



The Forest High School

187 Allambie Road, Allambie Heights, NSW 2100

Sustainable Design Brief

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E-LAB Consulting

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Document QA and Revisions

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Authorised by:

Engineering Lab NSW Pty Ltd



Alex Kobler | Director

Sustainability

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1 EXECUTIVE SUMMARY

This Sustainable Design Brief has been prepared on behalf of School Infrastructure NSW / ADCO Pty Ltd for The Forest High School development located at 187 Allambie Road, Allambie Heights, NSW 2100. This report provides an overview of the proposed sustainability targets for the project and the sustainability initiatives to be included. Information contained within this report has been prepared in consideration of:

- The SINSW Campus Approach Document for Multi Building Single Rating projects.
- Educational Facilities Standards and Guidelines (EFSG) Sustainability Requirements.
- Government Architect NSW Environmental Design in Schools.
- NCC 2019 Amendment 1, Section J Part J1.
- A certified 5 Star Green Star Design & As Built v1.3 outcome.

The project will implement several sustainable design initiatives designed to mitigate the environmental impacts of the following areas:

- Energy & Carbon – energy efficiency across the buildings and use of on-site renewable energy
- Water Management – water efficient fixtures and fittings, collection and reuse of water and improved stormwater quality
- Health & Wellbeing - maximising daylight and improving indoor air quality through the use of low emissions materials
- Materials – consideration of the whole of life impact of materials and selection to minimise harm to the environment and efficient construction methods.
- Resilience – developing a site-specific climate change risk assessment and adaptation plan.

The following report detail the development's specific sustainable design response for Building Block A, Block B, Block C, Block D, Block E, Block F and Block G that surround a common assembly court quadrangle and adjacent Sporting fields.

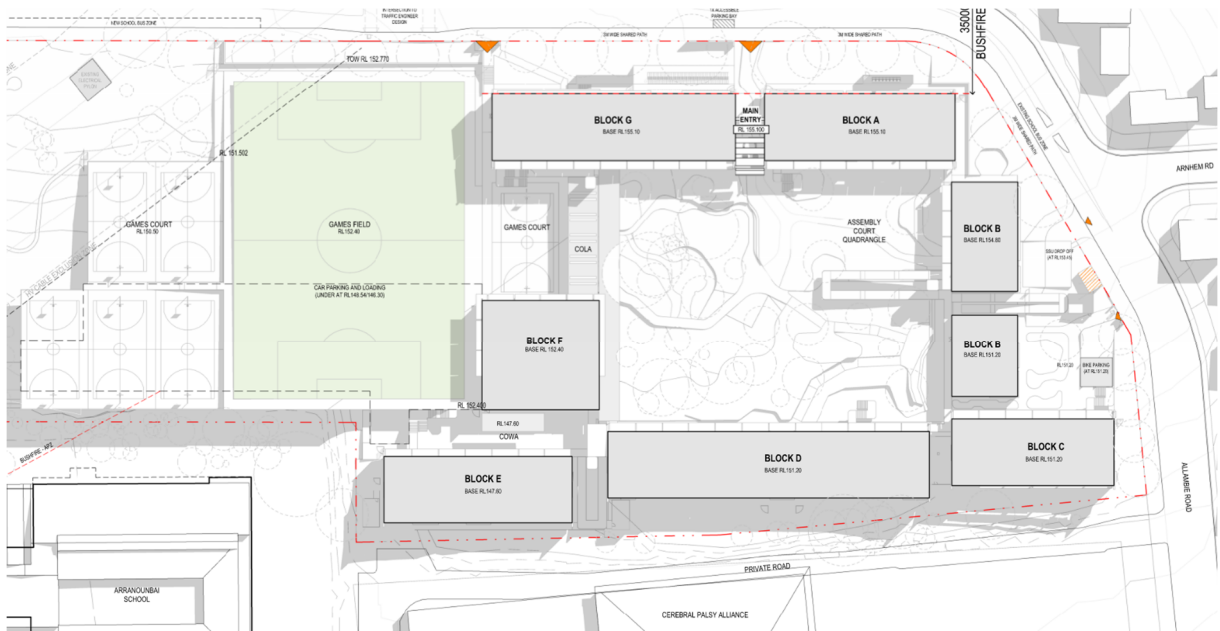


Figure 1: Context Plan - Site Plan (Source: architectus)

2 INTRODUCTION

The Forest High School development includes the construction of multiple school building blocks that surround an Assembly Court Quadrangle. The development includes the following buildings and amenities:

- Block A; Administration & Staff
- Block B; SSU
- Block C; Library
- Block D; Science
- Block E; Wood and Metal
- Block F; Gymnasium
- Block G; Performance & Fitness
- Adjacent Sport Fields and Games Courts
- Landscaping and Assembly Court Quadrangle

2.1 SITE LOCATION

The development of The Forest High School is located at 187 Allambie Road, Allambie Heights, NSW 2100 within the Northern Beaches Local Government. This location is considered as Climate Zone 5 (Warm Temperate).



Figure 2: Site and Local Context (Source: Google Maps)



Figure 3: Climate Zone Map (Source: ABCB NCC)

3 SUSTAINABILITY DRIVERS

3.1 OBJECTIVES

To demonstrate excellence in sustainability, The Forest High School development is targeting the following sustainability outcomes:

- Aligning the overall vision of the project with the ESD principles outlined in the Environmental Planning and Assessment Regulation
- Compliance with the Educational Facilities Standards and Guidelines (EFSG) by the Department of Education
- Exceeding the requirements of Section J of the National Construction Code 2019
- A 5 Star Green Star Design & As Built v1.3 certified outcome
- Inclusion of initiatives to minimise energy and water demand and minimising overall environmental impacts inline with Environmental Design in Schools by GANSW

3.2 SEARS

DPIE has issued Secretary's Environmental Assessment Requirements (SEARs) for the proposed development. A Sustainable Development Plan has been prepared in response to the relevant SEARS which include Infrastructure Requirements and Utilities, upgrades and delivery staging plans.

