23-47 Villiers Street, North Melbourne

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A	12.03.2024	FP/DC/MT/DO	LD	TP Draft
B	22.04.2024	FP/DC/MT/DO	LD	TP
C	04.09.2024	FP/DC/MT/DO	LD	TP

Contents

Appendices

1.0 Introduction

Ark Resources has been engaged by Sentinel to provide advice in relation to environmentally sustainable development outcomes from the proposed development at 23-47 Villiers Street, North Melbourne.

The proposed mixed-use development at 23-47 Villiers Street, North Melbourne has been designed to meet Clauses 15.01-2L-01 (Energy and Resource Efficiency) and 53.18 (Stormwater Management) of the Melbourne Planning Scheme. This report demonstrates how the development meets policy objectives of Clauses 15.02 and 53.18 (Stormwater Management in Urban Development) of the Planning Scheme.

This report contains a summary of:

- Environmental objectives adopted for the development
- Sustainable design initiatives integrated into the design of the project.

Performance outcomes in this report are based on:

- Discussions and correspondence with Tim Cox, Architectus
- Architectural drawings prepared by Architectus, issued 28.08.2024 (Rev A).

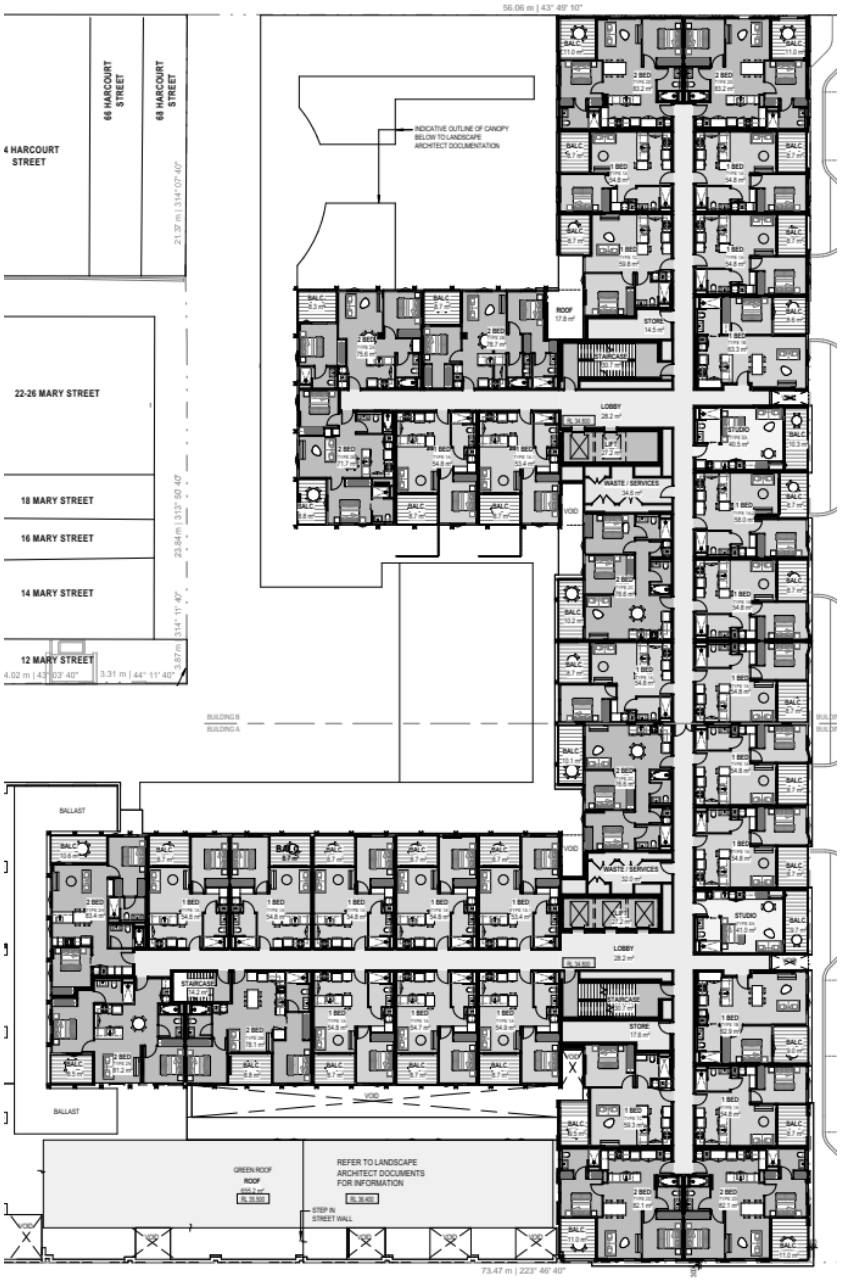
2.0 Site Description

The building comprises the following uses:

- 353 Build to Rent apartments, with 502 bedrooms
- Communal facilities for residents
- Office for building management
- Located within the Melbourne City Council
- Site area 6,528m2 (approximately)
- Surrounds mix of residential and commercial uses

A plan of Level 3 of the proposed development is provided.

An image of the site and the surrounding locale is provided on the following page.




Morrah St
Canning St
Chapman St
Fleming Rd
Levers Ln
Park Dr
Wood St
Abbotsford St
Hardwicke St
A60
Harris St
Harcourt St
Villiers St
Vale St
Courtney St
Flemington Rd
Grattan St
Medical Rd
O'Shanassy St
Arden St
North Melbourne
Oxford St
Tyrone St
Blackwood St
Berkeley St
Barry St
Errol St
Leveson St
Glass St
Provost St
Bedford St
Pelham St
Queensberry St

3.0 Key ESD Initiatives

A detailed analysis has been undertaken in order to nominate the ESD initiatives required and confirm the performance outcomes achieved. The results of this analysis are set out in the remainder of this report.

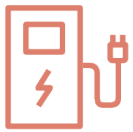
The following key sustainable design initiatives have been incorporated into this project:

Energy

Commitment to 100% Green Power

Transport

Electric vehicle chargers and infrastructure



Water

Rainwater harvesting system for toilet flushing

Performance

Energy efficient glazing and building services, appliances and fixtures

An assessment of sustainable design outcomes of the proposed development has been undertaken with Green Star Buildings, FirstRate 5 and MUSIC benchmarking tools. The information presented in this report demonstrates that:

Green Star Buildings

The development will achieve a 5 Star Green Star Buildings performance standard

5.0

star

Thermal Performance

The development will achieve a NatHERS development average of:

7.5

stars

Water Efficiency

The project will use 15% less potable water compared to a reference building.

15%

Stormwater

The development meets the Best Practice standard for stormwater quality.

4.0 MUSIC Modelling

To assess the quality of stormwater runoff from the site, an analysis has been undertaken using MUSIC Modelling software.

The proposed development exceeds the pollutant load reduction targets set out in the Best Practice Environmental Management Guidelines (BPEMG)

Reduction in Total Suspended Solids (TSS) load: **87.8%**	Reduction in Total Phosphorus (TP) load: **65.7%**
Reduction in Total Nitrogen (TN) load: **70.5%**	Reduction in Gross Pollutants (GP) load: **99.8%**

Refer to **Error! Reference source not found.** for the MUSIC rating results, **Error! Reference source not found. Error! Reference source not found.** for rainwater harvesting and reliability results and Appendix E for the WSUD Maintenance Manual.

A rainwater harvesting system will be installed comprising:

- 120kL rainwater tank, with harvested water from Building A & B (all roofs levels 2 and above). Catchment area approx. 3,867m2. Tank connected for toilet flushing to all residential toilets levels Lower Ground 2 to Level 9
- 20kL rainwater tank, with harvested water from Level 2 pool Terrace Building B and Level 1 Communal Terrace Buildings A & B. Catchment area approx. 340m2. Tank connected for irrigation
- Filtration and treatment of all rainwater prior to draining into the tank
- Total storage volume of 140kL rainwater tanks

In addition to the harvesting and re-use of rainwater, the following features will be incorporated into the proposed design to facilitate treatment of stormwater runoff:

- Surface runoff from hard paved areas – Green Heart and Little George Street, directed to raingardens with a total area of 20m2;
- A Rocla CDS Nipper gross pollutant trap (or equivalent primary treatment device) located near stormwater Legal Point of Discharge to Harcourt Street to capture suspended solids and litter generated onsite;
- 46kL detention tank prior to the Villiers Street Legal Point of Discharge

5.0 NatHERS Energy Ratings

FirstRate5 (Version 5.5.4(3.22)) energy ratings have been undertaken for a representative sample of the apartments.

The development achieves a 7.5 star average NatHERS rating which represents a high standard of thermal efficiency.

The energy ratings results indicate that the development will exceed the standard required by the National Construction Code 2022 in relation to residential sustainability.

Please refer to Appendix D for details of energy ratings and building construction assumptions.

NatHERS Rating

The project will achieve a development average of:

7.5

stars

Heating Load

The project has an average heating load of

26.1

MJ/m^2

Cooling Load

The project has an average cooling load of

19.6

MJ/m^2

6.0 Green Star Building

The Green Star Buildings (v1 Rev C) tool has been used as a benchmarking framework for the proposed scheme and demonstrates that the development has the preliminary design potential to achieve a 5 Star standard.

A detailed Green Star assessment has been undertaken to confirm the credits achievable by the proposed scheme.

The project will also reduce potable water use by 15% (compared to a reference building), meeting the requirements of Credit 25.

The initiatives which contribute to the 5 Star Green Star Buildings rating are detailed in Section 8.1 below.

Green Star Building Rating

5.0

stars

Total Points Targeted

47

points

Note that a minimum of 35 points must be achieved for a 5 star Green Star Buildings rating to be achieved. A points margin of 20% has been incorporated into the pathway presented in this report as a contingency to allow for the inevitable change to the pathway inclusive of attrition which typically occurs during the detailed design and construction phases. This does not imply that the applicant commits to delivering more than the points required for the rating targeted.

Summary of Green Star Building credits targeted.

