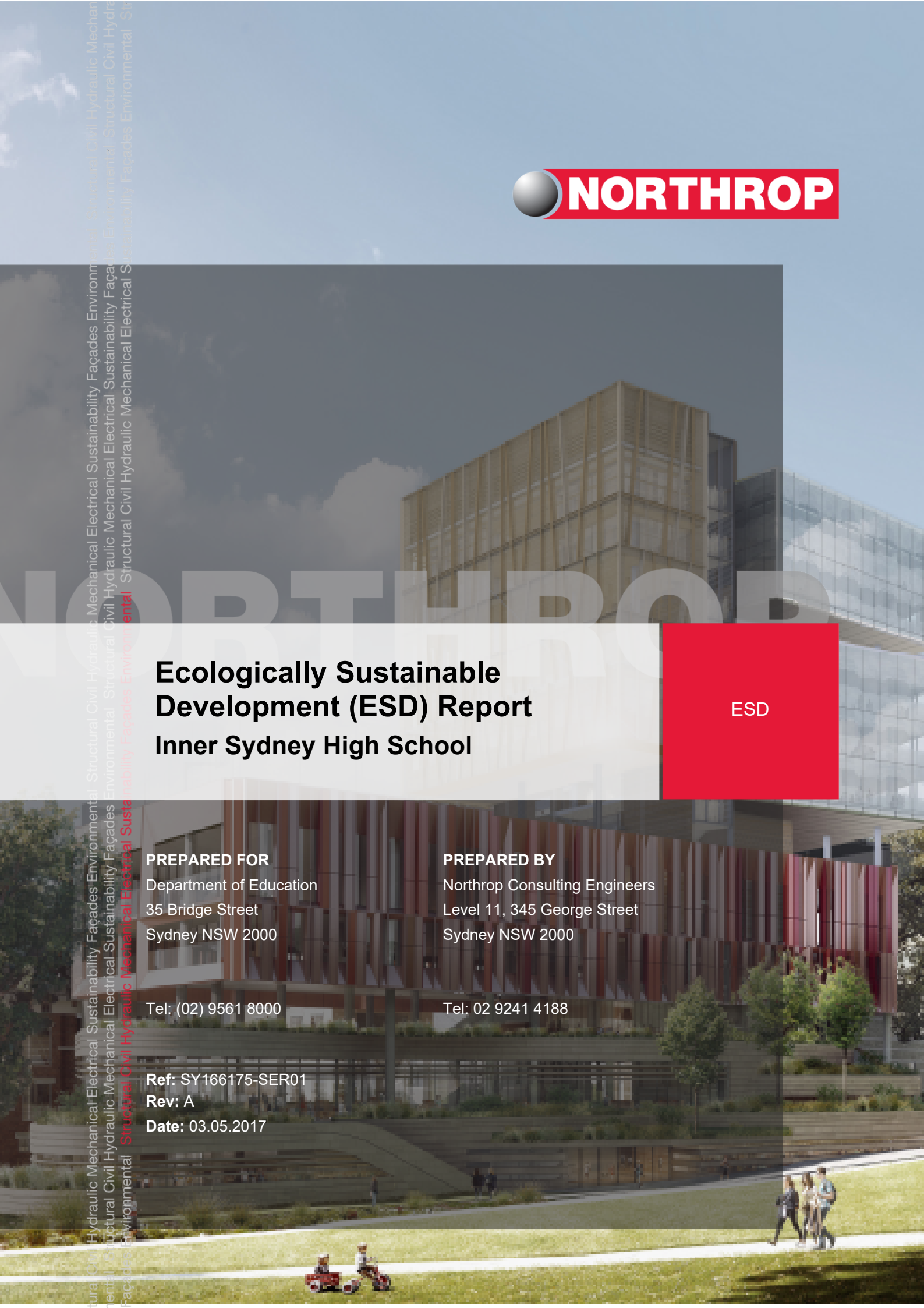

Ecologically Sustainable Development (ESD) Report

Inner Sydney High School

ESD

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EXECUTIVE SUMMARY

This ESD report outlines how the proposed scheme for Inner Sydney High School creates a landmark building, incorporating high levels of thermal comfort, efficient operation and a minimal environmental impact. The building has incorporated a design focus on maximising the energy and water efficiency while maintaining daylight access and views.

As a state significant development the project is required to meet the Secretary's Environmental Assessment Requirements (SEARs) and the Educational Facilities Standards and Guidelines (EFSG). In order to demonstrate that these requirements have been met the project has targeted the following sustainability benchmarks;

- A 5 Star Green Star Design Review & As Built v1.1 Rating (self-assessed); and
- Implementation of additional sustainability initiatives to create a space that will educate occupants about the building performance and how this is effected by occupant behaviour.

This report outlines the sustainability initiatives that are being implemented to address the above and details and Green Star pathways. The significant design initiatives to be implemented include:

- A strong commitment to energy efficiency with the project design to demonstrate a 40% energy reduction over a standard construction building of its type;
- A highly efficient façade system designed to minimise heat gain into the building while promoting the entry of daylight into classroom spaces;
- Low impact materials selections with the project maximising the reuse of onsite materials and the use of certified materials where applicable;
- The use of highly efficient water fixtures and fittings, alongside a waterless heat rejection system;
- Integration of educational signage, wayfinding and monitoring systems across the site;
- Integration of the site into the broader community through its interaction with the adjacent Prince Alfred Park; and
- An optimised air conditioning system to provide good provision of outside air while maintaining thermal comfort in the classroom areas.

Overall the integration of these initiatives demonstrate the sites strong commitment to social, environmental and economic sustainability of the project.

SUSTAINABILITY – ESD REPORT

Activity Schedule

Date	Revision	Issue	Prepared By	Approved By
03.05.2017	A	State Significant Development Application (SSD 16_7610)	I. Van Eerden	A. Girgis
23.05.2017	A1	Updated incorporating comments for State Significant Development Application (SSD 16_7610)	I. Van Eerden	A. Girgis

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1. INTRODUCTION

The NSW Department of Education (DoE) are preparing a State Significant Development Application (SSD 16_7610) for the development of 'Inner Sydney High School' located at the corner of Cleveland and Chalmers Street, Surry Hills (the 'site').

The Inner Sydney High School is proposed to accommodate up to 1200 students to take enrolment pressure off surrounding high schools exceeding student capacity, and accommodate future population growth within City of Sydney Local Government Area (LGA). The high school will contain high quality classrooms, collaborative learning spaces and associated facilities.

Specifically, this proposal seeks development consent for the following works at the site:

- Internal reconfiguration and refurbishment of the existing heritage listed buildings on the site to create:
    - General and specialist learning areas;
    - Amenities; and
    - Staff workplaces for teachers and administrative staff.
- Construction of a thirteen (13) storey plus roof level and basement (approximately 56.5m from park level), multi-purpose school building, containing:
    - Collaborative general and specialist learning hubs with a combination of enclosed and open spaces;
    - Library and Resource Hubs;
    - Staff workplaces;
    - Student canteen;
    - Indoor Movement Complex and other indoor recreation and performance spaces;
    - Outdoor learning and recreational areas.
- Associated site landscaping and public domain improvements; and
- Augmentation and construction of ancillary infrastructure and utilities as required.

1.1 Response to Secretaries Environmental Assessment Requirements (SEARs)

This report addresses how the proposed project addresses Item 7 of the SEARs and outlines strategies relating to the Integrated Water Management Plan. These requirements are outlined below alongside where the response to each can be found within this report;

Item	Action to Address The Requirement	Report Location
Detail how ESD principals (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the project.	This ESD report details how the project aims to address the ESD Principles and their incorporation into the design and ongoing operation of the project.	Section 2
Demonstrate that the development has been assessed against a suitably accredited rating scheme to meet industry best practice.	The project is being assessed against the Green Building Council of Australia Green Star Rating Framework.	Section 4
Include a description of the measures that would be implemented to minimise consumption of resources, water (including water sensitive urban design) and energy	The Department of Education EFSG addresses how schools can minimise consumption of resources, water and energy. A description of how the project is addressing this is included within Section 3.	Section 3
Preparation of an integrated Water Management Plan Detailing any proposed alternate water supplies, proposed end uses of potable and non-potable water, and water sensitive urban design.	This ESD report outlines how the project is incorporating water efficiency, monitoring and water sensitive urban design.	Section 2.4

1.2 Background

The population of Sydney is forecast to grow by over one million people in the next 10 years and a significant number will reside in or close to the Sydney CBD in new residential developments in areas such as Green Square, Central to Eveleigh precinct, Barangaroo, Central Square, the Bays Precinct and Ultimo. This growth in inner Sydney suburbs is occurring rapidly, putting significant pressure on public infrastructure, including transport, health services and education.