3.3 EDUCATIONAL FACILITIES STANDARDS AND GUIDELINES (EFSG)

The Educational Facilities Standards and Guidelines outline a number of ESD principles in DG02: Ecologically Sustainable Development including:

- 02.02 - Use of NSW Government Resource Efficiency Policy to drive efficiency in energy and water use, minimise waste and improving air quality
- 02.03 - Energy Conservation as the buildings system and façade is to comply with Section J requirements in the National Construction Code and energy consumption is to be predicted to be at least 10% lower than if built to minimum compliance with National Construction Code requirements without including renewable energy generation in the calculations. Energy reduction should consider the following design elements:
 - Use of natural daylighting to maximise daylight use of energy efficient LED lighting
 - Inclusion of lighting and HVAC sensors and capability to schedule services operation
 - External shading to reduce direct solar radiation
 - Energy efficient appliances in accordance with the GREP
 - Solar photovoltaic system to offset power consumption
- 02.04 – Water Conservation to reduce potable water use through:
 - Use of water efficient appliances and fittings
 - Rainwater harvesting for irrigation or toilet flushing
 - Closed loop system to capture and reuse fire test water or use of non-potable water
 - Stormwater management to minimise pollutants in waterways
- 02.05 – Sustainable Materials to improve indoor air quality and select materials that include:
 - Lower adverse environmental impacts throughout their life cycle
 - Reduced or no hazardous substances



- Reduced demand for rare or non-renewable resources
- Low embodied energy and water
- Recycled materials
- 02.06 – Ecological Conservation learning opportunities and modelling to the wider community to provide an ecological assessment report for the site.
- 02.07 – Waste management to develop:
 - Targets and diversion of construction and demolition waste sent to landfill with a minimum diversion rate target of 90%
 - Operational Waste management plan to establish waste targets and opportunities for reuse and recycling
- 02.08 – Climate change adaptation to adaptively respond to climate changes over time
- 02.09 – Sustainability benchmarking to develop a sustainable development plan, targets and initiatives to achieve a 4 Star Green Star rating
- 02.10 – Views to ensure high quality of views for both internal and external occupied spaces. The project will target 60% of primary occupied spaces having a clear line of sight to high quality or internal views.

4 PROJECT SUSTAINABILITY DESIGN RESPONSE

4.1 ENERGY EFFICIENCY

Energy consumption on the site will be minimised through building fabric optimisation to the thermal envelope. In order to maximise the overall energy efficiency of the site, thermal load and demand must first be reduced, then systems must be designed in the most efficient manner. On-site renewable energy should be maximised to the full potential on the site. It is only then that projects should look to offset using purchased carbon offsets.

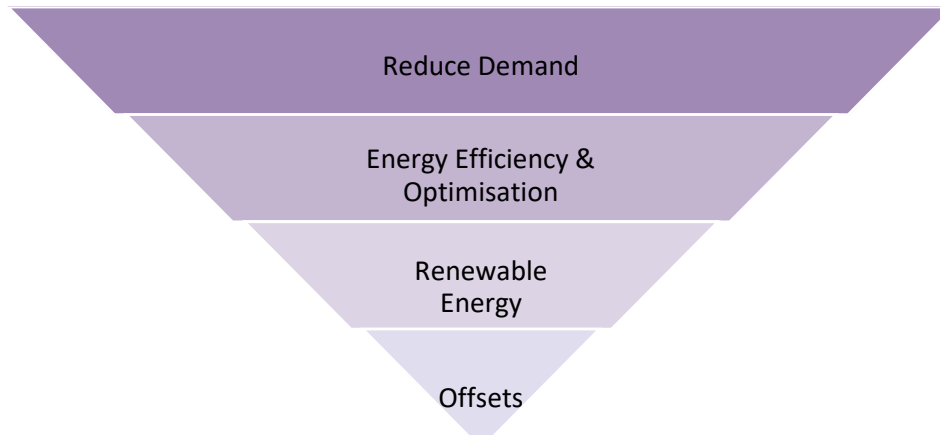


Figure 4 Hierarchy of Design - Energy Efficiency

4.1.1 High Performance Building Fabric

The building fabric has been carefully designed using a combination of solid elements and glazing for each building within The Forest High School development. Fixed vertical and horizontal projections that serve to control heat gains through the face in summer while maintaining daylight and views for general learning areas and administration areas.

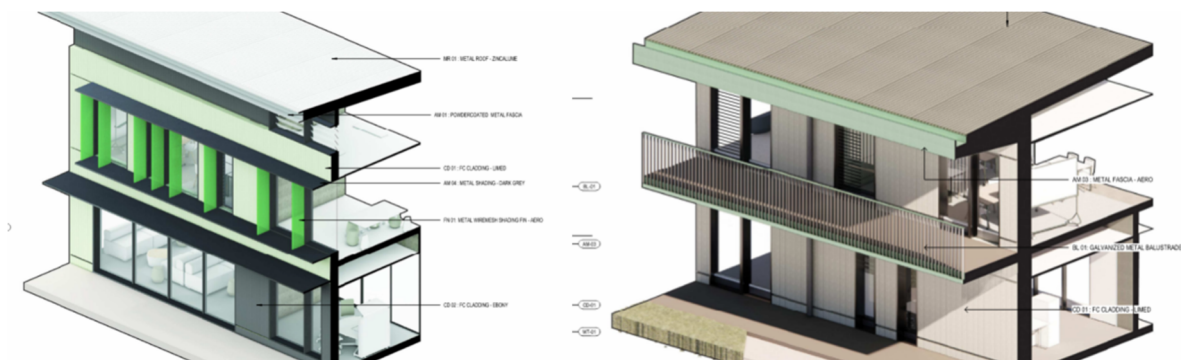


Figure 5 Façade Details 1 and 2 showing shading and vertical screens

This system is designed to reduce heating and cooling loads and complies with NCC 2019 Section J requirements for building fabric. It will also deliver greater comfort in the space to users, reduce energy consumption and improve indoor quality. Refer to E-LAB Section J report for detail.

