# St Luke's Grammar School – Senior School Campus

# SSD-10291

# Ecological Sustainable Development Report

**Prepared for:** Anglican Schools Corporation C/- Midson Group Pty Ltd

**Attention:** Toby James

**Date:** 28 October 2019

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**Ref:** 43194

WOOD & GRIEVE ENGINEERS

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# Revision

| Revision | Date | Comment | Prepared By | Approved By |
|---|---|---|---|---|
| 1 | 30/09/2019 | SSD Draft | NCJ | NCJ |
| 2 | 17/10/2019 | SSD Issue | NA | ALK |
| 3 | 28/10/2019 | Revised SSD Issue | GB | ALK |
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# Contents

# 1. Executive Summary

This Ecological Sustainable Development Report has been prepared on behalf of Anglican Schools Corporation C/- Midson Group for the proposed new St Luke's Grammar School – Senior School Campus, located at 800 Pittwater Road, Dee Why NSW. In response to the Secretary's Environmental Assessment Requirements (SEARs), the report provides an overview of the proposed Ecologically Sustainable Development (ESD) principles and sustainability initiatives to be included within the project forming part of the Environmental Impact Statement (EIS).

The report forms a direct design response to the ESD component of the Secretary's Environmental Assessment Requirements (SEARs), and NSW Environmental Planning and Assessment Regulation 2000, as required by the NSW Environmental Planning and Assessment Act 1979 No 203.

Information contained within this report has been prepared in direct response to the:

- Secretary's Environmental Assessment Requirements, dated 01 July 2019;
- NSW Environmental Planning and Assessment Act 1979;
- NSW Environmental Planning and Assessment Regulation 2000; and
- Warringah Council – Development Control Plan (2011)

In coordination with the above, the project will implement a number of sustainable design principles and includes initiatives designed to mitigate the environmental impact of the following:

- A response to NSW Environmental Planning and Assessment Regulation 2000;
- A minimum 4 Star Green Star (Design & As-built Certification demonstrating the projects commitment to environmental best practice;
- A response to Warringah Council, including a list of initiatives designed to minimise energy and water demand for the project;
- A response to NSW Government Architect design guide, including detail on the minimum performance of natural daylight levels; and
- A response to the new energy efficiency provisions of NCC Section J 2019.

The following sections detail the development's specific sustainable design response in more detail.

# 2. Introduction

The proposed development consists of an expansion of the current St Luke's Grammar School campus (located at 210 Headland Road, Dee Why) to include both 224 Headland Road & 800 Pittwater Road sites in Dee Why, NSW. An overview of the proposed development is further detailed below.

## 2.1 General Overview

The proposed development of the St Luke's Grammar School Senior school includes alternations and additions to the existing buildings located at both 224 Headland and 800 Pittwater Roads, Dee Why NSW to provide purpose built education facilities for up to 600 students. The proposed development application includes:

- Village centre with café, administration spaces, gathering spaces and hubs
- Science and Maths Precinct
- Arts & Design and Technology Precinct
- Humanities Precinct
- Wellness Precinct including a 25m indoor pool, dance studio and gym
- Social hubs, library hubs and study hubs
- 700 seat assembly hall
- 220 seat drama theatre
- Café and atrium
- Underground parking for 60 staff and 60 students.

## 2.2 Site Location

The proposed development of the St Luke's Grammar School Senior school includes alternations and additions to the existing buildings located at both 224 Headland and 800 Pittwater Roads, Dee Why NSW

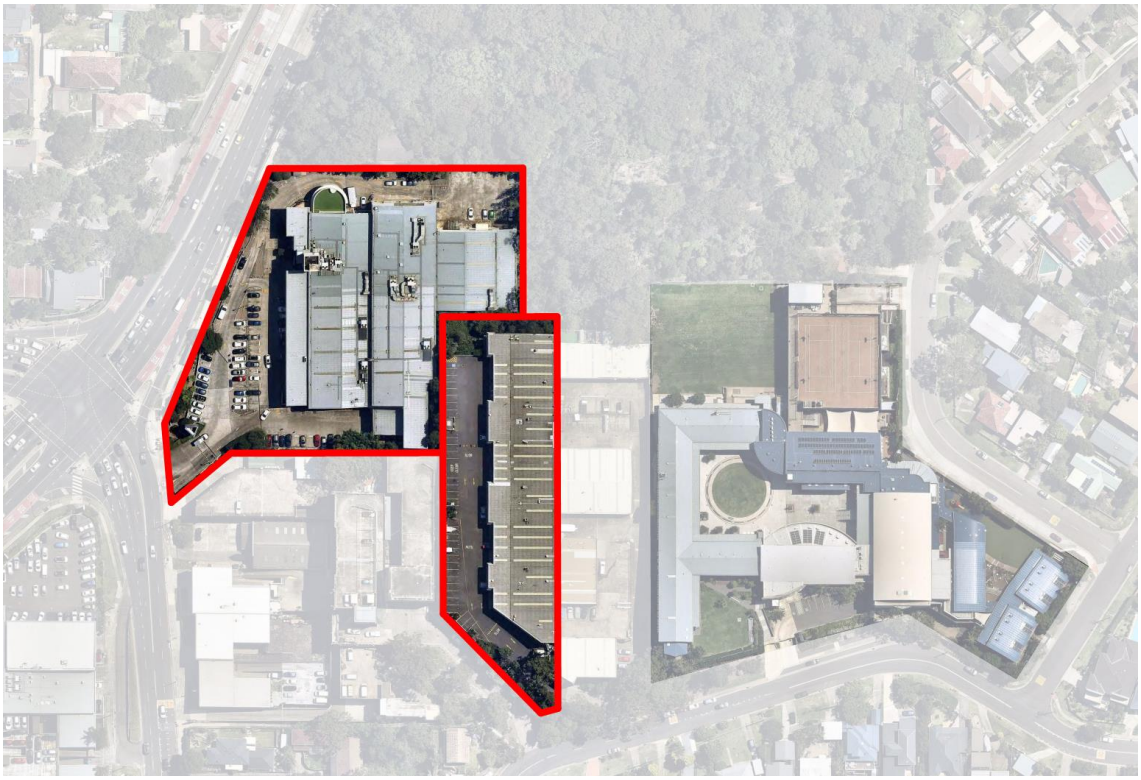


**Figure 1:** Existing Site Plan. Source: TZG Architects.

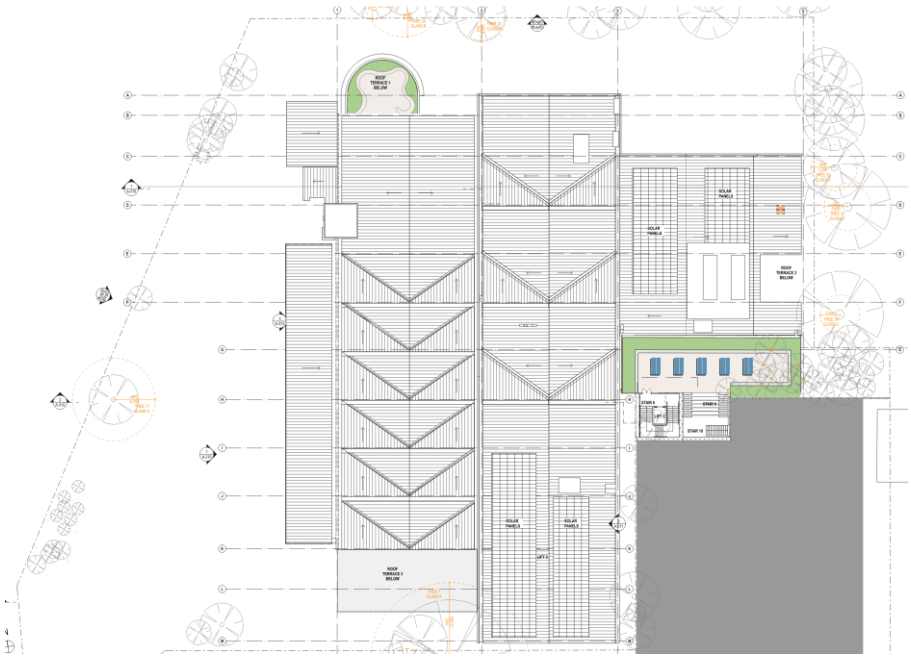


**Figure 2:** Proposed Development Plan (Stage 3). Source: TZG Architects.

## 2.3 Sustainable Design Framework

In pursuit of the ensuring the development includes ESD design principles, the new St Luke's Grammar School Senior Campus will pursue Ecological Sustainable Development (ESD) excellence benchmarked from a number of sources.

These include best practice design initiatives from:

- Secretary's Environmental Assessment Requirements – Section 78A(8);
- NSW Environmental Planning and Assessment Act 1979;
- NSW Environmental Planning and Assessment Regulation 2000; and
- Warringah Development Control Plan – 2011 (as amended).

This report addresses the proposed developments approach to ESD in response to Key Issue 8 – within the Secretary's Environmental Assessment Requirements listed under Section 78A(8) of the Environmental Planning & Assessment Act (Schedule 2 – Regulation 2000).

Further to the above, the report also addresses Warringah Council DCP (2011, as amended), Part D22 – Conservation of Energy & Water, inclusive of the associated objectives and requirements.

In response, this report utilises best practice sustainable design principals and references to industry best practice benchmarks to define the ESD approach for the project.

## 2.4 Environmental Planning and Assessment Regulation 2000

The SEARs response outlines requirements for this development that must be addressed as part of the Environmental Impact Statement. These are:

- Detail how **ESD principles** (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 development;

Schedule 2 7(4) of the Environmental Planning and Assessment Regulation 2000 states:

*"The principles of ecologically sustainable development are as follows:*

*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,*

*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,*

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

*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. (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. (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."*

- Include a framework for how the future 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 materiality assessment and include waste reduction design measures, future proofing, use of sustainable and low-carbon materials, energy and water efficiency design (including water sensitive urban design) and technology and the use of renewable energy;
- Include preliminary consideration of building performance and mitigation of climate change, including consideration of Green Star performance;
- Include an assessment against an accredited ESD rating system (or equivalent) program of ESD performance. This should include a minimum rating scheme target level;
- Demonstrate how environmental design will be achieved in accordance with the GANSW Environmental Design in Schools Manual; and
- Provide a statement regarding how the design of the future development is responsive to the CSIRO projects impacts of climate change, specifically:
    - Hotter days and more frequent heatwave events;
    - Extended drought periods;
    - More extreme rainfall events;
    - Gustier wind conditions; and
    - How these will inform landscape design, material selection and social equity aspects (respite/shelter areas).

## 2.5 Warringah Council Development Control Plan (DCP) 2011

Warringah Council has a specific DCP developed in 2011 (as amended) with aim of addressing the conservation of both energy and water within the municipality. The ESD requirements identified within the DCP include:

**Objectives:**

- To encourage innovative design solutions to improve the urban environment; and
- To ensure energy and water use is minimised.

**Requirements-**

- The orientation, layout and landscaping of sites are to make use of the best natural ventilation, daylight and solar layout;
- Site layout and structures are to allow for reasonable solar access for the purposes of water heating and electricity generation and maintain reasonable solar access to adjoining properties;
- Buildings are to be designed to minimise energy and water consumption;
- Landscape design is to assist in the conservation of energy and water;
- Reuse of stormwater for on-site irrigation and domestic use is to be encouraged, subject to consideration of public health risks; and
- All development must comply with Council's Water Management Policy.