The Department of Education has a legislative responsibility to provide teaching spaces to meet demand in all areas across NSW. A new inner city high school is to be built on Cleveland Street, Surry Hills to meet this demand. Cleveland Street Intensive English High School currently occupies the site. A new facility is being constructed for Cleveland Street Intensive English High School on a site already owned by the Department of Education (DoE) at Alexandria.

The Cleveland Street school site will be redeveloped to create a new future focused high-rise school with a mix of new and refurbished buildings. The heritage of the site is a major consideration for the design of the new school. A design excellence competition has been completed with the winning architects, Francis Jones Morehen Thorp

(FJMT) continuing to progress the design for the school. The new inner Sydney high school is expected to open in 2020. The new inner Sydney High School will offer:

- Facilities that are readily accessible and flexible to meet the demands of an evolving curriculum in line with future-focused learning principles.
- Flexible and well connected teaching and learning spaces that enable a variety of teaching and learning practices.
- Spaces that are engaging and supportive for students and teachers.
- Technology-rich settings with an emphasis on mobility and flexibility.
- A healthy and environmentally sustainable environment.
- Innovative, connected outdoor spaces that enable play and collaborative learning.
- Connected open space, creating a welcoming and accessible school with indoor and outdoor teaching and learning opportunities. No historic buildings are proposed to be demolished as part of the redevelopment.

The new teaching spaces will incorporate principles of energy efficiency and ecologically sustainable development (ESD). This includes:

- Passive design principles
- Thermal performance and comfort.
- Natural lighting.
- Water recycling management.

Works are as illustrated in detail in the Architectural Design Statement as prepared by FJMT.

1.3 Site Description

The Inner Sydney High School site is located at the south-east corner of Prince Alfred Park, bounded by Cleveland Street at the south and Chalmers Street at the east. The site is bounded on two sides by Prince Alfred Park and provides views over Central Station to the City. The existing site includes a combination of buildings ranging from high to low historical significance. Buildings of high and medium significance will be retained and the low significance building (Building 4, Cleveland Street Intensive English High School) is proposed to be demolished and redeveloped into a new thirteen (13) storey tower plus roof level and basement (approximately 56.5m from park level).

1.4 Sustainability Objectives

This project is required to comply with the Secretary's Environmental Assessment Requirements (SEARS). The initiatives outlined within this report illustrate a pathway to demonstrate compliance with these requirements however the ESD strategy will evolve and adapt over time as the design develops, and as such the assessed ESD credentials of the project may change. The SEARs requirement include the following in relation to ESD:

- Demonstration of how ESD principles will be incorporated into the design and ongoing operation of the development;
- Demonstration that the development has been assessed against a suitably accredited rating scheme to meet industry best practice; and

- Demonstration that measures have been implemented to minimise the consumption of resources, water and energy.

In addition, the project has included the design principles of the Educational Facilities Standards and Guidelines (EFSG) which is further detailed in Section 3 of this report.

To meet the above, the project will be targeting the following sustainability ratings, illustrating commitment to economic, social and environmental sustainability, alongside improved student wellbeing and comfort:

- Achievement of a 5 Star Green Star Design & As Built v1.1 Rating (self-assessed); and
- Implementation of additional sustainability initiatives to create a space that will educate occupants about the building performance and how this is effected by occupant behaviour.

The following sections broadly outline the sustainability initiatives that are being implemented to address the above with the detailed Green Star pathways included within Appendix B.

1.5 Disclaimer

Due care and skill has been exercised in the preparation of this advice.

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 Northrop for detailed advice, which will take into account that party's particular requirements.

2. SUSTAINABILITY INITIATIVES:

The following section describes how ESD principals (as defined in clause 7(4) of Schedule 2 of the Environmental Planning and Assessment Regulation 2000) will be incorporated in the design and ongoing operation phases of the project. This section in concert with the targeted Green Star rating, outlined in section 4 illustrates how the project addresses the following;

- The precautionary principle – through the implementation of environmental management, maintainability and climate change adaption planning the project is actively including adaptability and resilience within the project. These plans and corresponding design responses demonstrate that the design is actively considering the concepts behind the precautionary principle to create a space that can both accommodate for changes that may eventuate in the future and one that carefully evaluates and avoids serious or irreversible damage to the environment.
- Inter-generational equity to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations – through the inclusion of zero ozone depleting materials, sustainably sourced timber, low impact steel and concrete, alongside a focus on native vegetation, water sensitive urban design and support of connection with nature, the project demonstrates a strong commitment to the preservation of environmental health, diversity an productivity for future generations.
- Conservation of biological diversity and ecological integrity – through the planting of endemic native vegetation, improvement of stormwater runoff from the site and use of landscaping that blends with the surrounding parklands, the project will act to improve, conserve and support the local biological diversity and integrity.
- Improved valuation, pricing and incentive mechanisms - the project has involved significant input from the Quantity Surveyor who will be involved throughout the entire design process to ensuring that the project both remains on budget and effectively considers environmental factors in the valuation of assets and services. Furthermore the project will look at maintainability and the operational costs associated with individual design initiatives and the overall design.

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

2.1 Energy Efficiency:

Energy efficiency will be considered throughout the design development process with the following improvements already being implemented as part of the design;

2.1.1 Improved building fabric and glazing performance

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

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

2.1.2 New Building Management System (BMS) & Energy Management System (EMS)

The proposed HVAC system incorporates an intelligent BMS to control the buildings thermal comfort with minimal input from building occupants. This system assists in optimising the sites energy efficiency while maintaining comfortable conditions within the conditioned areas.

The provision of an EMS will also be investigated to monitor and report on energy and water consumption. This system could be used to drive the sites education infographics and provide a valuable educational tool for students around the building operation and efficiency.

2.1.3 Energy metering and monitoring strategy for key uses including lighting & small power

An energy metering and monitoring strategy is to be developed to effectively monitor the main energy uses within the building, alongside the lighting and small power use on each floor. This aims to allow students to understand the differing energy loads associated with different spaces and services and provide facilities management with notification of inefficacies within the facility. The implementation of this strategy will be dependent on feedback and support from the Department of Education facilities team.

2.1.4 Improved outdoor air rates coupled with an outdoor air economy cycle

The project design is currently incorporating a 50% increase in outdoor air provided to learning spaces. This will minimise CO2 build up in classrooms and improve comfort and health outcomes for the building occupants. Where budgets allow this measure will be further supported through the inclusion of CO2 monitoring to ensure that the building systems provide this additional outdoor air with minimal energy consumption.

The design will also incorporate on an outdoor air economy cycle will allow the building to exploit periods where the buildings external conditions can effectively provide thermal comfort in the space reducing the run times of the air-conditioning system.

2.1.5 Highly efficient lighting system

The installation of LED lighting throughout the facility will assist in the minimisation of lighting energy use with a target lighting power density of less than 5W/m2

Improved lighting energy also reduces the heat loads within the spaces and therefore lowers the energy used to condition the classroom areas.

2.1.6 Motion, photoelectric (PE) and timer controls for circulation space lighting;

The project is will install motion and PE controls on lighting throughout the circulation and recreation spaces. This will ensure that lighting is not used when spaces are unoccupied. Lighting systems will also be linked to the period bells for the school and timers to ensure that lighting does not remain on after hours and is active when students are entering circulation spaces.

2.1.7 Energy efficient domestic hot water

The use of solar, gas boost (or heat pump) hot water systems will be explored throughout the detailed design process with an efficient solution incorporated into the final design.

2.1.8 Lift destination controls

Destination control on the lifts is a key component of both the project energy efficiency strategy and vertical transport optimisation of the site. The lifts are expected to be used at full capacity during peak periods with accessible stairs provided to support active transportation for movements over a small number of floors.

