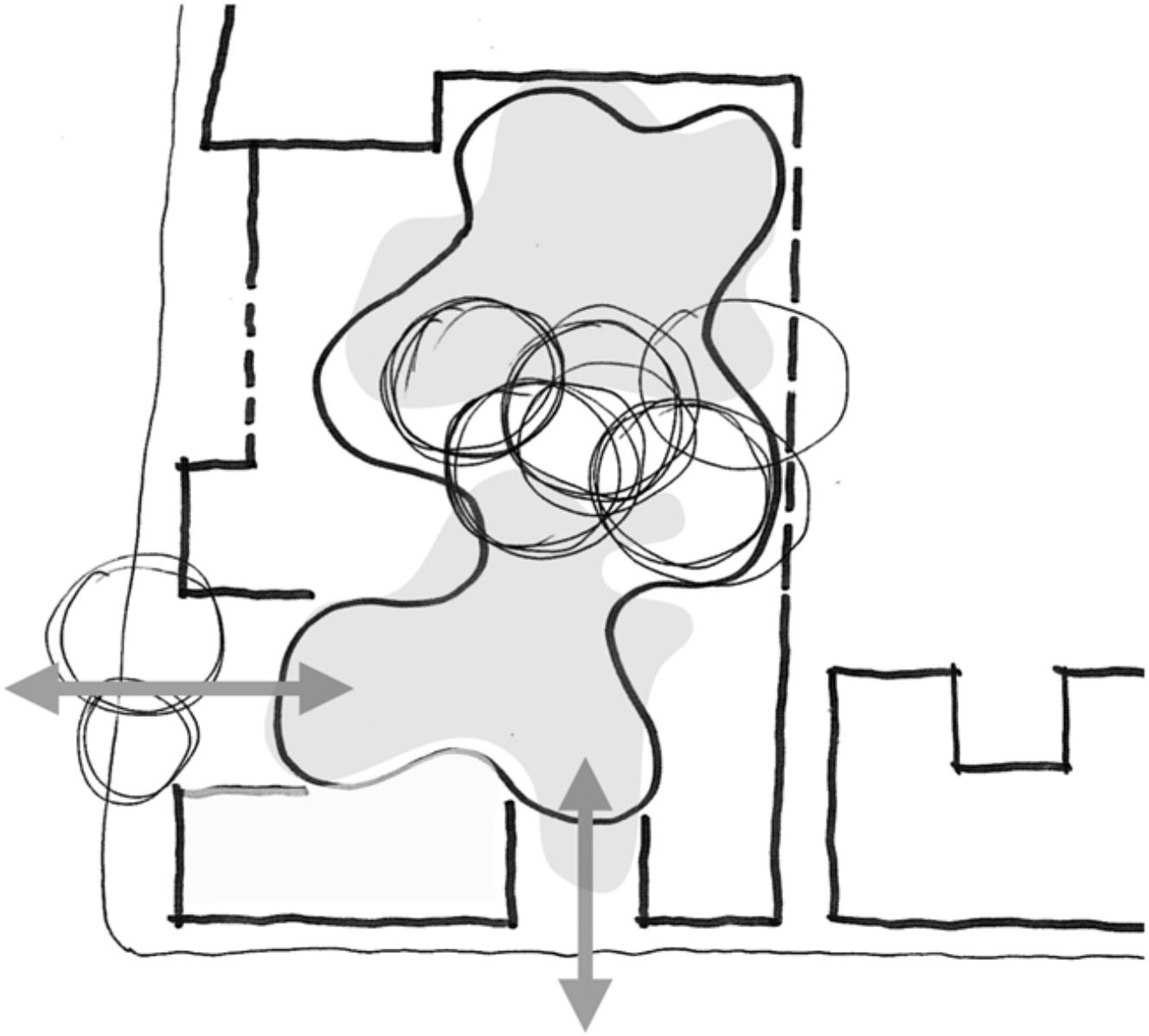
DARLINGTON PUBLIC SCHOOL REDEVELOPMENT

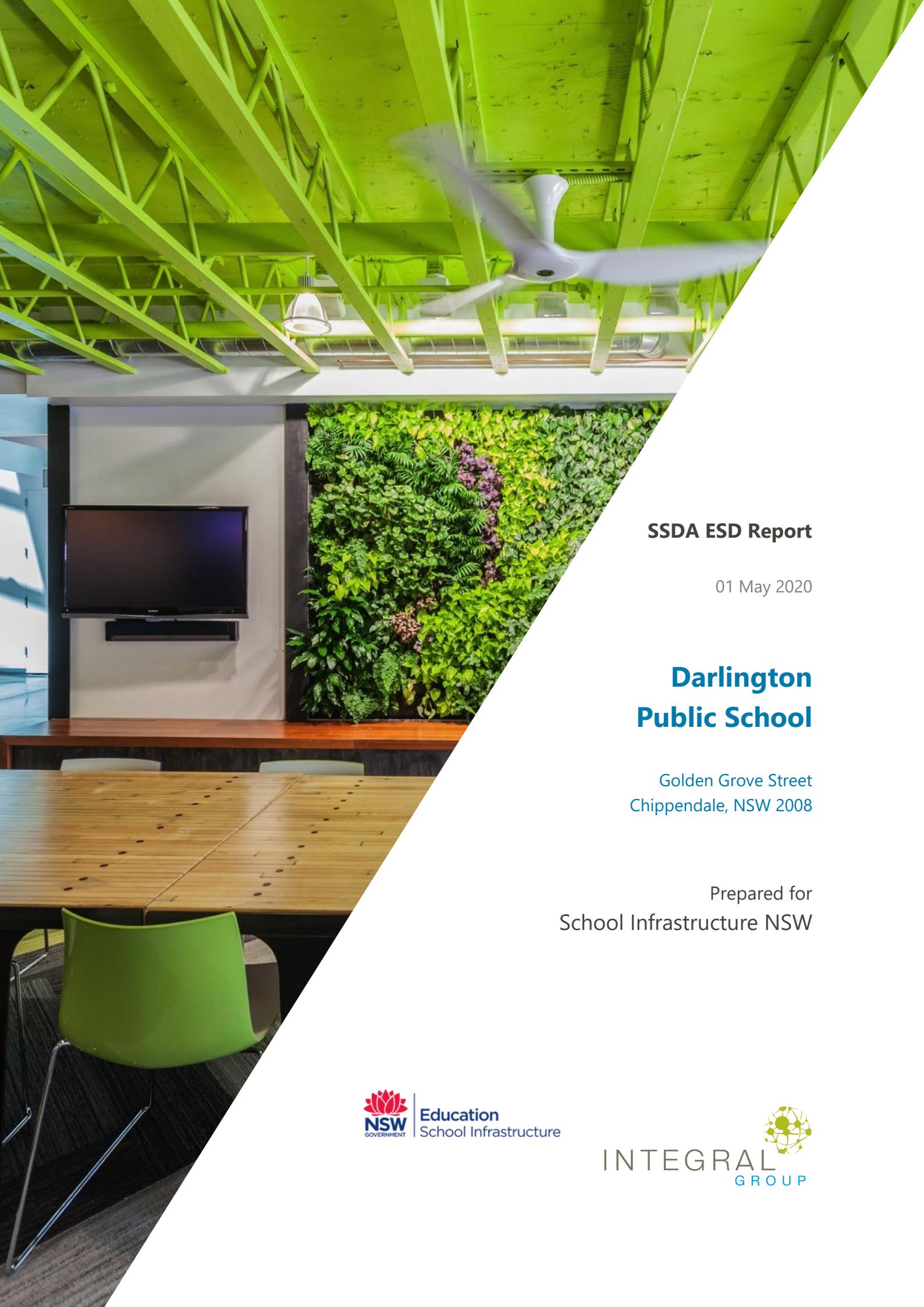
Appendix X — ESD Report

SSD-9914

Prepared by Integral

For NSW Department of Education





SSDA ESD Report

01 May 2020

Darlington Public School

Golden Grove Street
Chippendale, NSW 2008

Prepared for
School Infrastructure NSW

NSW GOVERNMENT Education School Infrastructure

INTEGRAL GROUP

Document Control

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Contents

1 SEARS Requirements

Table 1 outlines the SEARS requirements for Darlington specifically relating to the Ecological Sustainable Design (ESD) report. Other references to ESD do exist within SEARS, such as "demonstrate good environmental amenity", and these are addressed within other consultants' reports, such as the Architects.

Table 1 SEARS Requirements

Key Sustainability Issues	Relevant Report Section
Detail how ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design and ongoing operation phases of the development.	*Section 3, Pg 7*
Include a framework for how the future development will 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.	*Section 4, Pg 11*
Include preliminary consideration of building performance and mitigation of climate change.	*Section 5, Pg 14*
Include an assessment against an accredited ESD rating system or an equivalent program of ESD performance. This should include a minimum rating scheme target level.	Section 7, Pg 17.
Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically: - hotter days and more frequent heatwave events - extended drought periods - more extreme rainfall events - gustier wind conditions - how these will inform landscape design, material selection and social equity aspects (respite/shelter areas).	*Section 6, Pg 16*

2 Introduction

2.1 General

This ESD Report has been prepared by Integral Group on behalf of Schools Infrastructure New South Wales (SINSW). It accompanies an Environmental Impact Statement (EIS) prepared in support of the development of Darlington Public School (Darlington) at Golden Grove Street, Sydney, NSW (the 'Site').

The purpose of this ESD Report is to address the items identified in part "8. Ecologically Sustainable Development" of the Planning Secretary's Environmental Assessment Requirements, application number SSD-9912; to outline the measures that are proposed to be implemented to minimise consumption of resources, energy and water, and to demonstrate that the project has been assessed against a suitable sustainability framework.

2.2 Project Description

Darlington Public School is located on the corner of Golden Grove Street and Abercrombie Street, Darlington, within the City of Sydney Local Government Area. The school is adjacent to the University of Sydney Darlington Campus and within walking distance to Redfern and Macdonaldtown train stations. The site is legally described as Lot 100 in DP 623500 and Lot 592 in DP 7523049.

The SSD application seeks consent for demolition of existing school buildings and construction of a new part 2, part 3-storey building, increasing the school capacity from 230 to 437 students. The works also include replacement of the existing child-care facility (to the same capacity of 60 students), earthworks and landscaping. For a detailed project description refer to the EIS prepared by Ethos Urban.