## 2.6 NCC Section J – Energy Efficiency

Given the project timeline, the project will be required to demonstrate compliance with the new provisions outlined within NCC Section J 2019. NCC 2019 method represents a significant overhaul of the previous version of the NCC (2016) with significant amendments to Section J – energy efficiency provisions.

Section J outlines minimum performance requirements including,

- Maximum greenhouse gas emissions (GHG) levels;
- Minimum thermal envelope performance for building elements such as walls, floors, roof and external glazing;
- Treatment of thermal bridging across construction systems;
- Minimum performance requirements for building sealing;
- Maximum lighting power densities for internal lighting design;
- Minimum performance levels for building air-conditioning and ventilation systems;
- Minimum requirements for energy and water metering;
- Minimum requirements for energy and water data collection; and
- Minimum access for maintenance requirements.

The proposed new performance standards for Section J (2019) will increase the thermal performance requirements for code compliant façade designs, meaning consideration must be shown for the amount of exposed glazing included within the façade design.

Specifically, the existing heritage façade (western) on the 800 Pittwater Road site will require careful consideration of the glazing thermal performance, solar control, visible light transmittance and inclusion of appropriate shading features within the design response.

The development will need to seek to optimise energy efficiency & thermal performance via design elements which improve the building façade performance including façade design, thermal envelope, HVAC system selection and lighting design.

# 3. Project Design Response

## 3.1 SEARS Design Response

The following section documents the project's dedicated response to Key Issue 8 – Ecological Sustainable Development (ESD) as identified within the Secretaries Environmental Assessment Requirements, as outlined within the formal Department of Planning & Environment correspondence, dated 01 July 2019.

### 3.1.1 ESD Principles – Schedule 2, Clause 7(4) EPAR 2000

The principles of ecologically sustainable development (as documented within the Environmental Planning and Assessment Regulation 2000 are defined within Section 2.4 above. The following provides a direct response to the specific principles a) through d) as follows:

***The Precautionary Principle:***

There are no threats of serious or irreversible environmental damage as a result of locating the proposed St Luke's Grammar Senior School on the desired sites. The proposed buildings are to be located on a previously developed sites within an established urban area. As the proposed development is not a greenfield project, the risk of creating environmental damage often associated with building on a greenfield site is considered low. No threatened or endangered species are located on the land due to the previous development of the site. Where the proposed development boarders the Stoney Range Regional Botanic Gardens, risk of environmental damage or impact on the surrounding gardens shall be managed via the implementation of a site-specific environmental management plan.

The proposed development is proposed to carry out predominantly the same use as the current building(s) on the site. Therefore, no serious or irreversible environmental damage is expected due to the operation of the proposed building. Supporting design such as stormwater management, sediment & erosion control, environmental management plan during construction shall all be implemented to ensure the precautionary principle for the proposed development is supported.

***Inter-generational equity:***

The proposed development conserves inter-generational equity through minimising the consumption of resources whilst providing both an education facility and workplace which will ensure the health and well-being of students, staff and visitors into the future. The project will ensure a lower demand for resources than a standard practice development by introducing a number of best practice energy and water conservation measures. These initiatives will conserve more resources for future generations, instead of their immediate consumption by the current generation.

As the site is already developed, the existing environment condition is unlikely to be significantly altered. The proposed development shall include new landscaping which will maintain pockets of planted environment similar to those currently present on the site.

All waste streams will be dealt with in ecologically safe methods; waste water and storm water will be plumbed to the sewers or storm water drains as required by law. In addition, waste water will be lower for this development compared with a standard practice development as low-flow fixtures and fittings will be used to reduce water consumption throughout the building. Existing services infrastructure upgrades will be documented & included within the project where relevant and connect to the existing major services infrastructure currently serving the site.

***Conservation of biological diversity and ecological integrity:***

There is limited biological diversity on the current site due to the property being previously developed. The proposed development will have limited, if any impact on the current level of biological diversity and ecological integrity as there is little ecological valued landscaping on the current site that will be replaced by built development in this project.

The project's sustainability targets will aim to ensure improved conservation of resources than a comparative standard practice development. This means that the proposed development is likely to have a smaller gross biological and ecological footprint than other similar projects.

Energy conservation measures will reduce the project's demand for electricity and gas, which slows or reduces the need for new energy infrastructure in the broader energy markets. This indirectly reduces the land required for new infrastructure, and the pollution caused by electricity generation.

***Improved valuation, pricing and incentive mechanisms:***

This project will integrate a number of initiatives which aim to internalise pollution and other undesirable environmental outcomes. Contractors will be requested to provide and abide by an Environmental Management Plan and Environmental Management System which are in accordance with NSW Environmental Management Systems Guidelines or a similar standard. This places a value on environmentally responsible building practices and places a form of "polluter pays" onto the contractors to ensure they are held responsible for the environmental management of the building site as they complete their work.

The costs associated with the construction waste will be borne by the project team. They shall be required to target 80% recycling of construction waste. This will have a greater financial cost to the project, however it provides a more accurate reflection of the full life cycle costs of the materials which were on the site, and the waste from the new materials as a result of the construction. The increased cost of recycling construction materials will also incentivise the purchase of less materials, thereby reducing over-ordering and material wastage.

The costs of producing the following pollution: sewage, landfill waste, and $CO_2$ emissions are partially borne by project team and accounted for in the project's sustainability initiatives. The project has voluntarily elected to:

- improve their water consumption efficiency, thereby paying to reduce their production of sewage;
- reduce their energy consumption, which means solutions to reducing $CO_2$ emissions will be paid to be investigated during the design phase;
- recycle waste streams in the construction and operation of the project, which will cost more than standard practice where all material waste is directed to landfill.

### 3.1.2 Best Practice Sustainable Development Framework – Green Star Design & As-built

SEARS Key Issue 8 calls for the identification of a framework which reflects 'national best practice sustainable building principles' as a minimum performance requirement. Historically, project team teams have responded to this requirement via consultation with the nationally recognised framework Green Star, published by the Green Building Council of Australia.

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

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

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

While the SEARS Key Issue 8 refers specifically to consideration against Green Star Performance, the common design response within SSDA submission is to target a 'Design & As-built' submission as a broader project response to the specific items identified within SEARs Key Issue 8.

Consultation with the project design team to date has suggested the project will seek to ensure the minimum project performance outcome of **4 Star Green Star (Design & As-built)**, consistent with Australian Best Practice sustainable building principles. Due to the project timeline, the project may elect to amend and/or update the Green Star certification tool in order to be consistent with the current industry recognised best practice framework.

An eligibility criterion of Green Star certification includes spatial differentiation, meaning the building receiving certification must be clearly identifiable and distinct from surrounding buildings.

It is important to note, the proposed project Green Star scope and application for development approval will focus on the new building components to be constructed on the 800 Pittwater Road site only as illustrated below (refer Stages 2 & 3).

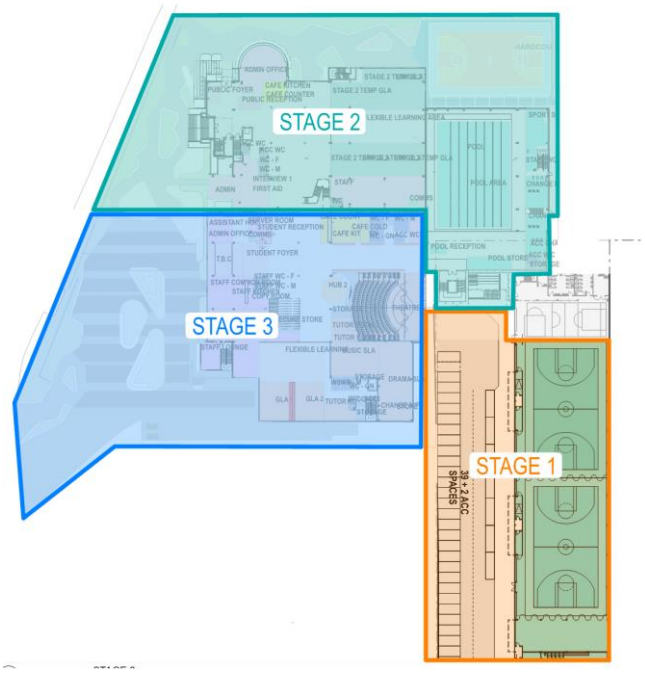



**Figure 3:** Project Staging Plan. Source: TZG Architects

While it is proposed to include a pedestrian link between the 800 Pittwater Road and 224 Headland Road sites, there remains clear separation between the two buildings. Given the project timeline and the planned refurbishment works 224 Headland Road site, it is presented to both the Department of Planning and the GBCA that **only the 800 Pittwater Road site development shall be included within the Green Star certification.**

Further to the above, it is proposed to only achieve a single Design & As-built Certification for the project. Given the 800 Pittwater Road site is an existing building and is likely to be refurbished in multiple stages, the Green Star certification process will take place in two distinct stages as identified above.

- Design Review – to be undertaken at the completion of design tender documentation; and
- As-built Certification – to be undertaken at the point of practical completion for the entire project.

Additional information is provided below regarding more specific initiatives and performance targets within Section 3.1.3.

### 3.1.3 Provisional Green Star Analysis

Whilst the proposed scope of works for Green Star certification (design & as-built) has not been finalised, provisional ESD and environmental performance initiatives have been presented & discussed via consultation with the project design team. It is expected that a more formalised Green Star scope of works shall be identified following development application approval and project registration with the GBCA.

A provisional list of ESD and environmental initiatives in accordance with the Green Star framework has been identified below.

- Green Star accredited professionals shall be engaged throughout the project to guide the design team and ensure a high level of environmental performance is achieved;
- High WELS rated water fittings ensuring lower building water demand;
- On-site rainwater harvesting & reuse will reduce the site discharge levels and maintain the overall health & ecological integrity of receiving water bodies;
- LED lights, which have longer lives, consume less energy and produce a higher quality light than their counterparts, reducing overall energy demand;
- Energy & water metering for effective monitoring & demand reduction;
- Passive thermal design features such as fixed external shading, operable external louvers for natural ventilation and cross flow and optimised daylight performance via performance glass;
- Low-VOC paints, sealants, adhesives, carpets (where applicable), which do not emit dangerous volatile components, risking the health of users;
- Steel sourced from manufacturers who are members of the Australian Steel Institute Sustainability Charter for sustainable and energy reducing steel manufacture;
- Best practice PVC plastics in formwork, piping, cables and conduits. These materials have a reputation for damaging the environment in their production, both upstream and downstream of the manufacturing process;
- Operational waste procedures including defined streams for effective material recycling;
- A target of 90% of construction and demolition waste will be diverted from landfill;
- On-site stormwater management in accordance with EPA/WSUD best practice guidelines;
- Contractors will be requested to provide and abide by an Environmental Management Plan and Environmental Management System that is in accordance with NSW Environmental Management Systems Guidelines;
- Engineered wood products will limit formaldehyde levels via architectural specification in accordance with industry best practice standards; and
- Consideration of additional material specifications which select & prefer materials and products which include reused content, environmental product declarations, third party sustainability certifications or product stewardship programs;
- Landscape design shall focus on the inclusion of local, indigenous species with drought tolerant capability;

- Sub-soil landscape irrigation systems;
- Completion of a dedicated climate change impact study and management plan during detailed design phase;
- Acoustic performance in accordance with both Green Star and education guidelines;
- Dedicated site-specific transport plan including suitable provision for sustainable modes of transport to be utiised by students, staff and visitors;
- Detailed design to undertake a detailed life-cycle assessment to inform and manage holistic material impacts for the project;
- Any identified hazardous materials to be removed and disposed of in accordance with relevant EPA and NSW best practice legislation;
- Light pollution shall be managed via effective external lighting design;
- Legionella risks shall be managed via air-cooled HVAC systems;
- Efficiency, high performance HVAC systems with a focus on energy efficiency to be installed. Consideration of mixed-mode natural ventilation shall be considered further during detailed design phase; and
- Additional Green Star innovation challenges as relevant and identified.

