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SUSTAINABILITY

STEENSEN VARMING

New high school for Leppington and Denham Court (LPHS)
Sustainability Report – REF Submission

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Sydney, 13th January 2024
Ref. No. 237220

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1.0 Introduction and declaration

This report has been prepared by Steensen Varming to support a Review of Environmental Factors (REF) for the Department of Education (DoE) for the new high school in Leppington (the **activity**). The purpose of the REF is to assess the potential environmental impacts of the activity prescribed by State Environmental Planning Policy (Transport and Infrastructure) 2021 (T&I SEPP) as "development permitted without consent" on land carried out by or on behalf of a public authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The activity is to be undertaken pursuant to Chapter 3, Part 3.4, Section 3.37 of the T&I SEPP.

The proposed activity is for the construction of a new high school located at 128-134 Rickard Road, Leppington, NSW, 2179 (the site).

The ESD design strategies for this activity have been developed in accordance with the following guidelines and standards:

- Government Resource Efficiency Policy (GREP)
- Sustainable Building State Environmental Planning Policy (SB SEPP)
- SINSW Educational Facilities Standards & Guidelines
- Environmental Planning and Assessment Act
- National Construction Code of Australia (NCC) 2022
- Green Star Buildings V1

1.1 Proposed Activity Description

The proposed activity is for a new high school for Leppington and Denham Court. The new high school will accommodate up to 1,000 students across 3 new buildings that will comprise 48 permanent teaching spaces (PTS), 3 support teaching spaces (STS), 9 specialist labs/workshops/kitchens and a hall. Buildings A, B and C will wrap the western and southern boundaries of the site, with the hall being located in south-east corner. The activity also includes the construction of a sports field in the centre of the site and 3 x multipurpose courts along the northern boundary. The proposed scope of works is illustrated in Figure 1 below.

Figure 1 New High School for Leppington and Denham Court (source: djrd architects)

2.0 Activity site

The site is known as 128-134 Rickard Road, Leppington, NSW, 2179 and is legally described as Lots A and B in Deposited Plan 411211. The site is located on the eastern side of Rickard Road and is approximately 4.1ha in area. The site is located immediately south of the existing Leppington Public School at 144 Rickard Road and is approximately 700m south of Leppington Train Station.

Figure 2 below provides an aerial image of the site.

Figure 2 Aerial Photograph for activity site

The northern portion of the site is currently used for residential purposes. The southern portion of the site is used for agricultural purposes, with multiple greenhouses and an existing pond on the property.

2.1 Need for Activity

As part of the NSW Government's plan to rebuild public education, the 2024-25 Budget is delivering record education funding, for new and upgraded schools in Western Sydney. This targeted investment will ensure growing communities get access to a world class public education.

This project will deliver a new high school for the growing communities in Denham Court and Leppington. The New high school for Leppington and Denham Court is scheduled in two stages. Stage 1 is planned to cater for 1000 students with approximately 36 teaching spaces.

3.0 REF Reporting Requirements & Responses

This section addresses the REF requirements applicable to the project, as well as the requirements of the Sustainable Buildings SEPP 2022. The requirements and the associated responses are outlined in the following Tables, along with corresponding references to sections within this report.

3.1 Project response to Section 171 of the EP&A Regulation 2021

The following environmental factors have been specified in Review of environmental factors—the Act, s 5.10(a):

- the environmental impact on the community,
- the transformation of the locality,
- the environmental impact on the ecosystems of the locality,
- reduction of the aesthetic, recreational, scientific or other environmental quality or value of the locality,
- the effects on any locality, place or building that has—
    - aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance, or
    - other special value for present or future generations,
- the impact on the habitat of protected animals, within the meaning of the *Biodiversity Conservation Act 2016*,
- the endangering of a species of animal, plant or other form of life, whether living on land, in water or in the air,
- long-term effects on the environment,
- degradation of the quality of the environment,
- risk to the safety of the environment,
- reduction in the range of beneficial uses of the environment,
- pollution of the environment,
- environmental problems associated with the disposal of waste,
- increased demands on natural or other resources that are, or are likely to become, in short supply,
- the cumulative environmental effect with other existing or likely future activities,
- the impact on coastal processes and coastal hazards, including those under projected climate change conditions,
- applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1,
- other relevant environmental factors.

Of the above REF environmental factors, the factors that are applicable to the proposed activity are outlined in the following table, with a corresponding response.

Table 1 REF Requirements and Relevant Responses and References

Item	REF Requirement	Project Response and reference in Report
1.0	Any environmental impact on a community	**Section 2.1** Provide world class education for growing communities.
2.0	Any environmental impact on the ecosystems of the locality	**Section 4.1** Biodiversity Report Soil contamination Report
3.0	Any risk to the safety of the environment	**Section 4.2** Climate change Risk assessment
4.0	Any reduction in the range of beneficial uses of the environment	**Section 4.2** Mitigation measures
5.0	Any pollution of the environment	**Section 4.3** Passive design strategies for IEQ **Section 4.4, 4.5** Net-zero by 2050 Goal, Green Energy **Section 4.7** Water consumption management **Section 4.9** Embodied Carbon emissions reduction
6.0	Any environmental problems associated with the disposal of waste	**Section 4.8** Construction and Operational waste management
7.0	Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply	**Section 4.4, 4.5** Reduction in energy demand, Net-zero by 2050 Goal, Green Energy

The ESD initiatives proposed for the New High School for Leppington and Denham Court aim to reduce the environmental impacts typically associated with buildings during the construction and ongoing operation of the building.

