



Low Impact Development  
Consulting

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PLAN**



## Environmentally Sustainable Design

Sustainable Design Assessment for:

423 Blackshaws Road, Altona North

Stage 1 - New Marianist Building

Prepared for: Emmanuel College

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29/06/2023

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Version	Date	Description	Drawings	Prepared	Checked
1.0	29/06/2023	TP Issue	P5 – 22/06/2023	JN	CH

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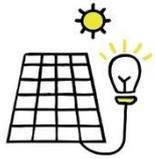
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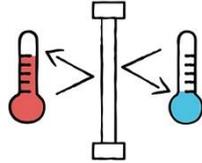
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## Development highlights

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Renewable energy PV Panels



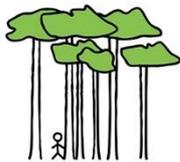
Improved energy efficiency - use of double glazed windows



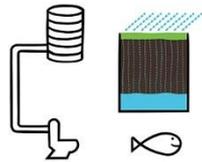
Energy and water efficient heating and cooling



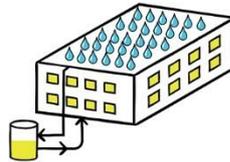
Energy efficient hot water heat pump systems



Avoidance of use of rainforest timbers



Onsite water use and infiltration - Best Practice Stormwater treatment



Potable (drinking) water savings – 25kL Rainwater tank connected to toilets and irrigation



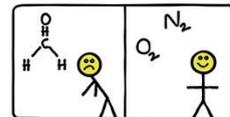
Potable (drinking) water efficient fixtures



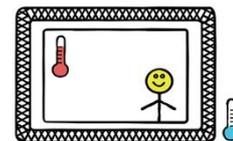
Energy and water efficient appliances



Environmentally friendly materials choices



Improved indoor air quality due to reduced use of off-gassing materials



Well insulated building fabric and windows

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 LID acknowledges and pays respect to the Australian Aboriginal and Torres Strait Islander people, to their ancestors and elders, past, present and emerging, as the traditional custodians of the lands upon which we work and live. We recognise Aboriginal and Torres Strait Islander people’s deep cultural and spiritual relationships to the water, land and sea, and their rich contribution to society.

# Executive summary

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## Project summary

This ESD report is for the proposed Stage 1 – New Marianist building at 423 Blackshaws Road, Altona North and is based on the drawing set provided by Watson Young Architects on the 23<sup>rd</sup> of June, 2023.

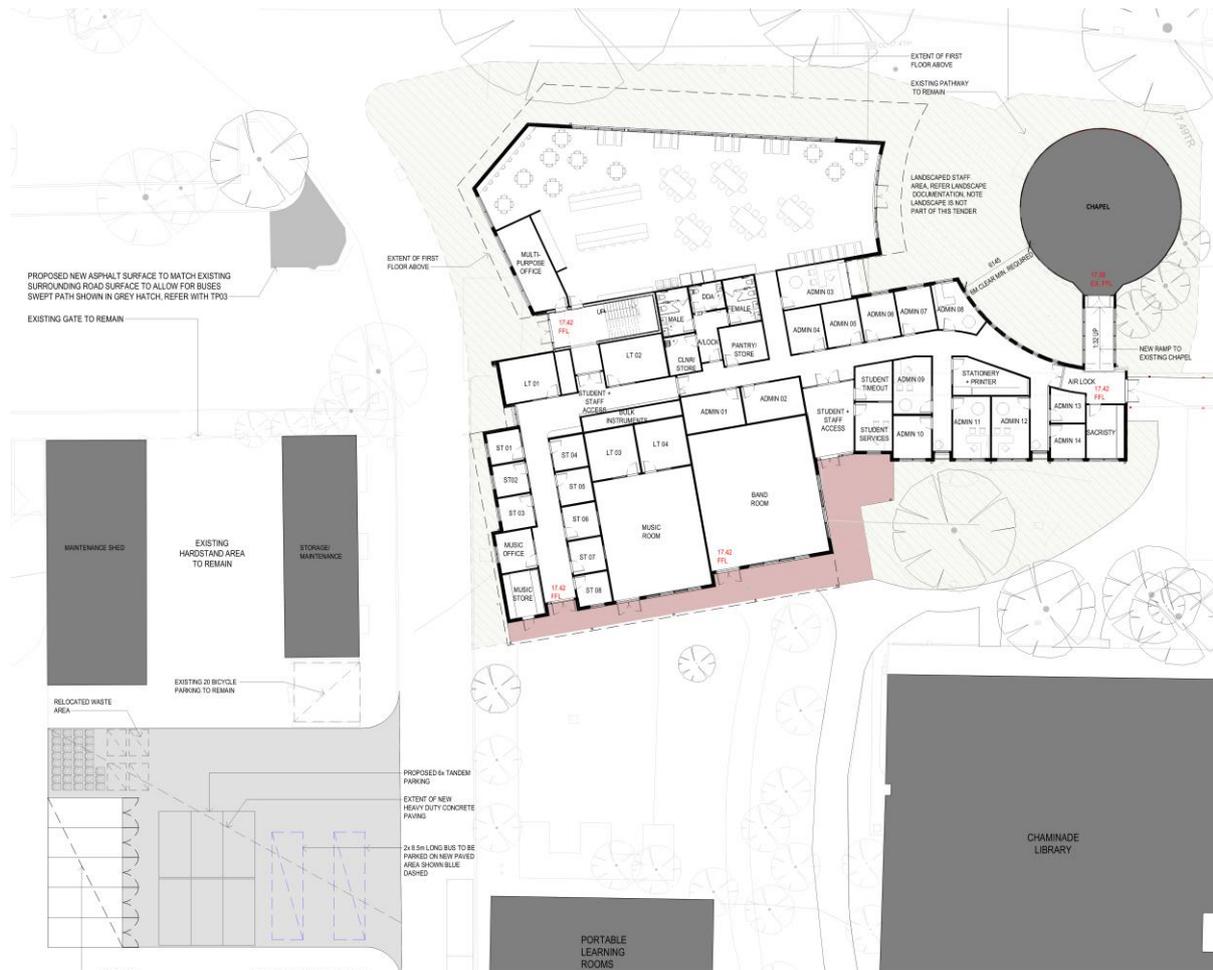


Figure 1: Proposed Site Layout

This report addresses the environmentally sustainable development requirements under the Hobsons Bay City Council Planning Scheme (relevant clauses listed below), specifically per clause 15 Built environment and heritage:

*Planning should promote development that is environmentally sustainable and minimise detrimental impacts on the built and natural environment.*

*Planning should facilitate development that:*

- Is adapted and resilient to climate related hazards
- Supports the transition to net zero greenhouse gas emissions

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- *Minimises waste generation and supports resource recovery*
- *Conserves potable water*
- *Supports the use of, and access to, low emission forms of transport*
- *Protects and enhances natural values*
- *Minimises off-site detrimental impacts on people and the environment.*

This sustainability report details measures that meet and often exceed mandatory Environmentally Sustainable Design (ESD) requirements for this type of development.

The body of the report contains a full list of ESD initiatives to be included in the development. A summary of the major ESD initiatives committed to are included below:

- Net Zero carbon / carbon neutral capability
  - The development will be future proofed and built to enable net zero carbon emissions capability in operation. The project has electricity rather than gas as the fuel source for all energy uses: space heating, hot water heating and cooking.
- Energy
  - 10% increase on required NCC2019 insulation levels for floor and roof elements
  - Energy efficient heating and cooling systems beyond minimum standards (within one star of best available)
  - Energy efficient electric heat pump storage hot water units
  - Renewable energy Photovoltaic (PV) Panels to supply power to the proposed building (100kW capacity existing PV system)
- Water and Stormwater
  - On-site water use and infiltration measures to meet CSIRO Best Practice Stormwater Management (Water Sensitive Urban Design) treatment quality requirements
  - Rainwater tanks of 25,000L retention capacity connected to all toilets to reduce potable water consumption and assist with stormwater quality management requirements.
  - Potable (drinking) water saving measures including low flow toilets, showers and taps
- Indoor Environment Quality (IEQ)
  - Daylight levels assessed to Best Practice standards
  - Minimised indoor pollutants from the use of low off-gassing materials such as low VOC paints, carpets and adhesives, and low formaldehyde products
- Sustainable materials
  - Avoidance of the use of endangered rainforest timbers in this development.
  - Use of lower embodied carbon/energy alternatives for concrete.
  - More environmentally friendly material alternatives for timber, insulation and other building components
- Urban ecology
  - Light -medium coloured roofing to help mitigate the effects of the Urban Heat Island effect

Generally, other non-mandatory guidelines and good design principles have also been incorporated where deemed to be relevant in respect to the scope and nature of this development. This encourages further levels of sustainability above and beyond the mandatory requirements.

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The proposed development advances basic sustainability principles by increasing the potential use of the site, in line with the surrounding environment. In the context of rising costs and a need to limit use of material, energy and land resources, the proposed development enables a more affordable and energy efficient model of development. The expected design life of this development would be in excess of 40 years.

Mandatory guidelines and tools addressed in this report as relevant to sustainability include:

- National Construction Code (NCC) / Building Code of Australia (BCA) Volume One Section J;
- Victorian Planning Policy (VPP) and Local Planning Policy (LPP) clauses including
  - 11 Settlement
  - 12 Environmental and Landscape Values
  - 15 Built Environment and Heritage
  - 15.01-2S Building Design
  - 15.01-2L-04 Environmentally Sustainable Development
  - 19.03-3S Integrated Water Management
  - 53.18 Stormwater Management in Urban Development
- Built Environment Sustainability Scorecard (BESS); and
- The STORM assessment.

The proposed development will address the relevant ESD requirements of the above planning scheme provisions.

## Results summary

Further to the above initiatives and in conjunction with others listed in this report, the development was assessed using the 'Built Environment Sustainability Scorecard' (BESS), obtaining a total score of **53% and passing all mandatory categories**. A score of 50% or greater (including compliance under water, energy, stormwater and IEQ categories) demonstrates a Best Practice environmentally sustainable development.

