SUSTAINABLE DESIGN ASSESSMENT - SDA
WATER SENSITIVE URBAN DESIGN - WSUD
FOR TOWN PLANNING PURPOSES

PROJECT

Proposed Residential Development – 3 units
@ 23 Hodge Street, Werribee VIC 3030

REVISION	DATE
A	08.03.2022
B	05.05.2022

MERRICK RASIM
Accredited Thermal Performance Assessor **VIC/BDAV/17/1802**

GREEN ZONE
BUILDING DESIGN & THERMAL ASSESSMENTS
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BUILDING DETAILS

Project Name:	Proposed residential development (Three units)
Planning application:	VJA Architects
Site address:	23 Hodge Street, Werribee 3030
Site area:	627.3 m2
Total number of Dwelling:	3
Total Site Permeability:	309.6 m2 / 49.4%
No. of bedrooms:	each Dwelling has 4 bedrooms.
No. of carparking space:	each Dwelling has 2 carparking space.
Materials:	each dwelling: brick veneer on ground floor, lightweight cladding on first floor, Concrete slab on ground level, timber flooring on first level Aluminium frame windows and Metal roof sheeting.
Local Authority:	Wyndham City Council
Class of Building:	Class 1a
Drawings:	Town Planning drawings (provided by VJA Architects)

INTRODUCTION

This Sustainable Design Assessment (SDA) and Water Sensitive Urban Design (WSUD) report has been prepared for the purpose of town planning for the proposed multi-unit development (3 units) at 23 Hodge Street, Werribee 3030 as per the requirements of the Environmentally Sustainable Development Policy at Clause 22.02-4 & Clause 53.18 of the Wyndham Planning Scheme.

The BESS report, STORM report and the Thermal Performance Assessments (NatHERS energy ratings) as well as FirstRate5 Thermal Performance software have been used as benchmark assessment tools.

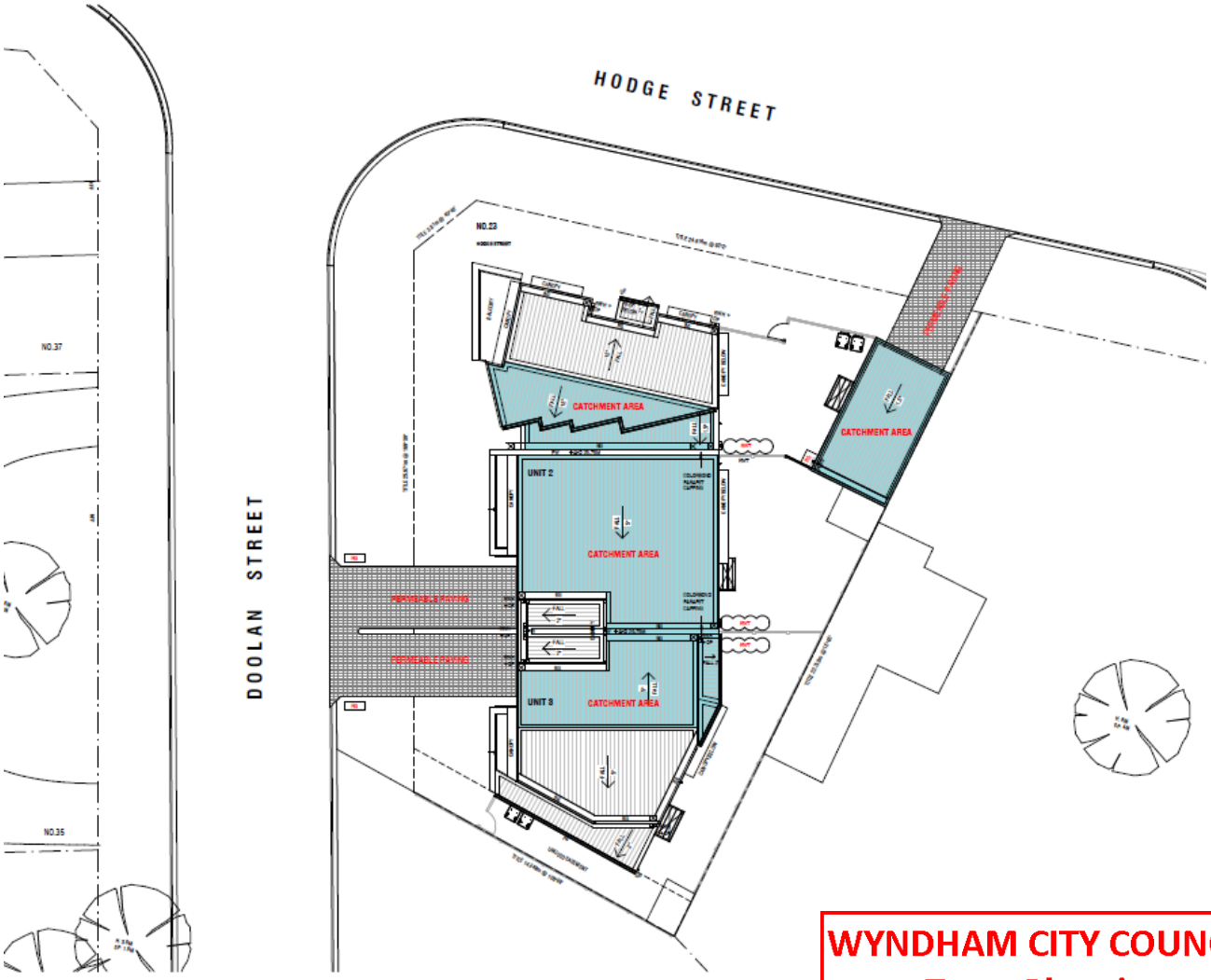
The proposed development meets, and exceeds by a considerable margin, the benchmarks set out by BESS.