The following key strategies have been adopted within the proposed design, to ensure a sustainable outcome:

- Design high quality spaces to promote comfortable and productive learning environments, while supporting the functional demand of the building, i.e., a learning / teaching environment. Key design emphasis is on providing optimised Indoor Environmental Quality (IEQ) and occupant comfort, including optimised indoor air quality, thermal, acoustic, and visual comfort. This is achieved through a high level of internal natural daylight and ventilation within the proposed buildings.
- Incorporate a high-performance building envelope, to ensure energy efficiency as well as occupant comfort (including thermal, visual, and acoustic comfort). This is demonstrated by adopting a 10% improvement of the DTS requirement of Section J as a project requirement.
- Incorporate appropriate passive design strategies, such as improved fabric thermal performance and active design strategies that include low energy active

systems (mechanical and lighting systems) to ensure a low-energy and low-maintenance design outcome.

- Adopt Water Sensitive Urban Design (WSUD) principles that include rainwater reuse for landscape irrigation, planting of low water species and stormwater management.
- Adopt practices to minimise construction and operational waste including recycling of construction and operational waste. This includes consideration for use of modular and prefabricated components in design, selection of recycled and reprocessed materials, returning package to the supplier, purchasing policies and auditing/ monitoring for the same.
- Utilise environmentally preferable materials, such as low carbon concrete and steel, selection of sustainable materials with low VOC's and formaldehyde content and have their Environmental Product Declaration (EPD) certificates.

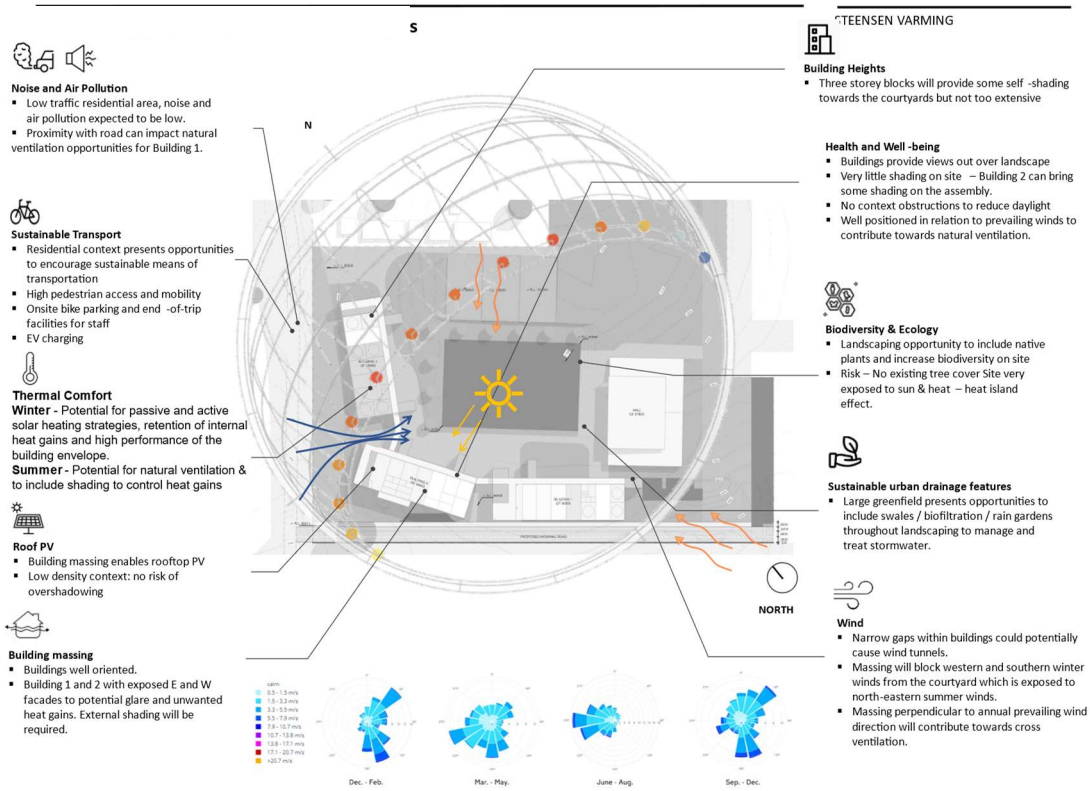

Figure 3: Site analysis

The outcome of the resource hierarchy approach is to ensure the project aligns with the ecologically sustainable development principles of Section 193 of the Environmental Planning and Assessment Regulation 2021, including the four key principles and our responses listed below.

3.2 Project response to Section 3.2 (1) of the State Environmental Planning Policy (Sustainable Buildings) 2022

This section has been prepared to address the relevant development requirements outlined in Chapter 3.2 (development consent for non-residential development) of the State Environmental Planning Policy (Sustainable Buildings) 2022. The following table summarises the requirements:

Table 2 Project response to SEPP SB 2022

Clause No.	SEPP SB (2022) Chapter 3.2 Requirement	Section of report where response is provided
3.2 (1)	(a) the minimisation of waste from associated demolition and construction, including by the choice and reuse of building materials	Refer to Section 4.8: minimisation of waste.
3.2 (1)	(b) a reduction in peak demand for electricity, including through the use of energy efficient technology	Refer to Section 4.4: Reduction in peak demand for electricity.
3.2 (1)	(c) a reduction in the reliance on artificial lighting and mechanical heating and cooling through passive design,	Refer to Section 4.3: Passive design below.
3.2 (1)	(d) the generation and storage of renewable energy,	Refer to Section 4.4: Energy efficiency for details on the on-site electricity generation systems.
3.2 (1)	(e) the metering and monitoring of energy consumption,	Refer to Section 4.6: Metering and monitoring.
3.2 (1)	(f) the minimisation of the consumption of potable water.	Refer to Section 4.7 Minimise potable water consumption.
3.2 (2)	The embodied emissions attributable to the development have been quantified.	Refer to Section 4.9: Embodied emissions.

