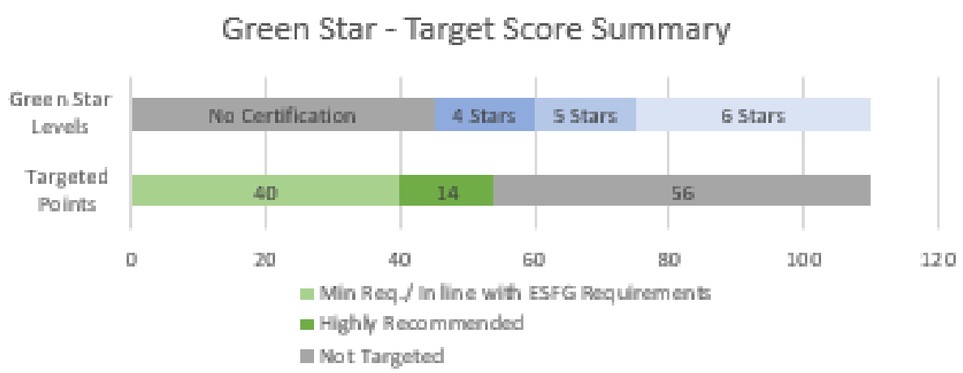
5.2 Green Star Pre-Assessment

To support the cost assessment and review of sustainability requirements for the project, an initial Green Star Pre-Assessment has been carried out. At this stage, a rating of 4 Stars is targeted through the Green Star Design & As Built v1.3. A summary of the score distribution is shown below.

From discussions with SINSW, it is understood the project is to target a formal 4 Star Green Star rating. This was discussed during the Jindabyne Central School - ESD Start Up Meeting on the 14th of December 2020.
After initial discussions and the ESD workshop a strategy revision was undertaken to reduce the initial 59 targeted points to 52. The updated summary score table is shown below.

Summary Scores - 30th July 2021

Category	Not Targeted	Available Pts	Min Req./ In line with ESFG Requirements	High. Rec.	Total
Management	14	14	11	2	13
Indoor Environment Quality	17	17	10	3	13
Energy	22	22	2	1	3
Transport	10	10	1	0	1
Water	12	12	5	0	5
Materials	14	14	4	2	6
Land Use & Ecology	6	6	1	2	3
Emissions	5	5	4	0	4
Innovation	10	10	2	4	6
Total	**110**	**110**	**40**	**14**	**54**
4 Star Target		45-59	45		**Yes**
5 Star Target		60-74	60		**No**
6 Star Target		75+	75		**No**



A detailed pre-assessment scorecard is provided in the Appendix A.

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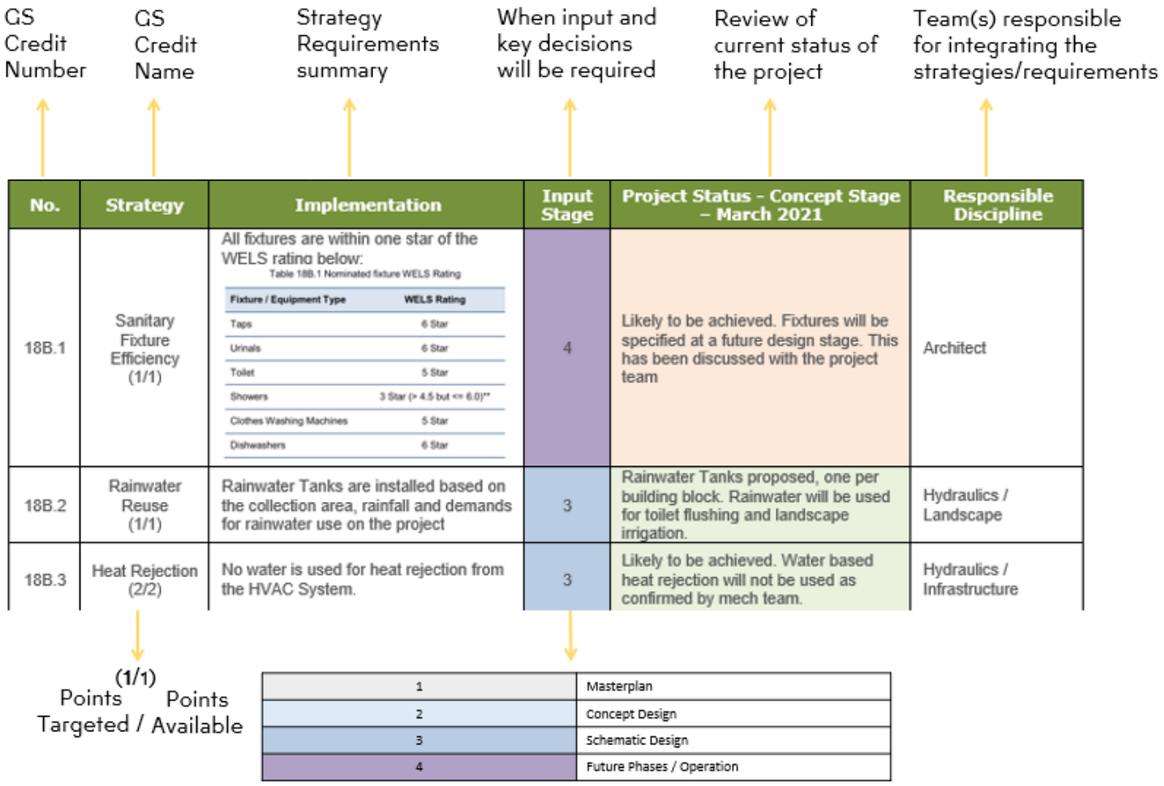
6.0 Sustainability Strategies by Category

6.1 Sustainability Strategies Review

The following sections provide an overview of the key goals and strategies targeted for each of the main ESD categories identified.
Each category has a table showing the Green Star Credits currently being targeted for the project and SV comments on how each item has been actioned so far. The selection of GS strategies was based on the sustainability requirements for the project and their alignment with the EFSG Design Guidelines.

The GS tables follow the structure below:



No.	Strategy	Implementation	Input Stage	Project Status - Concept Stage – March 2021	Responsible Discipline
18B.1	Sanitary Fixture Efficiency (1/1)	All fixtures are within one star of the WELS rating below: Table 18B.1 Nominated fixture WELS Rating Fixture / Equipment Type – WELS Rating Taps – 6 Star Urinals – 6 Star Toilet – 5 Star Showers – 3 Star (> 4.5 but <= 6.0)** Clothes Washing Machines – 5 Star Dishwashers – 6 Star	4	Likely to be achieved. Fixtures will be specified at a future design stage. This has been discussed with the project team	Architect
18B.2	Rainwater Reuse (1/1)	Rainwater Tanks are installed based on the collection area, rainfall and demands for rainwater use on the project	3	Rainwater Tanks proposed, one per building block. Rainwater will be used for toilet flushing and landscape irrigation.	Hydraulics / Landscape
18B.3	Heat Rejection (2/2)	No water is used for heat rejection from the HVAC System.	3	Likely to be achieved. Water based heat rejection will not be used as confirmed by mech team.	Hydraulics / Infrastructure

6.2 Community

Goals:
- Building and site as teaching tools
- Integration with the community

Key strategies included:
- Integrate educational sustainability features that the students can interact with and provide a greater understanding of sustainability in design;
- Best practice landscape design to align with native planting and design principles and encourage biodiversity;
- Use of sustainable materials throughout the project, and draw attention to their sustainable qualities;
- Incorporate community use facilities within the school (Sports Field)

Operational Activities
- Engage with local conservation groups – Develop programs to educate the students and the community about wildlife conservation and other sustainability goals;
- Train all staff to be aware of the sustainability goals of the site.
- Develop incentive schemes for staff and students for sustainable behaviour.

The table below shows the sustainability framework strategies proposed for Community and Schematic Stage comments:

No.	Strategy	Implementation	Input Stage	Project Status – Schematic Stage – July 2021	Responsible Discipline
30D	Community Benefits (1/1)	Project's investment in infrastructure for use by the broader community.	4	Opportunities for share uses are available however no joint use agreements are currently in place. No additional security lines are proposed but they have been considered in the design and could be included if required. GBCA approved request 14478, using the Schools Infrastructure policy 'Community Use of School Facilities' and the 'Share Our Spaces'	Architect
30D	Integrating Healthy Environments (1/1)	To support high-performance, cost-effective, and health-promoting project outcomes through an early analysis of the interrelationships among systems.	4	Likely to be achieved if Healthy Canteen Policy is applied. Confirmation from SI required. GBCA approved request 14476 regarding Healthy Canteen Policy research report.	SINSW
30D	Reconciliation Action Plan (1/1)	To encourage organisations to take formalised steps to provide opportunities for Aboriginal and Torres Strait Islander peoples. To achieve this, the project must: Develop a Reconciliation Action Plan (RAP), as defined and endorsed by Reconciliation Australia. The RAP must be endorsed by Reconciliation Australia. The Green Star project being rated must play a central role in the delivery of the Reconciliation Action Plan.	4	Could potentially be achieved through SINSW Organizational RAP The project must demonstrate a relationship to and a role in delivering, the action items within the organizational RAP. Scope of the RAP, goals and objectives are, who is responsible for delivering on these and any input from the contracting team will have to be reviewed in relation to evidence.	SINSW / Architect

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6.3 Site and Environment

Goals:
- Protect, restore and enhance all existing environmental features of the site
- Building and landscape design will consider incorporation of locally sourced natural materials
- 100% Landscaping native local indigenous species or native species with low water use
- Manage all stormwater falling onsite in a sustainable manner;
- Comfortable and usable site year round
- Design optimised to enhance microclimate at all times of year

Key strategies included:
- Native and adaptive planting to encourage native biodiversity, support ecological education and reduce water demand;
- Stormwater management – use landscape strategy to reduce flood risk, provide water storage and incorporate sustainable urban drainage features. The design should address stormwater quantity and quality, through storage, retention and bio-remediation measures;
- Landscape design strategy to consider climate change risks and incorporate ideas to help long term resilience and adaptation;
- Landscape lighting design to minimise light pollution.
- Aligned with the energy hierarchy approach, the first stage is to optimise the masterplan to provide passive thermal comfort to all users.
- Solar shading during summer months through landscape design, shading structures and building shading;
- Promotion of cooling winds during summer, while blocking unwanted winter winds;
- Reduce heat island effect;
- Use existing and new greenery to support evaporative cooling during the summer;

The table below shows the strategies proposed for Site & Environment and Schematic Stage comments:

Site & Environment – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
23.0	Endangered, Threatened or Vulnerable Species (Cond.)	Carry out EIA for the site to identify key environmental impacts. Confirm site does not contain critically endangered, endangered, or vulnerable species or ecological communities as defined in EPBC Act 1999	4	To be confirmed. Desktop Ecology report indicates potential Critically Endangered Species may be present on site. Field Study required to confirm. Current intention to offset affected areas on other areas of the site. This will compromise Green Star Credit.	Ecologist / Landscape
23.1	Ecological Value (1/3)	Ecological Value of the site is improved by the project	4	To be confirmed by ecologist. Site is previously developed (Golf Course) so ecological value of existing should be determined to confirm. Ecology value calculator to be used to determine points. Landscape team has been advised that native plantings will contribute towards this credit.	Ecologist / Landscape
24	Sustainable Sites – Conditional Requirement (Cond)	At the date of purchase the project site did not -Include old growth forest -Include prime agricultural land -Include a wetland of high national importance -Impact on matters of national significance	4	To be confirmed. Desktop Ecology report indicates site might need approval by EPBC. Field Study required to confirm.	Civil / Landscape / Architect
26.1	Stormwater Peak Discharge (26.1)	Post-development peak Average Recurrence Interval (ARI) event discharge from the site does not exceed pre-development peak ARI event discharge. (Related to Credit 3 – Adaptation & Resilience)	3	Stormwater management will be achieved through and OSD basin and natural ground absorption.	Civil / Landscape
26.2	Stormwater Pollution Targets (26.2)	All stormwater discharged from the site meets the required pollution reduction targets when compared to untreated runoff in accordance with local government regulations or GS guidelines	3	Pollution targets under review by Civil Engineer. Credit to be achieved through on-site water quality treatment devices.	Civil / Landscape
27.0	Light Pollution to Neighbouring Bodies (Cond.)	All outdoor lighting on the project complies with AS 4248:1997 Control of the obtrusive effects of outdoor lighting.	4	Discussed with lighting team. Likely to be achieved. Specifications to be considered at a future design stage.	Architect
27.1	Light Pollution to Night Sky (1/1)	Reduction of light pollution either with control of Upward Light Output Ratio (ULOR) or control of Direct Illuminance	4	Discussed with lighting team. Likely to be achieved. Specifications to be considered at a future design stage	Architect
28.0	Microbial Control (1/1)	Project to implement systems to minimise the impacts associated with harmful microbes (Legionella) in building cooling systems.	3	Likely to be achieved. Water based heat rejection will not be used as confirmed by mech team.	Mechanical

The engineer in his own way is an artist too - and not just a dead fish with a slide rule.
Jørgen Varming

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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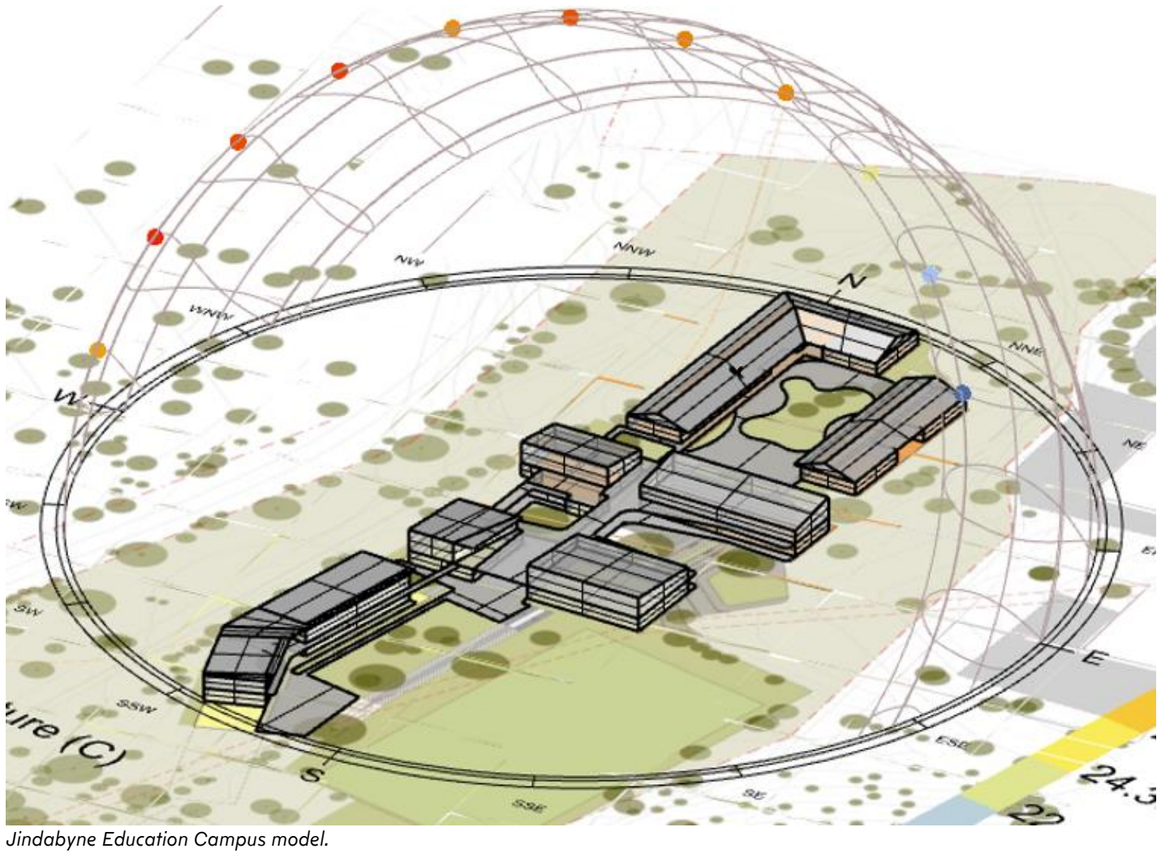
6.3.1 External Environment Review

One of the aims for this development is to produce a comfortable environment for as much of the year as possible. Analysis of the thermal comfort for external areas has been carried out to show the impact of the different comfort parameters:

- Air temperature;
- Radiant temperature – including incorporation of greenery, shading, materials;
- Relative Humidity;
- Air movement.

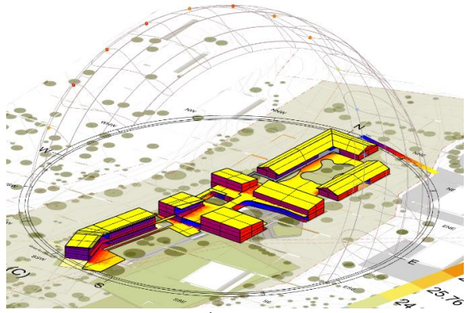
To help assess the external conditions on site, a simple model has been used to test the impact of different factors throughout the year.



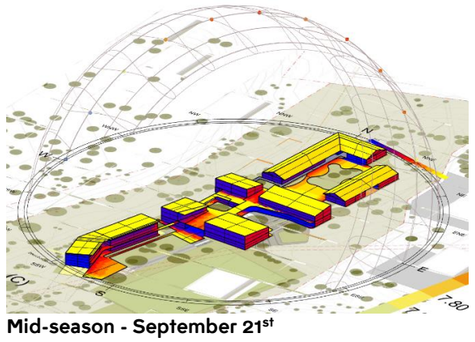
Jindabyne Education Campus model.

6.3.2 Direct sunlight hours simulation

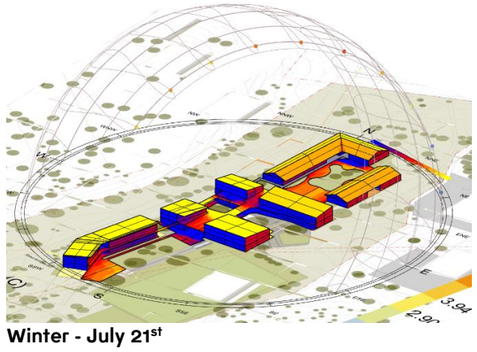
The following simulation results show the direct sunlight hours received on the building and the site. Three sample days have been analysed to show how the building is responding to orientation and the conditions in the external spaces in relation to exposure to sunlight and shade availability.



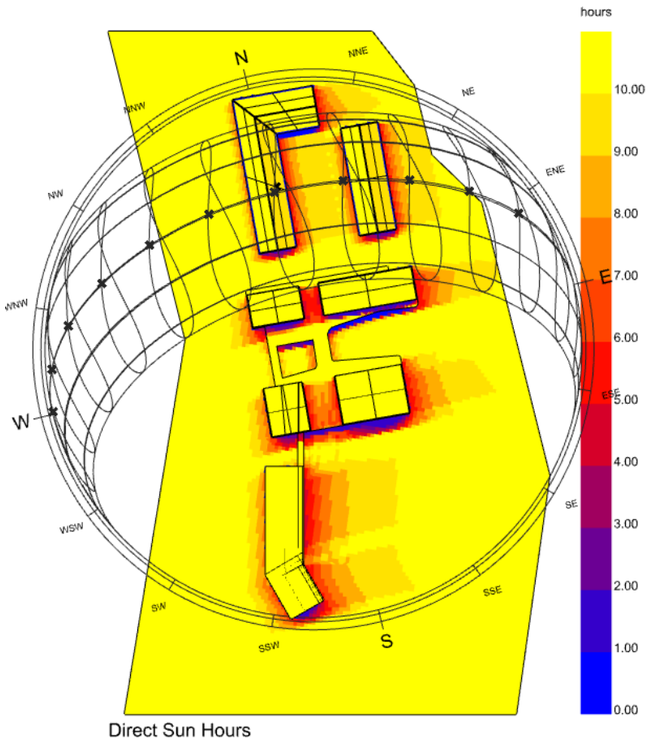
Summer - January 21st



Mid-season - September 21st



Winter - July 21st



Direct Sun Hours

N

Mid-season September 21st

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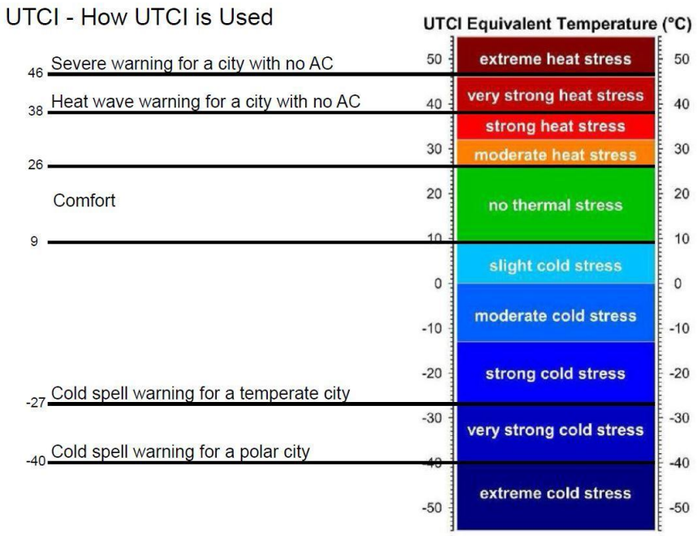
6.3.3 Universal Thermal Comfort Index (UTCI)

The UTCI is a measure of external comfort, considering the combined effect of the following factors:

- Dry bulb temperature;
- Mean Radiation Temperature;
- Relative Humidity (or water vapour pressure), and
- Wind Speed

The UTCI method combines these variables to determine an equivalent perceived temperature for the environment. It is defined as the air temperature of the reference environment which produces the same strain index value in comparison with the reference individual's response to the real environment.
UTCI is divided into 10 groups ranging from extreme cold stress to extreme heat stress:



Annual UTCI Distribution:

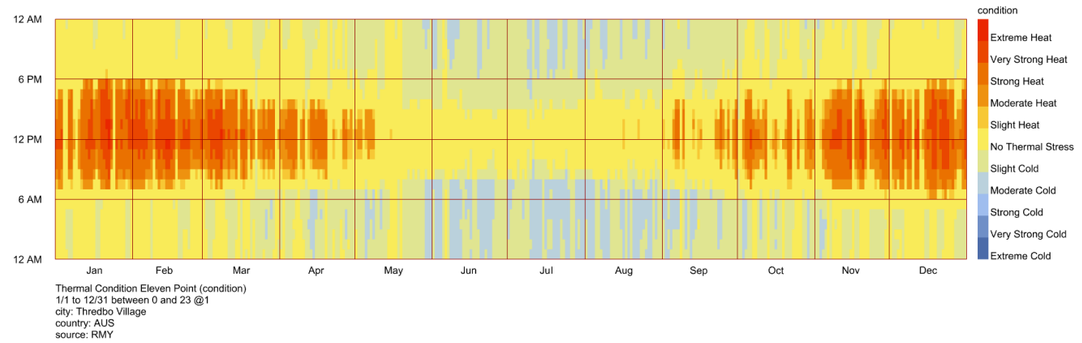
The following graphs show the annual distribution of UTCI for a few of the options described above:
The results show that shading and improved air movement clearly increase the amount of time during the summer that the site is comfortable, though increased air movement is detrimental during the winter months.

Exposed Site / No Shading:

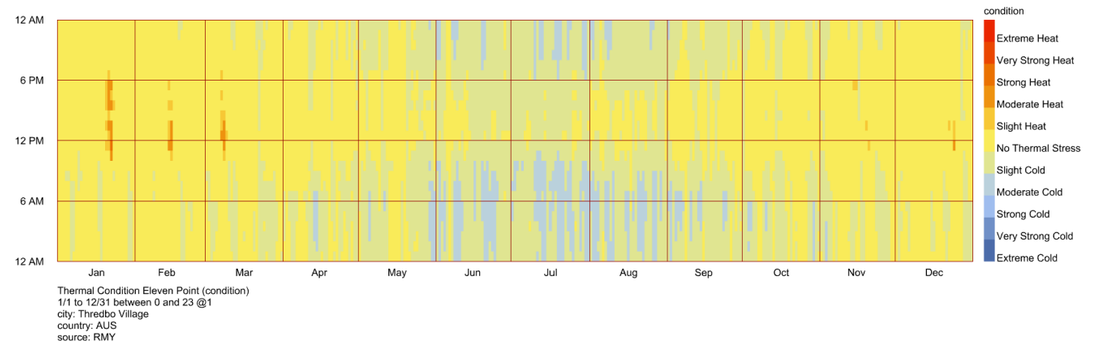
With Shading

With Shading and increased Air Movement

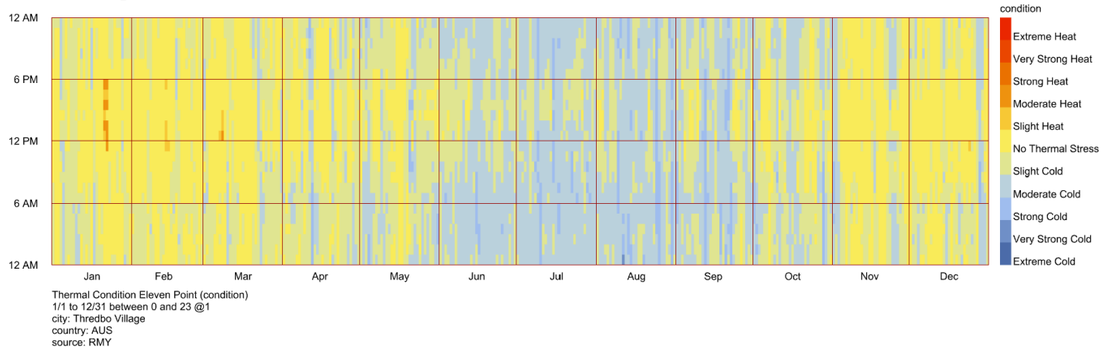
Exposed Site / No Shading:



With Shading:



With Shading and increased Air Movement



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6.4 Transport

Goals:
- Encourage cycling for students and staff
- Provide electric vehicle infrastructure
- Reduce car parking on site

Key strategies included:
- Secure and accessible bicycle storage provided on site;
- Lockers and shower facilities provided for staff;
- Reduce parking availability and prioritise parking for those with disabilities, electric vehicles and vehicles with multiple occupancy (ride-share)

The table below shows the sustainability framework strategies proposed for Transport and Schematic Stage comments:

Transport & Mobility – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
17B.3	Low Emission Vehicle Infrastructure (1/1)	Parking and dedicated infrastructure is provided to support low emission vehicles. 15% of parking is dedicated to fuel-efficient vehicles, or; 5% of parking is dedicated to electric vehicles and charging infrastructure is provided for each space. (Prescriptive pathway applies to parking spaces for building occupants and visitors)	3	5% of parking spaces will be included for EV. Under review as transport plan is currently under development. Number of total spaces TBC Considerations to include the wiring and system capacity for the building to be EV ready but the chargers to be installed in the future.	Architect / Electrical
17A	Performance Pathway (x/10)	Projects provide access to sustainable transport infrastructure which decreases GHG Emissions from transport, decreases mental and social impacts of commuting and encourages the uptake of healthier active transport options	4	GBCA Approved Request – 144226 SINSW projects that undertake a transport assessment as per the 'Transport Assessment: Template' and create a project specific School Transport Plan may claim points for this credit. SINSW will need to drive the design outcomes from this as it will indicate what infrastructure is needed. The team must respond to the 8 guiding principles in demonstrating the intent has been achieved. Transport plan currently under development	Transport / SINSW / Architects

6.4.1 Health and Wellbeing

Goals:
- Creating a safe, healthy, and engaging built environment.
- Achieve GS requirements for Daylight, Glare, Ventilation, Acoustics, Lighting and Thermal Comfort
- Whenever possible rely on passive strategies and natural ventilation to achieve comfort

Key strategies included:
- Building massing and space planning optimization
- Mechanical design optimization to achieve high levels of IEQ (Air Quality / Ventilation / Pollution)
- Façade design optimization to achieve high levels of IEQ (Daylight / Glare / Thermal Comfort)
- Provision and connection to outdoor space, nature and biophilia
- Healthy material selection
- Microclimate optimisation throughout the year to promote comfortable conditions in all external spaces;
- Surface materials should be selected to reduce heat island effect, but should also avoid causing issues of glare from low angle sunlight.
- Air quality to be optimised through reduction of possible pollutants:
    - Reduced vehicle emissions;
    - No smoking within the site;
    - Selection of paints, materials, etc that do not cause harmful off-gassing, especially for internally applied surfaces;
- Air quality to be further enhanced through landscape strategy and inclusion of planting to passively treat possible pollutants in the air;
- For air supply to buildings, filtration to be included for all air intakes to ensure high-quality internal environments;
- Noise sources, such as from vehicles, to be controlled.
- The flexibility of the homebase spaces (enclosed spaces vs. Integrated spaces) will have an impact on natural ventilation. Natural ventilation effectiveness will depend on ceiling height, window design and placement and will be reviewed as the design progresses.