This whole report should be read in conjunction with the town planning drawings.

THE SITE

The proposal is to construct 3 residential units with garages and Private open space.
The land is irregular in shape, and we have access to the proposed units via Hodge Street and Doolan Street.

The development falls under of the BCA building classification of: Class 1a.



Architectural proposed site layout and highlighted of catchment roof rain area.

CLAUSE 22.02-1 POLICY BASIS

Wyndham City Council is committed to creating an environmentally sustainable city. Critical to achieving this commitment is for development to incorporate appropriate environmentally sustainable design standards.

This policy aims to integrate environmental sustainability principles into land-use planning, new developments and redevelopment of existing infrastructure.

This policy provides a framework for early consideration of environmental sustainability at the building design stage in order to achieve the following efficiencies and benefits:

- Easier compliance with building requirements through passive design.
- Reduction of costs over the life of the building.
- Improved affordability over the longer term through reduced running costs.
- Improved amenity and liveability.
- More environmentally sustainable urban form; and
- Integrated water management.

If environmentally sustainable design is not considered at the time of planning approval, the ability to achieve environmentally sustainable development (ESD) may be compromised by the time these matters are considered as part of a building approval. In addition, there may be difficulties or extra costs associated with retrofitting the development to implement environmentally sustainable design principles.

This policy does not prescribe performance outcomes. The policy enables the provision of information and provides decision guidelines which will assist in the assessment of whether development meets environmentally sustainable development objectives.

This policy complements a range of non-statutory measures aimed at encouraging environmentally sustainable development. These measures include educating residents and applicants, assisting applicants to use ESD tools, leading by example with Council projects, promotion of exemplary private projects and promotion of the use of materials with favourable life cycle impacts.

CLAUSE 22.02-2 OBJECTIVES

The overarching objective is that development should achieve best practice in environmentally sustainable development from the design stage through to construction and operation.

In the context of this policy best practice ESD is defined as a combination of commercially proven techniques, methodologies, and systems, appropriate to the scale of development and site specific opportunities and constraints, which are demonstrated and locally available and have already led to optimum ESD outcomes. Best practice in the built environment encompasses the full life of the build.

The following objectives should be satisfied where applicable:

Energy performance

- To improve the efficient use of energy, by ensuring development demonstrates design potential for ESD initiatives at the planning stage.
- To reduce total operating greenhouse gas emissions.
- To reduce energy peak demand through particular design measures (eg, appropriate building orientation, shading to glazed surfaces, optimise glazing to exposed surfaces, space allocation for solar panels and external heating and cooling systems).

Water resources

- To improve water efficiency.
- To reduce total operating potable water use.
- To encourage the collection and reuse of stormwater.
- To encourage the appropriate use of alternative water sources (eg. greywater).

Indoor environment quality

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

Stormwater management

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

Transport

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

Waste management

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

Urban ecology

- To protect and enhance biodiversity within the municipality.
- To provide environmentally sustainable landscapes and natural habitats and minimise the urban heat island effect.
- To encourage the retention of significant trees.
- To encourage the planting of indigenous vegetation.
- To encourage the provision of space for productive gardens, particularly in larger residential developments.

CLAUSE 22.02-3 & 22.02-4 POLICY & APPLICATION REQUIREMENTS

It is policy to ensure innovative technology, design and processes positively influence the sustainability of all development.