4.0 Sustainability Approach

The following sustainability initiatives are being considered for the design in consultation with SINSW Sustainability team and governing guidelines such as SEPP, EFSG and Green Star Buildings v1. Relevant design documentation and reports to support these strategies have been developed and shared with the design team to inform the requirements for the following design phase and subsequent construction stage, where it will be the responsibility of the contractor to implement the targeted strategies.

4.1 Impact on Biodiversity

The project team will be developing an Ecological Assessment report to understand the short-term and long-term impacts on the environment. The project team also conducted the soil contamination test for the existing site to implement mitigation measures.

The landscape strategy, guided by Green Star Credit 35 (Impact to Nature), has been developed to enhance the environmental performance of the land to meet or improve beyond its existing condition, including integration of native plant species and incorporation of water sensitive urban design features to passively manage storm water across the site and enhance biodiversity.

4.2 Resilience

In accordance with Credit 16 (Climate change resilience), Credit 17 (Operations Resilience) and Credit 18 (Community Resilience) of Green Star, the project has identified and developed strategies to increase the resilience of the proposed activity in response to potential risks arising from climate change.

The latest available global climate models show that in the coming decades, Australia is projected to experience the following:

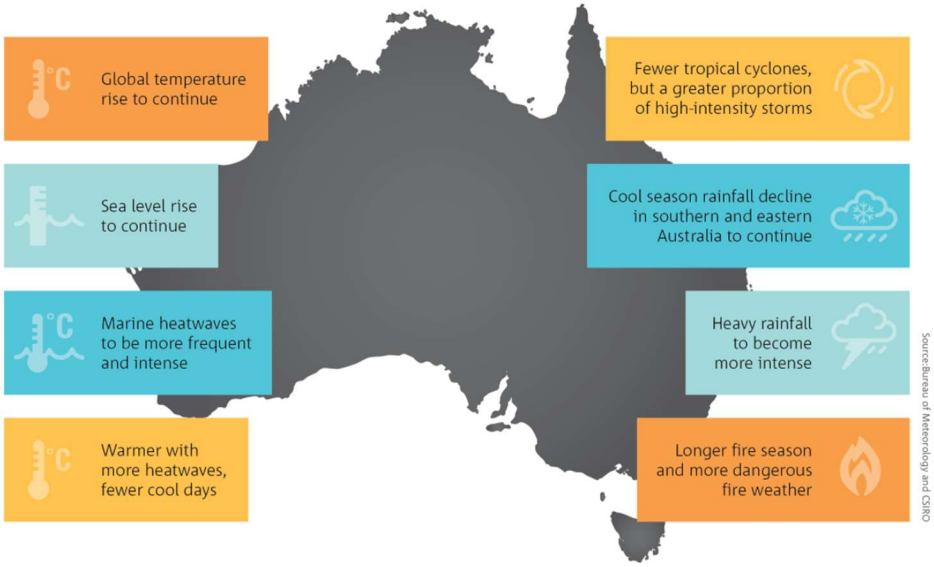

Figure 4 Summary diagram of climate projections for Australia. CSIRO and Bureau of Meteorology. Source: CSIRO

The below climatic variables have been considered to develop a resilience strategy for the school.

- Temperature
- Precipitation
- Fire weather/Bushfires
- Drought
- Flood
- Solar Radiation
- Relative Humidity
- Evapotranspiration
- Soil Moisture
- Wind
- Sea-level rise
- Cyclones

A Climate change workshop was conducted during the early design stage to discuss the Climate Change impacts/ risks on the design and to assess how the design and services strategy will respond to future expected climate conditions or develop risk mitigation strategies. This has been detailed in a Climate Change adaptation Plan by Steensen Varming.

The table below summarises the list of climate change risks and a review of how the design has addressed these risks based on the discussions at the Climate Change workshop held on 20.4.23. The climate change risks/ impacts in the table below is gathered from Adapt NSW and Steensen Varming has developed the responses against each upon discussion with all the design consultants during the climate change workshop held.

Table 3 List of climate change risks and design responses (Source: AdaptNSW and Steensen Varming)

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

Key Climate Change risk mitigation strategies considered for the proposed new high school includes:

- Passive Design Optimisation: (Increased thermal performance of the building envelope/ Shading / Air tightness / Heat recovery / etc.)
- Designed for natural ventilation and good air flow in indoor and outdoor areas (all classrooms and staff spaces) to allow for some increase in temperatures during peak times while maintaining comfortable conditions. The design is aligned with the acoustic performance requirement as explained in the REF Acoustic Report.
- Active design systems: Increase in plant capacity in buildings to accommodate higher ambient temperatures.

- Landscape strategy to include provision of trees, planting and covered walkways for shading and to connect outdoor spaces with buildings and use of soft landscape, hardscaping and roofing materials with high Solar reflectance index (SRI) to reduce the heat island effect and improve outdoor thermal comfort.
- Reduced stormwater runoff through rainwater harvesting from roofs and selection native species with low irrigation (potable water) demands. The temporary car park was assessed and no further impacts were identified.
- As part of the community resilience initiative, under the 'Share Our Space' program launched by SINSW, if needed, the schools could serve as a place of refuge in case of a natural calamity.