A provisional Green Star certification list of initiatives demonstrating the projects ability to achieve the minimum 4 Star Green Star performance outcome has been included within Appendix A of this report. Note, the provisional list of initiatives will be subject to further amendment during project detailed design phase following development approval.

### 3.1.4 Government Architect NSW Environmental Design in Schools

In response to the SEARS requirements, the following section details the proposed project's design response to the NSW Government Architect – Environmental Design in Schools Guideline. The guideline outlines a number of key impact categories and initiatives design to improve the environmental performance as well an improve the quality of schools design for the students, staff and stakeholders.

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

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

Additional commentary is provided below with regards to the proposed project design response.

**Air** and **Comfort** are to be managed via a dedicated approach to ensuring the passive thermal design elements of the project are fundamental to the project design approach. Whilst utilising the existing building form, the proposed design has sought to achieve a balance between ensuring effective natural daylight and optimised energy efficiency.

As part of the minimum design compliance requirements, compliance with NCC Section J (2019) energy efficiency provisions shall be required. This will ensure a minimum level of façade performance and is further defined within Section 3.3 of this report.

Further to the above, the project is also considering in great detail the passive thermal performance of the project design inclusive of thermal comfort and appropriate design response. Due to the inclusion of the village centre (refer Figure 4

below), a detailed thermal comfort analysis is being undertaken to ensure effective passive thermal performance and natural ventilation is achieved within the village centre design.

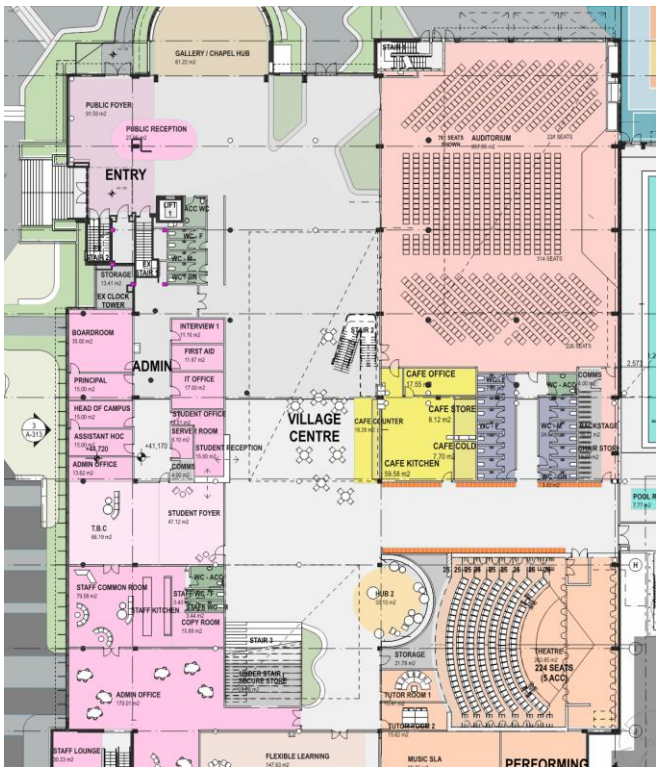



**Figure 4:** Village Centre Concept. Source: TZG Architects.

The following image details the conceptual passive thermal natural ventilation and 'stack effect' concept to which the proposed project is seeking to continue to develop as key passive thermal design concept.

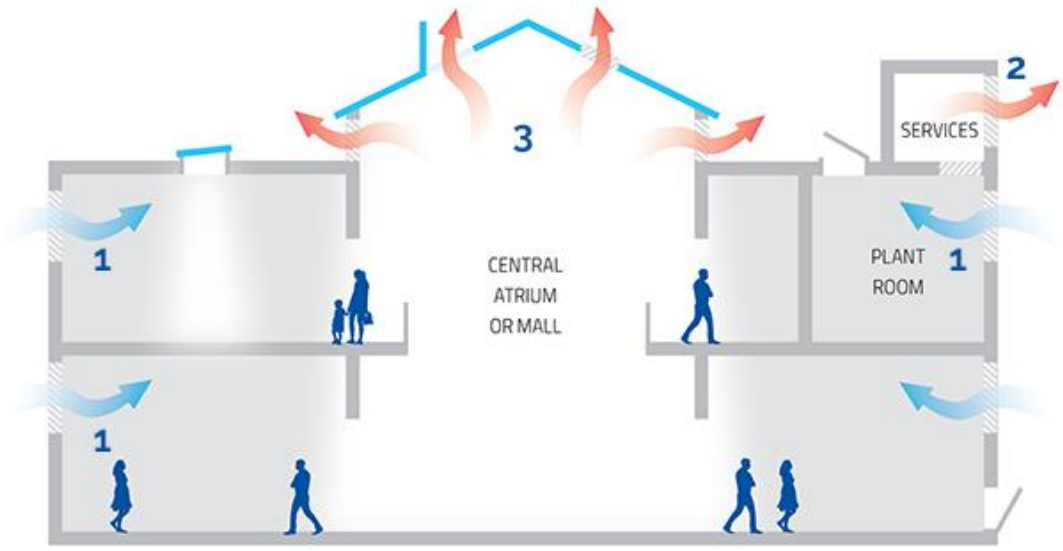



**Figure 5:** Example natural ventilation concept – **Source:** Lareine

**Light** shall be optimised via a dedicated design response to include optimum levels of natural daylight to all dedicated teaching and learning zones. The following elevation details the high-level skylight concept created by TZG Architects to ensure optimum levels of natural daylight are achieved within the General Learning Areas (GLAs) and village centre zones.

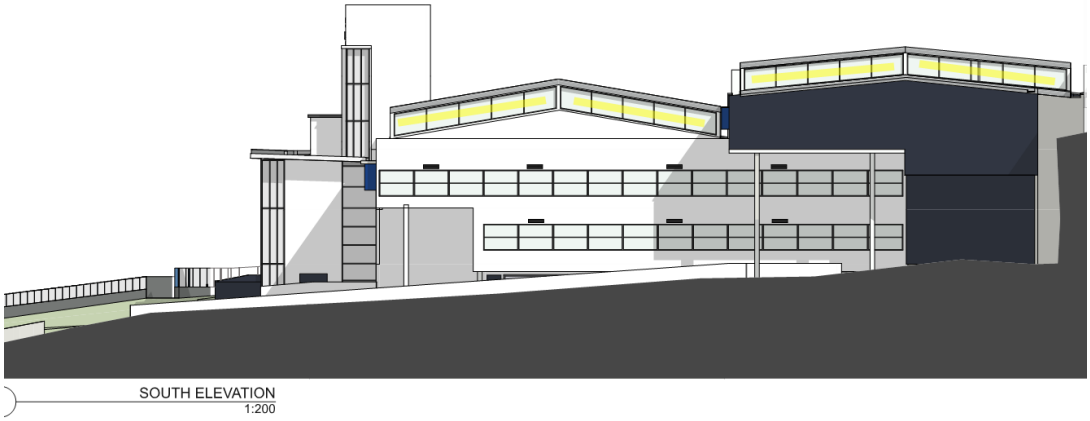



**Figure 6:** High level natural daylight skylights – **Source:** TZG Architects

Providing optimum levels of natural daylight to learning spaces is known to benefit concentration, productivity and physical comfort for students. The south-facing high-level skylights provide diffuse daylight with good natural colour rendering into the space and a connection to the outdoors without direct solar heat gains.

A daylight analysis has been undertaken to determine the levels of daylight achieved in each space of the proposed building. The analysis demonstrates that the GLAs achieve good levels of daylight. Appendix B provides daylight level (lux) overlays for all spaces.

**Noise** shall be mitigated and managed via a dedicated Acoustic design response. In addition to the Government Architect Environmental design guide, the performance requirements identified within Green Star are likely to be included within the project design as part of the targeted Green Star certification.

**Energy, Water, Landscape** and **Materials** impacts shall all be managed and optimised via the projects commitment to Green Star certification, refer additional commentary provided within Sections 3.1.2 and 3.1.3 above and further information provided within Appendix A of this report.

### 3.1.5 Projected Impacts of Climate Change

As part of the provisional design response for the project, an assessment of project risks associated with the predicted impacts of Climate Change has been undertaken for the proposed development. The assessment has been undertaken to ensure the project design allows for suitable provisions for the predicted impact of climate change scenarios.

The project design team has conducted a site-specific analysis of the likely scenarios which represent the most significant projected impacts of climate change. The assessment is summarised within the table below inclusive of specific categories as defined within SEARS document, dated 01 July 2019.

The assessment has been undertaken in accordance with CSIRO and Australian Bureau of Meteorology data in accordance with the SEARS requirements.

The table below summarises the projected impacts of climate change across two scenarios (RCP4.5 and RCP8.5*): the near future 2020-2039 (referred to 2030) and far future 2080-2099 (referred to 2090). These projections are generalised for the ‘East Coast (South) Cluster’ region as defined by the CSIRO and BOM (2015) and is taken as the most representative of the proposed site’s future climate-change enhanced conditions in Sydney.

*Representative Conservation Pathway – 4.5 represents normalised emission levels. 8.5 represents worst case scenario based upon 2005 emissions trends.

| Climate Variable | Climate Projections (change relative to 1986 – 2005 baseline) | | | |
|---|---|---|---|---|
| | 2030 | | 2090 | |
| | RCP4.5 | RCP8.5 | RCP4.5 | RCP8.5 |
| Mean temperature change (°C) | 0.9 (0.6 to 1.1) | 1.0 (0.7 to 1.3) | 1.8 (1.3 to 2.5) | 3.7 (2.9 to 4.6) |
| Extreme temperature (days per year over 35°C) | 7.21 | 7.82 | 11.12 | 19.84 |
| | Substantial increase in intensity and frequency of extreme temperature days | | | |
| Mean annual rainfall change (%) | -3 (-10 to 6) | -1 (-11 to 6) | -2 (-16 to 9) | -3 (-20 to 16) |
| Extreme rainfall | Extreme rainfall events to increase in intensity | | | |
| Drought | Time spent in drought conditions to increase | | | |
| Bushfire weather (Number of severe fire danger days; FFDA > 50) | Severity of fire-weather climate to increase | | | |
| Solar radiation (%) | 0.5 (-0.5 to 1.9) | 0.8 (-0.7 to 2.7) | 1.5 (-0.3 to 3.7) | 1.3 (-1.2 to 3.4) |
| Relative humidity (%, absolute) | -0.5 (-1.6 to 0.8) | -0.6 (-1.4 to 0.9) | -1.0 (-3.1 to 0.3) | -1.5 (-3.8 to 1.3) |
| Wind Speed (%) | -1.1 (-2.9 to 0.5) | -0.5 (-2.3 to 1.9) | -1.0 (-4.2 to 0.2) | -1.1 (-6.9 to 4.2) |
| Sea level rise (m) | 0.13 (0.09 to 0.18) | 0.14 (0.10 to 0.19) | 0.47 (0.30 to 0.65) | 0.66 (0.45 to 0.88) |

**Table 1:** Summary of Climate Change Projects (CSIRO, 2015)

Summary of major impacts assessment:

**Mean & Average Temperature**

With very high confidence, air temperatures are projected to increase due to continued substantial warming from a mean warming of around 0.4 to 1.3°C by 2030 relative to the climate of 1986-2005. As a consequence of rising temperatures, peak temperature events will become more frequent whereby the number of days above 35°C are expected to nearly double under RCP4.5 and nearly triple under RCP8.5 by 2090 (CSIRO and BOM, 2015).