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The table below shows the strategies proposed for Health & Wellbeing and Schematic Stage comments:

Health & Wellbeing – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2020	Responsible Discipline
9.1	Ventilation System Attributes (1/1)	Ventilation System must be designed to comply with ASHRAE Standard 62.1:2013 regarding minimum separation distances between pollution sources and outdoor air intakes. Ventilation system designed for ease of Maintenance and Cleaning New Ductwork cleaned as per standard specifications prior to use and occupation	3	Targeted. Confirmed by mechanical. No issues raised after initial review of preassessment.	Mechanical
9.2	Provision of Outdoor Air (1/2)	Provision of outdoor air at a rate 50% greater than the minimum required by AS 1668.2:2010 or c	3	Concentrations of CO2 to be maintained below 800ppm	Mechanical
9.3	Exhaust or Elimination of Pollutants (1/1)	Enhance local air quality and reduce air pollution sources. Exhaust or elimination of pollutants (printing, photocopying equipment, kitchen stoves or vehicles)	4	Kitchen exhaust locations presented in initial Mech review. Vehicle pollution is not likely to be an issue in this location. School printing and copying equipment specifications not yet addressed but it has been established that the preferred solution is to purchase equipment with low emissions.	Mechanical / Architect / SINSW
10.1	Internal Noise Levels (1/1)	Internal ambient noise levels in the nominated area are no more than 5dB(A)above the lower figure in the range recommended in Table 1 of AS/NZS2107:2016	4	Acoustic Consultant not to be engaged in Schematic Stage. High-risk points until reviewed by specialist consultant. GBCA Approved Request R-14412 allowing for 30 to 35 for glazed operable walls between enclosed spaces only. All other areas within the project are required to meet the compliance requirements of the Submission Guidelines. Wall types should be identified on the drawings to cover all scenarios.	Acoustic / Mechanical
10.2	Reverberation (1/1)	Reverberation time in the nominated area is below the maximum stated in the Recommended Reverberation Time" provided in Table 1 of AS/NZS2107:2016	4	Acoustic Consultant not to be engaged in Schematic Stage.	Acoustic
10.3	Acoustic Separation (1/1)	The project addresses noise transmission in enclosed spaces within the nominated area. Compliance is demonstrated through 1 of the 3 methods presented by GS	4	Acoustic Consultant not to be engaged in Schematic Stage. Mechanical Team advised acoustic credits will be difficult to achieve considering the use of large, glazed sliding doors.	Acoustic / Mechanical
11.0	Minimum Lighting Comfort (Cond.)	Lights in the nominated area are flicker-free and accurately address the perception of colour in the space.	3	Targeted. Lights will be specified at a future design stage, but likely to be achieved	Lighting / Electrical / Architect
11.1	General Illuminance and Glare Reduction (1/1)	In 95% of the nominated area lighting levels comply with best practice guidelines and glare is eliminated	3	As above	Lighting / Electrical / Architect
12.0	Glare Reduction (Cond.)	Glare from sunlight through all viewing facades and skylights is reduced through a combination of blinds, screens and fixed devices or other means.	3	Initial façade recommendations discussed with architect, especially considering West and East facades where glare is likely to happen.	ESD / Architect
				Pending confirmation from sun studies.	
12.1	Daylight (1/2)	Achieve 160 lux due to daylight during 80% of the nominated hours in 40% of the nominated area	3	Targeted. Likely to be achieved pending confirmation from Daylight modelling	ESD / Architect
12.2	Views (1/1)	60% of the nominated area has a clear line of sight to a high quality internal or external view	3	Targeted. Achieved. Compliance documentation to be prepared	Architect
13.1	Paints, Adhesives, Sealants and Carpets (1/1)	95% of all internally applied paints, adhesives, sealants and carpets meet stipulated 'Total VOC Limits'	3	Discussed with architects. Targeted. Materials will be specified as per GreenStar requirements for TVOC	Architect
13.2	Engineered Wood Products (1/1)	95% of all engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building.	3	Discussed with architects. Targeted. Materials will be specified as per GreenStar requirements for TVOC	Architect / Structural
14.1	Thermal Comfort (1/1)	High degree of thermal comfort is provided to the occupants, equivalent to 80% of all occupants being satisfied in the space.	3	Part of Section J requirements. Will be achieved	Mechanical
30D	Universal Design (1/1)	To encourage projects to provide safe, equitable and dignified access for persons with disabilities.	3	Likely to be already achieved. GBCA approved request 14538. Schools can provide Education Facilities Sustainable Guidelines (EFSG) in lieu of a needs analysis report, plus accessibility plan developed for the project and drawings or photos demonstrating the accessibility initiatives. Compliance documentation to be prepared.	Architect

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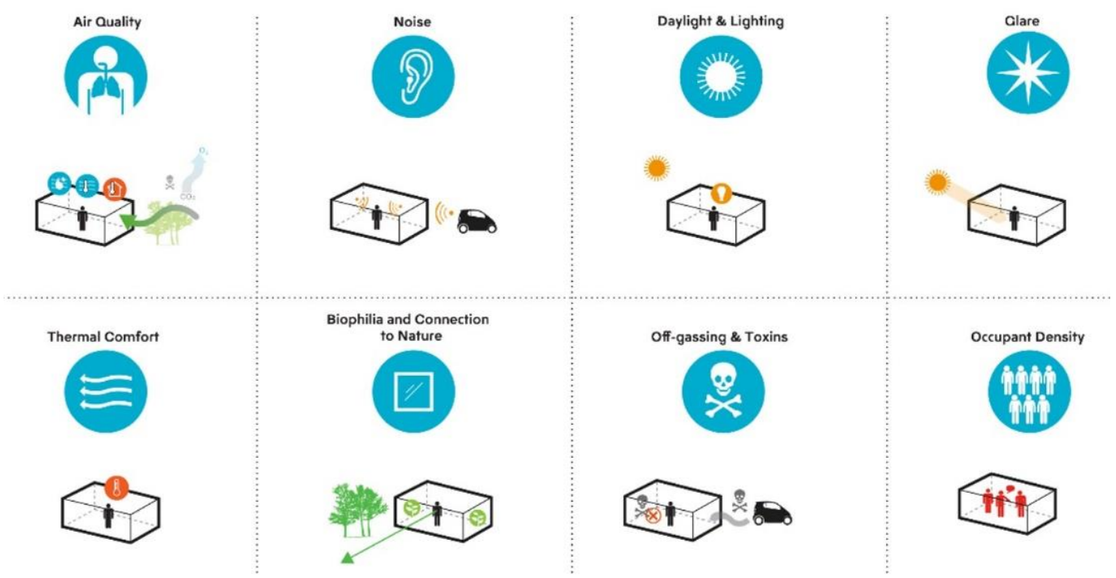
6.4.2 Indoor Environmental Quality

One key aim for this project is to provide a healthy environment for all users of the buildings within the development. Systems should therefore be selected to balance Indoor Environmental Quality (IEQ) with energy efficiency, utilizing passive measures and living methods where possible to reduce the need for mechanical treatment. For all buildings within the site, a high-quality environment should be achieved. Consideration should be given to:

- Enhance indoor air quality through improved ventilation rates, filtration of pollutants and removal of polluting elements from buildings
- Provide access to nature and natural elements, through incorporation of indoor natural elements and/or views to external natural environments
- Promote Daylight access but avoid glare throughout the buildings
- Provide a high-quality acoustic environment, blocking unwanted external noise, controlling indoor acoustic conditions for different zones and requirements and controlling noise produced by the building to the surrounding areas
- Optimise Thermal Comfort for all users while minimizing energy consumption
- Occupant Density: Utilise buildings efficiently without overcrowding. Provide a range of spaces and flexibility of environments to allow users and workers to select their preferred environment.



6.4.3 Daylight Design

There are many benefits to good daylight within buildings, including:

Human Benefits:
- Connection with space and time
- Stress reduction
- Improved concentration
- Higher productivity
- Better overall health of occupants
- Happier users
- Wider range of comfort zone.

Cost Benefits:
- Lower electricity consumption
- Possibility for natural ventilation and cooling loads reduction
- Reduced HVAC system size
- Less sick days.

However, it is also important to consider possible issues, such as:

- Glare
- Higher heat gain/loss through windows
- High heat gains from direct sunlight.

To achieve good quality daylight while avoiding the negative impacts, the following measures should be considered:

- Optimize building massing
- Shade appropriately
- Design for diffuse light, reduce direct sunlight
- Orient windows correctly
- Distribute glazing properly
- Specify high performance glazing
- Install reasonably airtight windows
- Optimize building massing

The following diagram shows how window height can make a big difference to the daylight access in a space without increase window area:

The engineer in his own way is an artist too - and not just a dead fish with a slide rule.
Jørgen Varming

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

Copenhagen
London
Sydney
Hong Kong
New York

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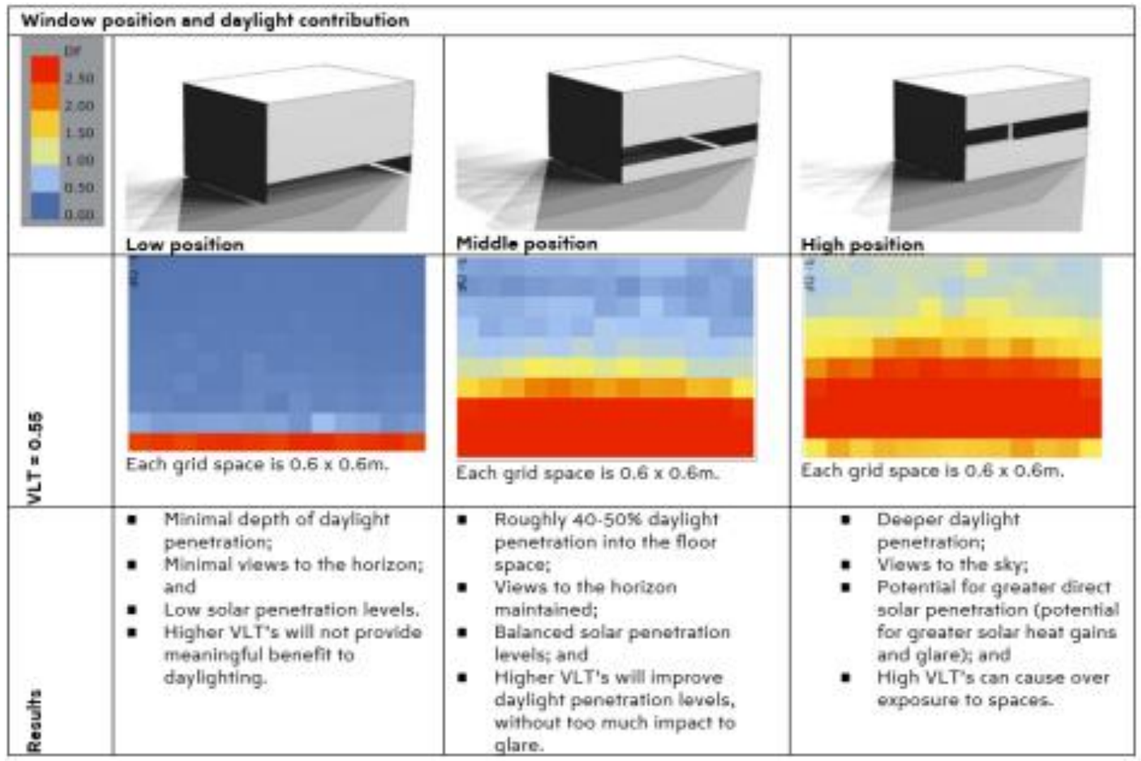


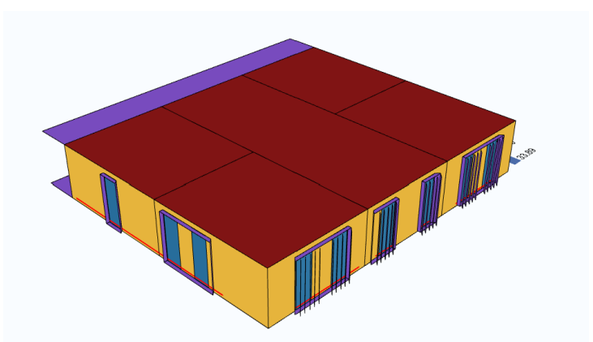
6.4.4 Preliminary Daylight assessment of a typical space

A preliminary daylight assessment of a typical Homebase module was undertaken to assist with the façade development. The module was tested to assess daylight availability during occupied hours as per EFSG and Green Star thresholds. Results will be confirmed and further developed in daylight report with the final design proposed for Schematic Phase.

Typical classroom module
4 Homebases + PAA Space

(One story primary school)
Overall dimensions 22.5m x 18m
Windows Type 1A, 1B & 2
Glazing performance TBC

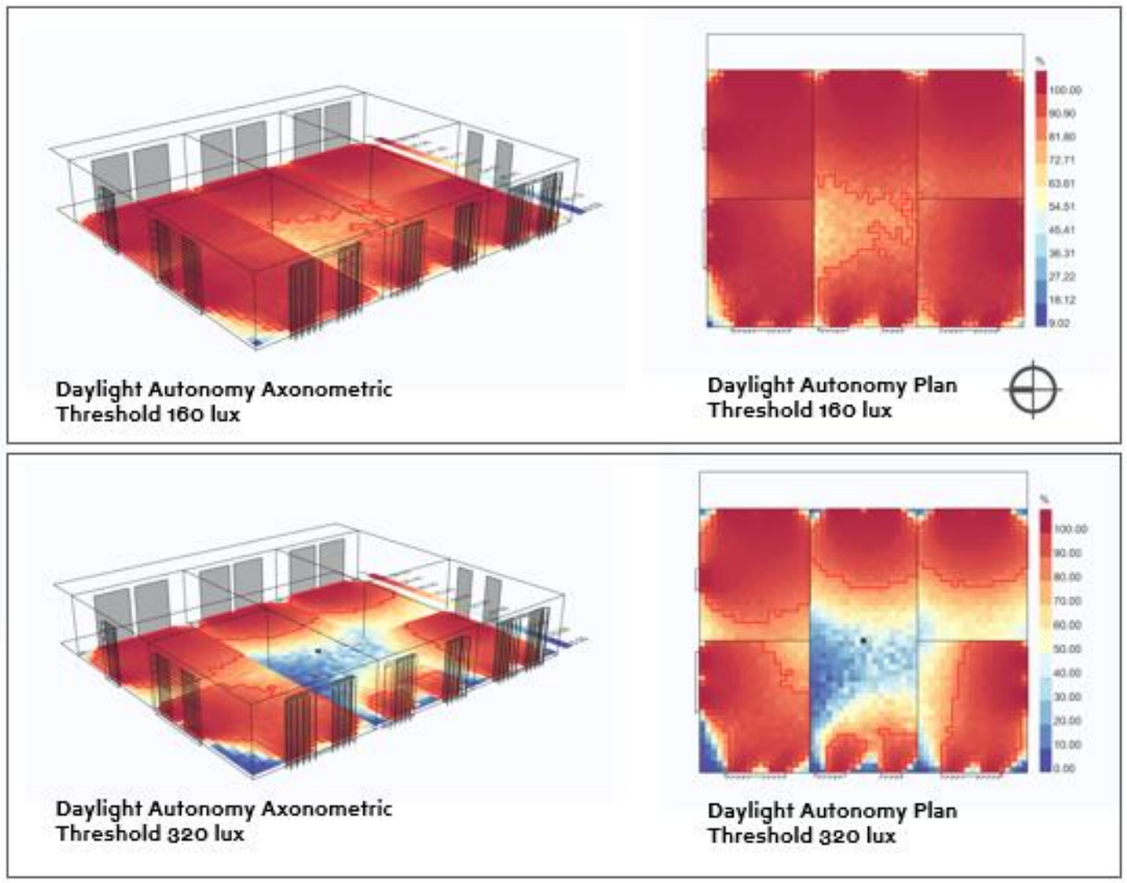
Shading
North: 250 mm frame
East: 2m horizontal overhang (Approx.)
West: 250mm frame + operable vertical fins
Assumed Glazing VLT 0.58



Daylight Autonomy

The targeted benchmarks require 40-60% of the combined floor area of primary spaces to achieve at least 160 lux levels during 80% of the time they are occupied. The daylighting metric used to evaluate daylight availability across the different spaces is Spatial Daylight Autonomy (sDA).

Schedule: Weekdays 9am to 5pm
Threshold: 40/60% of the space should receive at least 160 lux during 80% of the time.
Results: 89% of the space meets the 160 lux threshold over 80% of the time



Daylight modelling preliminary results.

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6.5 Energy

Goals:
- 10% Reduction in Energy Consumption compared to a baseline of NCC
- 10% Reduction in Green House Gas Emissions compared to a Reference Building (GS 4 Stars)
- 20% Reduction in Peak Electricity Demand (GS 4 Stars)
- Renewable Energy on site

Key strategies included:
- Minimise solar gains during summer
- Provide shading & appropriate glazing to minimise solar gain
- Improve building fabric performance & air tightness
- Enable natural ventilation where possible
- On-Site Renewables – PV
- Efficient supply and distribution of energy
- Supplying remaining demand through renewable sources (Off site renewables – Green Power Purchase)
- Building Scale Active Systems design should include:
  - Use Heat/coolth recovery systems (where applicable)
  - Use of energy efficient & smart appliances to minimise annual and peak energy demand
  - Efficient cooling systems
  - Efficient lighting systems
  - Efficient ventilation systems

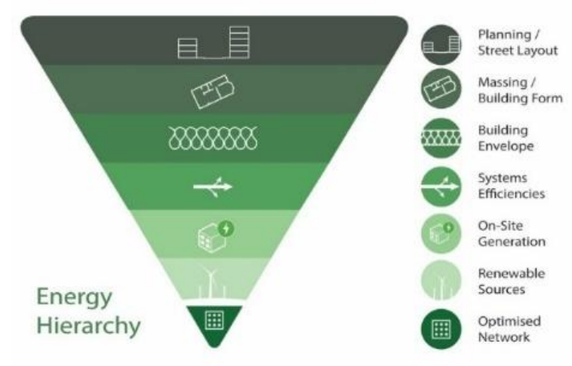
The table below shows the Green Star strategies proposed for Energy related credits:

Energy – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
15E.1 & 15E.2	Greenhouse Gas Emissions – Reference building pathway (2/14)	The operational GHG emissions from the Proposed Building are less than those of the equivalent Benchmark Building, Benchmark building represents a 10% improvement on a Reference Building which represents minimal compliance with NCC Section J using a defined HVAC system type.	3	Will be achieved through the optimization of the building fabric, appropriate shading, passive strategies, on-site PV and efficient building services.	Mechanical / ESD
16B	Peak Electricity Demand Reduction – Performance Pathway (1/2)	The project's predicted peak electricity demand has been reduced below that of a Reference Building by 20%	3	As above	Electrical

6.5.1 Energy Strategy Design Principles

ESD advice regarding the Net Zero pathway for the project has been provided in relation to the recommended Energy Hierarchy approach to ensure passive measures are considered first to reduce demand, followed efficiency of supply measures and renewable energy production as shown in the diagram below:



The following design aspects have been considered to improve the energy performance of the development:

Massing, Orientation and Building Form:

- Promote natural ventilation through:
  - Dual aspect facades
  - Taller, narrow plan buildings
  - Promotion of stack effect
  - Orientation of buildings towards prevailing summer winds
- Optimize solar exposure:
  - Reduce solar gains during summer, both internally and externally
  - Promote shading of internal and external spaces
  - Allow some winter sun to enter buildings to provide passive heating
- Intelligent organisation of rooms within buildings:
  - Cluster rooms with similar operating hours and set point temperatures
  - Consider acoustic constraints, proximity to plant and servicing strategies
  - Consider room requirements for daylight, aesthetics, views and other external factors
  - Promote use of stairs within buildings through good organisation of spaces

Landscaping:

- Provide extensive tree planting to add additional shading, reduce heat island effect and promote biodiversity
- Planting of grass, shrubs and other areas can help reduce heat island effects, reduce summer wind temperatures and promote biodiversity
- Water bodies or features – Strategic location of water bodies can encourage evaporative cooling externally or within building areas
- Green roofs – Help reduce overall building heating and cooling loads by providing better thermal insulation. They also help reduce external temperatures and relative humidity and encourage biodiversity.

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Building Envelope Design:

- **Thermal insulation** – Important for maintaining internal temperatures and reducing unwanted heat transfer between outdoor and indoor conditions (heating and/or cooling)
- **Thermal mass and night time purging** – Thermal mass can help reduce variations in internal temperatures, by absorbing heat during hotter daytime conditions, and releasing heat once the temperature cools
- **Performance glazing** – Glazing should be selected to optimise performance, admitting as much daylight as possible, while controlling the transmission of solar heat and thermal conduction
- **Glazing ratio** – Glazing ratios need to achieve an equilibrium between allowing daylight to enter buildings while reducing solar and conductive heat gains
- **Glazing position** – Windows should be positioned to block unwanted solar radiation, while allowing visible light and possibility for natural ventilation
- **External Shading** – Helps restrict unwanted heat gains within spaces, while allowing daylight access. Deciduous trees can also help shade direct solar ingress
- **Building air tightness** – Doors should be designed to close automatically to reduce unwanted heat transfer during peak summer and winter conditions. Consider revolving doors where applicable to maintain air tightness
- **Thermal Mass** – Exposed thermal mass can reduce the rate of change of temperatures within buildings and reduce the peak heating and cooling demands
- **Natural Ventilation** – Encourage openable windows to promote natural ventilation through buildings

Building Systems Design:

- Free Cooling
  - Run mechanical cooling plant in economy cycle when conditions are appropriate
  - Use evaporative cooling options when humidity levels permit
  - Use of labyrinths, earth ducts, night purge and other strategies
- Pre-temper outside air – Use of geothermal or heat recovery systems to lower outside air temperatures
- Relax internal set points – Allowing a greater range of thermal conditions can reduce heating and cooling plant loads
- Seasonal temperature and humidity set points – Vary set-points throughout the year based on operational use and user demographics
- Reduce Hot Water usage – Provide cold water only wash basins
- High Efficiency plant – Provide high efficiency heating, cooling, hot water and ventilation systems
- Efficient lighting and lighting controls – Use of LEDs, occupancy and daylight sensors, plus intelligent organisation of spaces to reduce light requirements for different uses
- Metering and Monitoring – Metering and monitoring of energy, water and air quality to promote healthy environment and save energy and resources
- Building Management Systems – BMS system to link to sensors and meters, with the ability to control lighting, hydraulic and mechanical systems and reduce energy usage
- System Commissioning – Comprehensive commissioning to ensure the building functions as designed.

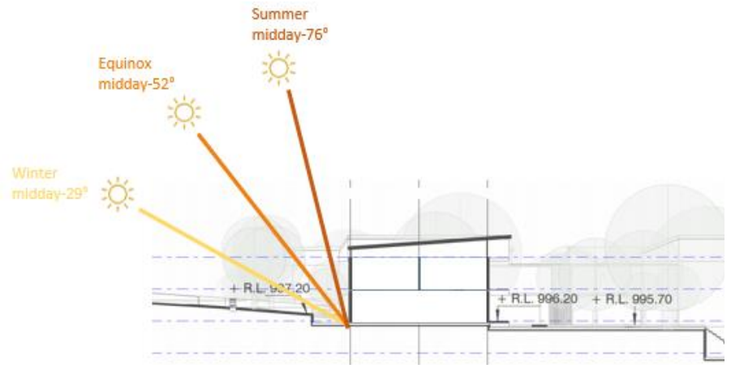
6.5.2 Solar Optimisation

Based on the analysis above, the following recommendations are made to help reduce the discomfort during the peak summer months.

Passive Measures:
The key passive strategies (requiring no operational energy) are as follows:

- Maximise the extent of Shading during the summer;
- Increase controlled Air Movement during summer;
- Allow for sun penetration during winter
- Heat Island optimisation.