4.3 Passive design

The following passive design initiatives have been considered for the project:

- Considering this is a school building, glazing has been strategically placed in spaces which can allow for more relaxed environmental conditions and that can benefit from access to daylight, views and natural ventilation.
- Where required the windows are designed to have appropriate shading or be of high performance to control heat gains and glare.
- The performance of the building fabric will be above NCC 2022 Section-J Energy Efficiency minimum requirements by at least 10%.
- The building will be tested for airtightness. This will ensure a well-constructed façade and will prevent unwanted heat transfer to the exterior.
- Occupancy sensors are considered for all non-critical spaces, to ensure the artificial lighting system is only activated when the space is occupied and remain turned off at all other times.

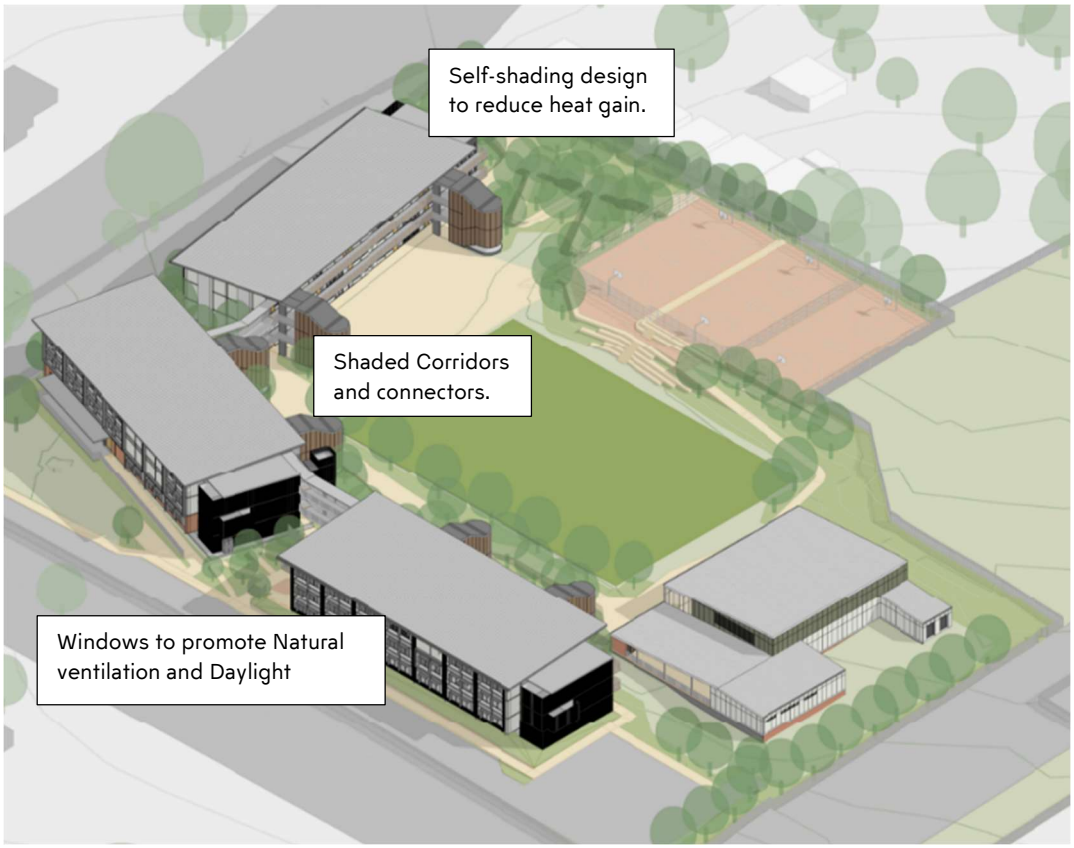

Figure 5: Passive design strategies for the New high school for Leppington and Denham Court

4.4 Reduction in peak demand for electricity

The following energy efficient design features are being considered in the current design, to reduce peak demand for electricity.

- An air quality monitoring system is being considered for the project. This system can allow adjustments on ventilation rates based on air quality, minimising the demand for outdoor air and therefore saving energy.
- In applicable non-specialist areas, the building is designed to maximise daylight availability,
- Electric lighting is designed to be comprised of high efficiency LED (Light Emitting Diode) technology and to include occupancy sensors where possible.
- Provision for a 99kW Photovoltaic on-site renewable energy generation has been included in the project, with the solar panels being provided on Building B as shown in the Figure 6 below.