4.1.2 Natural Ventilation

Mechanical air conditioning is the primary design to meet occupant thermal comfort for each of The Forest High School buildings. The design includes passive elements to reduce energy demand of the school's energy through operable glazed louvers to the perimeter of each building to reduce dependency on mechanical air conditioning and ventilation.

Occupants can introduce fresh air using operable glass louvers for the following areas:

- Building A: General Learning spaces
- Building B: Seminar room and general learning spaces
- Building C: Library Main Area, senior study rooms and seminar rooms
- Building D: Science Lab and Learning common areas
- Building E: General Learning Space and kitchen space
- Block F: Naturally ventilated with operable high level louvers
- Building G: Learning Common and General Learning room, workshops and seminar rooms

4.1.3 Renewable Energy

In line with EFSG DG 66, the project has been designed to incorporate a 99kW system to be installed to the roof of Block C with future panel space proposed for Block B, D and E. Final PV panel quantities, efficiency and capacity is to be confirmed as the design progresses.

4.1.4 Lighting

High efficiency LED lighting systems are to be provided as per the requirements of SG951 within the EFSG. This along with lighting control measures such as occupancy sensors and daylight sensors will aid in reducing the overall lighting energy demand.

4.2 WATER EFFICIENCY

Several considerations have been made to use and discharge water responsibly to improve the development's impact on the water cycle. The EFSG nominates several features in DG53, DG95, SG811, SG812 and SG821 which will be incorporated, including:

- The following **water efficient fixtures** will be targeted:
 - 6 Star WELS rated taps
 - 4 Star WELS dual flush toilets
 - Showers <6L/min
 - Urinals will be maximum 0.8L/flush (6 Star WELS)
- **Rainwater harvesting:** existing rainwater tanks will be on site to maximise non-potable water usage
- **Landscaping** will be designed to be low water use, with the following to be implemented:
 - Incorporation of native and low maintenance vegetation
 - Irrigation supply from non-potable water sources
 - Sub soil drip irrigation systems to minimise evaporation
- **Water Sensitive Urban Design** is a focus for the development, especially due to the proximity to coastal wetlands and biodiversity zones. Several strategies have been put in place to ensure water is intercepted and filtered before it reaches waterways and reduces overall stormwater discharge. The use of onsite

water detention and filtration systems will be used to minimise the impacts on council stormwater systems

4.3 RESOURCE EFFICIENCY

Construction materials are a highly carbon intensive component of any development. They often involve very energy intensive production processes, large amounts of raw materials including water and energy, and long transport distances to reach the location of the development. The Forest High School is committed to reduce material use and instead employ sustainably procured materials to reduce embodied carbon emissions. Alongside this, with the development being a refurbishment and redevelopment there is a reduction in total use of materials and energy intensive works to develop the site. The following strategies are in place:

- Concrete components reduction – concrete sourced for the project will have reduced Portland Cement, reduced water and reduced aggregates making the concrete utilised to be much less carbon intensive.
- Responsible steel – steel sourced for the project will be sourced from a responsible steel maker and ensure it is sustainably procured, this will ensure the products procured are aiming to reduce carbon usage during manufacture.
- Sustainable timber – timber sourced for the project will be sustainably procured to ensure the timber used is from timber farms that are actively ensuring renewability.

4.4 INDOOR ENVIRONMENT QUALITY

Improved indoor environment quality is a significant by-product of sustainable building design. The architectural design provides significant consideration to the incorporation of elements to improve indoor environment quality:

- **Covered walkways** have been designed to allow students to move between buildings while being protected from the elements, while providing a connection to nature that indoor corridors are unable to provide.
- **Views** have been considered for each of the buildings to optimise access to the outdoor environment while balancing thermal control
- **Daylight glare** is minimised through the use of vertical sunshades, blinds and horizontal self-shading building geometry
- **Artificial lighting** will be designed appropriately to minimise glare reduction and providing adequate illuminance levels. This will be done through careful luminaire selection and placement.
- **Acoustic comfort** will be optimised to ensure internal noise levels, reverberation levels and separation levels are achieved in line with best practice standards.
- **Materials and finishes** will be selected to be low-VOC and low formaldehyde to minimise off-gassing and provide a better quality environment for staff and students.
- **Thermal comfort** will be achieved through an appropriate mechanical system creating a comfortable environment for students during summer and winter.

5 GREEN STAR

The development will be targeting a **5 Star Green Star Design & As Built v1.3 certified rating**. This surpasses the 'national best practice sustainable building principles' as a minimum performance requirement.

Widely considered as the benchmark environmental assessment tool within the Australian Property Industry, Green Star is an independent accreditation framework which delivers sustainable built outcomes throughout the project lifecycle. Green Star is a credits-based star rating system ranging from one through to six stars.

Green Star assesses the environmental performance of projects in design, construction and operation via the following category frameworks:

- Management
- Indoor Environment Quality
- Energy
- Transport
- Water
- Materials
- Land use & Ecology
- Emissions; and
- Innovation

The project has been assessed against the Green Star framework and the following table outlines the proposed scorecard for the development:

CATEGORY	POINTS AVAILABLE	POINTS TARGETED
Management	14	11
Indoor Environment Quality	17	9
Energy	22	16.5
Transport	10	10
Water	12	5
Materials	12	8
Land Use & Ecology	6	2
Emissions	5	4
Innovation	10	5
Total	110	70.5

Refer to Appendix A for the full Green Star Pathway.



5.1 Multiple Building Single Rating (MBSR) approach

Schools Infrastructure NSW have developed with the GBCA an Umbrella Support Document that is applicable to all projects registered under the Design and As Built School Infrastructure NSW Umbrella. It outlines the purpose of the Multiple Building Single Rating (MBSR) approach as one that allows multiple buildings to be on the same site and covered under a single rating. This allows project teams to submit one submission with documentation covering all agreed buildings.