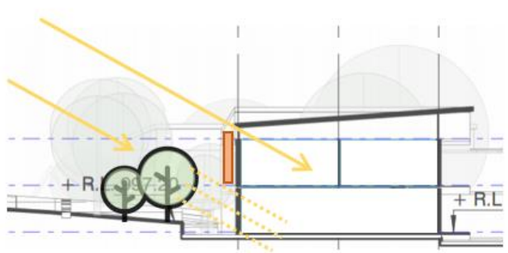
For shading, solar access into any of the buildings should be blocked during summer. The sun angles for the different seasons of the year are shown below. For midday sun on **Northern** facing facades, horizontal shading should block sun angles greater than 52°.
Considering that most of the classroom spaces are facing East and West, special consideration must be given to the design of those facades

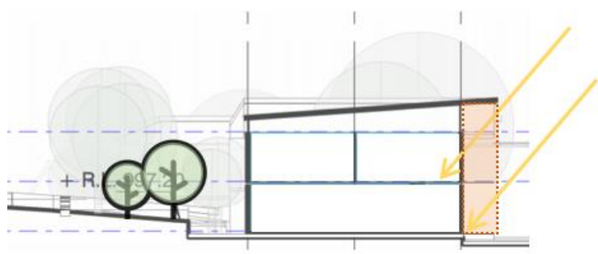


West
Low-angle western sun will cause unwanted heat gains during summer and glare in the afternoons. As a result, the following recommendations are suggested:

- Limit WWR to the minimum necessary to achieve good levels of daylight and views
- Incorporate vertical shading elements
- Use site topography and landscape as part of the shading solution

East
The circulation spaces for most of the buildings are located on the Eastern façade,
Circulation spaces will act as buffers for unwanted solar radiation during summer and if enclosed, they will provide a thermal buffer for the occupied spaces, keeping them warmer during the winter months.
For the school library and gym, the glazing on the Eastern facades should be kept to a minimum.





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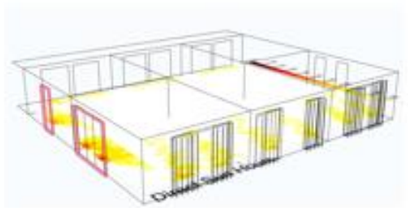
6.5.3 Preliminary sun study assessment of a typical space

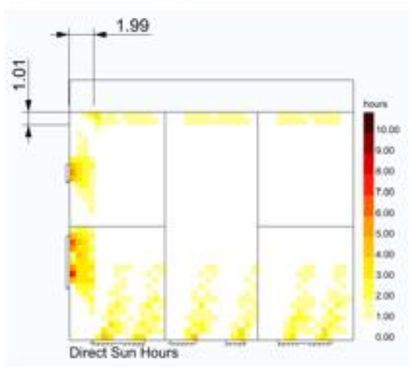
EFSG DG07 – Sun Control has the following requirements:

- Exclude direct sunlight from all learning spaces, libraries, administrative offices, and staff studies for the period of 9.00am to 3.30pm including Eastern Daylight-Saving Time between 21st September to 21st March (equinoxes).
- Exclude direct sunlight from desk level in all learning spaces between 9am and 3:30pm.

Sun exclusion and glare control can be achieved by the use of elements such as sunshades, eave extensions, tinted glazing, screens, vertical blades and the like. Glare must only be controlled by blinds as a last resort. Direct sun access can also be managed through the internal furniture layout, checking that the working planes are placed some distance away from the windows to avoid glare.
The simulations below show direct solar access to the space at desk level (750mm) within the specified timeframe 21/09 (9am-3:30pm) with different shading options.

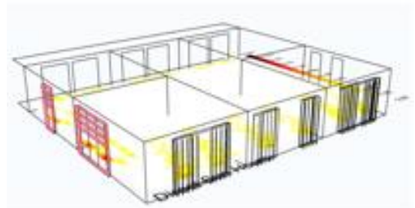
Currently proposed Shading
North: 250 mm frame
East: 2m horizontal overhang (Approx.)
West: 250mm frame + operable vertical fins

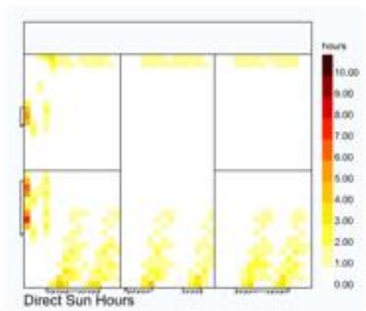




North: allows for direct sun to access about 2m into the space.
West: If shading is operable, direct sun access from that side could be blocked assuming shading will move to suit the conditions.
East: Only one hour exposure (9am-10am)

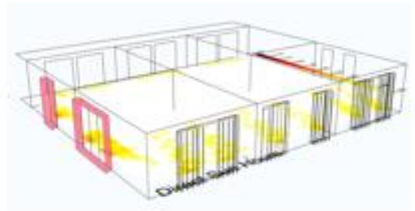
Modified Shading A
North: 250mm frame with 3 additional 250mm horizontal fins distributed from the top down every 500mm.
East: 2m horizontal overhang (Approx.)
West: 250mm frame + operable vertical fins

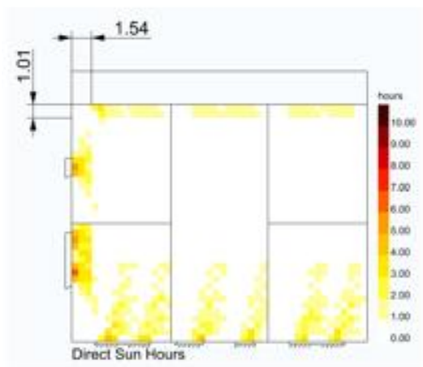




North: Better distribution of direct sun access
West: Operable fins
East: Only one hour exposure (9am-10am)

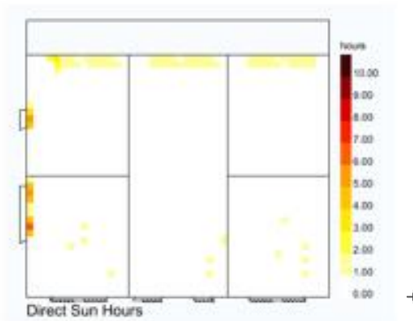
Modified Shading B
North: 500 mm frame
East: 2m horizontal overhang (Approx.)
West: 250mm frame + operable vertical fins





North: Less direct sun access
West: Operable fins
East: Only one hour exposure (9am-10am)

Modified Shading C
North: 250mm frame with 3 additional 250mm horizontal fins distributed from the top down every 500mm
West: 250mm frame + operable fins orientation adjusted



North: Less direct sun access and better distribution.
West: Mostly blocked by operable fins
East: Only one hour exposure (9am-10am)
We note that given the heating-driven type of climate, direct solar access will be beneficial for passive heating and likely desirable during winter. As such, consideration should be given to the balance of avoiding unwanted glare at desk level while allowing for some solar access during winter.

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6.5.4 Natural ventilation

A mixed mode ventilation approach is proposed for the school. When outdoor conditions are favourable, natural ventilation should prevail. Given the climatic conditions in Jindabyne, it is likely that natural ventilation could be used during most of summer and mid-seasons, as shaded spaces with some air movement is likely to be comfortable. During winter, since the outdoor temperature drops significantly, an active heating system will be needed.

Ventilation area
According to the openable window areas shown in the elevation diagrams provided, the total ventilation areas for the main spaces were calculated. Doors have not been taken into consideration as part of the ventilation strategy as it is expected they will remain closed when the students are in the room, **Confirmation is required regarding how were the openable areas provided calculated to validate this review.**

The EFSG (DG 55) provides some guidance in relation to the calculation methods for natural ventilation including:

- The calculation methods for natural ventilation must be based on the effective openable area. 'Effective area' is defined as the product of the discharge coefficient and free (measurable) area.
- The structural opening shall not be used for the openable areas calculations. Window or louvre manufacturers should confirm the effective area of the ventilation opening.
- Obstructions to the flow of air (eg deep external sills and recesses), blinds, flyscreens and bush fire mesh must be taken into account, as these will have the effect of reducing the airflow through the opening.

Considering how the spaces are going to be used, it is expected that single-sided ventilation or cross ventilation for spaces with windows in two walls, will be the predominant method for natural ventilation.
The DfMA modules (9m x 7,5m x 3m) have slightly larger dimensions than the optimum recommended for cross ventilation (Room depth ‹ 5*Room height) yet at the times when the internal partition is open, then cross ventilation through the space will be possible.

Figure 2.18 Single sided ventilation, single opening

Figure 2.19 Single sided ventilation, double opening

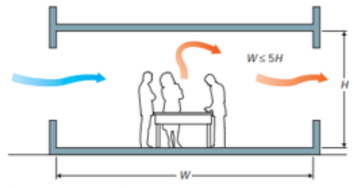
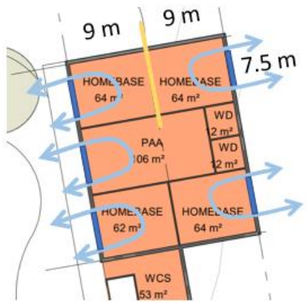
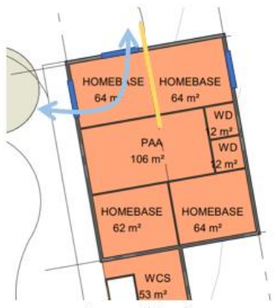


Figure 2.20 Cross ventilation

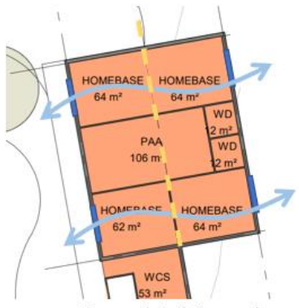
Source: CIBSE AM10: *Natural ventilation in non-domestic buildings* (2005b)



Single sided ventilation



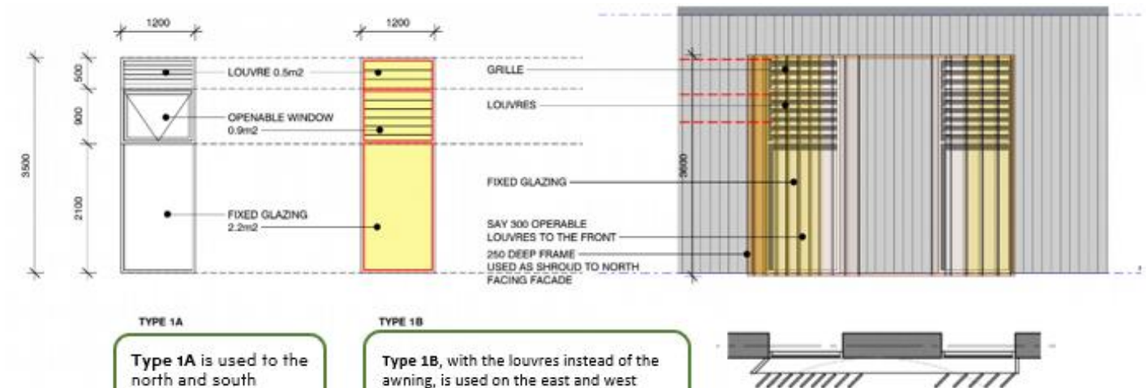
Cross-ventilation for corner rooms



Cross-ventilation for integrated spaces

6.5.5 Window typology, daylight & shading early stage review

A high-level initial assessment was undertaken to review the performance of the proposed windows and shading devices in relation to daylight availability, shading effectiveness and ventilation. Note that glazing performance, thermal performance and energy considerations will also have an impact on the proposed windows and will be reviewed at a later stage.
The review was done on a typical classroom module. The diagrams below represent the proposed windows for the project.

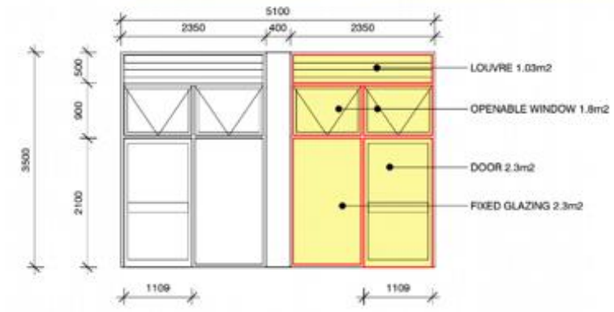


TYPE 1A

TYPE 1B

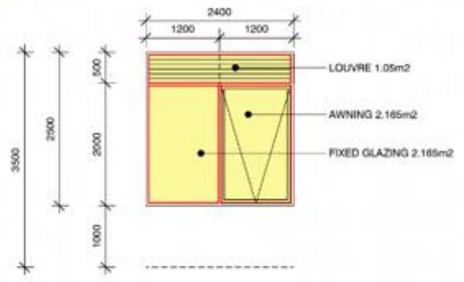
Type 1A is used to the north and south facades

Type 1B, with the louvres instead of the awning, is used on the east and west facades when behind the screens.



TYPE 2

Type 2 is the window/door type to be used on the access ways.



TYPE 3

Type 3 is the window type mainly used for the administration/staff building (including behind the screens). The awning would be on a restrictor.

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6.5.6 Ventilation Area

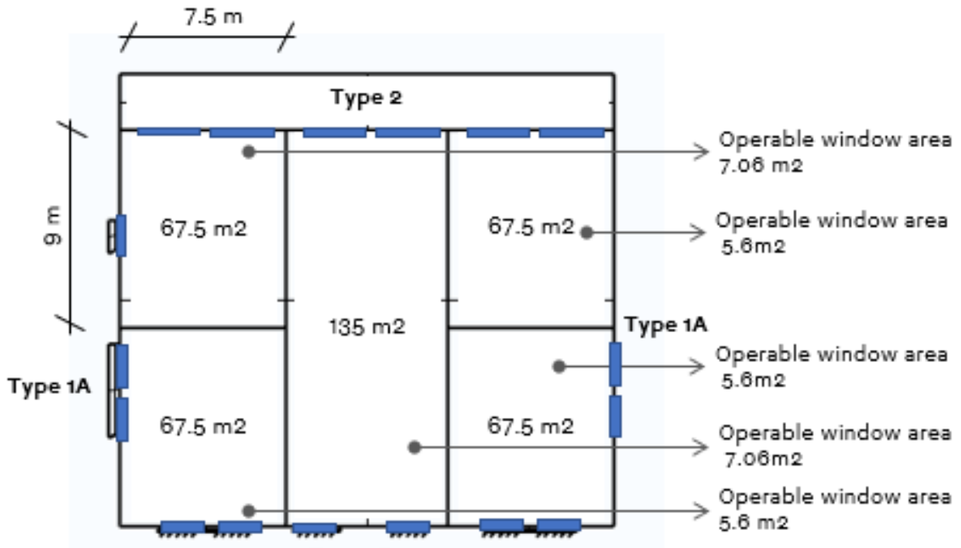
Ventilation areas for schools should be 6.25% of the floor area as a minimum. (NCC + AS1668)
If the assumed operable areas are correct, then most of the spaces achieve above 6.25% of their floor area as openable areas for ventilation except for the central space which is just under the recommended % (Has 7.06m2 and should have 8.43m2). However, **confirmation of free window areas by a window manufacturer or similar is required validate this review.** Being conservative, 65% of the total area of the louvred windows proposed could be counted as the effective area. However, it could go up to 80% if more precise calculations are undertaken.

6.5.7 Window type

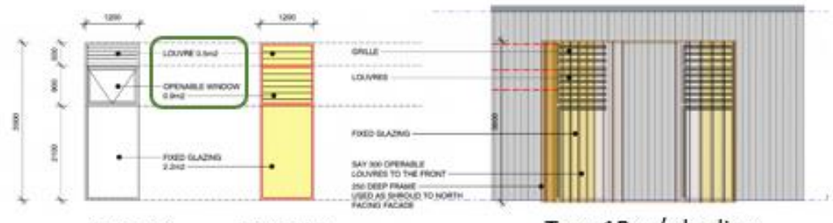
Louvres are the preferred system given their multiple benefits regarding effective ventilation area, weather protection and aperture flexibility. The key disadvantage for the louvres is their thermal performance, but it has been advised that high performing double glazed louvres options are currently under investigation (Breezway)

6.5.8 Window distribution & configuration

Ideally, ventilation works best with a combination of low- and high-level openings (Similar to proposed window Type 3) as this takes advantage of air movement due to wind and air movement due to the natural stratification of cool and warm air. Cool air enters the space and as it gets warmer it rises and is exhausted out of the room through the high-level openings. Wind-driven air movement is likely to be frequent given the weather conditions on the site and that will benefit the ventilation conditions.
In a single-sided ventilation scenario, with the air intakes located above 1.2m, it is likely that the air will flow above occupant height and might have to rely more on ceiling fans to move the cool air downwards. In spaces with openings in two walls, ventilation will be better.
During the times when the classes are integrated (middle partition open) then cross ventilation would work at its best with the current proposed windows.
Window location is well resolved as windows are evenly distributed and located across each other in opposing ends of the space.



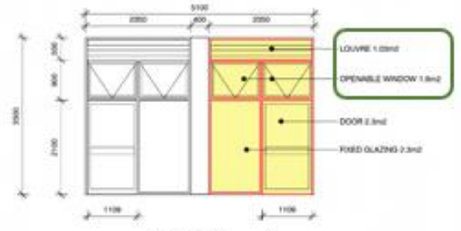
Typical home base space plan



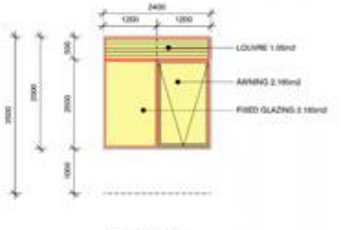
Type 1A (North/South)

Type 1B (West)

Type 1B w/ shading



Type 2 (East)



Type 3

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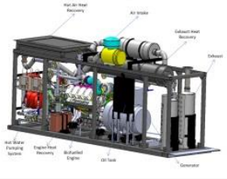
6.6 Renewable Energy Opportunities

An overview of renewable energy options that could be applicable for the site is discussed below.

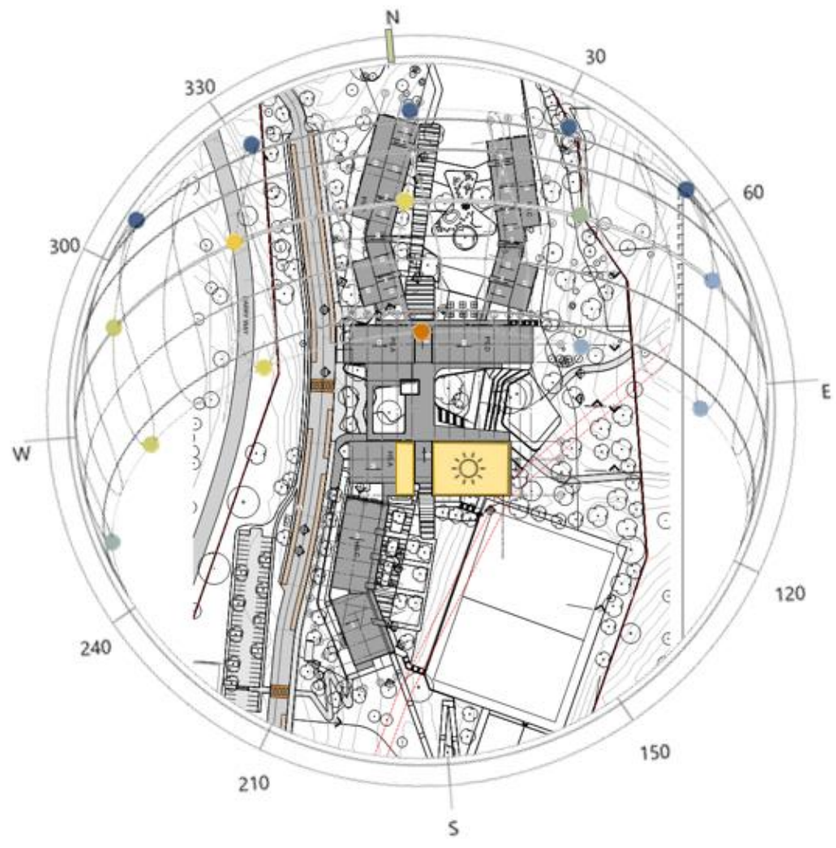
Technology	Description	Strengths / Weaknesses	Applicable for project
Solar PV 	Converts solar energy into electricity	• Mature technology, relatively cheap • Easy to install on roofs or site areas; • Inefficient (12%-15% of solar energy to electricity), meaning large areas required for the energy produced; • Need exposed roof area, unshaded, ideally angled around 30° facing north.	Yes, applied
Solar Thermal 	Converts solar energy into heat	• Mature technology, relatively cheap; • Easy to install on roofs or site areas; • Fairly efficient (50%-75%) • Can meet the requirements of buildings with relatively small roof area requirements; • Panels only produce heat, so have limited use.	Yes, should be considered
Wind Power 	Converts wind energy into electricity or mechanical movement	• Large scale wind turbines are a cost effective and efficient form of renewable energy; • Several environmental and nuisance issues (such as noise, light flicker, bird strike, etc) often limit the applicability of wind turbines near urban developments	Not considered but could be for the future given the low density of the site and wind availability.
Ground Source Heat Pumps (GSHP) 	GSHP utilise thermal energy from the ground to provide heating and/or cooling via a heat pump	• Energy savings can be achieved with minimal space requirements within buildings and very low input energy requirements; • Climate conditions in Jindabyne mean that GSHPs can be effective throughout the year; • Significant land area is required for installation of the ground loop heat exchanger. • Cost of ground works can be high due to the large areas and/or depths required.	Unlikely, due to high capital cost and ground excavation conditions
Biodiesel / Biogas CHP 	Biodiesel from a range of sources can be used in a combustion engine to produce power, heat and / or cooling.	• Low carbon emission fuel source; • Fuel can be produced from waste sources or from crops; • Some fuel stocks can be expensive, and potential for non-renewable oils to be used to produce biodiesel; • Emissions / pollutants released through combustion; • Low site head demand.	Possible, could be considered further if a reasonable fuel source is available.

Solar PV

Photovoltaic panels convert solar energy into electricity which can be used directly by surrounding buildings. PV panels would be suitable for implementation within the development.

For the site, the possible areas for incorporating PV panels include:
- Roof integrated panels.
- Shading structures.
- Building integrated PV panels (integrated into façade or rooflight systems).

The proposed area for the PV system is shown below:



It is understood that the current government incentives for solar reduce increase the payback time for PV arrays larger than 100kW (as they switch from the small-scale renewable incentive to the large scale power plant scheme). The system proposed at this stage is a 70kW system, which is currently under development.
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6.7 Water

Goals:
- Potable Water Use Reduction
- Aim for Zero potable water where alternative sources could be used (e.g. Irrigation / Toilet flushing)
- Capture, treat and reuse as much water as possible

Key strategies included:
- On-site water storage – Rainwater Harvesting
- Stormwater management - Water Sensitive Urban Design
- Efficient Systems and appliances
- Use native and adaptive planting to reduce irrigation demand.
- Separate sewer and stormwater infrastructure to help increase ease of water recycling and reduce treatment requirements.
- Water metering and monitoring strategy - Integrated smart water metering and monitoring to optimise water efficiency.
- Link to BMS system to check usage and identify leaks and inefficiencies immediately.

The table below shows the sustainability framework strategies proposed for Water and Schematic Stage comments:

Water Demand – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
18B.1	Sanitary Fixture Efficiency (1/1)	All fixtures are within one star of the WELS rating below: Table 18B.1 Nominated fixture WELS Rating Taps: 6 Star Urinals: 6 Star Toilet: 5 Star Showers: 3 Star (> 4.5 but <= 6.0)** Clothes Washing Machines: 5 Star Dishwashers: 6 Star	4	Likely to be achieved. Fixtures will be specified at a future design stage. This has been discussed with the project team	Architect
18B.2	Rainwater Reuse (1/1)	Rainwater Tanks are installed based on the collection area, rainfall and demands for rainwater use on the project	3	Rainwater Tanks proposed, one per building block. Rainwater will be used for toilet flushing and landscape irrigation.	Hydraulics / Landscape
18B.3	Heat Rejection (2/2)	No water is used for heat rejection from the HVAC System.	3	Likely to be achieved. Water based heat rejection will not be used as confirmed by mech team.	Hydraulics / Infrastructure
18B.4	Landscape Irrigation (1/1)	Either drip irrigation with moisture sensor override is installed or where no potable water is used for irrigation.	3	Discussed with landscape team, subsoil irrigation with moisture sensor as preferred irrigation method and use of harvested rainwater. Likely to be achieved	Hydraulics / Landscaping

6.7.1 Water Efficiency & Stormwater Management

An integrated water management approach is recommended for the site, balancing water demand with waste-water and stormwater supply throughout the year, Options and design measures will be incorporated to manage rainwater falling on the site and Sustainable Urban Drainage Strategies (SUDS) will be recommended where appropriate.
A hierarchical approach is used for the water strategy development for the site, to ensure demand reduction is considered first, followed by efficient supply, identification of different water streams for different uses, and the recycling/treatment of water.

Water Hierarchy

Demand Reduction:
- Low flow fixtures and fittings to be selected throughout all buildings;
- Through coordination with landscape architects and water engineers, the planting selection will ensure irrigation demand is less than rainfall quantities;
- Irrigation management – let it brown during drought periods in order to reduce water consumption;
- Behaviour change strategies/education to promote sustainable water consumption.

Efficient Supply and Distribution:
- Use of drip irrigation and demand controlled irrigation to optimise irrigation supply;
- Sensors within water networks to identify possible leaks and act quickly to reduce losses;
- Connection of buildings to enable the collection of rainwater for use in adjacent buildings.

Water Streams:
- Dedicated Greywater network to provide non-potable water supply, for toilets, irrigation, etc;
- Rainwater collection for use in greywater network.

Water Quality:
- High-quality water should be used wherever human contact or consumption is likely.

