SUSTAINABLE DEVELOPMENT
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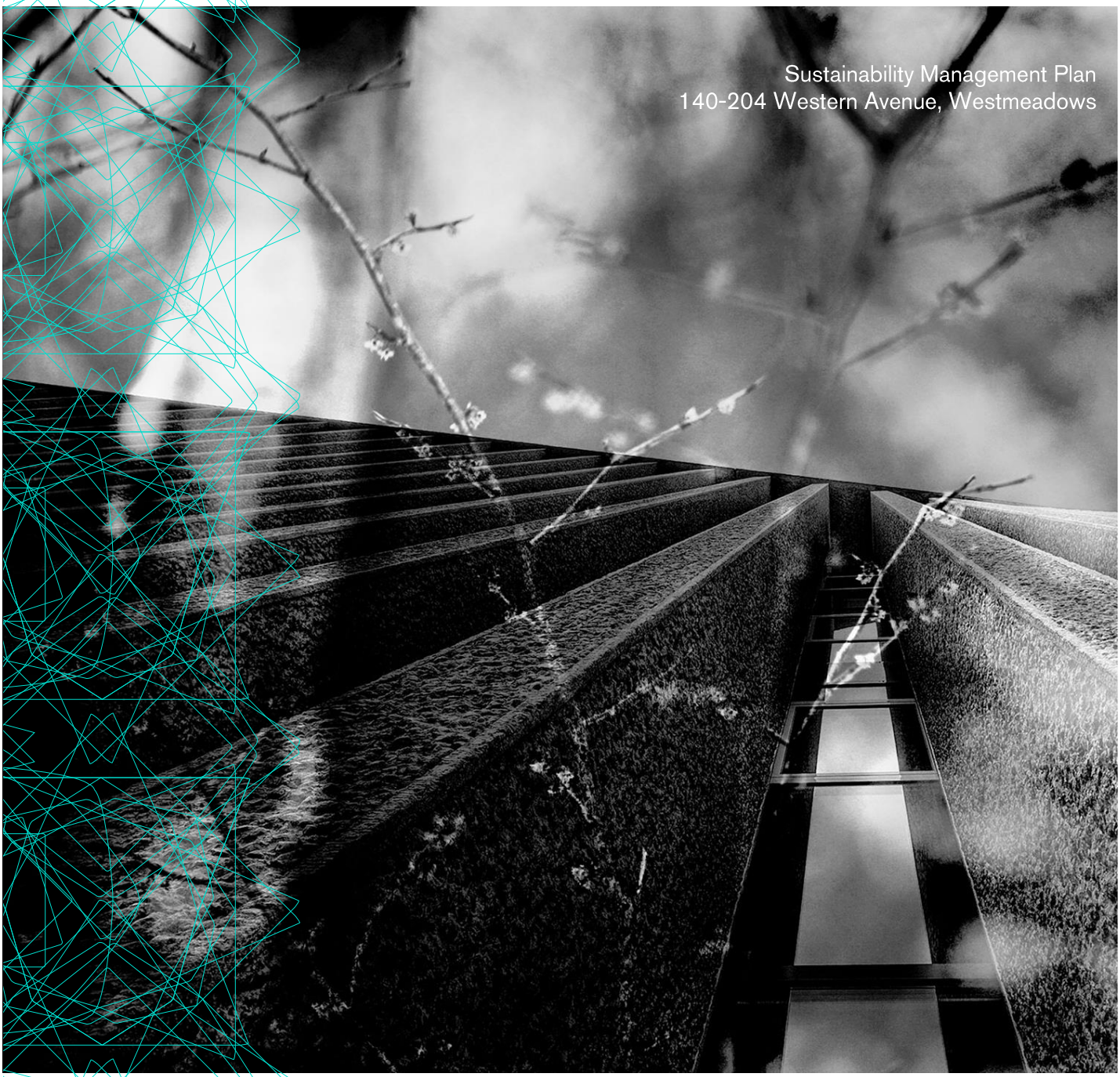

Sustainability Management Plan
140-204 Western Avenue, Westmeadows

SUSTAINABLE DEVELOPMENT
_CONSULTANTS

Proposed Industrial Development 140-204 Western Avenue, Westmeadows

Sustainability Management Plan

November 2022

S4734 SMP.V1

PREPARED BY:

Sustainable Development Consultants

2nd Floor, 555 Riversdale Rd.
Camberwell VIC 3124

T: (03) 9882 9967 F: (03) 9882 9969
info@sdconsultants.com.au

sdconsultants.com.au

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Version	Date of Issue	Description	Author	Approved
V1	22-11-2022	For Council Submission	SW	BdW

1. Introduction

This Sustainability Management Plan (SMP) has been prepared to assist the design, construction and operation of the proposed industrial development at 140-204 Western Avenue, Westmeadows, comprising of a data centre, office space and café.

Sustainable Development Consultants have assessed the proposed development and provided input to the design team. This SMP captures initiatives necessary to ensure that the development meets the sustainability requirements of the Hume City Council including Clause 22.21 of the planning scheme, as outlined in Section 1.3 of this report.

This document has been prepared by Sustainable Development Consultants with reference to the concept plan drawings prepared by Watson Young.

1.1 Site Description

The site at 140-204 Western Avenue, Westmeadows is located within an expanding industrial area with a total site area of 30,110m². The site can be accessed via the Tullamarine Freeway and lies approximately 18km North of the Melbourne CBD, close to Melbourne Airport. The land is currently undeveloped, which will facilitate construction. The proposed development will feature a data centre with adjoining service and office spaces, on-site parking, and a café.

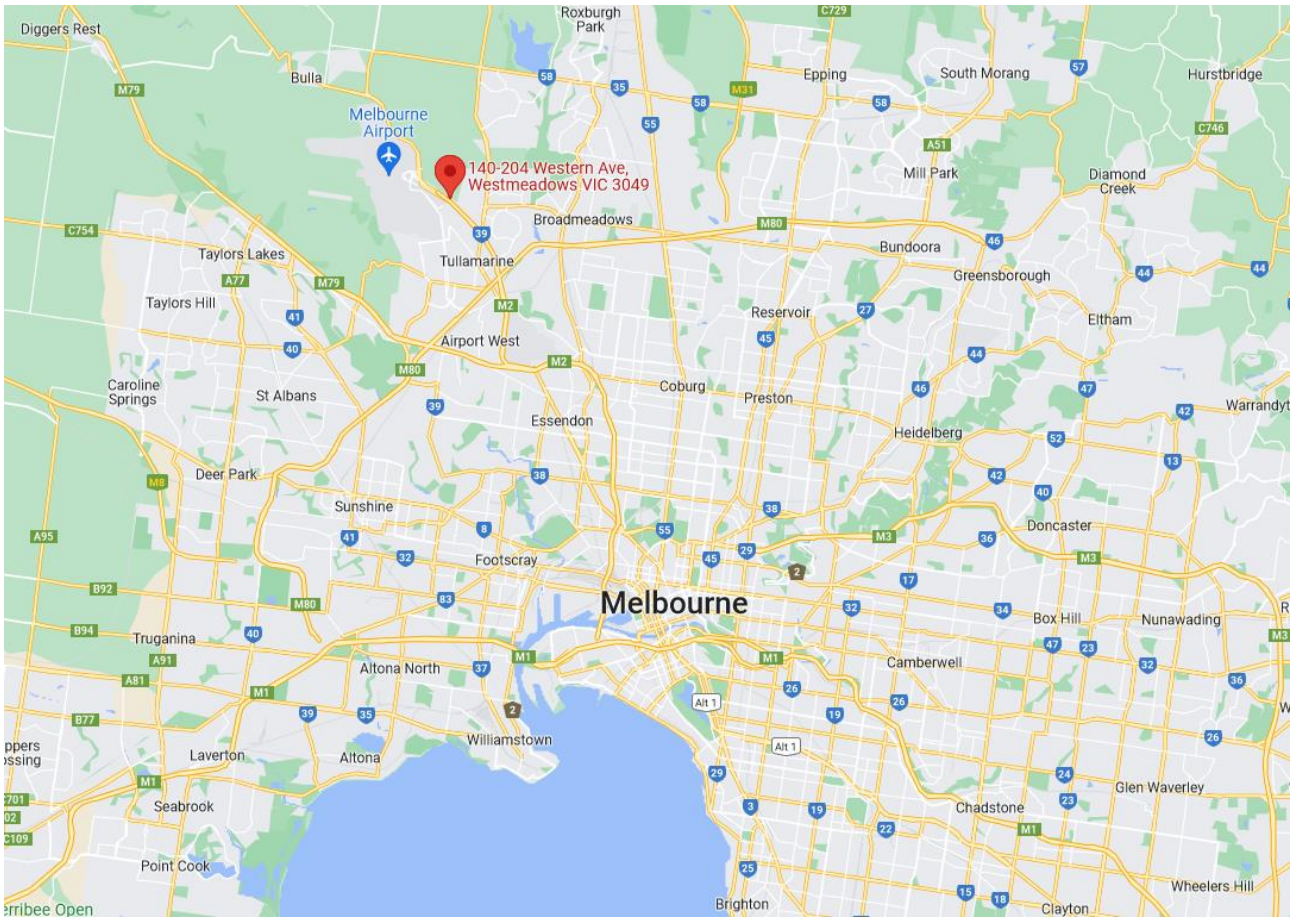


Figure 1: Location of 140-204 Western Avenue, Westmeadows in relation to the Melbourne CBD (Source: Google Maps)