Credit		Target	Points
1	Industry Development	Credit Achievement	1
2	Responsible Construction	Credit Achievement	1
3	Verification and Handover	Credit Achievement	1
4	Operational Waste	Minimum Expectation	
5	Responsible Procurement		
6	Responsible Structure	Credit Achievement	3
7	Responsible Envelope		
8	Responsible Systems		
9	Responsible Finishes	Credit Achievement	1
10	Clean Air	Minimum Expectation	
11	Light Quality	Credit Achievement	2
12	Acoustic Comfort	Credit Achievement	2
13	Exposure to Toxins	Credit Achievement	2
14	Amenity and Comfort	Credit Achievement	2
15	Connection to Nature		
16	Climate Change Resilience	Credit Achievement	1
17	Operations Resilience		
18	Community Resilience		
19	Heat Resilience	Credit Achievement	1
20	Grid Resilience		
21	Upfront Carbon Emissions	Credit Achievement	3
22	Energy Use	Credit Achievement	3
23	Energy Source	Exceptional Performance	6
24	Other Carbon Emissions	Credit Achievement	2
25	Water Use	Minimum Expectation	
26	Life Cycle Impacts	Credit Achievement	2
27	Movement and Place	Credit Achievement	3
28	Enjoyable Places		
29	Contribution to Place	Credit Achievement	2
30	Culture, Heritage and Identity		
31	Inclusive Construction Practices	Credit Achievement	1
32	Indigenous Inclusion		
33	Procurement and Workforce Inclusion		
34	Design for Inclusion		
35	Impacts to Nature	Minimum Expectation	
36	Biodiversity Enhancement		
37	Nature Connectivity		
38	Nature Stewardship		
39	Waterway Protection	Credit Achievement	2
40	Market Transformation		
41a	Leadership Challenges – Climate Positive Pathway	Credit Achievement	1
41b	Sector Specific Credit - Tenant Energy Source	Exceptional Performance	5

Refer to Appendix A for details of credit requirements

7.0 Conclusion

This report provides details of a comprehensive package of sustainable design features which will be integrated into the design and specification of the proposed mixed-use development in order to improve environmental outcomes during occupation.

In terms of performance outcomes, the analysis presented in this report demonstrates that the proposed development will:

- attain a 5 star Green Star standard based on the Buildings rating tool (V1 Rev C);
- reduce potable water; and
- attain the Best Practice standard for urban stormwater quality

Accordingly, the sustainable design outcomes from the proposed development are considered to be consistent with the objectives of Clauses 15.01-2L-01 (Energy and Resource Efficiency) and 53.18 (Stormwater Management) of the Melbourne Planning Scheme.

Please note that this analysis is based on the best information currently available in relation to the technical and commercial feasibility of the initiatives proposed. Further investigation will be undertaken during design development which may result in change to the package of initiatives specified in order to meet the 5 star Green Star Buildings

Green Star

The combination of design features and services initiatives meets all the standards for a Green Star Building Rating of:

5.0

stars

Potable Water Reduction

Using the GSB Credit 25 Water Use calculator, the development will achieve a reduction against a reference building, of:

15%

Best Practice

The development meets the Best Practice standard for stormwater Quality

Appendix A. Green Star Building Pathway

The key design elements and processes which underpin the preliminary Green Star rating are summarised in the table below. The design attributes will be incorporated into the design in accordance with the technical criteria for each credit set out in the Green Star Buildings Submission Guidelines (v1 Revision C, 18 October 2023).

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
1 Industry Development The development facilitates industry transformation through partnership, collaboration, and data sharing	The building owner or developer appoints a Green Star Accredited Professional (GSAP).	1	Strategy Brief Concept Design Tender Construction Handover Use
	The building owner or developer discloses the cost of sustainable building practices to the GBCA. The project team must complete, and include in the submission, the Green Star Financial Transparency disclosure template. The template requires and enables the project team to submit the cost of sustainable building practices of the project including design, construction, and documentation to the GBCA.		
	The building owner or developer markets the building's sustainability achievements. The project team must: – Provide information from the project's marketing team must answer the questions in the submission form for a Green Star Case Study. The case study seeks information on the sustainability initiatives that the building targeted to enable it being featured on the GBCA's website – Detail how the building will detail its sustainability achievements to its stakeholders. The stakeholders are defined as the typical building occupants and visitors.		
	The building owner or developer appoints a Green Star Accredited Professional (GSAP).		
2 Responsible Construction The builder's construction practices reduce impacts and promote opportunities for improved environmental and social outcomes	The builder must have an environmental management system (large builders will need to be ISO14001 accredited).	MINIMUM EXPECTATION	Tender Construction
	The site must have a project specific Environmental Management Plan (EMP). The EMP must be developed to cover the scope of construction activities to assist the head contractor and its service providers to manage environmental performance conditions and impacts arising from demolition, excavation, and construction. It must be implemented from the start of construction and include all works within the project scope.		
	80% of Construction and demolition waste must be recycled.		
	The builder must have an environmental management system (large builders will need to be ISO14001 accredited).		
	Sustainability training is provided to construction workers. The head contractor must provide the following training:		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	– Information on the sustainable building certification(s) sought, including: · the sustainability attributes of the building and their benefits the value of certification · the role site worker(s) play in delivering a sustainable building		
	90% of construction and demolition waste is diverted from landfill, and waste contractors and facilities comply with the Green Star Construction and Demolition Waste Reporting Criteria	1	
3 Verification and Handover The building has been optimised and handed over to deliver a high level of performance in operation	The building is set up for optimum ongoing management due to its appropriate metering and monitoring systems. The building must have accessible energy and water metering for all common uses, major uses, and major sources. The meters must be connected to a monitoring system capable of capturing and processing the data produced by the meters. The monitoring system must accurately and clearly present the metered data and include reports on consumption trends for the automatic monitoring system.	MINIMUM EXPECTATION	Design Tender Construction Handover Use
	The building has set environmental performance targets, designed and tested for airtightness, been commissioned, and will be tuned. The project team must perform the following: – Prior to construction: · Set environmental performance targets · Perform a services and maintainability review · Design for airtightness – During construction and practical completion: · Commission the building · Engage building tuning service provider · Test for airtightness – After practical completion: · Tune the building over the next 12 months		
	The project team create and deliver operations and maintenance information to the facilities management team at the time of handover. Information is available to building users on how to best use the building.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	The project team must provide operations and maintenance information for all nominated building systems to the building owner (or designated representative). This means: – Appropriate content for all nominated building systems has been developed and provided – The appropriate user group has access to the information they require to deliver best practice environmental outcomes – Guidance on keeping information up to date is provided to the facilities management team in these documents		
	An independent level of verification is provided to the commissioning and tuning activities through the involvement of an independent commissioning agent. or The project uses a soft landings approach that involves the future facilities management team.	1	
4 Operational Waste Operational waste can be separated and recovered in a safe and efficient manner The building must have appropriate spaces for waste management and an appropriately sized loading dock	The building is designed for the collection of separate waste streams. The building must provide bins or storage containers to building occupants to enable them to separate their waste. These bins must be labelled and easy to access, and evenly distributed throughout the building. They must also allow for separating the following as a minimum: – General waste going to landfill – Recycling streams to be collected by the building's waste collection service, including: · paper and cardboard · glass · plastic – One additional waste stream identified by the project team. This may include collecting any of the following waste types: · organics, e-waste, batteries etc.	MINIMUM EXPECTATION	Design Handover Use
	The building provides a dedicated and adequately sized waste storage area. A dedicated area, or areas, for the storage and collection of the applicable waste streams must be provided. The storage area must be sized to accommodate all bins or containers, for all applicable waste streams, for at least one collection cycle.		
	The building ensures safe and efficient access to waste storage areas for both occupants and waste collection contractors.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	A waste specialist and/or contractor must sign-off on the designs to confirm they are adequately sized and located for the safe and convenient storage and collection of the waste streams identified.		
6 Responsible Structure The building's structure is comprised of responsibly manufactured products	50% of all structural components (by cost) meet a Responsible Products Value of at least 10 The structure is defined as load bearing and stability components of a building	3	Design Tender Construction
9 Responsible Finishes The building's internal finishes are comprised of responsibly manufactured products	40% of all internal building finishes (by cost) meet a Responsible Products Value of at least 7. Internal finishes include flooring, plasterboard, paints, ceilings, partitions, doors, internal windows or similar. Joinery used as part of a wall finish may be counted, e.g. wall panelling or fixed shelving/cupboards that make up a partition. Sealants and adhesives used for finishes are also included. Loose furniture is not included.	1	Design Tender Construction
10 Clean Air Pollutants entering the building are minimised, and a high level of fresh air is provided to ensure levels of indoor pollutants are maintained at acceptable levels	Non-residential building ventilation systems must be designed to comply with ASHRAE Standard 62.1:2013 or AS 1668:2012 (whichever is greater) regarding minimum separation distances between pollution sources and outdoor air intakes. All new and existing ductwork that serves the building must be cleaned prior to occupation in accordance with a recognised Standard.	MINIMUM EXPECTATION	Design Tender Construction Handover Use
	The building must be provided with at an adequate amount of outside air. The regularly occupied areas must be provided with good access to outdoor air, appropriate for the activities and conditions by using one of the following options: Where ventilation is by mechanical means, the building must provide outdoor air as per AS1668.2:2012 for the default occupancy. Where ventilation is by natural means, the building must meet natural ventilation requirements as per AS1668.4:2012. Where active heating or cooling is provided, a dedicated and controlled outside air path must be constructed and commissioned at a rate of at least 2.5L/s per bedroom and living space, with a minimum of 5L/s per unit. Outside air must be provided to each space that is heated or cooled.		
	Point source pollutants must be exhausted directly outside (printers, kitchens).		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
11 Light Quality The building provides good daylight and its lighting is of high quality	Lighting within the building meets minimum comfort requirements. Lighting within the building must meet the following requirements: – All LED lighting installed has no observable effect as per the standard IEEE 1789-2015 – Light sources must have a minimum Colour Rendering Index (CRI) 85 or higher – Light sources must meet best practice illuminance levels for each task within each space type with a maintained illuminance that meets the levels recommended in AS/NZS 1680.1:2006 – The maintained Illuminance values must achieve a uniformity of no less than that specified in Table 3.2 of AS/NZS 1680.1:2006, with a maintenance factor method as defined in AS/NZS 1680.4 – All light sources must have a maximum of 3 MacAdam Ellipses deviation.	MINIMUM EXPECTATION	Concept Design Tender
	Good lighting levels suitable for the typical tasks in each space are available.		
	The building provides adequate levels of daylight. – Ensures regularly occupied areas are in reasonable proximity to glazed façades, windows, or skylights – Maximises daylight to spaces that prioritise learning, healing, and living: · For apartments, how in 95% of all apartments, the living rooms and all bedrooms have access to a view and daylight.		
	The building provides best practice artificial lighting. The artificial lighting solution must address the quality of light in the space, provide highlights and contrasts, and seek to avoid excessive lighting or overly uniform solutions. Horizontal illuminance levels must meet or exceed the recommended levels in AS/NZS 1680 for the relevant task for at least 90% of the GFA At least one wall in the field of view of a regularly occupied area is to be illuminated to create demonstrable contrast and visual interest. The total area of illuminated wall must represent at least 20% of the area of walls in the field of view	2	
12 Acoustic Comfort The building provides acoustic comfort for building occupants	Internal noise levels from services and the outside is limited through an acoustic comfort strategy. The Acoustic Comfort Strategy is to include: – A summary of the Standards, legislation, guidelines, and other requirements that apply to the project – The proposed performance metrics for each of the Acoustic Comfort criteria relevant to the different uses within the building and whether this exceeds minimum legislative or best practice guidelines – Description of how the design solution is intended to achieve the proposed performance metrics	MINIMUM EXPECTATION	Design Tender Construction Handover