In response to the above, the project design seeks to ensure the passive thermal design elements are fundamentally sound ensuring that average daily temperature and peak extreme temperature days are managed as best as possible. External shading, glazing design, HVAC and natural ventilation shall all be fundamentally proven to ensure the proposed project design responds appropriately to the projected risks of climate change.

## 3.2 Warringah council DCP 2011

The following section details a provisional list of ESD initiatives for inclusion within the design & development of the project in direct response to the Warringah Council DCP 2011 (as amended).

Part D22 – Conservation of Energy & Water – focuses on ensuring the development includes suitable design elements in order to efficiency use & reduce overall annual demand for both energy & water. The following commentary is provided with regards to the applicable design elements which focus on reducing the overall building demand for both energy and water.

***D22 – Requirement 1:*** *The orientation, layout and landscaping of the site are to make use of the best natural ventilation, daylight and solar layout.*

As the project predominantly seeks to utilise the existing built form, suitable design provision for the utilisation of natural ventilation, daylight and solar access has been considered heavily within the proposed design response. In addition to the DCP requirements, additional performance standards as defined within both National Construction Code – Section J energy efficiency and NSW Government Architect environmental schools design guide which further support the approach to both natural ventilation and daylight/solar access.

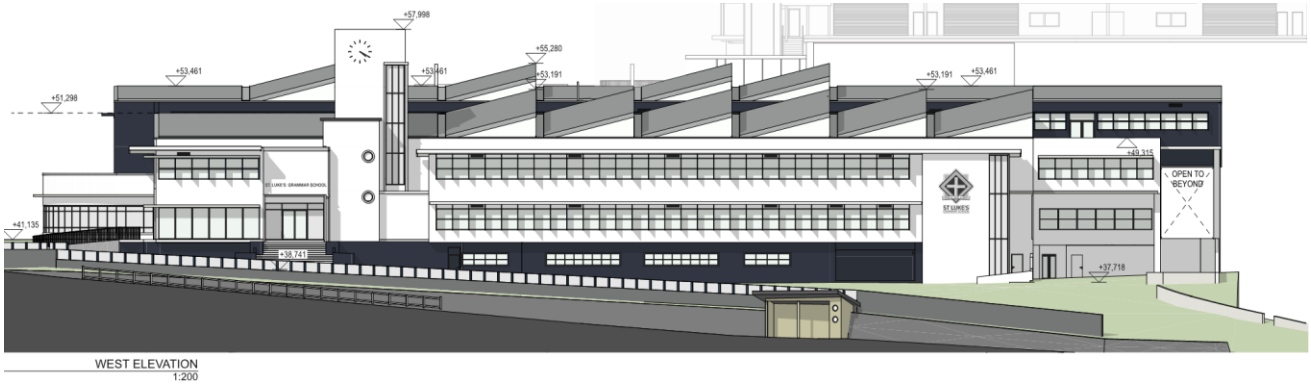



**Figure 7:** Proposed West façade inclusive of passive solar design features. Source: TZG Architects.

***D22 – Requirement 2:*** *Site layout and structures are to allow for reasonable solar access for the purposes of water heating and electricity generation and maintain reasonable solar access to adjoining properties*.

The proposed design intends to utilise a significant proportion of the existing building structure and façade. Furthermore, the proposed design includes suitable provision for roof mounted plant inclusive of potential hot water and energy generation. Due to site topography rising significantly to the south of the building and existing building scale, the proposed design response is not likely to significantly impact on solar access of adjoining sites in addition to the current building form.

***D22 – Requirement 3:*** *Buildings are to be designed to minimise energy and water consumption.*

The overall building design will reduce demand for both energy and water via the documented design response to the performance design requirements as defined both NCC Section J and Green Star. The overall project design approach has been influenced by the following design hierarchy:

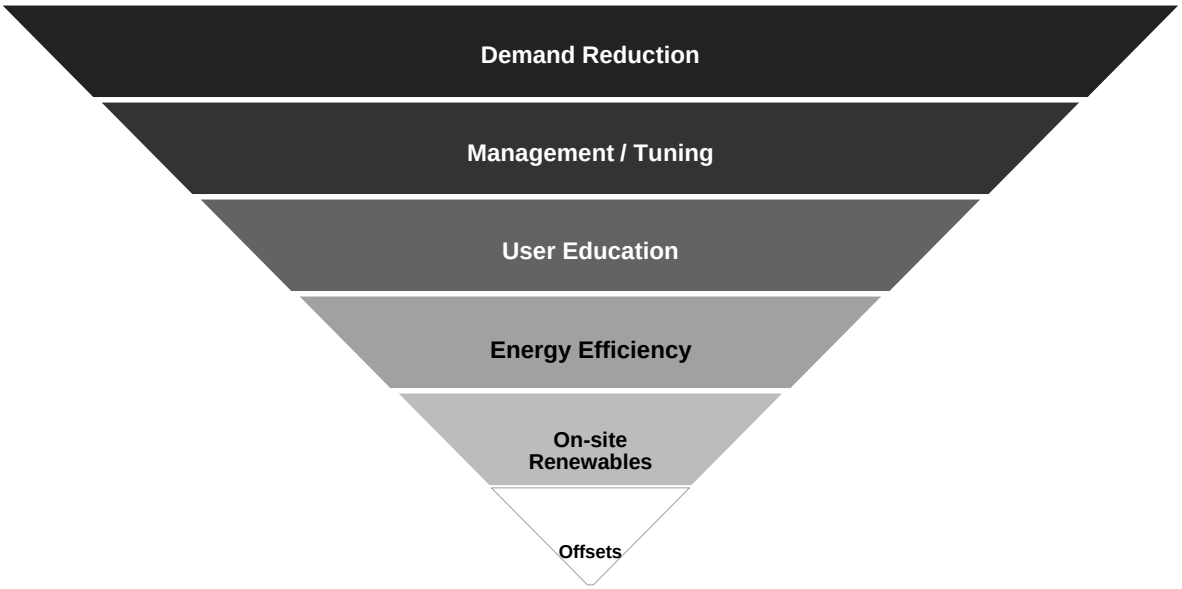



**Figure 8:** Energy & Water efficiency design hierarchy.

Additional design considerations and initiatives likely to be included within the project design in response to DCP D22 Requirement 3 include:

- Façade design for optimised passive thermal performance. Refer additional commentary provided above.
- Efficient lighting e.g. LEDs. This will reduce the electrical load on the grid for the same electrical output. Further, LED globes have a longer life, reducing replacement periods which demands less maintenance, as well as reducing landfill of precious materials – applicable to both administration building/ processing plant.
- Lighting controls including timing and occupancy sensors to reduce the demand on the lighting systems.
- Sub-metering will allow for effective energy management & optimisation of building performance.
- External lighting to timeclock controlled for optimised energy efficiency.
- Energy and water efficient appliances – lowering energy demand.
- Localised hot water systems for lower GHG emissions impact & on demand response.
- Water efficient fixtures and fittings – includes taps, wash basins, WCs, Urinals, showers and supplementary water uses.

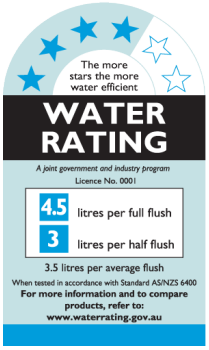



**Figure 9:** Example of a WELS water efficiency rating label.

In accordance with industry best practice standards, the following performance schedule identified within Green Building Council of Australia's – Green Star scheme will ensure potable water demand is effectively reduced:

| Nominated WELS Fixtures – Green Star Design & As-built V1.2 | |
|---|---|
| **Fixture / Equipment Type** | **WELS Rating (minimum)** |
| Taps | 6 Star |
| Toilet | 5 Star |
| Showers | 3 Star (>4.5 but <= 6.0 L/min) |
| Dishwashers | 5 Star |

- Water meters will ensure inefficiencies such leaks are detected prior to the significant loss of water;
- On-site rainwater harvest – offset on-site irrigation demand reducing the demand from potable water supplies.

***D22 – Requirement 4:*** *Landscape design is to assist in the conservation of energy and water.*

The project landscape design will seek to include the following initiatives designed to reduce energy & water demand:

- Irrigation supply from non-potable sources such as rainwater etc.
- Irrigation supply to be delivered via sub-soil infrastructure.
- Plant selection shall focus on native, indigenous and drought tolerant species. Consideration of deciduous species to ensure seasonal passive thermal solar gains shall also be included within the design.
- External lighting design to be controlled by either daylight sensor or timer.

***D22 – Requirement 5:*** *Reuse of stormwater for on-site irrigation and domestic use is to be encouraged, subject to consideration of public health risks.*

The project stormwater design shall respond to minimum DCP, EPA and relevant associated legislation. In addition, the approach to Green Star certification is likely to include a design response to stormwater quality. Refer civil engineers report and supporting documentation for further commentary.

- ***D22 – Requirement 6:*** *All development must comply with Council's Water Management Policy.*

Refer Civil Engineers report for further information & commentary.

## 3.3 NCC Section J (2019) – Energy Efficiency Design Response

NCC 2019 will require new developments is to comply with the new provisions outlined within NCC Section J 2019.

The proposed new performance standards for NCC Section J will increase the thermal performance requirements for code compliant façade designs, meaning consideration must be shown for the amount of exposed glazing included within the façade design. Glazing thermal performance, solar control, visible light transmittance and inclusion of appropriate shading features within the design response must be considered in accordance with the increased performance requirements of NCC Section J 2019.

The proposed development will seek to optimise energy efficiency & thermal performance via design external façade design elements which improve the building passive thermal performance (i.e. fixed external shading, insulated façade elements, etc.). Particular focus will be on the western façade inclusive of the existing heritage elements and also replacement of the existing precast wall panels and curtain walls with new high-performance building envelope elements.

In addition to the above, thermal comfort modelling will be included to demonstrate compliance with the new NCC 2019 code, with a minimum performance of -1.0 < PMV <1.0 in each mechanically conditioned zone. The design of the building fabric will demonstrate compliance with this clause through dynamic modelling of the building against a reference case.

### 3.3.1 Shading

The proposed design is inclusive of fixed external shading on both the North and West facades. The proposed shading devices will have a significant impact on the overall energy performance of the building in association with the predicted climatic changes as documented within Section 3.1.5 above.

### 3.3.2 Performance Requirements

NCC Section J – energy efficiency provisions will apply to the design & construction of the development with the intent to ensure the build form and associated building services demonstrate a minimum level of energy efficiency performance.