2.3 Referenced Standards

This report has been undertaken with reference to the following:

- Clause 7(4) Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulations)
- SINSW Sustainability Framework Tool
- Green Building Council of Australia, Green Star Design & As-Built v1.3 Rating Tool
- SEARS Application number SSD 9912, relevant clauses
- CSIRO projected impacts of climate change
- NSW and ACT Government Regional Climate Modelling (NARCliM) climate change projections.

2.4 Source Documentation

The project's architectural documentation has been used in preparation of this report. Inputs have also been coordinated with all relevant Consultants.

2.5 Limitations of This Report

Due care and skill have been exercised in the preparation of this report.

The purpose of this ESD Report is to outline the measures that are proposed to be implemented to minimise consumption of resources, energy and water, and to demonstrate that the project has been assessed against a suitable accredited rating scheme, as detailed within the EIS. It should be read in conjunction with the current project documentation and specific applications may vary during the design development of the project.

No responsibility or liability to any third party is accepted for any loss or damage arising out of the use of this report by any third party. Any third party wishing to act upon any material contained in this report should first contact Integral Group for detailed advice which will consider that party's requirements.

2.6 Departures from the EFSG

There are no departures from the EFSG to note for the ESD requirements.

3 Schedule 2 of EP&A Regulation 2000

The followings section details how the proposed Darlington Public School incorporates the principles of ecologically sustainable development (ESD) in accordance with Schedule 2 Clause 7(4) of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation).

3.1 The Precautionary Principle

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

*(a) the **"precautionary principle",** namely, that 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. In the application of the precautionary principle, public and private 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.

3.1.1 Project Response

The precautionary principle has been adopted and all potential impacts have been considered and mitigated where a risk is present, as outlined in this report and any accompanying documentation.

The built form embraces sustainable design principles as it has been planned to maximise the passive (i.e. energy free) performance of the building. The building is generally formed around a shallow plan allowing daylight to penetrate the spaces; on the upper levels south facing skylights have been incorporated to improve daylight access without increasing the heat load. Where zones are designed around a deep plan, increasing the ceiling heights improves daylight availability and air movement through the spaces, such as the Main Hall.

Incorporating natural ventilation across the site will assist minimising energy consumption from mechanical systems. A Green Light / Blue Light system, Figure 1, is being incorporated to display when conditions are suitable for natural ventilation, and mechanical systems can be shut down.

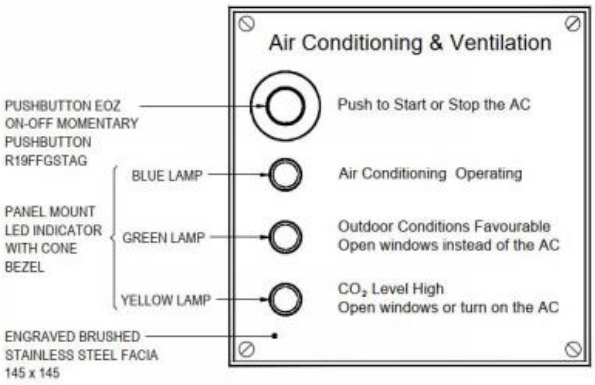


Figure 1 Green Light / Blue Controls Panel

External shading detailing will reduce solar gain during the summer months in turn reducing cooling loads and the risk of overheating. The walkway along the Eastern Façade, Figure 2, ensures that the entire façade is shaded during the summer months to mitigate solar gain. The Western Façade incorporates deep reveals to limit late afternoon sun, when zones are most likely to overheat.

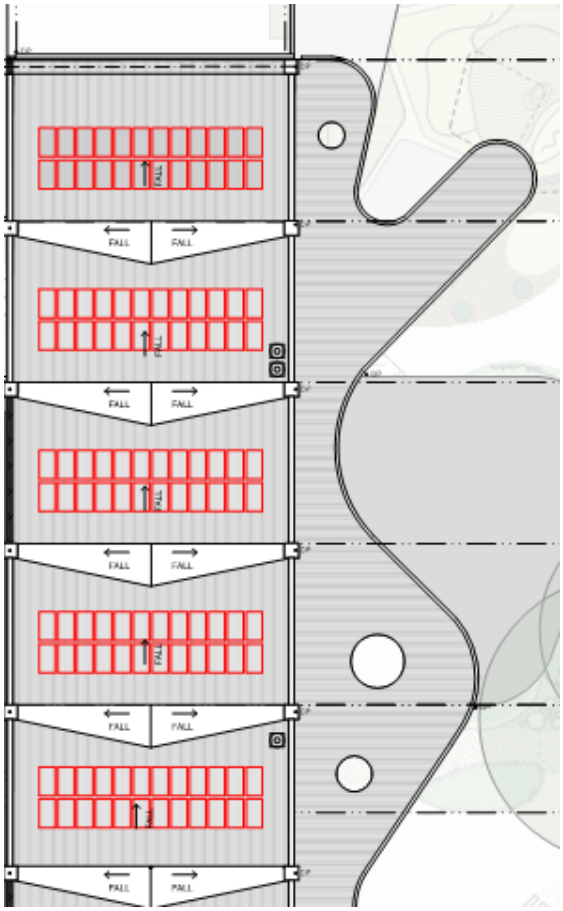


Figure 2 Roof Layout showing Eastern Walkway

Stormwater design will ensure post-development peak event discharge rates do not exceed pre-development rates and design development will explore the feasibility for all rainwater from new upper site roofing is to be captured and re-used on site for irrigation. Roof materials and colours will also be carefully selected in order to contribute to a cooler microclimate and mitigate any potential for the 'Heat Island Effect'.

Building services, lighting and equipment will be specified to be highly energy efficient using current best practice approaches and products. We are also currently investigation routes to allow the building to be classified as "all electric". A building developed now that all electric will have lower emissions than a comparable gas building. This is due to the NSW grid decarbonising as more renewables come online.

Whilst a comprehensive climate risk assessment has not been carried out on this site, any potential future climate-driven risks relating to this site have been considered, with the highest risk being an increase in maximum temperatures and the length and frequency of heat events.

In relation to any predicted increases in temperatures, the current concept design pays attention to addressing high external heat loads by proposing measured glass to façade ratios and other passive measures to support energy efficient mechanical solutions. Design development will further explore options for enhancements to the building thermal envelope through increased insulation, high-performance glazing, detailing of the building fabric to minimise unwanted infiltration and careful consideration of thermal mass.

Therefore, the design directly addresses Greenhouse Gas Emissions (GHG Emissions) and their impact on climate change.

3.2 Inter-Generational Equity

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

(b) ***"inter-generational equity",*** *namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.*

3.2.1 Project Response

Good architecture often outlasts the architect, great architecture may endure ten times as long. The impact of architecture on its environment is enduring and significant. What architects do today will shape the environment for future generations; Darlington Public School embodies this approach by proposing a keystone building for the local precinct, acting as a landmark for the local area.

The concept design has embraced Indoor Environmental Quality as a fundamental requirement by focusing on delivering fresh air, quality acoustics, and low toxicity materials and finishes.

The proposed design places an emphasis on daylight access that will result in the project actively engaging its occupants with their surroundings, considered a key factor in the link between building design and occupant wellbeing – commonly referred to as our 'biophilic response'.

The building targets high levels of energy efficiency and low operational energy consumption. A low energy building minimises the GHG gas emissions during use. GHG Emissions are a known key contributor to human-caused climate change, considered one of the most critical inter-generational issues of our time. By addressing this at an early stage the building aims to "meet the needs of the present without compromising the ability of future generations to meet their own needs" a key takeaway from the infamous Brundtland Report. [1]

[1] Our Common Future ('Brundtland Report'). 1987. Brundtland. G et al.

3.3 Conservation of Biological Diversity and Ecological Integrity

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

*(c) **"conservation of biological diversity and ecological integrity",** namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration.*

3.3.1 Project Response

The proposed works have minimal impact on existing vegetation and biological communities on the site, moreover the intended works increase the number of plant species improving biodiversity across the area. The landscape design will consider a range of initiatives to enhance the biodiversity on the site, including native plants, educational aspects and community food gardens. Refer to the landscape architectural package for more information on proposed landscape.

3.4 Improved Valuation, pricing and incentive mechanisms

Per Schedule 2 Clause 7(4) of the EP & A Regulation:

*(d) **"improved valuation, pricing and incentive mechanisms"**, namely, that environmental factors should be included in the valuation of assets and services, such as:*

(i) polluter pays, that is, 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.

3.4.1 Project Response

The environmental targets for the project have largely been embedded in the nature of the development rather than as additional 'add-on' items. For example, the proposed areas will have a high degree of thermal efficiency and careful considerations has been given to incorporate excellent distribution of daylight and optimisation of mechanical ventilation systems throughout the learning areas - reducing ongoing operating costs for the school.

In many areas a Whole of Life (WOL) costing approach has been taken. For example, going beyond Section J insulation requirements allows for a reduction in HVAC capex as the peak loads placed on the system are reduced. By taking a holistic approach to the design and recognising where trade-offs in spending can be made, overall savings are realised by the project.

A reduction in waste directed to landfill will be realised through planned waste management strategies and as such a cost saving may be realised. Further cost savings will be achieved by a reduction in potable water consumption via rainwater harvesting and re-use. Finally, by ensuring the total volume of stormwater discharge is not increased this development will place no greater strain on existing infrastructure, thus negating the need to upgrade said infrastructure. The cost of which ultimately gets passed onto the rate payer in the medium to long term.

4 Developing a Framework

SINSW has a vision that "*by 2030, it will be a leading provider of sustainable infrastructure that inspires students and enriches learning." (SINSW – Framework vision – 6.8.19)*

In pursuing this vision, SINSW have elected to focus on five discrete themes. These themes and their associated objectives are set out in the *SINSW Sustainability Strategy* and are as follows:

Table 2 SINSW Sustainability Strategy

Theme	2030 Objective
Energy & Carbon	*SINSW are targeting carbon neutrality by 2030 and will support communities to reduce their greenhouse gas footprints*
Water	*SINSW will use and discharge water responsibly to improve their impact on the water cycle*
Waste & Materials	*SINSW will responsibly select materials and manage wastes throughout the life cycle of their facilities*
Place	*SINSW will create places that people want to use by enhancing connections to the natural and cultural environments*
Resilience	*SINSW will ensure their infrastructure assets are ready for an uncertain future and the emerging needs of schools and communities*

In order to embed this vision across its projects, SINSW has developed a sustainability framework to guide consultants throughout the design process.