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	Internal ambient noise levels in the regularly occupied areas must be no greater than the upper range value relevant to the activity type in each space as recommended in the current AS/NZS 2107:2016. and/or Internal ambient noise levels in the regularly occupied areas must be no greater than the upper range value relevant to the activity type in each space as recommended in the current AS/NZS 2107:2016. and/or The project must address noise transmission between enclosed spaces within the regularly occupied area. Compliance can be demonstrated via either: – Privacy – Sound insulation And/or The building minimises impact noise transfer in accordance with ISO 16283-2 and/or Reverberation time in the regularly occupied area must be below the maximum stated in the 'Recommended Reverberation Time' provided in Table 1 of AS/NZ 2107:2016.	2	

Project Type	Maximum Internal Noise Levels	Minimum Internal Noise Levels	Acoustic Separation	Impact Noise Transfer	Reverberation Control	Requirement for 2 points
Residential (Class 2, 3 & 9a)	•		•	•		2/3
Healthcare	•		•	•	•*	3/4
Schools	•	•	•	•	•	3/5
Fit-out (commercial)	•	•	•	•	•	4/5
Fit-out (retail)	•		•	•	•	3/4
Base build (commercial)	•		•			2/2
Base build (retail)	•		•			2/2
Sport and Leisure	•		•	•	•	3/4
Industrial	•		•			2/2

<table>
<tr><th>Green Star Credit Project Outcomes</th><th>Credit outcomes</th><th>Target</th><th>Project Stage</th></tr>
<tr><td>13 Exposure to Toxins

The building's occupants are not directly exposed to toxins in the spaces they spend time in</td><td>The building's paints adhesives, sealants, and carpets are low in TVOC or non-toxic.
At least 95% of internally applied paints, adhesives, sealants (by volume) and carpets (by area) must meet stipulated 'Total Volatile Organic Compounds (TVOC) Limits' below.
Paints, Adhesives and Sealants
<table><tr><th>Product category</th><th>Max. Total Volatile Organic Compounds (TVOC) content in grams per litre (g/L) of ready to use product</th></tr><tr><td>General purpose adhesives and sealants</td><td>50</td></tr><tr><td>Interior wall and ceiling paint, all sheen levels</td><td>16</td></tr><tr><td>Trim, varnishes, and wood stains</td><td>75</td></tr><tr><td>Primers, sealers, and prep coats</td><td>65</td></tr><tr><td>One and two pack performance coatings for floors</td><td>140</td></tr><tr><td>Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives</td><td>250</td></tr><tr><td>Structural glazing adhesive, wood flooring and laminate adhesives and sealants</td><td>100</td></tr></table>Carpets
<table><tr><th>Compliance option</th><th>Test protocol</th><th>Limit</th></tr><tr><td rowspan="2">ASTM D5116</td><td>ASTM D5116 - Total VOC limit*</td><td>limit* 0.5mg/m² per hour</td></tr><tr><td>ASTM D5116 - 4-PC (4-Phenylcyclohexene) *</td><td>0.05mg/m² per hour</td></tr><tr><td>ISO 16000 / EN 13419</td><td>ISO 16000 / EN 13419 - TVOC at three days</td><td>0.5 mg/m² per hour</td></tr><tr><td>ISO 10580 / ISO/TC 219 (Document N238)</td><td>ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours</td><td>0.5mg/m² per hour</td></tr></table></td><td rowspan="2">MINIMUM EXPECTATION</td><td rowspan="2">Design
Tender
Construction
Handover</td></tr>
<tr><td>The building's engineered wood products are low in TVOC or non-toxic.</td></tr>
</table>

<table>
<tr><th>Green Star Credit Project Outcomes</th><th>Credit outcomes</th><th>Target</th><th>Project Stage</th></tr>
<tr><td></td><td>Either no new engineered wood products are used in the building, or at least 95% (by area) of all engineered wood products meet specified formaldehyde emission limits, as per the following:
<table>
<tr><th>Test protocol</th><th>Emissions Limit / Unit of Measurement</th></tr>
<tr><td>AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood</td><td>≤1mg/L</td></tr>
<tr><td>AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16</td><td>≤1.5 mg/L</td></tr>
<tr><td>AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16</td><td>≤1mg/L</td></tr>
<tr><td>AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)</td><td>≤1mg/L</td></tr>
<tr><td>Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL</td><td>≤1mg/L</td></tr>
<tr><td>JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460</td><td>≤1mg/L</td></tr>
<tr><td>JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460</td><td>≤1mg/L</td></tr>
<tr><td>JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)</td><td>≤0.1 mg/m²hr*</td></tr>
</table>
<table>
<tr><th>Test protocol</th><th>Emissions Limit / Unit of Measurement</th></tr>
<tr><td>ASTM D5116 (applicable to high pressure laminates and compact laminates)</td><td>≤0.1 mg/m²hr</td></tr>
<tr><td>ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates</td><td>≤0.1 mg/m²hr (at 3 days)</td></tr>
<tr><td>ASTM D6007</td><td>≤0.12mg/m³**</td></tr>
<tr><td>ASTM E1333</td><td>≤0.12mg/m³***</td></tr>
<tr><td>EN 717-1 (also known as DIN EN 717-1)</td><td>≤0.12mg/m</td></tr>
<tr><td>EN 717-2 (also known as DIN EN 717-2)</td><td>≤3.5mg/m²hr</td></tr>
</table></td><td></td><td></td></tr>
<tr><td></td><td>Occupants are not exposed to banned or highly toxic materials in the building.
A comprehensive hazardous materials survey must be carried out on any existing buildings or structures on the project site, in accordance with the relevant Environmental and Work Health and Safety (WHS) legislation.</td><td></td><td></td></tr>
<tr><td></td><td>On-site tests verify the building has low Volatile Organic Compounds (VOC) and formaldehyde levels as follows:
<table>
<tr><th>Element</th><th>Concentration</th></tr>
<tr><td>TVOC</td><td>0.27 ppm</td></tr>
<tr><td>Formaldehyde</td><td>0.02 ppm</td></tr>
</table></td><td>2</td><td></td></tr>
<tr><td>14 Amenity and Comfort
The building provides internal amenities that improve occupant experience of using the building</td><td>The building has dedicated amenity rooms to act as a parent room, relaxation room, or an exercise room. The room(s) must be accessible to all staff and occupants. The room must be separate from bathrooms, showers, lockers, and active facilities. All amenities and/or infrastructure necessary to use the room(s) for its intended purposes must be provided (for example, including a sink or bench for a parent room).</td><td>2</td><td>Brief
Concept
Design
Tender
Handover
Use</td></tr>
</table>

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
16 Climate Change Resilience The building has been built to respond to the direct and indirect impacts of climate change	The project team completes the climate change pre-screening checklist. The project team communicates the building's exposure to climate change risks to the applicant	MINIMUM EXPECTATION	Strategy Brief Concept Design
	Climate Change Risk & Adaptation assessment undertaken during early stage aligned with AS5334 under RCP 8.5 for 2050 & 2080.	1	
19 Heat Resilience The building reduces its impact on heat island effect	At least 75% of the whole site area comprises of one or a combination of strategies that reduce the heat island effect. The strategies that can be used to reduce the heat island are: Vegetation – Green roofs – Roofing materials, including shading structures, having the following: · For roof pitched <15°– a three-year SRI of minimum 64 For roof pitched >15°– a three-year SRI of minimum 34 – Unshaded hard-scaping elements with a three-year SRI of minimum 34 or an initial SRI of minimum 39 – Hardscaping elements shaded by overhanging vegetation	1	Design Tender Construction
21 Upfront Carbon Emissions The building's upfront carbon emissions from materials and products have been reduced and offset	The building's upfront carbon emissions are at least 10% less than those of a reference building, calculated using the Upfront Carbon Emissions calculator.	MINIMUM EXPECTATION	Strategy Brief Concept Design
	The building's energy use is at least 20% less than a reference building, calculated using the Upfront Carbon Emissions calculator.	3	
	Where an existing building less than 30 years old has been fully or partly demolished for construction, an embodied carbon calculation must be done for the demolished portion and these emissions offset.		