## Commitment & documentation on plans

Where possible the "ESD initiatives" in each section **should be included on the plans**.

Examples include (where relevant):

- Water tank retention size and location
- The openable component of a window
- Hot water system location and type
- Solar panels and total capacity
- External materials
- Bicycle parking
- Location for internal and external waste bins
- Other relevant readily shown items.

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Where items are not usually shown on town planning plans, these can be included on a notes box on the drawings to ensure they flow through to construction drawings, or included in the specification.

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**As a minimum this ESD report must be referenced** in a single note, such as:

“Plans are to be read in conjunction with the endorsed ESD report (which forms part of the town planning permit submission), and all initiatives contained within must be implemented to the satisfaction of the responsible authority”

Abbreviations used in this report include:

- BCA – Building Code of Australia
- SDAPP – Council Sustainable Design Assessment in the Planning Process
- BESS – Built Environment Sustainability Scorecard

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## 1 Net zero carbon emissions - Carbon neutral energy capability

### Goals

- To support the transition to net zero greenhouse gas emissions (planning scheme cl15)

Minimising greenhouse gas emissions means reducing carbon dioxide (carbon) and other greenhouse gas emissions. Actions to minimise emissions can occur during the operation of a building, and also during the construction of that building/development.

### Minimised greenhouse gas emissions from operational energy consumed – Energy source selection

Net zero carbon/carbon neutrality in operational energy consumption is not difficult to achieve in new developments.

Developments can be built to be net zero carbon/carbon neutral emissions capable in terms of operational energy consumption where the energy source can readily be supplied from a renewable, fossil free fuel source. Electricity is an energy source for buildings that can readily be sourced from renewable energy whether from onsite solar photovoltaic (PV) panels, or offsite solar PV systems or wind via readily accessible GreenPower or carbon neutral energy purchasing. Installing electricity infrastructure ensures building occupants can readily choose when they wish to purchase 100% renewable zero carbon energy.

In addition, standard business-as-usual purchasing of electricity from the electricity grid is increasingly relying on more renewables for electricity generation. In the last year 39.8% of Victoria's grid electricity came from renewable electricity<sup>1</sup>. By 2030 this will be beyond 50%<sup>2</sup>. All electric services and appliances will automatically become greener due to the greening of the electricity network.

Natural gas on the other hand is methane and produces carbon dioxide when burned in heating, hot water or cooking. While trials are occurring for introducing clean burning hydrogen into our gas network, no clear path is confirmed on how and when all of the network could deliver beyond 10% hydrogen.

Installing gas infrastructure into buildings ties the development to burning a greenhouse gas fuel until the infrastructure is replaced. It is better for the environmentally conscious tenants and future users not to install gas infrastructure at the time of building development.

Carbon neutral energy supply ready	The development will be built to facilitate going net zero carbon emissions in operation. To achieve this, no gas will be included within the development. <ul style="list-style-type: none"> <li>Space heating and cooling will be heat pump technology, not gas.</li> </ul>	Additional sustainability practice
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<sup>1</sup> OpenNEM <https://opennem.org.au/energy/vic1/?range=1y&interval=1h> 15 May 2023.

<sup>2</sup> Victorian Government legislated Renewable Energy (Jobs and Investment Planning) Act 2017. <https://www.energy.vic.gov.au/renewable-energy/victorias-renewable-energy-targets>

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	<ul style="list-style-type: none"> <li>• HWS will be electric heat pump with storage tanks or solar boosted electric with storage tanks.</li> <li>• Cooking (if any) will be electric induction.</li> </ul>	
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## Minimised greenhouse gas emissions during construction

Net zero carbon emissions / carbon neutrality in the construction of a building takes a little more thought or expense than net zero carbon emissions / carbon neutrality in the operational energy of a building. There is a very high level of embodied energy (carbon) built into most materials used.

Simple approaches can minimise embodied carbon in new buildings:

1. Source materials locally where possible to reduce carbon emissions generated in transport
2. Maximise timber use – timber to be FSC or PEFC/AFS accredited
3. Select materials variants that utilise lower carbon inputs. There are variants available within most material types. A key low carbon variant is where waste or recycled products from other industrial processes are used such as with greener concrete.

See Materials section of this report for more detail on lower carbon construction options.

## 2 Energy Efficiency

### Goals

- To improve the efficient use of energy and reduce total operating greenhouse gas emissions
- To reduce energy peak demand through particular design measures (e.g. appropriate building orientation, shading to glazed surfaces, optimise glazing to exposed surfaces, space allocation for solar panels and external heating and cooling)
- Improve efficiency in energy use through greater use of renewable energy technologies and other energy efficiency upgrades

### Initiatives

Building sealing	Building sealing will be in accordance with NCC 2019 Volume 1 Part J3 <i>Building Sealing</i> .	NCC2019 Volume 1 Part J3
Improved building fabric, heating and cooling, and hot water supply	<p>The proposed development will achieve improvements on the Deemed to Satisfy (DtS) requirements of NCC 2019 Section J, including:</p> <ul style="list-style-type: none"> <li>• 10% improvement on NCC2019 insulation levels (total R-value upwards and downwards) for all exposed floors and ceilings (forming part of the envelope);</li> <li>• Wall insulation and glazing systems within NCC2019 allowances for wall-glazing fabric;</li> </ul>	NCC2019 Part J, BESS Energy

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	<ul style="list-style-type: none"> <li>• Heating and cooling systems within 85% of the best CoP/EER available (or within one star) for the required capacity; and</li> <li>• Water heating systems within one star of the best available, or 85% of the performance of the best available for the required capacity.</li> </ul> <p>Alternatively, if JV3 modelling is undertaken to verify building fabric performance, the proposed building will demonstrate equivalent or better energy efficiency when compared to an 'intermediate building' representing 10% improvement on NCC2019 Section J Deemed to Satisfy floor/roof insulation levels (BESS Best Practice).</p>	
Hot water supply	The hot water supply will be from electric heat pump storage units.	SDAPP - Energy efficiency / BESS tool
Space heating and cooling	Heating and cooling will be delivered via efficient electric inverter air-conditioner/heat pump units selected to be within 1 star of the best available system on the market of relevant size/capacity.	SDAPP - Energy efficiency / BESS Energy
Windows	Windows will be double glazing throughout the development.	NCC2019 Part J1, NatHERS, BESS Energy
External shading	Glazing to primary habitable areas is shaded via a combination of vertical fins, box shroud shading, and horizontal eaves/roof overhangs.	Additional sustainability practice
Natural ventilation	Operable windows are provided to all primary habitable spaces, allowing natural ventilation to occur. This will reduce reliance on mechanical cooling systems during warmer weather, and facilitate better indoor air quality.	Additional sustainability practice
Downlights	Downlights will not require gaps in ceiling insulation. Downlights will be LED IC rated (Insulation Contact) type, running cooler and allowing for insulation to be directly installed over the downlight fitting itself (as per manufacturer's instructions).	Additional sustainability practice
Lighting	Lighting density throughout the development will be within the Building Code of Australia (BCA) 2019 maximums.	NCC2019 Part J6 – Mandatory
Lighting switching in perimeter zones	Lighting in a natural lighting zone within 3m of a window will be separately controlled from artificial lighting in a separate zone not adjacent to windows.	

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External lighting	External lighting to paths and carpark will have a daylight sensor and either timer or motion sensors installed.	NCC2019 Part J6
Solar PV	The existing Jubilee and McCoy halls currently have 100kW of Solar photovoltaic (PV) panels installed, which supply power to all buildings on site.	BESS Energy

## Additional Details

Improved insulation

The proposed development will deliver a 10% improvement on NCC2019 minimum requirements for floor and roof insulation within conditioned spaces. This equates to:

Building element	Part J – DTS required insulation levels	10% improvement on DTS insulation levels
Roof	3.2	3.52
Floor	2.0	2.2

Building sealing

Building sealing prevents un-intended air movement through the thermal envelope (infiltration and exfiltration). Air gaps in the building fabric result in uncontrolled heating and cooling demands in addition to high risk of structural damage due to condensation internally in well insulated envelope walls.

It is important to ensure air-tight connections between internal lining on exterior walls, ceiling and floor plate, around electrical and hydraulic penetrations going through the air-tight barrier by using a system of grommets, membranes and tapes. Alternatively, a combination of plasterboard and caulking with high level attention to detail can make a large difference to the air leakage rate of the building

To address air leakage through doors and windows, the following measures are recommended:

- Compressible foam or similar seals provided around doorways from conditioned to non-conditioned spaces;
- Draft protection devices along the bottom edge of external swing doors;
- Multi-fit cable and pipe seals/adhesive membrane grommets for sealing around pipes or conduits passing through the building envelope; and
- Self-closing dampers fitted to exhaust fans.

Space heating and Cooling

A transition away from fossil fuel must happen as soon as possible. Installing gas fired space heaters, gas burners, gas fuelled domestic hot water services and commercial gas fuelled kitchen appliances into a new development is therefore highly discouraged.

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alternatives are readily available to suit the same needs and should be adopted.

Electrical equipment and appliances are able to utilise electricity generated on-site with emission free photovoltaic (PV) panels. Achieving net zero emissions or preparing for net zero emissions in the future is not feasible with a gas installation.

Future-proofing the development is therefore important by acquiring equipment that utilise the most flexible source of energy – electricity.

## Windows

When selecting a window system, attention must be paid to all components of the system, not just the average thermal values of the glass.

Framing material with low thermal conductivity must be selected to ensure the internal surface of the frame remains at a temperature higher than dew point of the indoor air in winter.

The spacer material between the glass panes must also be detailed in a material with low thermal conductivity to ensure the temperature along the edge of the glazing does not drop below dew point.

If such details are not in place, condensation will form on the internal side of the frames in winter. This will provide good growing conditions for mould and is likely to damage the construction.

## 3 Indoor Environment Quality

### Background

Access to daylight and sunshine is advantageous to the wellbeing of humans.