To be eligible for the Multiple Building Single Rating (MBSR) approach, the project meet the following eligibility criteria and submit an application to the GBCA prior to registration.

- The buildings are to be owned as a package and must be bought and sold together;
- A commitment needs to have been made to deliver the buildings at the same time and under the same contract;
- The buildings should sit near each other, with minimal chance of a building being constructed between them;
- The buildings should have the same use;
- The buildings should have the same design.

As an extension the 'Campus Approach' allows buildings located on site that form part of the development to be included with direction for credit compliance for 'site wide' documentation or as 'Building Specific' documentation.

5.2 Registered Green Star Ratings with approved MBSR approach

As part of the registration process SI NSW have submitted approval through the GBCA to address the eligibility criteria for the project to have a MBSR approach awarded for the development. Currently, the Forest High School has the following Green Star Ratings Registered and targeting a Green Star Design and As-Built V1.3 Rating:

- GS-6857DA The Forest High School Block A, C, D & E, NSW
- GS-6862DA The Forest High School Block B, NSW

5.3 Consideration for Revised MBSR

The project has developed since registration on the 1st of November 2021. At registration the projects proposed scope of works included five mod-rise high school buildings with the following description.

BUILDING	PROPOSED USE	STOREYS	AREA (M ²)
Block A;	Learning Space	4	3,387
Block B;	Admin/Staff Support	4	8,424
Block C	Gymnasium	1	1,188
Block D	Movement Studio	2	1,110
Block E	Learning Space and Staff Spaces	3	3,332

It is proposed SI NSW resubmit an update to the eligibility criteria for the Multiple Building Single Rating to reduce documentation requirements for multiple Green Star ratings and submissions. As the GBCA has approved the Movement Studio and Gymnasium form part of the current MBSR approach, it is anticipated that a single rating could be achieved for all school buildings in the development.

6 NCC 2019 SECTION J ASSESSMENT SUMMARY

Section J of the National Construction Code 2019 relates to the energy efficiency of buildings in reference to building fabric, building sealing, air conditioning and ventilation systems, artificial lighting and power, heated water supply and facilities for energy monitoring. The Forest High School development has demonstrated compliance to Section J Energy Efficiency, JP1 Energy use using the JV3 Verification method for a Class 9b building and has agreed the following approach with the building certifier MBC Group.

The Forest High School proposed buildings A to G is to have separate façade calculators for each building to establish a combined Model 1 Reference Building with an annual greenhouse gas emissions benchmark to be compared to Model 2 Proposed Building with the same services

The modelling profile for all spaces is to reference Specification JVc Modelling Profiles, Table 2j Occupancy and operation profiles of a Class 9b school for Model 1 Reference Building and Model 2 Proposed Building.

The development includes seven buildings known as Building A to Building G that are connected by a common Assembly Court Quadrangle with the following general information:

- Address; The Forest High School, 187 Allambie Road, Allambie Heights, NSW 2100
- Building State; NSW
- Building Classification; Class 9b – schools
- Climate Zone; Class 5 – Warm temperate

A NCC 2019 Section JV3 assessment has been carried out for the development to verify the proposed building thermal performance targets for solid and glazed elements on the building fabric thermal envelope. The table below outlines the improvement of thermal performance for the proposed walls, floor and roof of Building A to Building G in reference to the minimum thermal performance requirements NCC 2019 Section J Deemed-to-Satisfy provisions.

Solid Elements:

BUILDING	ELEMENT (BUILDING FABRIC LOCATED ON THERMAL ENVELOPE)	REFERENCE PROJECT	PROPOSED PROJECT
Building A Building B	Roof/Ceiling	R _T -Value = 3.7 m ² .K/W	R_T-Value = 4.1 m².K/W
Building C Building D	External Walls	R _T -Value = 1.0 m ² .K/W	R_T-Value = 1.43 m².K/W
Building E Building F	Internal Walls	R _T -Value = 1.0 m ² .K/W	R_T-Value = 1.43 m².K/W
Building G	Exposed Floor	R _T -Value = 2.0 m ² .K/W	R_T-Value = 2.2 m².K/W

The extent of glazing to façade ratio for each building's elevation has been derived from Architectural general arrangements, elevations, façade details and window schedules and is outlined in the table below. It includes a summary of the Model 1 Reference Building Deemed-to-Satisfy thermal performance benchmark and the Model 2 Proposed Building total system thermal performance targets for fixed glazing and operable louvers included in the design.

Glazed Elements:

BUILDING	ELEVATION	GLAZING TO FAÇADE AREA	REFERENCE PROJECT (METHOD 2)	PROPOSED PROJECT*
Building A	North	31%	Total System U-Value: 5.5 Total System SHGC: 0.54	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	23%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	37%		
	West	8%		
Building B	North	19%	Total System U-Value: 4.8 Total System SHGC: 0.47	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	39%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	31%		
	West	40%		
Building C	North	34%	Total System U-Value: 4.5 Total System SHGC: 0.41	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	14%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	54%		
	West	5%		
Building D	North	41%	Total System U-Value: 4.7 Total System SHGC: 0.50	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	21%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	35%		
	West	21%		

BUILDING	ELEVATION	GLAZING TO FAÇADE AREA	REFERENCE PROJECT (METHOD 2)	PROPOSED PROJECT*
Building E	North	35%	Total System U-Value: 5.7 Total System SHGC: 0.52	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	15%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	31%		
	West	11%		
Building F	North	N/A	N/A Naturally Ventilated with Electric radiant heating	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	N/A		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	N/A		
	West	N/A		
Building G	North	25%	Total System U-Value: 5.8 Total System SHGC: 0.61	Glazed Swing Doors/Louvers Total System U-Value: 5.0 Total System SHGC: 0.50
	East	15%		All other Windows/Sliding Doors Total System U-Value: 3.5 Total System SHGC: 0.30
	South	27%		
	West	3%		

*Glazing performance values are total system values, including the impact of framing.

The above design details can be found in E-LAB Section J report.