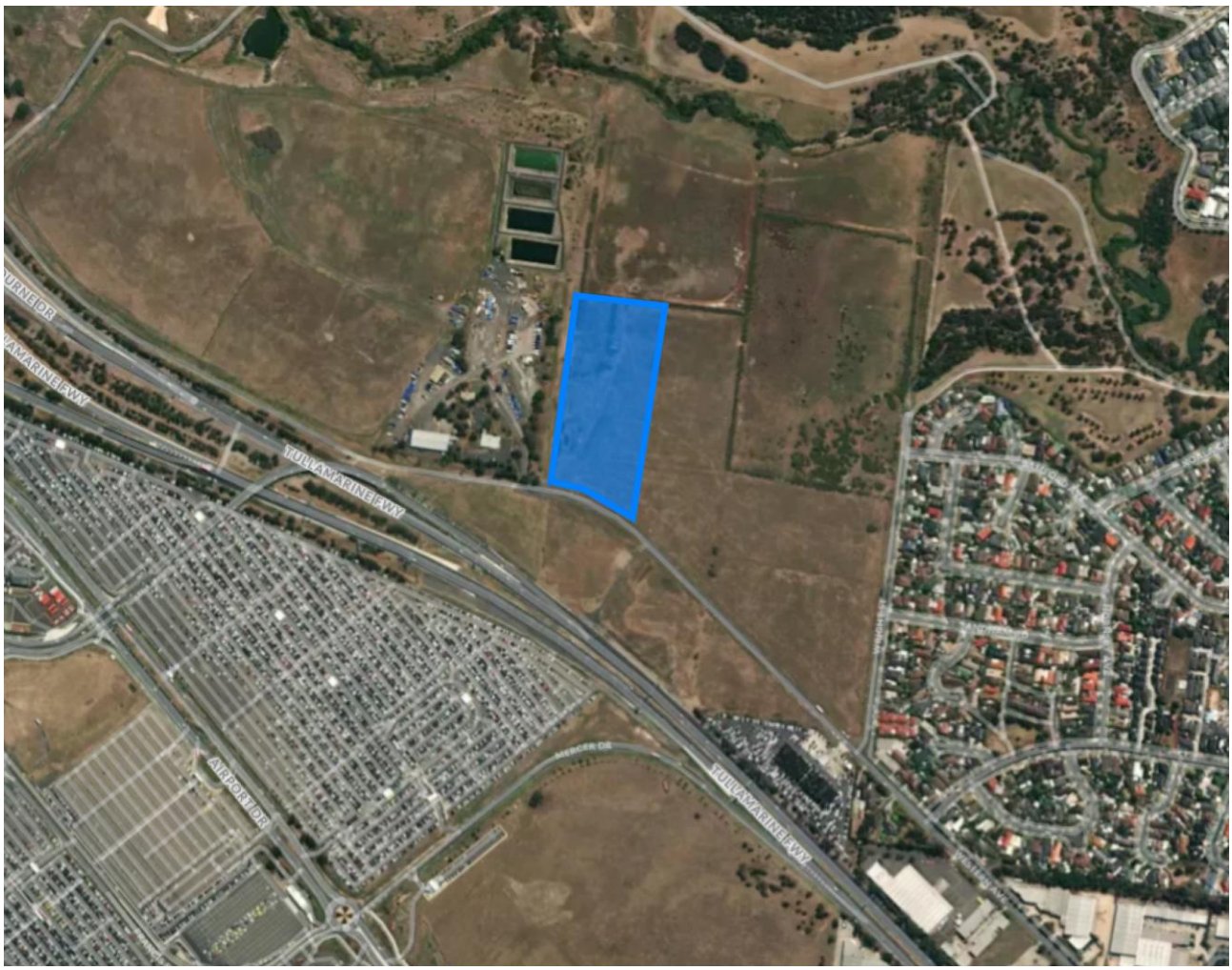


Figure 2: Aerial image of the development site at 140-204 Western Avenue, Westmeadows (Source: Google Map, mark-up by SDC)

1.2 Development Summary

Set out in Table 1 below is a development summary for this project.

Table 1: Development Summary

Development Information	
Total Site Area	30,110m^2
Carparking Spaces	55 on-site car spaces
Data Centre and Services	29,531m^2
Office Spaces (including Café)	946m^2
Total Area	30,477m^2

1.3 Hume City Council Requirements

Hume City Council is committed to achieving best practice in environmentally sustainable development from the design stage through to construction and operation. Critical to achieving this commitment is for development to meet appropriate environmental design standards.

To comply with the Local Planning Scheme including Clause 22.21 *Environmentally Sustainable Development,* this project is required to satisfy the objectives as set out within the following categories, where applicable:

- Energy Performance
- Integrated Water Management
- Indoor Environment Quality
- Transport
- Waste Management
- Urban Ecology

This requires a Sustainability Management Plan (SMP) which demonstrates how for this project, the relevant policy objectives will be achieved.

Hume City Council also requires that this project addressed the following planning scheme provisions:

- Clause 22.19 *Industrial Stormwater Management Policy*
- Clause 53.18 *Stormwater Management in Urban Development*

1.4 ESD Assessment Tools

There are several calculators and modelling programs available in Victoria to assess proposed developments against benchmarks for ESD, as set by the Victorian government, local councils and the Building Code of Australia.

Set out below are the assessment tools that have been adopted for this project.

1.4.1 BUILT ENVIRONMENT SUSTAINABILITY SCORECARD (BESS)

BESS was developed by the Council Alliance for Sustainability in the Built Environment (CASBE). This tool assesses the energy and water efficiency, thermal comfort and overall environmental sustainability performance of new buildings or alterations. It was created to demonstrate that new development meets sustainability requirements as part of a planning permit application.

A BESS assessment has been conducted for the proposed development. This provides a guide as to the level of sustainability achieved by the proposed development in line with the Council's ESD requirements. Each target area within the BESS tool generally receives a score of between 1% and 100%. A minimum score of 50% is required for the energy, water, stormwater and Indoor Environment Quality (IEQ) areas. An overall score of 50% for the project represents 'Best Practice' while a score over 70% represents 'Excellence'.

1.4.2 DESIGNBUILDER V7

DesignBuilder is a comprehensive analytical software package that analyses the energy and economic impacts of building-related selections such as architectural features; heating, ventilation and air-conditioning (HVAC) systems; HVAC equipment; building utilisation or scheduling, and financial options. DesignBuilder includes weather data including, latitude, longitude, altitude, time zone, and summer and winter design conditions; hourly observations information such as dry-bulb and wet-bulb temperatures (OADB, OAWB), humidity ration (HR), cloud cover (CCM), wind velocity, and outdoor air pressure (OAP). DesignBuilder was used for both the thermal performance modelling (verification method JV3) and daylight modelling of the regularly occupied components of the building.

Results of the thermal performance modelling are presented in Appendix 3.

Results of the daylight modelling can be found in Appendix 4.

2. Sustainability Initiatives

The following sections outline the initiatives that will be incorporated into the development throughout its design, construction and operation. Initiatives that are included to contribute towards the BESS benchmark have a reference next to them, e.g. (BESS Management 4.1). Some initiatives without the BESS reference have also been included as they also contribute to the overall sustainability of the development.

The following sections, as well as nominating the sustainability initiatives, also identify the party/parties responsible for implementation of the initiative, and the stage at which implementation will be demonstrated.

The following are the broad project stages:

1	Design Development	• Consultants develop conceptual design drawing to a detailed stage suitable as a basis for preparing working drawings - Integration of architectural, services, structure and site attributes • Checking compliance with all statutory requirements, codes and standards • Arranging special surveys or reports as required
2	Construction Documentation	• Architectural and services drawing sets completed • All specialist reports completed • All necessary planning and building consents obtained as required by authorities
3	Construction	• All work carried out onsite – site preparation, construction, alteration, extension, demolition • Purchase of all materials / certification • Evidence gathering from subcontractors • Commissioning
4	Post Occupancy	• Operation and Maintenance • Education – Building Users Guides

2.1 Energy Efficiency

Energy usage in the offices and data centre will be minimised by the installation of an efficient hot water system, heating and cooling systems, lighting, and incorporating best practice building envelopes.

Design Requirements	Responsibility & Implementation	Project Stage
Building Envelope (BESS Management 2.3; BESS Energy 1.1, 2.1 & 2.3)		
Preliminary energy modelling has been undertaken to determine the appropriate level of thermal performance of building fabric elements for the envelope of the conditioned areas of the building. For modelling purposes, the office and café spaces have been grouped into the same thermal envelope. The development will achieve the requirements in HVAC energy demand when compared to a reference building, as per the energy modelling verification method of the NCC 2019 Section J. This is achieved with the specification of a thermally efficient building fabric and HVAC systems. One possible combination of these that is designed to achieve the required outcome is outlined in Appendix 3.	Architect	Construction Documentation
Heating and Cooling Systems (BESS Energy 2.1, 2.2 & 2.3)		
Heating and cooling for all spaces within the development will be provided by energy efficient air conditioners (within one energy rating star of the best available, if no star rating applies, achieve an EER/COP at least 10% more efficient than minimum allowed under MEPS for an equivalent sized unit). All ventilation systems must be selected to meet DTS requirements of Part J5.	Mechanical Engineer	Design Development
Hot Water (BESS Energy 2.3 & 3.2)		
Hot water to the development will be provided via efficient electric heat pump systems with a minimum COP of 3.5 (at least 85% or better than the most efficient equivalent capacity unit). All pipework will be insulated to minimise distribution heat losses.	Services Consultant	Design Development
Indoor Lighting (BESS Energy 3.7)		
Energy consumption from artificial lighting throughout the development to be reduced by using LED lighting and optimising daylight diffusion via light-coloured internal surfaces (particularly walls, furniture and ceilings). Lighting levels must not exceed the maximum wattages listed in Table J6.2a of the 2019 BCA without the use of any adjustment factor.	Electrical Engineer	Design Development
External Lighting		
External lighting will be LED and will have controls (e.g. motion detectors, and timers) to minimise consumption during off-peak times (e.g. 11pm-5am).	Electrical Engineer	Design Development
Metering and Monitoring (BESS Management 3.2, 3.3)		
The design includes electronic metering systems that will be integrated into the building to monitor and report on energy and water consumption and control the building central services. Tenancy types will be split and sub-metered to office, café, data centre, major common area and mechanical designations.	Services Engineer	Design Development

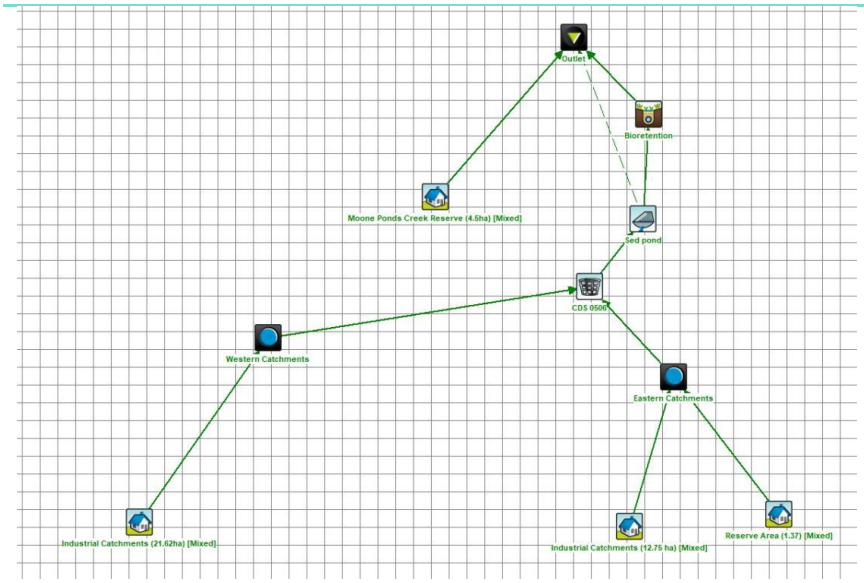
Design Requirements	Responsibility & Implementation	Project Stage
Building Sealing		
All windows, doors, exhaust fans and pipe penetrations will be constructed to minimise air leakage as required by the provisions outlined in Section J3 of the NCC 2019. This will include the use of seals around operable windows and doors as well as caulking to pipe penetrations, and the addition of self-closing louvers or dampers to exhaust fans.	Architect	Design Development
Solar PV Systems (BESS Energy 4.2)		
Peak electricity demand to be reduced with the addition of roof-mounted solar photovoltaic arrays. This would generate green energy and help to offset the HVAC and internal lighting loads of the development. Space on the roof of the development will be allocated for the provision of a minimum 99kW solar PV system. The location of the panels will be coordinated with the services penetrations during design development. These PV systems will reduce mains electricity use and the overall greenhouse gas emissions of the building by producing an estimated 135,319kWh of green electricity per year assuming an inclination of 10° and orientation to the north.[1]	Electrical Engineer / Structural Engineer	Construction Documentation

2.2 Water Resources & Stormwater Treatment

Water will be used efficiently in the offices and data centre through efficient fixtures and fittings, and collection and use of rainwater which helps to reduce mains water requirements and diverts stormwater.