2.1.9 Photovoltaic (PV) Energy Systems

The project is sizing an optimal PV array within the project, initial investigation indicates that a 50kW system is likely to be achievable with an allowance for up to 100kW is being included within the electrical design. A PV system will provide onside renewable energy and will reduce the sites electricity consumption from the grid.

Building integrated PV applied as shading devices and building elements is also being investigated as an option for expanding the size of the onside generation.

2.1.10 Interactive displays

It is intended that interactive displays will be installed within the facility's circulation spaces for real-time resources consumption these will be used as both an educational tool and as a building management tool. These display systems will allow students and staff to perform the following;

- Monitor changes in the facility's operation
- Identify and explain excessive energy use
- Detect instances when consumption is unexpectedly higher or lower than would usually have been the case
- Visualise energy consumption trends (daily, weekly, seasonal, operational…)
- Observe how changes to relevant driving factors impact energy efficiency
- Develop performance targets for energy management programs

2.2 Education

Given the educational focus of the project, the following initiatives will help to promote an understanding of sustainability and building operation within the school population.

2.2.1 Energy, water, waste and indoor environment monitoring

The project is investigating the inclusion of in class displays with monitoring results from energy, water, waste and indoor environmental measurements will assist in understanding the operational performance of the facility. It will also promote the connection between utility services and outputs e.g. when the air conditioner is on the energy consumption increases.

2.2.2 Rooftop Garden

The provision of a rooftop garden will promote an understanding of food production and heathy eating decisions. This understanding will help to reinforce other initiatives throughout the school like the NSW Department OF Education Healthy School Canteens program. This space will also help to build community identity and create a welcoming space for students to study and relax.

2.2.3 Educational tools

The project is investigating the installation of new energy technologies to illustrate the connection between energy production and use, equipment such as green gym facilities (which produce energy), solar panels and piezo electric tiles in common areas will help educate students about energy production.

2.2.4 Celebration of the sites heritage

The project will be providing a range of educational signage and tools to celebrate the heritage of the site. Having been an operational school for over 150 years this information will create a sense of connection with the sites history and an appreciation of the significance of maintaining the existing infrastructure.

2.2.5 The provision of WiFi Connectivity across the site

High speed WiFi will be installed throughout the entire site to provide support for next generation educational tools including tablets and laptop learning.

2.2.6 Interactive Facades

The project will also investigate opportunities to incorporate the use of visually engaging interactive façade across the site. These will provide a tool to educate the public and students about the performance of the buildings, events and provide a highly visual element to the building form.

2.3 Indoor Environment Quality

Indoor environment quality is of paramount importance in an educational facility and the following considerations are to be incorporated into the building design:

2.3.1 CO_2 Sensors

Inclusion of CO_2 sensors to maintain CO_2 levels at 700ppm will provide an effective mechanism for managing outdoor air supply to the classroom spaces and will improve student concentration

Higher than normal CO_2 concentration can be an indicator of inadequate ventilation and can significantly impact on the comfort and productivity of people within the space. The installation of CO_2 monitoring systems can detect issues with the indoor air quality and automatically adjust the flow of air to the space.

2.3.2 Daylight Access

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

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

2.3.3 Access to views

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

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

2.3.4 Interior noise level control (sound masking + treatment)

Acoustic considerations have been included into the design of the building layout and systems design with interior nose levels to be maintained below the acceptable limit of 45dB (this is in line with industry accepted practice).

2.3.5 Material selection

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



2.4 Water Efficiency

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

2.4.1 Integrated Water Management Plan

The project will implement an Integrated Water Management Plan which will detail the sites potential for alternate water supplies, end uses detail the proposed end uses of both potable and non-potable water, and incorporate water sensitive design into the project.

2.4.2 Use of high efficiency fixtures and fittings

The project is implementing water efficient fixtures and fixtures in line with both the requirements of the EFSG and Green Star. This will result in a significant reduction in the facility's potable water use when compared to a standard practice building.

2.4.3 Smart water meters linked to the monitoring system with alarms for leak detection

The provision of water metering and a monitoring system will provide a system to for the school to effectively manage their water usage and be aware of potential leaks at the site. The monitoring system will be capable of raising an alarm where there is a consistent increase in the base line water consumption of the site or a system as this tends to indicate a system leak.

This system will also provide a detailed understanding of the schools use of potable and non-potable water in operation.

2.4.4 Small rainwater tanks for education and minor irrigation purposes

A small rainwater capture and storage system will be installed to provide educational support around water efficiency and to provide for the sites minor irrigation needs. Space provisions have been made within the design to accommodate this system.

2.4.5 Use of low maintenance native and xeriscape landscaping

The sites landscaping has endeavoured to incorporate native and low maintenance vegetation where possible which will significantly reduce the potable water consumption of the site.

2.4.6 Water Sensitive Urban Design

The project in incorporating a strong focus on water sensitive urban design with the external landscape and pavement design facilitating surface water recharge, minimisation of irrigation and promotion water sensitive plant and materials selection.

2.5 Improved Ecology

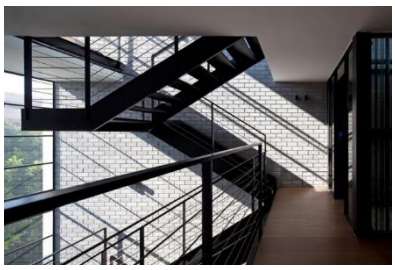
Through planting native vegetation and promoting improved interaction with the natural environment, the project will improve the site's ecology and minimise the ongoing environmental impact of the project. The project is currently implementing the following:

- Extensive native vegetation endemic to the local area;
- Minimisation of light spill from the facility which impacts on migratory animals and insects;
- Reduced dissolved pollutants in stormwater discharged from the site; and
- Adaption of a brownfield site.

2.6 Sustainable Transport

The project design is currently incorporating the following initiatives to promote active and sustainable transport both to the site and within the buildings. The following are some of the measures being implemented:

- Protected bridges to connect buildings
- Well-lit and attractive stairwells to encourage active transport as an alternative to the use of lifts;
- Lift Destination control with access cards to promote the efficient and effective movement of students within the buildings;
- Bicycle parking facilities for students to support the use of active transport;
- Limited onsite car parking to encourage use of public and active transport options; and
- Providing strong links to nearby public transport facilities.



2.7 Waste Management

Effective waste management throughout demolition, construction and operation of the site will help to promote resource efficiency and minimise the adverse environmental impacts of the project. The following are being implemented as part of the design:

- Dedicated waste recycling spaces;
- Provision of accessible water sources for drinking water to reduce the use of bottled water on site;
- Provision of waste education resources linking with waste companies;
- Provision of City of Sydney waste recycling rewards bin onsite;
- Minimisation of construction and demolition waste sent to landfill; and
- Provision of separated waste streams for recycling and general waste.

3. EFSG SUSTAINABILITY TARGETS

3.1 Overview

The Educational Facilities Standards and Guidelines (EFSG) have been developed by the NSW Department of Education, to assist the management, planning, design, construction and maintenance of new and refurbished school facilities. The EFSG is to be treated as a reference guide that provides a starting point to allow for a consistent standard of delivery across various types of school developments.

The EFSG Design Guide considers a framework incorporating several aspects of design including extensive Ecologically Sustainable Development (DG02) requirements. The following categories are covered within the EFSG DG02 Design Guide:

- NSW Government Resource Efficiency Policy (GREP)
- Environmental Design Policies
- Environmental Design Features of Educational Facilities
- Insulation
- Ventilation
- Pesticides
- Water Conservation

The proceeding sections outline how the project addresses each of the requirements of the EFSG DG02 Design Guideline.

3.2 NSW Government Resource Efficiency Policy

The NSW Government Resource Efficiency Policy's aim is to ensure that Government agencies minimise energy, water, waste resources and reduce harmful air emissions. By targeting a 5 Star Green Star Design & As-Built rating and the above sustainability initiatives, the project addresses the outcomes of this policy.