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	Where the existing building is between 30 to 50 years old, the contribution must be calculated and discounted at 10% for every two additional years past year 30.		
22 Energy Use (Residential Pathway) The building has low energy consumption	The building has a weighted-area average of NatHERS 7.5 stars	MINIMUM EXPECTATION	Brief Concept Design Tender
	The building meets at least NatHERS 5 stars for each sole-occupancy unit		
	The building addresses domestic hot water demand		
	Where a pool exists, it has a pool cover		
	The building has a weighted-area average of NatHERS 7 Stars and at least NatHERS 5.5 Stars for each sole-occupancy unit	3	
	The building addresses four out of nine following building services energy uses (to be determined during DD): – Domestic Hot Water – Domestic Hot Water Generation – Heating and Cooling of Sole Occupancy Units – Clothes Drying – Ceiling Fans – Car Parking – Vertical Transportation – Lift Lobbies and Corridors – On-site solar PV		
23 Energy Source The building's energy comes from renewables	The building provides a Zero Carbon Action Plan. The Zero Carbon Action Plan must include a target date by when the building is expected to operate as fossil fuel free. The Zero Carbon Action Plan must cover all energy consumption, procurement, and generation and cannot rely on procuring renewable fuels as its only solution. It must also include infrastructure provided for tenants or future occupants such as gas installations for cooking.	MINIMUM EXPECTATION	Brief Concept Design Tender
	100% of the building's electricity comes from renewable electricity	**3**	
	100% of the building's energy comes from renewables	**3**	

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
24 Other Carbon Emissions The building's emissions from refrigerants, upfront carbon, and remaining carbon sources are eliminated or offset	The building owner eliminates emissions from high global warming potential refrigerants. or The building owner offsets emissions from refrigerants.	2	Concept Design Tender Construction
25 Water Use (Residential – Class 2 or 3) The building has low water use	The building will use 15% less potable water compared to reference building. The building installs efficient water fixtures: – Taps 5 star – Toilets 4 star – Urinals 5 star – Showers 3 star (<= 7.5 l/m) – Dishwashers 5 star – Washing machines 4 star	MINIMUM EXPECTATION	Design Tender Construction Use
26 Life Cycle Impacts The building has lower environmental impacts from resource use over its lifespan than a typical building	The reduction in life cycle impacts must be demonstrated through a whole-of-building, whole-of-life (cradle to grave) comparative Life Cycle Assessment (LCA), as defined by EN 15978. The results of the LCA must be entered into the GBCA's Life Cycle Assessment calculator.	2	Strategy Brief Concept Design Tender Construction
27 Movement and Place The building's design and location encourage occupants and visitors to use active, low carbon, and public transport options instead of private vehicles	There are showers, lockers, and change rooms in the building for staff.	MINIMUM EXPECTATION	Strategy Brief Concept Design Tender Construction
	The facilities are accessible, inclusive, and located in a safe and protected space		
	The building's access prioritises cycling and includes bicycle parking facilities – 446 bicycle spaces – Cycle maintenance rack and foot-pump – Retail staff EoT facilities including:	3	

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	– 1 shower, – 2 lockers – changing area with benching & ironing facilities Clear, safe and inclusive access to cyclist facilities via 2 lifts. 2-way ramp also provided (non-dedicated) – gradients of 1:10 or greater to incorporate minimum slip resistance classification of P5 in accordance with AS 4586.		
	Sustainable Transport Plan to be prepared and implemented.		
	EV charging infrastructure: – Chargers to 5% of car spaces: 13 chargers (minimum 7kW capacity) – EV charging to include load management supervisor hardware – Electrical containment e.g. trunking/conduit installed to facilitate future installation of cabling supplying a further 20% of car spaces (50 spaces)		
	Transport options that reduce the need for private fossil fuel powered vehicles are prioritised.		
	Walkability encouraged via access to at least 10 amenities across 5 categories – Walkscore = 80		
29 Contribution to Place The building's design makes a positive contribution to the quality of the public environment	The project team must provide an urban context report and public realm interface design that outlines the urban context of the development and the design responses. or Independent design reviews are to be held at key points in the development of the design.	2	Strategy Brief Concept Design Construction
31 Inclusive Construction Practices The builder's construction practices promote diversity and reduces physical and mental health impacts	There are provisions for providing gender appropriate facilities and personal protective equipment The head contractor also installs policies on-site to increase awareness and reduces instances of discrimination, racism, and bullying	MINIMUM EXPECTATION	Strategy Brief Tender Construction

Green Star Credit Project Outcomes	Credit outcomes	Target	Project Stage
	The head contractor must show that they have introduced programs and solutions to address Physical and Mental Health of potential site workers and sub-contractors based on a needs analysis. The project must provide an evaluation report to the client and sub-contractors on the effectiveness of the program.	1	
35 Impacts to Nature Ecological value is conserved and protected	The building was not built on, or significantly impacted, a site with a high ecological value	MINIMUM EXPECTATION	Strategy Brief Concept Design
	The building's light pollution has been minimised. All outdoor lighting on the project complies with AS/NZS4282:2019 Control of the obtrusive effects of outdoor lighting.		
	There is ongoing monitoring, reporting, and management of the site's wetland ecosystem		
39 Waterway Protection Local waterways are protected, and the impacts of flooding and drought are reduced	The project demonstrates a reduction in average annual stormwater discharge (ML/yr) of 40% across the whole site (Refer to Appendix C.4 for discharge rates).	2	Concept Design Construction Handover
	Specified pollution reduction targets are met (Refer to Section 4.0 and 0 for MUSIC modelling results and assumptions)		
41a Leadership Challenges	Climate Positive Pathway	1	
41b	Sector Specific Credit - Tenant Energy Source	5	
Total Green Star Points		**47**	
Green Star Rating		**5 Star**	

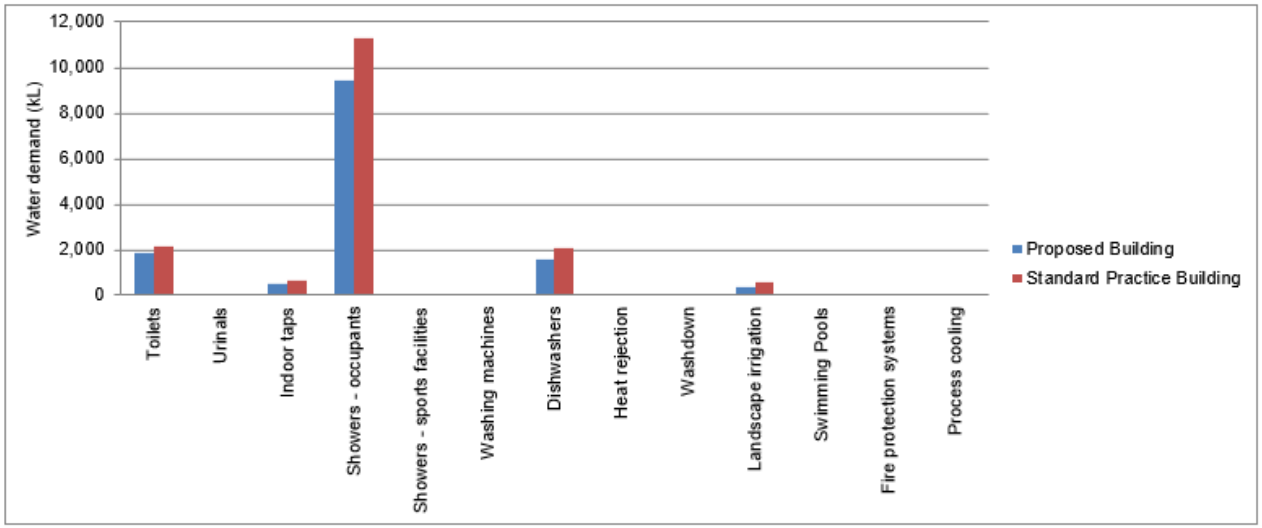
Appendix B. Green Star Buildings Credit 25 Water Use Calculator

Percentage reduction in Potable Water Consumption compared to the Standard Practice Building	**24%**