The engineer in his own way is an artist too - and not just a dead fish with a slide rule.
Jørgen Varming

Mechanical Engineering
Lighting Design
Sustainable Design
Electrical Engineering

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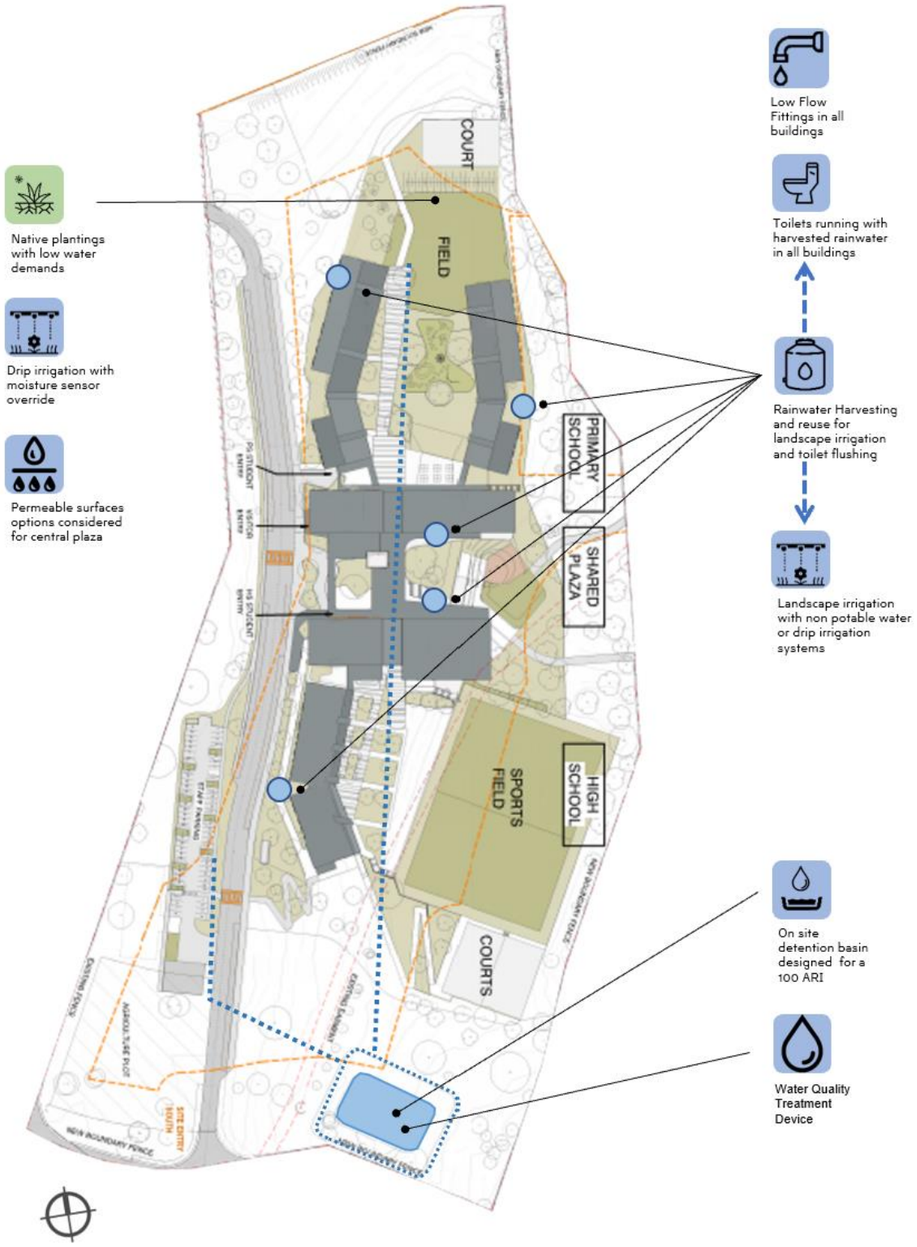
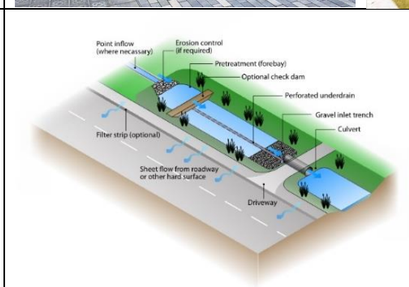
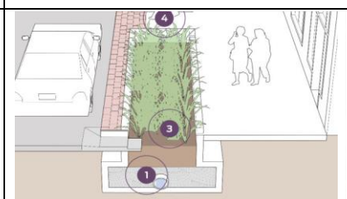
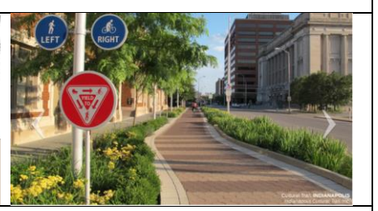
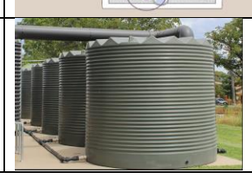
The diagram below illustrates the water management strategies proposed for the project:



For stormwater and rainwater management, a sustainable approach will be adopted with the aim to capture, passively treat and store as much water as possible, including measures to treat water prior to it leaving the site. Some of the strategies under consideration include:

Technology	Reference Image / Diagram
On-site Detention (OSD) Basin Detention basins are used to manage stormwater, they provide general flood protection and can also control extreme flood events. They allow large flows of water to enter but limit the outflow to control runoff. For JEC, water will flow through a water quality device and discharged to on-site detention tank before discharging water to Lees creek.	
Source Control – Permeable Paving Permeable paving will reduce the impact of storm events through reduction of impervious surfaces, allowing stormwater to pass through the paving surface and soak into the ground below. This system will not provide capture for future re-use, but will reduce surface water flooding.	 
Source Control – Swale A swale is a channel integrated into the landscape or at the side of a road, that provides stormwater storage when needed. At other times, the channel is dry and planted and / or lined with gravel. Swales can passively remove pollutants such as oil through the inclusion of gravel, reeds, and other pollutant removing materials. The purpose of the swales is primarily to reduce stormwater flows and treat run-off, rather than to capture and re-use.	 
Biofiltration Planter Similar approach to a bio-swale, using passive treatment and storage, but can be used where space is more constrained. Could be considered alongside the roadways and pedestrian pathways at the perimeters of the project site.	 
Rainwater Tank While a storage tank should be sized for the site water demand and not for peak storm events, through good management, storage tanks could support a stormwater strategy.	

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6.8 Materials & Waste

Goals:
- Reduce the use of materials
- Reduce the amount of waste going to landfill
- Use of materials with low embodied carbon and low environmental impact

Key strategies included:

Construction Waste Management:
- Optimise cut and fill activities onsite to avoid waste production
- Use prefabricated or modular materials to reduce wasted materials
- Targets for all contractors for construction and demolition works:
    - 90% of Construction Waste diverted from landfill

Operational Waste Management:
- Centralised waste management to improve efficiencies of waste storage and recycling rates
- Use of organic waste for composting and possible anaerobic digestion for biogas generation:
    - Consider partnering with adjacent Sports Centre for additional BioGas production for use onsite.

The table below shows the sustainability framework strategies proposed for Materials & Waste and Schematic Stage comments:

No.	Strategy	Implementation	Input Stage	Project Status – Schematic Stage – July 2021	Responsible Discipline
19B.1	Lifecycle impacts – Concrete (1/3)	Portland Cement content in all concrete used in the project has been reduced by replacing it with supplementary cementitious materials. -30% reduction of Portland Cement compared to a reference case. (1 point) -40% reduction (2 points) -Mix water for all concrete contains at least 50% captured or reclaimed water (0.5 points) **Aggregates Reduction** (0.5 points) -40% of coarse aggregate in the concrete is crushed slag aggregate or another alternative material -Or, 25% of fine aggregate (sand) inputs in the concrete are manufactured sand or other alternative material. *Cost of concrete must me more than 1% of the Project Contract Value for this credit.	3	Likely to be achieved. Discussed with design team. To be discussed by DFMA supplier when engaged.	Structural
20.1	Responsible Building Materials – Structural and Reinforcing Steel (1/1)	95% of the building steel (by mass) is sourced from a Responsible Steel Maker and, -For steel frame buildings 60% of the fabricated structural steelwork is supplied by a steel fabricator/contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute. -For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually) *Cost of steel must me more than 1% of the Project Contract Value for this credit.	3	Likely to be achieved. Discussed with design team. To be discussed by DFMA supplier when engaged.	Structural
20.2	Timber Products (1/1)	95% (by cost) of all timber used in the building and construction works is either: -Certified by a forest certification scheme that meets the GBCA's 'Essential' Criteria for forest certification -Is from a reused source *Cost of timber must me more than 0.1% of the Project Contract Value.	3	Materials selection to be confirmed, but agreement that material specifications will align with GS requirements.	Structural
22B	Construction and demolition waste – Percentage benchmark (1/1)	Construction waste going to landfill is reduced by a determined percentage. 90% Target	4	To be defined at a later project phase. Credit requirements to be included in contractor tender documents,	Architect / Contractor
8B	Operational Waste – Prescriptive Pathway Waste Facilities (1/1)	-Separation of Waste Steams (General Waste / Recycling Streams / 1 other Waste Stream) -Dedicated Waste Storage Area -Access to Waste Storage Area These facilities meet best-practice storage and access requirements for collection by the relevant waste contractor	3	Waste management strategy to be developed with Waste Consultant when engaged. Waste management facilities space has been already included in the Concept Plans.	Architect / Waste Consultant

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6.9 Resilience

Goals:
- Building responds to long-term adaptation strategies to accommodate a changing climate
- Enable future improvement of infrastructure to allow adoption of emerging technologies

Key strategies included:
- Climate Adaptation Plan to address risks
- Resilience to future climate and hazards
- Reduction of Heat Island Effect through green infrastructure
- Flexibility of building to adapt to future uses
- Maximising the building lifespan

The table below shows the strategies proposed for Resilience and Schematic Stage comments:

Resilience – Proposed Strategies and Comments

No.	Strategy	Implementation Options	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
3.1	Implementation of a Climate Adaptation Plan (1/2)	Project Specific CAP considering the following: -Summary of project characteristics -Different climate change scenarios and including potential risks for the project and the people -List of actions and responsibilities for high and extreme risks identified. -Stakeholder consultation undertaken during plan preparations and how the issues raised have been incorporated.	3	Initial climate risks considerations and actions for the project have been presented in this report. Climate adaptation workshop held with Project Team. Climate Adaptation Plan to be prepared.	Climate Risk Consultant / ESD
25	Heat Island Effect Reduction (1/1)	75% of the total project site area comprises building or landscaping elements that reduce the impact of the heat island effect	3	Large landscaped areas on site and roof PV will contribute towards this credit. Material selection (SRI) for roof and hardscape elements will be defined at a later stage.	Architect

6.10 Sustainability Management & Optimization

Goals:
- The building is designed to maximise occupant comfort, healing and productivity whilst minimising operational costs and resource consumption
- The building provides capacity to reduce operational costs

Key strategies included:
- Advanced metering and monitoring strategy
- Integrated smart technology to optimise all strategies, including energy, water, waste.
- Free wifi to pupils, staff and visitors
- High speed connectivity

The table below shows the strategies proposed for Sustainability Management and Schematic Stage comments:

Sustainability Management – Proposed Strategies and Comments

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
1.0	Accredited Professional	A Green Star Accredited Professional-D&AB (GSAP) has been contractually engaged to provide advice, support and information related to GS principles, structure, timing and processes, at all stages of the project, leading to certification.	3	Steensen Varming currently providing AP role. Future stages to be confirmed.	ESD
2.0	Environmental Performance Targets	Documented targets for the environmental performance of the project must be set through a Design Intent Report or an Owner's project requirements (OPR) prepared during the design phase stage and outline: -Description of the basic functions, operations, and maintenance of the nominated building systems. -Targets for energy and water consumption and budgets for nominated building systems -Description of how energy, water and IEQ are metered and monitored	3	Under development. Energy targets will be based on results of JV3 modelling. IEQ, water and waste targets mostly set	SINSW / ESD
2.1	Services and Maintainability Review	Comprehensive services and maintainability review which must address the following aspects for all nominated building systems: -Commissionability / Controllability / Maintainability / Operability, including 'Fitness for Purpose / Safety	4	To be developed at a later project stage.	Head Contractor
2.2	Building Commissioning	Demonstrate that pre-comissioning and commissioning activities have been performed based on approved stardards and guidelines. The following must be documented: -Commissioning Specification -Commissioning Plan -Air Permeability Testing	4	To be developed at a later project stage.	Contractor
2.3	Building Systems Tuning	Following practical completion and prior to occupation the owner has	4	To be developed at a later project stage.	ICA

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		formally committed to a tuning process for all nominated building systems			
2.4	Independent Commissioning Agent	Independent Commissioning Agent (ICA) has been appointed	3	GBCA Approved 14422-SINSW Commissioning team will need to develop the commissioning plan, and inherit the responsibilities as per the Credit requirements, including preparing the commissioning reports and providing the extracts for the As-built submission. SINSW to appoint an ICA representative to discuss roles and responsibilities.	ICA
4.1	Building Information	Comprehensive O&M information is developed and made available to the facilities management team Relevant and current building user information is developed and made available to all relevant stakeholders	4	To be developed at a later project stage.	Architect / Services
5.1	Environmental Building Performance	80% of the project's GFA (excluding car parking areas) is covered by a commitment to set, measure and report on its environmental performance on at least 2 of GHG Emissions / Potable water usage / Operational Waste / IEQ	3	Commitment from SINSW. Likely to be achieved.	SINSW
6.0	Metering	Accessible metering is provided to monitor building energy and water consumption including common uses, major uses and sources,	3	Metering to be applied to key areas only. Metering used to monitor and educate if data can be displayed at the school. Metering strategy under development	Mechanical
7.0	Environmental Management Plan	A project specific best practice EMP is developed and implemented to cover the environmental impacts arising from construction works. It must be site-specific.	4	To be developed at a later project stage with contractor	Contractor
7.1	Formalised Environmental Management System	A formalised systematic and methodical approach to planning, implementing, and auditing is in place during construction to ensure compliance with the EMP	4	To be developed at a later project stage with contractor	Contractor
30D	Digital Infrastructure	Green Star Communities Credit 22 - High speed broadband available Wireless Local Area Network for staff and students	3	Comms strategy currently under review	Architect / Comms

6.11 Innovation Points

Consider additional GBCA approved requests which could be claimed as innovation points:

No.	Strategy	Implementation	Input Stage	Project Status - Schematic Stage – July 2021	Responsible Discipline
30A	Innovative Technology or Process Principal's Dashboard	Approved CIR R14537- SINSW to provide Principal's Dashboard requirements/functional brief to ensure Design Team is allowing for sufficient infrastructure/IT/BMS capability. PD can provide information on how the building assets are performing.	4	TBC	
30B	Market Transformation DMFA	Sustainability in the supply chain can be addressed by the DFMA process. The Following must be provided: A short narrative outlining the purpose of this analysis including the expected outcomes from industry. DFMA Guideline document outlining how sustainability principles can be embedded throughout prefabrication. Evidence outlining how the sustainability advice in the guideline was integrated into the construction (3 items) Supplementary evidence required to support this claim Copy or the approved CIR R-14427	4	Requires a report to be prepared. TBC.	SINSW / Mech

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7.0 Next Steps

This report provides our assessment for the recommended sustainability strategies for the development, in line with the project brief and updated drawings. The following steps are recommended to continue the development of the set of sustainability strategies and targets and embed these into the project:

- Further coordination with design teams for strategy development
- Highlight which teams needs to carry out analysis to support strategies
- Develop specifications and evidence registers for the different teams to start compiling Green Star documentation
- Start to coordinate and complete Green Star calculators and review documentation requirements

Appendix B: Green Star Pre-Assessment Scorecard

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8.0 Appendix A: EFSG ESD Schedule

PROJECT: **Jindabyne**

Consultant Input

Theme	Indicator	Sustainability initiatives / requirements from the EFSG This is an extract only from the relevant EFSG. For full requirements refer to https://efsg.det.nsw.edu.au/welcome	EFSG	Standard evidence to demonstrate compliance	Responsibility	Has this been implemented in the project? Y or N	Mandatory/Required	Initial Comments from consultants (July 2021)
Energy & carbon	EC1: Energy efficiency	**Improvement over NCC** All new facilities must be designed and built so that energy consumption is predicted to be at least 10% lower than if build to minimum compliance with National Construction Code requirements. **The energy consumption reduction must be achieved without including renewable energy generation in the calculation. TBD with SINSW**	DG02.03	1. Energy modelling report / Predictive energy modelling and thermal comfort assessment. Report needs to show at least 10% improvement of building over minimum NCC requirements; and 2. As-built evidence that model is an accurate representation of the building, e.g. drawings; and 3. Specifications / calculations supporting modelling inputs, e.g. window energy rating scheme certificates, calculated R-values of walls, roofs, etc. 4. As an alternative to 2 and 3 above, a Statement by energy modeller confirming that the model accurately represents the building.	ESD	Y	MANDATORY	10% improvement of building over minimum NCC requirements to be achieved. Energy modelling report to be undertaken after SD.
Energy & carbon	EC1: Energy efficiency	**Energy conservation** Design and construct all school buildings within the parameters specified in the: · NSW Public Works Energy Manual for Buildings · Building Code of Australia (BCA) Section J for Energy Efficiency The NSW Public Energy Manual for Buildings provides an energy saving strategy by identifying aspects of the building and services where reductions in operating and maintenance costs can be made through proper selection of: · Building fabric · Insulation materials · Shading and ventilation · Services and control It also requires the formulation of an energy impact statement.	DG65.02	1) Section J report 2) Energy impact statement	ALL	Y	MANDATORY	ESD input: A Section J report will be produced.
Energy & carbon	EC1: Energy efficiency	**Daylighting** · Designers must seek to maximise natural daylight in all learning and administration spaces to reduce energy usage through windows and skylights · Including daylight sensors in rooms to reduce light output or turn off light when sufficient daylight is provided within the space · When the space is large and perimeter lighting is adjacent to windows, perimeter lighting is on a separate zone to make maximum use of daylight	DG2.3.1 DG12	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces; and 2. As built drawings demonstrating that the model accurately represents the building (i.e. window size and location; skylights installed, etc.); and 3. Specifications supporting inputs used in modelling (e.g. skylights and glass specs)	ARCH / ESD	TBC	MANDATORY	Building design developed to achieve good levels of daylight. Daylight modelling to be undertaken to assess daylight conditions. Item covered by Green Star
Energy & carbon	EC1: Energy efficiency	**Shading devices** On exposed facades subject to direct sunlight, external window shading has been considered as part of the building design.	DG2.3.1	1. As built drawings	ARCH	Y	MANDATORY	External window shading has been included as part of the building design.
Energy & carbon	EC1: Energy efficiency	**Lighting energy conservation** Lighting system must have timed or sensor feedback functionality for energy conservation	DG2.3.2	1. As built mechanical drawings / statement from head contractor	LIGHTING	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Energy efficient lighting** · LED lighting must be installed · The design of the lighting systems and the selection of fittings is to be undertaken based on a Whole of Life approach · System must support sustainable design principles including reducing energy consumption · Use light sources lamps and control gear with a long life	DG2.3.1 SG63.01	1. As built electrical drawings	LIGHTING	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Maximum illumination power densities** Section J part 6 of the National Construction Code provides tables that define the maximum illumination power density that is acceptable in various locations. This, and all other elements of Section J part 6 should be applied appropriately.	DG63.05.01	1) Lighting drawings 2) Lighting specifications / schedules 3) Lighting modelling report showing compliant power densities	LIGHTING	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Lighting control** The required communication protocol for the luminaires is DALI. The following systems for the control of luminaires fitted with DALI control gear are considered acceptable: · Diginet Rapix suite of products. · Clipsal C-bus suite of products · Philips Dynalite suite of products · KNX based systems Systems must be designed to be as simple as possible. This simplicity must extend from the topography to ease of use. It is a specific requirement that programming of any control system must be relatively simple and not limited to costly specialist consultants. Allowances should be made in system design specifications for user group training of control systems and for the programming of the system as part of the commissioning and hand over process. All equipment and manuals necessary to operate and maintain the system must be provided to the school and Asset Management	DG63.06.01	1) Commissioning report 2) Confirmation from AMU that all relevant manuals have been handed over	LIGHTING	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Constant light output / Daylighting** -Constant Light Output (CLO) systems consisting of dimming luminaires and light level sensors are highly recommended as they are effective in maintaining the required illuminance values. CLO systems ensure that the lit environment remains compliant at the lowest possible Watts per square metre for the reasonable operating life of the luminaires. Maintained illuminance values required for design compliance will result in areas being over-lit for a large proportion of their operating life without a CLO system. · Sensors can be fitted to each luminaire or by utilising sensors that control groups of luminaires. · Once in operation a CLO system delivers compliant light levels over the life of a system by reducing the light through dimming and ramping the levels up over the lifespan of the luminaire. These systems should be seamless and invisible in operation to users of the locations. · Daylight Harvesting can be delivered as a component of a CLO system and requires no additional hardware above and beyond that required for a CLO to operate. · Daylight harvesting is recommended in areas where there is a rapid transition from natural day light to a dark environment, such as when entering a multi deck or underground car park from a street in full daylight, or in a classroom where daylight from windows is within the field of view.	DG63.06.02 DG63.06.03	1) Lighting drawings 2) Lighting modelling report showing compliant power densities	LIGHTING	TBC	MANDATORY	NDY: Generally ok, will need further consideration in DD phase in conjunction with daylight and daylight harvesting.
Energy & carbon	EC1: Energy efficiency	**Switching strategy** · Local switching should be provided where it is identified that the users can benefit from manual operation of the lighting and other lighting automation technology is considered cost prohibitive. The switching should be clearly marked and robust. · Achieve energy efficient switching in Schools by: The use of multiple switching groups Automatic control of these groups to operate as follows: Controlled luminaires are to automatically turn-off nominally 3 minutes after the bell sounds. Turn-off is to be in two steps other than in small rooms, one step after 3 minutes and the second group 2 minutes later (5 min). If the lighting is required for the next period, occupants of that room can prevent the lights turning off by pressing the ON switch/es after the bell sounds. The luminaires in each room can be turned off at any time by pressing the OFF switch/es. The off signal is to be capable of transmission at the end of normal school hours or at other selected times without the bells sounding, with the lighting turning off in two steps (other than in small rooms).	DG63.07 DG65.03.01	1) Electrical & lighting drawings showing switching groups and automatic controls	LIGHTING	Y	NEGOTIABLE	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Energy efficient HVAC system** HVAC system must have timed or sensor feedback functionality for energy conservation Systems shall be designed to minimise energy consumption. System design / equipment selection is to be based on whole of life cost analysis. Specifically air conditioning equipment should: · support sustainable design principles including reducing energy consumption; and · be easily accessible and serviceable – easy to maintain with minimal impact on school operations / activities when maintenance is being performed. All new school buildings are to be designed to meet or exceed the requirements of building regulations for conditioned spaces	DG2.3.2 DG55 DG16.09	1. As built mechanical drawings / statement from head contractor; 2. Whole of life cost analysis demonstrating systems were selected based on WOL performance.	MECH	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Energy efficient appliances & equipment** Electrical equipment must be at least 0.5 stars above the market average star rating or comply with high efficiency standards specified in the GREP	DG2.3.3	1. Schedule of appliances and equipment with their star ratings or performance standards, signed by head contractor or architect. All appliances and equipment required in the GREP must be listed, incl air conditioning equipment, electric motors, transformers, etc.	ARCH / SINSW	Y	MANDATORY	GREP requirements: • refrigerators – 2.5 stars • clothes dryers (up to 10 kg) – 3 stars • washing machines – 3.5 stars • dishwashers – 4 stars • pool pumps – 7.5 stars • fridge/freezers – 3.5 stars • freezers – 3 stars • air-to-air heat pumps and air-conditioners – 4 stars if less than 4 kW and 3 stars if greater than 4 kW (applies to both heating and cooling for reverse cycle air conditioners) • televisions – 5 stars (Tier 2 rating). Commercial and industrial-sized clothes dryers (above 10 kg capacity) should aim for high efficiency but will be excluded from this benchmark if there are insufficient models available above the market average. Equipment purchased in the following categories will have an ENERGY STAR® label recognising its high efficiency: • computers (i.e. desktops, notebooks and tablets, workstations, small-scale servers and thin clients) • printers • photocopiers • DVD players.
Energy & carbon	EC1: Energy efficiency	**Heat loss/gain** Building/HVAC design must consider: · Climate/ micro-climate: This data must come from the current AIRAH handbook and where a specific area is not referenced in the handbook, the Bureau of Meteorology statistics must be utilised. · Orientation: exposure to sun(solar) and wind · Natural Ventilation and cross ventilation · Insulation, thermal capacity and time lag of building fabric. · Energy and Resources Cost: Initial and on-going, of heating and cooling. Reduced energy consumption provides future cost savings and a reduced carbon footprint. · Activities / Equipment that may produce excess heat. Energy modelling software must be used to determine heating and cooling loads as part of the Whole of Life analysis that must be undertaken. (i.e. Camel or Carrier).	DG04.01	1. Thermal modelling report 2. As built evidence demonstrating that model is an accurate representation of the building 3. Specifications/ calculations supporting modelling inputs	MECH	Y	MANDATORY	Reviewed by NDY