The proposed building fabric will likely exceed prescriptive values in order to work with the architecture and mechanical performance of the building, including:

- **External Walls:** Min R2.5 additional insulation (90mm). Total R1.4
- **Roof and Ceilings:** Min R5.0 additional insulation (155mm) Total R3.7
- Light coloured roofs if aesthetically possible and pending reflectivity requirements (<0.45 Absorptance)
- **Windows:** As required to exceed compliance. Options include:
  - Low E coatings
  - Double glazed, performance glazing
  - Shading structures to at least the northern & western façade.

Final details with regards to the above shall be defined within the tender issue report following development application approval. A detailed NCC Section JV3 report shall be provided in association with the project tender design demonstrating compliance with the provisions of the NCC Section J – energy efficiency.

# 4. Summary

Ecologically Sustainable Design is a driving consideration in the development of the proposed St Luke's Senior School Campus located at 800 Pittwater Road, Dee Why NSW. As described within the report above, the project will incorporate a number of ESD and environmentally conscious initiatives in both design & operation aimed at ensuring the principles of sustainable development are both demonstrated & achieved in accordance with the minimum SEARS requirements.

The development's commitment to reducing the overall environmental impact is evident of the holistic approach taken to long-term sustainability. Documented initiatives cover a range of categories including:

- A response to NSW Environmental Planning and Assessment Regulation 2000;
- A minimum 4 Star Green Star (Design & As-built Certification demonstrating the projects commitment to environmental best practice;
- A response to Warringah Council, including a list of initiatives designed to minimise energy and water demand for the project;
- A response to NSW Government Architect design guide, including detail on the minimum performance of natural daylight levels; and
- A response to the new energy efficiency provisions of NCC Section J 2019.

Additional supporting information is provided within the Appendices of this report.

We trust this Ecological Sustainable Development report provides sufficient overview of the project commitment to environmentally sustainable design and the sustainability vision for the proposed St Luke's Senior School Campus project.

# Appendix A – Provisional Green Star Credit Schedule

**Green Star Design & As Built v1.2 Credit Schedule** Revision 1

## St Lukes Senior School

Date 21/06/2019

**GS-XXXXDA**

| | Credit No. | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|---|
| Management | 1.0 | **Green Star Accredited Professional** | **1** | 1 | | Low | WGE | Requires consultant to manage the Green Star certification process, undertake energy modelling, undertake Green Star credit calculations, closely review design & as built documentation for compliance, collate the submission and coordinate with the Green Building Council. |
| | 2.0 | **Environmental Performance Targets** | **-** | Complies | | Low | CONTRACTOR/ CLIENT, ALL SERVICES & SUBCONTRACTORS | Note - 'Complies' means that the design and installation will have to comply with this conditional requirement<br><br>St Lukes will need to identify project specific Environmental Performance targets (e.g. typically these are defined as energy and water consumption targets).<br><br>Detailed Design & Construction team shall develop design intent report to describe building services, main components, intended operations, maintenance requirements, metering strategy and other related information. |
| | 2.1 | **Services and Maintainability Review** | **1** | 1 | | Low | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Contractor + Sub-contractors will need to undertake services commissioning and maintainability review during detailed design finalisation period and prior to construction. |
| | 2.2 | **Building Commissioning** | **1** | | 1 | Med | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Credit comes with additional cost requirements, associated with air tightness testing of the building. This can be conducted by the mechanical engineer and is recommended to be included in their scope of works. Potential for up to 2 innovation points as part of undertaking this for achieving the level of performance.<br><br>Note for information: If this credit is targeted, The Contractor & services sub-contractors must prepare and implement a commissioning plan that outlines all of the pre-commissioning and commissioning requirements to specific Green Star recognized commissioning standards. Commissioning activities will need to be undertaken to a typically higher standard (e.g. AIRAH DA27 & DA 28, CIBSE Commissioning Codes, ASHRAE for mechanical services) compared to 'business as usual' due to additional tests and maintaining commissioning documentation.<br><br>To be identified in accordance with HVAC building strategy. inclusion of any natural ventilation elements will require target adjustments.<br><br>Commissioning must also include Whole Building Air Permeability Performance Testing with the contractor required to limit infiltration levels to maximum levels as described in the Green Star Submission Guidelines. Testing must be undertaken by an accredited air tightness/infiltration practitioner. This mauy be a good initiative and cost ~$30,000 |
| | 2.3 | **Building Systems Tuning** | **1** | 1 | | Low | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Post-occupancy building tuning shall be undertaken as part of the Defects Liability Phase Post-completion. The tuning team should include Contractor, sub-contractors and facilities management/operators.<br><br>Contractor and sub-contractors shall undertake at least quarterly tuning for 12 months after building is occupied and must commit to implementing any improvements based on the tuning.<br><br>A tuning plan must be created prior to practical completion. A building tuning report must be generated as part of the process |
| | 2.4 | **Independent Commissioning Agent** | 1 | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 3.1 | **Implementation of a Climate Adaptation Plan** | **2** | 2 | | Med | ESD | It is recommended that a qualified consultant prepare a project specific optional climate change risk & adaptation plan sufficiently early in the design phase. The plan will assess the risks associated with climate change and propose design strategies to mitigate these risks. This is best done as early as possible in the program to ensure the best possible outcome<br><br>Note: Any 'high' or 'extreme' risk items identified within the climate adaptation plan must be addressed by specific design & construction responses<br><br>WGE charges approx. $10,000 for this service |
| | 4.1 | **Building Information: Operations & Maintenance Information, Building Log Book and Building User Information** | **1** | 1 | | Low | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Contractor + Services Sub-Contractors must provide Green Star compliant O&M Manuals + Building Log Book + Building Users Info Guide at practical completion.<br>Services Contractors must supply the following in strict compliance with the Green Star stipulated requirements:<br>a) detailed O&M information for each service and<br>b) A Building Log Book which is in compliance with CIBSE TM31.<br>c) Building Users Information (Guide)<br><br>Must be provided in a digital format. |
| | 5.1 | **Environmental Building Performance** | **1** | 1 | | Low | CLIENT | Client to formally commit to setting/monitoring/reporting of at least 2 environmental targets for the facility in operation (covering 80% of the Gross Floor Area):<br>- Greenhouse gas emissions;<br>- Water usage;<br>- Operational waste;<br>- Indoor environment quality.<br><br>Contractor to ensure Metering & monitoring infrastructure (water & energy) is installed. |
| | 5.2 | **End of Life Waste Performance** | **1** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 6.0 | **Metering** | **-** | Complies | | med | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Note: 'Complies' means that the design and installation will have to comply with this conditional requirement<br><br>Majority of energy meters will need to comply with BCA Part J8 standard requirement, however additional separate meters will be required as follows:<br><br>Separate Private Electrical Sub-Meters (connected to BMS or EMS) as a minimum for:<br>- Energy meter for individual mechanical switchboards<br>- Individual elec distribution boards or individual uses that exceed 5% of the total building energy OR 100 kW (whichever is smaller)<br>- Floor-by-floor separate energy meters (covering light and power) .<br>- house power meters in the building<br>- Major Mech equipment with load >100kW<br>- Lifts<br>Note: Variable Speed Drives (if used for fans) must have ability to report on kWh energy consumption via high level interface connection with BMS/EMS<br><br>Separate Gas sub-meters (connected to BMCS) as a minimum for:<br>- Gas sub-meter for domestic hot water<br>- Gas for cafe/commercial tenancy (if gas is supplied)<br>- Gas boilers for mechanical space heating.<br><br>Note: All private sub-meters must be validated in accordance with the NABERS Rules for Non-Utility Meters |
| | 6.1 | **Monitoring Systems** | **1** | 1 | | Med | CONTRACTOR, ALL SERVICES SUBCONTRACTORS | Contractor & BMS contractor shall provide a BMCS/EMS with automatic meter monitoring capabilities (electricity, gas, water sub-meters).<br><br>The BMCS/EMS automatic meter monitoring system (including meter connections to head-end PC/BMS) must be capable of:<br>- Collecting data from all energy and water meters at regular intervals (e.g. 15mins, 30mins)<br>- Alerting to missing data due to failures;<br>- Alerting if any inaccuracies in excess of the meter tolerance occur (e.g. 1% for a Class 1 meter)<br>- Recording and processing of data at user adjustable intervals;<br>- Raising an alarm when the energy or water use increase;<br>- Including the consumption water or energy, the load versus time (load profile), and the power factor (in the case of energy); and<br>- Producing, as a minimum, a quarterly report that is automatically sent to the facilities manager responsible for the building. |
| | 7.0 | **Responsible Construction Practices: Environmental Management Plan** | **-** | Complies | | Low | CONTRACTOR | Mandatory requirement for Contractor to provide & implement a project specific Environmental Management Plan as outlined in accordance with NSW Environmental Management Systems Guidelines. |

| Credit No. | | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|---|
| | 7.1 | Responsible Construction Practices: Formalised Environmental Management System | 1 | 1 | | Low | CONTRACTOR | Contractor must provide a formal audited Environmental Management System for the project in line with ISO 14001. |