Appendix A – SINSW Sustainability Framework" contains this framework; throughout the initial design stages the consultants have provided information for how the measures within the framework will address the five sustainability themes highlighted above. This has been documented throughout the Appendix. Broadly the themes above align with the following SEARS requirements:

- a materiality assessment and include waste reduction design measures.
- use of sustainable and low-carbon materials
- energy and water efficient design (including water sensitive urban design) and technology and use of renewable energy.

Below we will provide a summary of how each requirement is responded to for Darlington Public School:

4.1 A Materiality Assessment Including Waste Reduction Design Measures

A systematic and methodical Environmental Management plan will be formalised for implementation during the construction phase by the Contractor such as ISO 14001.

During the construction and demolition phase of the project, waste shall be recycled to a minimum 80%.

The design will include infrastructure for operational waste management and the separation of waste streams in order to facilitate recycling throughout the school.

On-site biodigesters are being investigated with the aim, if possible, to create a compost stream for the landscape areas from compostable waste on site.

4.2 The use of Sustainable and Low Carbon Materials

Material use for building adhesives, sealants, flooring and paint products will aim to be selected to contain low or no Volatile Organic Compounds (VOCs) and all engineered wood products used in exposed or concealed applications are specified to contain low or no formaldehyde to avoid harmful emissions that can cause illness and discomfort for occupants.

Internal furnishings within the building can be selected based on their recycled content, end-of-life recyclability and reduction of carbon footprint.

The project where possible will implement an independent environmental certification, for example use 'Ecospecifier' or Good Environmental Choice Australia related products, the project will confidently reduce environmental impacts and waste from furnishings over the life of the building.

Use building's structural and reinforcing steel sourced from a responsible steel maker.

Steel will aspire have a post-consumer recycled content or be reused steel. Sustainable timber shall be specified for at least half of the timber products used on the project. Recycled concrete shall be specified using recycled aggregate or manufactured sand and reduced quantities of Portland cement to reduce environmental impacts of concrete production and embodied energy.

Investigations into using low carbon concrete such as Ground Granulated Blast Furnace Slag (GGBS) is being undertaken by Integral Group and Bonacci (the Structural Engineer). Recommendations have been made for a 40-50% GGBS mix for any in-situ concrete on site. As Figure 3 illustrates, this can equate to a 35% saving in embodied carbon.

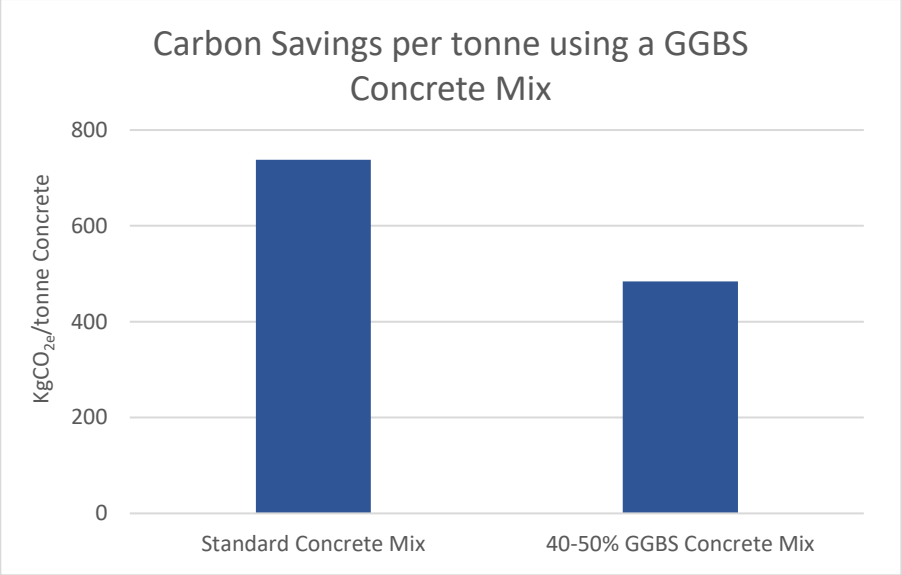


Figure 3 Embodied carbon in a GGBS mix in comparison to standard concrete (Cementmineralproducts.org)

4.3 Energy and Water Efficient Design (Including Water Sensitive Urban Design) and Technology and Use of Renewable Energy

The design intends to build on the sustainability principles of 'be lean, be clean and be green". We're aiming to reduce energy demand through passive design measures, provide HVAC services as cleanly as possibly using high COP chillers & maximise onsite generation through Solar PV. This three-stage approach is coupled with control systems which further minimise energy use. The green/light blue light ventilation system indicates when air quality is beneficial for natural ventilation m, reducing the HVAC systems operational hours and minimising energy consumption. Ceiling fans throughout the teaching spaces reduce operational hours further by increasing levels of comfort, raising the cooling set point.

Beyond energy and carbon, a diverse landscape is being created, improving the site's biodiversity and connecting pupils with nature. The site will feature various green zones (food production, wildflower zones, water swales) throughout the playground. Rainwater will be capture onsite and utilised to mitigate potable water consumption for irrigation. Measures are also in place to respond to climatic change events such as high intensity storms and deluges, preventing the site from flooding. Water efficient fixtures and fittings will be implemented to reduce water consumption in accordance with the Australian Government's Water Efficiency Labelling Scheme (WELS).

5 Preliminary assessment of Building Performance and Climate Change

As previously mentioned, a three-stage approach has been taken to designing a low energy building. The principles of "be lean, be clean and be green". Following this approach provides the best value for low energy building design, as illustrated in Figure 4.

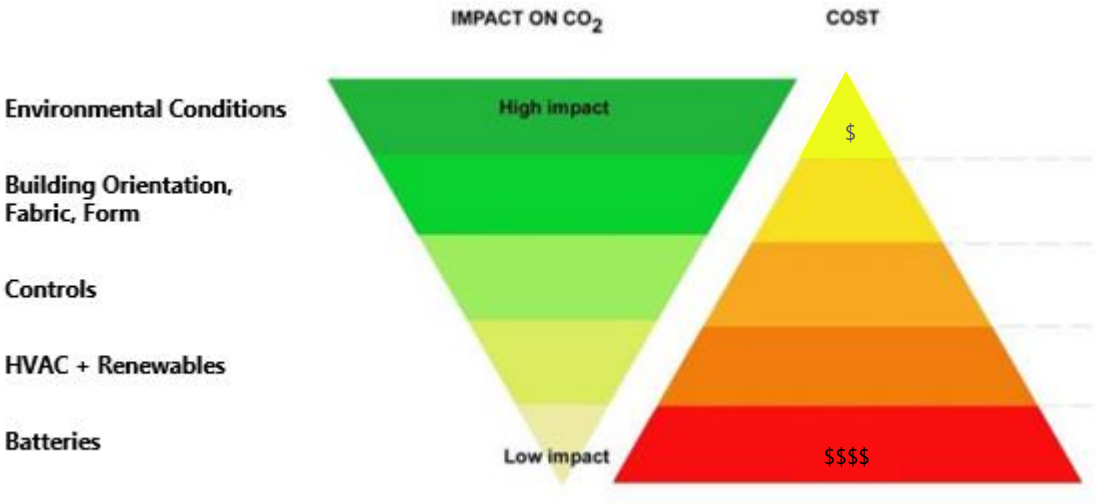


Figure 4 Sustainability hierarchy of cost beneficial measures for reducing Carbon

These principles can be outlined as follows:

- **Passive Measures** - *minimise building energy use by considering building form ("passive environmental control") in order to avoid or minimise the need for mechanical cooling and heating, and artificial lighting;*

Our response:

To minimise the inherent energy use of the building, we have firstly considered the form, orientation and structure of the building.

The façade has been optimised using energy analysis, to maximise benefits of natural daylight and views out of the building, whilst minimising the winter heat loss, limiting solar gain in summer, and reducing problems associated with glare.

Maximising cross ventilation through teaching spaces to allow for air flow, reducing the operational hours for the mechanical cooling system.

- **Efficient Services** - *minimise plant energy use by selecting the most appropriate engineering systems and optimising system performance ("active environmental control"); and*

Our Response:

In addition to these low energy measures, we will look to incorporate the following conventional energy saving ideals into the proposed design:

- Low energy/LED Lighting, with automatic switching and dimming.
- Variable speed pumps and fans.
- Control of plant via carbon dioxide monitoring.
- Provision of mix-mode ventilation design, blue light/green light system reducing the mechanical cooling system's operational hours.
- Post Occupancy Evaluation by the SINSW delivery team, providing an aftercare service to ensure all HVAC plant, and wider services systems, have been commissioned.
- Sizing mechanical systems to account for future climatic scenarios such as increased peak temperatures.

- **Renewable Energy** - the use of appropriate on-site renewable energy technologies.

Our response:

A 52 kWp solar system will aim to be installed on site. The performance of which has been amplified by orientating the saw tooth roof design to the North to increase the efficiency of the PV panels. A battery system has been investigated but the electrical engineer calculated that there would be little to no excess electricity for storage within the battery.

6 SEARS / CSIRO Response

This section responds to the following SEARS requirement:

Provide a statement regarding how the design of the future development is responsive to the CSIRO projected impacts of climate change, specifically:

o hotter days and more frequent heatwave events

o extended drought periods

o more extreme rainfall events

o gustier wind conditions

o how these will inform landscape design, material selection and social equity aspects (respite/shelter areas).

Climatic events such as heat waves cause additional stress on building's systems. High performance building envelopes help to mitigate these effects, shielding the environment from extreme weather events. Measures to achieve this include:

- Attention to solar gain through shading devices, high-performance windows, orientating glazing away from North and sensible glazing ratios, to provide excellent daylight, without causing an uplift in peak loads.
- Airtight construction and controlled ventilation; with a responsive cooling system providing year-round thermal comfort.
- High levels of insulation minimise the heat gains through the building fabric.
- Attention to the size of cooling coils has been considered by the mechanical engineers to adapt for peak day temperatures under a future climate scenario.

Storm water detention rates will be sized to account for increase, prolonged rainfall events. By slowly releasing water from the site there is less pressure on the local storm water system, reducing the chance of flash floods.

Changes to wind patterns in future climates is unclear, with little agreement between statistical data. However, increasingly frequent extreme weather events will lead to short, intense high wind periods. Strengthening the frame and foundation design will accommodate the additional loading. Intense wind periods usually occur during storms, which subject buildings to driving rain. Driving rain will be mitigated by a tightly detailed façade stopping water ingress and preserving the building fabric.