Many paints, adhesives, sealants and flooring types contain Volatile Organic Compounds (VOCs) which are released into the indoor air. Joinery has, over the last 30 years, contained high levels of formaldehyde. VOCs and formaldehyde are recognised as potentially harmful to humans as well as contributors to atmospheric pollution.

### Goals

- To achieve a healthy indoor environment quality for the wellbeing of building occupants, including the provision of fresh air intake, cross ventilation and natural daylight.
- To achieve thermal comfort levels with minimised need for mechanical heating, ventilation and cooling.
- To reduce indoor air pollutants by encouraging use of materials with low toxic chemicals levels.
- To minimise noise levels and noise transfer within and between buildings and associated external areas.

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## Initiatives

Natural ventilation	<p>All primary habitable spaces will be naturally ventilated, with operable windows provided across multiple orientations to provide cross flow ventilation. This provides significant energy savings in mechanical ventilation and cooling requirements in warmer weather.</p> <p>Where supplementary mechanical ventilation is provided, this will include a 50% increase in provision of fresh air when compared to the requirements of AS1668.2:2012, and will include CO<sub>2</sub> monitoring facilities to monitor and maintain a concentration not greater than 800ppm. Higher ventilation levels are also shown to reduce the incidence of air-borne disease transmission.</p>	BESS IEQ
Daylight	The proposed development exceeds BESS Best Practice daylight criteria, with >33% of primary habitable spaces achieving a Daylight Factor (DF) of 2.0% as determined through Green Star Daylight Hand Calculation assessment methodology. Refer to Appendix 3 for further details.	NCC-BCA Section F
	Light coloured walls internally will help to maximise daylight levels.	Additional sustainability practice
Low VOC products	<p>For occupant health benefits, paints and adhesives will be low volatile organic compounds (VOC) types or water based.</p> <p>Carpets will be low VOC and comply with the limits as outlined in additional details.</p> <p>Contractors are required to provide evidence of these commitments.</p>	Green Star / BESS tool
Low formaldehyde products	For occupant health benefits, engineered wood products (including MDF, particleboard and plywood) will be Class E1 formaldehyde or better.	Green Star

## Additional details

### Low VOC

Volatile Organic Compounds is the term used to describe several hundred petrochemical solvent type compounds found in paints, adhesives, sealants, carpets, reconstituted wood products, and new furniture. Newer buildings generally have higher concentrations of these VOC's that contribute to headache, lethargy, etc. to occupants.

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**Low VOC paints, adhesives and sealants** – the VOC content of paints, adhesives and sealants will not exceed the levels listed in the table below (VOC limits are less water and exempt compounds) (from the Green Star Design and As Built v1.1 guidelines). Low VOC adhesives and sealants are readily available and can be purchased in bulk to minimise the price premium. Mapei adhesives offer a full low VOC adhesives range.

Product category	Maximum VOC content (g/litre)
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One & two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membrane and sealant, fire retardant sealant and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesive and sealants	100

Low VOC paints are readily available at all suppliers:

- Watty! ID Eco System Low VOC
- Haymes - [www.haymepaint.com.au](http://www.haymepaint.com.au)
- Porters Paints - [www.porterspains.com](http://www.porterspains.com)
- Bio Products Aust - [www.bioproducts.com.au](http://www.bioproducts.com.au)
- Ecolor - [www.ecolour.com.au](http://www.ecolour.com.au)
- Livos - [www.livos.com.au](http://www.livos.com.au)
- Murobond - [www.murobond.com.au](http://www.murobond.com.au)
- Oikos non toxic Paints - <http://www.nontoxicpaint.com.au>
- The Natural Paint Company

**Low VOC carpets** – the VOC content of carpets will not exceed the levels listed in the table below in accordance with the relevant test protocols (from Green Star Design and As Built v1.1 guidelines).

Test protocol	Limit
ASTM D5116 – Total VOC limit	0.5mg/m <sup>2</sup> per hour
ASTM D5116 – 4-PC (4-Phenylcyclohexene)	0.05mg/m <sup>2</sup> per hour
ISO 16000/EN13419 – TVOC at three days	0.5mg/m <sup>2</sup> per hour
ISO 10580 / ISO/TC 219 (document N238) – TVOC at 24 hours	0.5mg/m <sup>2</sup> per hour

Low formaldehyde products

Formaldehyde is used in the production of resins that are used for engineered wood products and is a colourless gas with a strong odour. Exposure to formaldehyde can cause irritation of the eyes

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nose and throat with various authorities recommend E1 as a maximum emissions class.

Reduced formaldehyde emissions in engineered wood products are classed as below:

Class	Limits (mg/L)
Super E0	Less than or equal to 0.3
E0	Less than or equal to 0.5
E1	Less than or equal to 1.0
E2	Less than or equal to 2.0
E3	Greater than 2.0

Companies offering low formaldehyde engineered wood products include:

- Polytec offers E1 and E0.
- Nikpol offers E1, E0 and Super E0 for select products.
- Austral Plywood E1, E0 and Super E0 for select products.
- Laminex Australia offer E1, E0, Super E0 and no added formaldehyde for select products.

## 4 Water Conservation

### Background

As populations increase and global warming contributes to fast climate change, the access to clean potable water will become more of an issue to Australians and the world. Inefficient use of water can lead to the destruction of habitat for dams, over-use of artesian water supplies creating a rising water table or intensive energy use for desalination plants.

### Goals

- To ensure the efficient use of water.
- To reduce total operating potable water use.
- To encourage the collection and re-use of stormwater
- To encourage the appropriate use of alternative water sources.
- To minimise associated water costs.

### Initiatives

Water efficient fixtures, fittings and appliances	Water saving, water efficient fixtures, fittings and appliances have been selected in line with the following WELS ratings: <ul style="list-style-type: none"> <li>• 4 star shower (6-7.5L/min)</li> <li>• 4 star toilets</li> <li>• 5 star bathroom taps</li> <li>• 5 star kitchen taps</li> </ul>	BESS, Green Star
Rainwater collection and use	Rainwater collection will reduce potable (drinking water) consumption. Rainwater collection and use will involve the installation of a rainwater tank	STORM, BESS tool, Green Star

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	of minimum 25,000L retention capacity, collecting water from all roof areas and supplying it to all toilets and landscape irrigation in the development.	
Accessibility of pumps	Water pumps and manual over-ride switches will be readily accessible for access in the event of malfunction.	Additional sustainability practice
Water efficient landscaping	Proposed planting will be water efficient and will not require watering after an initial period when plants are getting established. Therefore, no irrigation system is proposed.  Where irrigation is installed, this will be connected to rainwater harvesting systems or an alternative water source, with no potable water connection.	BESS Water 3.1
Building systems water use reduction	Where installed, fire safety system test water will be reticulated to retention tanks in accordance with VBA PN-61-2018, ensuring a minimum 80% reduction in potable water consumption.  No water-based heat rejection systems are proposed for this development.	BESS Water 4.1

## Additional details

### Water efficient fixtures & fittings

All fittings to be specified are based on recommendations from [www.savewater.com.au](http://www.savewater.com.au) or from the product search on the following site [www.waterrating.gov.au](http://www.waterrating.gov.au) and will be amongst the most efficient on the market, and a significant improvement on fittings historically used in most buildings. Traditionally shower heads would use more than 16 litres of water per minute. One star shower heads use between 12 – 16 litres per minute, 2 star shower heads use between 9-12 litres per minute. To reduce this to 6-7.5 litres per minute with a 4 star shower head is a significant improvement.

Further water efficient appliances will be determined from sources such as the following web site <http://www.waterrating.gov.au>.

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## 5 Stormwater Management

### Background

Pollutants that build up on impervious surfaces get washed into the stormwater system and end up in local waterways. Water Sensitive Urban Design is now a major goal of urban development to prevent this occurring.

The quality of water leaving a site (and peak and total stormwater run-off volumes) can be improved by collection of water in water tanks, natural infiltration through gardens and lawns into the soils, and minimisation of impervious pavements or the shedding of water from impervious surfaces into garden beds that have particularly good infiltration into the ground – known as infiltration beds. The following measures have been adopted to ensure these concerns are addressed.

### Goals

- To reduce the impact of stormwater run-off
- To improve the quality of stormwater run-off
- To achieve best practice stormwater quality outcomes
- To incorporate the use of water sensitive urban design, including stormwater re-use

### Initiatives

Best Practice Stormwater treatment	Stormwater run-off quality will be maintained in this development, and has been assessed using MUSIC stormwater quality modelling software. Refer to MUSIC modelling report for additional details.	STORM, Planning scheme clause 53.18-5
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## 6 Material Selection

### Background

Careful selection of construction materials can help to limit the environmental impacts of the production, transport and incorporation of these materials in our buildings. In many cases there are similarly performing, comparable but more environmentally friendly product selection options available.

### Goals

The goals in environmentally sustainable construction material selection should be to:

- Limit the use of new materials where possible - to help minimise the detrimental outcomes of product manufacture or modification
- Select durable materials and re-use materials where possible – increase the lifespan of all products.
- To minimise the environmental impacts materials used by encouraging the use of materials with a favourable lifecycle assessment based on the fate of materials, their recycling / reuse potential, their embodied energy, their biodiversity, human health, and environmental toxicity impacts.