3.3 Environmental Design Policies

3.3.1 Green Building Design and Green Star

The EFSG DG02 Design Guide suggests incorporating a minimum 4 Green Star – Education v1 Design & As-Built rating for assessing new school sustainable design principles. Since the development of the guideline, the Green Star – Education v1 Design & As-Built rating tool has been exhausted. The project is targeting a 5 Star Green Star – Design & As-Built v1.1 rating which has replaced the previous tool and is most applicable for this type of development.

3.3.2 Green Star Requirements

The project is targeting a 5 Star Design & As-Built v1.1 rating, exceeding the suggested 4 Star rating in the EFSG DG02 Design Guide. Refer to Section 5 and Appendix C that outlines the initiatives targeted under the Green Star Design & As-Built v1.1 rating tool for this project.

3.3.3 Environmental Management Plan

A site specific Environmental Management Plan (EMP) is required prior to the commencement of the relevant site works and is to be a condition of contract. The intent of this requirement is addressed under the following target revised Green Star credits under the new Design & As-Built v1.1 tool:

- Construction Environmental Management - 7.0 Environmental Management
- Construction Environmental Management - 7.1 Formalised Environmental Management Plan
- Responsible Building Materials – 20.3 Permanent Formwork, Pipes, Flooring, Blinds and Cables

3.3.4 Timber

The project will endeavour to support sustainably sourced timber that aligns to the below commitments:

- No Rainforest timbers to be used unless plantation grown
- No timbers from high conservation forests
- Use only recycled timber, engineered and glued timber composite products, timber from plantations or from sustainably managed regrowth forests.

Additionally the Responsible Building Materials – 20.2 Timber Products is to be targeted under the Green Star Design & As-Built v1.1 rating tool which will complement the above initiatives.

3.3.5 Ecologically Sustainable Development

The ecologically sustainable development outcomes provided by the EFSG DG02 Design Guide are as follows:

- Ensure the preservation, maintenance and sustainable use of the community's natural and material assets
- Protect and support biological and ecological diversity
- Restrict the flow of pollutants into our natural environment

The development has proposed to address these ecological outcomes through the planting of native vegetation and promoting improved interaction with the natural environment as identified in Section 2.6 of this report.

3.3.6 Environmentally Friendly Materials/Products

Environmentally friendly materials and products are encouraged to be used on site. The following initiatives are to be included in the proposed development:

- Materials that adequately and economically perform their intended functions, and also have lower adverse environmental impacts throughout their life cycle.
- Contain reduced or no hazardous substances (Low VOC)
- Reduce the demand for rare or non-renewable resources
- Are made from or contain recycled materials or can be recycled at the end of their useful life.

These requirements are addressed in the Green Star Design and As-Built v1.1 rating tool under serval targeted credits including:

- Indoor Pollutants – 13.1 Paints, Adhesives, Sealants and Carpets (low VOC)

- Indoor Pollutants – 13.2 Engineered Wood Products (low formaldehyde)
- Life Cycle Impacts – 19B.1 Concrete (30% reduction in Portland cement)
- Life Cycle Impacts – 19B.3 Building Reuse
- Responsible Building Materials - 20.2 Timber Products
- Responsible Building Materials – 20.3 Permanent Formwork, Pipes, Flooring, Blinds and Cables

3.3.7 Conservation of Biological Diversity

The project aims to conserve for future generations, the biological diversity of genetic materials, species and ecosystem. Additionally the project is to assess purchasing impacts on the natural environment during all project phases and adopt a precautionary approach where risk is high.

Conservation of biodiversity is a repeated focus throughout the initiatives proposed for the project.

3.3.8 Pesticide

It is proposed that no chemical pesticides and termiticide are to be used on site which will be included in project Environmental Management Plan.

3.3.9 Waste

The EFSG DG02 requires consideration to eliminate unnecessary waste by better planning and more efficient use of natural and manufactured resources. As identified in section 2.8 the project is targeting several waste initiatives as part of the Inner Sydney High School sustainability strategy. This includes the associated materials and waste credits targeted in the Green Star Design & AS-Built tool.

3.4 Environmental Design Features of Education Facilities

3.4.1 Natural Light

The following design solutions are to be considered as part of the proposed design for Inner City High School in effort to incorporate energy conservation principles into the development. The intention of incorporating good daylighting into the project is to minimise energy consumption and ongoing running costs and ultimately provide natural light for the students. The project is to include:

- Natural daylight improves the indoor environmental quality of spaces and encourages beneficial learning.
- Natural daylight is to be provided to all teaching spaces unless identified otherwise.
- Natural daylight can be provided via windows, skylights, rooflights and the like. Where a room is required to have a brownout function, rooflights and skylights will need to include a method to sufficiently adjust light levels.
- Include daylight sensors to rooms to reduce light output or turn off lights when sufficient daylight is provided within the space.
- When the space is large, it is recommended that perimeter lighting is adjacent to windows be on a separate zone to make maximum use of daylight.

3.4.2 Sun Shading

External shading is to be incorporated as part of the building design to provide a good sense of thermal comfort to the building occupants.

3.4.3 Period Bells

Energy consumption should be minimised in the development where possible. An area that is to be addressed as part of the new development is to include the following initiatives as part of the period bells design:

- Period Bell Light switching systems are to be in all new schools, major conversions and additions
- All luminaires in rooms are to automatically turn off five minutes after the period bell has rung and all students have left the room. Alternatively include systems to turn off lights when the room is not in use
- A conscious decision is required to turn the lights on again

3.4.4 Appliances and Equipment

Minimum standards for new electrical appliances and equipment is to be compliant with the NSW Government Resource Efficiency Policy Part E3 and must have the minimum Greenhouse and Energy Minimum Standards (GEMS) star ratings as stipulated in the Policy.

3.4.5 Air Cooling and Heating Systems

Air cooling and heating systems proposed for the development are to incorporate the following:

- Timed or sensor operation functionality for all Air Cooling systems
- Centralised control of HVAC plant with programmable schedules for the school year
- Consideration of one single infrastructure for heating and cooling where it demonstrates whole life cycle cost savings.

3.4.6 Electricity Meters

Electricity metering requirements of the Green Star Design and As-Built Rating tool are more stringent than what is suggested in the EFSG DG02 Guide. Therefore the project satisfies this requirement which assists lower electricity meter maintenance costs through selecting a fit for purpose meter and better access to energy consumption data at the school. Electricity meters will be linked to a BMS System that will be able to provide real-time monitoring, useful for collecting and displaying data to facilities management and the building occupants.

3.4.7 Renewable Energy Generation

Renewable energy generation is being considered as part of the site to supplement the base load demand of the school. Refer to section 2.1 for further details.

3.5 Insulation

Insulation is to be compliant with the Building Code of Australia under Section J, Part J1 Building Fabrics of the National Construction Code. The associated minimum compliance requirements of the development will be provided at a later stage of the development in the form of a Section J Assessment. Ultimately, the project aims to utilise passive building elements such as insulation to; keep heat out of classrooms in summer and provide warmth in winter.

3.6 Ventilation

Natural ventilation is to be used where possible to maintain good environmental air quality through all school areas. Natural ventilation principles are to be incorporated into the architectural design where possible.

It is noted that the acoustic conditions for classroom areas limits the opportunity for natural ventilation for areas with a line of site to Cleveland and Chalmers streets. The current design has incorporated initiatives to maximise the use of outside air to promote thermal comfort within teaching spaces and adopted a mixed mode ventilation strategy.

3.7 Pesticides

As stated in Section 3.3.8 above no pesticides and termiticide are to be used on site in the proposed development.

3.8 Water Conservation

Water conservation initiatives proposed on site are identified in Section 2.4 Water Efficiency.

4. GREEN STAR DESIGN & AS-BUILT

4.1 Overview

The Green Star rating system is a comprehensive tool for assessing environmental performance of Australian buildings.

The Green Star framework incorporates ESD principles which are categories into nine categories. Points are awarded across each category for credits that are incorporated into the project. The Design and As-Built documentation is then verified through two rounds of independent assessments by the Green Building Council of Australia (GBCA). This section outlines Inner Sydney High School's strategy for achieving the principles of a 5 Star rating under the Green Star Design and As Built Tool.

4.2 Rating Tool Eligibility and Certification

The project is being assessed against the new Design and As-Built rating tool, version v1.1. The eligibility criteria for this tool are:

- Building Type
- Spatial Differentiation
- Timing of submission for certification
- Conditional Requirements

The project achieves the minimum eligibility requirements given that it is predominantly a commercial office space that has a distinct project address that is undergoing a major building refurbishment.