| | Credit No. | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|---|
| | 7.2 | **Responsible Construction Practices: High Quality Staff Support** | **1** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 8A | **Performance Pathway - Specialist Plan** | **1** | 1 | | Low | CONTRACTOR/ CLIENT, WASTE CONSULTANT, ARCHITECT | Consultant to be engaged to develop a Waste Management Plan for DA. The OWMP requirements for storage, access, collection etc. must be reflected in the architectural design of the facility.<br><br>Note: Any plan will also need to meet Northern Beaches Council local requirements. It will need to expicitly specify the waste generation rates and access arrangements. This must be reflected in the design of the waste storage area. |
| | 8B | **Prescriptive Pathway - Facilities** | - | 0 | | | | |
| ***MANAGEMENT TOTAL*** | | | **14** | **10** | **1** | **0** | | |
| Indoor Environment Quality | 9.1 | **Ventilation System Attributes** | **1** | 1 | | High | CONTRACTOR & MECH SUBCONTRACTOR | 1. Outdoor air intakes locations must be compliant with ASHRAE 62.1:2013<br>2. Ease of maintenance requires access to both sides of moisture catching components (coils, filters, etc.). VAV Systems create simpler requirements as all major equipment is in plant space not ceiling void.<br>Incredibly difficult with ACBs or FCUs |
| | 9.2 | **Provision of Outdoor Air** | **2** | 1 | | Low | CONTRACTOR & MECH SUBCONTRACTOR | For primary + secondary areas that have mechanical ventilation (i.e. office, lobby), the Mech Contractor shall target providing a minimum +50% increase on minimum fresh air ventilation rates of AS1668.2:2012.<br><br>Note: Adding additional outside air will result in larger HVAC plant capacities and more riser space, as well as higher energy consumption. |
| | 9.3 | **Exhaust or Elimination of Pollutants** | **1** | 1 | | Low | CONTRACTOR & MECH SUBCONTRACTOR | Base Build to have dedicated exhaust riser not shared with any kitchens.<br><br>Carpark to be exhausted in line with AS1668. Office floors to be served with general exhaust for the fitout's u |
| | 10.1 | **Internal Noise Levels** | **1** | 1 | | Low | CONTRACTOR, ACOUSTIC CONSULTANT, MECH SUBCONTRACTOR | Requires building services and facade (due to external noise, e.g. traffic) acoustic control measures. Acoustic Testing is required post-completion.<br><br>Mechanical Ventilated Spaces: Internal ambient noise levels in the nominated area is to be no more than 5dB(A) above the lower figure in the range recommended in Table 1 of AS/NZS 2107:2016.<br><br>Credit responds to GANSW design intent of improved Acoustic performance for the benefit of building occupants. Also proximity to Pittwater Road and traffic noise to be managed via localised facade and acoustic treatments. |
| | 10.2 | **Reverberation** | **1** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 10.3 | Acoustic Separation | **1** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 11.0 | **Minimum Lighting Comfort** | **-** | Complies | | Low | CONTRACTOR, ELEC SUBCONTRACTOR | Assume that lighting design will be compliant with this 'Business as usual' standard.<br><br>All lights must be LED 'flicker free' and have a minimum CRI of 80. |
| | 11.1 | **General Illuminance and Glare Reduction** | **1** | 1 | | Low | CONTRACTOR, ELEC SUBCONTRACTOR | The internal lighting levels in all primary & secondary spaces must meet the recommended maintained illuminance levels AND minimum uniformities as specified in AS 1680.<br><br>Additionally, glare from lamps must be limited by:<br>- Ensuring that all bare light sources are obscured from direct viewing by occupants through baffles/louvers/diffusers etc., including occupants looking directly upwards; OR<br>- The lighting system complies with the luminaire selection system as detailed in Section 8.3.4 of AS 1680.1 OR<br>- Unified Glare Rating must not exceed values in Table 8.2 of AS/NZS 1680.1<br><br>Tenant fitout guide to be provided explaining that this credit is to be targeted by tenant. Lighting in Back of house tertiary areas is excluded from compliance |
| | 11.2 | **Surface Illuminance** | **1** | | 1 | | CONTRACTOR, ELEC SUBCONTRACTOR, ARCHITECT | The objective of the credit is to ensure that a combination of lighting and surfaces improve uniformity of lighting to give visual interest in primary & secondary spaces.<br><br>If targeted, the following lighting design must be complied with for all primary & secondary spaces.<br>To meet the credit criteria, the following options may be used (alone or in combination):<br>Option 1.<br>A. Ensure an average surface reflectance of at least 0.75 for ceilings, and<br>B. Ensure an average surface illuminance on the ceiling of at least 30% of the lighting levels on the working plane.<br>OR<br>Option 2.<br>Model spaces to show that:<br>A. The average ceiling luminance does not exceed 0.5 kcd/m2 and that no point on the ceiling exceeds 1.5 kcd/m2; And<br>B. That the ceiling has an average surface illuminance of at least 30% of the working plane;<br><br>Shell & Core Tenancy Lighting to be confirmed with GBCA. Tenant fitout guide to be provided explaining that this credit is to be targeted by tenant, or shell & core area to be completely excluded |
| | 11.3 | **Localised Lighting Control** | **1** | 0 | | | CONTRACTOR, ELEC SUBCONTRACTOR | Not targeted as part of 4 Star scope of works. |
| | 12.0 | **Glare Reduction** | **-** | Complies | | Low | CONTRACTOR, ARCHITECT | If targeted, this credit requires provision of blinds or fixed shading to window/skylight/glazed doors etc. final requirements shall be confirmed via relationship to functional layout of space use directly adjacent to facade. Will require specific treatment for western facade (inclusive of any heritage constraints). Provision of blinds to window glazing to be confirmed by Architect.<br><br>Generally requires that manual blinds (VLT < 10%) be installed for ALL primary areas with external facade or roof light glazing (within office, kitchen, commercial cafe etc.). Can often be removed from the southern facade<br><br>Potential to model out some areas if required. |
| | 12.1 | **Daylight** | **2** | 1 | | med | ESD | Requires prerequisite of Credit 12.0 to be fulfilled. Daylight factor of 2% at FFLwill need to be achieved for at least 40% of primary spaces. ESD consultant to model to demonstrate compliance can be achieved. Potentially compliance could be limited via compliance solution via NCC Section J 2019 compliance which will drive additional external shading elements. |
| | 12.2 | **Views** | **1** | | 1 | med | ESD CONSULTANT, ARCHITECT | Requires at least 60% of primary spaces to have access to external views (no solid obstructions within 8m of window). Will ultimately depend on the functional layout arrangement for internal space use. ESD consultant to model to demonstrate compliance early. |
| | 13.1 | **Paints, Adhesives, Sealants and carpets** | **1** | 1 | | med | CONTRACTOR, ALL TRADES, ARCHITECT | Only compliant Low VOC paints, adhesives, sealants & carpets to be used internally with all supply & installation records to be maintained. All trades must comply with this low VOC requirement including building services. Contractor and each trade must maintain records of installation. All fit-out related works must comply. |
| | 13.2 | **Engineered Wood Products** | **1** | 1 | | med | CONTRACTOR, ALL TRADES, ARCHITECT | Only compliant Low Formaldehyde engineered wood products to be used internally with all supply & installation records to be maintained. Within base build scope - including amenity partitions, joinery, etc. |
| | 14.1 | **Thermal Comfort** | **1** | 1 | | Low | CONTRACTOR, MECH SUBCONTRACTOR, ESD CONSULTANT | Assuming Air-Con to most of the primary & secondary spaces and a thermally efficient building envelope, thermal comfort modelling will demonstrate that PMV Thermal Comfort Levels between -1 and +1 can be achieved. Minimum requirements of NCC Section J 2019 to include thermal comfort modelling. |
| | 14.2 | **Advanced Thermal Comfort** | **1** | | | med | CONTRACTOR, MECH SUBCONTRACTOR, ESD CONSULTANT | Not targeted as part of 4 Star scope of works. |
| ***IEQ TOTAL*** | | | **17** | **9** | **2** | **0** | | |

| | Credit No. | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|---|
| Energy | 15E.0 | **GHG Energy Conditional Requirement - 10% min GHG emissions reduction relative to NCC Section J DTS Reference Building** | - | Complies | | Low | ESD CONSULTANT, CONTRACTOR, ARCHITECT | Note - 'Complies' means that the design and installation will have to comply with this conditional requirement.<br><br>The building design must target exceeding the NCC Section J energy efficiency targets for building envelope and services. New GBCA release of Green Star V1.3 in assocaition with NCC Section J 2019 update - final details TBC at the time of reporting. +10% improvement may be governed by inclusion of additional on-site renewable energy supply.<br><br>Modelling to be undertaken by ESD Consultant as mechanical system design is refined. |
| | 15E.1 | **GHG Energy: Comparison to a Reference Building Pathway** | **20** | 4.0 | | Med | ESD CONSULTANT, CONTRACTOR, ARCHITECT, ALL SERVICES SUBCONTRACTORS | The air-conditioning system will likely be based on a air-cooled heat rejection VAV system and/or air-cooled chiller (final mechanical selection TBC). Lighting will be mainly LED-based. Domestic Hot Water design to be gas boiler. Strong recommendation for PV systems in assocation with minimum conditional performance requriements.<br><br>The introduction of Design and As Built v1.3 in June will make this credit particularly difficult. Maximum 4 points is envisaged due to new NCC 2019 targets. TBC when Energy modelling is completed later. Targeting additional points will likely require provision of solar PV cells on roof and additional energy considerations undertaken at greater cost.<br><br>All energy modelling will need to be undertaken based on finalised design in DD phase. |
| | 16A | **Peak Elec Demand Reduction Prescriptive Pathway - On site Energy Generation** | - | 0 | 2 | | ESD CONSULTANT, CLIENT ARCHITECT | Additional opportunities to be confirmed via inclusion of on-site renewable power contribution. Further discussion with School and coordiantion with NCC Section J 2019 / Green Star V1.3 tool updates required. |
| | 16B | **Peak Elec Demand Reduction Performance Pathway - Reference Building Comparison** | **2** | 0.0 | | | | |
| ***ENERGY TOTAL*** | | | **22** | **4.0** | **2.0** | | | |
| Transport | 17A.1 | Performance Pathway | **10** | 5 | 1 | Med | | Performance pathway is recommended as a cost-effective way to achieve high points, based on transport mode shift in the area. Requires team to engage transport consultant - typical cost <$5,000 |
| | 17B.1 | **Access by Public Transport** | **3** | 0 | | | | Recommend performance pathway compliance method. |
| | 17B.2 | **Reduced Car Parking Provision** | **1** | 0 | | | | Recommend performance pathway compliance method. |
| | 17B.3 | **Low Emission Vehicle Infrastructure** | **1** | 0 | | | | Recommend performance pathway compliance method. |
| | 17B.4 | **Active Transport Facilities** | **1** | 0 | | | | Recommend performance pathway compliance method. |
| | 17B.5 | **Walkable Neighbourhoods** | **1** | 0 | | | | Recommend performance pathway compliance method. |
| ***TRANSPORT TOTAL*** | | | **10** | **5** | **1** | | | |
| Water | 18A.1 | **Potable Water - Performance Pathway** | - | 4 | | Low | ARCHITECT, HYDRAULIC SUBCONTRACTOR, FIRE SUBCONTRACTOR, LANDSCAPE CONTRACTOR | Performance pathway will provide greater result than prescriptive. 4 points achievable, if fire system collection >80%. Outcome is based on air-cooled cooled heat rejection and efficient fittings. Minimum performance requirements:<br>* 4 Star WCs<br>* Waterless or 0.3L/flush Urinals<br>* 5 L/min Showers (where applicable)<br>* 2.5 L/min tapware<br>* Tenant guide on tapware and fittings<br>* On-site rainwater tank - serving irrigation and potentially swimming pool top up. |
| | 18B.1 | **Sanitary Fixture Efficiency** | **1** | | | | ARCHITECT, HYDRAULIC SUBCONTRACTOR | Recommend performance pathway compliance method. |
| | 18B.2 | **Rainwater Reuse** | **1** | | | | HYDRAULIC SUBCONTRACTOR | Recommend performance pathway compliance method. |
| | 18B.3 | **Heat Rejection** | **2** | | | | MECH SUBCONTRACTOR | Recommend performance pathway compliance method. |
| | 18B.4 | **Landscape Irrigation** | **1** | | | | LANDSCAPE ARCHITECT, LANDSCAPE SUB-CONTRACTOR, HYDRAULIC SUBCONTRACTOR | Recommend performance pathway compliance method. |
| | 18B.5 | **Fire System Test Water** | **1** | | | | FIRE SUBCONTRACTOR | Recommend performance pathway compliance method. |
| ***WATER TOTAL*** | | | **12** | **4** | **0** | | | |
| Materials | 19A.1 | **Comparative Life Cycle Assessment** | **6** | 3 | 1 | Low | ESD | A cost effective 5 Star Green Star strategy will likely require a whole-of-building whole-of-life Life Cycle Assessment (LCA) to be undertaken.<br><br>It is recommended that design team include an LCA consultant to undertake this LCA Assessment on the project (in comparison against a "Reference building"). The LCA must show how the proposed project reduced the environmental impact when compared to the "reference building". The LCA study must be peer reviewed by a suitably qualified professional.<br><br>For example, for the proposed building, initiatives to be explored include reducing Portland cement content by at least 30%, mix water for all concrete used must be at least 50% reclaimed water, 25% of fine aggregate (sand) inputs are manufactured sand etc. |
| | 19A.2 | **Additional Life Cycle Impact Reporting** | **4** | 0 | 1 | med | ESD | An additional 2 points can be claimed if the LCA is used to influence the building's design process through at least 2 of the following:<br>a) Additional life cycle impact reporting<br>b) material selection improvement<br>c) construction process improvement<br>d) LCA design review |
| | 19B.1 | **Concrete** | - | 0 | | | | |
| | 19B.2 | **Steel** | - | 0 | | | | |
| | 19B.3 | **Building Reuse** | - | 0 | | | | |
| | 19B.4 | **Structural Timber** | - | 0 | | | | |
| | 20.1 | **Structural and Reinforcing Steel** | **1** | 1 | | Low | CONTRACTOR | This credit shall be targeted and will require at least 95% by mass of all NEW steel to be sourced from an environmentally Responsible Steel Maker (with ISO14001 Environmental Management Systems AND member of World Steel Association WSA Climate Action Program).<br><br>Assuming the building is a concrete frame building, at least 60% (by mass) of all NEW reinforcing bar and mesh must be produced using energy-reducing processes in its manufacture (measured by average mass by steel maker annually). |
| | 20.2 | Timber Products | **1** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 20.3 | **Permanent Formwork, Pipes, Flooring, Blinds and Cables** | **1** | 1 | | Low | CONTRACTOR, ARCHITECT, ALL TRADES | Point listed as TBC for now due to additional cost impact. In order to achieve the credit, at least 90% by cost of permanent formwork, pipes, flooring, blinds, cables shall be PVC-free or Green Star "Best practice" sustainable PVC. |
| | 21.1 | **Product Transparency and Sustainability** | **3** | 0 | | | | Not targeted as part of 4 Star scope of works. |
| | 22A | **Fixed Benchmark** | - | 0 | | | | |
| | 22B | **Percentage Benchmark** | **1** | 1 | | Low | CONTRACTOR, WASTE RECYCLING SUBCONTRACTOR | All waste contractors and waste processing facilities servicing the project must demonstrate compliance with the "Green Star Construction and Demolition Waste Reporting Criteria" AND at least 90% construction & demolition waste by mass must be diverted from landfill. |
| ***MATERIALS TOTAL*** | | | **14** | **6** | **2** | | | |