Design Requirements	Responsibility & Implementation	Project Stage
Water Fixtures and Fittings (BESS Water 1.1)		
Efficient water fittings and fixtures will be installed to reduce the volume of mains water used. The following Water Efficiency Labelling Scheme (WELS) star ratings will be specified: • Showerheads – 4 Star (>6.0 but ≤7.5L/min). • Kitchen and Bathroom Taps – 6 Star (5 Star in disabled toilets). • Toilet – 4 Star. • Urinals – 6 Star.	Architect / Services Consultant	Design Development
Rainwater Collection and Reuse (BESS Water 1.1 & Stormwater 1.1)		
A Stormwater Management Plan prepared by Dalton Consulting Engineers **has been provided** for the entire estate. Please see the image following for the MUSIC model layout and output extracted from the provided report.	Civil / Hydraulic Engineer	Design Development

[1] Solar PV annual energy generation calculated through PV Watts for the site located at 140-204 Western Avenue, Westmeadows.

Design Requirements	Responsibility & Implementation	Project Stage
 Treatment Train Effectiveness - Outlet Sources / Residual Load / % Reduction Flow (ML/yr): 148 / 140 / 5.3 Total Suspended Solids (kg/yr): 29500 / 2690 / 90.9 Total Phosphorus (kg/yr): 61.3 / 32.2 / 47.4 Total Nitrogen (kg/yr): 430 / 132 / 69.3 Gross Pollutants (kg/yr): 5740 / 125 / 97.8 Further to this, rainwater will be collected from a minimum 2,000m^2 of roof area to be stored in rainwater tank(s) with an effective storage capacity of 25,000L. The tanks will be connected to all toilets and urinals in addition to being made available for irrigation.		
Water Efficient Landscaping (BESS Water 3.1)		
Landscaping will be designed and constructed in accordance with water efficiency principles. If required, a sub-surface drip irrigation system with moisture sensor override will be specified, however it is a requirement that some landscaped areas be designed so as not to require any watering after an initial establishment period.	Developer	Construction Documentation
Waterless HVAC System (BESS Water 4.1)		
Air-conditioning units will use air-cooled condenser components which will help to reduce the developments overall water usage, whilst also preventing the growth of legionella bacterium which thrive in warm stagnant water.	Mechanical Engineer	Design Development
Fire System Water (BESS Water 4.1)		
The fire protection system will not expel water for testing, this will be achieved via the large fire storage tank onsite which will pump all test water back into the tank during testing.	Fire Engineer	Design Development

2.3 Indoor Environment Quality

Indoor Environment Quality (IEQ) within the offices and data centre will be improved through various initiatives which help to create a healthy indoor environment free from toxins with ample supply of daylight and outside air.

Design Requirements	Responsibility & Implementation	Project Stage
Volatile Organic Compounds (VOCs) (BESS IEQ 4.1)		
All paints, adhesives and sealants and flooring will not exceed limits outlined in Appendix 2. Alternatively, products with no VOCs will be selected.	Architect	Construction Documentation
Formaldehyde Minimisation (BESS IEQ 4.1)		
All engineered wood products will have 'low' formaldehyde emissions, certified as E0 or better. Alternatively, products with no formaldehyde will be specified. Emissions limits are listed in Appendix 2.	Architect	Construction Documentation
Acoustic Comfort		
Noise from any mechanical services will be kept to a minimum using good quality, suitably located and baffled mechanical plants and quiet air conditioners and fans.	Acoustic/ Mechanical Engineer	Construction Documentation
Daylight Access (BESS IEQ 1.4)		
Daylight Modelling has been conducted for the proposed development. A total of 33% floor area of office and café spaces will achieve more than 2% daylight factor. The data centre is designed to store sensitive equipment and thus is not suited to having any translucent roof sheeting, resulting in no daylight penetration of the space. Refer to Appendix 4 for daylight modelling results based on one type of glazing that meets this requirement.	Architect	Design Development
Daylight Improvement		
Daylight penetration through windows/openings will be enhanced with the use of light internal colours, allowing for a better internal reflection of daylight.	Architect	Construction Documentation
Ventilation (BESS IEQ 2.3)		
Any kitchens and printer zones in the office or café will have a separate dedicated exhaust fan which will not be recycled to any enclosed space within the building; it will be ducted directly outside. The office and café HVAC systems will provide outside air at a rate that exceeds the minimum required rate per person outlined in AS 1668.2:2012, by a minimum of 50%, to provide a comfortable and healthy internal environment to the occupants. The HVAC system of the data centre is designed to supply air for pressurisation and humidity control, to ensure ideal storage conditions for the sensitive equipment. This means no occupant comfort related ventilation will be targeted.	Mechanical Engineer	Design Development

2.4 Building, Construction and Waste Management

Initiatives included in building, construction and waste management promote adoption of environmental initiatives at different stages of the project – not just in the project design stage.

Design Requirements	Responsibility & Implementation	Project Stage
Operational Waste – Food & Garden Waste (BESS Waste 2.1, 2.2)		
Dedicated bin spaces will be provided within the development for general waste (landfill waste), organic & green waste, glass and commingled recyclables. This will assist to minimise the risk of food and garden waste, glass and commingled recyclables ending up in landfill. Recycling facilities will be just as convenient to access as general waste receptacles and will be signed appropriately to ensure no contamination.	Architect/ Building Owner	Design Development/ Post Occupancy
Construction Waste Management		
The builder will develop a construction waste management plan (CWMP) for the construction phase. This will include the following: • Waste generation; • Any waste systems; • Minimisation Strategy; • Performance / Reduction targets; • Bin quantity and size; • Collection frequency; • Signage; and • Monitoring and reporting including frequency and method. The CWMP will include a requirement for not less than 80% of all civil works and built form construction waste to be recycled or re-used. The CWMP will require that all hazardous substances, pollutants and contaminants must be managed and disposed of in accordance with all state regulatory requirements. Where these materials are treated, or used on site, they must be in accordance with a sanctioned remediation process. The CWMP may form part of a broader Construction Environmental Management Plan (CEMP).	Builder	Construction Documentation
Building Users Guide (BESS Management 4.1)		
A Building Users Guide (BUG) will be developed and made available to all owners/tenants. It will be comprehensive and will include descriptions of the systems installed in the development, sustainable transport in the area, and will include relevant sustainable operation suggestions.	Architect/ ESD Consultant	Construction Documentation

Figure 3: Examples of kitchen waste management bins incorporated into joinery

2.5 Building Materials

Materials initiatives help reduce the use of virgin materials and generating waste and promote the use of materials with lower embodied energy and environmental impacts.

Design Requirements	Responsibility & Implementation	Project Stage
Concrete		
A proportion of the concrete mix will contain non-potable water (rainwater or purchased recycled water) and include some supplementary cementitious material (SCMs) aiming for minimum 10% reduction in Portland Cement content.	Builder / Structural Engineer	Construction Documentation
Steel		
Wherever possible, steel for the development will be sourced from a Responsible Steel Maker[2]. Reinforcing steel for the project will be manufactured using energy reducing processes.	Builder / Structural Engineer	Construction Documentation
Timber		
All timber used in the development will be Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC) certified or recycled / reused.	Architect	Construction Documentation
Cables, pipes, floors and blinds		
All standard uses of cables, pipes, flooring and blinds within the development will either not contain any PVC or will be sourced from a manufacturer/supplier that adheres to the Green Building Council of Australia's *Best Practice Guidelines for PVC in the Built Environment*.	Services Consultant	Construction Documentation

[2] A Responsible Steel Maker must have facilities with a currently valid and certified ISO 14001 Environmental Management System (EMS) in place and be a member of the World Steel Association's (WSA) Climate Action Program (CAP).

Design Requirements	Responsibility & Implementation	Project Stage
Flooring		
All flooring will be manufactured from materials/products certified under any of the following: • Carpet Institute of Australia Limited, Environmental Certification Scheme (ECS) v1.2; • Ecospecifier GreenTag GreenRate V3.1; and/or • Good Environmental Choice (GECA); Alternatively, floor coverings must be durable, include some eco-preferred content, be modular and/or come from a manufacturer with a product stewardship program and ISO 14001 certification.	Builder/ Architect	Construction Documentation

Figure 4: Examples of approved environmental labels for products which may be incorporated for the development.

2.6 Transport

Design Requirements	Responsibility & Implementation	Project Stage
Public Transport		
The development has direct access to the following public transport options within a 1.5km walk: **Bus Routes** • 479: Airport West SC – Sunbury Station • 478: Airport West SC – Melbourne Airport • 484: Broadmeadows – Roxburgh Park • 477: Moonee Ponds – Broadmeadows Station • 902: Chelsea – Airport West • 901: Melbourne Airport – Frankston • 952: City – Broadmeadows	Inherent in Location	
Cycling Facilities (BESS Transport 1.4 and 1.5)		
The development will be provided with a minimum of 8 secure bicycle parking spaces. These spaces will encourage staff and any visitors to consider more sustainable transport methods.	Architect	Construction Documentation

Electric Vehicle Infrastructure (BESS Transport 2.1)		
To enhance the development's ability to reduce vehicle emissions, 3 car parking spaces will be nominated for electric vehicle charging (and provided with charging infrastructure). This will encourage building users to consider purchasing electric vehicles by making their use more convenient. The design of charging infrastructure will take into consideration requirements for further expansion, with the provision made for at least 8 spaces to facilitate EV charging in the future, as electric vehicles become more prevalent.	Services Consultant	Design Development

2.7 Urban Ecology

Design Requirements	Responsibility & Implementation	Project Stage
Vegetation (BESS Urban Ecology 2.1)		
At least 15% of the site is covered with vegetation. It is recommended that a variety of native species be included in the landscaping of the site. This will help maintain/enhance local biodiversity and encourage native birds to visit the space.	Architect / Landscape Architect	Design Development
Refrigerant ODP		
All HVAC refrigerants used in the development will be selected to have an Ozone Depletion Potential (ODP) of zero.	Mechanical Engineer	Construction Documentation
Insulation Ozone Depleting Potential		
All thermal insulation used in the development will not contain any ozone-depleting substances and will not use any in its manufacturing.	Architect	Construction Documentation
Light Pollution		
No external luminaire on the project will have an Upward light Output Ratio (ULOR) exceeding 5%, relative to its mounted orientation. External lighting will be designed to avoid light spill off the site or into the night sky.	Architect/ Electrical Engineer	Schematic Design