4.3 Rating Bands and Categories

Green Star awards achievement at 3 levels, depending on the points achieved after assessment by the independent panel:

- 4 Star – 45-59 points, recognising industry "Best Practice"
- 5 Star – 60-74 points, recognising "Australian Excellence"
- 6 Star – 75+ points, recognising the project as a "World Leader"

The development is targeting 63.8 points for a 5 Star Green Star rating which covers initiatives outlined in the credit categories below.

Table 1: Green Star Credit Categories

Category	Category Reference Code	Available Points
Management	Man	14
Indoor Environment Quality	IEQ	17
Energy	Ene	22
Transport	Tra	10
Water	Wat	12
Materials	Mat	14
Land Use and Ecology	Eco	6
Emissions	Emi	5
Innovation	Inn	10
Total Points		110

The proceeding sections describe each of the targeted credits and provide an understanding of what is required to achieve compliance in the design review stage.

4.4 Green Star Targeted Credits

LIST OF CREDITS			
Index	Credit	Points Available	Points Targeted
MANAGEMENT			
1	Green Star Accredited Professional	1	1
2	Commissioning and Tuning	4	4
3	Adaptation and Resilience	2	2
4	Building Information	2	2
5	Commitment to Performance	2	1
6	Metering and Monitoring	1	1
7	Construction Environmental Management	1	1
8	Operational Waste	1	1
INDOOR ENVIRONMENT QUALITY			
9	Indoor Air Quality	4	3
10	Acoustic Comfort	3	1
11	Lighting Control	3	2
12	Visual Comfort	3	2
13	Indoor Pollutants	2	2
14	Thermal Comfort	2	0
ENERGY			
15	Greenhouse Gas Emissions	20	10
16	Peak Electricity Demand Reduction	2	1
TRANSPORT			
17	Sustainable Transport	10	6
WATER			
18	Potable Water	12	4
MATERIALS			
19	Life cycle Impacts	7	4
20	Responsible Building Materials	3	2
21	Sustainable Products	3	0
22	Construction and Demolition Waste	1	1
LAND USE AND ECOLOGY			
23	Ecological Value	3	0
24	Sustainable Sites	2	2
25	Heat Island Effect	1	1
EMISSIONS			
26	Stormwater	2	1
27	Light Pollution	1	1
28	Microbial Control	1	1
29	Refrigerant Impacts	1	0
INNOVATION			
30	Innovation	10	5
Total		**110**	**63.8**

4.5 Management

The credits within the Management category promote the adoption of environmental principles from project inception, design and construction phase, to commissioning, tuning and operation of the building and its systems. The following credits will be targeted;

4.5.1 Accredited Professional

One point is available where a Green Star Accredited Professional – Design & As Built (GSAP), has been contractually engaged to provide advice, support and information related to Green Star principles, structure, timing and processes, at all stages of the project, leading to certification.

This will be achieved via the engagement of Northrop Consulting Engineers.

4.5.2 Commissioning and Tuning

4.5.2.1 Environmental Performance Targets

To qualify for points under this credit the project team must set and document environmental performance targets for the project.

This will be demonstrated through the development (early in the design phase) of a design intent report or an owner's project requirements (OPR) document. This document must be prepared by the design team at the design phase stage and outline at least the following items:

- Description of the basic functions, operations, and maintenance of the nominated building systems including:
    - A description of its intended operation and maintenance requirements; and
    - A list of what the main components are (including controls), their operation and the importance of their efficient use.
- The targets for the project energy and water consumption and energy and water budgets for all nominated building systems.
- Description of how energy, water, and aspects of indoor environment quality are metered and monitored. This includes a meter diagram that illustrates how energy and water budgets are confirmed in operation.

4.5.2.2 Services and Maintainability Review

One point is awarded where a project team can demonstrate that a comprehensive services and maintainability review has been conducted, led by the head contractor or the owner's representative (or the ICA) during the design stage and prior to construction.

The services and maintainability review is to facilitate input from the design team, the facilities manager and operations staff (if known), and any relevant suppliers and subcontractors (if engaged). The review will address the following aspects for all nominated building systems:

- Commissionability;
- Controllability;
- Maintainability;
- Operability, including 'Fitness for Purpose'; and
- Safety

The services and maintainability review and its outcomes will be summarised in a 'Service and Maintainability Report'. This report will be agreed and signed off by the involved parties. Action items resulting from this review will be incorporated in the Design Intent Report or the Owner's Project Requirements document.

4.5.2.3 Building Commissioning

One point is awarded when a project team can demonstrate that the pre-commissioning and commissioning activities have been performed based on the approved standards and guidelines. To demonstrate compliance, the following must be documented:

- Commissioning specification – nominating design parameters for each system, required commissioning activities, how each system is intended to operate and acceptable tolerances during commissioning.
- Commissioning plan – outlining objectives or basis of the design, scope of the commissioning plan, individual responsibilities, sequence of commissioning, commissioning procedures, witnessing requirements, commissioning program and requirements for subcontractor commissioning manuals.

This will be demonstrated through the development of the above with the design team and the head contractor.

4.5.2.4 Building Systems Tuning

One point is awarded where, following practical completion and prior to occupation, the owner/client has formally committed to a tuning process for all nominated building systems. At a minimum, the commitment must include quarterly adjustments and measurement for the first 12 months after occupation and a review of building system manufacturer warranties. The scope of the tuning works will determine the relevant tuning period.

4.5.2.5 Independent Commissioning Agent

One point is awarded where an Independent Commissioning Agent (ICA) has been appointed to advise monitor and verify the commissioning and tuning of the nominated building systems through the design, tender, construction, commissioning and tuning phases.

The specified commissioning requirements must be overseen by a qualified independent commissioning professional (separate from the design team) who is engaged directly by the client/building owner and reports directly to the owner.

4.5.3 Adaption and Resilience

4.5.3.1 Implementation of a Climate Action Plan

Two points are awarded where the following requirements are met:

Climate Adaption Plan

The Climate Adaption Plan must contain as a minimum the following information:

Summary of project's characteristics (site, location, climatic characteristics);

- Assessment of climate change scenarios and impacts on the project using at least two time scales, relevant to the project's anticipated lifespan. This must include a summary of potential direct and indirect (environmental, social and economic) climate change impacts on the project;
- Identification of the potential risks (likelihood and consequence) for the project and the potential risks to people. This risk assessment is to be based on a recognised standard;
- A list of actions and responsibilities for all high and extreme risks identified; and

- Stakeholder consultation undertaken during plan preparation and how these issues have been incorporated.

Developing Climate Change Scenarios

Prior to undertaking the initial assessment, the Australian Greenhouse Office (AGO) Guide (Section 4.2) calls for climate change scenarios to be developed and reviewed. The scenarios used by the applicant must be sourced from the Intergovernmental Panel on Climate Change (IPCC) endorsed Global Circulation Models (GCMs) and may include:

- CSIRO projections;
- State or Federal climate projections; or
- Projections determined by a more detailed climate model.
- The project will justify the selection of the climate scenario and emissions scenario used.

Risk Assessment

Undertake the 'Initial Assessment' outlined in Section B (subsections 4-6) of the AGO Guide. The ISO 31000 Standard must be used for further guidance in undertaking the risk analysis process prescribed in Section B (subsections 5.1-5.6) of the AGO Guide. The consequence/success criteria in the AGO Guide have been refined to be more applicable at the development scale and are provided in the 'Guidance' section below. Alternatively, organisations may use internal corporate success/criteria tables.

The assessment of climate change impacts must address a minimum of two time scales relevant to anticipated building lifespan for the primary effects of temperature, precipitation and sea-level rise. The plan must then consider the secondary effects of relative humidity, drought/flood, wind, cyclones and bushfire as a minimum.

Recognised Standards

Compliance should be demonstrated in accordance with the following standards:

- AS 5334:2013 Climate Change Adaptation for Settlements and Infrastructure

OR, the following two standards when combined:

- ISO 31000-2009 – Risk Management – Principles and Guidance; and
- AGO, Climate Change Risks and Impacts: A Guide for Government and Business.