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## Initiatives

Greener concrete mixes	<p>20-35% slag and/or flyash or similar geopolymer mixes will be incorporated in on-site on-ground poured structural and paving concrete mixes where vehicles will not be regularly driving over the concrete, subject to structural engineer's approval.</p> <p>The proposed concrete mix has circular economy and lower embodied energy components. Waste product slag and/or flyash (Supplementary Cement materials SCMs)- will partially substitute carbon intensive Portland cement in concrete mixes. In addition recycled aggregate, water and/or sand will be included in the concrete mixes</p>	SDAPP / Green Star
Greener aggregate options	Aggregate and sand will be from circular economy and lower embodied energy sources. 50% recycled aggregate or recycled glass sand will be used as sub-base under paths and or roads subject to design engineer's approval.	Additional sustainability practice
Greener pipe bedding options	100% recycled glass sand will be used for pipe bedding (plumbing pipe, electrical cable etc) In preference to mined virgin sand, subject to the design engineer's approval.	Additional sustainability practice
Greener structural steel	<p>Structural steel used in the project will be sourced from a Responsible Steel manufacturer.</p> <p>Fabricators will be required to confirm their steel is sourced from one of the Responsible Steel member suppliers listed here <a href="https://www.responsiblesteel.org/about/members-and-associates/">https://www.responsiblesteel.org/about/members-and-associates/</a></p>	Additional sustainability practice / Green Star
Light coloured roofing	<p>The building roof colour is to be light – medium colour (as per the BCA definitions) rather than dark to deliver a cooler surrounding micro-climate) and help mitigate the overall Urban Heat Island effect.</p> <p>Lighter external surfaces also result in lower cooling requirements and less air-conditioning use.</p>	Additional sustainability practice
Light coloured paving	Paving will be light in colour to reduce solar absorption and mitigate the addition to the urban heat island effect. The alternative, dark pavers, would absorb more heat and potentially provides a hotter localised micro-climate on hot days requiring greater use of air-conditioning by occupants to keep cool.	Additional sustainability practice

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Accredited plantation timber	Framing timber will be sourced from accredited sustainable plantations (either FSC or PEFC/AFS accreditation) that mitigates damage to ecosystems for flora and fauna.	SDAPP / Green Star
Sustainable timbers	No unsustainable rainforest timbers will be incorporated i.e. no Oregon, Western Red Cedar, Meranti, Merbau, Teak or Luan as timbers sourced from unmanaged (often overseas) rainforests disrupt under threat ecosystems.	Green Star
Glasswool insulation	Where glasswool insulation is to be used, a circular economy and lower embodied energy product with 80% recycled glass will be used.  In addition, the product will avoid negative health effects by not using formaldehyde as a binder.	Additional sustainability practice
Carpet underlay	Where carpet is installed, underlay with recycled content providing circular economy and lower embodied energy benefits will be used under carpets.  Alternatively, a carpet underlay with third party GECA environmental certification will be used (e.g. Cloudwalk carpet cushion range).	Additional sustainability practice
Carpets	Installed carpet will have a rating of level 2 or greater under the Carpet Institute of Australia Environmental Classification Scheme (ECS), or will be certified by a third-party environmental accreditation scheme such as Ecospecifier GreenTag or GECA.	Additional good sustainability practice

## Additional details

Greener concrete mixes - Partial cement replacement in concrete

Cement production is the single biggest industrial producer of greenhouse gas generating emissions. Cement production causes 8% of global emissions – more than the global car fleet. (From page 7 of the BZE Rethinking Cement report which references International Energy Agency 2015. Various data sources <http://www.iea.org/statistics/>).

The industry standard cement type has been Portland cement, for which the raw material is limestone. The first stage of cement making is to transform limestone (calcium carbonate -  $\text{CaCO}_3$ ) into lime ( $\text{CaO}$ ), thus releasing carbon dioxide ( $\text{CO}_2$ ) a Greenhouse Gas as a waste product. This single process accounts for about half of the carbon emissions associated with cement making, and therefore around 4% of the world's total emissions. The rest comes from the heat required to drive the production processes and the energy to grind and transport material.

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Alternative supplementary cementitious materials (SCM) concrete mixes have a complying strength, are a similar price and use a reduced amount of high greenhouse gas producing Portland cement when compared with standard cement mixes. They also incorporate the recycling of industrial waste products such as fly ash and slag and reduce the amount of raw resources required to produce the end product.

Embodied energy levels:

Concrete Product	Embodied carbon TCO <sub>2</sub> -e/m <sup>3</sup>	Embodied carbon as a percentage of OPC 32MPA
Generic 32MPA Ordinary Portland Cement	0.481	100%
With 20% flyash	0.397	82.5%
With 20% blast furnace slag	0.404	84.0 %
With 50% flyash	0.273	56.8%
With 50% blast furnace slag	0.288	60.0%
With 100% slag or flyash geopolymer replacement (must be structurally approved. Suitable for some applications)	0.120	25.0%
Holcim EcoPact (lowest non geopolymer we are aware of)	0.198	41.1%
Holcim EcoPact Zero (ECOPact with carbon offset)	0.028	5.8%

Source – The Green Book

Suppliers of geopolymer – Supplementary Cementitious Materials cement:

Company	Product	Contact
<b>Hansen Concrete</b>	Ask for the <b>Green Star mix</b> . Common mixes include 30-50% fly ash/slag component	Bob Aldersy 03 9274 3700 Kevin Skilling 9570 3244 Dave Miller 0418 548 321
<b>Boral Concrete</b>	<b>Envirocrete</b> <b>Envirocrete Plus</b> <b>Envisia</b>	Office 13 30 06 Tania Neil 0401 892 027
<b>Barro Concrete</b>	<b>Triple blend mix</b> is the fly ash/slag/cement mix - generally has 20-35% fly ash and/or slag	Tom Kovaks 9646 5520 Piero 0438 181 681
<b>Holcim</b>	<b>ECOPact</b> Low carbon concrete range offers between 30-60% reduction on embodied carbon.	Dylan Viviers 0429 790 600

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Greener aggregate options

Recycled rock is cheaper than virgin quarry product and less product is required for a job, hence also reducing the transport emissions.

100% recycled rock is able to be used in road and path sub-base and per Alex Frasers advice can constitute up to 65% saving on embodied emissions depending on the distance of transport from plant to site.

Greener pipe bedding options

Recycled glass sand is competitively priced with beach sand and has OHS benefits as the grains are larger and have lower potential to cause health issues compared to virgin sand.

Responsible Steel

The Responsible Steel Standard V1.1 was developed to recognise steel sites that are operated in a responsible manner. The 12 Principles of the Standard cover environmental, social and governance issues.

1. Corporate Leadership
2. Social, Environmental and Governance Management Systems
3. Occupational Health and Safety
4. Labour Rights
5. Human Rights
6. Stakeholder Engagement and Communication
7. Local Communities
8. Climate Change and Greenhouse Gas Emissions
9. Noise, Emissions, Effluents and Waste
10. Water Stewardship
11. Biodiversity
12. Decommissioning and Closure

Light coloured roofing

The proposed development will adhere to the NCC2019 Section J Deemed to Satisfy requirements of J1.3 Roof and ceiling construction. The upper surface of all roof elements will have a solar absorptance not greater than 0.45.

The Colorbond colour range noted below can inform solar absorptance values of different finishes for metal roof construction.

[https://colorbond.com/sites/default/files/pdf/brochures/colorbond\\_steel\\_colours\\_for\\_your\\_home\\_colour\\_chart.pdf](https://colorbond.com/sites/default/files/pdf/brochures/colorbond_steel_colours_for_your_home_colour_chart.pdf)

Light coloured paving

Light coloured paving has a low solar absorptance per below. Alternatively it has a high Solar Reflective Index (SRI) of 39 minimum initial value or 34 as a three year value (from the Green Star Design and As Built Credit 25 criteria).

Note typical initial SRI values are:

Description	SRI
Grey concrete 35	35
White concrete 86	86
Standard white paint 100	100
Standard black paint 5	5
New asphalt 0	0

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Recycled bricks	<p>Recycled bricks are available at cost competitive prices per brick from the suggested following suppliers:</p> <ul style="list-style-type: none"> <li>• <b>Beaver bricks</b> (97288344)</li> <li>• <b>Ecobricks</b> (1300 326 274)</li> <li>• <b>Paddy's bricks</b> (9687 2338)</li> </ul>
Glasswool insulation	<p>Recycled glass used for glasswool manufacture is typically glass that cannot be used in higher grade flat or container glass uses. If using glass based (glasswool/fibreglass) insulation batts the following products which have better environmental characteristics:</p> <ul style="list-style-type: none"> <li>• Earthwool by Knauf - Earthwool (Green Tag certified) is made using up to 80% recycled glass and with ECOSE® Technology a sustainable bio-based binder that contains no added formaldehyde or artificial colours or dyes, the brown colour is completely natural.</li> <li>• CSR Bradford Gold batts (Green Tag certified) made from up to 80% recycled glass.</li> </ul>
Carpet underlay	<p>Carpet underlay with significant recycled content (per above) or other environmental benefits will be used.</p> <p>Suggested recycled underlay products include:</p> <ul style="list-style-type: none"> <li>• <b>Dunlop flooring</b></li> <li>• <b>Airstep carpet underlay</b></li> <li>• <b>Cloudwalk carpet cushion</b></li> </ul>

## 7 Location and Transport

### Goals

- To ensure that the built environment is designed to promote the use of walking, cycling and public transport in that order.
- To minimise car dependency
- To promote the use of low emission vehicle technologies and supporting infrastructure

### Location

The location of this development meets urban consolidation goals as set out in government policy documents. The development is relatively close to public transport and facilities.

### Initiatives

Local public transport information packs	<p>Relevant local train, tram and bus timetables will be included in the Building Users Guide provided. Also included will be brief details of the Melbourne myki public transport payment card system including how to register and load funds against a myki card.</p> <p>Occupants will be alerted to the existence of various public transport smartphone apps such as</p>	SDAPP - Transport
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	the Public Transport Victoria app and/or train or tram tracker	
Public transport	The proposed location is serviced by the following public transport options: <ul style="list-style-type: none"> <li>• Train – 3,800 metres from the site</li> <li>• Bus – &lt;50 metres from the site</li> </ul>	Additional sustainability practice

## Additional details

Public transport Tram, bus and train timetables can be accessed from <http://ptv.vic.gov.au/timetables/>

A full range of Public Transport Victoria maps can be sourced from <http://ptv.vic.gov.au/getting-around/maps/>  
For more train specific information visit [www.metrotrains.com.au](http://www.metrotrains.com.au)

A Travel Smart map showing major local travel interchanges can be obtained for the councils listed on the site <http://www.transport.vic.gov.au/projects/travelsmart/maps>

## 8 Waste Management

### Goals

- To promote waste avoidance, re-use and recycling during the design, construction and operation stages of development.
- To ensure durability and long term re-usability of building materials.
- To ensure sufficient space is allocated for future change in waste management needs, including (where possible) composting and green waste facilities.