It is policy that applications for the types of development listed in Table 1 be accompanied by information which demonstrates how relevant policy objectives will be achieved.

Table 1 requires an SDA for a development of 1-9 dwellings.

A Sustainable Design Assessment should:

- Provide a simple assessment of the development. It may use relevant tools from the examples listed in the table or an alternative assessment approach to the satisfaction of the responsible authority; and
- Identify environmentally sustainable development measures proposed in response to policy objectives, having regard to the site's opportunities and constraints.

Various assessment tools have been listed which may be used to assess how the proposed development addresses the objectives of this policy, as appropriate.

Example tools listed include STORM and BESS, which has been used in preparing this SDA.

CLAUSE 22.02-5 DECISION GUIDELINES

In determining an application, the responsible authority will consider as appropriate:

- The extent to which the development meets the objectives and requirements of this policy from the design stage through to construction and operation.
- Whether the proposed environmentally sustainable development performance standards are functional and effective to minimise environmental impact.
- Whether the proposed environmentally sustainable development initiatives are reasonable having regard to the type and scale of the development and any site constraints.
- Whether an appropriate assessment method has been used.
- Whether an ESD plan or framework has previously been approved by the responsible authority (whether under a planning control or otherwise).

CLAUSES 22.02-5 REFERENCE DOCUMENTS

BESS (Built Environment Sustainability Scorecard) www.bess.net.au, Council Alliance for a Sustainable Built Environment (CASBE), 2015
Nationwide House Energy Rating Scheme (Nat HERS), Department of Climate Change and Energy Efficiency, www.nathers.gov.au
STORM, Melbourne Water, www.storm.melbournewater.com.au
Urban Stormwater Best Practice Guidelines, CSIRO, 2006.

CLAUSE 53.18-1 APPLICATION

This clause applies to an application under a provision of a zone to subdivide land, construct a building, or construct or carry out works, other than the following applications:

- An application under a provision of the Farming Zone, Green Wedge Zone, Green Wedge Zone, Low Density Residential Zone, Public Conservation and Resource Zone, Road Zone, Rural Activity Zone, Rural Conservation Zone, Rural Living Zone, Urban Floodway Zone or Urban Growth Zone.
- A VicSmart application.
- An application to subdivide land in a residential zone for residential purposes.
- An application to construct or extend a dwelling, fence or residential building in a residential zone.
- An application for development associated with the use of land for agriculture or earth and energy resources industry.
- An application to construct a building or construct or carry out works associated with one dwelling on a lot.
- An application to alter, extend or make structural changes to an existing building provided the gross floor area of the building is not increased by more than 50 square metres.

- An application to construct a building with a gross floor area not exceeding 50 square metres.
- An application to construct or carry out works with an area not exceeding 50 square metres.
- An application to subdivide land into lots each containing an existing building or car parking space.
- An application to construct a building or to construct or carry out works on a lot if all of the following requirements are met:
  - The lot was created in accordance with a permit granted under this planning scheme.
  - The application for that permit was assessed against the requirements of this clause.

- An application for land affected by a development plan or incorporated plan that was approved or incorporated in this planning scheme before the approval date of Amendment VC154.
- An application lodged before the approval date of Amendment VC154.
- An application for an amendment of a permit under section 72 of the Act, if the original permit application was lodged before the approval date of Amendment VC154.

CLAUSE 53.18-2 & 53.18-3 OPERATION & REQUIREMENTS

The provisions of this clause contain:
Objectives. An objective describes the desired outcome to be achieved in the completed development.
Standards. A standard contains the requirements to meet the objective.

A standard should normally be met. However, if the responsible authority is satisfied that an application for an alternative solution meets the objective, the alternative solution may be considered.

An application must be accompanied by details of the proposed stormwater management system, including drainage works and retention, detention and discharges of stormwater to the drainage system.

CLAUSE 53.18-5 STORMWATER MANAGEMENT OBJECTIVES FOR BUILDINGS AND WORKS

To encourage stormwater management that maximises the retention and reuse of stormwater.

To encourage development that reduces the impact of stormwater on the drainage system and filters sediment and waste from stormwater prior to discharge from the site.

To encourage stormwater management that contributes to cooling, local habitat improvements and provision of attractive and enjoyable spaces.

To ensure that industrial and commercial chemical pollutants and other toxicants do not enter the stormwater system.

CLAUSE 53.18-6 SITE MANAGEMENT OBJECTIVES

To protect drainage infrastructure and receiving waters from sedimentation and contamination.