Points Achieved - General	**3.5**

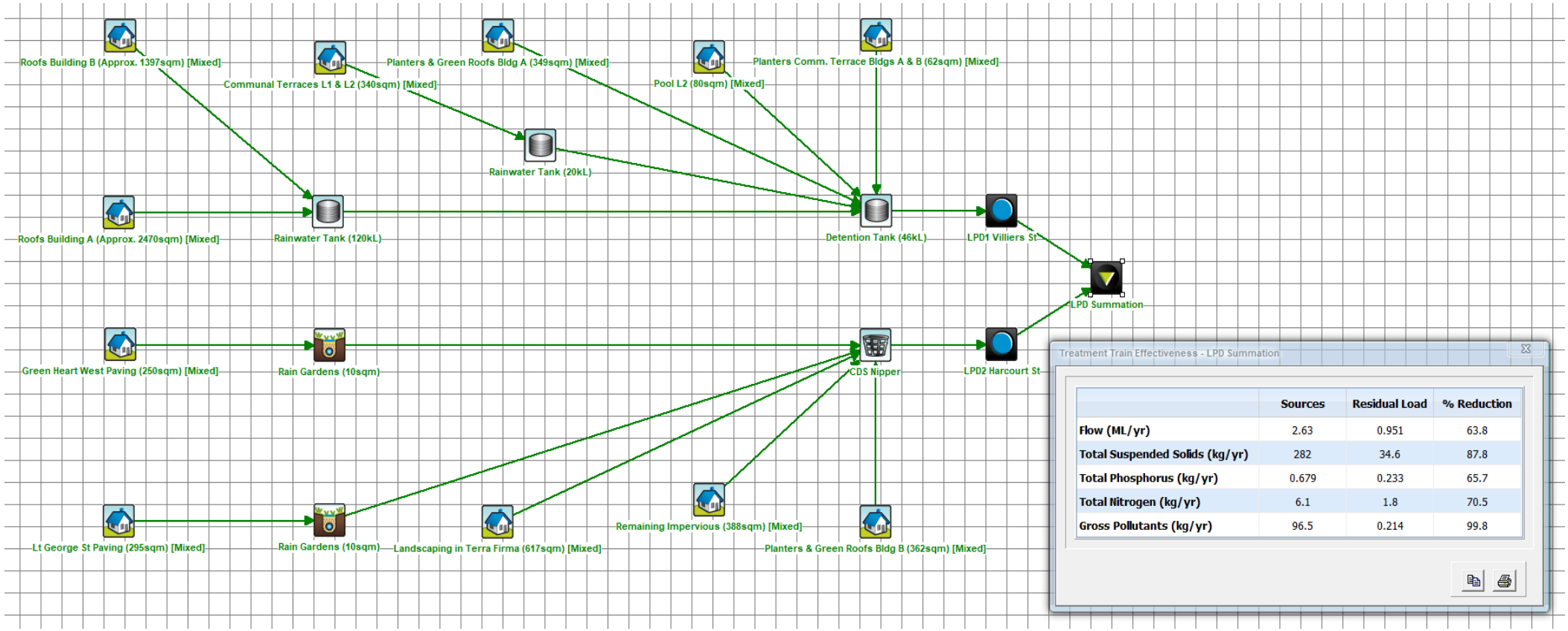
TOTAL WATER DEMAND FOR EACH SYSTEM

Water system	Proposed Building (kL)	Standard Practice Building (kL)
Toilets	1,866	2,132
Urinals	0	0
Indoor taps	522	652
Showers - occupants	9,422	11,306
Showers - sports facilities	0	0
Washing machines	0	0
Dishwashers	1,582	2,111
Heat rejection	0	0
Washdown	0	0
Landscape irrigation	336	548
Swimming Pools	1	1
Fire protection systems	0	0
Process cooling	0	0
Total	13,728	16,750



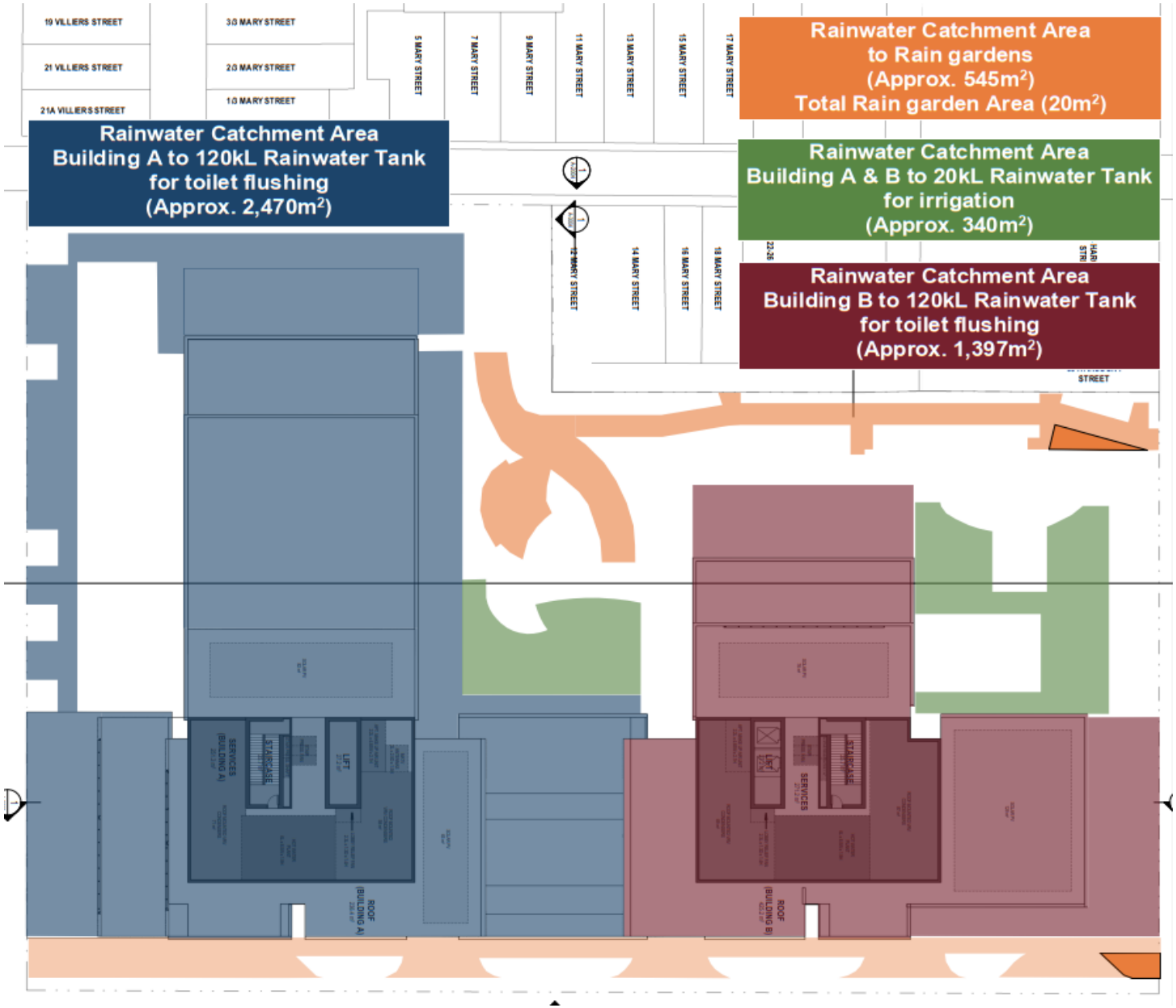
Appendix C. MUSIC Modelling

C.1 MUSIC Schematic



	Sources	Residual Load	% Reduction
Flow (ML/yr)	2.63	0.951	63.8
Total Suspended Solids (kg/yr)	282	34.6	87.8
Total Phosphorus (kg/yr)	0.679	0.233	65.7
Total Nitrogen (kg/yr)	6.1	1.8	70.5
Gross Pollutants (kg/yr)	96.5	0.214	99.8

C.2 Rainwater Catchment Areas




Green Roof
Building B to Harcourt St LPD
via GPT
Green Roof
Building A to Villiers St LPD
via Detention Tank
VILLIERS STREET

C.3 MUSIC Modelling Inputs

Area Name	Area [m^2]
Total Areas to Rainwater Tank (120kL for toilet flushing)	3,867
All roofs Level 2 and above Building A	2,470
All roofs Level 2 and above Building B	1,397
Total Areas to Rainwater Tank (20kL for irrigation)	340
Level 2 pool Terrace Building B	206
Level 1 Communal Terrace Buildings A & B	134
Level 2 Swimming Pool	82
Landscaping/Planters over structure Green Roof Areas Building A	349
Landscaping/Planters over structure Communal Terrace Bldgs A & B	62
Total Area to LPD1 Villiers St	4,638
Paving Areas to Rain gardens	545
Paving Green Heart	250
Paving Little George St	295
Planting in terra firma	535
Landscaping/Planters over structure Green Roof Areas Building B	363
Remaining Area	388
Total Area to LPD2 Harcourt St	1,467
Total Site Area	**6,530**

Treatment Devices Features	
Rainwater Tanks	1 x 120kL & 1 x 20kL
Total Rainwater tanks Capacity	140 kL
Est. daily water demand for Toilet Flushing	9.58 kL/day
All residentail toilets on levels Lower Ground 2 to Level 9	
Est. annual demand for irrigation	220 kL/yr
*Total Rain gardens surface area	17 m^2
**Primary Treatment System 1 (Gross Pollutant Trap)	Rocla CDS Nipper (or equivalent)
***Total Detention Tank Volume	80 kL

NOTES:

* Rain gardens vegetated with Effective Nutrient Removal Plants. Further specification to be undertaken in Detailed Design.

**Nutrient reduction (Phosphorous and Nitrogen) not attributed to Gross Pollutant Trap as per Melbourne Water MUSIC guidelines.

***Detention volume indicative only - to be further specified during Detailed Design.

C.4 MUSIC Results and Modelling Parameters

Pollutant	MUSIC Model Results	Green Star Building Targets (Credit Achievement)	Melbourne Water Targets
Reduction in Stormwater Discharge	63.8%	40.0%	-
Reduction in Total Suspended Solids (TSS)	87.8%	85.0%	80.0%
Reduction in Total Phosphorus (TP)	65.7%	65.0%	45.0%
Reduction in Total Nitrogen (TN)	70.5%	45.0%	45.0%
Reduction in Total Gross Pollutants	99.8%	90.0%	70.0%
Compliance with Project Targets		YES	YES

Rainfall data	
Rainfall Range & Station Name	B - Melbourne Airport (500-650mm)
10 Year Period	B - 1971-1980
Mean annual rainfall	B - 575mm
Evapotranspiration	B - 1041
Time step	6 minutes
Estimation method	Stochastically generated

Soil properties - Melbourne	
Soil store capacity	120mm
Field capacity	50mm

Rain Garden	
Filter Depth	500mm
Extended Detention Depth	150mm
Saturated Hydraulic Conductivity	100mm/hour
Underdrain present?	Yes

GPT Pollutant Removal Rates (Rocla CDS)	
Total Suspended Solids	70%
Total Nitrogen	0%
Total Phosphorous	0%
Gross Pollutants	98%
Validation report	CRC for Catchment Hydrology