Energy & carbon	EC1: Energy efficiency	**Passive design** The need for active cooling and heating shall be minimised by employing passive / sustainable design principles. Windows: The size and proportions of windows need to be carefully considered in the design to provide maximum efficiency and a balance between the ESD factors such as; maximising daylight in rooms but avoiding unnecessary solar heat gain and thermal loss etc. Roofing: The colour selected will have an impact on the thermal performance. Light colours will reflect more of the sun's heat and darker colours absorb more of the sun's heat, which will be transferred into the roof structure. Unless prevented by glare issues to surrounding development, light colours must be selected to reduce the thermal load from solar heating and contribute to heat island effect mitigation. Orientation (as close to True North as possible). With appropriate shading, this will provide a balanced approach to reducing summer heat ingress and encouraging solar warmth during winter. Appropriate glazing/ shading strategy (related to orientation and local environment), Depending on the climate, windows would be minimised on southern, eastern & western elevations with external shading on western and eastern facades). Use of thermal mass (to stabilise internal temperatures). Insulation: maximise insulation	DG55 DG06.02 DG27.12	1. Thermal modelling report 2. As built evidence demonstrating measures implemented to reduce need for active cooling / heating 3. Passive design report by Architect listing all passive design initiatives implemented	ARCH / ESD	Y	MANDATORY	Thermal modelling (PMV) will be undertaken as part of Section J Report. Roofing colour selection aligns with Green Star Window design maximises natural daylight and natural ventilation opportunities. Vertical screening on the East, and most particularly West facades, provides adequate sunshading. Horizontal sunshading is used on North facing facades.
Energy & carbon	EC1: Energy efficiency	**Ventilation strategy** A ventilation strategy must be developed to ensure that sufficient ventilation is provided to all spaces to meet the requirements of the BCA/NCC and associated standards. Specifically ventilation equipment must be designed from a whole-of-life perspective and: · Enable healthy learning environments with indoor air quality (IAQ) that supports learning and teaching (i.e. IAQ that is fit for purpose for schools) · Support sustainable design principles including reducing energy consumption · Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	DG57.01	1) Cooling system strategy including WOL analysis 2) Concept plans 3) Construction drawings 4) Trade-based specification 5) As built drawings	MECH	Y	MANDATORY	NDY: ok, strategy defined by DG55
Energy & carbon	EC1: Energy efficiency	**Natural ventilation** · Is required to all classrooms for comfort in summer and to maintain a healthy indoor environment. · Where cross ventilation may be restricted (i.e. where rooms are located on each side of a corridor, at least one whole wall of operable windows plus ceiling fans are required, to provide air movement. · Some windows need to be operable in driving rain and so must be protected with appropriately designed weather hoods, eaves overhang or other method of protection.	DG05.01	As built drawings demonstrating windows have been installed as required.	MECH	Y	MANDATORY	Considered and included.
Energy & carbon	EC1: Energy efficiency	**Mechanically assisted cross-ventilation** In two storey blocks where cross flow ventilation is not possible to the lower floor, mechanically assisted cross ventilation is to be provided to the lower floor learning spaces nominated in the EFSG. The ventilation system is to be sized to provide at least 7 air changes per hour. The system is to be thermostatically controlled to activate when room temperature exceeds 28 deg C and is to run continuously until the room temperature drops below 27 deg C. Additionally the system is not to be activated unless the outdoor temperature is lower than the indoor temperature and is to be immediately de-activated as soon as the outdoor temperature exceeds indoor air temperature. Provide programmable seven-day time clock and 0-2 hrs adjustable after-hour timer to control each mechanically assisted exhaust ventilation system.	DG57.18	As built mechanical drawings and specifications Extracts from commissioning report	MECH	N	MANDATORY	NDY: This will not be provided, a deviation will be included in the schematic reporting
Energy & carbon	EC1: Energy efficiency	**Ceiling void ventilation** Provide ventilation so as to remove hot air build-up in large enclosed roof spaces. Roof mounted turbo ventilators are an approved method. · The size and number of ventilators to be included will depend upon the volume and use of the individual rooms and the local climatic conditions to provide suitable air changes and room cross ventilation. · Provide a minimum of two roof ventilators to each Secondary General Learning Space or a Primary Home Base unless otherwise directed, or other number recommended by the manufacturer for the size of the space (whichever is the greater). · Ventilator throat diameter to be no less than 400mm.	DG05.02 DG37	As built mechanical drawings demonstrating ventilation has been installed as required.	MECH	N	MANDATORY	NDY: This will not be provided, a deviation will be included in the schematic reporting
Energy & carbon	EC1: Energy efficiency	**Roof ventilator control** Provide controls for the operation of the motorised dampers on the roof ventilators. Generally one switch is required for each space within the school where roof ventilators are installed	DG65.16	Mechanical / electrical drawings showing controls	MECH	N	MANDATORY	NDY: This will not be provided, a deviation will be included in the schematic reporting
Energy & carbon	EC1: Energy efficiency	**Wind powered roof ventilators** School buildings can use wind powered roof ventilators with dampers to provide effective summer ventilation. Design to suit local ambient climatic conditions to ensure correct sizes, locations and numbers are provided for each particular application. Co-ordinate the locations of ventilators with the ceiling fans to achieve effective air movement. Fan assisted ventilators should also be considered on days of low wind Provide a wall mounted switch to open /close the damper.	DG57.14	As built mechanical drawings showing location of roof ventilators if installed	MECH	N	MANDATORY	NDY: This will not be provided, a deviation will be included in the schematic reporting
Energy & carbon	EC1: Energy efficiency	**Ventilation in sanitary spaces** · Greater air circulation than that required by building regulations is required, with sufficient natural ventilation or mechanical ventilation, to disperse odours and /or humidity. · Cross ventilation is to be used where possible. · Provide mechanical ventilation to all Disabled Toilets. · Operate the system by time control equipment (time switches or run-on timers as appropriate).	DG05.04 DG57.16	As built mechanical drawings demonstrating ventilation has been installed as required.	MECH	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Ventilation in storage spaces** · Permanent air ventilation openings are to be provided (without compromising security), to prevent concentration of odours.	DG05.05	As built mechanical drawings demonstrating ventilation has been installed as required.	MECH	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Ventilation in permanent learning spaces and libraries** Where feasible / practical: · Ceiling fans shall be installed where ceiling height is equal to or greater than 2,700mm. · Wall fans shall be installed where ceiling heights are less than 2,700mm	DG55	As built drawings demonstrating ceiling/wall fans have been installed as required.	ARCH	Y	MANDATORY	Ceiling fans are proposed
Energy & carbon	EC1: Energy efficiency	**Indoor environment controls** · Both the thermal comfort and indoor air quality shall be controlled automatically within specified parameters. · Controls shall be simple and intuitive to use. · A prominent green light shall highlight to occupants when conditions are suited to opening windows and doors to utilise natural ventilation. · A prominent blue light shall highlight to occupants when the air conditioning is operating. · The lights shall be clearly labelled with traffic light labels as follows: + Green light – "External conditions are suited to opening windows and doors" + Blue light – "Air conditioning is operating. Windows and doors should be closed" · Temperature and CO2 sensors are to be installed within the space and be readily accessible for maintenance. · Sensors must be located so as to accurately record the actual room temperature and indoor air quality (CO2). · Controls shall be designed to minimise energy consumption – e.g.: by minimising over cooling and heating and automatically switching off when the space is unoccupied. · Controls shall be designed so that the system/s will shut down automatically if a room is unoccupied for greater than 10 minutes (except in specific cases such as designated computer rooms). · Controls shall be properly labelled and suitably located in the space (preferably near the light switch) and incorporate: + a key operated auto / manual / off switch; and + a push on / push off adjustable hour run timer. The run timer shall be adjustable from 1 to 4 hours and initially be set at 2 hours	DG55	1) As built evidence demonstrating controls have been installed as required. 2) Commissioning report / statement by head contractor confirming controls have been set as required	MECH	Y	MANDATORY	Reviewed by NDY
Energy & carbon	EC1: Energy efficiency	**Access for maintenance** All systems and equipment that is installed within a school is to be provided with suitable access to ensure that this equipment is safely and efficiently maintainable. In order to ensure that maintenance is available, on the completion of all buildings, drawings are to be provided showing the completed (As Built) building including all equipment and equipment access arrangements. **Communication services** DoE requires a 4 hour on-site training session for up to four persons on the use of the SCS. Training is to be accompanied by appropriate documentation and a video that demonstrates operation of the system and its components, including patching, cable management for voice, video and data of the SCS installed on site. Include explanation of detailed drawings left on site. The video / CD ROM may be generated from the on-site training for future use by DoE school staff. The Project Manager will, in consultation with the School Principal, nominate the timing of this session together with the number of attendees. Manuals are to be handed to the school during the training session. Include in copies of all cabling test reports and the (minimum) 20-year warranty certificate the manual. As built documentation and manufacturers warranty and test results are required **Building user's guide** Produce a Building User's Guide to enable the client to understand the building systems and operate systems to maximise efficiency. This must: · Clearly and concisely describe the operation of building and its services · Detail a reasonable maintenance program · Advise the user of the most suitable replacements for consumables	DG16.10 DG64.10 DG65.02	1) As built drawings including all equipment access arrangements for maintenance 2) Training records 3) Operation manuals 4) Manufacturers warranties and cabling test reports 5) Building user's guide	ALL	Y	MANDATORY	It is expected that the teams will provide suitable access to services. Building user guide in line with GS management requirements.
Energy & carbon	EC2: Scope 1 & 2 emissions	**Renewable energy** A grid connected solar PV system must be installed in line with DG66 requirements Where feasible, PV systems shall be installed to offset as much of the electricity consumed by the school as is practicable	DG2.3.4 DG55	1) As installed drawings of PV system 2) Energy modelling report showing renewable energy generation	ELEC	Y	MANDATORY	A PV array will be included in both schools. Current provision for a 70kW system. Confirmation required regarding DG 66 PV sizing requirements for Primary School and Secondaty schools

Energy & carbon	EC2: Scope 1 & 2 emissions	**Battery Energy Storage System** A battery energy storage system shall only be designed in consultation with SINSW Sustainability sustainability.enquiries@det.nsw.edu.au	DG66.8.3	1) As installed drawings of battery storage system	ELEC	N	MANDATORY (If Applicable)	NDY: no batteries proposed
Energy & carbon	EC2: Scope 1 & 2 emissions	**Heaters** Electric heating must be preferred over gas heating. Where gas heating is considered, it must be approved by SINSW Sustainability Heating equipment must be designed from a whole-of life perspective and: · Support sustainable design principles including reducing energy consumption and carbon emissions · Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed	DG56	1) If reverse cycle air conditioning is installed, confirmation that gas heaters are not installed, OR 2) Evidence that the gas heaters installed are energy efficient	MECH	TBC	MANDATORY	NDY: Due to climate and performance of heat pumps gas may be more appropriate for this site. Currently unresolved.
Energy & carbon	EC2: Scope 1 & 2 emissions	**Water heaters** · Hot water and tempered water generation for schools must be carefully considered to ensure that a Whole of Life assessment is undertaken to minimise life cycle costs and carbon emissions · Environmentally friendly options such as solar heating (if vandal resistant) and heat pumps are preferred energy sources to minimise energy consumption.	DGS3.09	1. WOL cost assessment for hot water systems 2. Hydraulic drawings/schematics showing installed DHW systems	HYDRAULICS	TBC	MANDATORY	NDY: Due to climate and performance of heat pumps gas may be more appropriate for this site. Currently unresolved.
Energy & carbon	EC3: Scope 3 emissions	Transport plan	N/A		TRANSPORT	Y		Transport Plan is being prepared
Energy & carbon	EC3: Scope 3 emissions	**Bicycle storage** Provide 1 space for every 20 students to AS2890.3 standard	SGS52 4.36		ARCH	Y		Bicycle parking will be provided
Water	W1: Water use efficiency	**Potable water conservation** WATER CONSERVATION STRATEGIES must be implemented on school sites, including: Manual Flush Urinal Systems: New and replacement urinals must use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative. Water Conserving Taps: Use metal flow control valves and /or push down taps with pre set flow limits. All new water-using appliances must be at least 0.5 stars above the average Water Efficiency Labelling and Standards (WELS) star rating by product type, except toilets and urinals, which must be purchased at the average WELS star rating. Refer to DGS3.02 for specific rating requirements. Harvest Rainwater: Where practical, harvest roof water and connect to a pumped rainwater supply system to authorities' requirements for landscaped areas and toilet flushing	DGS3	1. Schedule of fixtures and fittings showing type of urinals and taps installed are as required	ARCH / SINSW	Y	MANDATORY	Rainwater will be harvested and used for toilet flushing and landscape irrigation
Water	W1: Water use efficiency	**Fixture efficiency** All products must be rated to AS 6400 to the following minimum WELS ratings: · Tapware to 5 star flow rating requirements · Showers to have 3 star flow rating requirements · Water Closet Pans to 4 star flow rating requirements · Flow restrictors can be used to minimise water usage and wastage for staff amenities · Taps with timed flow can be used to minimise water usage and wastage in student amenities. In any case, all new water-using appliances must be at least 0.5 stars above the average WELS star rating by product type, except toilets and urinals, which must be purchased at the average WELS star rating. Where WELS rating is not available, use the alternative WaterMark rating scheme.	DGS3.02 DG2.4.1	1. Schedules of materials, fixtures, fittings and equipment with WELS/WaterMark ratings, demonstrating compliance and identifying those with flow restrictors and timed flow.	ARCH / SINSW	Y	MANDATORY	Water efficient fixtures will be specified
Water	W1: Water use efficiency	**Hydraulic services** Hydraulic services should: · Support sustainable design principles including reducing water consumption and waste production. · Appropriately treat any trade waste to ensure minimal environmental impact · Be accessible and serviceable - easy to maintain with minimal impact on school use when maintenance is being performed · Use products with a long life span – many hydraulic services are concealed so durability is essential	DGS1.01	1) Hydraulic report showing sustainability initiatives implemented to reduce potable water consumption **2) As built drawings showing trade waste arrestors**	HYDRAULICS	Y	MANDATORY	Reviewed by NDY
Water	W1: Water use efficiency	**Water sub-metering** In addition to the main water meter for the site provide sub meters for the following: · Mixed irrigation systems · Laboratory buildings · Amenities blocks · Canteens · Any other major water use on the site	DGS3.04	1) As built hydraulic drawings	HYDRAULICS	Y	MANDATORY	Reviewed by NDY
Water	W2 – Proportion of potable vs non-potable water	**Rainwater collection** It is DoE policy to include roof water harvesting and tank storage in new schools and to encourage it where practical in existing schools, to reduce the demand on drinking water supplies. Tank water can connect to drip irrigation systems for adjacent landscape/gardens with the major preference being for gravity fed supply to minimise ongoing maintenance.	DGS3.14 DG2.4.2 DGS3.01	1) As built hydraulic drawings showing tank connection to end uses and capacity	HYDRAULICS / LANDSCAPE	Y	MANDATORY	Tanks will be included and water collected used for irrigation and toilet flushing. Hydraulics to confirm tank size.
Water	W2 – Proportion of potable vs non-potable water	**Fire system water reuse** Where schools are required to install a sprinkler system for fire safety, it is recommended to install a closed loop system must be installed to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.	DG2.4.2	Fire engineering report	FIRE	N/A	MANDATORY	NDY: No sprinklers, not appliacable.
Water	W2 – Proportion of potable vs non-potable water	**Ground water** Where ground water is available for use for irrigation purposes in drought affected locations, enquiries must be undertaken with the Department of Planning, Industry and Environment to determine the suitability of a ground water system.	DGS3.03	1. Relevant due diligence report / investigation	HYRAULICS	N/A	MANDATORY	
Water	W3 – Responsible water discharge	**Stormwater management** Must aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes. Due diligence for flooding must be done early to inform building and landscaping design	DG2.4.3	Stormwater modelling report showing stormwater pollution and flows. Civil / Hydraulic drawings showing management measures. Water sensitive urban design report (if WSUD was use4)	CIVIL	Y	MANDATORY	Civil to confirm All stormwater discharged from the site can meet the required pollution reduction targets when compared to untreated runoff. Include detention tanks, Water Quality Treatment Devices & WSUD features. Benchmark from Green Star Min Pollution Reduction Targets Total Suspended Solids TSS - 80% Gross Pollutants - 85% Total Nitrogen (TN) - 30% Total Phosphorus (TP) - 30% Total Petroleum Hydrocarbons - 60% Free Oils - 90%
Water	W3 – Responsible water discharge	**Trade waste** Arrestors for acid, grease, plaster and clay of adequate capacity must be installed to treat wastewater from science laboratories, kitchens, art rooms and canteens as required in DGS2.	DGS2	1) As built drawings showing trade waste arrestors or 2) Letter by Hydraulic Engineer confirming arrestor have been installed as required	HYDRAULICS	Y	MANDATORY	Reviewed by NDY
Waste & materials	WM1: Materials selection and use	**Life cycle assessment (environmental)** Environmental impacts of products and materials has been assessed and inform material selection	DGD1.03	Life cycle assessment report	ALL	TBC	RECOMMENDED	Final material selection has not been made, open to Contractor input
Waste & materials	WM1: Materials selection and use	**Whole of life costing (WOL)** Total cost of ownership (TCO) assessment / Analysis of direct and indirect costs and benefits / Life cycle costing analysis When calculating the whole of life cost for the different materials / building elements or systems, the following must be considered: · the total initial capital cost of the system/s – including design, project management, builder and building services works in connections etc. · resources (energy and where applicable water) consumption. · Maintenance. · the replacement of component parts. · disposal costs · ecological sustainable options · durability · vandalism · safety The whole of life cost shall be calculated over the estimated life of the asset/s.	DGD1 All design guides for selection of materials and building systems	Life cycle costing report for relevant system	ALL	TBC	RECOMMENDED	Final material selection has not been made, open to Contractor input
Waste & materials	WM1: Materials selection and use	**Sustainable materials** Construction materials must be selected based on the following: · Adequately and economically perform their intended functions, and also have lower adverse environmental impacts throughout their life cycle (refer to DG 3) · Contain reduced or no hazardous substances (e.g. low VOC) to ensure effective indoor environmental quality. Reduce the demand for rare or non-renewable resources. · Have low embodied energy and water. · Are made from or contain recycled materials or can be reused or recycled at the end of their useful life.	DGD2.05	Environmental Product Declarations of products / materials used; Product certificates (like GECA, FSC, et3) Suppliers' declarations confirming recycled contents in products Bill of quantities	ARCH / CONTRACTOR	Y	MANDATORY	Architect's intention to specify low VOC materials. Opportunity to explore additional sustainable material pathways with DFMA as design progresses. VOC limits as per Green Star requirements
Waste & materials	WM1: Materials selection and use	**Sustainable timber** · No rainforest timbers, or timbers from high conservation forests, are to be used unless plantation grown. Use only recycled timber, engineered and glued timber composite products, or timber from plantations or from sustainably managed regrowth forests that is FSC, AFS or PEFC certified · All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard level.	DG2.5.1 DG21.05.01	1. Evidence of chain of custody 2. Bill of quantities	ARCH / LANDSCAPE	Y	MANDATORY	Will depend on product specification which will be defined at a later project stage. Architects to note any timber used must be sourced from sustainable sources. Timber selection as per Green Star requirements
Waste & materials	WM1: Materials selection and use	**Built for disassembly** Consider the use of building materials which are able to be disassembled for re-use, in conjunction with considerations for the addition and removal of accommodation over time.	DG02.07		ARCH	Y	MANDATORY	DfMA Design

Waste & materials	WM1: Materials selection and use	**Concrete** - Use materials complying with AS based on the Whole of Life approach to materials selection. - Do not use breccia or dolerite in concrete mixes. - Fly ash is a manufacturing bi-product that can be used as a cement replacement but should limited to a maximum of 20% by weight of cement content.	DG21.02	Structural specifications and drawings Structural Engineer's report showing %cement replacement	STUCTURE AND DFMA	Y	MANDATORY	In line with Green Star requirements
Waste & materials	WM2 – Resource efficient school operations	**Operational waste** A waste storage area must be included in all new school sites. The provision of space must include source separation including bin stations and appropriate signage of waste and receptacles for multiple waste streams, including: - Organics - Comingled containers - Paper & cardboard - Container deposit scheme - Soft plastic - General waste Designers must refer to AS 4123.7 Mobile waste containers - Colours, markings, and designation requirements for further guidance on bin colour, waste stream and waste type. Safe methods for vehicle access and the transfer of waste must also be considered. For new and refurbished schools, an operational waste management plan (OWMP) must be developed to establish operational waste targets, identify opportunities for reuse and recycling in the operation of the facilities and make adequate provision for the facilities to accommodate for the OWMP. The OWMP must address all requirements from DG 2.7.2	DG02.07	Operational waste management plan Operational waste reports showing diversion rates	PM / SINSW	Y	MANDATORY	Preliminary OWMP prepared for SSDA. Required by Green Star. A final OWMP will have to be prepared for school operation.
Waste & materials	WM2 – Resource efficient school operations	**Building flexibility** Position structural members considering the future flexibility of the structure. Avoid ad hoc placing of columns internally, giving preference to uniformity in layout. Design all internal walls as non-load bearing to enable future flexibility.	DG21.1.16	As built drawings or statement by relevant professional	ARCH	Y	MANDATORY	DfMA Design
Waste & materials	WM3 – Responsible management of waste	**Construction waste** Consider opportunities for re-use and recycling of materials in the construction phase	DG02.07	Construction waste reports showing percentage of waste re-used and recycled (diverted from landfill)	CONTRACTOR	TBC	MANDATORY	Targets established to increase diversion of waste sent to landfill, with a minimum diversion rate target of 90%. Opportunities for re-use and recycling of materials in the construction phase must be identified and implemented. Covered by Green Star
Waste & materials	WM3 – Responsible management of waste	**Operational waste** A waste storage area must be included in all new school sites, with the provision of space for the separation of waste and receptacles for multiple waste streams, including: - general rubbish, - co-mingled recycling, - paper and cardboard, - secure waste, and - green waste. Safe methods for vehicle access and the transfer of waste must also be considered.	DG02.07	As-built drawings showing location of waste storage area	ARCHITECT	Y	MANDATORY	Refer waste report, separate bins are provided for general waste and recyclables
Place	P1 – Green infrastructure	**Environmental conservation education** The design of the facilities provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community.	DG02.06	Statement / Report by qualified ecologist	ECOLOGIST / LANDSCAPE	TBC	MANDATORY	Likely to be included. Landscape to confirm
Place	P1 – Green infrastructure	**Productive landscape** Consider including opportunities for development of community garden within the site and relationships with community groups for this to occur.	DG02.06	Site plan demonstrating location and size of community garden	LANDSCAPE	TBC	MANDATORY	Likely to be included. Landscape to confirm
Place	P1 – Green infrastructure	**Drinking water catchment protection** For developments within drinking water catchment areas, a water cycle management study is to be included with the Development Application for Education Facility developments involving: - Agriculture facilities - Biosolids and effluent re-use schemes - Sewerage systems or works (including package sewerage treatment plants) - Stormwater or works involving the disposal of untreated runoff	DGS1.07	1. Water cycle management study 2. Evidence that recommendations in the study have been followed / implemented	CIVIL	TBC	MANDATORY	TBC
Place	P2 – Community & heritage connections	**Site investigations for place making / community connections** The following detailed reports/ surveys/ information should be considered in developing the business case: - Local environment/ character - Climate and microclimate - Heritage significance / impact - Appraisal of physical and visual factors affecting site development - Available transport/ road infrastructure servicing the site - Geo-technical and Soil reports will be required for each site to investigate the suitability of the topsoil and anticipated sub-grade materials for horticultural purposes. - Testing for toxic residues must be undertaken in all areas identified as being a possible risk - *i.e.* filled or dumped ground.	DG03.02	1) Relevant reports/surveys developed (these ideally include recommendations for further development stages) 2) Evidence demonstrating recommendations / best practice solutions have been implemented/addressed.	ARCH / PM	Y	MANDATORY	Site analysis has been undertaken to assess environmental character, climate, and context. Specialist consultant reports have been prepared to assess: Heritage, Biodiversity, Traffic & Transport, Geo-tech and Contamination, Aboriginal Cultural Heritage
Place	P2 – Community & heritage connections	**Sense of place** The following design principles to every landscape zone of the school. - A healthy and safe landscape - A sense of place - A sustainable landscape - A low maintenance landscape	DG90.04	1) Landscape design report 2) Landscape drawings	LANDSCAPE	Y	TBC	Likely to have considered & included in landscape design. Landscape team to confirm.
Place	P2 – Community & heritage connections	**Community use of facilities** Some school facilities are used out of hours for activities such as weekend church groups, sport events and public meetings. Liaise with the Project Director to gain an understanding of any shared use, or community use arrangements that are being considered for the site. New schools should be designed so that direct access to the open play space, fields , hall and gym can be achieved without the public gaining access to the buildings.	DG16.08	1. Confirmation by the Architect that direct access has been provided to open space and any other facilities that could be shared with the community. 2) A list of community engagement activities undertaken to develop a community benefits strategy. 3) Plans clearly outlining how the outcomes from the community benefits strategy have been implemented in the project 4) Joint-use or lease agreements where already in place	ARCH	TBC	TBC	School design can allow for community use of school spaces. No additional security lines proposed but potential location identified if required. No joint use agreements currently in place however there are opportunites for share uses available.
Place	P2 – Community & heritage connections	Reconciliation action plan	N/A	1) DoE's Reconciliation Action Plan 2) Evidence of the project's relationship with the RAP, e.g. actions implemented in line with RAP, etc.	SINSW	Y		Likely to be achieved. Operational Credit SINSW to confirm. Covered by the broader DoE RAP - https://education.nsw.gov.au/about-us/strategies-and-reports/our-reconciliation-action-plan/reconciliation-action-plan however the projects contribution towards the implementation of the RAP will have to be explained. This relates to a Green Star innovation credit.
Place	P3 – Welcoming learning spaces	**Daylighting** Maximise natural daylight in all habitable spaces to improve indoor amenity and create a pleasant environment	DG2.3.1	1. Daylight modelling report demonstrating how natural daylight has been maximised in all habitable spaces	ESD	TBC	MANDATORY	Daylight modelling will be undertaken. Performance targets for Daylight will aim to achieve 160 lux during 80% of the nominated hours for at least 40% of the spaces. Covered by Green Star
Place	P3 – Welcoming learning spaces	**Daylight glare control** Discomforting glare and brightness contrasts must be avoided. Designers must seek to: - Exclude direct sunlight from all learning spaces, libraries, administrative offices and staff studies for the period of 9.00am to 3.30pm including Eastern Daylight Saving Time between 21st September to 21st March (equinoxes). - Exclude direct sunlight from desk level in all learning spaces between 9am and 3:30pm. Sun exclusion and glare control can be achieved by the use of elements such as; Sun shades, eave extensions, vertical blades and the like. Glare must only be controlled by blinds as a last resort. Designers must prepare sun diagrams in the design phase as a minimum requirement.	DG12 DG07.01	1. Daylight glare modelling report / sun diagrams showing direct sunlight has been excluded as required. 2. Drawings supporting inputs of model, showing location of blinds and any other glare control device	ARCH/ESD	TBC	MANDATORY	Architects are designing the facades and shading devices with glare control as a key element. Daylight modelling/sun diagrams will be undertaken to show compliance.
Place	P3 – Welcoming learning spaces	**Lighting comfort** - Consider the furniture layouts to determine the orientation of luminaires. Especially when positioning luminaires in Materials Technology spaces to ensure adequate illumination on machines and work surfaces; - avoid potential stroboscopic effects and avoid shadows from ductwork - Mount luminaires as high as possible, but generally no higher than 4000mm AFFL (excluding Gymnasiums and Halls), to improve luminance uniformity and reduce direct glare in the direction of normal view - The standard lamp colour temperature is 4,000°K, except in certain toilet areas where the Design Guide requires the use of blue colours - Compliance with the uniformity requirements of the applicable standard should be demonstrated by the presentation of the output from lighting design software. - Unified Glare Rating (UGR) must be calculated using design software and compliant with the maximum recommended in AS/NZS 1680.1:2006	DG63.03 DG63.03.05	1) Lighting drawings 2) Architectural drawings 3) Lighting specifications / schedules 4) Product data sheets 5) Isolux plot drawings 6) Lighting modelling report showing compliant uniformity and UGRs	LIGHTING	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**Lighting modelling** Lighting designs should be carried out utilising industry standard lighting design software such as AGI32, Dialux or Relux. Modelling must provide output that clearly demonstrates that the proposed design is compliant with the standards including but not limited to the following parameters: - Maintained illuminance values (average, maximum and minimum) on horizontal surfaces such as floors or working planes as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Maintained illuminance values (average, maximum and minimum) on vertical surfaces such as walls, shelves or racks as required, broken down to identify the parameters defined in AS/NZS1680.4 or AS/NZS1158 as applicable - Unified Glare Rating (UGR) as defined by AS/NZS1680, - Uniformity as defined by the applicable standard for indoor or outdoor illumination, - Lighting power density in System Watts/m2	DG63.03.02	Lighting modelling report confirming compliance with required standards and parameters	LIGHTING	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**External access lighting** External Access Lighting shall be provided to illuminate building entrances, footpaths, sheltered walkways, roadways and car park. External Access Lighting must: - Be minimal and designed to prevent glare to pedestrians, nearby residents and to motorists. Evidence of compliance with AS4282, AS/NZS 1158 and other applicable Australian Standards must be provided by the designer. - Be located so as to link various sources of illumination such as street lighting (for carpark and roadways) and internal security lighting (for footpaths, walkways and entrances). - Illuminate building entry doors. - Highlight 'accident-prone' areas such as changes in level, stairs and ramps. - Provide vertical illumination.	DG63.08.01	1) As built drawings indicating the location of all external luminaires 2) Letter by lighting designer describing glare prevention measures	LIGHTING	Y	MANDATORY	Reviewed by NDY