To protect the site and surrounding area from environmental degradation prior to and during construction of subdivision works.

CLAUSE 53.18-7 DECISION GUIDELINES

Before deciding on an application, in addition to the decision guidelines in Clause 65, the responsible authority must consider, as appropriate:

- Any relevant water and stormwater management objective, policy or statement set out in this planning scheme.
- The capacity of the site to incorporate stormwater retention and reuse and other water sensitive urban design features.
- Whether the development has utilised alternative water sources and/or incorporated water sensitive urban design.
- Whether stormwater discharge from the site will adversely affect water quality entering the drainage system.
- The capacity of the drainage network to accommodate additional stormwater.
- Whether the stormwater treatment areas can be effectively maintained.
- Whether the owner has entered into an agreement to contribute to off-site stormwater management in lieu of providing an on-site stormwater management system.

BESS ASSESSMENTS TOOL

The council alliance for a sustainable build environments (CASBE) within the MVA (Municipal Association of Victoria) has developed a board program called “sustainable Design Assessment in Planning Process” (SDAPP),

The SDAPP program refers to the consistent inclusion of key environmental performance considerations into planning permit approvals process in order to achieve more sustainable outcomes for long term benefit of the wider community.

The Building will exceed in most cases by large margin, the benchmark set out by SDAPP specifically using the BESS assessment tool, This will be enabled by the Carful Selection of water efficient taps and fitting, energy efficient heating and cooling appliances, building materials with low embodied energy and other sustainable features to meet the required BESS targets.

EXPLANATION OF BESS ASSESSMENT SCORRING

Points are allocated for each action or commitment made, for meeting best practice standards YES or NO and for passing certain thresholds of performance.

There are different number of points for each category, and between building types in the same category.

Percentages for each category are obtained by comparing the points you achieve to the total points possible for your building.

You are scored based on percentage.

Each category has score weighting.

Best practice generally defined as 50%.

Project excellence defined as 70%.

Trade-offs within categories but not across them.

Scoring emphasises design stage of development.

BESS ASSESSMENT SCORING FOR THIS PROJECT

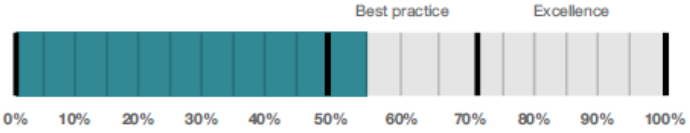
Best practice defined with a 50% best practice pass score overall.

The project has achieved 54% overall score, please refer to the BESS report attached for each category percentage with energy and water requiring a score of 50% each to pass.

This BESS report outlines the sustainable design commitments of the proposed development at 23 Hodge St Werribee VIC 3030. 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 Wyndham 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

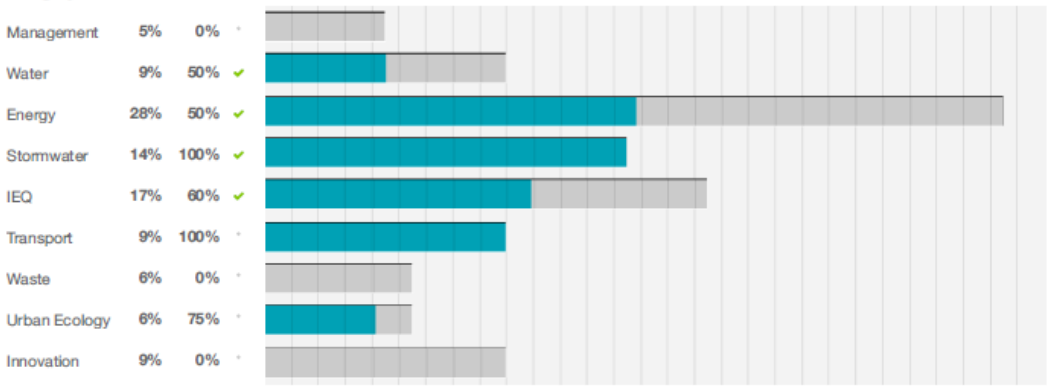


54%

Project details

Address	23 Hodge St Werribee VIC 3030
Project no	347770DD-R3
BESS Version	BESS-6
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	merrick@greenzone.net.au
Application no.	
Site area	627 m²
Building floor area	461.9 m²
Date	30 April 2022
Software version	1.7.0-B.384

Performance by category ● Your development ● Maximum available



BESS SPECIFICATION SCHEDULE

Appliances, Water fixtures, fittings and connections

Showerheads:	4 star WELS (> 6.0L but ≤ 7.5L)
Kitchen taps :	5 star WELS rating
Bathroom taps:	5 star WELS rating
WC's:	5 star WELS rating
hot water system:	6 star gas instantaneous
heating and cooling systems:	5 star