3. Conclusion

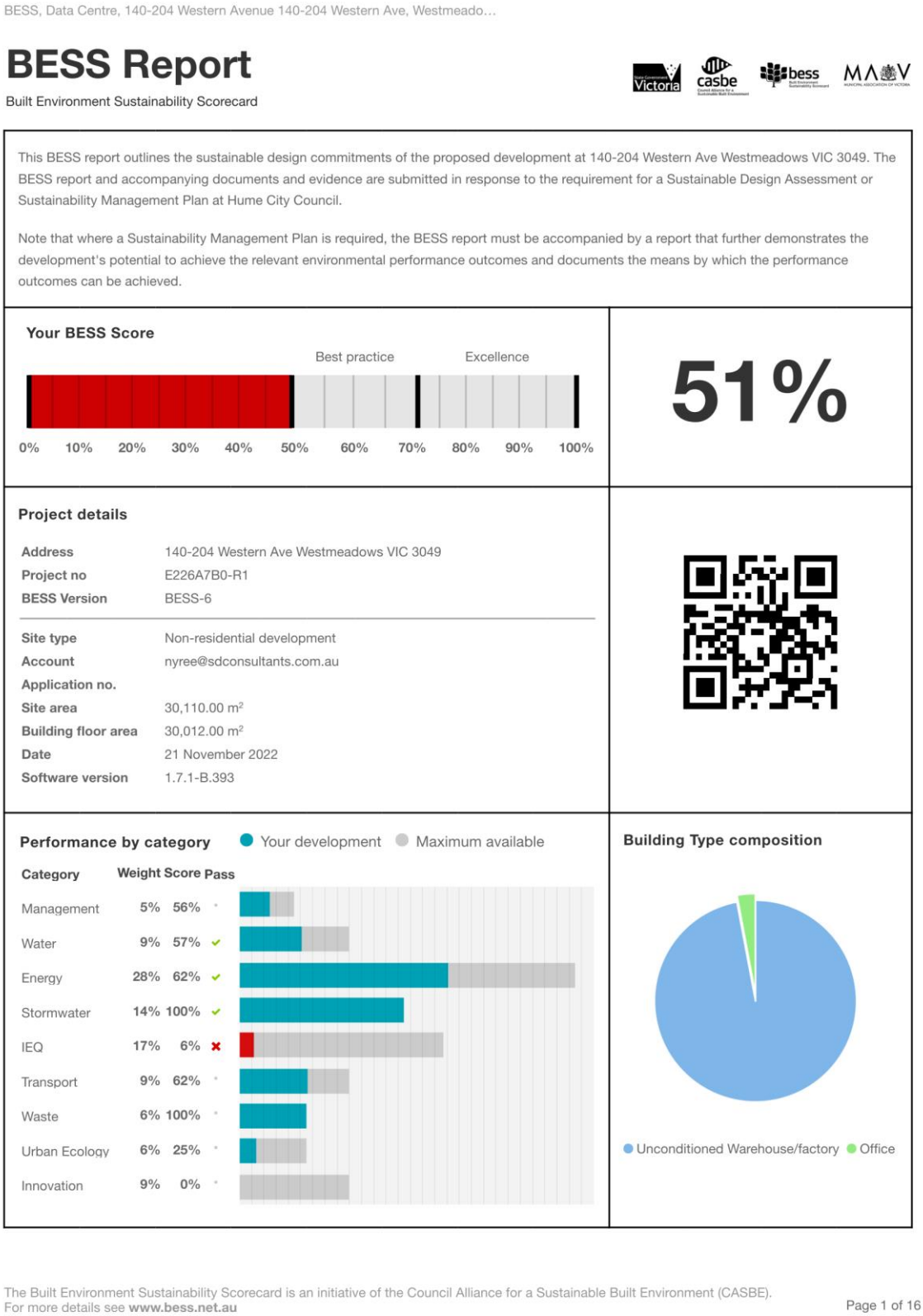
As noted within this report, the proposed data centre at 140-204 Western Avenue, Westmeadows complies with the objectives and requirements of the planning scheme of Hume City Council Clause 22.21 *Environmentally Sustainable Development*, meeting best practice requirements through the initiatives outlined in this report. This includes the use of energy efficient systems, rainwater tank(s) to service on site native landscaping and the use of low to zero VOC content materials, as well as reduced environmental impacts during the construction stage.

The initiatives that have been included within this SMP all have a proven track record of serving their individual purpose and can be easily maintained with any failures obvious to the occupants of the office and data centre. This helps to ensure the ongoing sustainability of the development, as the systems installed in the beginning are maintained for purpose throughout the life of the building.

The implementation of this SMP requires a clear process that will include:

- Full integration with architectural and building services plans and specifications;
- Endorsement of the SMP Report with town planning drawings; and
- SMP Report initiatives to be included in plans and specifications for building approval.

Appendix 1 – BESS Assessment[3]



BESS, Data Centre, 140-204 Western Avenue 140-204 Western Ave, Westmeado...

BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at 140-204 Western Ave Westmeadows VIC 3049. 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 Hume 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

Best practice Excellence

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

51%

Project details

Address	140-204 Western Ave Westmeadows VIC 3049
Project no	E226A7B0-R1
BESS Version	BESS-6
Site type	Non-residential development
Account	nyree@sdconsultants.com.au
Application no.	
Site area	30,110.00 m²
Building floor area	30,012.00 m²
Date	21 November 2022
Software version	1.7.1-B.393

Performance by category Your development Maximum available

Category	Weight	Score	Pass
Management	5%	56%	
Water	9%	57%	✓
Energy	28%	62%	✓
Stormwater	14%	100%	✓
IEQ	17%	6%	✗
Transport	9%	62%	
Waste	6%	100%	
Urban Ecology	6%	25%	
Innovation	9%	0%	

Building Type composition

Unconditioned Warehouse/factory Office

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**

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[3] Please note that compliance within the IEQ Category is compromised by the nature of the Data Centre warehouse because Credit IEQ 1.4 Daylight Access and IEQ2.3 Ventilation cannot be scoped out for the warehouse component of this project. As the Data Centre contains sensitive equipment it does not have translucent roof sheeting and therefore will not receive any daylight. Similarly, ventilation is not designed for occupant comfort and rather pressurization and humidity control to protect the equipment.

Buildings

Name	Height	Footprint	% of total footprint
Data Centre	2	15,262 m²	100%

Dwellings & Non Res Spaces

Non-Res Spaces

Name	Quantity	Area	Building	% of total area
Office				
Office and Cafe	1	883 m²	Data Centre	2%
Total	**1**	**883 m²**	**2%**	
Unconditioned Warehouse/factory				
Data Centre	1	29,129 m²	Data Centre	97%
Total	**1**	**29,129 m²**	**97%**	

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Management 3.2	Individual utility meters annotated		-
Management 3.3	Common area submeters annotated		-
Water 3.1	Water efficient garden annotated		-
Energy 4.2	Floor plans showing location of photovoltaic panels as described.		-
Stormwater 1.1	Location of any stormwater management systems used in STORM or MUSIC modelling (e.g. Rainwater tanks, raingarden, buffer strips)		-
Transport 1.4	All nominated non-residential bicycle parking spaces		-
Transport 1.5	All nominated non-residential visitor bicycle parking spaces		-
Transport 2.1	Location of electric vehicle charging infrastructure		-
Waste 2.1	Location of food and garden waste facilities		-
Waste 2.2	Location of recycling facilities		-
Urban Ecology 2.1	Vegetated areas		-

Supporting evidence

Credit	Requirement	Response	Status
Management 2.3a	Section J glazing assessment		-
Management 2.3b	Preliminary modelling report		-
Energy 1.1	Energy Report showing calculations of reference case and proposed buildings		-
Energy 3.7	Provide a written description of the average lighting power density to be installed in the development and specify the 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.		-

BESS, Data Centre, 140-204 Western Avenue 140-204 Western Ave, Westmeado…

Credit summary

Management Overall contribution 4.5%

		56%
1.1 Pre-Application Meeting		0%
2.3 Thermal Performance Modelling - Non-Residential		100%
3.2 Metering - Non-Residential		100%
3.3 Metering - Common Areas		100%
4.1 Building Users Guide		100%

Water Overall contribution 9.0%

	Minimum required 50%	57%	✔ Pass
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%

	Minimum required 50%	62%	✔ Pass
1.1 Thermal Performance Rating - Non-Residential		12%	
2.1 Greenhouse Gas Emissions		100%	
2.2 Peak Demand		0%	
2.3 Electricity Consumption		100%	
2.4 Gas Consumption		N/A	✣ Scoped Out
		No gas connection in use	
3.1 Carpark Ventilation		N/A	✣ Scoped Out
		The car park to the development is external, and not enclosed.	
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		60%	
4.4 Renewable Energy Systems - Other		N/A	⊘ Disabled
		No other (non-solar PV) renewable energy is in use.	

Stormwater Overall contribution 13.5%

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

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**

BESS, Data Centre, 140-204 Western Avenue 140-204 Western Ave, Westmeado…

IEQ Overall contribution 16.5%

	Minimum required 50%	6%	✖ Not Passed
1.4 Daylight Access - Non-Residential		0%	✖ Not Achieved
2.3 Ventilation - Non-Residential		0%	✖ Not Achieved
3.4 Thermal comfort - Shading - Non-residential		0%	
3.5 Thermal Comfort - Ceiling Fans - Non-Residential		0%	
4.1 Air Quality - Non-Residential		100%	

Transport Overall contribution 9.0%

	62%
1.4 Bicycle Parking - Non-Residential	100%
1.5 Bicycle Parking - Non-Residential Visitor	97%
1.6 End of Trip Facilities - Non-Residential	0%
2.1 Electric Vehicle Infrastructure	100%
2.2 Car Share Scheme	0%
2.3 Motorbikes / Mopeds	0%

Waste Overall contribution 5.5%

	100%	
1.1 - Construction Waste - Building Re-Use	N/A	✣ Scoped Out
	The land has not been previously developed.	
2.1 - Operational Waste - Food & Garden Waste	100%	
2.2 - Operational Waste - Convenience of Recycling	100%	

Urban Ecology Overall contribution 5.5%

	25%
1.1 Communal Spaces	0%
2.1 Vegetation	50%
2.2 Green Roofs	0%
2.3 Green Walls and Facades	0%
3.2 Food Production - Non-Residential	0%

Innovation Overall contribution 9.0%

	0%
1.1 Innovation	0%

The Built Environment Sustainability Scorecard is an initiative of the Council Alliance for a Sustainable Built Environment (CASBE).
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Credit breakdown