7 GOVERNMENT ARCHITECT NSW ENVIRONMENTAL DESIGN IN SCHOOL

The Environmental Design in Schools guideline produced by the Government Architect NSW (GANSW) outlines a number of key impact categories and initiatives design to improve the environmental performance as well as improve the quality of schools' design for the students, staff and stakeholders.

The NSW Government Architect guide generally outlines a number of key performance indicators, including:

- Air
- Comfort
- Light
- Noise
- Water
- Energy
- Landscape; and
- Materials

7.1 AIR

The Forest High School development includes Administration Areas, General Learning Areas and specialty areas require separate ventilation strategies as follows:

- Administration and General Learning Areas include mixed mode ventilation strategy to perimeter rooms. Occupants can introduce outside air to their local indoor environment by operating the glazed louvers to assist in cooling and air flow.
- Workshop areas include industrial ventilation systems that capture and remove contaminants at the source
- All science laboratories are ventilated by a dedicated exhaust system with fume cupboards separately exhausted and operating continuously
- Amenity areas include toilet extract fans
- Plant rooms and switch rooms included dedicated supply fans

7.2 COMFORT

Each building throughout the development includes mechanical air conditioning to address thermal comfort requirements of occupants. To reduce peak energy demand of the Forest High School development, the following passive design elements have been incorporated into the project:

- Self-shading building geometry, vertical sunshades and glazed louvers to perimeter rooms to reduce air conditioning thermal loads.
- Improvement on minimum NCC 2019 Section J Deemed-to-Satisfy thermal performance requirements to building fabric on the thermal envelope
- Window to wall ratios to reduce solar gains in summer and allow passive heating in winter for all buildings.
- Large fans and glazed louvers to circulate air and cool the gymnasium which is naturally ventilated with radiant heating.
- Large landscaped areas throughout the courtyard and project boundary to aid in reducing the heat island effect experienced by staff and school students.



7.3 LIGHT

The Forest High School development includes glazing to all building elevations to allow the following provisions:

- Access to natural light through perimeter glazing.
- Connection to views and outside environment.
- Larger rooms typically having glazing to multiple façade orientations.

7.4 NOISE

Noise shall be mitigated and managed via a dedicated acoustic design response and include provision for:

- Internal noise levels no more than 5dB above lower figure in AS/NZ 2017:2016.
- Reverberation times outlined in AS/NZ 2017:2016.
- Acoustic testing and reporting.

7.5 WATER

Potable water use is to be minimised and non-potable water use maximised through the incorporation of high efficiency fixtures, rainwater reuse systems and careful landscape design. Stormwater and Water Sensitive Urban Design is also a strong focus for the development. Refer to Section 4.2 for detailed efficiency measures. The project's commitment to Green Star certification also demonstrates this aspect will be addressed.

7.6 ENERGY

The development has been designed with energy efficiency features to minimise energy demand such as:

- Photovoltaic System to reduce peak load demand.
- Improvement on thermal performance to building fabric on the thermal envelope.
- Natural Ventilation to perimeter rooms and gymnasium to reduce peak thermal cooling loads.
- High efficient air conditioning and lighting.

7.7 LANDSCAPE

The landscape response for the development includes consideration of native vegetation and a strong focus on cultural and appropriate planting to maintain the site's ecology and minimise the ongoing environmental impact of the project. Additionally to combat the coastal wetlands, landscaping has been designed to mitigate any issues.

7.8 MATERIALS

A great level of consideration has been given to minimisation of materials for the development as shown in the project's commitment to Green Star Life Cycle Impacts, Sustainable Products, Responsible Building Materials and Construction and Demolition Waste Credits. The Forest High School development will document the following credits throughout the construction stage as part of the Green Star Design and As-built submission:

- Reduction in Portland Cement, water and aggregates
- Reduced Mass of Steel Framing
- Responsible Structural and Reinforcing Steel
- Responsible Permanent formwork, pipes, flooring, blinds and cables
- Product transparency and sustainability
- Compliance verification for waste contractor and facilities
- 90% diversion for landfill target



8 CLIMATE CHANGE RESILIENCE STATEMENT

As part of the Green Star response for the development and in line with EFSG requirements, the project will be evaluated using a full climate adaptation and risk assessment as per AS 5334-2013 and Green Star Design & As Built v1.3 to determine the design responses to be incorporated in the development.

As part of the initial design response for the project, an assessment of project risks associated with the predicted impacts of Climate Change will be undertaken for the proposed development. The assessment will be undertaken to ensure the project design allows for suitable provisions for the predicted impact of climate change scenarios. The NSW Government's NSW and ACT Regional Climate Modelling (NARCLiM) projections for the Metro Sydney region are to be used.

The NARCLiM modelling is on a regional basis, therefore Allambie Heights falls within the Metro Sydney region. The data from this region has been analysed.

8.1 CLIMATE ADAPTATION WORKSHOP

A Climate Change Adaptation Workshop will be facilitated with the design team inclusive of Architect, Landscape Architect, Civil Engineer, Mechanical Engineer, Electrical Engineer, Hydraulic Engineer, SINSW and Project Manager.

8.2 PROJECTED CLIMATE RISKS

Based on the NARCLiM data, the site-specific risks are to be confirmed and will be provided once the assessment is carried out.

8.3 PROJECT DESIGN RESPONSE

Adaptation strategies will be identified and will be summarised once the assessment is carried out.

8.4 CLIMATE ADAPTATION PLAN

A detailed climate risk assessment and plan will be completed to ensure the climate risks and design response are captured and incorporated into the design of the development.

9 SUMMARY

The Forest High School Development has considered Ecologically Sustainable Design throughout its design and operation by targeting a formal certification to an independent third-party certification scheme, Green Star under the Design and As Built v1.3 tool. The project will document the developments design and intent to achieve each initiative targeted in the sustainability rating through a design submission and a final As-built submission.