Lighting
LED downlights and other high efficiency light fittings to be used throughout (Not incandescent or halogen)

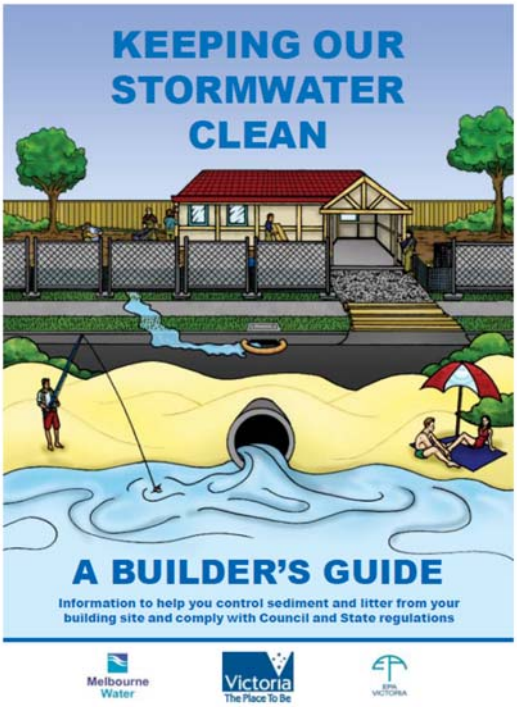
Note compliance with the following NCC illumination power density requirements:
The lamp power density of illumination power density of artificial light, must not exceed –
(i) within the building, 5W/m²; and
(ii) on a verandah or balcony of the building, 4W/m²

Note the external lighting is to be operated by movement sensors and the internal light energy density AS per that BESS report

Demolition
Provide a recycling target for all demolition and construction waste
a minimum of 70% of waste (by mass) of all demolition and construction waste should be recycled or reused.
Such as soil, concrete based masonry, brick, tiles timber, Aluminium, vegetation and metals.

Stormwater
Rainwater tank(s) connected to all toilets
Refer to STORM water rating report attached.

Erosion And Sediment Control Measures
Builder to follow and apply Melbourne water guide as below link provided
https://www.clearwatervic.com.au/user-data/resource-files/Keeping_Our_Stormwater_Clean-A_Builders_Guide%5b1%5d.pdf



Materials

- Low Volatile Organic Compounds (VOC) finishes and paints to be used throughout the project.
- Boards: E0 (zero emission of formaldehyde) or equivalent MDR. Plywood or particleboard to be specified.
- Paints: Several Australian organisations have standards for paints including the Australian Ecolabelling Association (GECA) and the Australian Paint Approval Scheme.
- Sealants, adhesives, paints and floor coatings: Choose natural products over those containing solvents or synthetics. Water based products should be used where possible.
- Floor coverings: Specification of low-emitting carpet, or resilient flooring.
- Durability and service life of materials selected will help reduce maintenance cycles, extend replacement
- schedules and contribute to a sense of quality.
- All elements of construction will be selected with an understanding of reuse and recycle potential at the conclusion of the current service life.
- Timber Materials:

– Sustainably produced and third party certified – Forest Stewardship Council or PEFC " Responsible wood" .
– Plantation software or hardwood; or Post-consumer recycled.
– 95% recycled or plantation timber to be used.

- External materials:

– Rot resistant woods, concrete and constructions techniques designed to eliminate the need to preservative will be used.
– Wood preservatives containing pentachlorophenol (Penta) will not be used.

- Floors and Footings: Products recommended on Ecospecifier or the council Greenlist will be selected.
- Wall and roof framing Products recommended on Ecospecifier or the council Greenlist will be selected.
- Roof cladding: Products recommended on Ecospecifier or the council Greenlist will be selected.

PRELIMINARY THERMAL PERFORMANCE FOR THE DVELOPMENTS

6 Star rating Benchmark for this climate zone (60) with heating load 126 MJ/m² and Cooling load 31 MJ/m²

Unit 1 : Star rating: 6.0
Unit 2 : Star rating: 6.0
Unit 3 : Star rating: 6.0

below summary of NatHERS energy star rating specification for units using FIRSTRATE software:

- Roofs: **R5.0** added insulation.
- External walls: **R2.5** added insulation.
- Concrete slab on ground: None.
- Suspended timber flooring: **R2.5** added insulation (over Garage).
- Windows & Sliding doors:

  All Fixed windows & sliding doors_Double glazing _ Aluminium Frame.