Landscape design will maximise permeable surfaces to slow the run-off of rainfall from the site. Furthermore, green spaces in the surrounding area will incorporate shading and rain refuge to cover occupants and visitors during climatic events. The large, covered entrance zone to the school will provide excellent refuge for a high number of occupants during a storm event.

7 Rating Scheme Equivalence - Green Star

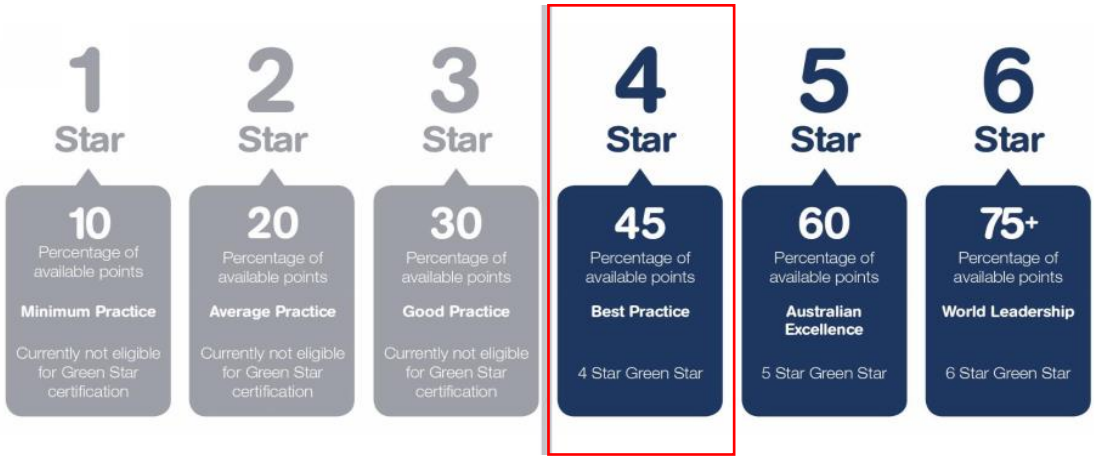
While the overarching driver for this project is to work towards the SINSW sustainability framework, as requested by the SEARS documents, we will demonstrate how the proposed design aligns with the Green Star Rating tool to demonstrate best practice equivalency.

Green Star is a comprehensive environmental rating system for buildings and communities. Green Star separately evaluates the environmental initiatives of design, projects and/or buildings based on several criteria, including energy and water efficiency, indoor environmental quality and resource conservations.

The proposal's informal (i.e. not formally certified by the Green Building Council of Australia, the administrators for Green Star) rating achieves 4-Stars, which is considered 'Best Practice' equivalency outcome.

The Green Star environmental rating system for buildings was created for the property industry in order to:

- Establish a common language;
- Set a standard of measurement for green buildings;
- Promote integrated, whole-building design;
- Recognise environmental leadership;
- Identify building life-cycle impacts; and
- Raise awareness of green building benefits.



7.1 Green Star Categories

The Green Star rating systems is made up of the following environmental categories:

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

The categories are then divided into individual credits, each of which addresses an initiative that improves or has the potential to improve, a design, project or building's environmental performance. Points are awarded in each credit for actions that demonstrate the project has met the overall objectives or Green Star and the specific aims of the rating tool.

In establishing the project's level of alignment with the Green Star rating tool 'scorecard', several assumptions must be made relating to how the future school will be managed and operated. Given that Green Star rewards projects not only for built works but also for how the completed building is operated, it is necessary during design phases to assume a minimum or best practice level of operational performance. The assumptions made within are considered 'typical' for new buildings and will without exception contribute to better environmental and financial performance of the completed site.

7.1.1 Management

The management category encourages and rewards the adoption of practices and processes that enable and support best practice sustainability outcomes throughout the different phases of a project's design, construction and its ongoing operation. The management category recognises projects which improve their sustainability performance by influencing areas where decision-making is critical, rewarding the implementation of processes and strategies that support positive sustainability outcomes during construction. The category also promotes practices that ensure a project will be used to its optimum operational potential.

The Project will include the following initiatives:

1. During design and documentation, the Project team will review the design for its ease of maintenance for all building services and building fabric.
2. Building user guides will be produced by the Contractor to help users interact effectively with the buildings, optimising building performance and user comfort. The Guides will include guidance on all sustainability attributes of the site, and information on maintenance requirements.
3. A systematic and methodical Environmental Management plan will be formalised for implementation during the construction phase by the Contractor such as ISO 14001.
4. The main contractor will aim to implement on-site staff wellbeing practice and enhance site workers knowledge on sustainable practice through educational programmes.

5. The design will include infrastructure for operational waste management and the separation of waste streams.

7.1.2 Indoor Environmental Quality

The Indoor Environment Quality category aims to encourage and reward initiatives that enhance the comfort and well-being of occupants. The credits within this category address issues such as air quality, thermal comfort and acoustic comfort. This category rewards projects that achieve sustainability performance improvements in a manner that also improves occupants' experience of the space. The 'Indoor Environment Quality' category recognises that buildings are designed for people and that a holistic approach should be taken where reductions in energy use and occupants' health and wellbeing are not pursued to the detriment of each other.

The Project will include the following initiatives:

1. The project will seek to address noise in enclosed spaces by aiming to reduce noise levels to no more than 5dB(A) above the satisfactory levels provided in Table 1 AS/NZS 2107:2000 and mitigation reverberation. Noise transmission and reverberation times will be through detailed acoustic separation and acoustic attenuators.
2. Light fittings shall be selected, where possible, such that glare is controlled or reduced and where required glare from sunlight will be reduced through a combination of blinds, screen, fixed devices, or other means. Occupants will also control lighting in the spaces through manual lighting controls.
3. All paints, sealants, adhesives, floor coverings and composite timbers used internally will aim to meet low VOC (Volatile Organic Compound) emissions limits in accordance with Green Star Design and As-Built v1.3 VOC Emissions limits tables.
4. Any engineered wood products will meet stipulated formaldehyde limits as per Green Star Design and As-Built v1.3 Table 13.2: Formaldehyde Emissions Limit Values for Engineering Wood Products.

7.1.3 Energy

The Energy category aims to reward projects that are designed and constructed to reduce their overall operational energy consumption below that of a comparable standard-practice building. Such reductions are directly related to reduced greenhouse gas emissions, lower overall energy demand as well as reductions in operating costs for building owners and occupants. The Energy category rewards projects that facilitate reductions in greenhouse gas emissions through energy efficient design and encourage the utilisation of energy generated by low-emission sources.

The Project will include the following initiatives:

1. Good passive design features will be incorporated into the proposal to achieve measurable impacts on both building services strategies and the thermal comfort of occupants.
2. LED lighting, which offers life cycle cost advantages and reduced annual energy consumption, shall be utilised wherever possible. A high percentage of lighting will be controlled either through occupant detection, daylight controls or time clock controlled to meet BCA Section J6 requirements.
3. The domestic hot water system (DHW), will be electric to take advantage of a decarbonising gird.

4. The project will make provisions for the inclusion of solar photovoltaic (PV) arrays to supplement energy consumption and reduce ongoing operating costs. It is proposed the available roof space is reviewed and a suitable PV system be assessed for feasibility in detailed design stage.

7.1.4 Transport

The Transport category aims to reward projects that facilitate a reduction in the dependency on private car use and promote the use of alternative means of transport to reduce overall greenhouse gas emissions.

If reliance on individual motor vehicle transportation is to be reduced, it is necessary to maximise alternative transportation options. Rather than limiting access to private fossil fuel vehicles, the Transport category aims to encourage and reward initiatives that reduce the need for their use. This may include initiatives that encourage and make possible the use of mass transport options, cycling or walking, and the selection of sites that are close to many amenities.

A Green Travel Plan and Work Travel Plan are being developed by TTPA which will encourage modes of Transport beyond the use of private cars, including End of Trip facilities for staff that use active means to get to work.

Additionally, given the projects location to various transport nodes, such as Redfern train station and numerous bus stops, the project is easily accessible by public transport. With good transport accessibility occupants will rely less on private transport to reach Darlington School.

7.1.5 Water

The Water category aims to encourage and reward initiatives that reduce the consumption of potable water through measures such as the incorporation of water efficient fixtures and building systems and water re-use.

Reductions in operational water consumption may be achieved through the maximisation of water efficiency within the project.

The Project will include the following initiatives:

1. The proposal includes rainwater harvest and re-use for irrigation across the landscape areas.
2. All bathroom fixtures (toilet pans, urinals, hand basin taps and showers) will meet minimum WELS ratings in accordance with the applicable Green Star Guidelines:
    a. Basin taps and urinals to be equal to or more than 5 Star WELS
    b. Showers to be equal to or more than 3 Star WELS
    c. Toilets to be equal to or more than 4 Star WELS
3. Landscape areas will be irrigated using sub-soil drip irrigation with wherever practical, the design aspiration is to provide automated controls to limit unnecessary irrigation

7.1.6 Materials

The Materials category aims to address the consumption of resources within a building construction context, by encouraging the selection of lower-impact materials. The category also encourages absolute reductions in the amount of waste generated or the recycling of as much of the waste generated as possible.

The Project will include the following initiative:

1. A minimum 80% of all construction waste generated will aimed to be diverted from landfill by either re-use or recycling.

In addition, the following options are being explored and may also be incorporated:

2. A high percentage of PVC products used in the project including those in all formwork, pipes, flooring, blinds and cables shall meet the *Best Practice Guidelines for PVC in the Built Environment*, published by the Green Building Council of Australia.
3. A high percentage of timber used in building and construction will be from a reused source or certified by a forest certification scheme.

7.1.7 Land Use and Ecology

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

The Project addresses this category through the following:

1. The site's current ecological value will be improved through well-considered landscape design.
2. The site makes use of previously developed land by upgrading the existing school and therefore does not develop any Green Space.
3. Rooftops that will contribute to a cooler microclimate using light coloured roof materials to reduce the 'Heat Island Effect'.

7.1.8 Emissions

The Emissions category aims to assess the environmental impacts of 'point source' pollution generated by projects. Negative impacts commonly associated with buildings might include increased stormwater discharge and pollutants entering the public sewer or disturbances to native animals and their migratory patterns as a result of light pollution.