Place	P3 – Welcoming learning spaces	**Thermal comfort** The inclusion of active cooling within school facilities is directed by the Department's Air Cooling policy: 2.1 Schools with a long term average mean maximum January temperature of 33 oC and above: Generally, air conditioning is to be provided to all school buildings. 2.2 Schools with a long term average mean maximum January temperature of below 33oC: Air conditioning is to be installed in all permanent learning spaces and libraries forming part of each projects scope. · Thermal modelling is undertaken to demonstrate that learning spaces and libraries have been designed to achieve a predicted mean vote (PMV) of +/- 0.5 for 95% of occupied hours	DG06.03 DGS5.01 DGS5.02	1) Mechanical drawings showing HVAC systems installed, or 2) Confirmation from sub-contractors that services have been installed and commissioned as required; and 3) Modelling report showing required PMV is achieved. Modelling report to be done in line with methodology described in Draft thermal comfort and indoor air quality interim performance brief for DGS5	MECH	Y	MANDATORY	Active cooling systems will be included. PMV calculations will be undertaken as part of Section J requirements.
Place	P3 – Welcoming learning spaces	**Background noise levels** · HVAC systems shall be designed in accordance with the recommended internal noise levels noted in table 1 of DGS5.02. The noise levels are the result from the cumulative contribution of traffic noise (via the façade) PLUS the building air-conditioning /ventilation systems. The noise measurement and documentation must be provided by a qualified acoustic consultant and in accordance with AS/NZS 2107. Noise measurement must account for all internal and external noise including noise arising from building services equipment, noise emission from outdoor sources such as traffic, and (where known) noise from industrial process. Occupancy noise is excluded. Compliance shall be demonstrated through measurement, and the measurements shall be conducted in at least 10% of the spaces in the nominated area. 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 range of measurement locations shall be representative of all spaces available within the nominated area. All relevant building systems must be in operation at the time of measurement. Projects less than 500m2 Gross Floor Area (GFA) must account for measurements conducted in at least 95% of spaces within the nominated area. · Enclosed circulation areas should be acoustically absorptive	DGS5.02 DG08.06	1. Road, rail, aircraft, industrial and rain noise assessment as per DG11.02 2. Report by qualified acoustics consultant demonstrating noise measurements are compliant.	MECH / ACOUSTICS	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**Room-to-room noise control** The following elements have prescriptive acoustic performance or construction requirements: · Operable walls (between general learning areas, all schools): Rw 45 · Entry doors to occupied teaching, music, drama and sports spaces: Solid core, minimum 35 mm thick with acoustic weather (where external) seals on all rebated closing faces. Gap at floor to be minimized. · Internal glazed sections in walls and vision panels in or adjacent to internal doors: minimum 10.38 mm laminated glass. In some situations acoustic windows may be needed for satisfactory noise separation. · Construction separating wastewater pipework from occupied spaces: Rw 40 · Where adjacent to an occupied space (and not serving that space), hydraulic supply pipework and wastewater pipework shall be separated from the adjacent occupied space. Construction between the adjacent spaces in this instance shall be a 'staggered stud' arrangement or otherwise discontinuous.	DG11.05	1. Detailed drawings including the acoustic design specification of operable walls, entry doors, internal glazed sections, etc. OR 2. Statement by a qualified acoustics consultant confirming compliance	ACOUSTICS	TBC	MANDATORY	TBC with Acoustic Consultant when engaged.
Place	P3 – Welcoming learning spaces	**Noise emission (to the environment)** Generally noise emission to the environment from mechanical services noise sources (such as air conditioners) are the subject of a development consent conditions. In NSW the development consent conditions will refer to the Industrial Noise Policy (INP) or Local Council requirement. Where no condition regarding noise sources exists for a school development, noise emission from such sources should be designed, in-principle, to satisfy the requirements of the Industrial Noise Policy.	DG11.04		MECH/ACOUSTICS	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**Acoustic post-occupancy evaluation** Post Occupancy evaluations are often undertaken to assess the performance of recently completed or existing facilities. Where a Post Occupancy Evaluation is to be undertaken it should be conducted by the project team or acoustic engineer and should be undertaken of selected acoustic parameters only. Evaluation may include: · Internal noise levels, · Room acoustics, · Noise emission, · Room-to-room acoustics performance	DG11.07	1. Commitment by SI to conduct acoustic post-occupancy evaluation	ACOUSTICS / PM / SINSW	TBC	TBC	Operational credit. SINSW to confirm. Deliverable for operational readiness phase
Place	P3 – Welcoming learning spaces	**Low VOC-emitting materials** All surface coatings, and other volatile organic compound (VOC) emitting products including adhesives, sealants, carpets, carpet tiles, and carpet underlays, must be made from low-VOC emission materials. Paints must meet the limits stipulated in the Australian Paint Approval Scheme's (APAS) VOC limits for low VOC paints. Adhesives and sealants must not exceed the maximum VOC limits stipulated in Table 13.1.1B of the Green Star – Design & As Built v1.3 tool. Carpets must not exceed the total VOC limits stipulated in Table 13.1.2B of the Green Star – Design & As Built v1.3 tool.	DG2.5.2	Product specifications, certificates, safety datasheets that demonstrate low-VOC contents Bill of quantities	ARCH	Y	MANDATORY	Architects will include requirements in their specifications. This is considered as best practice approach and is covered by Green Star requirements. Will be achieved.
Place	P3 – Welcoming learning spaces	**Low formaldehyde-emitting materials** Only low formaldehyde-emitting engineered wood products should be used, such as those that meet the Australian Standards for formaldehyde emission limit E1 (NICNAS classification) or lower.	DG2.5.2	Product specifications, certificates, safety datasheets that demonstrate low-formaldehyde contents Bill of quantities	ARCH	Y	MANDATORY	As above
Place	P3 – Welcoming learning spaces	**Ventilation in printing rooms** The ventilation system is to be designed to serve the whole room and is not intended to provide localised exhaust at equipment. · Discharge air from the ventilation unit to the outside of the building via a vermin proofed louvre. · Draw make-up air from inside the building through wall or door grilles. · Locate the inlet/s and exhaust to achieve good airflow across the room in plan and elevation to pick up all machine emissions. -Ensure the airflow doesn't draw equipment emissions across operator's face. -Note that the room door in many schools may be left open in normal daily operation. Allow for this when locating the exhaust fan so that cross ventilation is achieved with make-up air drawn through the door opening. · Required speed range: minimum of 6 air changes per hour and maximum of 15 air changes per hour.	DGS7.07	1. Mechanical drawings and specifications showing compliant printing room ventilation	MECH	Y	MANDATORY	NDY: ok, though preference is for equipment that does not emit fumes, which avoids the requirement.
Place	P3 – Welcoming learning spaces	**Chemical store ventilation** · Provide mechanical exhaust system with high and low level exhaust points to all chemical stores, with a minimum of 15 air changes per hour flow rate. · Discharge air according to the requirements of BCA. The discharge outlet is to be fitted with bird wire mesh. · Provide make up air to all chemical stores, (to replace exhausted air) through openings in an external wall, fitted with weatherproof louvres. All grilles and louvres are to be fitted with vandal proof bars and be fitted with vermin mesh. · For security and fire rating reasons do not use windows/doors or door grilles for air intake. · The chemical stores ventilation systems are to run continuously.	DGS7.09		MECH	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**Pesticide free environments** Schools must be designed, constructed and maintained, without using chemicals for termite and other pest control. No chemical pesticides and termicide to be used. Preventive treatments to be by physical means and careful desien to minimise risk	DG2.5.3	Statement by head contractor that no pesticides or termites have been used.	SINSW	Y	MANDATORY	Operational credit. SINSW to confirm Schools would be expected to comply with relevant EPA regulations where they seek to use pesticides - https://www.epa.nsw.gov.au/your-environment/pesticides/pesticide-use-nsw/schools-childcare-centres-pesticides
Place	P3 – Welcoming learning spaces	**Green cleaning**	N/A	1) WEB Clean School User Guide 2) Green Cleaning specifications	SINSW	TBC		Operational credit. SINSW to confirm
Place	P3 – Welcoming learning spaces	**Fly free indoors** Fly screening must be provided in all schools to the doors, windows and other openings in food preparation, biology, and non-water-closet toilet spaces or where specifically nominated in the EFSG. Schools in localities where fly incidence constitutes a health hazard (especially trachoma or other nuisance) will require fly screens to all opening sashes.	DG31.01	As-built drawings showing fly screening has been provided as required	ARCH	Y	MANDATORY	Flyscreening will be provided
Place	P3 – Welcoming learning spaces	**Indoor CO2 levels** For mechanically ventilated spaces: 1. Outdoor air ventilation rates are in accordance with requirements of AS 1668.2. 2. Mechanical ventilation systems shall be linked to CO2 sensors to provide demand-controlled ventilation within each space to ensure that CO2 levels are maintained below the required CO2 threshold. 3. Mechanical ventilation systems shall be designed to provide adequate access for maintenance and cleaning. 4. Ventilation systems are designed to maintain an average daily CO2 concentration as per the latest NCC code, and so that the maximum concentration does not exceed 1,500ppm for more than 20 consecutive minutes in each day. 5. The required outdoor air ventilation rates and CO2 concentrations shall be maintained without the need for any human intervention e.g. the opening of windows or external louvres. 6. Ventilation systems shall be designed minimise the entry of outdoor pollutants through ensuring that the ventilation system design is in accordance with the relevant parts of AS 1668.2. and ASHRAE Standard 62.1. 7. Where local sources of pollutants are present e.g. photocopiers, minimum exhaust ventilation flow rates should be provided in accordance with AS1668.2: Table B1.	DGS5.02	Mechanical drawings and specifications Extracts from commissioning report	MECH	Y	MANDATORY	Green Star requirements for CO2: For mechanically ventilated or mixed-mode spaces, outdoor air is provided at a rate 50% (1 point) 100% (2 points) greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm. NDY: We do not see the benifit of providing 150% outside air coupled with CO2 modulation, as the excess otside air will never be used. Further, the plant will be oversized.

Place	P3 – Welcoming learning spaces	**Ecological conservation** Schools sites must conserve for future generations, the biological diversity of genetic materials, species and ecosystems on that site and consider the surrounding natural environment. The design of the facilities must provide unique and valuable environmental conservation learning opportunities and effective environmental modelling to the wider community. Schools must model best practice design, material use, systems and operational methodology, demonstrating human's connections to nature and the operation of natural cycles of sun, wind, rain and the four seasons. Schools must connect with nature and incorporate biophilic design principles. Open space must allow for exploration, and biodiversity and earth education to enhance the site's outdoor learning potential. New and refurbished schools must: Preserve or re-establish native flora (unless it poses a safety risk or cannot be designed around) and create new landscapes through liaising with local government authorities, Landcare and environmental groups, and the use of native low water use plants. Consider opportunities for development of community garden within the site and relationships with community groups for this to occur. Adequate due diligence must be conducted where biodiversity or high ecological value is identified on the site. For more details see DG90 Landscape Design	DG02.06	1) Biodiversity or ecological assessment / local flora and fauna survey 2) Biodiversity management plan describing measures for the conservation and protection of threatened species or communities, biodiversity enhancement, tree protection, etc. 3) Evidence demonstrating measures have been implemented to protect and enhance endangered species / ecological communities identified; to preserve or re-establish native flora; etc.	ECOLOGIST/LANDSCAPE	TBC	MANDATORY	Likely to be achived. Lanscape to confirm.
Place	P3 – Welcoming learning spaces	**Accessibility** -All new facilities must meet current DTS provisions of the NCC and the associated standards. Generally AS 1428.1 is the minimum design standard for access and mobility. However, it is DoE's policy that any enhanced requirements noted in AS 1428.2 be incorporated in any new design. -Additionally, DoE have enhanced circulation requirements as noted in DG / CIRCULATION · Provide hearing augmentation system for areas that have amplification, generally within Gymnasium, libraries, movement studios and Communal Halls, provide a system to assist the aurally challenged to hear music and speech within the main auditorium and on the stage · Provide the International Symbol for Deafness to indicate that an assistive hearing device is installed.	DG19.01 DG65.14	1) Accessibility plan 2) As-built drawings or other evidence demonstrating that minimum and enhanced accessibility requirements have been provided for walkways, corridors, ramps, etc. 3) Photographic or other evidence of signage installed	ARCH	Y	MANDATORY	Design complies with accessibility requirements. Refer Access Report, all buildings and landscaped spaces are designed to be accessible
Place	P3 – Welcoming learning spaces	**Weather protection** Circulation areas provided between administrative, staff and all student spaces (except Agriculture), should be protected from sun, rain and unfavourable winds.	DG08.05	As built drawings showing circulation areas are protected as required	ARCH	Y	MANDATORY	The covered walkways which connect all buildings will provide protected circulation areas. Walkways have a 2.500/2.300mm overhang for weather protection. External circulation is covered, but not enclosed. The location of external circulation considers prevailing winds and weather conditions.
Place	P3 – Welcoming learning spaces	**Open play space** Open play space must be provided for students to access during recess, lunch breaks and for outdoor learning. Open play space can be comprised of · Paved and grassed areas · Rooftops and terraces · Covered outdoor areas The designated open play space must be easily monitored and managed by school staff. Where a joint use agreement can be negotiated with a local council or land owner, the required play space can be located off-site, providing the facilities are · In close proximity to the school · Easily accessible · Safe and secure Designs must aim to achieve a minimum of 10m2 per student. Where this figure is not achievable the proposed m2 per student of the completed project must not be less than the existing m2 per student currently on the site.	DG10.03	Plan view drawings showing provision of open space	ARCH	Y	MANDATORY	10m2 open playspace per student is readily achieved on this site. The landscaped spaces include a mix of active and passive playspaces.
Place	P3 – Welcoming learning spaces	**Staff room** Staff room has been provided as per EFSG requirements	N/A	1) Extracts from the EFSG requirements for staff rooms 2) Evidence of staff room delivered accordingly	ARCH	Y		Staff rooms have been provided for both Primary and High School to EFSG requirements. These are co-located, not combined.
Place	P3 – Welcoming learning spaces	**Healthy canteen policy**	N/A	1) Research report behind Healthy Canteen Policy 2) Evidence that policy initiative has been incorporated into the school under assessment.	SINSW	Y	MANDATORY	Operational credit. SINSW to confirm. School canteens will need to comply with Nutrition in School policy - https://education.nsw.gov.au/policy-library/policies/pd-2011-0420 Will be addressed in operational readiness phase.
Place	P3 – Welcoming learning spaces	**Safety by design** · The Work Health and Safety Act and the Department of Education principles of student safety and welfare mandate the avoidance of accidents through careful design of facilities · The designer must ensure, so far as is reasonably practicable, that the plant, substance or structure is designed to minimise risks to the health and safety of all parties who will work on a site connected with its design as well as the end users of the facility. · An important part of the Safety by Design principle is recording the risk assessments that are conducted during the design and providing to the client, owners, any users/occupiers of the facilities and those who will be building or maintaining the facilities, details of risks and hazards identified. · The design of facilities should not only be inherently safe but visually and pragmatically safe and not tempt students or the general public into unsafe practice. Examples: <u>Glazing</u>: The safety of occupants is paramount where glass is being used, especially in areas subject to human impact. All glazing types and thickness are to comply with the relevant AS as a minimum. <u>Hot water</u>: To minimise scalding risk all hand basins, showers and the kitchen sink in practical activities areas serving IO/IS classes, require "warm" rather than "hot" water provided at a specified temperature, by mixing hot and cold water through a Thermostatic Mixing Valve. (Note: Tempering Valves are not permitted in schools) <u>Drinking water tanks</u>: Ensure rainwater is not collected from areas containing lead materials. All coating materials used inside the reservoir must be suitable for drinking water and guaranteed against liner leakage for a period of 20 years. A filtering and UV system to be provided where drinking water tanks are present.	DG14.02 DG31.03 DG53.11 DG53.16 DG53.17	1. Safety risk assessments 2. Short report identifying safety-by-design principles incorporated / Sign off by head contractor confirming all mandatory requirements in DG14 have been addressed. 3. Manufacturer's certificate to AS/NZS 4020 for tanks	ARCH / PM	Y	MANDATORY	Safety in Design workshop has been undertaken and a SID register prepared
Place	P3 – Welcoming learning spaces	**Microbial control** As a measure to prevent legionella, heated water to hand basins, showers etc. shall be stored at temperature above 65 C. Thermostatic mixing valves are to be used for tempered water generation at each point of use. Valves need to comply with microbe disinfection requirements - "Code of Practice for Thermostatic Mixing Valves NSW" as approved by the NSW Health Department.	DG51.09 DG53.11	1. Letter by hydraulic engineer confirming hot water is stored above 65 deg and that valves comply with code of practice.	HYDRAULICS	Y	MANDATORY	Reviewed by NDY
Place	P3 – Welcoming learning spaces	**Security** Safety in Design and Crime Prevention Through Environmental Design (CPTED) principles are to be implemented in project planning stage. Advice on the electronic surveillance systems can be sought early in the design phase. CCTV systems are required in several locations where indicated in the Rooms and Spaces Technical Data table, including: · Secondary clinic · Primary sick bay · Library	DG14.10 DG65.08 DG65.10	1) Crime risk assessment or equivalent 2) Evidence of designing out crime principles implemented 3) Security services plans, schedules and forms by School Security Unit (SSU) 4) SSU specification and evidence of input on project specification	ARCH / SINSW	Y	MANDATORY	Refer CPTED report
Place	P3 – Welcoming learning spaces	**Hazardous materials** Where a new school is to be developed a Hazardous materials study is to be conducted, including: · Asbestos Containing Materials (ACM) · Synthetic Mineral Fibres (SMF) · Polychlorinated Biphenyl's (PCB) · Lead Paint · Ozone Depleting Substances Any existing structures and all parts of the site should be examined in order to determine the presence of hazardous materials before commencement of any renovation or demolition. Inspection should be conducted by organisations with the National Association of Testing Authorities (NATA) accreditation complying with the requirements of AS/NZS ISO.IEC 17020 for the inspection of hazardous materials (HazMat) including asbestos. Hazardous Materials inspection reports should be produced in accordance with the requirements of the various Safe Work Australia "Codes of Practice" for the management and control of hazardous substances. Where hazardous materials are found a Hazardous Materials Management Plan should be prepared	DG48.01	1. Hazardous materials study / site inspection report / survey 2. Management plans for hazardous materials identified 3. Remediation strategies implemented 4. Environmental auditor certificates / clearance certificates	PM	Y	MANDATORY	Hazardous Material studies have been undertaken and any relevant tasks arising from the findings will be actioned. Details on Hazardous material studies and remediation actions to be confirmed
Place	P3 – Welcoming learning spaces	**Digital infrastructure** New buildings and refurbishments are required to provide a common wireless solution compatible across the school, providing a consistent user experience and support mechanism. This involves the replacement of existing legacy wireless equipment, such as wireless access points and site switches	DG64.12.02	1) Contracts describing the network infrastructure specification and operational requirements	ARCH / COMMS	Y	MANDATORY	Digital infastructure will be provided, as the project comprises of all new buildings, there is no legacy equipment to replace
Place	P3 – Welcoming learning spaces	**Sustainability benchmarking** Ecologically Sustainable Development principles must be included in any new school buildings to a level that the building could be benchmarked to achieve a 5 Star Green Star rating if located in Sydney, Newcastle, or Wollongong metropolitan areas or a 4 star Green Star rating if located elsewhere in NSW. Benchmarking must be undertaken against the Green Star credits using the edition of the Green Star scorecard current at the time of the assessment. The filled out scorecard must demonstrate the project can achieve enough points for the required rating. Formal Green Star certification is not mandatory	DG02.09	1) Green Star scorecard demonstrated the final design is benchmarked to the required rating (by a Green Star Accredited Professional)	ESD	Y	MANDATORY	Project will undertake formmal Green Star D&AB 1.3 Certification
Resillence	R1 – Preparation for shocks	**Site investigations for resilience** The following detailed reports/ surveys/ information should be considered in developing the business case: · Slope, drainage and erosion issues including flood risks (if any) · Geotechnical and soil conditions · Airborne pollutants · Bushfire risks · Appraisal of available services infrastructure · Climate change risk assessment must be undertaken considering at least two different climate change scenarios An environmental risk report will be required for developments proposed within sensitive natural environments or sites subject to natural risks (i.e. flood prone sites, bush fire areas).	DG03.02	1) Detailed reports or surveys developed 2) Environmental risk report 3) Evidence demonstrating recommendations have been implemented and risks addressed through design responses.	DESIGN TEAM / PM	Y	MANDATORY	Relevant site investigations have been undertaken and actioned. A climate change risk assessment will be prepared. Site not located in a bushfire prone site or flood area risks. Bushfire Report and Flood Report prepared & can be submitted as evidence.
Resillence	R1 – Preparation for shocks	**Bushfire protection** Development applications on bush fire prone land must be accompanied by a Bush Fire Assessment Report demonstrating compliance with the aim and objectives of Planning for Bush Fire Protection and the specific objectives and performance criteria for the land use proposed. Local Authorities and the Rural Fire Service can provide advice on the design of buildings in bush fire prone areas. The Building Code of Australia and AS3959 "Construction of buildings in bushfire-prone areas" set out the requirements for buildings which are within close proximity to a defined bush fire zone. Mandatory landscape management strategies: · Keep the amount of fuel (leaves, twigs, logs, dead grass) in the vicinity of buildings to a minimum. · Ensure trees are located at away from buildings to avoid branches overhanging and leaves collecting on roofs. · Do not plant shrubs against buildings. · The crowns of trees planted on the hazard side of the development should not be contiguous. · Plant fire resistant trees and shrubs on the hazard side of the development to reduce the potential impact of wind, fire intensity, radiant heat, and rate of spread as well as intercepting burning embers. · Avoid combustible fencing materials. · Provide irrigation and garden sprinklers to water areas near the buildings (subject to water authority approval).	DG13.01	1) Bush fire assessment report 2) Statement by Architect / fire consultant outlining building strategies implemented in line with BCA and AS3959. 3) Bush fire management plan outlining management strategies implemented 4) Landscape plans detailing bush fire management measures implemented	BUSHFIRE / PM	Y	MANDATORY	Bushfire assesment report produced and building designed accordingly.

Resilience	R2 – Preparation for stresses	**Climate change adaptation** Sites and school communities must be able to withstand natural and urban hazards and adaptively respond to climate change over time, especially for projects involving vulnerable communities e.g. climate generating exacerbated flood, storm surge, inundation, heatwaves, bush fires, extreme storm and other weather events. School facilities must be able to withstand natural hazards and adapt to shocks and stresses to avoid social and economic costs of interrupted operation and repairing or replacing damaged assets. To achieve this, increasing resilience to natural hazards must be considered in the business case development so that associated costs are budgeted. An initial assessment of natural hazards and project vulnerability must be carried out, in consultation with resilience experts, to inform the business case and identify hazards where further analysis is required. Where significant risks are identified in the initial assessment, a comprehensive climate change risk assessment must be undertaken. Any high or extreme risks identified must be addressed through design measures.	DG02.08	1) Climate risk assessment, and 2) Climate adaptation plan 3) Emergency management plan	ESD	Y	MANDATORY	A climate change risk assessment will be prepared. The climate assessment reports on RCP 8.5 and RCP4.5 for three different time scales considering near and far future 2030, 2050 and 2070. The Assessment will allow the design team to identify potential risks and develop mitigation strategies to address them.