Appendix D. NatHERS Energy Rating Assumptions

D.1 Results

Apartment	Star Rating	Energy Demand (MJ/m2)		
		Total	Heating	Cooling
ALG01 - 54.9m2	7.6	50.6	25.8	24.8
ALG02 - 60.2m2	9.1	24.2	10.3	13.9
ALG04 - 55.3m2	8.0	43.4	29.5	13.9
ALG06 - 124.7m2	7.4	52.5	46.0	6.5
ALG09 - 98.7m2	6.9	63.5	33.8	29.7
ALG11 - 54.9m2	7.4	52.7	24.0	28.7
BLG2-01 - 123.3m2	7.3	55.1	32.3	22.8
BLG2-03 - 123.3m2	7.8	46.7	29.3	17.4
BLG2-05 - 123.3m2	6.7	66.9	52.4	14.5
BLG05 - 56.6m2	6.8	65.6	40.5	25.1
BLG07 - 55.8m2	7.5	51.3	22.2	29.1
BG07 - 55.3m2	8.5	33.6	24.6	9.0
BG09 - 62.4m2	7.2	57.5	46.1	11.4
B113 - 55.0m2	8.4	35.1	24.2	10.9
A301 - 76.6m2	8.1	41.9	19.9	22.0
A302 - 55.0m2	8.7	30.8	19.2	11.6
A303 - 54.8m2	8.6	31.6	17.4	14.2
A304 - 41.0m2	8.4	36.1	19.1	17.0
A306 - 55.0m2	8.6	31.7	14.7	17.0
A307 - 82.8m2	8.1	42.5	24.4	18.1
A308 - 82.8m2	7.9	44.2	28.7	15.5
A312 - 55.0m2	8.8	28.0	13.9	14.1
A314 - 81.4m2	7.7	49.6	25.1	24.5
A315 - 94.7m2	7.4	53.7	24.0	29.7
A316 - 55.0m2	8.5	33.6	4.8	28.8
A318 - 55.0m2	8.4	35.3	18.5	16.8
A320 - 53.6m2	7.6	49.7	22.7	27.0
B301 - 82.8m2	8.2	40.3	10.7	29.6
B302 - 82.8m2	8.3	37.5	10.3	27.2
B303 - 55.0m2	8.9	26.6	17.1	9.5
B304 - 55.0m2	9.2	22.4	12.7	9.7
B306 - 41.0m2	8.6	33.1	14.0	19.1
B307 - 58.4m2	9.4	19.2	4.9	14.3
B309 - 55.0m2	9.4	19.6	7.7	11.9
B310 - 55.0m2	7.7	48.5	19.3	29.2
B311 - 79.2m2	8.8	28.2	20.5	7.7
B312 - 54.6m2	8.4	35.5	25.4	10.1
B314 - 70.3m2	7.4	54.3	7.9	26.4
B315 - 75.6m2	7.5	51.9	24.9	27.0
B316 - 79.3m2	7.1	61.0	40.6	20.4
B317 - 58.3m2	8.2	39.6	20.9	18.7
B318 - 55.0m2	8.6	32.8	16.7	16.1
A701 - 76.2m2	8.1	42.0	20.5	21.5
A702 - 55.0m2	8.8	28.8	15.5	13.3
A703 - 54.6m2	8.5	33.3	17.4	15.9
A704 - 41.0m2	8.1	41.6	18.3	23.3
A705 - 55.0m2	8.7	29.9	7.7	22.2

Apartment	Star Rating	Energy Demand (MJ/m2)		
		Total	Heating	Cooling
A706 - 96.6m2	8.9	26.6	12.2	14.4
A707 - 95.8m2	7.9	45.9	29.7	16.2
A708 - 55.2m2	8.7	30.9	20.4	10.5
A709 - 84.9m2	6.9	64.1	52.4	11.7
A710 - 103.3m2	7.6	50.6	32.3	18.3
A711 - 93.3m2	7.5	51.2	24.6	26.6
A712 - 86.2m2	7.3	55.6	34.3	21.3
A713 - 53.6m2	8.4	36.3	21.9	14.4
B701 - 82.9m2	8.4	35.9	12.7	23.2
B702 - 80.6m2	8.5	34	7.3	26.7
B703 - 81.1m2	8.9	25.6	17	8.6
B704 - 41.0m2	8.3	37.8	18.3	19.5
B705- 58.1m2	9.3	20.2	5.5	14.7
B707 - 55.0m2	9.3	20.8	7.5	13.3
B708 - 55.0m2	7.7	48.9	19.7	29.2
B709 - 79.2m2	8.8	29.3	21.6	7.7
B710 - 54.6m2	8.4	36.1	25.7	10.4
B711 - 70.4m2	7.4	53.2	29.5	23.7
B712 - 103.9m2	7.8	46.5	23.9	22.6
B713 - 58.1m2	8.2	40.7	22.5	18.2
A1001 - 60.8m2	6.0	80.8	51.7	29.1
A1002 - 80.6m2	6.7	66.6	46.7	19.9
A1003 - 55.2m2	7.3	56.9	35.8	21.1
A1004 - 95.6m2	6.9	62.0	32.4	29.6
A1005 - 63.9m2	6.2	77.9	49.4	28.5
A1006 - 75.1m2	6.2	77.6	51.0	26.6
A1007 - 75.2m2	6.2	76.5	50.8	25.7
B1001 - 82.4m2	7.1	59.5	40.9	18.6
B1002 - 80.9m2	7.4	52.7	29.2	23.5
B1003 - 80.8m2	7.9	44.8	29.2	15.6
B1004 - 55.9m2	7.4	52.8	31.6	21.2
B1005 - 81.4m2	7.4	54.3	33.0	21.3
B1006 - 60.4m2	6.1	78.1	49.6	28.5
B1007 - 61.5m2	6.0	80.1	50.7	29.4
B1008 - 80.8m2	6.1	78.5	53.2	25.3
B1009 - 58.1m2	7.1	60.5	37.5	23.0
Estimated Development Average	**7.8**	**45.9**	**26.1**	**19.6**

Class 2 Climate Zone 21

The results of the modelling confirm that:

- The development achieves a 7.5 star average NatHERS rating which represents a high standard of thermal efficiency;
- All individual apartments have cooling loads of less than 30 MJ/m2 and therefore meet the energy efficiency objectives set out in clause 58.03-1 of the Planning Scheme for the relevant climate zone (NatHERS Climate Zone 21 Melbourne);
- The average heating load of 26.1 MJ/m2 and the cooling load of 19.6 MJ/m2 are significantly less than the relevant threshold loads set out in NCC 2022 for Class 2 dwellings (average heating load <48 MJ/m2, average cooling load <32 MJ/m2), and;
- The individual apartment heating and cooling loads are significantly less than the relevant threshold loads set out in NCC 2022 for Class 2 dwellings (heating load <55 MJ/m2, cooling load <38 MJ/m2).

D.2 Building Materials

Element	Description	Added R Value
Floor Type	Suspended concrete	
Floor Insulation	50mm Kingspan Kooltherm K10 G2 R 2.3 soffit board: Underside of concrete floor to apartments shared with basement 01, basement 02, substations, carpark ramp, loading bays	R 2.3
	25mm Kingspan Kooltherm K10 G2 R 1.1 soffit board: Underside of apartments concrete floor sections exposed to external air below.	R 1.1
Wall Insulation	External precast concrete walls: 90mm R 2.5 bulk insulation	R 2.5
	External light weight walls: 90mm R 2.5 bulk insulation	R 2.5
	Lightweight party walls: 75mm R 1.5 bulk insulation	R 1.5
	Lightweight corridor walls: 75mm R 1.5 bulk insulation	R 1.5
	Precast concrete Lift & stairwell walls: 25mm R 0.65 bulk insulation	R 0.65
Roof Insulation	50mm Kingspan Kooltherm K10 G2 R 2.3 soffit board: Underside of concrete ceiling / roof sections shared with terraces above	R 2.3
	60mm Kingspan Kooltherm K10 G2 R 2.75 soffit board: Underside of concrete roof above to level 10 apartments	R 2.75
Roof Colour	Solar Absorptance – 0.5	
Window Frames	Aluminium thermally broken frames	
Window Colour	Solar Absorptance – Charcoal 0.67	
Sky Lights	Nil	
Ceiling fans	Nil	

NOTES

The added insulation R value must be equal to or higher than that specified above to meet the energy rating results.
All insulation specified for construction must meet Fire Engineer requirements

D.3 Glazing

Window Type	Description	Whole of Window Value		Location
		U	**SHGC**	
Thermally Broken Aluminium Sliding Door	Capral Futureline SD Series: Clear Double Glazed Low-e 6ET / 12Argon / 6	2.40	0.40	As per floor plans & elevations excluding apartments listed below
NatHERS Equivalent	AWS-089-08 A RES SERIES 704 FLUSH SLIDING DOOR DG 638ComPlsGy_12Ar_6mmClr	2.41	0.40	
Thermally Broken Aluminium Fixed Window	Capral Futureline 419TB Series: Clear Double Glazed Low-e 6ET / 12Argon / 6	2.16	0.51	As per floor plans & elevations excluding apartments listed below
Thermally Broken Aluminium Awning Window	Capral Futureline 54W Series: Clear Double Glazed Low-e 6ET / 12Argon / 6	2.87	0.39	As per floor plans & elevations excluding apartments listed below
Thermally Broken Aluminium Sliding Door	Capral Futureline SD Series: Clear Double Glazed Insulglass 24mmInsulglassMax 564	2.50	0.20	Apt A1001-60.8m2
NatHERS Equivalent	REY-003-09 B CP 155 Thermally Broken Sliding Door DG 6SnGn-12-6Sn	2.57	0.21	
Thermally Broken Aluminium Fixed Window	Capral Futureline 419TB Series: Clear Double Glazed Insulglass 24mmInsulglassMax 564	2.16	0.23	Apt ALG02-60.2m2: Bedroom Apt ALG04-55.3m2: Bedroom Apt A315-94.7m2: NW facing bedroom & SW facing kitchen/living Apt A318-55.0m2: Bedroom Apt B315-75.6m2: 2 x NW facing bedrooms & NW facing living Apt B316-79.3m2: NW facing bedroom & NW facing living Apt A710-103.3m2: 2 x SW facing bedrooms Apt A711-93.3m2: 3 x bedrooms Apt A713-53.6m2: Bedroom Apt B712-103.9m2: NW facing bedroom & living Apt A1001-60.8m2 Apt A1002-80.6m2: NW facing bedroom & living Apt A1006-75.1m2: SW facing bedroom & SE facing bedroom Apt B1001-82.4m2: NW facing bedroom & living Apt B1002-80.9m2: NE facing bedroom & living Apt B1006-60.4m2: SW facing bedroom