The proposed Green Star Pathway is included in **Appendix A** of this report and demonstrates the projects commitment to reducing the overall environmental impact through consideration of the developments Indoor Environment Quality, access to transport, energy and water performance material selection and site emissions. Initiatives targeted in the Green Star Pathway consider the developments design and reference the following sustainability commitment of the project:

- The Secretary's Environmental Assessment Requirements (SEARs) for this development.
- Educational Facilities Standards and Guidelines (EFSG) Sustainability Requirements.
- NCC 2019 Section J Amendment 1 Compliance
- A certified 5 Star Green Star Design & As Built v1.3 outcome
- The Environmental Design in Schools guideline produced by the Government Architect NSW

We trust this Sustainable Design Brief report provides sufficient overview of the project sustainability vision for The Forest High School Development.

Appendix A **GREEN STAR PATHWAY**



Green Star - Design & As Built Equivalency Scorecard

Project:	The Forest High School
Targeted Rating:	5 Star - Australian Excellence

Rev 01 - Preliminary
AK / ZM | 21/07/2023
Project: P00757
TFHS

Core Points Available	Total Points Targeted
100	71



CATEGORY / CREDIT	AIM OF THE CREDIT / SELECTION	CODE	CREDIT CRITERIA	POINTS AVAILABLE	POINTS TARGETED	RISK	RESPONSIBLE PARTY	COMMENTS
Management				14				
Green Star Accredited Professional	To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.	1.1	Accredited Professional	1	1	Low	E-LAB Principal	ESD Consultant to be engaged throughout the project as project GSAP, including workshops, providing assistance and preparing Green Star submission. Requirement for EFSG.
Commissioning and Tuning	To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.	2.0	Environmental Performance Targets	-	Complies	Low	E-LAB Head Contractor Principal	A project specific Design Intent Report must be developed. Services to provide input with description of systems in specifications. To be completed by GSAP.
		2.1	Services and Maintainability Review	1	1	Low	Head Contractor ICA	SINSW have a pre-approved TQ with GBCA to achieve this credit by demonstrating that the project has been delivered as per the EFSG and any issues have been rectified. Evidence to be provided in the form of a report. TBC with SINSW if there is a template Services & Maintainability Review Report specific to EFSG.
		2.2	Building Commissioning	1	0	NA	Services Principal SINSW	SINSW's Commissioning & Handover Procedure goes above and beyond Green Star requirements. It requires that a Commissioning & Handover Plan is developed including all key systems in the scope
						N/A	Services Principal SINSW	Requires air tightness testing to be completed and meet standards for high performance façade.
		2.3	Building Systems Tuning	1	1	Med	Services Principal SINSW	SINSW to commit to 12 month Building Tuning Period through head contract. Tuning requirements to be included in scope of works. Quarterly tuning for 12 months required in contract.
		2.4	Independent Commissioning Agent	1	1	Low	ICA SINSW	SINSW have a pre-approved TQ with GBCA to achieve this credit by using the Commissioning and Temporary Schools Team (C&TS) team in lieu of engaging a dedicated ICA.
Adaptation and Resilience	To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.	3.1	Implementation of a Climate Adaptation Plan	2	2	Low	E-LAB	Climate Adaptation Plan to be developed. All high and extreme risks identified and actions taken. EFSG requires consideration of high impact climate change and how to adapt.
Building Information	To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance.	4.1	Building Information	1	1	Low	Services Head Contractor	All subcontractors to provide O&M manuals and Building Log Book(s) in line with CIBSE TM31. Building Users Guide to be developed & provided to building users. EFSG requires this as standard.
Commitment to Performance	To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way.	5.1	Environmental Building Performance	1	1	Med	SINSW Principal	SINSW to report internally on building performance, including energy and water as a minimum. Template environmental performance letter received from SINSW.
		5.2	End of Life Waste Performance	1	0	N/A	SINSW Principal	SINSW to commit to extending the life of internal fitout for 10 years (excluding general wear and tear - interiors of schools expected to last more than 10 years as standard).
Metering and Monitoring	To recognise the implementation of effective energy and water metering and monitoring systems.	6.0	Metering	-	Complies	Med	Mechanical Electrical Hydraulic	Accessible metering for all uses plus all loads >5% of annual energy use or > 100kVA plus metering of all demands >10% of water use. Floor by floor metering of electricity & separate uses (e.g. hall) The EFSG require all main water end uses are to be separately submetered but contains no provisions for energy submetering - this will need to be conducted to meet compliance.
		6.1	Monitoring Systems	1	1	Med	Mechanical Electrical Hydraulic Principal	Requires Metering Schedule including type, location and consumption estimates. Monitoring Strategy to CIBSE TM39. 15min interval reporting capability, plus hourly, daily, monthly and annual interval (user-adjustable) energy reporting including power factor monitoring. Quarterly report generation automatic and alarms for out of range data.
Responsible Construction Practices	To reward projects that use best practice formal environmental management procedures during construction.	7.0	Environmental Management Plan	-	Complies	Low	Head Contractor	Contractor to develop best practice Environmental Management Plan for the project. Business as Usual.
		7.1	Environmental Management System	1	1	Low	Head Contractor	Contractor to be ISO14001 certified.
		7.2	High Quality Staff Support	1	0	N/A		Potential to achieve, confirm with contractors: Programs and policies in place going beyond legal OHS requirements promoting physical well-being and mental health. Head contractor to conduct support (eg: R U OK day, Mates In Construction etc)
Operational Waste	B. Prescriptive Pathway	8B	Prescriptive Pathway: Facilities	1	1	Low	Waste Architect	EFSGs require waste storage areas are included, with the provision of space for the separation of waste and receptacles for multiple waste streams. Safe methods for vehicle access and the transfer of waste must also be considered.
Total				14	11			