### Initiatives

Construction waste	A minimum of 80% of materials will be recycled during construction.  Written documentation will be required from contractor(s) in advance on company letterhead confirming items to be recycled, and on completion, confirmation of percentage of materials recycled.	SDAPP - Waste
Plastering waste	The plastering contractor will be required to supply their own bin and recycle plasterboard off-cuts.	Additional sustainability practice
PVC pipe and conduit offcuts will be recycled	PVC pipe and conduit offcuts will be recycled at one of the firms listed in Additional information below.	Additional sustainability

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Separate waste stream collection	<p>Space for four bins will be allowed for in each kitchen and in the bin store location to facilitate separation of</p> <ul style="list-style-type: none"> <li>• garbage (landfill waste)</li> <li>• co-mingled recycling (paper and plastic),</li> <li>• FOGO (food organics and garden organics)</li> <li>• glass bins</li> </ul> <p>This is in line with planning scheme clause 15.01-2S.</p>	SDAPP - Waste
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## Additional details

Recyclable materials

The following materials can generally be recycled:

- Bricks
- Concrete products (ie. Blocks, roof tiles, pavers etc)
- Unpainted or treated timber
- Steel / metal products
- Glass
- Plasterboard
- Plastics
- Carpet underlay
- Carpet tiles
- Asphalt
- Cardboard
- Green waste

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Bin companies or similar that recycle more than others include:

- Jobsite Recyclers. <http://www.jobsitecyclers.com.au/>
- Mobius Waste <http://www.mobiusmr.com.au/>
- Eastern Recycling [www.easternrecycling.com.au](http://www.easternrecycling.com.au)
- BinGo Industries [www.bingoindustries.com.au](http://www.bingoindustries.com.au)

Plastering (recycling)

Bins are available from plasterboard recyclers such as ecoGypsum (<http://www.ecogypsum.com.au/collections.html>) or Sunshine Groupe <http://www.sunshinegroupe.com.au/>. Alternatively contact recycling companies such as T&L recycling on 0407 867 133 or similar firms.

PVC pipe and conduit for recycling

Companies that accept clean used PVC pipe and conduit for recycling. Check conditions before collecting and sending pipe and conduit.

- Pipemakers Australia - 07 3344 3377
- Armstrong Flooring P/L - 03 9586 5548
- CryoGrind Australia - 03 9794 6608
- Emmans - 03 9462 1644
- NWC Recycling - 0438 565 640
- Rojo Pacific - 03 9872 1000
- Welvic Australia - 03 9361 8700
- PVC Separation - 03 5339-2096



## 9 Urban Ecology

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### Background

Urban development has seen the destruction and displacement of plant species and in turn wildlife habitat. With new developments there is an opportunity to redress this that should be taken up. In all infill development cases there should be an improvement on the current environment.

### Goals

- To protect and enhance habitat bio-diversity of the urban environment
- To encourage the retention of significant trees
- To encourage the planting of indigenous vegetation.
- To reduce CO<sub>2</sub> in the atmosphere through increased vegetation
- Reduce the urban heat island effect by greening urban areas, buildings, transport corridors and open spaces with vegetation (c115.02-1S)
- Encourage retention of existing vegetation and planting of new vegetation as part of development proposals (c115.02-1S)

### Initiatives

Improved ecological variety	The ecological variety of the currently poor ecological value site will be improved by the proposed planting.	Green Star
Erosion control	Silt fences, erosion control blankets, and/or drain filters will be utilised during construction to ensure top soil/earth is not eroded to drains and creeks.	Additional sustainability practice

## 10 Management, Innovation, Climate Adaptation and Community Benefit

### Goals

- To encourage design and innovation in the development, which positively influence the improved life of, and sustainability of, the building.
- To encourage a holistic and integrated design and construction process and ongoing high performance.

### Initiatives

Climate Adaptation and Resilience	<p>The development will address climate adaptation and resilience by ensuring the following risks are considered and addressed.</p> <ul style="list-style-type: none"> <li>• <b>Higher temperature threats</b> <ul style="list-style-type: none"> <li>○ Thermal envelope well insulated and shaded to offer comfort in any conditions</li> </ul> </li> </ul>	
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	<ul style="list-style-type: none"><li>○ Cooling equipment will be located out of the sun for improved efficiency and air intake locations will be away from heat surces.</li><li>● <b>Extreme wind threats</b> - external services will be installed so as to be protected from wind blown vegetation or high wind loads</li><li>● <b>Extreme rainfall events</b> - heating/cooling, services, lifts and energy supply services will be located to not suffer the effects of heavy rainfall, hail stones or flooding of roof drainage systems or flooding at ground level.</li><li>● <b>Poor indoor air quality</b> - airborne dust or smoke ingress has been considered and addressed</li><li>● <b>Weather proofing</b> - Windows and doors will be designed to handle water from extreme rainfall events.</li></ul>	
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# Appendix 1 - BESS Report

## ADVERTISED PLAN

BESS, St Pauls College, 423 Blackshaws Rd, Altona North VIC 3025, Australia - ...

### BESS Report

Built Environment Sustainability Scorecard



This BESS report outlines the sustainable design commitments of the proposed development at St Pauls College Altona North Victoria 3025. The BESS report and accompanying documents and evidence are submitted in response to the requirement for a Sustainable Design Assessment or Sustainability Management Plan at Hobsons Bay City Council.

Note that where a Sustainability Management Plan is required, the BESS report must be accompanied by a report that further demonstrates the development's potential to achieve the relevant environmental performance outcomes and documents the means by which the performance outcomes can be achieved.

#### Your BESS Score

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

# 53%

---

#### Project details

<b>Address</b>	St Pauls College Altona North Victoria 3025
<b>Project no</b>	79DBC4DD-R2
<b>BESS Version</b>	BESS-7

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<b>Site type</b>	Non-residential development
<b>Account</b>	info@lidconsulting.com.au
<b>Application no.</b>	
<b>Site area</b>	3,371.00 m <sup>2</sup>
<b>Building floor area</b>	2,129.00 m <sup>2</sup>
<b>Date</b>	23 June 2023
<b>Software version</b>	1.7.1-B.396

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#### Performance by category

● Your development ● Maximum available

Category	Weight	Score	Pass
Management	5%	14%	*
Water	9%	57%	✓
Energy	28%	70%	✓
Stormwater	14%	100%	✓
IEQ	17%	54%	✓
Transport	9%	37%	*
Waste	6%	33%	*
Urban Ecology	6%	12%	*
Innovation	9%	0%	*

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The Built Environment Sustainability Scorecard is an initiative of the Council Alliance for a Sustainable Built Environment (CASBE). For more details see [www.bess.net.au](http://www.bess.net.au)

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BESS, St Pauls College, 423 Blackshaws Rd, Altona North VIC 3025, Australia - ...

## Buildings

Name	Height	Footprint	% of total footprint
Stage 1 - New Marianist Building	2	1,332 m <sup>2</sup>	100%

## Dwellings & Non Res Spaces

### Non-Res Spaces

Name	Quantity	Area	Building	% of total area
<b>Other building</b>				
Stage 1 - New Marianist Building (School)	1	2,129 m <sup>2</sup>	Stage 1 - New Marianist Building	100%
<b>Total</b>	<b>1</b>	<b>2,129 m<sup>2</sup></b>	<b>100%</b>	

## Supporting information

### Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Annotation: Water efficient garden details		-
Energy 4.2	Location and size of solar photovoltaic system		-
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips)		-
Transport 1.4	Location of non-residential bicycle parking spaces		-
Transport 1.5	Location of non-residential visitor bicycle parking spaces		-
Waste 2.2	Location of recycling facilities		-
Urban Ecology 2.1	Location and size of vegetated areas		-

### Supporting evidence

Credit	Requirement	Response	Status
Management 2.3a	Section J glazing assessment		-
Energy 1.1	Energy Report showing calculations of reference case and proposed buildings		-
Energy 3.7	Average lighting power density and lighting type(s) to be used		-
Energy 4.2	Specifications of the solar photovoltaic system(s)		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 1.4	A short report detailing assumptions used and results achieved.		-

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For more details see [www.bess.net.au](http://www.bess.net.au)

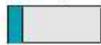
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## Credit summary

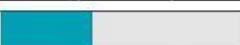
### Management Overall contribution 4.5%

		<b>14%</b>
1.1 Pre-Application Meeting		0%
2.3 Thermal Performance Modelling - Non-Residential		50%
3.2 Metering - Non-Residential		N/A  Scoped Out
		N/A - single operator
3.3 Metering - Common Areas		0%
4.1 Building Users Guide		0%

### Water Overall contribution 9.0%

		<b>Minimum required 50%</b>	<b>57%</b>	 <b>Pass</b>
1.1 Potable Water Use Reduction			40%	
3.1 Water Efficient Landscaping			100%	
4.1 Building Systems Water Use Reduction			100%	

### Energy Overall contribution 27.5%

		<b>Minimum required 50%</b>	<b>70%</b>	 <b>Pass</b>
1.1 Thermal Performance Rating - Non-Residential			37%	
2.1 Greenhouse Gas Emissions			100%	
2.2 Peak Demand			100%	
2.3 Electricity Consumption			100%	
2.4 Gas Consumption			N/A	 Scoped Out
				No gas connection in use
2.6 Electrification			100%	
3.1 Carpark Ventilation			N/A	 Scoped Out
				N/A - no enclosed carpark as part of proposed
3.2 Hot Water			100%	
3.7 Internal Lighting - Non-Residential			100%	
4.1 Combined Heat and Power (cogeneration / trigeneration)			N/A	 Scoped Out
				No cogeneration or trigeneration system in use.
4.2 Renewable Energy Systems - Solar			100%	
4.4 Renewable Energy Systems - Other			0%	 Disabled
				No other (non-solar PV) renewable energy is in use.