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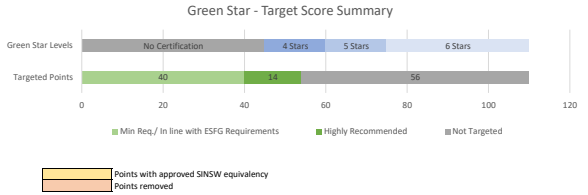
9.0 Appendix B: Green Star Pre-Assessment Scorecard

Summary Scores 30 Jul 2021

Category	Not Targeted	Available Pts	Min Req./ In line with ESFG Requirements	High. Rec.	Total	Not Targeted
Management	14	14	11	2	13	1
Indoor Environment Quality	17	17	10	3	13	4
Energy	22	22	2	1	3	19
Transport	10	10	1	0	1	9
Water	12	12	5	0	5	7
Materials	14	14	4	2	6	8
Land Use & Ecology	6	6	1	2	3	3
Emissions	5	5	4	0	4	1
Innovation	10	10	2	4	6	4
Total	**110**	**110**	**40**	**14**	**54**	56
4 Star Target		45-59	45		Yes	
5 Star Target		60-74	60		No	
6 Star Target		75+	75		No	



207170 Jindabyne Education Campus Scorecard

Green Star (D&AB v1.3)

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	CREDIT DESCRIPTION	POINTS AVAILABLE	INPUT	Required	Good Practice / highly Rec. / Buffer Points	Total Targeted	Comments Workshop 23/07/21	Project specific evidence (example)	Captures EFSG (Yes / No / Partially)	EFSG Alignment with Green Star	Alignment with EFSG Priorities (Climate Action / Give Back more /	Alignment with GANSW Better Placed Manuals. Design Guide for Schools (DGfS) Environmental Design in Schools (EDiS)	EP&A Reg 2000 Alignment with SEARS clause 7 (4)
Management				**14**											
Accredited Professional	1.0	Accredited Professional	An ESD specialist has been contractually engaged as part of the project team, to deliver advice and must deliver at least one workshop to the project team. It is expected that this workshop will be of most benefit at project inception.	1	ESD	1		1	Additional GS Management fees from the Contractor - TBC Project to be registered before the end of the year otherwise GS Buildings will apply which might have cost implications. (Until December 2021)	• ESD consultant procurement documentation • ESD consultant outputs (e.g. letters of advice, reports, etc.)	Yes	High			
Commissioning and Tuning	2.0	Environmental Performance Targets	Minimum requirement to establish targets for environmental performance. This includes 3 items at a minimum and should consider energy, water, IEQ, waste etc. Performance targets either documented in an OPR or design intent report. This design intent report or owner's project requirement (OPR) should outline the following; - Description of basic functions, operations & maintenance of the nominated building systems. - Targets for the project energy and water consumption and energy and water budgets for all nominated building systems. - Description of how energy, water and aspects of indoor environmental quality are metered and monitored. This includes a meter diagram.	Req	SINSW ESD	C		C	Targets will come from Energy Model Water Calculator IEQ Credits Target	• SINSW Environmental Performance Plan	Yes	High	Climate Action	**Aligns with DGfS** **2 - Sustainable, efficient and durable.** Minimise the consumption of energy, water and natural resources and reduce waste and encourage recycling. **6-Whole of life, flexible and adaptive.** Good design for schools should deliver high environmental performance	**Aligns with *The precautionary Principle*** Detail the projects environmental considerations
Commissioning and Tuning	2.1	Services and Maintainability Review	Services and maintainability review must address the following aspects for all nominated building systems: - Commissionability; - Controllability; - Maintainability; - Operability, including 'Fitness for Purpose'; - Safety. This review and its outcomes must be summarized in a "Service and maintainability Report" which must be agreed and signed of by the involved parties. Action items resulting from this should be incorporated in the OPR report.	1	SINSW Façade Mechanical Electrical Lighting V. Transport Hydraulics	1		1	To be done by SINSW ICA Team Contractor involvement	• Expert review group and technical stakeholder group (TSG) meeting minutes • TSG sign off certificates • Design Advisory Reports	Yes	High	Climate Action		
Commissioning and Tuning	2.2	Building Commissioning	Pre-commissioning and commissioning activities have been performed. **1 Commissioning Specification** - Contractual tender must list commissioning requirements for each system. **2 Commissioning Plan** - Include objectives/scope/team/procedures/witnessing/Com.program Etc. **3 Air Permeability Testing** - As per approved standards and meeting a maximum air permeability rate. The contractual tender or construction documentation must - List the design parameters for each system;	1	Mechanical Electrical V. Transport Fire Hydraulics		1	1	To be discussed with SINSW ICA Team Most of the requirements will be done inherently however Air Permeability Testing is required. This will have to be confirmed	• Commissioning & Handover Plan • PV installation checklist	Yes	High	Climate Action		
Commissioning and Tuning	2.3	Building Systems Tuning	An owner/client has formally committed to a tuning process for all nominated building systems. Minimum: quarterly adjustments and measurements for the first 12 months and a review of building systems manufacturer warranties. Commitment must include at least the following: - Operating and Maintenance Manuals to be developed in accordance with approved standards and guidelines; - A building tuning manual, or a building tuning plan, has been developed in accordance with - The approved standards and guidelines; - A building tuning team has been created including the facilities manager, the	1	Mechanical Electrical V. Transport Fire Hydraulics Head Contractor ICA	1		1	Can be done by SINSW ICA Team	• Maintenance reports • FMWeb online portal	Yes	High	Climate Action		
Commissioning and Tuning	2.4	Independent Commissioning Agent	An Independent Commissioning Agent (ICA) has been appointed to advise, monitor, and verify the commissioning and tuning of the nominated building systems throughout the design, tender, construction, commissioning and tuning phases.	1	ICA	1	0	1	SINSW ICA Team	• Expert review group and technical stakeholder group (TSG) meeting minutes • TSG sign off certificates • Design Advisory Reports • Commissioning & Handover Plan • Witness testing reports	Yes	High	Resilience		
Adaptation and Resilience	3.1	Implementation of a Climate Adaptation Plan	1 A **project-specific climate adaptation plan** has been prepared in accordance with the relevant standards, 2 **Solutions have been included** in the building design and construction to specifically address the risk assement component of the plan. The Climate Adaptation Plan must contain as a minimum the following information: Summary of the project's characteristics (site, location, climatic characteristics); - Assessment of climate change scenarios* and impacts on the project using at least two time scales (e.g. 2030, 2040, 2050 or 2070), relevant to the projects anticipated lifespan. This must include a summary of potential direct and indirect climate change	2	ESD	1	1	2	To be prepared. Outcomes of Climate Adaptation Workshop will form the base of the plan. Can potentially claim 2 points if strategies are applied.	• Service Need Report • Site investigation reports (e.g. flooding, geotechnical, air pollution) • Master plan report • Concept design report • Business case report • Climate change risk assessment (if conducted) • Bushfire assessment report • Environmental risk report	Partially	High	Resilience	**Aligns with DGfS** Allow for Future Adaptation	**Aligns with The precautionary Principle** Make reference to a Risk Management Plan (RMP) and the inclusion of any environmental, social and climate change risks, in the RMP if the project has included these

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	CREDIT DESCRIPTION	POINTS AVAILABLE	INPUT	Required	Good Practice / highly Rec. / Buffer Points	Total Targeted	Comments Workshop 23/07/21	Project specific evidence (example)	Captures EFSG (Yes / No / Partially)	EFSG Alignment with Green Star	Alignment with EFSG Priorities (Climate Action / Give Back more /	Alignment with GANSW Better Placed Manuals. Design Guide for Schools (DGfS) Environmental Design in Schools (EDiS)	EP&A Reg 2000 Alignment with SEARS clause 7 (4)
Building Information	4.1	Building Information	Comprehensive operations and maintenance (O&M) information is available to the facilities management team. Current building user information is available to all relevant stakeholders. Project Team must develop a building log book for the building owner before practical completion 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.	1	Mechanical Electrical V. Transport Fire Hydraulics Head Contractor ICA Landscape	1		1	Likely to be achieved. Specifications and documentation required to be discussed.	• Project specific manuals, as-builts, warranties, etc. • Signage and posters • Training records • AMS online portal	Partially	High	Climate Action		
Commitment to Performance	5.1	Environmental Building Performance	At least 80% of the project's gross floor area (GFA), excluding car parking areas, is covered by a commitment to set, measure and report on its environmental performance	1	SINSW	1		1	Likely to be achieved. To be included in the design intent report or owner's project requirement (OPR) related with credit 2	• ERM Power customer online portal • Principal's Dashboard • GREP annual reports	Yes	High	Climate Action		
Commitment to Performance	5.2	End of Life Waste Performance	At least 80% of the project's GFA, excluding car parking areas, has a formal commitment in place to reduce demolition waste at the end of life of an interior fitout or base building component. Contractual agreement in the form of an internal requirement (when building owner and tenant are the same entity). Building owner must commit to extending the life of interior fitout and finishes to at least 10 years, barring minor wear and tear and minor repairs.	1	SINSW	1		1	Commitment from SINSW		Partially	High			Aligns with Improved valuation, Pricing and Incentive Mechanisms Make reference to DG01.03 Whole of life
Metering and Monitoring	6.0	Metering	Metering shall be provided to allow for monitoring of the relevant areas or functions of the project. In most cases floor-by-floor metering will suffice if the entire floor has a single use. If a floor has multiple uses, the different uses shall be metered. Therefore, should a floor be composed of office space and a seminar room, both spaces shall be separately sub-metered. Where an energy load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered. Supplementary equipment can also be installed on the same measured circuit as the major use item. However, the total combined energy use of any systems connected to the major use item must not contribute more than 10kVA to the overall energy use. Where a common water use consumes 10% of the project's water use, these must be independently metered.	Req	Mechanical Electrical Hydraulics	C		C	Single line diagram for metering- Metering strategy as per CIBSE TM39 Under development by NDY. Requirements discussed.	• As built hydraulic drawings	Partially	Low	Climate Action		
	6.1	Monitoring Systems	A monitoring system is provided capable of capturing and processing the data produced by the installed energy and water meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends.	1	Mechanical Electrical Hydraulics	1		1	Send requirements		Partially	Med			
Responsible Building Practices	7.0	Environmental Management Plan	A project-specific best practice EMP is developed and implemented, to assist the Principal/Head Contractor and its service providers to manage environmental performance, conditions and impacts arising from demolition, excavation and construction. The EMP must cover environmental impacts arising from construction works, and it must be site specific.	Req	Contractor	C		C	To be included in contractor specifications	• EMP	No	Low	Give back more than	**Aligns with EDiS** Contribute to Local Environment	Aligns with Improved valuation, Pricing and Incentive Mechanisms Make reference to DG03.07 Waste
	7.1	Formalised Environmental Management System	A formalised systematic and methodical approach to planning, implementing and auditing is in place during construction, to ensure compliance with the EMP. The plan must be implemented by a responsible party with a formal environmental	1	Contractor	1		1	To be included in contractor specifications	• Head contractor's ISO certificate	No	Low	Give back more than	**Aligns with EDiS** Contribute to Local Environment	Aligns with Improved valuation, Pricing and Incentive Mechanisms
	7.2	High Quality Staff Support	Promote positive mental and physical health outcomes of site activities and culture of site workers, through programs and solutions on site; and Enhance site workers' knowledge on sustainable practices through on-site, off-site, or online education programs.	1	Contractor				Becoming best practice. TBC with contractor		No	Low			
Operational Waste	8A	Performance Pathway - Specialist Plan	A qualified waste auditor prepares an Operational Waste Management Plan (OWMP) for the building in accordance with best practice approaches. The requirements or recommendations made in the Operational Waste Management Plan must then be reflected in the design of the building's facilities.	1	Waste SINSW	1		1	Is there a Waste Consultant involved? Will an OWMP be prepared? Preliminary OWMP prepared for SSDA submission. To be reviewed	• School waste management plan	Yes	High			
	8B	Prescriptive Pathway - Facilities	Facilities are in place to collect and separate district waste streams and where these facilities meet best practice access requirements for collection by the relevant waste contractor.	-	Waste SINSW			0	Allow for Waste Facilities Management Area	• As built architectural drawings • Schedule of accommodation	Yes	High	Give back more than	**Aligns with EDiS** Contribute to Local Environment	Aligns with Improved valuation, Pricing and Incentive Mechanisms
Total				**14**		**11**	**2**	**13**							
Indoor Environment Quality				**17**											
Indoor Air Quality	9.1	Ventilation System Attributes	The entry of outdoor air pollutants to the space must be minimised. The building ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 in regards to 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. Any mechanical ventilation system within the building, whether existing or new, must be designed to provide adequate access for maintenance, to both sides of all moisture and debris-catching components, within the air distribution system. Moisture-producing and debris-catching components include items such as cooling coils, heating coils, fan coil units, humidifiers and filters in the air handling system. All new and existing ductwork that serves the building must have been cleaned in accordance with the recognised Standards. This includes all ductwork in the base building that serves the building from the air handling unit to the supply vents.	1	Mechanical	1		1	NDY: Achievable. No issues raised Ductwork cleaning is for the contractor, and can be added to specification once developed.	• As built mechanical drawings • Confirmation of cleaning by contractor	Yes	Low	Unlocking Individual Potential		
	9.2	Provision of Outdoor Air	For mechanically ventilated or mixed-mode spaces, outdoor air is provided at a rate 50% (1 point) 100% (2 points) greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm. For naturally ventilated spaces the requirements of AS 1668.4-2012 to be met.	2	Mechanical	1		1	CO2 sensor can meet requirement Potential Cost Implications EFSG requires outdoor air ventilation rates in accordance with requirements of AS 1668.2 and CO2 limits to be below 1500 ppm	• As built mechanical drawings • Commissioning report	Partially	Med	Unlocking Individual Potential		

CATEGORY / CREDIT	CODE	CREDIT CRITERIA	CREDIT DESCRIPTION	POINTS AVAILABLE	INPUT	Required	Good Practice / highly Rec. / Buffer Points	Total Targeted	Comments Workshop 23/07/21	Project specific evidence (example)	Captures EFSG (Yes / No / Partially)	EFSG Alignment with Green Star	Alignment with EFSG Priorities (Climate Action / Give Back more /	Alignment with GANSW Better Placed Manuals. Design Guide for Schools (DGfS) Environmental Design in Schools (EDiS)	EP&A Reg 2000 Alignment with SEARS clause 7 (4)
	9.3	Exhaust or Elimination of Pollutants	Pollutants from printing and photocopying equipment, cooking processes and equipment and vehicle exhaust are limited from the nominated area by either: •Removing the source of pollutants (products compliant with minimum emission standards or not present) •Exhausting pollutants directly to the outside in accordance with a recognized Standard and / or physically separated from occupants.	1	Mechanical	1		1	TBC Preferred option to purchase equipment with no emissions rather than ventilation solution pathway.	● As built mechanical drawings	Partially	High	Unlocking Individual Potential		
Acoustic Comfort	10.1	Internal Noise Levels	**Internal ambient noise levels** in the nominated area is no more than 5dB(A) above the "satisfactory" sound levels provided in Table 1 of AS/NZS 2107:2016. - The noise measurement and documentation must be provided by a qualified acoustic consultant. Qualified acoustic consultant - A member of the Australian Acoustical Society (AAS) or equivalent international recognised body, or a qualified staff member within an Association of Australian Acoustical Consultants (AAAC) member firm. - Noise measurement must account for all internal and external noise sources including noise arising from building services equipment, noise emission from outdoor sources such as traffic, and (where known) noise from industrial process. Occupancy	1	Acoustics	1		1	Not engaged yet. Will be required. Acoustic consultant required	● Detailed drawings ● Acoustic report ● Commissioning report ● Acoustic post occupancy evaluation	Yes	High	Unlocking Individual	**5-Amenity** - Locate buildings away from noisy roads and other noise sources to ensure acoustic levels within teaching and learning spaces are acceptable EDGS Acoustics	
	10.2	Reverberation	**Reverberation** - The persistent prolonged reflections of sound in a space. A technical definition is provided in AS/NZS 2107:2000. **Reverberation** time in the nominated area must be below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016. - Where note 3 of AS/NZ 2107:2016 applies and requires that reverberation times be	1	Acoustics		1	1	Acoustic consultant required		Yes	High	Unlocking Individual Potential		
	10.3	Acoustic Separation	**Enclosed space** - Meeting rooms, private offices, classrooms, residential units and any other similar space, where it is expected that noise should not carry over from one space to the next. **10.3** The project addresses noise transmission in enclosed spaces. There are two methods for demonstrating compliance with this criterion	1	Acoustics		1	1	Acoustics consultant required		Yes	High	Unlocking Individual	**Aligns with DGfS** **5-Amenity** Where teaching and learning spaces must be located alongside noise sources, arrange built form to ensure dual aspect that will allow for natural ventilation away from	
Lighting Comfort	11.0	Minimum Lighting Comfort	**11.0 Flicker-free lighting** to luminaires that have either: - A minimum Class A1 & A2 ballast; - High frequency ballasts for all fluorescent lamps; or - Electronic drivers that feature 12-bit or greater resolution for all Light-emitting Diode (LED)lighting. **11.0 Minimum Colour Rendering Index (CRI) of 80**, unless the project team can demonstrate that, in a particular area, the activity is not impeded by a lower CRI based on Table 7.2 in AS 1680.1:2006.	-	Lighting	C		C	NDY Comments: No issues. Achievable	● Lighting drawings ● Architectural drawings ● Lighting specifications / schedules ● Isolux drawings	Yes	High	Unlocking Individual Potential		
	11.1	General Illuminance and Glare Reduction	**11.1.1 General Illuminance** Maintained illuminance that meets the levels recommended in the relevant Standard (AS1680) or ANSI/IES RP-28-07 for retirement living spaces. Maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS 1680.1:2006, with an assumed standard maintenance factor of 0.8. **11.1.2 Glare Reduction methods** - Prescriptive: all 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 looking directly upwards. - Prescriptive: For uniform lighting solutions, the lighting system complies with the	1	Lighting	1		1	NDY Comments: No issues. Achievable		Yes	High	Unlocking Individual Potential		
	11.2	Surface Illuminance	**OPTION 1**: 95% of the spaces in the nominated area must have: - A surface reflectance for ceilings of at least 0.75 obtained from the manufacturer's data sheet; - A direct/indirect lighting system present such that the ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane. **OPTION 2**: the 95% of the spaces in the nominated area must be modelled to show that: -The average ceiling luminance (excluding light fixtures) does not exceed 0.5 kcd/m2 and the maximum luminance at any point on the ceiling does not exceed 1.5 kcd/m2;	1	Architect Lighting			0	Not likely to achieve. Not targeted point removed		Yes	High	Unlocking Individual Potential		
	11.3	Localised Lighting Control	95% of the nominated area, occupants have the ability to control the lighting in their immediate environment. This includes turning the lights on and off and adjusting their light levels.	1	Lighting		1	1	Non-dimmable. One switch per classroom. Check requirements about control levels. TBC upon discussion of control options in Education buildings		Partially	Med	Unlocking Individual Potential Climate Action		
Visual Comfort	12.0	Glare Reduction	**OPTION 1**: For viewing facades (except skylights) , the nominated plane is at ground level and is a narrow band along the entire length of viewing façade, 1.5m in from the viewing façade. Nominated plane must be shown to be shaded for 80% of the nominated hours each day of the equinoxes and solstices. **OPTION 2**: All blinds or screens in the nominated area must meet the following criteria: The blinds must provide glare reduction to at least 95% of the area of viewing façade and skylights; Blinds must be controlled by all affected occupants within each individual space; and Blinds must have a visual light transmittance (VLT) of = 10%.	-	Architect ESD	C		C	Aligns with EFSG sun control DG, to block direct sun from 9am to 3pm. TBC sun study to be done.	● Architectural drawings	Partially	High	Unlocking Individual Potential		
	12.1	Daylight	**OPTION 1:** For this option, daylight access is determined through modelling the Daylight Factor across the Nominated Area. High Levels of daylight are deemed to have daylight factors above 2.0% for all spaces, except living rooms and dining rooms in residential primary spaces, where the threshold is a 1.5% daylight factor. **OPTION 2**: For this option, daylight access is determined through modelling Daylight Illuminance (DI) across the Nominated Area. High Levels of daylight are deemed to have at least 160 lux due to daylight during 80% of the nominated hours.	2	Architect ESD	1		1	TBC in Daylight Report. Under development	● Daylight modelling report	Yes	High	Unlocking Individual	**Aligns with DGfS** **4-Health and Safer** Locate buildings and design facades that optimise fresh air intake and access to daylight **Align with EDGS** Daylight and views	
	12.2	Views	**At least 60% of the nominated area** has a clear line-of-sight to a high quality internal or external view. All floor areas within 8m from a compliant view can be considered to meet this credit criterion.	1	Architect	1		1		● Landscape design report ● Architectural drawings	Yes	High	Unlocking Individual	**Aligns with DGfS** **5-Amenity** Ensure access to sunlight, natural ventilation and visual outlook wherever	

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Indoor Pollutants	13.1	Paints, Adhesives, Sealants and Carpets	**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	1	Architect	1		1	To be specified during material selection	● Materials specifications	Yes	High	Give back more than	As above	
	13.2	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 the formaldehyde emission limits. Engineered wood products include particleboard, plywood, MDF, LVL, HOL, Compact Laminate and decorative overlaid wood panels. AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	1	Architect Head Contractor	1		1	To be specified during material selection.	As above	Yes	High	Give back more than we take		
Thermal Comfort	14.1	Thermal Comfort	For 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided. There are a number of options for demonstrating compliance depending on the type of space, as follows. **A.** Naturally Ventilated Spaces – The internal temperatures in each space are within 80% of Acceptability Limit 1 of ASHRAE Standard 55-2013; **B.** Mechanically Ventilated Spaces – The space meets specified prescriptive criteria for Thermal Comfort or the Predicted Mean Vote (PMV) levels are between -1 and +1,	1	Mechanical	1		1	Aligns with EFSG and NCC. Section J	● Drawings ● Thermal comfort modelling report	Partially	High	Unlocking Individual	**Aligns with EDiS** Ventilation Strategy	
	14.2	Advanced Thermal Comfort	For 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided. There are a number of methods for demonstrating compliance, as follows: A Naturally Ventilated Spaces A. The internal temperatures in each space are within 90% of Acceptability Limit 1 of ASHRAE Standard 55-2013, in accordance with 14.1A	1	Mechanical			0				High			
Total				**17**		**10**	**3**	**13**							
Energy				**22**											
Greenhouse Gas Emissions	15E.0	Conditional Requirement: Reference Building Pathway	Operational GHG from the proposed building are less than those of the equivalent Benchmark Building. The BB represents a 10% improvement on a building which achieves minimal compliance with the NCC Section J DTS sions using a defined HVAC type (Reference Building)	0	Architect Mechanical Façade V.Transport Electrical Hydraulics ESD	C		C	EFSG requirement to achieve 10% Energy Reduction from NCC **without accounting for renewables.**	● Section J modelling report	Yes	High	Climate Action		
	15E.1	Comparison to a Reference Building Pathway	Relates to building fabric performance	4						● Energy modelling report	-	High			
	15E.2	Comparison to a Reference Building Pathway	Reducing the proposed building's modelled emissions against the Benchmark Building energy model	16	Architect Mechanical Façade V.Transport Electrical Hydraulics ESD	2		2	70kW PV System currently included Confirm number of cores: 21 PS 2 Stream HS PV As per DG66 Confirm proposed location, number of panels and orientation. On the HS gym buildings (central building towards the south)		Yes	High	Climate Action	**Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Minimise reliance on mechanical systems **Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Include initiatives to reduce emissions **Aligns with EDiS** - Passive cooling and heating - Shading - Building Envelope and glazing - Building Sealing - Energy efficiency - Include Solat Panels	
Peak Electricity Demand Reduction	16A	Prescriptive Pathway - On-site Energy Generation	Where it is demonstrated that the use of on-site electricity generation systems reduces the total peak electricity demand by at least 15%		Electrical					As above		High			
	16B	Performance Pathway - Reference Building	It is demonstrated that the project's predicted peak electricity demand has been reduced below that of a Reference Building 20% : 1 point 30%: 2 points	2	Electrical		1	1	TBC				Climate Action	**Aligns with DGfS** **Sustainable, Effcient and durable.** - Include the use of advanced energy production systems where possible **EDiS**	
Total				**22**		**2**	**1**	**3**							
Transport				**10**											
Sustainable Transport	17A.1	Performance Pathway	Up to 10 points are available where projects provide access to sustainable transport infrastructure ihch decreases GHG emissions from transport, decreases mental and social impacts of commuting and enco uptake of healthier active transport options.	10	Transport Architect SINSW				Transport Plan under development. Point will not be claimed until plan is further developed	● Green Travel Plan ● Architectural drawings		High		**Aligns with DGfS** **1-Context, built for and landscape.** Take advantage of its context by optimising access to nearby transport, public facilities and local centres. **Aligns with EDiS** Encourage physical activity	
	17B.1	Access by Public Transport	Points available based on the accessibility of the site by public transport	3										**Aligns with DGfS** **2- Sustainable, Efficient and durable.** - Maximise opportunities for safe walking, cycling and public transport access to and	
	17B.2	Reduced Car Parking Provision	Reduction in the number of car parking spaces when compared to a standard practice building.	1											
	17B.3	Low Emission Vehicle Infrastructure	Parking spaces and/or dedicated infrastructure is provided to support the uptake of low-emission vehicles.	1	Architect Electrical	1		1	TBC 5% of parking spaces to have EV infrastructure. Currently 2 visitor spaces with EV infrastructure. Confirm the % of EV if is for regular				Climate Action		
	17B.4	Active Transport Facilities	Bicycle parking and associated facilities are provided to regular building occupants and visitors.	1											
	17B.5	Walkable Neighbourhoods	The project is located conveniently to amenities or the project achieves a specified Walk Score.	1										**Aligns with DGfS** **4-Health and Safety** - Support safe walking and cycling to and from school through connections to local hike and foot paths and the provision of	
Total				**10**		**1**	**0**	**1**							
Water				**12**											
Potable Water	18A.1	Potable Water - Performance Pathway	Up to 12 points available based on the magnitude of the predicted reduction in potable water consumption, when the project is compared against a Reference Building. Potable Water calculator must be used.	12	Hydraulics Landscape				Water Calculator to be done	● Hydraulic drawings ● Potable water calculations		High			