Indoor Environment Quality							17	
Indoor Air Quality	To recognise projects that provide high air quality to occupants.	9.1	Ventilation System Attributes	1	1	Med	Mechanical	Ventilation systems intakes and exhausts designed to ASHRAE 62.1, have adequate access to both sides of heating & cooling coils, humidifiers & filters. Ductwork to be blue bagged on site prior to installation. Up to 4 rows of cooling coils for FCUs are compliant for 1-sided access. EFSG requires ventilation to meet these requirements.
		9.2	Provision of Outdoor Air	2	0	N/A		Not targeted. Likely additional cost and complexity. Will need to confirm with EFSG
					0			
		9.3	Exhaust or Elimination of Pollutants	1	1	Low	Mechanical Principal	Any print/photocopy equipment to comply with emissions guidelines or located in enclosed room. Kitchens with cooking equipment to be separated and exhausted (commercial kitchen only). EFSG has requirements for this.
Acoustic Comfort	To reward projects that provide appropriate and comfortable acoustic conditions for occupants.	10.1	Internal Noise Levels	1	1	Low	Acoustic	Internal noise levels no more than 5dB(A) above lower figure in AS/NZ 2107:2016. Testing required at completion.
		10.2	Reverberation	1	1	Low	Acoustic	Spaces to meet reverberation times outlined in AS/NZ 2017:2016. Typically achievable for school projects.
		10.3	Acoustic Separation	1	0	N/A	Acoustic	Possible to target this, will be costly
Lighting Comfort	To encourage and recognise well-lit spaces that provide a high degree of comfort to users.	11.0	Minimum Lighting Comfort	-	Complies	Low	Electrical Lighting	CRI >80% and 12-bit or greater resolution for LED drivers or flicker free luminaires
		11.1 General Illuminance and Glare Reduction	11.1.1 General Illuminance	1	1	Low	Electrical Lighting	Best practice lighting levels in line with AS/NZS 1680.2 to be achieved. Isolux plots to be provided.
			11.1.2 Glare Reduction					All luminaires to have diffusers or meet UGR values of AS 1680.1. Isolux calculations to be provided.
		11.2	Surface Illuminance	1	0	N/A		Not targeted - consumes additional energy and requires wall washing, light finishes everywhere, etc.
		11.3	Localised Lighting Control	1	0	N/A		Not targeted, would require dedicated lighting system with addressable lighting per fixture. Difficult for class rooms
Visual Comfort	To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.	12.0	Glare Reduction	-	Complies	Low	Architect	Requires block out blinds with VLT <10% to all primary spaces. EFSG requires this as standard.
		12.1	Daylight	2	0	N/A	E-LAB Architect	Minimum 40% of floor area to be provided with high levels of daylight. Based on layouts, not possible to achieve.
		12.2	Views	1	1	Low	E-LAB Architect	Minimum 60% of floor area to have high quality external view. Based on layouts, should be achievable. To be confirmed via calculations.
Indoor Pollutants	To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels.	13.1 Paints, Adhesives, Sealants and Carpets	13.1.1 Paints, Adhesives and Sealants	1	1	Low	Head Contractor Architect Services	Requires 95% of products comply with Total VOC limits prescribed. Contractor to have standard processes in place to track this. EFSG requirements in line with this.
			13.1.2 Carpets					
		13.2	Engineered Wood Products	1	1	Low	Head Contractor Architect	Requires 95% of products to comply with formaldehyde limits prescribed. E0 or E1 typically. Contractor to have standard processes in place to track this. EFSG requirements in line with this.
Thermal Comfort	To encourage and recognise projects that achieve high levels of thermal comfort.	14.1	Thermal Comfort	1	1	Med	Mechanical E-LAB	Will need to provide thermal comfort - this will be confirmed with modelling.
		14.2	Advanced Thermal Comfort	1	0	N/A	Mechanical E-LAB	High degree of thermal comfort to be provided (-0.5<PMV<+0.5). Achieved through air conditioning systems. Currently no points targeted, possible to achieve after modelling.
Total				17	9			

Energy								22
Greenhouse Gas Emissions	E. Reference Building Pathway	15E.0	Conditional Requirement: Reference Building Pathway	-	Complies	Low	E-LAB	Minimum improvement of 10% against NCC 2019 reference building - will be modelled.
		15E.1	GHG Emissions Reduction: Building Fabric	4	0.5	Med	E-LAB	0.5 point may be anticipated improvement of façade performance against code minimum as NCC 2019 requirements are already quite stringent.
		15E.2	GHG Emissions Reduction	16	12	Med	Services E-LAB	12 points aimed for in reduction in annual greenhouse gas emissions above benchmark through energy efficient lighting systems, efficient mechanical equipment selection and PV inclusion. Large amount of PV on site may push these points much higher.
		15E.3	Off-Site Renewables	8	0	N/A		Not targeted. Requires SINSW to enter into Power Purchase Agreement to source electricity from certified renewable electricity for 10 years.
		15E.4	District Services	7	0	N/A		Not targeted as no precinct scale services.
		15E.5 Additional Prescriptive Measures	15E.5.1 Transition Plan	1	0	N/A		Not targeted. Requires the development of a plan to move away from fossil fuels by 2030.
			15E.5.2 Fuel Switching	2	2	Med	Principal Services	Potential to achieve points, confirmation needed.
			15E.5.3 On-Site Storage	1	0	N/A		Not targeted, requires battery storage system. Likely not feasible given cost & usage pattern
Peak Electricity Demand Reduction	B. Performance Pathway	16B	Modelled Performance Pathway: Reference Building	2	2	Med	E-LAB	Peak demand reduction through services efficiencies & PV demonstrated through modelling. Provision of PV demonstrated.
Total				22	16.5			

Transport							10	
Sustainable Transport	A. Performance Pathway	17A	Performance Pathway	10	10	Med	SINSW	Note: SINSW has a Transport Assessment: Template which has been approved by the GBCA. If this template is followed to produce a specific School Transport Plan, 10 points are available. Need to review the Transport Assessment Template to confirm what is required.
Total				10	10			

Water								12
Potable Water	A. Performance Pathway	18A	Potable Water - Performance Pathway	12	5	Med	Architect Hydraulic Landscape	EFSGs require a number of initiatives to reduce potable water consumption. This includes rainwater harvesting, water efficient fixtures and fittings, drought tolerant vegetation for landscaping etc.
Total				12	5			