Management Overall contribution 3%

1.1 Pre-Application Meeting		0%
Score Contribution	This credit contributes 43.7% 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	
2.3 Thermal Performance Modelling - Non-Residential		100%
Score Contribution	This credit contributes 12.6% towards the category score.	
Criteria	Has a preliminary facade assessment been undertaken in accordance with NCC2019 Section J1.5?	
Question	Criteria Achieved ?	
Office	Yes	
Criteria	Has preliminary modelling been undertaken in accordance with either NCC2019 Section J (Energy Efficiency), NABERS or Green Star?	
Question	Criteria Achieved ?	
Office	Yes	
3.2 Metering - Non-Residential		100%
Score Contribution	This credit contributes 14.6% towards the category score.	
Criteria	Have utility meters been provided for all individual commercial tenants?	
Question	Criteria Achieved ?	
Office	Yes	
Unconditioned Warehouse/factory	Yes	
3.3 Metering - Common Areas		100%
Score Contribution	This credit contributes 14.6% towards the category score.	
Criteria	Have all major common area services been separately submetered?	
Question	Criteria Achieved ?	
Office	Yes	
Unconditioned Warehouse/factory	Yes	
4.1 Building Users Guide		100%
Score Contribution	This credit contributes 14.6% towards the category score.	
Criteria	Will a building users guide be produced and issued to occupants?	
Question	Criteria Achieved ?	
Project	Yes	

BESS, Data Centre, 140-204 Western Avenue 140-204 Western Ave, Westmeado…

Water Overall contribution 5% Minimum required 50%

Water Approach	
What approach do you want to use for Water?:	Use the built in calculation tools
Project Water Profile Question	
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
Water fixtures, fittings and connections	
Building: All	Data Centre
Showerhead: All	4 Star WELS (>= 6.0 but <= 7.5)
Bath: All	Scope out
Kitchen Taps: All	>= 6 Star WELS rating
Bathroom Taps: All	>= 6 Star WELS rating
Dishwashers: All	Scope out
WC: All	>= 4 Star WELS rating
Urinals: All	>= 6 Star WELS rating
Washing Machine Water Efficiency: All	Scope out
Which non-potable water source is the dwelling/space connected to?: All	Tank 1
Non-potable water source connected to Toilets: All	Yes
Non-potable water source connected to Laundry (washing machine): All	No
Non-potable water source connected to Hot Water System: All	No
Rainwater Tank	
What is the total roof area connected to the rainwater tank?: Tank 1	2,000 m²
Tank Size: Tank 1	25,000 Litres
Irrigation area connected to tank: Tank 1	4,600 m²
Is connected irrigation area a water efficient garden?: Tank 1	Yes
Other external water demand connected to tank?: Tank 1	-

1.1 Potable water use reduction		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	17274 kL	
Output	Proposed (excluding rainwater and recycled water use)	
Project	12051 kL	
Output	Proposed (including rainwater and recycled water use)	
Project	11068 kL	
Output	% Reduction in Potable Water Consumption	
Project	35 %	
Output	% of connected demand met by rainwater	
Project	20 %	
Output	How often does the tank overflow?	
Project	Never / Rarely	
Output	Opportunity for additional rainwater connection	
Project	2183 kL	
3.1 Water Efficient Landscaping		100%
Score Contribution	This credit contributes 14.3% towards the category score.	
Criteria	Will water efficient landscaping be installed?	
Question	Criteria Achieved ?	
Project	Yes	
4.1 Building Systems Water Use Reduction		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?	
Question	Criteria Achieved ?	
Project	Yes	

Energy Overall contribution 17% Minimum required 50%

Use the BESS Deem to Satisfy (DtS) method for Energy?:	No
Use the BESS Deem to Satisfy (DtS) method for Energy Unconditioned Spaces?:	Yes
Are water heating systems within one Star available, or 85% or better than the most efficient equivalent capacity unit?:	Yes
Non-Residential Building Energy Profile	
Heating, Cooling & Comfort Ventilation - Electricity - reference fabric and reference services:	23,363 kWh
Heating, Cooling & Comfort Ventilation - Electricity - proposed fabric and reference services:	22,215 kWh
Heating, Cooling & Comfort Ventilation - Electricity - proposed fabric and proposed services:	21,231 kWh
Heating - Wood - reference fabric and reference services:	-
Heating - Wood - proposed fabric and reference services:	-
Heating - Wood - proposed fabric and proposed services:	-
Hot Water - Electricity - Baseline:	5,784 kWh
Hot Water - Electricity - Proposed:	3,024 kWh
Lighting - Baseline:	469,941 kWh
Lighting - Proposed:	469,941 kWh
Peak Thermal Cooling Load - Baseline:	-
Peak Thermal Cooling Load - Proposed:	-
Solar Photovoltaic systems	
System Size (lesser of inverter and panel capacity):	
PV 1	9.0 kW peak
PV 2	90.0 kW peak
Orientation (which way is the system facing)?:	
PV 1	North
PV 2	North
Inclination (angle from horizontal):	
PV 1	10.0 Angle (degrees)
PV 2	10.0 Angle (degrees)
Which Building Class does this apply to?:	
PV 1	Office
PV 2	Unconditioned Showroom/Machine shop

1.1 Thermal Performance Rating - Non-Residential 12%

Score Contribution	This credit contributes 26.8% towards the category score.
Criteria	What is the % reduction in heating and cooling energy consumption against the reference case (NCC 2019 Section J)?
Output	Total Improvement
Office	4 %

2.1 Greenhouse Gas Emissions	100%	
Score Contribution	This credit contributes 15.5% towards the category score.	
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?	
Output	Reference Building with Reference Services (BCA only)	
Office	875 kg CO2	
Output	Proposed Building with Proposed Services (Actual Building)	
Office	728 kg CO2	
Output	% Reduction in GHG Emissions	
Office	16 %	
2.2 Peak Demand	0%	
Score Contribution	This credit contributes 3.3% towards the category score.	
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?	
2.3 Electricity Consumption	100%	
Score Contribution	This credit contributes 15.5% towards the category score.	
Criteria	What is the % reduction in annual electricity consumption against the benchmark?	
Output	Reference	
Office	858 kWh	
Output	Proposed	
Office	714 kWh	
Output	Improvement	
Office	16 %	
2.4 Gas Consumption	N/A	Scoped Out
This credit was scoped out	No gas connection in use	
3.1 Carpark Ventilation	N/A	Scoped Out
This credit was scoped out	The car park to the development is external, and not enclosed.	
3.2 Hot Water	100%	
Score Contribution	This credit contributes 7.8% towards the category score.	
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?	
Output	Reference	
Office	170 kWh	
Output	Proposed	
Office	89.0 kWh	
Output	Improvement	
Office	47 %	

3.7 Internal Lighting - Non-Residential	100%	
Score Contribution	This credit contributes 15.5% 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 ?	
Office	Yes	
Unconditioned Warehouse/factory	Yes	
4.1 Combined Heat and Power (cogeneration / trigeneration)	N/A	Scoped Out
This credit was scoped out	No cogeneration or trigeneration system in use.	
4.2 Renewable Energy Systems - Solar	60%	
Score Contribution	This credit contributes 7.8% 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	
Office	10,907 kWh	
Output	% of Building's Energy	
Office	75 %	
4.4 Renewable Energy Systems - Other	N/A	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?:	MUSIC or other modelling software	
1.1 Stormwater Treatment	100%	
Score Contribution	This credit contributes 100.0% towards the category score.	
Criteria	Has best practice stormwater management been demonstrated?	
Question	Flow (ML/year)	
Project	5.3 % Reduction	
Question	Total Suspended Solids (kg/year)	
Project	90.9 % Reduction	
Question	Total Phosphorus (kg/year)	
Project	47.4 % Reduction	
Question	Total Nitrogen (kg/year)	
Project	69.3 % Reduction	

IEQ Overall contribution 1% Minimum required 50%

1.4 Daylight Access - Non-Residential	0%	✖ Not 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?	
Annotation	The data centre does not have translucent roof sheeting because it contains sensitive equipment. As such it would be more appropriate to scope out the daylight criteria for the data centre, but as that is not an option (without also scoping out the office) we have conservatively proceeded to finalise the BESS per the modelling results.	
Question	Percentage Achieved?	
Office	33 %	
Unconditioned Warehouse/factory	0 %	
2.3 Ventilation - Non-Residential	0%	✖ Not Achieved
Score Contribution	This credit contributes 35.3% towards the category score.	
Annotation	The data centre is not designed for occupant comfort and rather pressurisation and humidity control to protect the sensitive equipment. This would thus be more appropriate to scope out, however, this is not an available option.	
Criteria	What % of the regular use areas are effectively naturally ventilated?	
Question	Percentage Achieved?	
Office	-	
Unconditioned Warehouse/factory	0 %	
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?	
Office	50 %	
Unconditioned Warehouse/factory	0 %	
Criteria	What CO2 concentrations are the ventilation systems designed to achieve, to monitor and to maintain?	
Question	Value	
Office	0 ppm	
Unconditioned Warehouse/factory	-	
3.4 Thermal comfort - Shading - Non-residential	0%	
Score Contribution	This credit contributes 17.6% towards the category score.	
Criteria	What percentage of east, north and west glazing to regular use areas is effectively shaded?	
Question	Percentage Achieved?	
Office	-	
Unconditioned Warehouse/factory	-	

3.5 Thermal Comfort - Ceiling Fans - Non-Residential	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?
Office	-
Unconditioned Warehouse/factory	-
4.1 Air Quality - Non-Residential	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 ?
Project	Yes
Criteria	Does all carpet meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Project	Yes
Criteria	Does all engineered wood meet the maximum total indoor pollutant emission limits?
Question	Criteria Achieved ?
Project	Yes

Transport Overall contribution 6%

1.4 Bicycle Parking - Non-Residential	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 ?
Office	Yes
Unconditioned Warehouse/factory	Yes
Question	Bicycle Spaces Provided ?
Office	2
Unconditioned Warehouse/factory	2
1.5 Bicycle Parking - Non-Residential Visitor	97%
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 ?
Office	No
Unconditioned Warehouse/factory	Yes
Question	Bicycle Spaces Provided ?
Office	2
Unconditioned Warehouse/factory	2
1.6 End of Trip Facilities - Non-Residential	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 ?
Office	0
Unconditioned Warehouse/factory	0
Question	Number of lockers provided ?
Office	0
Unconditioned Warehouse/factory	0
Output	Min Showers Required
Office	1
Unconditioned Warehouse/factory	1
Output	Min Lockers Required
Office	2
Unconditioned Warehouse/factory	2

2.1 Electric Vehicle Infrastructure		100%
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	Yes	
2.2 Car Share Scheme		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	
2.3 Motorbikes / Mopeds		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 6%

1.1 - Construction Waste - Building Re-Use		N/A	Scoped Out
This credit was scoped out	The land has not been previously developed.		
2.1 - Operational Waste - Food & Garden Waste		100%	
Score Contribution	This credit contributes 50.0% towards the category score.		
Criteria	Are facilities provided for on-site management of food and garden waste?		
Question	Criteria Achieved ?		
Project	Yes		
2.2 - Operational Waste - Convenience of Recycling		100%	
Score Contribution	This credit contributes 50.0% 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		