				Apt B1007-61.5m2: SW facing bedroom Apt B1008-80.8m2: SW facing bedroom & living
Thermally Broken Aluminium Awning Window	Capral Futureline 54W Series: Clear Double Glazed Insulglass 24mmInsulglassMax 564	2.88	0.19	Apt ALG02-60.2m2: Bedroom Apt ALG04-55.3m2: Bedroom Apt A315-94.7m2: NW facing bedroom & SW facing kitchen/living Apt A318-55.0m2: Bedroom Apt B302-82.8m2: NW facing bedroom Apt B315-75.6m2: 2 x NW facing bedrooms Apt B316-79.3m2: NW facing bedroom Apt A710-103.3m2: 2 x SW facing bedrooms Apt A711-93.3m2: 3 x bedrooms Apt A713-53.6m2: Bedroom Apt B712-103.9m2: NW facing bedroom & living Apt A1001-60.8m2 Apt A1002-80.6m2: NW facing bedroom & living Apt A1006-75.1m2: SW facing bedroom & SE facing bedroom Apt B1001-82.4m2: NW facing bedroom & living Apt B1002-80.9m2: NE facing bedroom & living Apt B1006-60.4m2: SW facing bedroom Apt B1007-61.5m2: SW facing bedroom Apt B1008-80.8m2: SW facing bedroom & living

GLAZING NOTES

Window system values used in the NatHERS ratings must be tested by an accredited professional according to the Technical Protocols and Procedures Manual for Energy Rating of Fenestration by the Australian Fenestration Rating Council, as per the NatHERS Technical Note (2023) and NCC 2022 Volume Two Housing Provisions. Energy ratings cannot be certified for NCC compliance until documentation is provided demonstrating window system performance values have been tested according to this protocol.

The energy rating software accredited by the Australian Building Codes Board contains a relatively limited library of window systems. When the glazing systems specified are not available in the software, the protocol requires that the glazing type which most closely matches the specified glazing is selected for the purpose of calculating the energy rating.

The table above sets out the glazing specified for the purposes of calculating the energy rating. The whole of window U – Value must be equal or lower than the energy rating software value and the whole of window SHGC – Value must be within +/-5% of the energy rating software value.

** Insulglass has been specified to reduce the cooling loads to meet NCC and BADS maximum cooling load limits. Apartments listed are part of the representative sample of apartments that have been assessed. Insulglass requirements for apartments that have not been included as part of this representative sample, will be determined during the certification assessment process.

D.4 General Rating Assumptions

Item	Details
Floor Coverings	Tiles to bathrooms and laundries Carpet to bedrooms Timber boards to kitchen, living and all other areas
Window Coverings	Holland blinds to all windows. (Regulation Mode)1
Draught Proofing	Weather strips to all entry & external doors and windows. Seal all exhaust fans.
Down lights	Recessed down lights in ceiling /roof space to be fitted with fire proof unvented down light covers (external roof areas only) to provide air tightness and contact with insulation
General	All party walls are classed as neighbour walls.
Shading	Overshadowing from adjoining buildings has been incorporated into the energy ratings
Ceiling Calculation	Calculation for loss of ceiling insulation due to down lights, exhaust fans, ceiling speakers etc. have been incorporated into the energy rating where applicable

NOTES

Changes to any of the above stated specifications may affect energy performance and invalidate the energy ratings detailed in this report.

Sealing of gaps and cracks: inadequate sealing of gaps and cracks can negatively affect the energy performance of a dwelling. Provide sealing in accordance with NCC 2019 Part J3.

[1] Holland blinds are assumed as required by VBA Practice Note 55 (Clause 5.2). This assumption is for regulatory purposes only.

Rainwater Harvesting System Maintenance Program

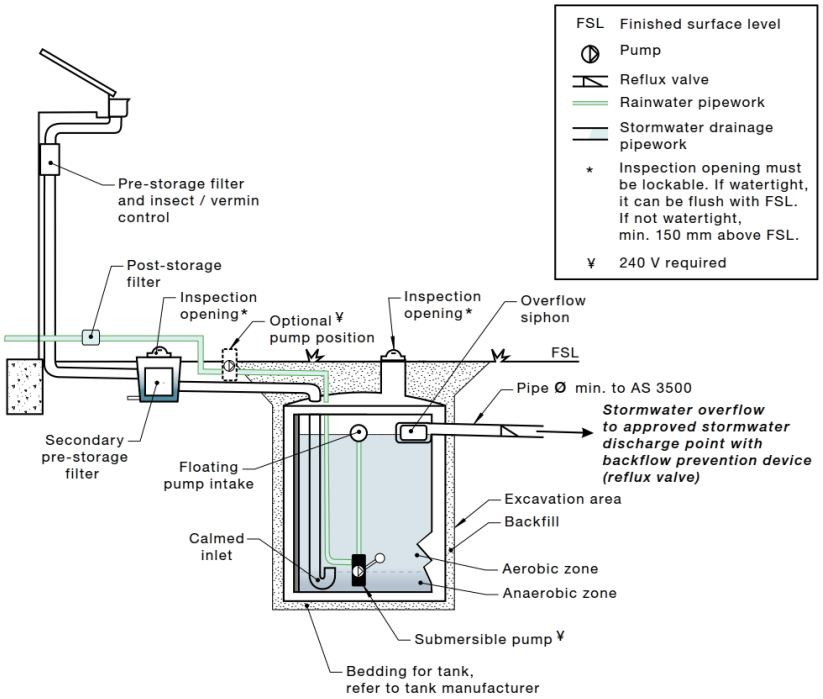
Once installed, a systematic maintenance program will be implemented by the owner's corporation maintenance contractor to ensure the rainwater harvesting system operates as designed and water quality is maintained.

The scope of the maintenance program will include inspection and rectification of issues associated with:

- Roof gutters and downpipes
- First flush screens and filtration devices
- Pumps
- Distribution pipework and reticulation systems
- Overflow systems

Inspections of the system and any maintenance works required will be undertaken on a quarterly basis or as per manufacturers guidelines.

The rainwater harvesting system will be installed in accordance with the guidelines set out in the Rainwater Design & Installation Handbook published by the National Water Commission[2]. A schematic diagram of the rainwater tank installation is provided below.



Rainwater Tank Element	Inspection Item	Y/N	Likely Maintenance Task
Roof gutters and downpipes	Is there leaf litter or debris in the gutters?		Remove by hand and dispose responsibly
First flush diverter	Is there anything blocking the first flush diverter (Leaves etc.)?		Remove by hand and dispose responsibly
Potable mains back up device	Is the potable mains back up switch operating correctly?		Repair or replace devise. Consider a manual switching device.
Mesh cover	Has the mesh cover deteriorated or have any holes in is?		Replace mesh cover.
Tank volume	Is there large amounts of sediment or debris sitting in the bottom of the tank, reducing the volume available in the tank to store water?		Remove sediment and dispose responsibly.
Pump	Is the pump working effectively? Have you heard it on a regular basis?		Check the potable mains back up is not permanently on. Repair or replace pump.
Pipes and taps	Are pipes and taps leaking?		Repair as needed.
Overflow	Is the overflow clear and connected to the storm water network?		Remove blockages and/or restore connections to stormwater network.

Maintenance Frequency												
	J	F	M	A	M	J	J	A	S	O	N	D
All tasks	X			X			X			X		

Raingarden Design and Maintenance Program

Once installed, a systematic maintenance program will be implemented by the owner's corporation maintenance contractor to ensure the raingarden operates as designed.

Design, construction and planting of raingardens shall be implemented in accordance with the relevant Instruction Sheet published by Melbourne Water and the Victorian state government:

Inground raingardens: - https://www.melbournewater.com.au/media/447/download

Infiltration raingardens - https://www.melbournewater.com.au/media/446/download

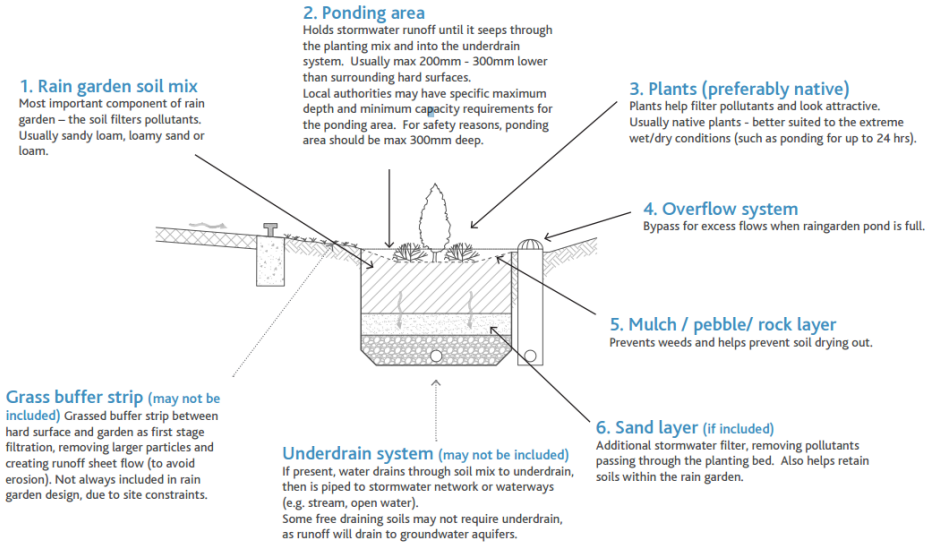
Further guidelines for raingarden planning, design, construction and maintenance guidelines have been developed by the Cooperative Research Centre for Water Sensitive Cities, with support from Melbourne Water:

https://watersensitivecities.org.au/content/stormwater-biofilter-design/

The scope of the maintenance program will include inspection and rectification of issues associated with:

- Raingarden soil mix
- Ponding area
- Plants
- Overflow system
- Mulch/ pebble/ rock layer
- Underdrain system (where applicable)

A cross-sectional diagram of a typical raingarden is provided below.