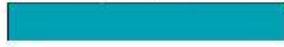
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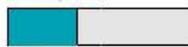
## Stormwater Overall contribution 13.5%

	Minimum required 100%	100%	✔ Pass
1.1 Stormwater Treatment		100%	

## IEQ Overall contribution 16.5%

	Minimum required 50%	54%	✔ Pass
1.4 Daylight Access - Non-Residential		36%	✔ Achieved
2.3 Ventilation - Non-Residential		50%	✔ Achieved
3.4 Thermal comfort - Shading - Non-Residential		100%	
3.5 Thermal Comfort - Ceiling Fans - Non-Residential		0%	
4.1 Air Quality - Non-Residential		100%	

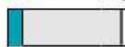
## Transport Overall contribution 9.0%

	37%		
1.4 Bicycle Parking - Non-Residential		100%	
1.5 Bicycle Parking - Non-Residential Visitor		100%	
1.6 End of Trip Facilities - Non-Residential		0%	
2.1 Electric Vehicle Infrastructure		0%	
2.2 Car Share Scheme		0%	
2.3 Motorbikes / Mopeds		0%	

## Waste Overall contribution 5.5%

	33%		
1.1 - Construction Waste - Building Re-Use		0%	
2.1 - Operational Waste - Food & Garden Waste		0%	
2.2 - Operational Waste - Convenience of Recycling		100%	

## Urban Ecology Overall contribution 5.5%

	12%		
1.1 Communal Spaces		0%	
2.1 Vegetation		25%	
2.2 Green Roofs		0%	
2.3 Green Walls and Facades		0%	
3.2 Food Production - Non-Residential		0%	

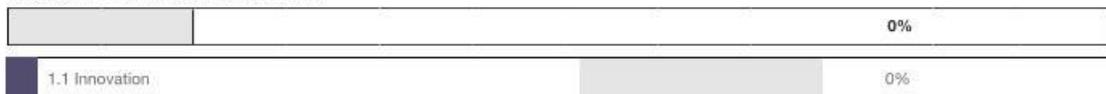
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**Innovation Overall contribution 9.0%**



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## Credit breakdown

### Management Overall contribution 1%

<b>1.1 Pre-Application Meeting</b>	0%
Score Contribution	This credit contributes 42.9% towards the category score.
Criteria	Has an ESD professional been engaged to provide sustainability advice from schematic design to construction? AND Has the ESD professional been involved in a pre-application meeting with Council?
Question	Criteria Achieved ?
Project	No
<b>2.3 Thermal Performance Modelling - Non-Residential</b>	50%
Score Contribution	This credit contributes 28.6% towards the category score.
Criteria	Has a preliminary facade assessment been undertaken in accordance with NCC2019 Section J1.5?
Question	Criteria Achieved ?
Other building	Yes
Criteria	Has preliminary modelling been undertaken in accordance with either NCC2019 Section J (Energy Efficiency), NABERS or Green Star?
Question	Criteria Achieved ?
Other building	No
<b>3.2 Metering - Non-Residential</b>	N/A  Scoped Out
This credit was scoped out	N/A - single operator
<b>3.3 Metering - Common Areas</b>	0%
Score Contribution	This credit contributes 14.3% towards the category score.
Criteria	Have all major common area services been separately submetered?
Annotation	N/A - no common areas
Question	Criteria Achieved ?
Other building	No
<b>4.1 Building Users Guide</b>	0%
Score Contribution	This credit contributes 14.3% towards the category score.
Criteria	Will a building users guide be produced and issued to occupants?
Question	Criteria Achieved ?
Project	No

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**Water** Overall contribution 5% Minimum required 50%

<b>Water Approach</b>	
What approach do you want to use for Water?:	Use the built in calculation tools
<b>Project Water Profile Question</b>	
Do you have a reticulated third pipe or an on-site water recycling system?:	No
Are you installing a swimming pool?:	No
Are you installing a rainwater tank?:	Yes
<b>Water fixtures, fittings and connections</b>	
Showerhead:	4 Star WELS (>= 6.0 but <= 7.5)
Bath:	Scope out
Kitchen Taps:	>= 5 Star WELS rating
Bathroom Taps:	>= 5 Star WELS rating
Dishwashers:	Default or unrated
WC:	>= 4 Star WELS rating
Urinals:	Scope out
Washing Machine Water Efficiency:	Occupant to Install
Which non-potable water source is the dwelling/space connected to?:	RWT
Non-potable water source connected to Toilets:	Yes
Non-potable water source connected to Laundry (washing machine):	No
Non-potable water source connected to Hot Water System:	No
<b>Rainwater Tank</b>	
What is the total roof area connected to the rainwater tank?: RWT	1,575 m <sup>2</sup>
Tank Size: RWT	25,000 Litres
Irrigation area connected to tank: RWT	-
Is connected irrigation area a water efficient garden?: RWT	-
Other external water demand connected to tank?: RWT	-

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<b>1.1 Potable Water Use Reduction</b>		40%
Score Contribution	This credit contributes 71.4% towards the category score.	
Criteria	What is the reduction in total potable water use due to efficient fixtures, appliances, rainwater use and recycled water use? To achieve points in this credit there must be >25% potable water reduction.	
Output	Reference	
Project	5181 kL	
Output	Proposed (excluding rainwater and recycled water use)	
Project	4346 kL	
Output	Proposed (including rainwater and recycled water use)	
Project	3704 kL	
Output	% Reduction in Potable Water Consumption	
Project	28 %	
Output	% of connected demand met by rainwater	
Project	100 %	
Output	How often does the tank overflow?	
Project	Never / Rarely	
Output	Opportunity for additional rainwater connection	
Project	2219 kL	
<b>3.1 Water Efficient Landscaping</b>		100%
Score Contribution	This credit contributes 14.3% towards the category score.	
Criteria	Will water efficient landscaping be installed?	
Question	Criteria Achieved ?	
Project	Yes	
<b>4.1 Building Systems Water Use Reduction</b>		100%
Score Contribution	This credit contributes 14.3% towards the category score.	
Criteria	Where applicable, have measures been taken to reduce potable water consumption by >80% in the buildings air-conditioning chillers and when testing fire safety systems?	
Annotation	No water based heat rejection systems. Where installed, fire safety system test water will be reticulated to rainwater tanks.	
Question	Criteria Achieved ?	
Project	Yes	

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**Energy** Overall contribution 19% Minimum required 50%

Use the BESS Deem to Satisfy (DtS) method for Energy?:	Yes
Do all exposed floors and ceilings (forming part of the envelope) demonstrate a minimum 10% improvement in required NCC2019 insulation levels (total R-value upwards and downwards)?:	Yes
Does all wall and glazing demonstrate meeting the required NCC2019 facade calculator (or better than the total allowance)?:	Yes
Are heating and cooling systems within one Star of the most efficient equivalent capacity unit available, or Coefficient of Performance (CoP) & Energy Efficiency Ratios (EER) not less than 85% of the CoP & EER of the most efficient equivalent capacity unit available?:	Yes
Are water heating systems within one star of the best available, or 85% or better than the most efficient equivalent capacity unit?:	Yes
<b>Non-Residential Building Energy Profile</b>	
Heating, Cooling & Comfort Ventilation - Electricity Reference fabric & services:	-
Heating, Cooling & Comfort Ventilation - Electricity - proposed fabric and reference services:	-
Heating, Cooling & Comfort Ventilation - Electricity Proposed fabric & services:	-
Heating - Wood - reference fabric and services:	-
Heating - Wood - proposed fabric and reference services:	-
Heating - Wood - proposed fabric and services:	-
Hot Water - Electricity - Reference:	-
Hot Water - Electricity - Proposed:	-
Lighting - Reference:	-
Lighting - Proposed:	-
Peak Thermal Cooling Load - Reference:	-
Peak Thermal Cooling Load - Proposed:	-
<b>Solar Photovoltaic system</b>	
System Size (lesser of inverter and panel capacity): PV	15.0 kW peak
Orientation (which way is the system facing)?: PV	North
Inclination (angle from horizontal): PV	10.0 Angle (degrees)
<b>1.1 Thermal Performance Rating - Non-Residential</b>	37%
Score Contribution	This credit contributes 40.0% towards the category score.
Criteria	What is the % reduction in heating and cooling energy consumption against the reference case (NCC 2019 Section J)?
<b>2.1 Greenhouse Gas Emissions</b>	100%
Score Contribution	This credit contributes 10.0% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?

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<b>2.2 Peak Demand</b>	100%
Score Contribution	This credit contributes 5.0% towards the category score.
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?
<b>2.3 Electricity Consumption</b>	100%
Score Contribution	This credit contributes 10.0% towards the category score.
Criteria	What is the % reduction in annual electricity consumption against the benchmark?
<b>2.4 Gas Consumption</b>	N/A  Scoped Out
This credit was scoped out	No gas connection in use
<b>2.6 Electrification</b>	100%
Score Contribution	This credit contributes 10.0% towards the category score.
Criteria	Is the development all-electric?
Question	Criteria Achieved?
Project	Yes
<b>3.1 Carpark Ventilation</b>	N/A  Scoped Out
This credit was scoped out	N/A - no enclosed carpark as part of proposed
<b>3.2 Hot Water</b>	100%
Score Contribution	This credit contributes 5.0% towards the category score.
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?
<b>3.7 Internal Lighting - Non-Residential</b>	100%
Score Contribution	This credit contributes 10.0% towards the category score.
Criteria	Does the maximum illumination power density (W/m2) in at least 90% of the area of the relevant building class meet the requirements in Table J6.2a of the NCC 2019 Vol 1?
Question	Criteria Achieved ?
Other building	Yes
<b>4.1 Combined Heat and Power (cogeneration / trigeneration)</b>	N/A  Scoped Out
This credit was scoped out	No cogeneration or trigeneration system in use.
<b>4.2 Renewable Energy Systems - Solar</b>	100%
Score Contribution	This credit contributes 5.0% towards the category score.
Criteria	What % of the estimated energy consumption of the building class it supplies does the solar power system provide?
Output	Solar Power - Energy Generation per year
Other building	18,178 kWh
Output	% of Building's Energy
Other building	30 %

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<b>4.4 Renewable Energy Systems - Other</b>	0%	Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.	