Urban Ecology Overall contribution 1%

1.1 Communal Spaces		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 : * 1m² for each of the first 50 occupants * Additional 0.5m² for each occupant between 51 and 250 * Additional 0.25m² for each occupant above 251?	
Question	Common space provided	
Office	-	
Unconditioned Warehouse/factory	-	
Output	Minimum Common Space Required	
Office	60 m²	
Unconditioned Warehouse/factory	283 m²	
2.1 Vegetation		50%
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?	
Question	Percentage Achieved ?	
Project	15 %	
2.2 Green Roofs		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	
2.3 Green Walls and Facades		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	
3.2 Food Production - Non-Residential		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	
Office	-	
Unconditioned Warehouse/factory	-	
Output	Min Food Production Area	
Office	18 m²	
Unconditioned Warehouse/factory	146 m²	

Innovation Overall contribution 0%

1.1 Innovation		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 – Green Star VOC and Formaldehyde Limits

Table 2: Maximum Volatile Organic Compound Levels for construction materials (Source: Green Building Council Australia – Green Star Design and As Built v1.3 2019 Manual)

Product Type/Sub Category	Max TVOC Content (g/L of ready-to-use-product)
Paints, Adhesives and Sealants	
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100
Carpets	
Total VOC limit	0.5 mg/m^2 per hour
4-PC (4-Phenylcyclohexene)	0.05mg/m^2 per hour
ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m^2 per hour
ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5 mg/m^2 per hour

Table 3: Maximum Formaldehyde levels for processed wood products. (Source: Green Building Council Australia – Green Star Design and As Built v1.3 2019 Manual)

Formaldehyde emission limit values for different testing methods	
Test Method	Emission Limit/ Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m^{2}hr
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m^{2}hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m^{2}hr (at 3 days)
ASTM D6007	≤0.12mg/m^3
ASTM E1333	≤0.12mg/m^3
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m^3
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m^{2}hr

Appendix 3 – Preliminary JV3 Modelling Report

This assessment has been undertaken in relation to BCA Performance Requirement JP1 and is prepared in accordance with Verification Method JV3, Verification using a reference building, where a Building Solution is proposed as an Alternative Solution to the Deemed-to-Satisfy Provisions.

This notice is only relevant to BCA Section J, Parts J0 (Energy Efficiency), J1 (Building Fabric), J3 (Building Sealing) and J8 (Facilities for Energy Monitoring).

The proposed development underwent a preliminary energy modelling assessment - both as a deemed-to-satisfy designed building and as currently proposed on plans and specifications (available to this point) with deemed to satisfy services. It has been found that at present the proposed design can meet both the greenhouse gas emissions and thermal comfort requirements of Verification Method JV3 of the 2019 BCA, assuming the following parameters (or equally approved equivalents) are met.

The modelling parameters used in the preliminary assessment are outlined in the table below:

Building Fabric Element	Description
Walls	External/internal walls forming part of the building envelope were modelled using the wall types listed below and are required to be insulated with added insulation specified to achieve compliance. Note that wall construction details such as stud / frame sizes are not available at the time of this assessment. Assumptions were made based on provided elevations and floor plans. • **Precast Concrete Wall** Solar Absorptance: 0.44 (Light Grey) Construction Details and Insulation Requirement: ○ 150mm concrete panel ○ R0.2 thermal break (Thermatape or similar) installed between panel and stud frame ○ 90mm R2.5 added insulation installed between steel studs ○ 13mm plasterboard lining • **Colour Back Glass – Spandrel** Construction Details and Insulation Requirement: ○ per NCC 2019 Specification J1.5b Configuration 1, with R2.0 insulation. All internal walls within the office are standard stud walls with plasterboard lining. Warehouse external walls were modelled as insulated panels as designated on architectural plans. Please refer to Figure 5 & 6 for the thermal envelope mark ups.
Floors	Ground level floors were modelled as concrete slab on ground and do not require insulation. Level 1 floors were modelled as suspended concrete slab, with an additional R2.0 insulation required for sections of the floor that lie outside of the Ground Floor thermal envelope. Please refer to Figure 7 for the mark up of applicable floor sections.
Roof & Ceiling	The office roof was modelled as a metal sheet roof with suspended ceiling. A total system value of R3.2 has been modelled with insulation under the metal sheet. Both the office and warehouse roofs were modelled with a solar absorptance of 0.55. This corresponds to a Zincalume finish. Please refer to Figure 8 for the mark up of applicable roof sections.

<table>
<tr><th>Building Fabric Element</th><th>Description</th></tr>
<tr><td>Windows and Glazed Doors</td><td>As window/door schedules are not available at this stage, sizes of all fenestrations were measured from provided elevations and floor plans.

All external windows/glazed doors of the office are required to have the following thermal performance values for glass and frame combined:

<table>
<tr><td></td><td>U-value</td><td>SHGC</td><td>VLT</td></tr>
<tr><td>External fixed windows</td><td>3.0</td><td>0.31</td><td>0.26</td></tr>
<tr><td>Hinged Door</td><td>3.8</td><td>0.25</td><td>0.19</td></tr>
</table>
These values are based on EVantage grey double glazing in Capral aluminium frames.

The windows and frames specified for the development must, as a minimum, meet the modelled thermal performance values above for the remainder of this design advice to hold true.</td></tr>
<tr><td>Warehouse Glazing</td><td>The Danpalon panels to the warehouse walls have been modelled as Danpalon 8mm Clear, as follows:

<table>
<tr><td></td><td>U-value</td><td>SHGC</td><td>VLT</td></tr>
<tr><td>Warehouse panels</td><td>3.3</td><td>0.64</td><td>0.67</td></tr>
</table></td></tr>
<tr><td colspan="2">Please note the above selected products are an example only. These have been identified as being able to meet the energy efficiency requirement of Section J of the BCA. Please check with the glazing contractor for other products that may meet the above energy efficiency requirements along with any specific considerations to other project requirements such as structural adequacy, safety, wind loads, acoustics etc.</td></tr>
<tr><td>Shading</td><td>External overhangs and screens that provide shading to glazing have been modelled as per the proposed design. The feature mesh screen must achieve at least 75% transparency to meet the daylight requirements.</td></tr>
<tr><td>Insulation</td><td>Part J1.2 for general thermal construction & installation must be followed, which require insulation must be installed to comply with AS/NZS 4859.1 and be installed so that it forms a continuous barrier and installed with the required air space. Also, Insulation must maintain its position and thickness.

Part J1.3(c) for compensation for a loss of ceiling insulation must be followed if ceiling insulation is used instead of that proposed and downlights are provided.</td></tr>
<tr><td>Sealing</td><td>A seal to restrict air infiltration must be fitted to each edge of a door and operable window in accordance with Provision J3.4, other than glazed elements which comply with AS 2047.

All entry doors leading to conditioned spaces must be fitted with a self-closing device.

Exhaust fans serving any conditioned spaces must be fitted with self-closing dampers.

Roofs, ceilings, walls, floors and any opening such as a window frame, door frame, roof light frame or the like will be constructed to minimise air leakage via the enclosure by internal lining systems or sealed by caulking, skirting, architraves, cornices or the like.</td></tr>
<tr><td>Artificial Lighting</td><td>The default BCA 2019 illumination power density (W/m^2) values were used for each space. It is recommended that the proposed design not exceed the maximum wattages listed Table J6.2a of the BCA without the use of any adjustment factors.</td></tr>
</table>

Building Fabric Element	Description
Heating, Ventilation & Air-Conditioning (HVAC)	The systems were zoned as outlined below (refer to Figure 5 & 6). Unitary Heat Pump air conditioning systems have been modelled for the proposed buildings with an EER/COP 10% more efficient than the minimum allowed under MEPS for an equivalent sized unit. All ventilation systems must be selected to meet DTS requirements of Part J5. If alternative HVAC zoning or equipment types are proposed, please notify SDC of the proposed system types and zoning so that we can update the energy model and confirm that the building fabric advice provided is still relevant.
Access & Monitoring	Access must be provided to all plant, equipment and components of services that require maintenance. The building must have energy meters configured to record individual time-of-use consumption of gas and electricity, including the energy consumption of the air-conditioning plant, artificial lighting, appliance power, central hot water supply, and other ancillary plant uses. These energy meters must be interlinked by a communication system that collates the time-of-use energy consumption data to a single interface monitoring system where it can be stored, analysed and reviewed.

HVAC Layout and Thermal Envelope

Coloured area mark-ups indicate the assumed HVAC zones and areas not highlighted indicate assumed non-conditioned spaces. The pink perimeter indicates the building's thermal envelope and requires R2.5 added insulation.

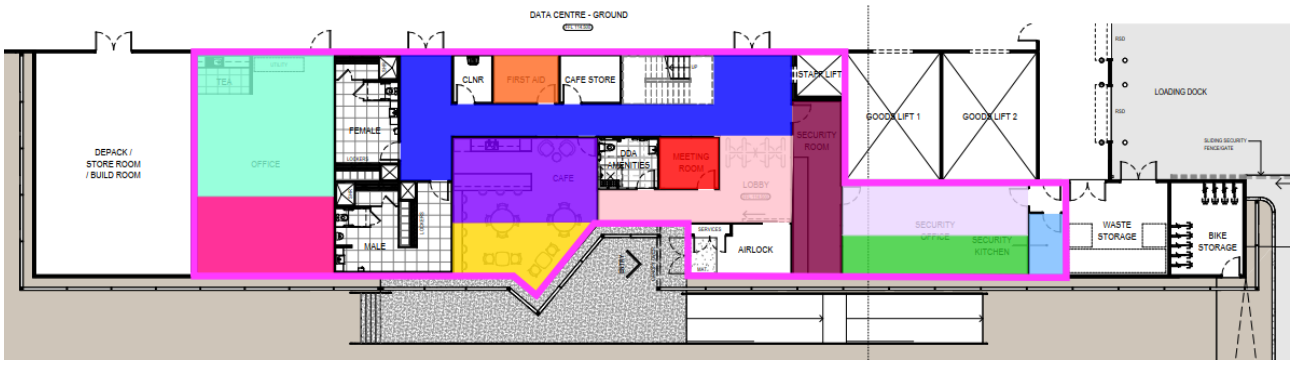

Figure 5: Office Ground Floor HVAC zones and thermal envelope

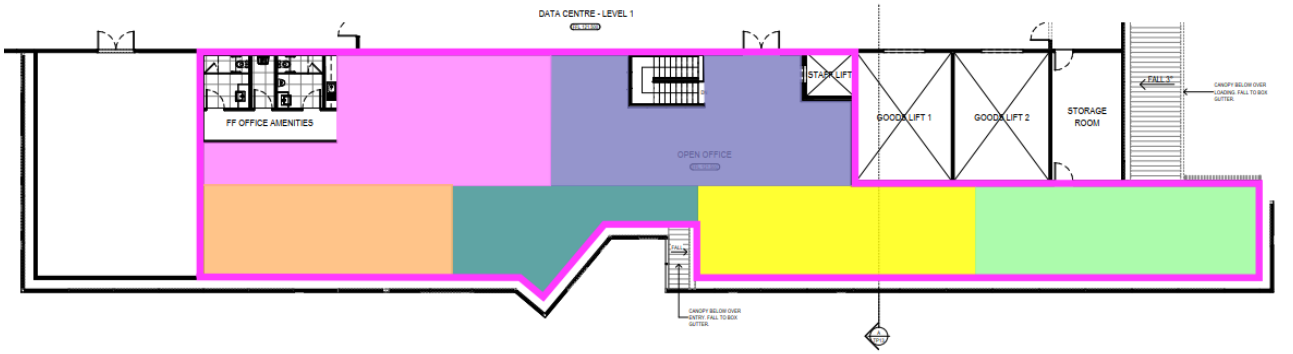

Figure 6: Office Level 1 HVAC zones and thermal envelope

Insulation Requirements

Level 1 floor sections highlighted in green form part of the thermal envelope and require added insulation to achieve a total system R-value of R2.0.