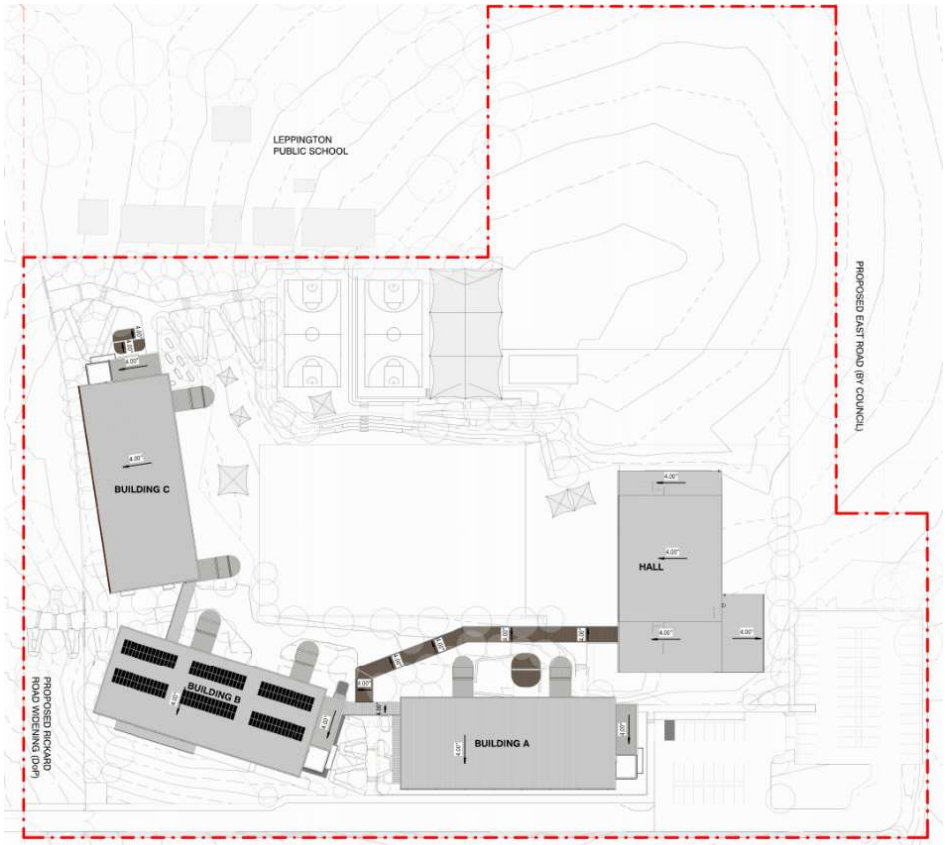

Figure 6: Provision of Solar Panels to provide renewable energy for the New high school for Leppington and Denham Court

- Passive strategies detailed in Section 4.3 will also contribute towards reducing peak demand as cooling loads will be lower.
- The project is targeting a minimum 10% improvement over NCC 2022 Section-J energy efficiency requirements.

4.5 Energy efficiency

Aligning with the NSW Government commitment to achieving net-zero emissions by 2050 and halving emissions by 2030, the activity is designed to endeavour for optimized energy efficiency and reduction in GHG emissions.

The proposed approach to sustainability and energy related systems is based on applying an "energy hierarchy" methodology.

This methodology has the reduction of energy use as its priority, and then seeks to meet the remaining energy demand by the most efficient means available, before the inclusion of on-site generation and procurement of green power.

Figure 7 Energy Hierarchy

The following initiatives are being considered for the project's energy generation and storage capabilities.

- Currently, a 99kW PV system has been incorporated into the design. Further, a spatial allowance will be made in the architectural design of each building, to ensure an area of at least 20% of the roof space is available for PV installation. This is in accordance with the minimum deemed-to-satisfy (DTS) requirements of NCC Section-J.
- The main switchboard will be designed in accordance with NCC 2022 Section-J requirements, to allow for PV and future battery installation.

4.6 Metering and Monitoring of Energy Consumption

The following initiatives are being considered, to enable metering and monitoring of energy consumption of the project.

- A BMS system as per NCC requirements will be included in the project.
- The project will sub meter significant energy uses via the proposed BMS to understand energy usage and distribution. This will also assist in target-based approach to reduce operational energy consumption in the future by capturing the main guzzlers.

4.7 Minimise Potable Water Consumption

The following hierarchy alongside the Green Star Buildings and Educational Facilities Standards & Guidelines (EFSG) has been considered as the basis of water strategies/ initiatives implemented within the proposed the New high school for Leppington and Denham Court.

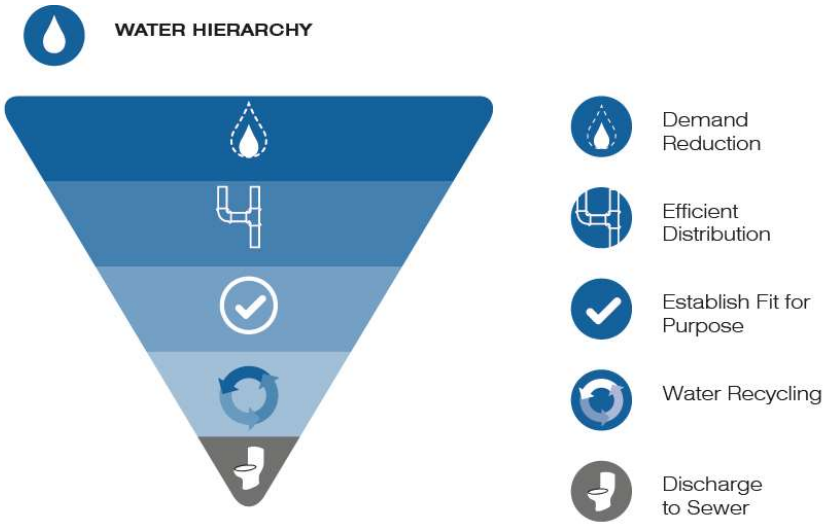

Figure 8 Water Hierarchy

The following initiatives are being considered in the current design, to minimise the project's potable water consumption.

- Water efficient fixtures and fittings, such as taps, showerheads, toilets, zip taps, dishwashers etc certified under the WELS rating scheme will be specified for the project.
- Rainwater harvesting is incorporated in the current design and will be reused for landscape irrigation.
- Efficient water management through an automatic water meter monitoring system will be installed.