Materials14								
Life Cycle Impacts	B. Prescriptive Pathway - Life Cycle Impacts	19A.1	Comparative Life Cycle Assessment	0	0	N/A		EFSG recommends whole of life cost analysis - if achieving this above and beyond, then there is potential for points.
		19A.2	Additional Reporting	0	0	N/A		
		19B.1 Concrete	19B.1.1 Portland Cement Reduction	2	1	Med	Head Contractor Structural	Concrete mix to have 30% reduction in Portland cement
			19B.1.2 Water Reduction	0.5	0.5	Med		Min 50% of water used to be from non-potable sources. Relatively standard for concrete suppliers
			19B.1.3 Aggregates Reduction	0.5	0.5	Med		25% fine aggerate manufactured from alternate means
		19B.2 Steel	A. Reduced Mass of Steel Framing	1	1	High	Structural	Potential to gain point - discuss with Enstruct
			19B.3	Building Reuse	2	0	N/A	
		2			0	N/A		
		19B.4	Structural Timber	-	0	N/A		
3	0			N/A				
Responsible Building Materials	To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.	20.1	Structural and Reinforcing Steel	-	Complies	Med	Head Contractor Structural	Steel sourced from responsible steel maker.
				1	1	Med		Ensure steel is sustainably procured
		20.2	Timber	1	0	N/A	Head Contractor Structural Architect	EFSG requires timber to be sustainably procured but not aiming for this credit as it is stringent.
		20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	Low	Head Contractor Services Architect	90% of cables, pipes, flooring, blinds either: - do not contain PVC - meet Best Practice Guidelines for PVC Typically BAU across items tracked. Includes non PVC items
Sustainable Products	To encourage sustainability and transparency in product specification.	21.1	Product Transparency and Sustainability	3	2	Low	Head Contractor Services Architect	Potential to achieve
Construction and Demolition Waste	B. Percentage Benchmark	22.0	Reporting Accuracy	-	Complies	Low	Waste	Waste contractors and facilities to hold compliance verification summaries.
		22B	Percentage Benchmark	1	1	Low	Waste	1 pt for <10kg/m² or 90%+ diversion from landfill. Additional innovation pt for <5kg.m² if achieved across GFA. Requires Waste Contractor to hold compliance Summary verification, and provide reporting in line with Green Star Standard.
Total				12	8			

Land Use & Ecology				6				
Ecological Value	To reward projects that improve the ecological value of their site.	23.0	Endangered, Threatened or Vulnerable Species	-	Complies	N/A	Landscape E-LAB	EFSG requires analysis of any species on site.
		23.1	Ecological Value	3	0	N/A		Requires significant site landscaping compared to existing site or improvement in quality
Sustainable Sites	To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminate land.	24.0	Conditional Requirement	-	Complies	Low	Landscape E-LAB	Site does not contain old growth forest, prime agricultural land or wetland of 'High National Importance'.
		24.1	Reuse of Land	1	0	N/A		Site is not a reuse. So no point is awarded for reusing the land
		24.2	Contamination and Hazardous Materials	1	1	Low	Head Contractor Principal	Contaminants are to be assessed and stabilised or removed according to best practice guidelines. EFSG requires this to occur.
Heat Island Effect	To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.	25.1	Heat Island Effect Reduction	1	1	High	Architect E-LAB	Potential to achieve this with correct shading and colours of roofing elements
Total				6	2			

Emissions5								
Stormwater	To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.	26.1	Stormwater Peak Discharge	1	1	Med	Civil Hydraulics	Post development stormwater discharge does not exceed pre development discharge using 1 year or 5 year ARI depending on site climate risk assessment.
		26.2	Stormwater Pollution Targets	1	1	Med	Civil Hydraulics	Stormwater pollution reduction targets to be in line with Column A. One Innovation point for Column B. 80% TSS, 90% GP, 45% TN, 60% TP, 90% TPH, 90% Free Oils.
Light Pollution	To reward projects that minimise light pollution.	27.0	Light Pollution to Neighbouring Bodies	-	Complies	Low	Electrical Lighting Landscape	All outdoor lighting to comply with AS4282:1997 for light spill to inhabited boundaries.
		27.1	Light Pollution to Night Sky	1	1	High	Electrical Lighting Landscape	Requires upward light output ratio <5%; OR Max direct illuminance of 0.5 lux to site boundary and 0.1 lux to 4.5m beyond site boundary. Typically achieved, minimal outdoor lighting in project
Microbial Control	To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.	28	Legionella Impacts from Cooling Systems	1	1	Med	Mechanical	Waterless VRF heat rejection systems proposed.
Refrigerant Impacts	To encourage operational practices that minimise the environmental impacts of refrigeration equipment.	29.1	Refrigerants Impacts	1	0	N/A		Not targeted, requires use of low ODP refrigerants and leak detection & auto recovery.
Total				5	4			

Innovation10								
Innovative Technology or Process	The project meets the aims of an existing credit using a technology or process that is considered innovative in Australia or the world.	30A	Innovative Technology or Process	10				
Market Transformation	The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.	30B	Market Transformation					
Improving on Green Star Benchmarks	The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmark required to achieve full points.	30C	Improving on Green Star Benchmarks		2	Med	Head Contractor Architect	Extremely Low VOCS - Paints Energy - PV
Innovation Challenge	Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.	30D	Innovation Challenge		3	Med	Head Contractor Principal Architect Services	Integrating Healthy Environments (healthy canteen policy) - pre approved with GBCA (1) Community Benefits for Community Use of School Facilities & Share Our Spaces Program - pre approved with GBCA (1) Universal Design - pre approved with GBCA via EFSG (1)
Global Sustainability	Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tools.	30E	Global Sustainability					
Total				10	5			

TOTALS		AVAILABLE	
CORE POINTS		100	65.5
CATEGORY PERCENTAGE SCORE			65.5
INNOVATION POINTS		10	5.0
TOTAL SCORE TARGETED			70.5