| | Credit No. | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|---|
| Ecology | 23.0 | **Endangered, Threatened or Vulnerable Species** | - | Complies | | Low | ARCHITECT, LANDSCAPE ARCHITECT | Site was previously developed. It is assumed that the current site fulfils the conditional requirement that there are no endangered/vulnerable species or ecological communities on site |
| | 23.1 | **Ecological Value** | 3 | 0 | | High | ARCHITECT, LANDSCAPE ARCHITECT | Points achieved will be dependent on improving the 'before' and 'after' construction site condition.<br><br>Unlikely given the current site. |
| | 24.0 | **Conditional Requirement** | - | Complies | | Low | CONTRACTOR, ESD CONSULTANT | It is understood that the site was not old growth forest, prime agricultural land, wetland or nationally significant |
| | 24.1 | **Reuse of Land** | 1 | 1 | | Med | ARCHITECT, ESD CONSULTANT | At least 75% of the site was previously developed. |
| | 24.2 | **Contamination and Hazardous Materials** | 1 | 1 | | Med | CONTRACTOR | Must confirm hazardous materials survey has been conducted, and Asbestos, Lead, PCB's are removed or stabilised.<br><br>For Credit 24.2B Hazardous Materials, Contractor to confirm if any asbestos/lead/PCBs within the existing site will be stabilised or removed |
| | 25.0 | **Heat Island Effect Reduction** | 1 | | 1 | | CONTRACTOR, ARCHITECT, LANDSCAPE ARCHITECT, LANDSCAPE CONTRACTOR | Point listed as TBC for now, depending on roof material used<br><br>If this credit is targeted, at least 75% of the total project site area must include building or landscaping elements that reduce the impact of heat island effect (high SRI roof & paving materials, vegetation etc.)<br><br>Claiming this credit will require metal deck roof sheeting with high solar reflectance index of minimum 82 (initial SRI for roof pitch < 15deg). Landscape designer will need to specify unshaded hard-scape elements within site boundary (e.g. paving, road and hardstand areas) with initial SRI > 39 (e.g. very light coloured concrete).<br><br>Inclusion of on-site renewable energy such as solar panels will assist in achieving compliance. |
| ***ECOLOGY TOTAL*** | | | **6** | **2** | **1** | | | |
| Emissions | 26.1 | **Reduced Peak Discharge** | 1 | 1 | | Low | CONTRACTOR, HYDRAULIC SUBCONTRACTOR, CIVIL | Credit is assumed to be achievable based on the assumption that post-development peak ARI discharge does not exceed pre-development peak ARI discharge (1 or 5 year) through OSD tank & treatment train. Generally a council requirement. RWT/OSD sizing to be confirmed by Civil consultant.<br><br>Stormwater treatment in OSD requires a MUSIC model and DRAINS model to confirm pollution reduction and ARI peak event discharge reduction. |
| | 26.2 | **Reduced Pollution Targets** | 1 | | 1 | Low | CONTRACTOR, HYDRAULIC SUBCONTRACTOR, CIVIL | Stormwater must be treated before release. Treatment of the stormwater discharge to reduce the Total Suspended Solids, Nitrogen, Phosphorus and hydrocarbon levels is required to achieve this point (refer Credit 26 Table 26.2 Column B) AND exceeing Council requirements.<br><br>Stormwater treatment in OSD requires a MUSIC model and DRAINS model to confirm pollution reduction and ARI peak event discharge reduction.<br><br>DA stage stormwater requirements likely require the pollution reduction targets of Column B are achieved. Compliance will be dependent on utilisation of existing on-site stormwater infrastructure as well as any upgrade requirements. |
| | 27.0 | **Light Pollution to Neighbouring Bodies** | - | Complies | | med | ELEC SUBCONTRACTOR | Note: 'Complies' means that the design and installation will have to comply with this conditional requirement<br><br>Compliance with AS4282:1997 'Control of obtrusive effects of outdoor lighting' is assumed to be a default requirement for Council.<br><br>Whilst AS 4282 only refers to 'at the boundary of residential windows', the GBCA requires a worst case scenario to be analysed and expect compliance at the site boundary, regardless of the distance to the nearest residential development. |
| | 27.1 | **Light Pollution to Night Sky** | 1 | 1 | | med | ELEC SUBCONTRACTOR | Credit to be targeted, but prevents the use of any uplighting to façade or landscape elements. All external lighting must have a maximum upward light ratio of 5%. |
| | 28.0 | **Microbial Control: Legionella Impacts from Cooling Systems** | 1 | 1 | | | MECH SUBCONTRACTOR | Compliant based upon provisional inclusion of air-cooled HVAC and no water based heat rejection. |
| | 29.0 | **Refrigerants Impacts: Refrigerant Leak Detection** | 1 | 0 | | | | Not targeted as part of 4 Star scope of works. |
| ***EMISSIONS TOTAL*** | | | **5** | **3** | **1** | | | |
| Innovation | 30C | **Improving on Green Star Benchmarks: Indoor Pollutants Ultra Low VOC Paints** | 1 | | 1 | med | CONTRACTOR, ARCHITECT | Ultra Low VOC Paints: 1 point TBC if at least 50% of paints (by volume) used in the building have a maximum TVOC content of 5 g/L. Generally able to be used everywhere without much uplift except doors and frames |
| | 30C | **Improving on Green Star Benchmarks: Power from Renewables** | 2 | | | | | |
| | 30C | **Improving on Green Star Benchmarks: Stormwater Treatment** | 2 | | 1 | med | CONTRACTOR, HYDRAULIC SUBCONTRACTOR, CIVIL | Stormwater treatment targets in line with Column B Credit 26.2 Table 26.1: 1 point can be targeted if Column B pollutant reduction levels can be achieved - may require additional capacity in filter unit |
| | 30C | **Supplementary Tenancy Fitout Review** | 1 | | | Med | CONTRACTOR, SUBCONTRACTORS | In line with credit 2.1, an innovation point is awarded for completing a supplementary fitout review for the major fitout. This will be available if the project is delivered as an integrated fitout. |
| | 30C | **Air Tightness Testing** | 2 | | 1 | High | CONTRACTOR, MECHANICAL SUBCONTRACTOR | Requires demonstration that the building façade's air tightness has been tested and achieves 5.0m3/hr/m2 of façade. This is considered normal, and less than half the perfromance of best pracirce |
| | 30D | **Innovation Challenge: Financial Transparency** | 1 | 1 | | Low | CONTRACTOR | Financial Transparency: 1 point can be targeted if Building Owner and Contractor complete the Financial Transparency Disclosure Template to identify Green Star costs related to design & construction. Building owner to participate in yearly GBCA report (anonymized data) |
| | 30D | **Digital Infrastructure** | 1 | | | Low | CONTRACTOR | |
| | 30D | **Innovation Challenge: High Performance Site Offices** | 1 | | | Low | CONTRACTOR | |
| | 30D | **Innovation Challenge: Occupant Engagement** | 1 | | | | CLIENT | Occupant Engagement: 1 point can be targeted if Client undertakes an occupancy comfort and sustainability survey for the staff & Customers within 6-12 months after practical completion. Metrics such as comfort, improvements to productivity, reduced sick absences etc. are to be surveyed. Occupancy survey results are to be provided to the GBCA for information only. Examples include the Building Occupants Survey System Australia (BOSSA). |
| | 30E | **Global Sustainability - Green Cleaning** | 1 | | | | CONTRACTOR, CLIENT | |
| | 30E | **Global Sustainability** | | 0 | | | | |
| | 30 | **Innovation - TBC** | 5 | | | | TBC | Additional Opportunities will present themselves, depending on the opportunities available within the design. PV to be confirmed, but may contribute to an additional 2 innovation points. |
| ***INNOVATION TOTAL*** | | | **10** | **1** | **3** | | | |

## Green Star Design & As Built v1.2 Target Score Summary

| Environmental Category | Points Available | Base | TBC |
|---|---|---|---|
| Management | **14** | 10 | 1.0 |
| Indoor Environment Quality | **17** | 9 | 2.0 |
| Energy | **22** | 4 | 2.0 |
| Transport | **10** | 5 | 1.0 |
| Water | **12** | 4 | 0.0 |
| Materials | **14** | 6 | 2.0 |
| Land Use & Ecology | **6** | 2 | 1.0 |
| Emissions | **5** | 3 | 1.0 |
| TOTAL POINTS (without Innovation) | 100 | 43 | 10.0 |

| Credit No. | Title | Points Available | 4 Star Pathway | TBC | Risk | Responsibility<br><br>NB: ESD Consultant involved in all credts | Credit Comments |
|---|---|---|---|---|---|---|---|
| | **BASE Total Percentage Score (without Innovation)** | 100 | 43.0 | 10.0 | | | |
| | Innovation | 10 | 1 | 3 | | | |
| | **Total Potential Percentage Score (Base Target + Innovation)** | | **57.0** | **#REF!** | | | |