**Stormwater** Overall contribution 14% Minimum required 100%

Which stormwater modelling are you using?:	Melbourne Water STORM tool
<b>1.1 Stormwater Treatment</b>	100%
Score Contribution	This credit contributes 100.0% towards the category score.
Criteria	Has best practice stormwater management been demonstrated?
Question	STORM score achieved
Project	100
Output	Min STORM Score
Project	100

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**IEQ** Overall contribution 9% Minimum required 50%

<b>1.4 Daylight Access - Non-Residential</b>		36%	✓ Achieved
Score Contribution	This credit contributes 35.3% towards the category score.		
Criteria	What % of the nominated floor area has at least 2% daylight factor?		
Question	Percentage Achieved?		
Other building	36 %		
<b>2.3 Ventilation - Non-Residential</b>		50%	✓ Achieved
Score Contribution	This credit contributes 35.3% towards the category score.		
Criteria	What % of the regular use areas are effectively naturally ventilated?		
Question	Percentage Achieved?		
Other building	100 %		
Criteria	What increase in outdoor air is available to regular use areas compared to the minimum required by AS 1668.2:2012?		
Question	What increase in outdoor air is available to regular use areas compared to the minimum required by AS 1668:2012?		
Other building	-		
Criteria	What CO2 concentrations are the ventilation systems designed to achieve, to monitor and to maintain?		
Question	Value		
Other building	-		
<b>3.4 Thermal comfort - Shading - Non-Residential</b>		100%	
Score Contribution	This credit contributes 17.6% towards the category score.		
Annotation	All north, east and west glazing to primary habitable spaces is effectively shaded via a combination of eaves, shade fins and built form self-shading		
Criteria	What percentage of east, north and west glazing to regular use areas is effectively shaded?		
Question	Percentage Achieved?		
Other building	100 %		
<b>3.5 Thermal Comfort - Ceiling Fans - Non-Residential</b>		0%	
Score Contribution	This credit contributes 5.9% towards the category score.		
Criteria	What percentage of regular use areas in tenancies have ceiling fans?		
Question	Percentage Achieved?		
Other building	-		
<b>4.1 Air Quality - Non-Residential</b>		100%	
Score Contribution	This credit contributes 5.9% towards the category score.		
Criteria	Do all paints, sealants and adhesives meet the maximum total indoor pollutant emission limits?		
Question	Criteria Achieved ?		
Other building	Yes		

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Criteria	Does all carpet meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Other building	Yes
Criteria	Does all engineered wood meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Other building	Yes

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## Transport Overall contribution 3%

<b>1.4 Bicycle Parking - Non-Residential</b>		100%
Score Contribution	This credit contributes 25.0% towards the category score.	
Criteria	Have the planning scheme requirements for employee bicycle parking been exceeded by at least 50% (or a minimum of 2 where there is no planning scheme requirement)?	
Question	Criteria Achieved ?	
Other building	Yes	
Question	Bicycle Spaces Provided ?	
Other building	2	
<b>1.5 Bicycle Parking - Non-Residential Visitor</b>		100%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Have the planning scheme requirements for visitor bicycle parking been exceeded by at least 50% (or a minimum of 1 where there is no planning scheme requirement)?	
Question	Criteria Achieved ?	
Other building	Yes	
Question	Bicycle Spaces Provided ?	
Other building	18	
<b>1.6 End of Trip Facilities - Non-Residential</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Where adequate bicycle parking has been provided, Is there also: * 1 shower for the first 5 employee bicycle spaces plus 1 to each 10 employee bicycles spaces thereafter, * changing facilities adjacent to showers, and * one secure locker per employee bicycle space in the vicinity of the changing / shower facilities?	
Question	Number of showers provided ?	
Other building	-	
Question	Number of lockers provided ?	
Other building	-	
Output	Min Showers Required	
Other building	1	
Output	Min Lockers Required	
Other building	2	
<b>2.1 Electric Vehicle Infrastructure</b>		0%
Score Contribution	This credit contributes 25.0% towards the category score.	
Criteria	Are facilities provided for the charging of electric vehicles?	
Question	Criteria Achieved ?	
Project	No	

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<b>2.2 Car Share Scheme</b>	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Has a formal car sharing scheme been integrated into the development?
Question	Criteria Achieved ?
Project	No
<b>2.3 Motorbikes / Mopeds</b>	0%
Score Contribution	This credit contributes 12.5% towards the category score.
Criteria	Are a minimum of 5% of vehicle parking spaces designed and labelled for motorbikes (must be at least 5 motorbike spaces)?
Question	Criteria Achieved ?
Project	No

## Waste Overall contribution 2%

<b>1.1 - Construction Waste - Building Re-Use</b>	0%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been re-used?
Question	Criteria Achieved ?
Project	No
<b>2.1 - Operational Waste - Food &amp; Garden Waste</b>	0%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	Are facilities provided for on-site management of food and garden waste?
Question	Criteria Achieved ?
Project	No
<b>2.2 - Operational Waste - Convenience of Recycling</b>	100%
Score Contribution	This credit contributes 33.3% towards the category score.
Criteria	Are the recycling facilities at least as convenient for occupants as facilities for general waste?
Question	Criteria Achieved ?
Project	Yes

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## Urban Ecology Overall contribution 1%

<b>1.1 Communal Spaces</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Is there at least the following amount of common space measured in square meters : * 1m <sup>2</sup> for each of the first 50 occupants * Additional 0.5m <sup>2</sup> for each occupant between 51 and 250 * Additional 0.25m <sup>2</sup> for each occupant above 251?	
Question	Common space provided	
Other building	-	
Output	Minimum Common Space Required	
Other building	78 m <sup>2</sup>	
<b>2.1 Vegetation</b>		25%
Score Contribution	This credit contributes 50.0% towards the category score.	
Criteria	How much of the site is covered with vegetation, expressed as a percentage of the total site area?	
Annotation	Landscaping details TBC - it is expected >5% of new works areas will be covered with vegetated landscaping.	
Question	Percentage Achieved ?	
Project	5 %	
<b>2.2 Green Roofs</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Does the development incorporate a green roof?	
Question	Criteria Achieved ?	
Project	No	
<b>2.3 Green Walls and Facades</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Does the development incorporate a green wall or green façade?	
Question	Criteria Achieved ?	
Project	No	
<b>3.2 Food Production - Non-Residential</b>		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	What area of space per occupant is dedicated to food production?	
Question	Food Production Area	
Other building	-	
Output	Min Food Production Area	
Other building	27 m <sup>2</sup>	

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## Innovation Overall contribution 0%

<b>1.1 Innovation</b>	0%
Score Contribution	This credit contributes 100.0% towards the category score.
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?

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## Appendix 2 - Preliminary Façade Assessment

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## NCC 2019 Wall-Glazing Calculator v3.0

Wall and glazing energy efficiency in Class 2-9 buildings - Method 2 of Specification J1.5a, NCC 2019

Building name and description New Marianist Building - 423 Blackshaws Road, Altona North		Classification Other	Climate Zone 6
Calculated Area-Weighted U-Value	1.97	Calculated Representative Air-Conditioning Energy Value	272.6
Allowable Area-Weighted U-Value	2.00	Allowable Representative Air-Conditioning Energy Value	273.2
Building total U-Value allowance met	<b>99%</b>	Building total SHGC allowance met	<b>100%</b>
Check Values Visible	<b>Met</b>	Display Glazing Element Requirements	<b>-</b>

Building Check-Values					
	Area (m <sup>2</sup> )			Display	Glazing Percentage (non display)
	Walls	Glazing	Sub-total		
North	288.9	181.6	470.5	0.0	39%
East	155.6	50.8	206.4	0.0	25%
South	285.6	94.2	379.8	0.0	25%
West	172.8	60.9	233.7	0.0	26%
Internal	0.0	0.0	0.0	0.0	0%
<b>Total</b>	<b>903.0</b>	<b>387.5</b>	<b>1290.4</b>	<b>0.0</b>	<b>30%</b>

Element Limits	
Wall U-Value*	1.00
Display Glazing U-Value	5.8
Display Glazing Solar Admittance	0.81

\*The wall u-value limit will update based on building class and glazing %

Use of this calculator does not guarantee compliance with the NCC. The disclaimer and a version update check are available at the bottom of the page.