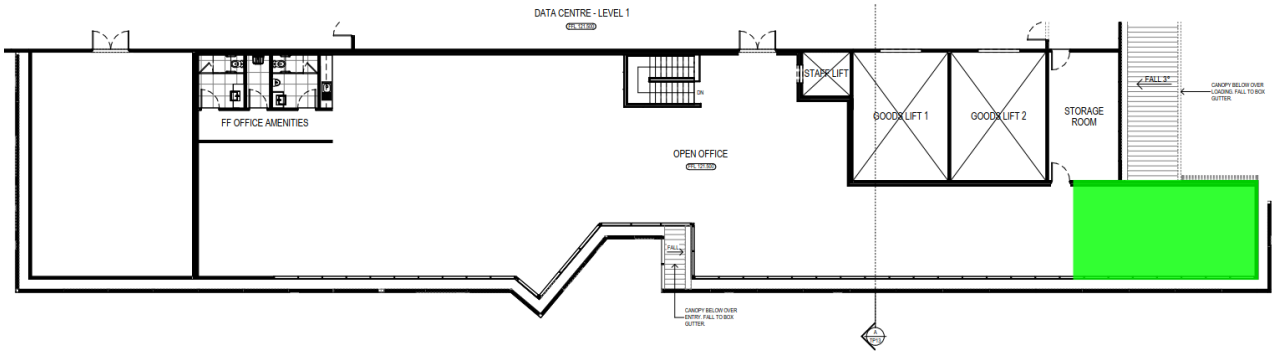

Figure 7: Office Level 1 floor insulation requirement mark up

Roof sections highlighted in red form part of the thermal envelope and require added insulation to achieve a total system R-value of R3.2.

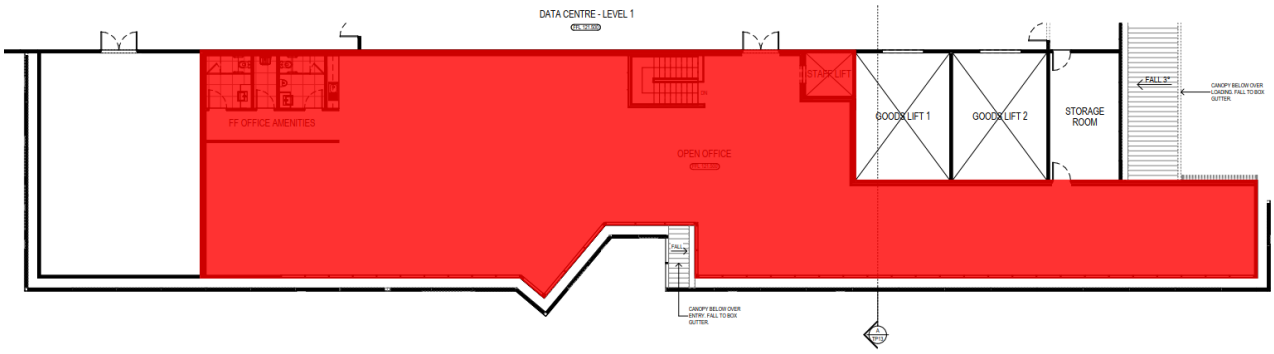

Figure 8: Office roof insulation requirement mark up

Results

Compliance with BCA Section J (based on Verification Method JV3) is achieved if the respective predicted annual greenhouse gas emissions of Simulation B and Simulation C are 'less than' or 'equal to' the predicted energy consumption of Simulation A. It has been found that at present the proposed design can meet the requirements of Verification Method JV3 of the 2019 BCA, assuming the parameters outlined above are met. See the table below for the results of the assessment.

Energy End Use	SIMULATION A BCA 'Deemed to Satisfy' Fabric and Services (Reference Building) (kWh)	SIMULATION B Proposed building fabric with 'Deemed to Satisfy' Services (kWh)	SIMULATION C Proposed Building Fabric with Minimum Required Services (kWh)
Space Heating	12,515	11,810	10,954
Space Cooling	1,432	1,409	1,281
Air Handling Units (Supply Fans)	9,416	8,996	8,996
Lighting	469,941	469,941	469,941
TOTAL (kWh)	493,303	492,156	491,172
TOTAL (HVAC – heating + cooling + fans) (kWh)	23,363	22,215	21,231
TOTAL Greenhouse Gas Emissions ($KgCo^2$/year)	573,613	572,278	571,134

For the thermal comfort, the below calculation is based on occupancy equating to 2,313 hours per year per office space and 1,236 hours per year per common space. As such, it is confirmed that the project will comply with the NCC 2019 JV3 requirement to maintain PMV levels between -1 and +1 across 95% of the floor area of all occupied zones for over 98% of the year in each space.

The table below lists the results of the thermal comfort assessment.

Zone	Annual Occupied Hours	Annual Hours Within Threshold	% of Annual Hours Within Threshold
Ground Floor			
Office South	2,313	2,313	100
Office Internal	2,313	2,313	100
Cafe South	2,313	2,313	100
Cafe Internal	2,313	2,313	100
First Aid	2,313	2,313	100
Meeting Room	2,313	2,313	100
Security Room	2,313	2,313	100
Security Office South	2,313	2,313	100
Security Office Internal	2,313	2,313	100
Security Kitchen	2,313	2,313	100

First Floor			
Open Office South 1	2,313	2,313	100
Open Office South 2	2,313	2,313	100
Open Office South 3	2,313	2,313	100
Open Office South 4	2,313	2,313	100
Open Office Internal 1	2,313	2,313	100
Open Office Internal 2	2,313	2,313	100
Total Floor Area Achieving above 98% of Annual Occupied Hours Within Threshold			**100%**

Compliance with the thermal comfort requirements of the 2019 BCA JV3 verification method is demonstrated as the proposed building achieves a Predicted Mean Vote ranging between -1 and +1 for more than 98% of the annual hours of operation of the office building.

Wall Insulation Calculations

The total wall system R-value for each wall type used in the proposed building model are calculated from the NCC 2019 Façade Calculator.

If alternative wall specifications are proposed, please notify SDC of the proposed specification types and layers so that the calculations can be revised and confirm that the building fabric advice provided is still relevant.

Note: The wall structure and insulation types specified for the development must, as a minimum, meet the thermal performance values detailed here for this design advice to hold true.

The following calculations were input for non-spandrel walls forming the thermal envelope in the NCC 2019 Façade Calculator:

Precast Concrete Wall

Wall Systems

	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation		Unventilated					
Material	Concrete - solid	Insulation 90mm R2.5	Gypsum plasterboard				
Thickness (mm)	150	90	13				
Conductivity (W/mK)	1.440	0.036	0.170				
Framing Material		Steel					
Metal Frame, Web Thickness (mm)		0.75					
Metal Frame, Flange Width (mm)		35					
Framing Area %		13.0%					
Thermal Break Material		Thermatape					
Thermal Break Thickness (mm)		10					
Thermal Break Overlap Area %							
Resistance (m².K/W)	0.10	1.23	0.08	0	0	0	0
Wall Construction	Concrete 150mm		External Surface Resistance (moving air, more than 3m/s and not more than 7/ms wind speed)				0.03
						Internal Surface Resistance (still air, on a wall)	0.12
						System R-Value (m².K/W)	1.56
						System U-Value (W/m².K)	0.64

Precast Concrete Wall (Internal)

Wall Systems

	Layer 1	Layer 2 (Air space)	Layer 3	Layer 4	Layer 5	Layer 6	Layer 7
Ventilation		Unventilated					
Material	Concrete - solid	Insulation 90mm R2.5	Gypsum plasterboard				
Thickness (mm)	150	90	13				
Conductivity (W/mK)	1.440	0.036	0.170				
Framing Material		Steel					
Metal Frame, Web Thickness (mm)		0.75					
Metal Frame, Flange Width (mm)		35					
Framing Area %		13.0%					
Thermal Break Material		Thermatape					
Thermal Break Thickness (mm)		10					
Thermal Break Overlap Area %							
Resistance (m².K/W)	0.10	1.23	0.08	0	0	0	0
Wall Construction	Concrete 150mm (Int Semi-Expo)					Internal Surface Resistance (Still air)	0.14
						Internal Surface Resistance (still air, on a wall)	0.12
						System R-Value (m².K/W)	1.67
						System U-Value (W/m².K)	0.60

Preliminary NCC 2019 Façade Calculator

Preliminary NCC 2019 Façade Calculator (used to prepare the reference building for the JV3 assessment) is provided below. Please note that the most likely building fabric for the proposed development is provided in the JV3 modelling advice above, the below is for comparison purposes only.