Implementation of the Climate Change Adaption Plan

Implementation of the Climate Adaptation Plan must include:

- At least two risk items identified in the risk assessment component of the Climate Adaptation Plan must be addressed by specific design responses; and
- All risk items identified as 'high' or 'extreme' must be addressed by specific design responses
- Where no risks are identified by the Climate Adaptation Plan, this criterion is deemed to be met.

4.5.4 Building Information

4.5.4.1 Building Operations and Maintenance Information

One point is awarded where the project team can demonstrate that comprehensive building operation and maintenance information is available to the facilities management team. Compliance will be demonstrated with

one document that includes Operations and Maintenance Information and the Building Log book, or by two separate documents that contain the same information.

4.5.4.2 Building User Information

One point is awarded where the project team can demonstrate that current building user information is available to all relevant stakeholders in accordance with the following requirements.

- Building user information is a source of up-to-date, relevant information for the 'building user' and made available in a digital format; and
- All building user information must be available to the building owner and facility management at the time of practical completion of the project.

4.5.5 Commitment to Performance

4.5.5.1 Environmental Building Performance

One point is awarded if at least 80% of the project's gross floor area (GFA), excluding car parking areas is covered with a commitment to set measure and report on its environmental performance. Compliance shall be demonstrated by providing commitment to achieve a certified operational performance rating for the building in the form of at least two NABERS ratings (Energy, Water, Waste, IE), the results from these ratings are to be used to demonstrate the measurement and reporting of environmental performance targets.

The building owner and tenant will jointly agree and commit to targets through formal commitments to each other. This may be achieved through a 'Best Practice Lease' Agreement or similar formal agreement, or a memorandum of understanding.

These agreements must address the targets through:

- An obligation that the landlord separately monitors the agreed targets of each tenant;
- A defined mechanism for setting and monitoring targets; and
- A collaborative and non-punitive approach to prevention and rectification, where obligations are not met. This should also detail a flexible, fair and open mechanism to resolve any relevant issues.

Lease agreements will include these targets, or a separate formal agreement between the tenant and the landlord will be determined.

4.5.6 Metering and Monitoring

4.5.6.1 Metering

It is a conditional requirement of this credit that project teams must provide accessible metering to all energy and water common uses and major uses, and to energy and water sources provided by the base building as follows;

Metering distinct uses or floors:

- Metering shall be provided to allow for monitoring of the relevant areas or functions of the project. In most cases floor by floor metering will suffice if the entire floor has a single use.
- Where a load for a single item exceeds 5% of the total energy use for the building, or 100kW, it must be independently metered.
- Water and energy meters

Utility meters must meet metering guidelines under the weights and measures legislation, as outlined under the current National Measurement Regulations. Project teams must verify if existing meters meet these requirements as well as any other utility meters being installed.

4.5.6.2 Monitoring Systems

One point is awarded where a monitoring system is provided capable of capturing and processing the data produced by the installed energy and water meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends, in accordance with the following requirements.

The monitoring strategy must be developed in accordance with a recognised standard, such as CIBSE TM39 Building Energy Metering. The same principles described in the standard shall be used for developing water metering and monitoring strategies.

The monitoring strategy must include a metering schedule. This schedule shall address the estimated loads for energy and water and must list:

- The incoming input (electricity, gas, water, etc.);
- The end use (lighting, HVAC, fans);
- The estimated energy consumption for the end use;
- Which meter(s) provide the required information; and
- The individual estimated end consumption.

The project team must provide automatic monitoring systems that record both consumption and demand of energy or water, and are capable of producing reports on quarter hourly, hourly, daily, monthly, and annual energy use for all meters.

The installed meters must be capable of producing an output that can be transmitted to a central location (either onsite or offsite). This central location must provide data retrieval and reporting mechanisms.

4.5.7 Construction Environmental Management

4.5.7.1 Environmental Management Plan

To qualify for points in this credit a project-specific best practice EMP must be developed and implemented, to assist the Principal/Head Contractor and its service providers manage environmental performance, conditions, and impacts arising from excavation, demolition and construction. The EMP must cover environmental impacts arising from construction works, and it must be site-specific.

4.5.7.2 Formalised Environmental Management System

The formalised Environmental Management System in use on site must have been certified by a third party organisation that provides independent verification of system compliance to ISO standards (or equivalent Australian Standards) and are members of the International Accreditation Forum. The Environmental Management System must be certified against one of the following standards: AS/NZS ISO 14001, BS 7750 or the European Community's EMAS.

A Principal/Head contractor which holds the accreditation is an acceptable method of demonstrating compliance for this requirement. In this case, the Principal/Head Contractor for each building and/or piece of infrastructure in the project site area must have a valid certificate before and throughout construction. All subcontractors must be required to adhere to the EMP conditions, and monitored for compliance.

In addition, project teams must report any nonconformities recorded by the EMS during construction. Where nonconformities with the EMS have been recorded, corrective and preventive actions must also be demonstrated to have been applied, in order for credit compliance to be achieved. Where there haven't been any nonconformities recorded, the project team must state so, supported by audit records, inspection reports or other equivalent documentation that forms part of the EMS.

4.5.8 Operational Waste – Facilities

One point is awarded where project teams meet all three requirements including:

- Separation of waste streams
- Dedicated waste storage area
- Access to waste storage area

Separation of Waste Streams

Collection bins or storage containers shall be provided for building occupant use that allow for separation of all applicable waste streams. The following waste streams must be provided with separate bins or containers:

- General waste;
- Paper and cardboard;
- Glass;
- Plastic; and
- At least one other waste stream.

These bins or containers must be clearly marked for each stream, to allow for separation of the applicable waste streams as specified. Bins or containers must be provided, evenly distributed throughout the building.

Dedicated Waste Storage Areas

A dedicated sufficiently sized area for the storage and collection of the applicable waste streams, shall be provided.

The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle. The calculations used to demonstrate that the area provided is adequately sized to handle the recyclable waste streams specified must be based on:

- Waste generated by project; and
- Collection frequency for each waste stream.

4.6 Indoor Environment Quality

4.6.1 Indoor Air Quality

4.6.1.1 Ventilation System Attributes

One point is available where project teams can demonstrate that all of the following conditions are met:

- The entry of outdoor air pollutants is mitigated - The building services must be designed to comply with ASHRAE Standard 62.1:2013 in regards to minimum separation distances between pollution sources and outdoor air intakes.
- The system is designed for ease of maintenance and cleaning; and
- The system has been cleaned prior to occupation and use.

4.6.1.2 Provision of Outdoor Air

One point is awarded where outdoor air is provided at a rate 50% greater than the minimum required by AS 1668.2:2012, or CO2 concentrations are maintained below 800ppm.

An additional point is awarded where the outdoor air is provided at a rate 100% greater than the minimum require by AS 1668.2:2012, or CO2 concentrations are maintained below 700ppm.

4.6.1.3 Exhaust or Elimination of Pollutants

A dedicated exhaust riser must be provided for photocopy rooms, kitchens and cooking equipment, and carpark exhausts. These exhausts must not recirculate air through spaces and must exhaust to outside. All exhaust facilities must be designed in accordance with AS 1668.2-2012.

4.6.2 Acoustic Comfort

4.6.2.1 Internal Noise Levels

One point is awarded where project teams demonstrate that internal ambient noise levels, in the nominated area, are no more than 5dB (A) above the “satisfactory” sound levels provided in Table 1 of AS/NZS 2107:2000.

The noise measurement and documentation must be provided by a qualified acoustic consultant in accordance with AS/NZS 2107:2000.

4.6.3 Lighting Comfort

4.6.3.1 Minimum Lighting Comfort

To qualify for points in this credit project teams must demonstrate that all lights in the nominated area are flicker free and accurately address the perception of colour in the space.

- Flicker-free lighting refers to luminaires that have either:
- A minimum Class A1 & A2 ballast;
- High frequency ballasts for all fluorescent lamps, or
- Electronic ballasts in High Intensity Discharge (HID) lighting.

4.6.3.2 General Illuminance and Glare Reduction

One point is awarded where project teams can demonstrate that, in the nominated area, lighting levels comply with best practice guidelines for Office Spaces; corresponding to Table 3.1 of AS 1680.2.