The Project will include the following initiatives:

1. The lighting design shall be compliant with AS1158: Lighting for Roads and Public Spaces and AS4282: Control of the Obtrusive Effects of Outdoor Lighting. This would be achieved through control of upward light output ration (LOR) or control of direct illuminance.
2. Stormwater design will aim to ensure post-development peak event discharge rates do not exceed pre-development rates and that pollution reduction targets will be met.
3. Landscape solutions will be applied to achieve a high level of stormwater performance across the site, improving water quality prior to discharge from the site.

4. Water based heat rejection has been avoided to avert any potential impacts associated with harmful microbes in building cooling systems.

7.1.9 Innovation

The Innovation category is a way of encouraging, recognising, and rewarding the spread of innovative practices, processes and strategies that promote sustainable communities and cities.

The Innovation category acknowledges efforts which demonstrate that sustainable development principles have been incorporated not only for the community for which the Green Star criteria apply, but also in a broader sense. This may include collaboration between developers and other parties and is recognised separately from any outcomes rewarded in other categories.

1. The design team are considering proposals for the innovation challenge credits, going beyond the normal rigors of Greenstar by providing exemplary targets for the building.
2. The design team are currently investigating ways to exceed Greenstar benchmarks. Surpassing the storm water pollution requirements by improving the sites discharge filtration is their current target.

8 Appendix A – SINSW Sustainability Framework

ID	Theme & objective (SINSW Sustainability Strategy)	Indicator	Sustainability initiatives / requirements from EFSGs	EFSG type	Crossover with Green Star	Criteria Owner (Design)	Comment	Has this been implemented in project? Y or N	Is this documentary evidence available? Otherwise please propose alternative evidence
EC1-a	**Energy & carbon**	EC1: Energy efficiency	**Improvement over NCC** Building is designed and built so that energy consumtpion is predicted to be at least 10% lower than if build to minimum compliance with NCC requirements.	Mandatory	DAB c15E.0 GHG Emissions Reduction - Conditional Requirement	**ESD lead, Input from Mechanical, Electrical, Hydraulics**			
EC1-b			**Energy conservation** Design and construct all school buildings within the parameters specified in the: - Government Energy Management Program (GEMP) - NSW Public Works Energy Manual for Buildings - Building Code of Australia (BCA) Section J for Energy Efficiency The GEMP recognises that savings must be made in energy usage and maintenance to maintain the program of capital works. 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.	Mandatory	DAB c15 GHG Emissions Reduction	**ESD lead, Input from Mech, Electric, Hydraulics**	Hydraulics: Generally WS+P specifies that heated water services pipes are insulated to minimise heat losses throughout the system.		Hydraulics: Documentry evidence of insulation requirements will be given in the Hydraulic Specification.
EC1-c			**Daylighting** - Maximise natural daylight in all habitable 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	Mandatory	DAB c15 GHG Emissions Reduction	**TBC**	Arch: We are aiming for glazed areas to be 15% of the floor area as advised by ESD consultant.		
EC1-d			**Shading devices** On exposed facades subject to direct sunlight, external window shading has been considered as part of the building design	Mandatory	DAB c15 GHG Emissions Reduction	**Architect**	Arch: Sunshading is provided by the vertical screening across the eastern facade of the classrooms. Windows on the western facade are to be limited in size and recessed to provide solar protection. The facades are currently undergoing an internal design review and shading is being considered.		
EC1-e			**Lighting energy conservation** Lighting system must have timed or sensor feedback functionality for energy conservation	Mandatory	DAB c15 GHG Emissions Reduction	**Electrical**	To be included within scope		
EC1-f			**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	Mandatory	DAB c15 GHG Emissions Reduction	**Electrical**	To be included within scope		
EC1-g			**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.	Mandatory	DAB c15 GHG Emissions Reduction	**Electrical**	To be included within scope		
EC1-h			**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	Mandatory	DAB c15 GHG Emissions Reduction DAB c4 Building Information	**Electrical**	Confirming the Sustainability Framework requires DALI lighting control for the project.		

EC1-i			**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.	Mandatory	DAB c15 GHG Emissions Reduction	**Electrical**	To be included within scope		
EC1-j			**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).	Negotiable / TBC	DAB c15 GHG Emissions Reduction	**Electrical**	To be included within scope		
EC1-k			**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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Equipment selection is in-line with DG55 recommendations for a school of this size (VRF system) System has timer functionality and shall be controlled in-line with DG55 requirements	Y	
EC1-l			**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	Mandatory	DAB c15 GHG Emissions Reduction	**FF&E / Arch**			
EC1-m			**Heat loss/gain** Building/HVAC design must consider: - Climate/ micro-climate: This data shall come from the current AIRAH handbook and where a specific area is not referenced in the handbook, the Bureau of Meteorology statistics shall 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 is to be used to determine heating and cooling loads as part of the Whole of Life analysis that is to be undertaken. (ie Camel or Carrier).	Mandatory	DAB c15 GHG Emissions Reduction	**ESD / Mechanical**			

EC1-n			**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. 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 in line with	Mandatory / Recommended	DAB c15 GHG Emissions Reduction	**Arch / ESD**	FJMT: The buildings are mainly oriented along Golden Grove Street, with the long facades facing east-west. External shading for glazing exposed to direct sunlight is being address in the building design.		
EC1-o			**Ventilation strategy** A ventilation strategy is to 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 should: - 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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Ventilation shall be in-line with AS1668.2 as a minimum Access shall be provided to all in-ceiling or roof mounted fans and equipment	Y	
EC1-p			**Natural ventilation** - Is required to all classrooms for comfort in summer and to maintain a healthy indoor environment. - Where cross ventilation may be restricted (ie 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.	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Ceiling fans shall be provided to all larning spaces	Y	
EC1-q			**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.	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	As air conditioning is being provided with a cooling mode to 27deg C. As such mechanical cross ventilation has not been provided. Architect to advise if natural cross ventilation is achievable	N	
EC1-r			**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.	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	To be confirmed if this is required as the roof design progresses	TBC	
EC1-s			**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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical / Electrical**	See above	TBC	
EC1-t			**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.	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	See above	TBC	
EC1-u			**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).	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Mechanical ventilation with adequate make-up air shall be provided to all sanitary spaces in line with AS1668.2	Y	

EC1-v			**Ventilation in storage spaces** - Permanent air ventilation openings are to be provided (without compromising security), to prevent concentration of odours.	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Mechanical ventilation with adequate make-up air shall be provided to all storage spaces in line with AS1668.2	Y	
EC1-w			**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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Shall be documented	Y	
EC1-x			**Indoor enviroment 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 trafolyte 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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Shall be documented	Y	
EC1-y			**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	Mandatory	DAB c4 Building Information	**Mechanical / Electrical / Hydraulics**	Mech: Coordination shall be completed during the design phase to ensure that maintenance access is achievable. Access panels shall be documented on the design drawings Hydraulics: Design generally completed in alignment with good practice industry standards	Y	
EC2-a		EC2: Scope 1 & 2 emissions	**Renewable energy** A grid connected solar PV system must be installed Where feasible, PV systems shall be installed to offset as much of the electricity consumed by the school as is practicable	Mandatory	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	**Electrical / ESD**	Energy modelling report to be provided by PV installation contractor.		
EC2-b			**Energy storage** Battery used as energy storage of grid or solar energy may be used for grid forming, grid support, peak-demand management and load shifting, and self-consumption of renewable electricity. Energy storage is substantiated when: - there is historical evidence of grid outages and a need for backup power; - there are critical loads which require an uninterruptible power supply or backup power supply; - It is economical for energy storage systems to supplement or replace an existing backup generator (financial assessment required); - the DNSP requires that the energy storage be implemented; - The financial benefit of the system outweighs the cost of the system. This can be demonstrated by calculating and showing that the Levelised Cost of Electricity (LCOE) from a battery energy system with a certain operation regime is less than the retail tariff rate experienced at the site, or by showing that the BESS can reduce energy cost at the site and achieve a payback period of 8 years or less.	Mandatory	DAB c15 GHG Emissions Reduction; DAB c16 Peak Electricity Demand Reduction	**Electrical / ESD**	Battery systems are not appropriate for this site for the following reasons: - Load profile of the energy consumption on site does not align with typical optimal battery usage. - Sufficient power supply available at LV to site. - Confined space on site for batteries.		

EC2-c			**Heaters** In rooms where reverse cycle air conditioning is installed gas heaters shall not be provided. The only exception to this may be in the coldest parts of the state where reverse cycle air conditioning may be unable to provide effective heating. Heating equipment should: - 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	Mandatory	DAB c15 GHG Emissions Reduction	**Mechanical**	Not required	N	
EC2-d			**Water heaters** - Hot water and tempered water generation for schools should be carefully considered to ensure that a Whole of Life assessment is undertaken to minimise life cycle costs - Environmentally friendly options such as solar heating (if vandal resistant), high efficiency instantaneous gas and heat pumps are preferred energy sources to minimise energy consumption.	Mandatory	DAB c15 GHG Emissions Reduction	**Hydraulics**	Due to a recent push in previous ERG meetings (safety), WS+P has opted for electric methods for heating hot water throughout the school. Additionally, the mechanical services do not rely on the provision of natural gas services.		
EC3-a		EC3: Scope 3 emissions	Transport plan	N/A	DAB c17 Sustainable Transport	**Transport Consultant?**			
EC3-b			**Bicycle storage** Provide 1 space for every 20 students to AS2890.3 standard	TBC	DAB c17 Sustainable Transport	**Architect**	Arch: Bicycle storage has been increased to 21 spaces to cater for 418 students.		
W1-a	**Water**	W1: Water use efficiency	**Potable water conservation** The following are to be implemented on school sites where possible: Manual flush urinal systems: New and replacement urinals shall use manual in lieu of automatic flushing mechanisms. A microwave-activated urinal flushing system may be used as an alternative. Water conserving taps: Wherever possible and practical, use metal flow control valves and /or push down taps with pre set flow limits.	Mandatory	DAB c18 Potable Water	**Hydraulics / Arch**	Hyd: Generally completed in alignment with good practice industry standards. Water conservation strategies such as the inclusion of manual flush urinal systems and water conserving tapware are to be documented by the architect. Arch: Noted. These requirements will be considered during schematic design when selecting the fixtures and fittings.		
W1-b			**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 fixtures and fittings must be at least the average WELS star rating by product type. Where WELS rating is not available, use the alternative WaterMark rating scheme.	Mandatory	DAB c18B.1 Potable Water - Sanitary Fixture Efficiency	**Hydraulics / Arch**	Hyd: Selection of FFE elements generally falls within architect scope. Arch: Noted. These requirements will be considered during schematic design when selecting the fixtures and fittings.		
W1-c			**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	Mandatory	DAB c18 Potable Water	**Hydraulics**	Design generally completed in alignment with good practice industry standards.		
W1-d			**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	Mandatory		**Hydraulics**	WS+P is happy to provide sub-metering as required by the ESD. This item should be worked through in future design stages to confirm metering approach.		
W2-a		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.	Mandatory	DAB c18B.2 Rainwater Reuse	**Hydraulics / civil / landscape**	WS+P will provide roof drainage and downpipes for inground collection by Civil Engineer. Civil Engineer to document rainwater tank and relevant services. Civil has modelled a rainwater tank (size 30kL) with water to be used for irrigation only. This assists in meeting Council water quality targets. Hydraulic/Landscape Engineer to provide additional advice (including irrigation strategy/methods, any hydraulic requirements		Civil Concept Design Report - FINAL has been provided to macegroup.
W2-b			**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 to capture and reuse fire systems testing and maintenance water, or by using an alternative non-potable water source.	Optional	DAB c18B.5 Fire System Test Water	**Fire**	The school is not provided with a fire sprinkler system therefore W2-b is not applicable in this case.		