**5 Star - 60 to 74**
**6 Star - 75+**

# Appendix B – Provisional Daylight Analysis

Project Name: St Luke's Grammar School

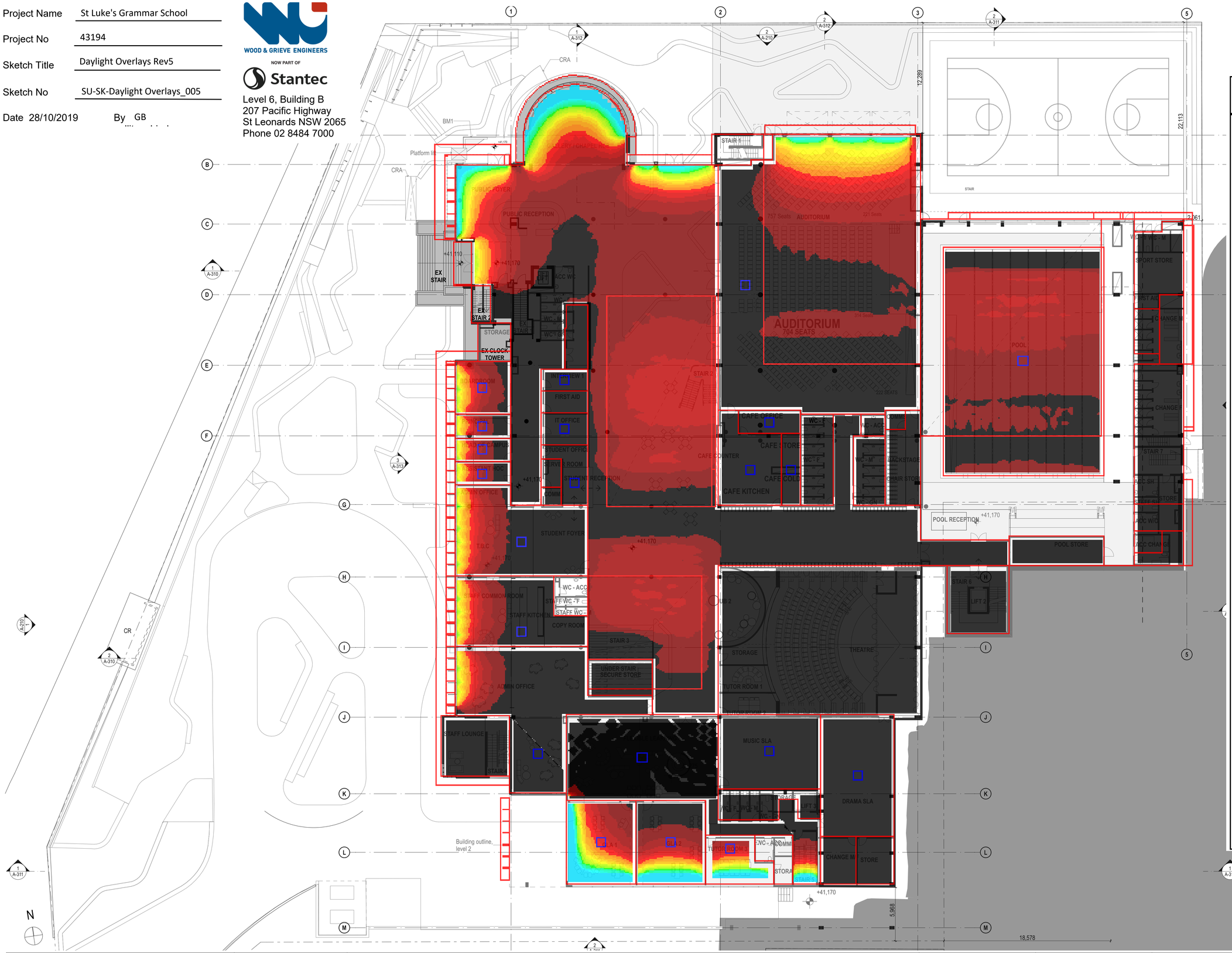
Project No: 43194

Sketch Title: Daylight Overlays Rev5

Sketch No: SU-SK-Daylight Overlays_005

Date 28/10/2019 By GB

WOOD & GRIEVE ENGINEERS
NOW PART OF
Stantec
Level 6, Building B
207 Pacific Highway
St Leonards NSW 2065
Phone 02 8484 7000




## Daylight (lux)

- >1000.00
- 950.00
- 900.00
- 850.00
- 800.00
- 750.00
- 700.00
- 650.00
- 600.00
- 550.00
- 500.00
- 450.00
- 400.00
- 350.00
- 300.00
- 250.00
- 200.00
- 150.00
- 100.00
- 50.00
- 0.00

Existing to be retained
Existing to be demolished
Proposed
Existing, significant heritage item

**DRAFT SSDA ISSUE 18/10/19**



PROJECT :
ST. LUKE'S GRAMMAR SCHOOL - NEW SENIOR SCHOOL CAMPUS
800 Pittwater Road Dee Why NSW 2099 + 224 Headland Road North Curl Curl NSW 2099
PROJECT NO : 18032

ARCHITECT
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tonkin zulaikha greer ARCHITECTS

**DRAWING TITLE**
800 PITTWATER ROAD
LEVEL 1 PLAN - STAGE 3_800

**DRAWN BY** RM + CE + EG
**CHECKED** PT
**SCALES AT A1** 1:200
**DATE** 18/10/19
**PHASE** SSDA
**DRAWING NO** A-117
**REV**

Project Name: St Luke's Grammar School

Project No: 43194

Sketch Title: Daylight Overlays Rev5

Sketch No: SU-SK-Daylight Overlays_005

Date 28/10/2019 By GB


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St Leonards NSW 2065
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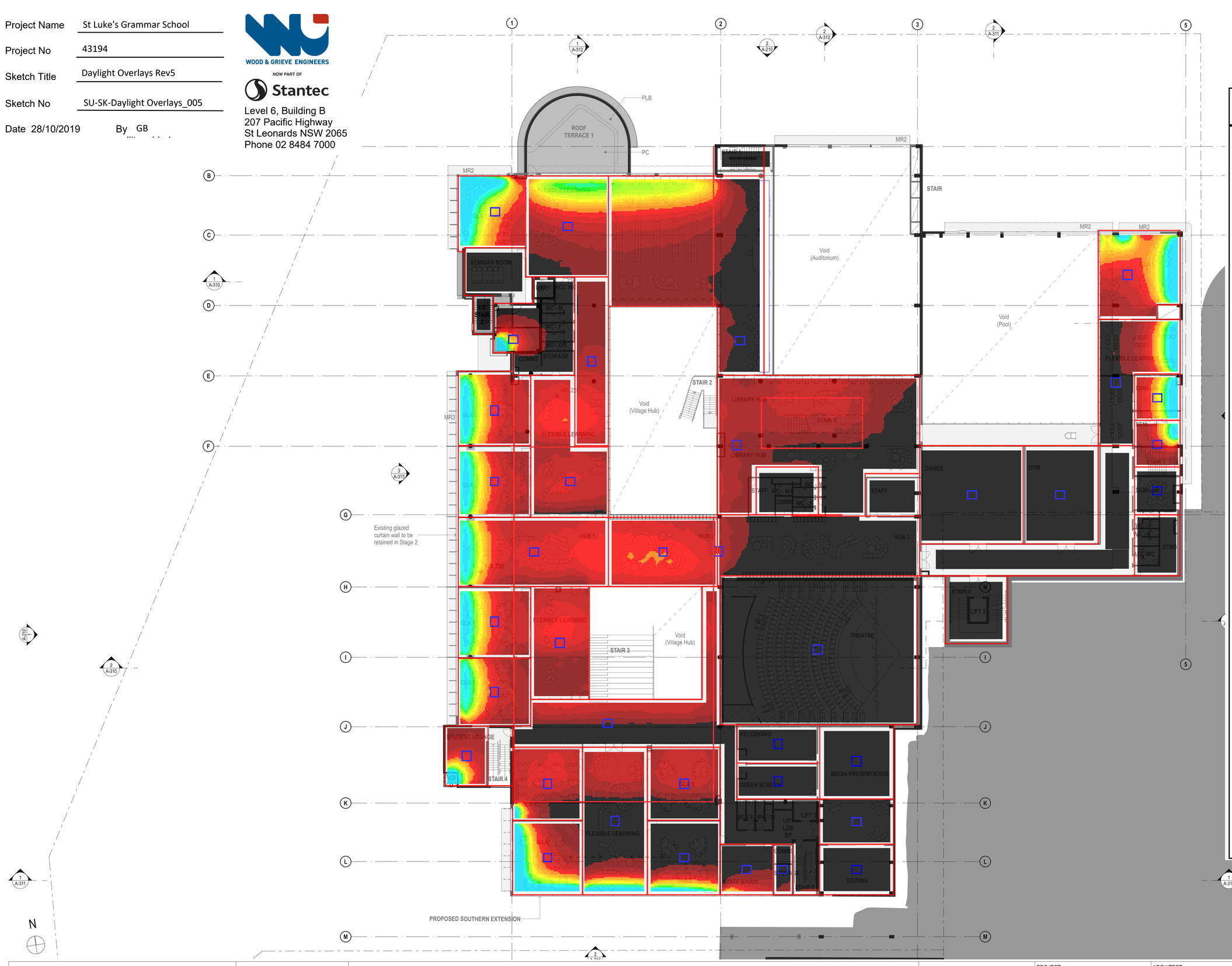


## Daylight (lux)

| |
|---|
| >1000.00 |
| 950.00 |
| 900.00 |
| 850.00 |
| 800.00 |
| 750.00 |
| 700.00 |
| 650.00 |
| 600.00 |
| 550.00 |
| 500.00 |
| 450.00 |
| 400.00 |
| 350.00 |
| 300.00 |
| 250.00 |
| 200.00 |
| 150.00 |
| 100.00 |
| 50.00 |
| 0.00 |

- Existing to be retained
- Existing to be demolished
- Proposed
- Existing, significant heritage item

**DRAFT SSDA ISSUE 18/10/19**



PROJECT :
ST. LUKE'S GRAMMAR SCHOOL - NEW SENIOR SCHOOL CAMPUS
800 Pittwater Road Dee Why NSW 2099 + 224 Headland Road North Curl Curl NSW 2099
PROJECT NO : 18032


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**DRAWING TITLE**
800 PITTWATER ROAD
LEVEL 2 PLAN - STAGE 3_800

**DRAWN BY** RM + CE + EG
**CHECKED** PT
**SCALES AT A1** 1:200
**DATE** 18/10/19
**PHASE** SSDA
**DRAWING NO** A-118
**REV**

Project Name: St Luke's Grammar School

Project No: 43194

Sketch Title: Daylight Overlays Rev5

Sketch No: SU-SK-Daylight Overlays_005

Date 28/10/2019 By GB

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## Daylight (lux)

- >1000.00
- 950.00
- 900.00
- 850.00
- 800.00
- 750.00
- 700.00
- 650.00
- 600.00
- 550.00
- 500.00
- 450.00
- 400.00
- 350.00
- 300.00
- 250.00
- 200.00
- 150.00
- 100.00
- 50.00
- 0.00

- Existing to be retained
- Existing to be demolished
- Proposed
- Existing, significant heritage item

**DRAFT SSDA ISSUE 18/10/19**

**NOTES:**
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DRAWING TITLE: 800 PITTWATER ROAD
LEVEL 3 PLAN - STAGE 3_800

SCALES AT A1: 1:200

PHASE: SSDA

DRAWING NO: A-119

REV:

DRAWN BY: RM + CE + EG

CHECKED: PT

DATE: 18/10/19

Design with
community in mind

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E sydney@wge.com.au

For more information please visit
www.wge.com.au

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