In addition glare is to be eliminated in accordance with Prescriptive Pathway A where; all bare light sources must be fitted with baffles, louvers, translucent diffusers, ceiling design, or other means that obscures the direct light source from all viewing angles of occupants, including looking directly upwards.

4.6.3.3 Surface Illuminance

One point is awarded where project teams can demonstrate that, in the nominated area, a combination of lighting and surfaces improve uniformity of lighting to give visual interest. To achieve compliance, all the spaces in the nominated area must have:

- An average surface reflectance for ceilings of at least 0.75 for at least 90 percent of the ceiling; and
- A direct/indirect lighting system is present such that the ceiling area has an average surface illuminance of at least 30% of the lighting levels on the working plane.

4.6.3.4 Localised lighting Control

One point is awarded where the project teams can demonstrate that, in a nominated area, occupants have the ability to control the lighting in their immediate environment. This included turning the lights on and off and adjusting their light levels.

4.6.4 Visual Comfort

4.6.4.1 Glare Reduction

To qualify for points in this credit project teams must demonstrate that glare from sunlight through all viewing façades in the nominated area is reduced through a combination of blinds, screens, fixed devices, or other means.

4.6.4.2 Daylight

Two point is awarded where project teams can demonstrate that an 80 percent of the nominated area receives high levels of daylight during 80 percent of the nominated occupied hours. All new areas will demonstrate compliance with this credit with existing areas restricted by heritage constraints.

4.6.4.3 Views

One point is available where project teams can demonstrate that at least 60% of the nominated area has a clear line of sight to a high quality internal or external view. All floor areas within 8m from a compliant window, atrium, or view can be considered to meet this credit criterion.

4.6.5 Indoor Pollutants

4.6.5.1 Paints, Adhesives, Sealants and Carpets

One point is available where at least 95% of all internally applied paints, adhesives, sealants and carpets meet stipulated ‘Total VOC Limits’ (TVOC), or, where no paints, adhesives, sealants or carpets are used in the building.

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

Table 2 Maximum TVOC Limits for Paints, Adhesives and Sealants

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

To demonstrate compliance for the use of carpets all products will be certified under a recognised Product Certification Scheme or other recognised standards. With the certification current at the time of specification.

4.6.5.2 Engineered Wood Products

One point is available where at least 95% of all engineered wood products including: particleboard, plywood, Medium Density Fibreboard (MDF), Laminated Veneer Lumber (LVL), High-Pressure Laminate (HPL), Compact Laminate and decorative overlaid wood panels meet stipulated formaldehyde limits or no new engineered wood products are used in the building.

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

Table 3 Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	Emission Limit/Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m²hr (at 3 days)
ASTM D6007	≤0.12mg/m³**

ASTM E1333	≤0.12mg/m³***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

*mg/m²hr may also be represented as mg/m²/hr.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

4.6.6 Thermal Comfort

One point is awarded where project teams demonstrate that, for 95% of the nominated area and 98% of the year, a high degree of thermal comfort is provided. For mechanically ventilated spaces the Predicted Mean Vote (PMV) levels must be between -1 and +1, inclusive. This will be demonstrated using the GBCA's Deemed to Satisfy Methodology.

4.7 Energy

Through the 'Energy' category, Green Star - Design & As Built aims to facilitate reductions in greenhouse gas emissions by facilitating efficient energy usage and encouraging the utilisation of energy generated by low-emission sources.

4.7.1 Greenhouse Gas Emissions – Comparison to a Reference Building Pathway

Up to 20 points are available where it is demonstrated that there is a specified reduction in the predicted energy consumption and GHG emissions of the proposed building.

Points are awarded based both on improvements to the building's façade, and on the project's predicted ability to reduce its energy consumption and emissions towards 'net zero'.

Prediction of the building performance against this benchmark is assessed using building performance modelling that assesses potential energy use for building services systems including:

- Mechanical Services
- Electrical Services
- Communications, AV and security systems
- Hydraulic Services
- Vertical Transportation Systems

The project will be targeting 10 points which correlates to a reduction of 20% improvement on building fabric and 40% reduction for the building overall.

4.7.2 Peak Electricity Demand Reduction – Reference Building

One point is awarded where it is demonstrated that on-site generation sources reduces the peak electricity demand by at least 15%.

Peak electricity demand is the predicted annual peak calculated as the sum of all distribution boards (to include all miscellaneous loads) relevant to the building as shown in the as-installed electrical schematics.

Peak electricity demand must be calculated in line with the below requirements:

- In accordance with AS/NZS 3000:2007 (or as subsequently amended);

- As the absolute design capacity of the system, after the application of diversity factors, but prior to the application of contingency factors as required for utility agreements (the value is likely to be about 30% less than that for the utility agreement); and
- To include all building end-use loads, except process loads, in the peak demand assessment.

4.8 Sustainable Transport

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

4.8.1 Access by Public Transport

Up to three points are awarded based on the accessibility of the site by public transport. Based on the location of the project, all three points will be awarded for this credit.

4.8.2 Reduced Car Parking Provision

One point is available where there is a reduction in the number of car parking spaces in the proposed building when compared to a standard practice building. Minimal car parking will be provided. Maximum parking spaces will be in the order of 75.

4.8.3 Bicycle Facilities

One point is available where the project provides secure bicycle parking facilities for 7.5% of regular building occupants. This broadly equates to 115 bike parking spaces and relevant support facilities.

4.8.4 Walkable Neighbourhoods

One point is awarded where the project team demonstrates that the project achieves a walk score of at least or at least 80 as determined by the website, www.walkscore.com

4.9 Water

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

4.9.1 Sanitary Fixture Efficiency

One point is awarded where all fixtures are within one star of the WELS rating stated in the table below:

Table 4 Sanitary Fixture Efficiencies

Fixture / Equipment Type	WELS Rating
Taps	6 Star
Urinals	6 Star
Toilet	5 Star
Showers	3 Star (> 4.5 but <= 6.0)
Clothes Washing Machines	5 Star
Dishwashers	6 Star

4.9.2 Heat Rejection Water

A waterless heat rejection system is utilised on site.

4.9.3 Landscape Irrigation

One point is awarded where either drip irrigation with moisture sensor override is installed, or where no potable water is used for irrigation.

4.10 Materials

The aim of the materials credits is to reward projects that include building materials that are responsibly sourced or have a sustainable supply chain.

4.10.1 Building Reuse

Reuse of Building Fabric

Two points are awarded where at least 80 percent of the building façade is retained. Refurbishment of a reused façade element is inconsequential to determining whether the element is reused. However, where more than 20% of a façade element is replaced as part of the refurbishment, the element may not be counted as reused. The proportion of the façade refurbishment should be measured by length, volume or mass, whichever is more appropriate.

Reuse of Building Structure

Two points are awarded where at least 60 percent of the building structure is retained Refurbishment of a structural element is inconsequential to determining whether the element is reused. However, where more than 20% of a structural element is replaced as part of the refurbishment, the element may not be counted as reused. The proportion of the structural element refurbishment should be measured by length, volume or mass, whichever is more appropriate.

4.10.2 Responsible Materials

4.10.2.1 Timber Products

One point is available where at least 95% (by cost) of all timber used in the building and construction works is either:

- Certified by a forest certification scheme that meets the GBCA's 'Essential' criteria for forest certification; or
- Is from a reused source.

4.10.2.2 Permanent Formwork, Pipes, Flooring, Blinds and Cables

One point is available where 90% (by cost) of all cables, pipes, flooring and blinds in a project either:

- Do not contain PVC and have an Environmental Product Declaration (EPD); or
- Meet Best Practice Guidelines for PVC.

4.10.3 Construction and Demolition Waste – Percentage Benchmark

This project will meet the credit criteria for one point via a percentage benchmark approach, where one point is awarded where project teams can demonstrate that 90% of the waste generated during construction and demolition has been diverted from landfill. Waste is to be reported in kilograms of waste per square meter of GFA

as well as a percentage. Compliance verification summaries of the waste contractor and waste processing facilities must be provided.

4.11 Land Use and Ecology

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

4.11.1 Endangered, Threatened or Vulnerable Species

The Conditional Requirement is met where, at the date of site purchase or date of option contract, the project site did not include old growth forest or wetland of 'High National Importance', or did not impact on 'Matters of National Significance'.