Façade

Wall Glazing Areas + Results

User Input | Active Row - All Inputs Required | User Dropdown | Calculator

Results | Class 5 - office building | Climate Zone 6 - Mild temperate

Method 1

Wall-glazing U-Value

	North	East	South	West
W/m².K	0.00	0.00	0.00	0.00

Proposed Design | DTS Reference

Solar Admittance

	North	East	South	West
SA	0.000	0.000	0.000	0.000

Proposed Design | DTS Reference

Method 2

Wall-glazing U-Value - ALL

W/m².K	0.00	2.00

Proposed Design | DTS Reference

AC Energy Value

AC Energy	0	73

Proposed Design | DTS Reference

Wall Glazing Area

Compliant Solution =
Non-Compliant Solution =

North	Glazing Reference	Height (m)	Width (m)	Glazing Area (m²)	Shading Reference	Wall Reference	Wall Area (m²)	Total Area (m²)	Internal
1						Internal	512.12	512.12	☑
2						External	28.98	28.98	☐
3									☐
4									☐
5									☐
6									☐

	Result	Target				
Wall-glazing U-Value (W/m².K)	0.00	2.00	Glazing Area (m²)	0	Average Glazing U-Value (W/m².K)	
Solar Admittance			Wall Area (m²)	541.1	Average Glazing SHGC	
			Glazing to Façade Ratio	0%	Average Wall R-Value (m².K/W)	

East	Glazing Reference	Height (m)	Width (m)	Glazing Area (m²)	Shading Reference	Wall Reference	Wall Area (m²)	Total Area (m²)	Internal
1						External	21	21.00	☐
2						Internal	108.92	108.92	☑
3									☐
4									☐
5									☐
6									☐

	Result	Target				
Wall-glazing U-Value (W/m².K)	0.00	2.00	Glazing Area (m²)	0	Average Glazing U-Value (W/m².K)	
Solar Admittance			Wall Area (m²)	129.92	Average Glazing SHGC	
			Glazing to Façade Ratio	0%	Average Wall R-Value (m².K/W)	

South	Glazing Reference	Height (m)	Width (m)	Glazing Area (m²)	Shading Reference	Wall Reference	Wall Area (m²)	Total Area (m²)	Internal
1	Fixed GF	2.7	34.05	91.935		External	236.635	328.57	☐
2	Fixed L1	2.7	51.7	139.59		Spandrel	95.34	234.93	☐
3									☐
4									☐
5									☐
6									☐

	Result	Target				
Wall-glazing U-Value (W/m².K)	0.00	2.00	Glazing Area (m²)	231.525	Average Glazing U-Value (W/m².K)	0.00
Solar Admittance			Wall Area (m²)	331.975	Average Glazing SHGC	
			Glazing to Façade Ratio	41%	Average Wall R-Value (m².K/W)	

West	Glazing Reference	Height (m)	Width (m)	Glazing Area (m²)	Shading Reference	Wall Reference	Wall Area (m²)	Total Area (m²)	Internal
1	Fixed L1	2.7	2.55	6.885		External	12.63	19.52	☐
2	Sliding Door	2.7	1.95	5.265		Spandrel	5.46	10.73	☐
3						Internal	129.92	129.92	☑
4									☐
5									☐
6									☐

	Result	Target				
Wall-glazing U-Value (W/m².K)	0.00	2.00	Glazing Area (m²)	12.15	Average Glazing U-Value (W/m².K)	0.00
Solar Admittance			Wall Area (m²)	148.01	Average Glazing SHGC	
			Glazing to Façade Ratio	8%	Average Wall R-Value (m².K/W)	

Reference Building

Include shading? As Proposed

	Glazing to Façade Ratio	Wall U-Value (W/m².K)	Method 1 Glazing U-Value (W/m².K)	Shading Multiplier	SHGC	Wall U-Value (W/m².K)	Method 2 Glazing U-Value (W/m².K)	SHGC
North	0%			0.000		0.80	4.14	0.32
East	0%	0.71	1.50					
South	41%	1.00	3.43	1.000	0.32			
West	8%	0.71	5.80	1.000	0.81			

Appendix 4 – Daylight Assessment

The daylight assessment was carried out using DesignBuilder with the same inputs as the thermal performance modelling, including the building geometry and orientation, and the following reflectivity (building fabric) / visible light transmittance (fenestration):

Building Fabric	Reflectivity
Concrete External Wall	0.25
Plasterboard Wall Lining	0.80
Ceiling Tiles	0.70
Floor Tiles	0.20
Carpet	0.10
Vinyl	0.25
Offices & Warehouse Zincalume Roof	0.35
Fenestration	**Visible Light Transmittance**
External Double-glazed Fixed Windows	0.55
External Hinged Doors	0.40

These glazing values are based on EVantage grey double glazing in Capral aluminium frames for external fenestrations.

Below is an image of the rendered view of the daylight model for the proposed development. Note that the colour is for display purposes only.

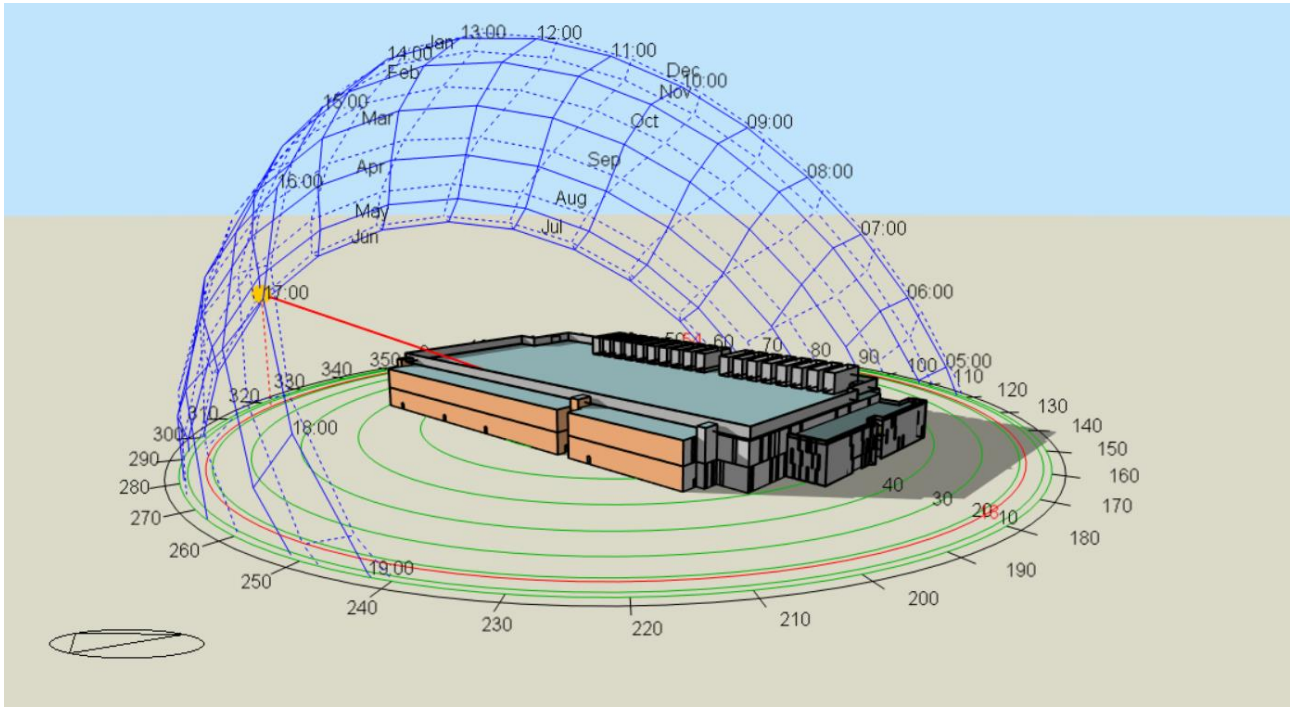

Figure 9: An overall view of the daylight model for the proposed development, showing the sun-path at 3pm on 15th July as an example

Below is a list of the applicable office spaces included in this daylight assessment. The data centre is designed to store sensitive equipment and thus is not suited to having any translucent roof sheeting, resulting in no daylight penetration of the space.

- Office
- Café
- Meeting Room
- Security Room
- Security Office
- Level 1 Open Office

Results

The images in this section are lux/daylight factor map exported from the modelling program DesignBuilder which were produced by the Radiance simulation engine. Please note that they are a graphical representation of the results only, for accurate results please refer to the summary in Table 2 below, and

Table 3 following for details.

Table 2: Summary of Daylight Analysis Result

	Total Floor Area (m^2)	Floor Area above Threshold (m^2)	Floor Area above Threshold (%)
All Office Spaces	604.8	201.4	33.3

The summary table above presents the daylight modelling results of the applicable spaces which indicate that at least 33% of the office spaces will achieve more than 2% daylight factor.

Lux/daylight factor map legend

- Grey < 2.0% DF (non-compliant area)
- Black to Red >2.0% DF (compliant area)

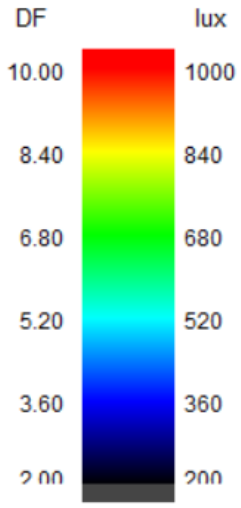

Table 3: Detailed Results of Daylight Analysis

(2% Daylight Factor Threshold)			
Zone	Total Floor Area (m^2)	Floor Area above Threshold (m^2)	Floor Area above Threshold (%)
Ground Floor			
Office	78.7	15.7	19.9
Café	49.2	17.4	35.3
Meeting Room	7.7	0.0	0.0
Security Room	22.0	4.3	19.7
Security Office	43.3	21.9	50.4
Level 1			
Open Office	404.0	142.2	35.2

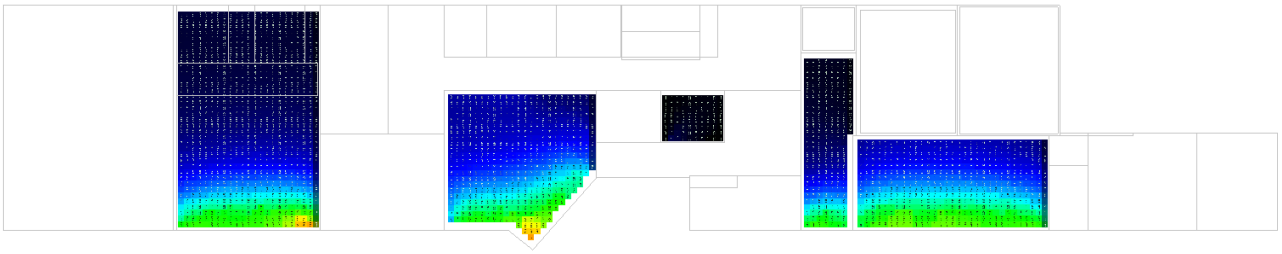

Figure 10: Office Ground Floor Daylight Factor Map

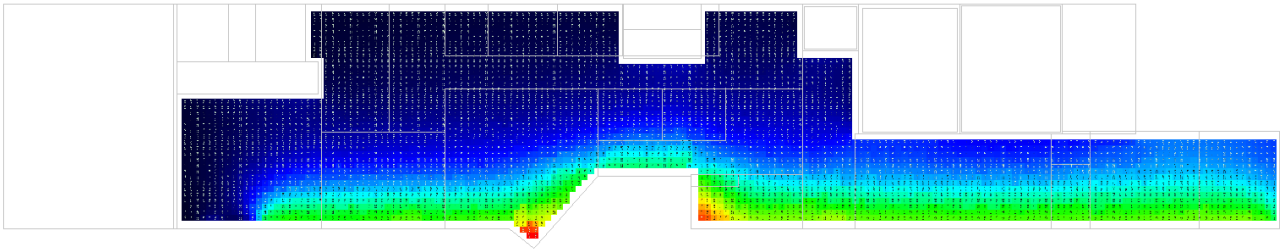

Figure 11: Office Level 1 Daylight Factor Map