Element Description				U-Value		SHGC and Shading					Element Check-Values					
ID	Description (optional)	Element Type	Facing Sector	Area (m <sup>2</sup> )	U-Value	U-Value Element share of allowance used	SHGC	Glazing Height (m)	Shading Height (m)	Shading Projection (m)	SHGC Element share of allowance used	Rounded G/H	Rounded P/H	Shading Factor	Solar Admittance	AC Energy Value
1	North wall	Wall	North	288.90	0.71	8% of building total					Not counted	0	0	1	0	0
2	East wall	Wall	East	155.63	0.71	4% of building total					Not counted	0	0	1	0	0
3	South wall	Wall	South	285.60	0.71	8% of building total					Not counted	0	0	1	0	0
4	West wall	Wall	West	172.82	0.71	5% of building total					Not counted	0	0	1	0	0
5	Internal wall	Wall	Internal	0.00	0.71	0% of building total					Not counted	0	0	1	0	0
6						Not counted					Not counted	0	0	1	0	0
7	North staff lunch	Glazing	North	53.50	4.90	10% of building total	0.55	2.5	2.5	3.2	8% of building total	0	1.2	0.35	0.1925	21.83335
8	East staff lunch	Glazing	East	22.08	4.90	4% of building total	0.55	3.2	3.2	2	4% of building total	0	0.6	0.51	0.2805	10.0333728
9	East admin 03	Glazing	East	5.40	4.90	1% of building total	0.55	1.8	2.3	1.3	1% of building total	0.3	0.5	0.84	0.462	4.041576
10	North admin 06 + 07	Glazing	North	8.10	4.90	2% of building total	0.55	1.8			3% of building total	0	0	1	0.55	9.4446
11	East admin 08	Glazing	East	1.80	4.90	0% of building total	0.55	1.8			1% of building total	0	0	1	0.55	1.6038
12	North corridor x 5	Glazing	North	4.50	4.90	1% of building total	0.55	1.8			2% of building total	0	0	1	0.55	5.247
13	South sacristy	Glazing	South	3.60	4.90	1% of building total	0.55	1.5			1% of building total	0	0	1	0.55	1.98
14	South admin 14	Glazing	South	3.60	4.90	1% of building total	0.55	1.5			1% of building total	0	0	1	0.55	1.98
15	South corridor x 2	Glazing	South	3.60	4.90	1% of building total	0.55	1.5			1% of building total	0	0	1	0.55	1.98
16	South admin 10, 11,	Glazing	South	10.80	4.90	2% of building total	0.55	1.5			2% of building total	0	0	1	0.55	5.94
17	South student servic	Glazing	South	1.80	4.90	0% of building total	0.55	1.5			0% of building total	0	0	1	0.55	0.99
18	South student + staff	Glazing	South	12.00	4.90	2% of building total	0.55	4			2% of building total	0	0	1	0.55	6.6
19	East band room	Glazing	East	7.65	4.90	1% of building total	0.55	1.5			3% of building total	0	0	1	0.55	6.81615
20	South band room	Glazing	South	7.65	4.90	1% of building total	0.55	1.5	2.5		2.8 1% of building total	0.4	1.1	0.81	0.4455	3.408075
21	South band room do	Glazing	South	4.80	4.90	1% of building total	0.55	2.4	3.4		2.8 1% of building total	0.3	0.8	0.8	0.44	2.112
22	South music room	Glazing	South	11.25	4.90	2% of building total	0.55	1.5	2.5		1.8 2% of building total	0.4	0.7	0.89	0.4895	5.506875
23	South music room d	Glazing	South	4.80	4.90	1% of building total	0.55	2.4	3.4		1.8 1% of building total	0.3	0.5	0.9	0.495	2.376
24	South ST08	Glazing	South	1.80	4.90	0% of building total	0.55	1.5	2.5		1.8 0% of building total	0.4	0.7	0.89	0.4895	0.8811
25	South corridor	Glazing	South	6.90	4.90	1% of building total	0.55	3	3.4		2.8 1% of building total	0.2	0.8	0.73	0.4015	2.77035
26	West music office	Glazing	West	2.10	4.90	0% of building total	0.55	1.5	2.5		0.4 1% of building total	0.4	0.1	1	0.55	1.92885
27	West ST01, 02, 03	Glazing	West	5.40	4.90	1% of building total	0.55	1.5	2.5		1.2 2% of building total	0.4	0.4	0.94	0.517	4.662306
28	West corridor	Glazing	West	4.48	4.90	1% of building total	0.55	2.8			2% of building total	0	0	1	0.55	4.11488
29	West stairwell	Glazing	West	11.20	4.90	2% of building total	0.55	4			4% of building total	0	0	1	0.55	10.2872
30	West multi purp offi	Glazing	West	13.44	4.90	3% of building total	0.55	2.4			5% of building total	0	0	1	0.55	12.34464
31	West staff lunch	Glazing	West	6.72	4.90	1% of building total	0.55	2.4			2% of building total	0	0	1	0.55	6.17232
32						Not counted					Not counted	0	0	1	0	0
33	North main room	Glazing	North	102.90	4.90	20% of building total	0.55	3.5	4.6	3.5	32% of building total	0.3	0.7	0.72	0.396	86.386608
34	East main room	Glazing	East	2.24	4.90	0% of building total	0.55	1.4	1.4		0.7 0% of building total	0	0.5	0.57	0.3135	1.1376288
35	East kitchen	Glazing	East	9.80	4.90	2% of building total	0.55	3.5			3% of building total	0	0	1	0.55	8.7318
36	North quiet, print	Glazing	North	8.10	4.90	2% of building total	0.55	1.8			3% of building total	0	0	1	0.55	9.4446
37	East print	Glazing	East	1.80	4.90	0% of building total	0.55	1.8			1% of building total	0	0	1	0.55	1.6038
38	North corridor x 5	Glazing	North	4.50	4.90	1% of building total	0.55	1.8			2% of building total	0	0	1	0.55	5.247
39	South corridor	Glazing	South	5.40	4.90	1% of building total	0.55	1.8			1% of building total	0	0	1	0.55	2.97
40	South meeting x 4	Glazing	South	10.80	4.90	2% of building total	0.55	1.8			2% of building total	0	0	1	0.55	5.94
41	South main room	Glazing	South	5.40	4.90	1% of building total	0.55	1.8			1% of building total	0	0	1	0.55	2.97
42	West stairwell	Glazing	West	5.88	4.90	1% of building total	0.55	2.1			2% of building total	0	0	1	0.55	5.40078
43	West main room	Glazing	West	11.66	4.90	2% of building total	0.55	1.1	1.1	0.4	3% of building total	0	0.3	0.72	0.396	7.7109912
44						Not counted					Not counted	0	0	1	0	0
45						Not counted					Not counted	0	0	1	0	0
46						Not counted					Not counted	0	0	1	0	0
47						Not counted					Not counted	0	0	1	0	0
48						Not counted					Not counted	0	0	1	0	0
49						Not counted					Not counted	0	0	1	0	0
50						Not counted					Not counted	0	0	1	0	0

**Disclaimer:**

This calculator has been developed to assist in developing a better understanding of the glazing energy efficiency parameters of NCC 2019. While the author believes that the calculator, if used correctly, is likely to produce accurate results, it is provided "as is" and without any representation or warranty of any kind, including that it is fit for any purpose or of merchantable quality, or functions as intended or at all. Your use of this calculator is entirely at your own risk and the author accepts no liability of any kind.

Made by Alex Zeller

Email alex.wallglazingcalculator@gmail.com with any suggestions for improvement

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## Appendix 3 - Daylight Assessment

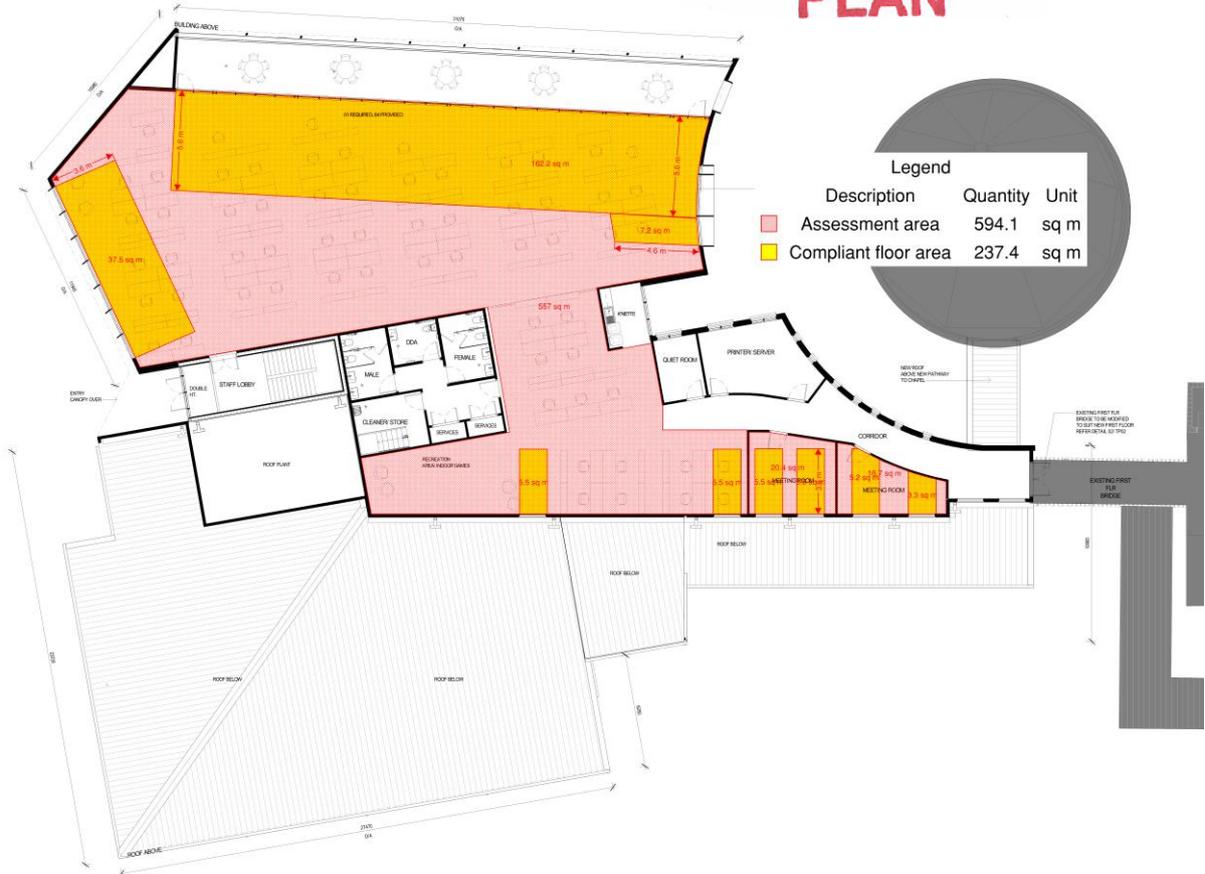
The following details the BESS daylight assessment, undertaken in accordance with Green Star Daylight Hand Calculation methodology.

Level	Assessment area (m <sup>2</sup> )	Compliant floor area (m <sup>2</sup> )	Compliant floor area (%)
0	861.6	294.4	34.2%
1	594.1	237.4	40.0%
<b>Total</b>	<b>1455.7</b>	<b>531.8</b>	<b>36.5%</b>



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First floor

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