4.8 Minimisation of waste

Addressing Green Star Credit 2 (Responsible Construction), the activity is targeting the following waste-related ESD strategies for the contractor to implement during construction:

- The builder or head contractor will be contractually required to have an environmental management system in place to manage impacts of construction activities on the site.
- The builder or head contractor will develop and implement an environmental management plan to cover the scope of construction activities.
- The builder diverts at least 90% of construction and demolition waste from landfill.

For operational waste management, the activity shall endeavour to implement measures assessed in the Operational Waste Management Plan. The project has been designed for the collection of separate waste streams and the design will ensure safe and efficient access to waste and storage areas for both staff and students, and waste collection contractors.

4.9 Embodied Emissions Reporting

As part of the Sustainable Buildings SEPP, a NABERS Embodied Emissions Material form is required to be prepared by the quantity surveyor for the project and will be submitted as a stand-alone document, at a later stage after the REF submission.

The embodied emissions material form would disclose the quantities and types of materials proposed for the project to inform on the amount of embodied emissions attributable to the development. This is to contribute towards developing a benchmarking tool for the industry.

To support a reduction in the embodied emissions for the project, the following recommendations are to be considered:

- Material reduction through efficient design layouts, structure and façade.
- Prioritising prefabricated and modular components
- Specification of low carbon materials
- Sourcing of local products and implementing 'Responsible Procurement' policies as guided by Green Star Buildings v1
- Substitution of raw materials with recycled or reclaimed alternatives
- Design for disassembly & repurposing of demolition waste

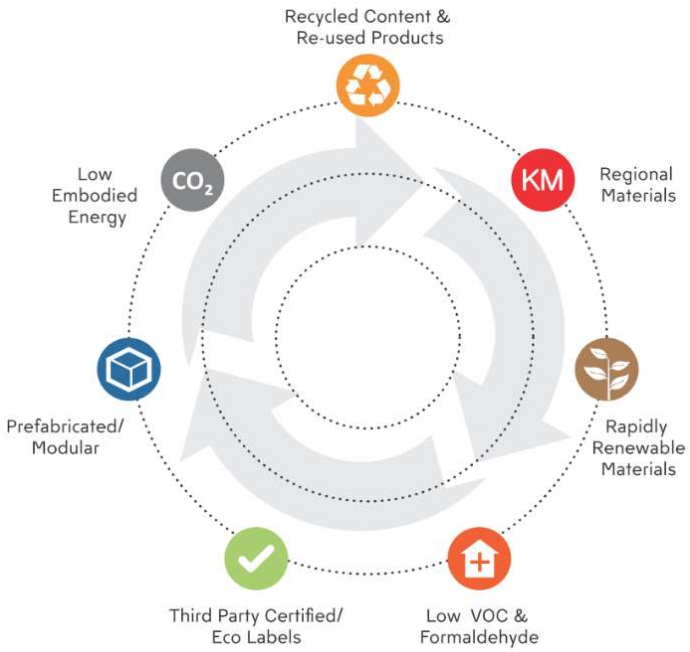

Figure 9 Material selection strategies

4.10 Green Star Certification

GBCA's Green Star Buildings v1.0 evaluation tool has been used to inform the project design, with an aspiration to achieve a 5-star rating.

To achieve the targeted rating the project must achieve a total of 35 points plus at least 5 buffer points within the rating tool. The table below provides a summary of the Green Star points currently targeted per category. Please note, that Points Targeted possibly will be revised during the Detailed Design (DD) Stage.

Table 4: Summary of GS points

Category	Points Available	Minimum Requirements	Points Targeted	Stretch points	Required Points for 5 Star
Total	**116**	**15**	**40**	**17**	**35 (+ 5 buffer)**
Responsible	**17**	**3**	**8**	**1**	
Healthy	**14**	**4**	**11**	**1**	
Resilient	**8**	**1**	**4**	**1**	
Positive	**30**	**4**	**6**	**0**	
Places	**8**	**1**	**4**	**4**	
People	**9**	**1**	**5**	**3**	
Nature	**14**	**1**	**2**	**4**	
Leadership	**16**	**0**	**0**	**3**	

5.0 Mitigation measures

The table below shows the key mitigation measures for the sustainability requirements of the activity and at what stage the measure is to be resolved:

Table 5 Mitigation Measures for the activity

PRE-CONSTRUCTION		
Mitigation Number/ Name	**Mitigation Measure**	**Reason for Mitigation Measure**
Formal Green Star Certification / Green Star Buildings v1 / 5 Star	A holistic approach to sustainability must be implemented, by addressing the requirements from Green Star Buildings framework, which is representative of an Industry Best-practice outcome.	To ensure the environmental performance and Indoor Environmental Quality of the building performs beyond the minimum regulatory compliance standard and achieves a high-performance outcome.
Passive design	The final building design must achieve high levels of daylight and natural ventilation.	To reduce operational energy consumption, and also contribute towards reduction of Greenhouse Gas Emissions.
Reduction in energy demand	The following strategies must be incorporated: Air Conditioning systems must utilise push-buttons with a run-on timer for activation and de-activation of the air-conditioning in all spaces. LED lighting fixtures must be provided with Passive Infrared Occupancy sensors. Sub-meters must be provided for monitoring and preparing targeted approach for future optimization.	To reduce the energy demand and move towards the Department of Education's Net-Zero Energy target.
CONSTRUCTION		
Mitigation Number/ Name	**Mitigation Measure**	**Reason for Mitigation Measure**
Minimise potable water consumption	Certified WELS rated water fixtures to reduce wastage of water. Rainwater tanks (2x20kL each) must be installed for enabling rainwater harvesting, to reduce the load on potable water demand.	To reduce the stress on natural resources and water demand.