4.11.2 Reuse of Land

One point is awarded as 75 percent of the site was previously developed land at the date of site purchase.

4.11.3 Contamination and Hazardous Materials

One point is awarded where:

- The site has been previously contaminated to the extent that the intended uses, as permitted under the relevant planning scheme, were initially precluded.
- The developer has adopted and implemented a best practice site remediation strategy.
- The best practice site remediation strategy and implementation has been signed off by an auditor prior to issue of the occupation certificate.

4.11.4 Heat Island Effect Reduction

One point is awarded where at least 75% of the whole site area (when assessed in plan view) comprises of one or a combination of the following:

- Vegetation;
- Green roofs;
- Roofing materials, including shading structures, having the following:
    - For roof pitched <15°– a three year SRI >64; or
    - For roof pitched >15°– a three year SRI >34.
- Only where the three year Solar Reflectance Index (SRI) for products is not available, use the following:
    - For roof pitched <15° – an initial SRI > 82; or
    - For roof pitched >15° – an initial SRI > 39.
- Unshaded hard-scaping elements with a three year SRI > 34 or an initial SRI > 39;
- Hard-scaping elements shaded by overhanging vegetation or roof structures, including solar hot water panels and photovoltaic panels;

- Areas directly to the south of vertical building elements, including green walls and areas shaded by these elements at the summer solstice.

4.12 Emissions

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

4.12.1 Reduced Peak Discharge

One point is available where the post-development peak event discharge from the site does not exceed the pre-development peak event discharge using the design Average Recurrence Interval (ARI) that corresponds to the associated flooding risk identified in the Climate Change and Adaption Assessment undertaken as part of the Adaption and Resilience credit.

4.12.2 Reduced Pollution Targets

An additional point is available if the Reduced Peak Discharge criterion is achieved and if it can be demonstrated that all stormwater discharged from the site meets the pollution reduction targets in Table 5.

Table 5 Minimum Pollution Reduction Targets

Pollutant	Reduction Target (% of the Typical Urban Annual Load)
Total Suspended Solids (TSS)	80%
Gross Pollutants	85%
Total Nitrogen (TN)	30%
Total Phosphorus (TP)	30%
Total Petroleum Hydrocarbons	60%
Free Oils	90%

4.12.3 Light Pollution to Neighbouring Bodies

To qualify for points under this credit project teams must demonstrate that all outdoor lighting on the project complies with AS 4282:1997. The conditions shall be applied to all inhabited boundaries, apart from boundaries with roads.

4.12.4 Light Pollution to Night Sky

One point is awarded where it can be demonstrated that one of the following specified reductions in light pollution has been achieved by the project.

- Control of upward light output ratio (ULOR) by demonstrating that no external luminaire on the project has a ULOR that exceeds 5%, relative to its actual mounted orientation; or
- Control of direct luminance- demonstrate that direct illuminance from external luminaries on the project produces a maximum initial point illuminance value no greater than:
    - 0.5 Lux to the site boundary, and
    - 0.1 Lux to 4.5 metres beyond the site into the night sky.

4.13 Innovation

The Green Star – Design & As Built 'Innovation' category aims to recognise the implementation of innovative practices, processes and strategies that promote sustainability in the built environment.

4.13.1 Market Transformation

The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world. Through the targeting of world leading sustainability principles at Inner City High School is contributing to a broader market transformation that repositions tenant health and well-being as a key indicator of sustainability.

4.13.2 Innovation Challenge – Financial Transparency

This Innovation Challenge aims to encourage owners, developers and operators to disclose the costs of sustainable building practices, and to agree to participate in a yearly report developed by GBCA that will inform the building industry on the true costs of sustainability.

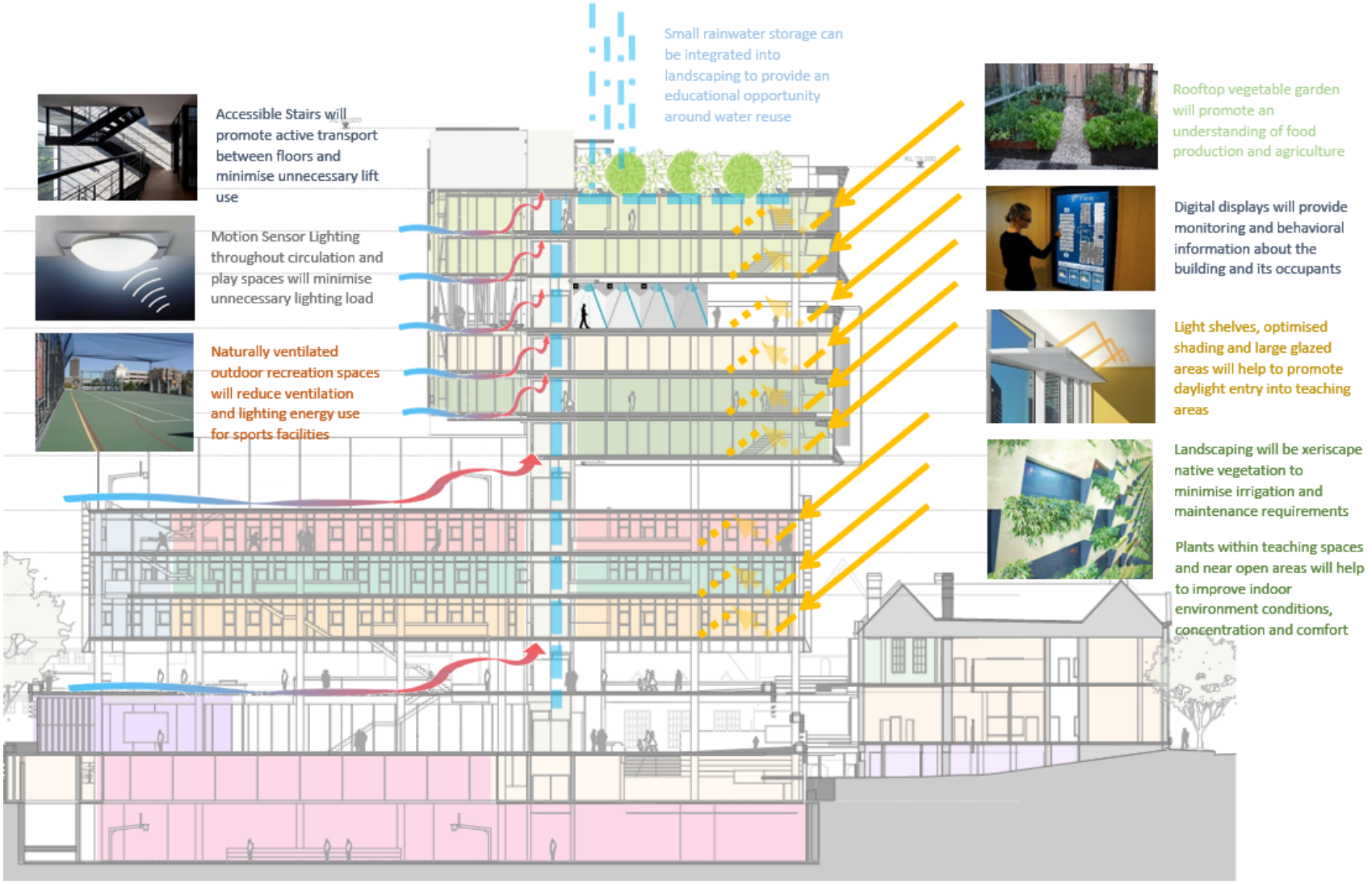
4.13.3 Innovation Challenge – Microbial Control in Hot Water Systems

An innovation point could be claimed where it is demonstrated that hot water systems have also been designed to manage the risk of microbial contamination.

4.13.4 Innovation Challenge – Indoor Plants

One point may be awarded where indoor plants are evenly distributed across the nominated area and are regularly maintained. One or more plants with a soil area of at least 500cm2 (0.05 m2) are required per 10m2 of nominated area (primary spaces and secondary spaces, excluding fully enclosed spaces smaller than 10m2).

APENDIX A: SECTION MARK-UP



APENDIX B: GREEN STAR SCORECARD