W2-c			**Ground water** Where ground water is available for use for irrigation purposes, enquiries should be undertaken with DPIE to determine the suitability of a ground water system.	Mandatory	DAB c18 Potable Water	**Hydraulics / civil**	According to the Geotech report "no free groundwater was observed in the bores during drilling for the short time that they were left open" (Section 6.1). Additionally, WS+P does not believe that the benefits of utilitsing ground water to irrigate would outweigh the costs of installing/maintaining this system. In accordance with the Detailed Site Investigation for Contamination on the Darlington Public School by Douglas Partners dated February 2019, ref: 92277.01, no free groundwater was observed in the boreholes for the short time they were open.		
W3-a		W3 – Responsible water discharge	**Stormwater management** Aim to minimise the transportation of toxicants to waterways and other offsite environments, and maintain the existing hydrological regimes.	Mandatory	DAB c26 Stormwater	**Civil**	Refer to Civil Concept Design Report for proposed water quality and water quantity control measures.		Civil Concept Design Report - FINAL has been provided to macegroup.
W3-b			**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 DG52.	Mandatory	Not covered in Green Star	**Civil**	Design generally completed in alignment with good practice industry standards. WS+P has confirmed in the recent TSG meeting that grease cooking will not be utilised and hence no need for any grease arrestors. Plaster/clay arrestors will be provided to art wash sinks as required.		
WM1-a	**Waste & materials**	WM1: Materials selection and use	**Life cycle assessment (environmental)** Environmental impacts of products and materials has been assessed and inform material selection	Recommended	DAB c19A - Life cycle assessment	**Arch / ESD**	Arch: Material selection will be undertaken during schematic design in consultation with the ESD consultant and Cost Planner.		
WM1-b			**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.	Recommended	GSC c20 - Return on Investment	**All**	Arch: Material selection will be undertaken during schematic design in consultation with the ESD consultant and Cost Planner and in reference to the design guides. Fjmt will contribute to WOL costing anaylsis as required.		
WM1-c			**Sustainable materials** The use of the following materials in construction is encouraged: - Materials that have lower adverse environmental impacts throughout their life cycle; - 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 recycled at the end of their useful life.	Optional	DAB c21 Sustainable Products	**Arch / ESD**	Arch: Material selection will be undertaken during schematic design in consultation with the ESD consultant and Cost Planner. Sustainable materials will be specified where possible.		
WM1-d			**Sustainable timber** - Use only recycled timber, engineered and glued timber composite products, timber from plantations or from sustainably managed regrowth forests. - All timber used is to be termite (white ant) resistant or treated to be termite resistant to the appropriate hazard level.	Mandatory	DAB c20.2 Responsible Building Materials - Timber	**Arch / ESD**	Arch: Noted		
WM1-e			**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.	Mandatory		**Arch**	Arch: Noted		
WM1-f			**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.	Mandatory	DAB c19B.1	**Structural**	The requirements have been considered in the design and will be reflected on the documentation in next phases of te project i.e. Design Development Stage		
WM2-a		WM2 – Resource efficient school operations	**Operational waste** Consider opportunities for re-use and recycling of materials in the operation of the facilities	Mandatory	DAB c8 Operational Waste	**Arch**	Arch: Noted		

WM2-b			**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.	Mandatory	Not covered in Green Star	**Structural**	The requirement will be further considered in design development stage. At present, where possible, Ground Zone roofs have been designed with additional loading capacty to accomadate possible expansion at a later date.		
WM3-a		WM3 – Responsible management of waste	**Construction waste** Consider opportunities for re-use and recycling of materials in the construction phase	Mandatory	DAB c22 Construction and Demolition Waste	**Main Contractor**	To be addressed by the contractor, takens to be taken from best practice Australian standards.		
WM3-b			**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.	Mandatory	DAB c8 Operational Waste	**Arch**	Arch: A covered and locakable bulk waste area has been provided adjacent to Abercrombie Street. Vehicle assess is being further explored (ie. whether the bulk waste area should be accessed from inside the school boundary or if a door should open onto the street).		
P1-a	**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.	Mandatory		**Ecologist**			
P1-b			**Productive landscape** Consider including opportunities for development of community garden within the site and relationships with community groups for this to occur.	Optional	GSC c14.2 Local Food Production	**Landscape**	Due to space constaints on site to provide sufficient space for pupils, a community garden has been been addressed within the landscape design.	N	
P1-c			**Drinking water catchment protection** For developments within drinking water catchement 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	Mandatory	GSC c24 Integrated Water Cycle	**Civil**	1. The site is not within drinking water catchment 2. Refer to Civil Concept Design Report for proposed water quality and water quantity control measures.		Civil Concept Design Report - FINAL has been provided to macegroup.
P2-a		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.	Negotiable	GSC c12 Culture, Heritage and Identity DAB 24.2 Contamination and Hazardous Materials	**Various**			
P2-b			**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	TBC	Not covered in Green Star	**Landscape**	These design principles form the core of the landscaping strategy, schools have a vital role and form a an important part of the community. School's enageg with communities in boarder ways beyound education, creating a sens eof place helps to embed schools within the community.	Y	
P2-c			**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.	TBC	DAB c30B Community Benefits	**Arch / SINSW**	Arch / SINSW:SINSW and City of Sydney are currently discussing joint usage of the Community Hall, Preschool and Basketball court. FJMT:A public entry has been provided to the proposed school hall on the corner of Abercrombie and Golden Grove Streets. The school buildings will be lockable at ground level so that the school grounds can be used outside of hours for organised events. A community preschool has been approved and will form part of the new school works.		
P2-d			Reconciliation action plan	N/A	DAB c30D Reconciliation Action Plkan	**SINSW**			
P3-a		P3 – Welcoming learning spaces	**Daylighting** Maximise natural daylight in all habitable spaces to improve indoor amenity and create a pleasant environment.	Mandatory	DAB c12 Visual Comfort	**TBC**	Arch: We are aiming for glazed areas to be 15% of the floor area as advised by ESD consultant. This Windows to floor ratio aims to provide 3% daylight factor for learning spaces		

P3-b			**Daylight glare control** Discomforting glare and brightness contrasts must be avoided. It is recommended 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). Elimination of direct sunlight into the spaces will also reduce unwanted heat gain in summer. - 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 should only be controlled by blinds as a last resort. Prepare sun diagrams in the design phase as a minimum requirement.	Mandatory	DAB c12.0 Glare Reduction	**Arch / ESD**	Arch: As part of the facade design we will undertake some preliminary solar studies to determine direct sunlight penetration into learning spaces.		
P3-c			**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	Mandatory	DAB c11 Lighting Comfort	**Electrical / Arch**	Item has been identified as achievable		
P3-d			**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	Mandatory	DAB c11.1 General Illuminance and Glare Reduction	**Electrical**	Item has been identified as achievable		
P3-e			**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.	Mandatory	DAB c27.0 Light Pollution to Neighbouring Bodies	**Electrical**	Item has been identified as achievable		
P3-f			**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	Mandatory	DAB c14 Thermal Comfort	**Mechanical / ESD**	Shall be completed as per guidelines	Y	

P3-g			**Background noise levels** - HVAC systems shall be designed in accordance with the recommended internal noise levels noted in table 1 of DG55.02. 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	Mandatory	DAB c10.1 Internal Noise Levels	**Acoustics**			
P3-h			**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.	Mandatory	DAB c10.3 Acoustic Separation	**Acoustics**			
P3-i			**Noise emissions** 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.	Optional	Not covered in Green Star	**Acoustics**			
P3-j			**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	Optional	GSP c13 Internal Noise Levels	**Acoustics / SINSW**			
P3-k			**Low VOC-emitting materials** All surface coatings, and other Volatile Organic Compound (VOC) emitting products including adhesives, sealants, carpets and carpet underlays, must be made from Low-VOC emission materials. In terms of surface coatings, the Australian Paint Approval Scheme's (APAS) VOC limits for Low VOC paints or lower are to be used	Mandatory	DAB c13 Indoor Pollutants	**Arch**	Noted		
P3-l			**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.	Mandatory	DAB c13 Indoor Pollutants	**Arch**	Noted		
P3-m			**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.	Mandatory	DAB c9.3 Exhaust or Elimination of Pollutants	**Arch / FF&E**	Noted		