Embodied Reporting	Must implement environmentally friendly materials and responsible procurement to reduce the stress on virgin materials. Must divert 90% of the construction waste from landfill	To align with Sustainable Buildings SEPP and Green Star guidelines to drive a sustainable design and operational building.
OPERATION		
Mitigation Number/ Name	**Mitigation Measure**	**Reason for Mitigation Measure**
On-site renewable energy generation	A 99kW Photovoltaic system must be incorporated in the design.	To enable the project to contribute towards the Department of Education's Net-Zero Energy target.
Formal Green Star Certification / Green Star Buildings v1 / 5 Star	For operations, meter, measure and monitor the building performance to address the requirements from Green Star Buildings framework, which is representative of an Industry Best-practice outcome.	Energy consumption data collection and analysis to reflect on the design initiatives and energy savings achieved because of them. Conduct post-occupancy audits as part of facilities management to monitor building performance. Help to aid with target-based approach for future improvement strategies.
Embodied Reporting	Potential waste streams that would occur during the operational stage must be identified, and a 'reduce-reuse-recycle' strategy must be implemented.	To align with Sustainable Buildings SEPP and Green Star guidelines to drive sustainable operation of the building.

6.0 Evaluation of Environmental Impacts

To support the sustainability targets for the project, a Green Star Pre-Assessment has been carried out. At this stage, a rating of 5-Stars is targeted through the Green Star Buildings tool. The associated requirements are addressed in the current design and expected to be implemented during the construction phase. The outcome of this process will ensure that the environmental impacts associated with the proposed activity are mitigated.

In conclusion, based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed activity, it is determined that:

- The extent and nature of potential impacts are low and will not have significant impact on the locality, community and/or the environment.
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal impact on the locality, community and/or the environment.

7.0 Appendices

7.1 Appendix A: Net-Zero Energy Statement

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STEENSEN VARMING

Mechanical and Electrical Services Schematic Design - Net Zero Energy Statement

New High School for Leppington and Denham Court, NSW

Sydney, 16th December, 2024
Ref. No. 237220 CER S00 [00]

Chris Arkins
Director

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This Net Zero Energy Statement accompanies an Environmental Impact Statement (EIS) pursuant to Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act), in support of a Review of Environmental Factors (REF) Application for the proposed new high school at 128-134 Rickard Road, Leppington, NSW, 2179.

This Net Zero Energy Statement has been prepared to address the relevant requirements under the NSW Sustainable Buildings State Environmental Planning Policies (SB SEPP) Section 3.4, and as defined under Section 35C of the Environmental Planning and Assessment Regulation 2021 (EP&A).

This statement addresses the Environmental Assessment Requirements issued for the project, notably:

Ref. No.	SB SEPP Requirement	Section of Statement where response is provided
3.4	If Chapter 3 of SEPP (Sustainable Buildings) 2022 applies: - provide a net zero statement (as defined in section 35C of the EP&A Regulation) that includes: - evidence of how the development will either be fossil fuel-free after the occupation of the development commences or transition to be fossil fuel-free by 1 January 2035. - details of any renewable energy generation and storage infrastructure implemented and any passive and technical design features that minimise energy consumption. - estimations of annual energy consumption for the building (if available)	- This Net Zero Energy Statement addresses this item - This Net Zero Energy Statement addresses this item - This Net Zero Energy Statement does not address this item. - A preliminary energy modelling was conducted, and Energy Modelling Report was prepared by Steensen Varming at Schematic Design stage. As the design progresses into Detailed Design phase, another iteration of energy modelling will need to be conducted to analyse system performance and energy efficiency achieved.

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We note that Steensen Varming are only engaged up to the completion of the Schematic design phase.

The following initiatives have included in the design; however, it remains the responsibility of the appointed design and construct contractor to ensure these initiatives are designed in detail and implemented during the construction phase.

While the mechanical and electrical services have been designed to be fossil fuel-free by way of being all-electric systems, it remains the responsibility of Schools Infrastructure to procure 100% renewable electricity in enabling a net zero emissions operation. This is in accordance to the NSW Department of Education's commitment to sustainability and net zero emissions in operation as per goal-5 of their "Our 9 goals to 2030" initiative.

On-site Fossil Fuel Usage

The mechanical and electrical services strategy for the proposed development has been designed to be all-electric from day 1 of its operation.

The electrical services design incorporates electric power outlets to serve the following equipment (provided by others) - domestic hot water heaters, kitchen equipment and science Bunsen burners.

Although the current directive is to move all schools to electric, there is ongoing review on the Bunsen burners and VET stovetops. The current direction under consideration with SINSW is to provide electric Bunsen burners with a backup of bottled gas in case the school is unable to procure electric burners. It is noted that the SINSW will have to purchase offsets equivalent to the usage of gas on site to be able to attain 100% net zero emissions in operation.

This allows the project to be capable of operating at net zero emissions once 100% renewable electricity is procured by Schools Infrastructure NSW, in line with the 1 January 2035 target, set out in Section 35C(2)(b) of the EP&A Regulation 2021.

Passive Design Features

The following passive design features have been integrated in order to minimise energy consumption.