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	18B.1	Sanitary Fixture Efficiency	All fixtures are within one Star of the WELS rating specified by GS Taps / Urinals / Dishwashers=6 Stars Toilets / Clothes washing machines=5 Stars Showers=3 Star (>4.5 but <=6.0)	1	Hydraulics Architects	1		1			Yes	High	Give back more than	**Aligns with EDiS** Combine Water Sensitive Design Water Efficiency	
	18B.2	Rainwater Reuse	Rainwater tank is installed to collect and reuse rainwater. The rainwater tank volume must meet the following criteria as a minimum: GFA 2.500 (m2) ------ 25 (kL) GFA 5.000 (m2) ------ 50 (kL) GFA 10.000 (m2) ------ 100 (kL) GFA 20.000 (m2) ------ 200 (kL) Note that this table is an over-simplified sizing indication. Tanks should be sized based on the collection area, rainfall and the demands for rainwater use on the project	1	Hydraulics	1		1	Current tank size proposed? Rainwater used for irrigation and toilet flushing as per EFSG. Potential for the OSD tanks to be used for irrigation.		Partially	High	Give back more than	**Aligns with EDiS** Contribute to Local Environment	
	18B.3	Heat Rejection	No water is used for heat rejection	2	Mechanical	2		2	Achieved		No	Low	Give back more than we take		
	18B.4	Landscape Irrigation	Either subsoil drip irrigation with moisture sensor override is installed or no potable water is used for irrigation. For Xeriscape gardens (Dry gardens) if any, the provision of irrigation systems must be able to be removed within 3 months of installation and the landscape must not require watering after this time	1	Landscape	1		1	Which areas will have irrigation? Ovals/Sports Field considerations CIR Irrigation around the building. TBC about any irrigation requirement for sport field		Yes	Med	Give back more than	**Aligns with EDiS** Contribute to Local Environment	
	18B.5	Fire System Test Water	One of the following conditions is met: - Fire protection system does not expel water for testing -The fire protection system includes temporary storage for 80% of the routine fire protection system test water and maintenance drain-downs for reuse on-site calculated on the basis that any single zone is drained down annually or; -If sprinkles are installed, each floor must be fitted with isolation valves or shut down points for system-by-system testing.	1	Fire				Not achievable		Yes	High			
Total				**6**		**5**	**0**	**5**							
Materials				**14**											
Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	Up to 7 points are available where a whole-of-building, whole of life (cradle to grave) life cycle assessment (LCA) is conducted for the project and a reference building.	0							Yes	Low	Give back more than we take		
	19B.1	Concrete	Portland Cement content in all concrete used in the project has been reduced by replacing it with supplementary cementitious materials. -30% reduction of Portland Cement (measured by mass) compared to a reference case. (1 point) -40% reduction (2 points) -Mix water for all concrete contains at least 50% captured or reclaimed water (0.5 points) Aggregates Reduction (0.5 points) -40% of coarse aggregate in the concrete is crushed slag aggregate or another alternative material -Or, 25% of fine aggregate (sand) inputs in the concrete are manufactured sand or other alternative material. *Cost of concrete must me more than 1% of the Project Contract Value for this credit.	3	Structural	1		1	Can be included. Structural to include in specifications. TBC by DFMA suppliers when possible.		Partially	N/A		**Aligns with DGfS** **7- Aesthetics** Achieve a purposeful composition of materials and elements through a rigorous design process **Aligns with DGfS** **2 - Sustainable, Efficient and durable.** - Include initiatives to reduce embodied Energy	
	19B.2	Steel	Steel framed building: 5% reduction of steel framing mass is reduced when compared to standard practice. Reduction can be achieved through: High strength steel (GS specifies strength grades) or mass reduction Concrete framed building: 5% reduction of steel reinforcement mass when compared to standard practice.	1	Structural		1	1	TBC by structural and DFMA suppliers when possible.		No	N/A			
	19B.3	Building Reuse	Façade Reuse: 1 point available where at least 50% (by area) of the building façade is retained or 2 points are available where the proportion retained is 80% Structure Reuse: 30% by mass of the existing major structure is retained or 2 points available the proportion retained is 60%	4	Architect					● Demolition drawings	No	N/A			
	19B.4	Structural Timber	Minimum requirement: All structural timber used in the building is responsibly sourced	4	Structural						No	N/A			
Responsible Building Materials	20.1	Structural and Reinforcing Steel	95% of the building steel (by mass) is sourced from a Responsible Steel Maker and, -For steel frame buildings 60% of the fabricated structural steelwork is supplied by a steel fabricator/contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute. -For concrete framed buildings, at least 60% (by mass) of all reinforcing bar and mesh is produced using energy-reducing processed in its manufacture (measured by average mass by steel maker annually)	1	Structural	1		1	To be included in material specification. TBD with DFMA supplier		No	Low	Give back more than	**Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Include initiatives to reduce embodied Energy	
	20.2	Timber Products	At least 95% (by cost) of all timber used in the building and construction works is either: A. Certified by a forest certification scheme that meets the GBCA "essential" criteria , ; or B. From a reused source This requirement applies to all timber specifications within the building and construction works. No distinction is made between temperate, tropical, hardwood, softwood timber and engineered wood products. Typical timber uses which apply to this credit include: ⊠Formwork and other temporary installations of timber ⊠Structural and non-structural timber ⊠External and internal cladding ⊠Flooring, walls and ceiling finishes ⊠Internal and external joinery, windows, doors, balustrades,	1	Architect Structural	1		1	Aligns with EFSG. Likely to be achieved	● Timber specifications	Yes	High	Give back more than we take		
	20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	90% (by cost) of all permanent formwork, pipes, flooring, blinds and cables in a project either: - Does not contain PVC and have a recognised product declaration (SDS or EPD) Meet the GBCA Best Practice Guidelines for PVC	1	Hydraulics Civil Architect Electrical Contractor		0	0	TBC. Potential cost impact. Not likely		No	Low			
Sustainable Products	21.1	Product Transparency and Sustainability	A proportion of all materials used in the project meet transparency and sustainability requirements specified. A specified percentage of eligible products meet one of the following initiatives: A. Reused Products (SF = 1.0); B. Recycled Content Products (SF = 0-1.0); C. Environmental Product Declarations (SF = 0.5 - 0.75); D. Third Party Certification (SF = 0.5 -1); or	3	Architect Structural		1	1	Potentially likely to be met if the other material credits are achieved.	● Environmental Management Plan ● C&D waste report		Med			
Construction and Demolition Waste	22A	Fixed Benchmark	Construction waste going to landfill is reduced by minimizing the total amount of waste sent to landfill when compared against a typical building.		Contractor							Med		**Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Include initiatives to reduce waste	

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	22B	Percentage Benchmark	Construction waste going to landfill is reduced by diverting a significant proportion of waste from going to landfill. (90%)	1	Contractor	1		1	To be included in contractor specifications		Yes	High	Give back more thar	**Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Include initiatives to reduce waste	Aligns with Improved valuation, Pricing and Incentive Mechanisms Make reference to
Total				**12**		**4**	**2**	**6**							
Land Use & Ecology				**6**											
Ecological Value	23.0	Endangered, Threatened or Vulnerable Species	A check is carried out to ensure that the site does not contain critically endangered, endangered, or vulnerable species or ecological communities' as defined in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).	Req	Ecologist Landscape	C		C	Update on Current situation with the endangered community identified on site. Current intention to offset on site. To be reviewed.	● Biodiversity and ecology studies ● Arborist studies ● Landscape drawings	Partially	High	Give back more thar	**Aligns with DGfS** **6- Whole of Life flexible and adaptive** Respond to the findings of a site appraisal including in-ground conditions, contamination, flora and fauna, flooding, drainage and erosion	Aligns with Conservation of Biological Diversity Ecological Integrity EFSG DG02.06 Ecological Conservation
	23.1	Ecological Value	The change in ecological value is determined by comparing the Ecological Value Score of the site at the time of purchase ('before' state) to the Ecological Value Score of the site as built ('after' state). The change in Ecological Value between the two states is used to determine the relative improvement. Improvement in Ecological Value 0.01 - 1 point 0.1 - 2 points. 2 - 3 points	3	Landscape		1	1	Depends on the initial ecological condition of the existing site. To be confirmed Requires calculation. Previous use was a golf course. TBC		Partially	High	Give back more thar	**Aligns with DGfS** **Design Considerations** **1- Context, built for and landscape.** - Designed to recognise and protect the special visual qualities and natural environment and designed to minimise the development's impact on the	Aligns with Conservation of Biological Diversity Ecological Integrity EFSG DG02.06 Ecological Conservation
Sustainable Sites	24.0	Conditional Requirement	The project is not on land containing old-growth forest. AND The project is not on prime agricultural land. AND The project does not impact on any wetland listed as being of 'High National Importance', unless specified Wetland Protection Measures are in place. AND The project does not have a significant impact on 'Matters of National Significance' listed under the Environmental Protection and Biodiversity Conservation Act (1999).	Req	Landscape	C		C		● Service Need Report ● Business case report	Partially	High	Give back more than we take		
	24.1	Reuse of Land	75% of the site was 'previously developed land' at the date of site purchase; or The project is a building extension, and 75% of the extension (including landscaping) falls within an area of the site that was 'previously developed land' at the project's Green Star registration date.	1	N/A					As above	No	Med			
	24.2	Contamination and Hazardous Materials	The site has been previously contaminated to the extent that the intended uses, as permitted under the relevant planning scheme, were initially precluded; - The developer has adopted and implemented a best practice site remediation strategy; and - The best practice site remediation strategy and implementation has been signed off by an auditor prior to issue of the occupation certificate. OR A comprehensive hazardous materials survey has been 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; and Where the survey identified asbestos, lead or PCBs in any existing buildings or	1	PM Contractor		1	1	Potentially can be achieved. Remediation works are required and will be done. Confirmation required regarding extent of remediations.	● Hazardous materials surveys ● Decontamination reports	Yes	High	Give back more thar	**Aligns with DGfS** **6 -Whole of life, flexible and adaptive** - Respond to the findings of a site appraisal including in-ground conditions, contamination, flora and fauna, flooding, drainage and erosion, noise and traffic generation	
Heat Island Effect	25.0	Heat Island Effect Reduction	At least 75% of the whole site area comprises of one or a combination of the following: - 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. - Only 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. - Unshaded hard-scaping elements with a three year SRI of minimum 34 or an initial SRI of minimum 39;	1	Architect	1		1	Likely to be achieved. Consider new asphalt on site. Calculation required on a site plan to demonstrate.	● Landscape drawings ● Roofing specifications	Partially	Med	Resilience	**Aligns with EDiS** Contribute to Local Environment Cooling air temperature Understand the importance of trees for heating, cooling, and shading Covered outdoor learning areas	
Total				**6**		**1**	**2**	**3**							
Emissions				**5**											
Stormwater	26.1	Stormwater Peak Discharge	Post-development peak event stormwater discharge from the site does not exceed the pre-development peak event stormwater discharge, using the Average Recurrence Interval (ARI) Management of stormwater peak flows may include one or more of the following techniques: •Stormwater reuse (Roof collection and reuse) •Water detention •Infiltration to native soils / plant stormwater treatment systems •Stormwater evapotranspiration	1	Civil Landscape	1		1	Likely to be achieved. Discussed with Civil, no issues raised. OSD basin designed for 1:100 ARI proposed	● Civil drawings and specifications ● Water sensitive urban design report	Partially	Med	Give back more thar	**Aligns with DGfS** **2-Sustainable, Efficient and durable.** - Integrate landscape, planting and Water Sensitive Urban Design (WSUD) principles to enhance amenity and building performance **Aligns with EDiS** Contribute to Local Environment Capturing run-off	
	26.2	Stormwater Pollution Targets	All stormwater discharged from the site meets the required pollution reduction targets when compared to untreated runoff. Include detention tanks, Water Quality Treatment Devices & WSUD features. Min Pollution Reduction Targets Total Suspended Solids TSS - 80% Gross Pollutants - 85% Total Nitrogen (TN) - 30% Total Phosphorus (TP) - 30% Total Petroleum Hydrocarbons - 60% Free Oils - 90%	1	Civil	1	0	1	Likely to be achieved. Potentially could claim 2 points if targets in column B are met.		Partially	Med	Give back more than we take		
Light Pollution	27.0	Light Pollution to Neighbouring Bodies	The project complies with AS 4248:1997 Control of the obtrusive effects of outdoor lighting	-	Lighting	C		C	Likely to be achieved	● As built drawings ● Confirmation by lighting	No	Med			
	27.1	Light Pollution to Night Sky	A specified reduction in light pollution has been achieved by the project. Two options available to demonstrate.	1	Lighting	1		1	Likely to be achieved		No	Med			
Microbial Control	28.0	Legionella Impacts from Cooling Systems	This credit can be claimed where the building is either: Is naturally Ventilated Has waterless heat rejection Has water based heat rejection systems that include measures for Legionella Control and Risk Management	1	Mechanical	1		1	Waterless heat rejection proposed	● Mechanical system specifications	No	High			

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Refrigerant Impacts	29.0	Refrigerants Impacts	Point can be claimed if one of the following is achieved: The calculated Total System Direct Environmental Impact (TSDEI) of the refrigerant systems in the building is less than 15 The calculated TSDEI is between 15 and 35 and a leak detection system with automated refrigerant recovery is in place All refrigerants in the project have an ozone depletion potential of zero and a global warming potential of 10 or less No refrigerants are employed within the building systems	1	Mechanical		0	0				Med			
Total				**5**		**4**	**0**	**4**							
Innovation				**10**											
Innovative Technology or Process	30A	Innovative Technology or Process	**Principal's Dashboard** The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	1	Architects SINSW		1	1	To be discussed with the school working group to determine if this will be installed.		Yes				
Market Transformation	30B	Market Transformation	**DFMA** The project has undertaken a sustainability initiative that sustainably contributes to the broader market transformation towards sustainable development in Australia or the world. Sustainability in the supply chain can be addressed by the DFMA process. The Following must be provided:	1	Architects SINSW		1	1	Requires a report to be prepared.						
Innovation Challenge	30D	Community Benefits	Projects within the SINSW umbrella may target 1 point using SI policy "Community Use of School Facilities" and "Share our spaces" in lieu of a needs analysis report. The following must be provided: - Submission Template - Narrative demonstrating the process undertaken to develop SI community use policies. - Evidence of community engagement activites undertaken to develop the community benefits strategy. - Plans outlining how these have been implemented in the project - Any supplementary evidence required to demonstrate this claim - Joint use or lease agreements where already in place - Copy of the approved CIR	1	SINSW Architect		1	1	Opportunities for share uses are available however no joint use agreements are currently in place. No additional security lines are proposed but they have been considered in the design and could be included if required.	● Confirmation of spaces accessible for community uses	Yes	High	Give back more than	**Aligns with DGfS** **3-Accesible and Inclusive** Schools should actively seek opportunities for their facilities to be shared with the community and cater for activities outside of school hours. **Aligns with EDiS** **4-Community Assets** Open schools as public spaces outside	
Innovation Challenge	30D	Integrating Healthy Environments	Projects within the SINSW umbrella may target 1 point providing the Healthy Canteen Policy research report in lieu of a community analysis report. The following must be provided: - Submission Template - Research behind Healthy Canteen Policy - A letter of commitment that this program will be implemented in all NSW schools - Evidence demonstrating that this program will be implemented in the project being	1	SINSW	1		1	To be discussed with the school working group to determine if this will be applied to the school.	● Healthy Canteen Strategy	Yes	High	Unlocking Individual Potential			
Innovation Challenge	30D	RAP	An organizational RAP can be used. However, the project must demonstrate a relationship to and a role in delivering, the action items within the organizational RAP. Compliance requirements are: - Develop a RAP endorsed by Reconciliation Australia - Demonstrate that relevant indigenous organizations have been consulted in the development of the RAP - A structure is in place to deliver the RAP including a RAP working group - Public reporting is undertaken to Reconciliation Australia - 80% of the RAP targets have been met in the first reporting cycle	1	SINSW		1	1	Reconciliation Action Plan Report (or similar) to be prepared. TBC	● Aboriginal community engagement or measures implemented in project	Yes	High	Give back more than we take			
Innovation Challenge	30D	Universal Design	Projects within the SINSW umbrella may target 1 point providing EFSG guidelines in lieu of a needs analysis report. The following must be provided: Completed Submission Template Extract of EFSG DG19 Access for people with disabilities demonstrating how design has been enhanced against the NCC	1	Architect SINSW	1		1	Preliminary access report.	● As built drawings ● DDA compliance reports	Yes	High	Unlocking Individual	**Aligns with DGfS** **3-Accesible and Inclusive** Ensure accessibility for all users of the site	
Total				**10**		**2**	**4**	**6**							
TOTAL				**110**		**40**	**14**	**54**							

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10.0 Appendix C: Climate Change Risk Assessment Matrix

Jindabyne Education Campus

Climate Change Risk Assessment and Mitigation Strategies

To be discussed and agreed with teams

Date **27th July 2021**

Risk Reference	Climate Projection	Potential impact on the project (environmental, social and economic)	Likelihood	Consequences	Risk Rating	Responsible Party	Adaptation actions
Increased Temperatures / Number of Hot Days							
1	Increased average temperatures / Number of Hot Days Projections for temperature increase range: Near future increase by (0.5-1.0°C) Far future increase by (1.7-2.5°C) (Daily Max. Temp)	Higher on-going cost for space and air conditioning. Higher cooling capacity of mechanical plant.	Likely	Moderate	High	Mech	Passive Design Optimisation - Façade and building fabric to perform better than min. NCC 2019 SJ requirements / Increasing insulation R-values / Glazing ratios and performance / Shading / Air tightness / Heat recovery / etc. Adaptive comfort and ceiling fans - will allow for some increase in temperatures during peak times. All spaces are conditioned, which is a newer requirement. School is closed during peak heat periods of the year - which reduces the risk. Possible strategies: Manage peak days or increase plant sizing. Implications in cost and space to increase plant.
2	Increased average temperatures	Increase in hot days leading to increased outdoor temperatures and reduced themal comfort. Likely worst for hardscaping areas (car parks / roads / etc) through urban heat island effect (HIE)	Likely	Moderate	High	Landscape and Architect	Provision of trees and covered walkaways for shading Use of soft landscape to reduce heat island and improve outdoor thermal comfort. Additional planting around car parking and other areas adjacent to hardscaped areas to improve shading and reduce HIE. - Trees proposed on car park. Break up hardscape as much as possible. Light colour and non reflective finishes to be used when possible to reduce HIE. Shade structures to provide shade particularly when trees are still growing. Potential issues with wind on site - intention to retain mature trees as much as possible for shading. Landscape Team: More trees near windows to reduce temperatures within class rooms - Bushfire requirements (3-5 meters) for tree distance. Trees provided in the West.
3	Increased average temperatures	Thermal expansion of the cladding, framing and building structure, leading to possible damage of buildings.	Unlikely	Moderate	Medium	Architect	Impact on building structure likely to be minimal? Thermal bridging and insulation will be designed to NCC 2019 Façade specifications under development, Potential heat impact on materials to be assessed once façade is further developed. Thermal expansion to be considered in facade design. Facade To be defined at a later stage.
4	Increased average temperatures	Blackout / Power interruptions impact to power and services, leading to loss of productivity and comfort and possibly impact on health of students.	Likely	Major	High	Electrical	Back up generation - no back up generation included. An additional connection could be considered so that a temporary generator could be brought in? Battery storage is not currently included. Potential for space to be provided for battery storage or a future generator to be stored more permanently? Passive design for daylight and thermal comfort will support operating during the daytime with no power? Potential Provision for a temporary generator connection will be made in the main switchboard design of both schools.? If site looses all power - students likely to be sent home. Potantially have a link box to connect portable generator. Cost implications $10K
5	Increased maximum temperatures.	Reduced thermal comfort within the buildings (also linked to humidity rise) and reduced cooling plant efficiency.	Almost Certain	Moderate	High	Mechanical and SINSW	TBC if Relaxed set points possible. Passive design measures to reduce impact. Management of facility to only condition certain areas in peak hot days not feasible because increasing occupancy will compromise the system's effectiveness.
6	Increased maximum temperatures	Passive cooling for the substations may not be sufficient, resulting in lower electrical loads and impacting equipment lifespan.	Possible	Minor	Medium	Electrical	Substations outdoors. Not determined by the project. Not a risk.

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7	Increased maximum temperatures	Sustained heat stress to vegetation and landscaping leading to wiltering/death and reducing greenery and comfort to outdoor areas of respite, views to landscape and contributes to urban heat island effect (HIE)	Likely	Moderate	High	Landscape	Selection of local, drought tolerent species Management plan to identify periods when heat stress occur and watering to provided to supplement existing watering/ maintenance schedule. Exotic species selected are able to tolerate heat.
8	Increased maximum temperatures	PV - Inverters can only operate in a certain temperature ranges. Other mechanical plant will also be impacted.	Likely	Minor	Medium	Electrical	Avoid direct solar radiation to inverters and mech equipment. Locate in well ventilated spaces. They will operate but there will be an impact to efficiency. Inverter life around 10 years so they will be replaced during the building's life.
9	Increased maximum temperatures	Heat stress on staff and students due to extreme heat days could lead to dehydration and associated health impacts.	Likely	Moderate	High	Architect and Landscape	Access to drinking water. Will be included Operational policies - management plans for operations during extreme heat days (where kids are allowed to go etc.)
Increased in Extreme Heat Days							
11	Increase in extreme heat days	Increase in extreme heat days impacting thermal comfort within the building.	Almost Certain	Moderate	High	Mechanical	Reliance on Adaptive comfort given the site's climatic conditions. It is likely that if provided with good shading and air movement, occupants will be able to adapt to the weather during extreme heat days.
12	Increase in extreme heat days	Increase in extreme heat days resulting in higher energy bills.	Almost Certain	Minor	Medium	Mechanical	Likely to happen. Not much to be done about it. Not considered a high risk.
13	Increase in extreme heat days	Loss of planting - could lose the entire planting due to extreme heat stress.	Possible	Moderate	Medium	Landscape	Selection of local, drought tolerent species Management plan to identify periods when heat stress occur and watering to provided to supplement existing watering/ maintenance schedule. Exotic species able to tolerate heat. Moisture sensors in irrigation systems to determine when additional irrigation is needed.
14	Increase in extreme heat days	Loss of planting through irrigation failure.	Possible	Moderate	Medium	Landscape /Civil	Selection of local, drought tolerent species Potential to secure water from stormwater harvesting. Hose cocks to be located close to planted areas for easy access. Irrigations system will have an alarm to alert if there are any issues. Create student learning opportunities to be responsbile for trees/ plant health
Increased Rainfall & Storm Events							
15	Increase in rainfall intensity and storm events	Impact of flooding and damage to internal ground level finishes / furniture / equipment. Possible health risks.	Unlikely	Major	Medium	Civil	Civil to team to confirm strategies - Stormwater management features within the site OSD basin is included. Flood assessment has been done. Floor levels well above risk level identified. WSUD Features - Rain Gardens and porous pavement could potentially be included to help the stormwater system.
16	Increase in rainfall intensity and storm events	Roof flooding causing water ingress into the building causing damage to internal linings, furniture, equipment etc.	Possible	Major	High	Hydraulics and Architect	Roof is pitched and has overhangs - water will fall directly into the ground via the downpipes. Limited risk of water ingress into the building. No box gutters
17	Increase in rainfall intensity and storm events	Roof drainage flooding into the drainage design to 1:200 year storm - damage to equipment and risk to health.	Possible	Major	High	Hydraulics	Overflows into ground
19	Increase in rainfall intensity and storm events - Increased Flood Risk	Impact of flooding limiting access to the school	Unlikely	Major	Medium	Civil	not a Risk given the identified flood levels
20	Increase in rainfall intensity and storm events	Increase rainfall intensity and frequency leading to a greater size rainwater tank and Stormwater infrastructure	Possible	Minor	Medium	Hydraulics	Consider large storm events in modelling.
21	Increase in rainfall intensity and storm events - Hail storms	Damage to façade materials and vehicles during hail storm events, leading to maintenance costs	Possible	Minor	Medium	Façade / Architect	Reinforced clad panels to resist impact and wind impacts? Selection of façade materials with greater impact resistance?
22	Increase in rainfall intensity and storm events - Hail storms	Damage to people, buildings, and vehicles during hail storm events, leading to injury	Possible	Moderate	Medium	SINSW and Architects	Management plan in place for where to shelter in event of hail storm. Covered walkways to provide safe exterior circulation spaces/shelter
23	Increase in rainfall intensity and storm events - Hail storms	Hail damage to Solar PV panels resulting in maintenance cost	Possible	Moderate	Medium	Electrical	Hail loading - Confirm roof pitches to ensure hail should fall off. Insurance for PV in case Hail damange.

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24	Increase in rainfall intensity and storm events - Hail storms	Hail damage to Solar PV panels resulting in reduced energy production	Possible	Minor	Medium	Electrical	Performance and output is monitored and benchmarked - that will indicate there is an issue with panels and action can be taken.
25	Increase in rainfall intensity and storm events - Hail storms	Storm events leading to blocking roof downpipes resulting in roof flooding, internal water ingress and damage to internal building / furniture / carpets / etc.	Possible	Moderate	Medium	Hydraulics	If there is a blockage, water will go into the overflow system and that will indicate there is something wrong with the drainage and issue can be resolved.
Increased Drought Events							
26	Increase in drought events	Drought conditions leading to damage to landscape areas leading to reduced amenity and plants that potentially die off to water restrictions / limited watering.	Possible	Moderate	Medium	Landscape / SINSW	Selection of local, drought tolerent species. Management plan in place to provide additional watering to supplement routine irrigation when absolutely necessary?
27	Increase in drought events	Cracking of pipes due to drought conditions	Possible	Moderate	Medium	Hydraulics / Civil	Rock underneath so no risk.
Increased Bushfire Conditions							
28	Increase in bushfire conditions	Bushfire smoke causing poor indoor air quality, and impact to staff, student and visitor health.	Likely	Major	High	Architects / Mech	Building is designed so it can be sealed and air filtered as it enters the building. CO2 will be monitored indoors to ensure healthy ventilation rates are achieved. Operational policy to close windows in times of poor air quality. Air quality monitoring (PM / VOCs) could be incorporated? Ability to increase filtration media when air quality is very poor - require operational policy. Better than normal air tightness to be included in the design? Mechanical: If filters are improved that will have an impact on energy consumption. Potential operational policies Operational procedure - to have an override in the central control system to close the outdside air dampers. Impact on CO2 levels.
29	Increase in bushfire conditions	Bush fires causing fire damage to the school	Rare	Major	Low	PM	Site not classified as bushfire prone land, but bushfire prone areas identified around. Trees located far from the school Bushfire report - create an asset protection zone. No buildings outside the asset protection zone. Planting underneath trees can only be low ground cover Maintenance and management policies to continuously remove fire ignition material
30	Increase in bushfire conditions	More regular filter changes, higher filter maintenance and cost.	Almost Certain	Minor	Medium	SINSW	Management plan to ensure filters are monitored and replaced when necessary.
31	Increase in bushfire conditions	Increased façade maintenance due to smoke and ash buildup.	Unlikely	Minor	Low	Architect and SINSW	Review façade treatments that may reduce ongoing maintenance requirements and allevaiate the need for short to medium term asset replacement.
32	Increase in bushfire conditions	Ash buildup on façade panels will impact efficiency of the PV panels.	Unlikely	Minor	Low	SINSW	Management plan to ensure cleaning of impact building areas in the unlikely event of ash build-up.
33	Increase in bushfire conditions	Plant maintenance due to ashes	Unlikely	Minor	Low	SINSW	Management plan to ensure plant assets are inspected and cleaned in the unlikely event of ash build-up.
Decrease in Humidity							
34	Decrease on humidity	Possible need for humidification for thermal comfort.	Unlikely	Minor	Low	Mech	Change in Relative Humidity (RH) in the near future is considered low.
Increase in Air Pollution							
35	Increase in air pollution	Increase in air pollution causing poor indoor air quality, and impact to student health.	Unlikely	Major	Medium	Mech	Remote site location. Air pollution not likely to be a risk.
36	Increase in air pollution	Increased air pollution resulting in increased filter costs and replacement.	Possible	Minor	Medium	Mech / SINSW	
Increase in Wind Velocity							
37	Impact of wind	Intense wind causing some trees close to the façade to collapse and damage the school and potentially staff, students and visitors.	Possible	Moderate	Medium	Landscape / Arch	Consideration of trees located close to the buildings Selection of appropriate tree species which are not high risk for losing limbs. Trees are checked regularly and trimmed.

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38	Impact of wind	Intense winds causing damage to roof structures, leading to increased maintenance and replacement costs.	Possible	Major	High	Structure	Designed to Australian Standards. 46m/s wind speed. Wind study done - and will be developed further to understand implications