  Minimum overall U factor value of **U 4.10 & SHGC 0.59**

  All remaining windows_Double glazing _ Aluminium Frame.

  Minimum overall U factor value of U **4.10 & SHGC 0.51**

- rainwater tank (min 2000 litre).
- Downlights type: LED modelled, downlights to be sealed type to prevent any air movement.
- Artificial Lighting Compliance as per NCC requirements.
- All exhaust fans to be sealed.
- All gaps & cracks are sealed 100%
- Windows and Sliding doors are Fitted with weather seals.
- External doors to be fitted with Weather Strip.

STORMWATER MANAGEMENT DESIGN

Objectives:

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

WSUD response:

- to improve water efficiency
- to reduce total operating potable water use
- to encourage the collection and reuse of stormwater
- to encourage the appropriate use of alternative water sources (e.g. grey water)
- to minimise peak stormwater flows and stormwater pollutants to improve the health of water bodies, including creeks, rivers and bays
- to reintegrate urban water into the landscape to facilitate a range of benefits.

Rainwater Tanks:

Rainwater tanks can reduce the harm to our waterways caused by too much stormwater. Tank water can be used to flush toilets, water gardens and wash cars, significantly reducing demand on drinking water.

Advantages:

- minimise water usage when used in the toilet or garden.
- reduce strain on the stormwater drainage system.
- retain water close to source.
- reduce site run-off and flood peaks.

Achieving best practice:

The best practice standards have been set out in the Urban Stormwater Best Practice Environmental Management Guidelines (Victoria Stormwater Committee, 1999) for reduction in total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN) loads.

The STORM Calculator rates the performance of treatment measures relative to the percentage of best practice targets that have been achieved by those treatment measures.

providing a final STORM rating. A rating of 100% means that objectives have been met.

EXPLANATION OF STORMWATER ASSESSMENT SCORRING

The information from the development plans that relates to stormwater runoff (impermeable areas and actual or potential treatment measures) is analysed by the STORM assessment rating tool.

STORM scores SHOULD BE ≥ 100%.

100% means that the development meets the best practice performance objectives for suspended solids, total phosphorus and total nitrogen, as set out in the Urban Stormwater Best Practice Environmental Management Guidelines, Victoria Stormwater Committee 1999 as amended.
Currently, these water quality performance objectives require:

- Suspended Solids - 80% retention of typical urban annual load.
- Total Nitrogen - 45% retention of typical urban annual load.
- Total Phosphorus - 45% retention of typical urban annual load.
- Litter - 70% reduction of typical urban annual load.

STORMWATER ASSESSMENT SCORING FOR THIS PROJECT

- STORM score of 103% means that the development has met and achieved the requirements as per BPEG_ the Best Practice Environmental Management Guidelines.
- **Dwelling 1** - rainwater from roof area (32m²) to be collected and discharged via gravity fed or mechanical pump into the proposed rainwater tank.
  New **on ground** raingarden from Garage roof area (28m²) to be collected and discharged via gravity fed into the proposed inground rain garden.
  DRIVEWAY OF DWELLING 1 WILL BE PERMEABLE PAVING.
- **Dwelling 2** - rainwater from roof area (73m²) to be collected and discharged via gravity fed or mechanical pump into the proposed rainwater tank.
  DRIVEWAY OF DWELLING 2 WILL BE PERMEABLE PAVING.
- **Dwelling 3** - rainwater from roof area (38m²) to be collected and discharged via gravity fed or mechanical pump into the proposed rainwater tank.
  DRIVEWAY OF DWELLING 3 WILL BE PERMEABLE PAVING.
- **Dwelling 1** - Proposed rainwater tank size: 2,000 Litres.
- **Dwelling 2** - Proposed rainwater tank size: 2,000 Litres.
- **Dwelling 3** - Proposed rainwater tank size: 2,000 Litres.
- New rainwater tank to be provided with overflow system to be connected into the existing storm water drainage LPOD.
- Proposed on ground rain garden size: 1m²
- New on ground rain garden to be connected into the existing storm water drainage LPOD.
- All toilet flush and laundry tap to be supplied with water from the rainwater tank.
- It is recommended to use Irrigation system supplied by water from the rainwater tank.
- Refer to Storm report attached.
- Refer to fact sheet of Melbourne rainwater tank attached.
- Refer to fact sheet of Melbourne on ground raingarden attached.