P3-n			**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.	Mandatory	Not covered in Green Star	**Mechanical**	Not required	N	
P3-o			**Pesticide free environments** Schools are 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 design to minimise risk	Mandatory	Not covered in Green Star	**Landscape / Ecology**	Pesticides will not be used on site	Y	
P3-p			**Green cleaning**	N/A	GSP c6 Green Cleaning	**SINSW**			
P3-q			**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.	Mandatory	Not covered in Green Star	**Arch**	Noted		
P3-r			**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.	Mandatory	DAB c9 Indoor Air Quality	**Mechanical**	Shall be completed as per guidelines Required outdoor ventilation rates and C02 concentrations shall be maintained without the need for human intervention while in air conditioning mode only. In all other instances, outdoor ventilation shall be achieved by opening of windows.	Y	
P3-s			**Ecological conservation** School sites must conserve for future generations, the biological diversity of genetic materials, species and ecosystems on that site - Consider including opportunities to preserve or re-establish native flora and create new landscapes through liaising with local government authorities, Landcare and environmental groups, and the use of native low water use plants. - Where practicable, retain both existing native and exotic trees and flora, plus under storey native vegetation, in accordance with any 'Fauna and Flora' study, Environmental Impact Statement recommendations and local authority (Council) tree preservation orders.	Mandatory	DAB c23 Ecological Value GSC c29 Ecological Value (incl Biodiversity Enhancement)	**Ecology / Landscape Arch**	Native Flora will be protected where possible, new planting on site will predominantly be hardy, low water use indigenous specieis.	Y	
P3-t			**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.	Mandatory	DAB 30D Universal design	**Arch / Access**	Noted		
P3-u			**Weather protection** Circulation areas provided between administrative, staff and all student spaces (except Agriculture), should be protected from sun, rain and unfavourable winds.	Mandatory	Not covered in Green Star	**Arch**	Noted. We are currently reviewing the extent of cover over these routes		

P3-v			**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.	Mandatory	Not covered in Green Star	**Arch / Landscape**	Arch: Noted. The proposed playspace area meets the 10sqm per student requirement.	Y	
P3-w			**Staff room**	N/A	GSI c Amenity Space		Arch: The staff room has been designed in line with the EFSG requirements for the Staff Unit.		
P3-x			**Healthy canteen policy**	N/A	DAB c30D Integrating Healthy Environments				
P3-y			**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: Glazing: 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. Hot water: 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) Drinking water tanks: 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.	Mandatory	Not covered in Green Star	**All**	Hyd: Design generally completed in alignment with good practice industry standards and to incorporate 'Safety in Design' considerations Arch: Noted. FJMT will attend, host and facilitate Safety in Design workshops at each phase of the design process.		
P3-z			**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 nees to comply with microbe disinfection requirements - "Code of Practice for Thermostatic Mixing Valves NSW" as approved by the NSW Health Department.	Mandatory	DAB c28 Microbial Control	**Hydraulic**	Design generally completed in alignment with good practice industry standards. WS+P will look to minimise the length of dead legs to reduce the risk of legionella growth in the system.		
P3-aa			**Security** Safety in Design and Crime Prevention Through Environmental Design (CPTED) principles are to be implemented in project planning stage. Advice on the electronic surveilance 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	TBC	GSC c15 Safe Places	**Security / Comms**			

P3-ab			**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	Mandatory	DAB 24.2 Contamination and Hazardous Materials	**Geo-Investigation / Main Contractor**			
P3-ac			**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	Mandatory	GSC c22.2 Digital Infrastructure	**Comms**			
R1-a	**Resilience**	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 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).	Negotiable	DAB c3 Adaptation and Resilience	**Various**			
R1-b			**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 aways 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).	Mandatory	DAB c3 Adaptation and Resilience	**Arch**	Arch: The school is not located on bushfire prone land.		
R2-a		R2 – Preparation for stresses	**Response to climate risks** Consideration to be given to how sites and school communities will be able to 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 weather events.	Mandatory	DAB c3 Adaptation and Resilience	**Arch / ESD**	Arch: Noted. FJMT will contribute to climate risk assessment as required in conultation with ESD consultant. ESD: Climate Risk assessment is addressed through the SEARS requiremnts in the SSDA report		

9 Appendix B – Green Star Pathway Demonstrating The SINSW's Framework Equivalency.

Darlington Public School: GREEN STAR PATHWAY

New South Wales	Green Star Design & As-Built Credit	v1.3 Available Points	4 Star Target	Optional for Consideration	Compliance Requirements & Comment	Client	Design Team	Contractor	Cost Impact	Integral Comment
MANAGEMENT		**14%**								
1.0	Green Star Accredited Professional	1	1	-	Requires a Green Star Accredited Professional (GSAP) to be engaged for all stages of the project.		Y		Negligible	ESD consultant engaged already
2.0	Environmental Performance Targets	-	Complies	-	Targets for energy and water consumption to be set and documented. E.g. 25% improvement on min DTS Energy Performance. 50% potable water reduction than typical school building.	Y			Negligible	No cost to developing targets internally
2.1	Services and Maintainability Review	1	1	-	School FM staff to review design during design stage and prior to construction. FM to consider commissionability, controlability, maintanability, fit for purpose and safety.	Y			Negligible	This would be done by School as good practice
2.2	Building Commissioning	1	1		Pre-commissioning & commissioning must be undertaken to CIBSE, ASHRAE and/or AIRAH standards/guidelines. Now also requires air tightness testing. This is largely standard practice now for upper tier builders, with the exception of airtightness testing. point not targeted due to air tightness requirement		Y	Y	Low	Commissioning activites primarily negligible cost, with exception of airtightness testing.
2.3	Building Systems Tuning	1	1	-	Requires formal 12month building tuning period with minimum quarterly tuning meetings and recommissioning. Differs from normal DLP activities.	Y	Y	Y	Moderate	Excellent initiative to ensure building is optimised for energy/water/IEQ performance. Cost associated with additional consultant/contractor time.
2.4	Independent Commissioning Agent	1		Y	Requires engagement of ICA to lead/coordinate commissioning & building tuning activities	Y			Moderate	ICA represents additional consultant and cost to project (e.g. $35k to $50k).
3.1	Implementation of a Climate Adaptation Plan	2	2	-		Y	Y	-		
4.0	Building Information	1	1	-	Involves developing package for occupants about building functions, initiatives to enhance energy efficiency, and O&M Information package and a Building Log Book. Intent to provide central point of information for those managing the facility.		Y	Y	Negligible	Generally included within Contractor scope as best practice hand-over materials for schools operation team.
5.1	Environmental Building Performance	1	1	-	Require the School to commitment to set, measure and report on Environmental Performance targets set through Credit 2.0.	Y			Negligible	No cost to developing targets internally
5.2	End of Life Waste Performance	1		-	Not claimed.	-	-	-		
6.0	Metering	-	Complies	-	Metering to be provided to monitor building energy and water consumption. Sub-metering must be provided to all major energy/water/gas demands (more extensive than minimum compliance). Excluded as it is unlikely the design has incorporated the level of sub-metering required		Y	Y	Low	Allowance above base Section J metering
6.1	Monitoring Systems	1	1	-	Requires strategy for how to monitor and use data from collected from BMS. Cloud based technology platforms can be applied for utility management and benchmarking.		Y	Y	Low	Base functionality provided by BMS, however dedicated cloud platforms are better suited.
7.0	Environmental Management Plan	-	Complies	-	A comprehensive project-specific Environmental Management Plan (EMP) must be in place for consutruction. To be included in Head contractor clauses/specification.			Y	Negligible	Good site practice anyway.
7.1	Formalised Environmental Management System	1	1	-	Formalised, systematic and methodical approach to planning, implementing and auditing the EMP to ensure conformance to EMP. To be included in Head contractor clauses/specification. Requires ISO14001 certification for the head contractor.			Y	Negligible	Expected of responsible contractor
7.2	High Quality Staff Support	1	1	-	Contractor required to implement on-site staff wellbeing practices and enhance site workers' knowledge on sustainable practices through educational programs			Y	Negligible	Higher tier contractors likely to have site practices which are consistent with the requirements.
8B	Operational Waste	1	1	-	Requires on-site waste recycling system which are consistent with best practice requirements. Requires engagment of Waste Consultant		Y		Negligible	Integrated with school waste management practices.
	Category Total	14	**12**							

Darlington Public School: GREEN STAR PATHWAY

New South Wales	Green Star Design & As-Built Credit	v1.3 Available Points	4 Star Target	Optional for Consideration	Compliance Requirements & Comment	Client	Design Team	Contractor	Cost Impact	Integral Comment
INDOOR ENVIRONMENTAL QUALITY		**17%**								
9.1	Ventilation System Attribiutes	1	1	-	Ventilation system design must meet best practice requirements with regards to intakes and exhaust locations	-	-	-	Negligible	Good design practices
9.2	Provision of Outdoor Air	2			1 point awarded for increase of 50% on AS 1668 minimum OA requirements or CO2 sensors are installed to prevent CO2 concentrations from exceeding 800ppm. 2 points available for 100% increase or not exceeding 700ppm		Y		Low	Nat vent must meet the requirements of AS 1668.4-2012 for quantity of air supplied.
9.3	Exhaust or Elimination of Pollutants	1	1	-	Exhausting pollutants from print/photocopy equipment, cooking equipment, and carpark vehicle exhaust through dedicated exhaust systems. Print/photocopy must be isolated in enclosed spaces.		Y		Low	Good design practice. Check if the staff office will have ptining/photocopying as currently there isn't a dedicated room
10.1	Internal Noise Levels	1	1	-	Acoustic Consultant to confirm. Internal ambient noise levels no more than 5dB(A) above the statisfactory levels provided in Table 1 AS/NZS 2107:2000.		Y		Low	Confirm if requires acoustic systems beyond minimum requirements
10.2	Reverberation	1	1	-	Acoustic Consultant to confirm. Requires mitigation of reverberation in accordance with Australian Standard		Y		Low	Acoustic Consultant to confirm.
10.3	Acuostic Separation	1	1	-	Acoustic Consultant to confirm. Partition between spaces should achieve a weighted sound reduction index (Rw) of at least 45.		Y		Negligible	Acoustic Consultant to confirm.
11.0	Minimum Lighting Comfort	-	Complies	-	Pending lighting design. Lights to be flicker free and address perception of colour in the spaces.		Y		Negligible	Good lighting design and fitting selection
11.1	General Illuminance and Glare Reduction	1	1	-	Pending lighting design. Lighting levels will comply with best practice guidelines (AS 1680.2.4) and glare is eliminated.		Y		Low	May require alternative fitting selection
11.2	Surface Illuminance	1		Y	Surface reflectacne of ceiling to be at least 0.75 (matt white) and ceiling area to have at least 30% illuminance of light on the working plane	-	-	-	-	Dependant on finish specification and lighting design
11.3	Localised Lighting Control	1	1	-	Consideration of lighting control provisions within individual spaces		Y		Low	Requires further review of credit criteria in context of a school.
12.0	Glare Reduction	-	Complies	-	Limited extent of glazing.		Y		Low	
12.1	Daylight	2		Y	Requires space to achieve good levels of daylight. Requires daylight modelling.		Y		Low	Modelling costs to verify
12.2	Views	1	1	-	Determine if glazing at high level is prohibited of views		Y		Negligible	No cost
13.1	Paints, Adhesives, Sealants and Carpets	1	1	-	Internally applied paints, adhesives, sealants and carpets meet stipulated Total VOC Limits. Refer to Green Star Design and As-Built guidelines for limits.		Y	Y	Negligible	Standard industry practice now and contributes to conducive learning environments.
13.2	Engineered Wood Products	1	1	Y	All engineered wood products meet stipulated formaldehyde limits or no new engineered wood products are used in the building. Refer to Green Star Design and As-Built guidelines for limits. Includes particleboard, plywood, fibreboard etc.		Y	Y	Negligible	Standard industry practice now and contributes to conducive learning environments.
14.1	Thermal Comfort	1		Y	Verification of thermal comfort performance required through the application of thermal comfort modelling.		Y		Moderate	Requires additional engagement of thermal comfort modelling by ESD consultant.
14.2	Advanced Thermal Comfort	1		-	90% Occupant satisfaction	-	Y	-		
	Category Total	17	**10**							