- The buildings' orientation is considerate of the site's constraints, solar pathway, and overall functionality requirements.
- The shading strategy has been developed in respect to the buildings' orientation and to minimise energy consumption and glare risk, while maximising daylight ingress and as a result reducing the use of artificial lighting, use of cooling, and these systems' energy consumption.
- The façade has been designed in considerations of;
    - Abundant daylight to all spaces to improve visual comfort and in minimising the use of artificial lighting. Detailed daylight simulations have been undertaken as part of the Environmental Sustainability Design (ESD) scope of works, to document daylight compliance with regulations and Green Star certification.
    - Efficient natural ventilation for all teaching spaces to improve thermal comfort, indoor air quality, and to reduce the use of mechanical ventilation and cooling systems, thereby reducing energy consumption.
    - The natural ventilation to the teaching spaces is provided through the use of louvres, windows, and doors, with an effective opening area of minimum 6.25% of the floor area.
    - Compliance with the Section J requirements of the National Construction Code (NCC) 2022.

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Technical Design Features

The following technical design features have been integrated into the design in order to minimise energy consumption.

- The air-conditioning system is a variable refrigerant type of system which is considered the most suitable solution for a school building, and which delivers good efficiencies, particularly at lower thermal loads.
- The mechanical ventilation system applies CO_2 monitoring in all spaces to activate the fans upon exceedance of the CO_2 threshold. This approach works in conjunction with the natural ventilation strategy in providing a high level of indoor air quality and a smooth transition between natural and mechanical ventilation, leading to reduced energy consumption.
- All the air-conditioning systems utilise push-buttons with a run-on timer for activation and de-activation of the air-conditioning in all spaces. This ensures that the air-conditioning is only activated when desired by the users and the run-on timer ensures the system deactivates after a set period (typically 2 hours).
- The lighting fixtures are highly efficient LED (Light Emitting Diode) technology.
- The lighting system applies passive infrared (PIR) sensors for all spaces to ensure the artificial lighting system is only activated once the space is occupied, and to ensure that the system is deactivated shortly after de-occupation of the space.
- In addition to the above, the lighting system applies daylight sensors to adjust the artificial lighting to the required levels.
- An Energy Monitoring System (EMS) will be applied to monitor the energy usage across the project. The energy and water usage data are available to staff and can be used to inform the students thereby assisting in their understanding of their consumption patterns, leading to improved, more resource-conscious user behaviour.

Renewable Energy Generation and Storage

The following initiatives have been implemented for the project's energy generation and storage capabilities.

- A 99-kW rated rooftop photovoltaic (PV) system has been designed to provide a portion of the project's electricity usage. The PV system is located on the roof of Building B.
- Furthermore, a spatial allowance has been made to ensure a total of 20% of the roof space (including the above) is available for future PV installation, on each building.
- The main switchboard has been designed to allow for future battery installation.

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Estimated Energy Consumption& GHG Emissions

Estimated energy consumption is not yet available for the project. Detailed energy modelling shall be undertaken by responsible parties as the design progresses, to help inform the design and its targeted Green Star requirements, as well as verify the design for regulatory compliance. This will include an estimation of PV-solar electrical contribution to the site and an estimation of grid-purchased electricity and associated direct and indirect emissions.

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Evidence

The following evidence has been provided to demonstrate electricity as the fuel source for mechanical services.

Document Reference Number	Description
237220 LeppHS -ME-SD-SPC-Part B - Schematic Design Report & Mechanical System Descriptions [A]	Excerpt from Mechanical Design Report outlining the HVAC system description, as being all-electric. Domestic hot water usage. No gas usage.

Excerpt from the Mechanical System Descriptions report.
Reference: '237220 LeppHS -ME-SD-SPC-Part B - Schematic Design Report & Mechanical System Descriptions [A]'
Date: 15/11/2024
Revision: A
Author: Alan Sharkey, Senior Associate, Steensen Varming

Systems	System selection Description
Air conditioning systems	**Admin office areas**: Ducted type VRF or Cassette type VRF reverse cycle heat recovery air conditioners providing simultaneous heating and cooling. Subject to compliance with acoustics. **General Learning spaces and library:** Ducted type VRF reverse cycle heat recovery air conditioners providing simultaneous heating and cooling. **High heat Load rooms/ Communications rooms:** Dedicated DX air conditioning split systems
Heating only systems	**Gym, Hall, OSCH and Canteen:** Electric radiant panel heaters. **Disabled Toilet**: Electric heaters.
Mechanical Ventilation systems	**Admin, learning spaces** Outside air will be generally ducted locally from the façade to internal fan coil units. A dedicated outside air supply grilles will be provided adjacent to indoor cassette type units when the flow rate is above 20 l/s due to the limitations of the direct duct connected size. **The gymnasium** will be provided a mechanical ventilation to comply with acoustic boundary conditions during amplified music operation (to be confirmed with site acoustic services consultant). This can be omitted if found not to be required. **Main switch rooms, Toilets, Changing areas, Stores, First aid, Communications rooms, Kitchen hoods, Fume cupboards, and the like:** Mechanical ventilation systems will be provided in accordance with AS1668.2.
Natural ventilation	Natural ventilation must be provided in addition to mechanical ventilation to all learnings spaces, admin areas and the hall. The windows/louvres will be manually operated except for any high-level openings in the hall or other applciations. Opening must be based on the effective opening areas and not the structural openings, as per DG55 requirements.
Smoke management systems	Smoke extract systems will be provided to stage where applicable.
BMS/Controls	The BMS will consist, of a virtual network on the SINSW LAN, LED traffic light digital controllers, 2 X weather and VOC stations, CO2 monitoring sensors, VOC sensors in selected areas, faults and alarms from all major plant and equipment. A laptop shall be required to enable early commissioning of the system should the network not be unavailable at the time. Any MCC's and VSD's mounted externally must be suitably protected from rain ingress. (The Energy metering and monitoring system forms part of the electrical package).