CONCLUSION & STATEMENT

The development will meet the objectives and application requirements of the Wyndham City Council objectives if it is constructed in accordance with the application drawings & the measures detailed in this SDA. This Sustainable Design Assessment has been prepared in conjunction with BESS, STORM and FirstRate5 software, which have been used as Sustainable Design Assessment in the Planning Process (SDAPP) assessment tools.

The proposed development assessed to achieve the specified result only if it is built in accordance with the Specification into this SDA report.

.....End of Report.....

STORM Rating Report

TransactionID: 1366099
Municipality: WYNDHAM (North/East of Skeleton Ck)
Rainfall Station: WYNDHAM (North/East of Skeleton Ck)
Address: 23 Hodge St

Werribee
VIC 3030
Assessor: MR
Development Type: Residential - Multiunit
Allotment Site (m2): 627.30
STORM Rating %: 103

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
ROOF UNIT 1	32.00	Rainwater Tank	2,000.00	3	170.00	82.00
ROOF UNIT 2	73.00	Rainwater Tank	2,000.00	4	170.00	82.00
ROOF UNIT 3	38.00	Rainwater Tank	2,000.00	4	170.00	82.00
roof garage unit 1	28.00	Raingarden 100mm	1.00	0	132.00	0.00
roof u1 untreated	41.00	None	0.00	0	0.00	0.00
roof U2 untreated	11.00	None	0.00	0	0.00	0.00
roof U3 untreated	48.00	None	0.00	0	0.00	0.00

Date Generated: 30-Apr-2022
Program Version: 1.0.0

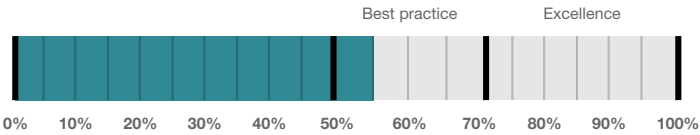
BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at 23 Hodge St Werribee VIC 3030. 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 Wyndham 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

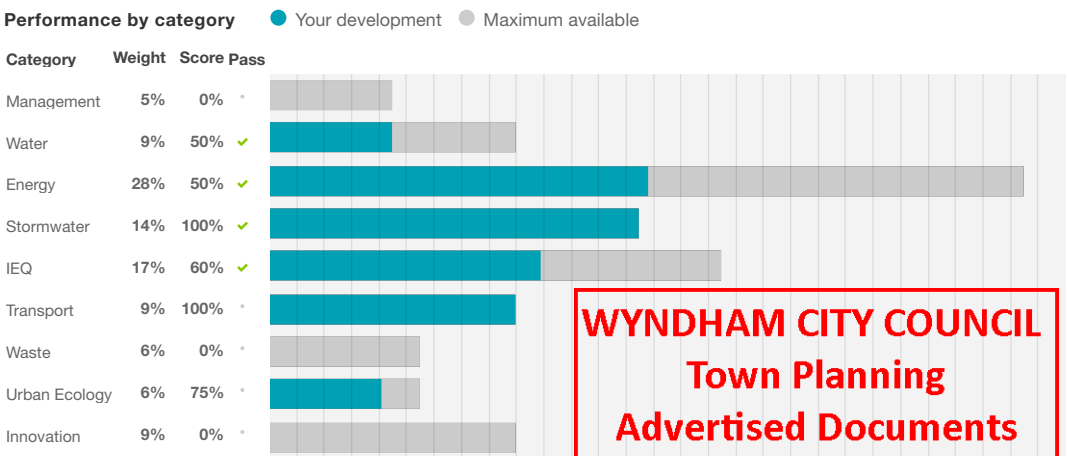


54%

Project details

Address	23 Hodge St Werribee VIC 3030
Project no	347770DD-R3
BESS Version	BESS-6
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	merrick@greenzone.net.au
Application no.	
Site area	627 m²
Building floor area	461.9 m²
Date	30 April 2022
Software version	1.7.0-B.384

Performance by category



Dwellings & Non Res Spaces

Dwellings

Name	Quantity	Area	% of total area
Townhouse			
UNIT 1	1	158 m²	34%
UNIT 2	1	153 m²	33%
UNIT 3	1	151 m²	32%
Total	**3**	**461 m²**	**100%**

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Water efficient garden annotated		-
Energy 3.3	External lighting sensors annotated		-
Energy 3.4	Clothes line annotated (if proposed)		-
Stormwater 1.1	Location of any stormwater management systems used in STORM or MUSIC modelling (e.g. Rainwater tanks, raingarden, buffer strips)		-
IEQ 3.1	Glazing specification to be annotated		-
IEQ 3.2	Adjustable shading systems		-
Transport 1.1	All nominated residential bicycle parking spaces		-
Transport 2.1	Location of electric vehicle charging infrastructure		-
Urban Ecology 2.1	Vegetated areas		-
Urban Ecology 2.4	Taps and floor waste on balconies / courtyards		-
Urban Ecology 3.1	Food production areas		-