Darlington Public School: GREEN STAR PATHWAY

New South Wales	Green Star Design & As-Built Credit	v1.3 Available Points	4 Star Target	Optional for Consideration	Compliance Requirements & Comment	Client	Design Team	Contractor	Cost Impact	Integral Comment
ENERGY		**22%**								
15A.0	Conditional Requirement	NA	Complies	-	Requires minimum Deemed-to-Satisfy (DTS) requirements of Parts J1 (building fabric) and J2 (glazing) of Section J to be exceeded by 5%.		Y			
15A.1	Building Envelope	1	1	-	Nominal increase of 10% over Section J minimum R-Value requirements for building fabric.		Y			
15A.2	Glazing	1	1	-	Requires 10% improvement on minimum Section J Glazing U-Value and SHGC requirements.		Y			
15A.3	Lighting	1	1		Lighting power density is 10% less than maximum allowed in Section J. Automated lighting control systems (occupant detection, daylight, time switches) provided.		Y			
15A.4	Ventilation and Air Conditioning	1	1		The space is naturally ventilated or 10% improvement on Section J efficiency requirements for fan, pump, water heater and air conditioning equipment.		Y			
15A.5	Domestic Hot Water	1	1	-	Domestic Hot Water to be powered by electric heat pump. Can be powered by natural gas but this is least preferrable option.		Y			
15A.7	Accredited GreenPower	5		Y	Requires ongoing purchase of green power energy premium.	Y				
15A - New credits	Optional Prescriptive Point: Transition Plan	1		Y	Requires to reduce fossil fuel use and develop a transition plan to phase them out. Project teams need to publicly commit to a transition plan and show it has been developed, demonstrating how the building will transition away from the use of fossil fuels.	Y				
	Optional Prescriptive Point: Fuel Switching	1	1	Y	Required to demonstrate that a percentage of energy required by the building annually is generated by on site renewable solutions; OR Other points have been achieved in the pathway		Y			
	Optional Prescriptive Point: Onsite Storage	1		Y	• A renewable energy storage procurement and use strategy has been developed and demonstrates that the storage is sized to match the requirements of the building and that value will be provided to the project; • The stored renewable energy is used to reduce the peak electricity demand; and • The onsite storage must be set up to receive renewable energy (onsite or offsite)		Y			
	Optional Prescriptive Point: Vertical Transport	1	Not targeted		Required that the energy associated with lift machinery or other vertical transportation meets: • The minimum lift energy efficiency is class B in accordance with ISO 25745-2; and • The minimum lift idle and standby energy performance level is 1 in accordance with ISO 25745-2. • The minimum escalator energy performance is class A+ in accordance with ISO 25745-3. Where projects have both lifts and elevators installed, all three criteria must be met.					
15E	GHG Emissions Reduction - Modelled Performance	20		Y	Requires energy modelling to demonstrate reduction in energy consumption and GHG emissions of the propsed building as compared to a reference building. Points are awarded based on efficient building services, PV renewable energy generation.		Y		Moderate	
16A	Peak Electricity Demand Reduction - On-Site Energy Generation	2	2	-	Requires to reduce total peak electricity demand by 15%. Achieved through the application of passive design features, efficient building services and embedded generation.					
	Category Total	36	**8**							
TRANSPORT		**10%**								
17B.1	Access by Public Transport	3	Not targeted	-	Based on accessibility of the site by public transport. Site achieves a good 'Walk Score'. Further work required to verify		Y		Negligible	Product of site characteristics
17B.2	Reduced car Parking Provision	1	1	Y	Requires consideration of additional on-site carparking.	-	Y	-	Negligible	School bus? Would need to review current parking numbers more closely
17B.3	Low Emisson Vehicle Infrastructure	1		Y	Requires provision of electric vehicle charging infrastructure and/or dedicated car share spaces.	-	Y	-	Moderate	Cost of chargers to be considered
17B.4	Active Transport Facilities	1	Not targeted	-	Requires bicycle parking, access to showers and lockers on site for occupants/visitors. Schools have an additional requirement for bicycle parking which is significant		Y			
17B.5	Walkable Neighbourhoods	1	Not targeted	-	The site achieves a good walk score due to location (receives a score of 73 where minimum required is 80).	-	Y	-		
	Category Total	7	**1**							

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WATER		**12%**								
18A	Potable Water - Performance Pathway	12	6	-	Fixtures to meet minimum WELS ratings: taps (6 *), urinals (6 *), toilets (5 *), showers (3 *), rainwater harvesting, avoidance of water-based heat rejection (standard for schools), efficient landscape irrigation system and fire system test water harvesting (TBC fire protection system).		Y		Negligible	Rainwater capture and reuse covered in the return brief report
	Category Total	12	**6**							
MATERIALS		**14%**								
19	Life Cycle Impacts	7		-	Not claimed.	-	-	-		
20.1	Structural and Reinforcing Steel	1		-	Not claimed.	-	-	-		
20.2	Timber Products	1	1	-	Requires timber used in building and construction to be from a reused source or certified by a forest certification scheme. To be confirm if this was included in the specification.			Y	Low	Generally attainable based on proactive management of sub-contractor material procurement.
20.3	Permanent Formwork, Pipes, Flooring, Blinds and Cables	1	1	-	Requires materials to have no PVC and have an Environmental Product Declaration, or PVC to meet bet practice guidelines for PVC. To be confirm if this was included in the specification.			Y	Low	Generally attainable based on proactive management of sub-contractor material procurement.
21	Product Transparency and Sustainability	3				-	Y	-	Low	Environmentally friendly building materials covered in the design brief
22B	Construction and Demolition Waste	1	1	-	Requires reducing construction waste going to landfill by reusing or recycling 90% of the waste generated during construction.			Y	Negligible	Good contractor practices
	Category Total	14	**3**							
LAND USE & ECOLOGY		**6%**								
23.0	Endangered, Threatened or Vulnerable Species	-	Complies	-		Y			Negligible	Product of site characteristics
23.1	Ecological Value	3	1	Y	Points awarded where the ecological value of the site is improved by the project. Assumed one point achieve, however verification required via Ecological Value Calculator.					Landscape design to be confirmed around Sports Hall
24.0	Sustainable Site	-	Complies	-			Y		Negligible	Product of the site characteristics
24.1	Reuse of Land	1		-	Available where 75% of the site was previously developed.					
24.2	Contamination and Hazardous Materials	1		-	Awarded where the site, or an existing building, was previoulsy contaminated and the site has been remediated in accordance with best practice remediation strategies. To be confirmed by geotechnical engineer.					
25.0	Heat Island Effect Reduction	1	1	-	Generally requires appropriate selection of roof materials, selection of hardscape treatment and extent of landscape/tree coverage. Would require conscious review of site landscape/hardscape.		Y		Low	Dependant on material selection / landscape design proposals
	Category Total	6	**2**							
EMISSIONS		**5%**								
26.1	Stormwater: Reduced Peak Discharge	1	1	-	Civil Engineer to confirm. Post-development peak event discharge from site does not exceed the pre-development peak event discharge.		Y		Moderate	Pending comment from Civil Engineer. Requirements may align with minimum council requirements.
26.2	Stormwater: Reduced Pollution Targets	1	1	-	Civil Engineer to confirm. All stormwater from the site meets specified Pollution Reduction Targets.		Y		Moderate	Pending comment from Civil Engineer. Requirements may align with minimum council requirements.
27.0	Light Pollution to Neighbouring Bodies	-	Complies	-	Pending lighting design. Project to comply with AS 4282:1997 Control of the Obtrusive Effects of Outdoor Lighting		Y		Negligible	Product of good lighting design
27.1	Light Pollution to Night Sky	1	1	-	Pending lighting design. It can be demonstrated that a specified reduction in light pollution has been achieved.		Y		Negligible	Product of good lighting design
28.0	Legionella Impacts From Cooling Systems	1	1	-	To be confirmed by mechanical. Awarded where water-based heat rejection is avoided for mechanical services.		Y		Negligible	Product of appropriate mechanical services design. Confirm if water based heat rejection systems are currently not proposed within project.
29.0	Refrigerants Impacts	1		-	Not claimed. Exceptionally challenging credit to achieve.	-	-	-		
	Category Total	5	**4**							

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INNOVATION										
30A	Innovative Technology or Process		1	-	Passive water treatment systems + Onsite renewable energy	-	Y	-	Moderate	PVs as per design brief
30B	Market Transformation			Y	Potentially Soft landings if ICA engaged	-	-	-	Moderate	ICA costs
30C	Exceeding Green Star Benchmarks		1	Y	1) If 15E pursued, can we achieve over 12 points through passive design strategies? 2) Civil engineer to confirm if project can improve on pollution reduction targets. 3) Construction and demo waste reductions to 5Kg/sqm of GFA		Y		Moderate	1) Extra modelling required. 2) Civil works for proprietary treatment systems. 3) Further waste avoidance/management
30D	Innovation Challenge	10	2	Y	1) Community benefits - potential benefits of the program to the student community 2) Contractor education 3) Financial transparency 4)Integrating healthy environments - health & wellness benefits to occupants of living/working/studying in the natural bush environment of the site?		Y			Points awarded based on sustainable initiatives taken which fall outside of available Green Star credits, such as "community engagement". Further work required
30E	Global Sustainability			-		-	-	-	-	
	Category Total	10	**4**							
TOTAL			**50.0**							