Inspections of the raingarden system and any maintenance works required will be undertaken as outlined in the maintenance schedule below.

Component	Maintenance Action
AFTER STORM EVENTS	
Ponding Area	Check raingarden inlet for sediment, rubbish and leaves and remove as required. Check for erosion or scour and repair. Check and ensure that the garden is infiltrating effectively. Check and re-profile topsoil as necessary – ensure level is below surrounding hard surface and overflow.
Kerb, Paved Area, or Grass Filter Strip (if included)	Remove rubbish, leaves and other debris from surrounding areas
Mulch	Check and redistribute/add mulch as necessary – particularly at the raingarden inlets.
3 MONTHLY	
Ponding area	Check raingarden inlets for sediment build up, litter and leaves. Check for erosion or scour and repair if necessary.
Mulch Layer	Remove litter, leaves and other debris. Redistribute/add mulch if necessary.
Overflow system	Check for any blockages and remove as necessary.
Plants	Check plant health and replace dead plants as necessary. Remove weeds – do not use herbicides, pesticides and fertilisers as the chemicals may infiltrate through the rain garden and pollute the stormwater runoff.
ANNUALLY	
Mulch Layer	Check for sediment build up – remove and replace as required.
Ponding Area	Check all water has drained 24 hours after heavy rain – remove and replace the crust from the top of raingarden if drainage not effective. Check for litter, leaves and sediment build up and remove as necessary. Check for erosion and gouging and repair where necessary.

Component	Maintenance Action
Raingarden Soil Mix	Check soil level is below surrounding hard surface level and the overflow
Underdrain System	If underdrain present, flush underdrain and check for blockages – repair if necessary.

Gross Pollutant Trap (GPT) Maintenance Program

Once installed, a systematic maintenance program will be implemented by the landowner to ensure the GPT operates as designed and water quality is maintained.

Cleaning and maintenance will be carried out in accordance with the manufacturer's written guidelines. Maintenance requirements and frequencies are dependent on the pollutant load characteristics.

The scope of the maintenance program will include inspection and rectification of issues associated with:

- Manhole cover
- Inlet pipe
- Outlet
- Screening area
- Collection area

Inspections of the GPT and any maintenance works required will be undertaken as outlined as a guide in the maintenance schedule below. Manufacturer's guidelines will take precedence.

Maintenance Action
3-6 MONTHLY
– Check components for damage. – Check that the inlet and outlet are free from debris or obstructions. – Remove large floating pollutants. – Measure sediment depth.
12-24 MONTHLY (or as guided by sediment depth)
– Removal of accumulated sediment and gross pollutants. – Inspection of screen and cleaning if required.

Appendix F. Solar Photovoltaics

During the construction phase, high-efficiency solar PV modules with a total capacity of 56.4 kWp will be installed at roof level as per the preliminary layout indicated below.

PV modules should be oriented in pairs to the east and west, or to the west, at 10-15° tilt and have at least 440Wp capacity (i.e. over 33% more efficient than traditional 360Wp 60-cell modules). High-efficiency modules deliver more compact arrays with inherently lower embodied ecological impact per unit of generation than standard efficiency modules.

The undulating east-west configuration prevents self-shadowing of the array and provides a low-profile installation with maximised packing factor. It also helps maximise self-consumption due to its flatter and broader power output yield profile.

Total yield of this array will be approximately 66.5 MWh per annum equating to an estimated annual carbon emissions offset of 57.1 tonnes C02-e per annum.

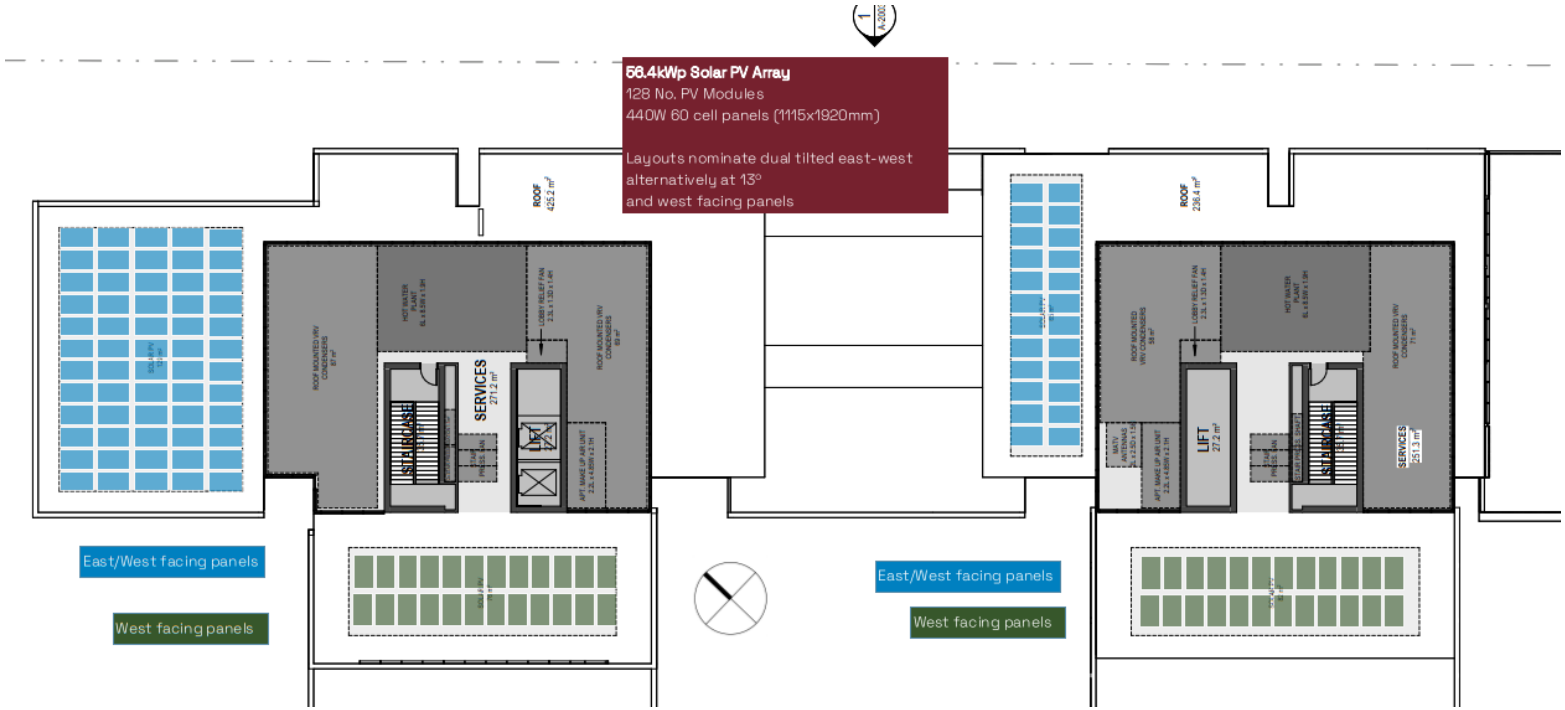


Figure 1 Indicative Solar Photovoltaic array layout

East facing array output

RESULTS

Print Results

20,730 kWh/Year*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	6.36	2,787
February	6.08	2,262
March	4.81	2,078
April	3.33	1,380
May	2.04	872
June	1.83	762
July	1.83	834
August	2.67	1,160
September	3.78	1,578
October	5.01	2,125
November	5.43	2,230
December	6.59	2,883
Annual	4.21	20,731

West facing array output

RESULTS

Print Results

45,753 kWh/Year*

Month	Solar Radiation (kWh / m^2 / day)	AC Energy (kWh)
January	6.87	6,281
February	6.27	5,152
March	4.88	4,539
April	3.28	2,844
May	2.03	1,815
June	1.80	1,833
July	1.88	1,798
August	2.63	2,502
September	3.81	3,482
October	4.86	4,827
November	5.64	4,875
December	6.67	5,888
Annual	4.22	45,754

Appendix G. Site Management Plan

During the construction phase, the key pollutants at risk of entering the stormwater system include:

- Sediments (soil, sand, gravel and concrete washings); and
- Litter, debris etc.

These pollutants arise from factors such as dirt from construction vehicles, stockpiles located close to surface runoff flow paths, and surface runoff from disturbed areas during earthmoving and construction works. It is therefore important to have measures that either prevent or minimise the pollutant loads entering stormwater system during construction.

In order to mitigate the impacts of the above pollutants on the stormwater system, the following stormwater management strategies will be implemented during the construction phase as appropriate:

- Installation of onsite erosion and sediment control measures. All installed control measures shall be regularly inspected & maintained to ensure their effectiveness. Such measures may include (but not limited to):
  - Silt fences
  - sediment traps
  - hay bales
  - geotextile fabrics
- Where possible, litter bins with a lid will be used to prevent litter from getting blown away and potentially entering stormwater drains.

Additionally, the following work practices shall be adopted to reduce stormwater pollution:

- Site induction by the head contractor/ builder to make personnel aware of stormwater management measures in place
- Employ suitable measures to reduce mud being carried off-site into the roadways such as installing a rumble grid/ gravel/ crushed-rock driveway (or equivalent measure) to provide clean access for delivery vehicles, removing mud from vehicle tyres with a shovel etc.
- Safe handling and storage of chemicals, paints, oils and other elements that could wash off site to prevent them from entering stormwater drains.
- Where practicable, stockpiles will be covered, located within the site's fence and away from the lowest point of the site where surface runoff will drain to. This initiative will minimise erosion.

Accordingly, the measures presented above are considered appropriate for the proposed development at this stage of the project. The measures will reduce the pollutants entering stormwater system from the site during construction works thereby protecting waterways.

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