Supporting evidence

Credit	Requirement	Response	Status
Energy 3.5	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.		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 3.1	Reference to floor plans or energy modelling showing the glazing specification (U-value and Solar Heat Gain Coefficient, SHGC)		-
IEQ 3.2	Reference to floor plans and elevations showing shading devices		-

Credit summary

Management Overall contribution 4.5%

	0%
1.1 Pre-Application Meeting	0%
2.2 Thermal Performance Modelling - Multi-Dwelling Residential	0%
4.1 Building Users Guide	0%

Water Overall contribution 9.0%

	Minimum required 50%	50%	✓ Pass
1.1 Potable water use reduction		0%	
3.1 Water Efficient Landscaping		100%	

Energy Overall contribution 27.5%

	Minimum required 50%	50%	✓ Pass
1.2 Thermal Performance Rating - Residential		0%	
2.1 Greenhouse Gas Emissions		100%	
2.2 Peak Demand		0%	
2.3 Electricity Consumption		100%	
2.4 Gas Consumption		100%	
2.5 Wood Consumption		N/A	◇ Scoped Out
		No wood heating system present	
3.2 Hot Water		100%	
3.3 External Lighting		100%	
3.4 Clothes Drying		100%	
3.5 Internal Lighting - Residential Single Dwelling		100%	
4.4 Renewable Energy Systems - Other		N/A	⊘ Disabled
		No other (non-solar PV) renewable energy is in use.	
4.5 Solar PV - Houses and Townhouses		N/A	⊘ Disabled
		No solar PV renewable energy is in use.	

Stormwater Overall contribution 13.5%

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

IEQ Overall contribution 16.5%

	Minimum required 50%	60%	✓ Pass
2.2 Cross Flow Ventilation		0%	
3.1 Thermal comfort - Double Glazing		100%	
3.2 Thermal Comfort - External Shading		100%	
3.3 Thermal Comfort - Orientation		0%	

Transport Overall contribution 9.0%

100%

1.1 Bicycle Parking - Residential	100%	
1.2 Bicycle Parking - Residential Visitor	N/A	Scoped Out
		Not enough dwellings.
2.1 Electric Vehicle Infrastructure	100%	

Waste Overall contribution 5.5%

0%

1.1 - Construction Waste - Building Re-Use	0%
2.1 - Operational Waste - Food & Garden Waste	0%

Urban Ecology Overall contribution 5.5%

75%

2.1 Vegetation	100%
2.2 Green Roofs	0%
2.3 Green Walls and Facades	0%
2.4 Private Open Space - Balcony / Courtyard Ecology	100%
3.1 Food Production - Residential	100%

Innovation Overall contribution 9.0%

0%

1.1 Innovation	0%

Credit breakdown

Management Overall contribution 0%

1.1 Pre-Application Meeting		0%
Score Contribution	This credit contributes 50% 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	

2.2 Thermal Performance Modelling - Multi-Dwelling Residential		0%
Score Contribution	This credit contributes 33.3% towards the category score.	
Criteria	Have preliminary NatHERS ratings been undertaken for all thermally unique dwellings?	
Question	Criteria Achieved ?	
Townhouse	No	

4.1 Building Users Guide		0%
Score Contribution	This credit contributes 16.7% towards the category score.	
Criteria	Will a building users guide be produced and issued to occupants?	
Question	Criteria Achieved ?	
Project	No	

Water

Overall contribution 4% 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	
Showerhead: All	4 Star WELS (>= 4.5 but <= 6.0)
Bath: All	Medium Sized Contemporary Bath
Kitchen Taps: All	>= 5 Star WELS rating
Bathroom Taps: All	>= 5 Star WELS rating
Dishwashers: All	>= 5 Star WELS rating
WC: All	>= 5 Star WELS rating
Urinals: All	Scope out
Washing Machine Water Efficiency: All	Default or unrated
Which non-potable water source is the dwelling/space connected to?:	
UNIT 1	RAIN TANK UNIT 1
UNIT 2	RAIN TANK UNIT 2
UNIT 3	RAIN TANK UNIT 3
Non-potable water source connected to Toilets: All	Yes
Non-potable water source connected to Laundry (washing machine): All	Yes
Non-potable water source connected to Hot Water System: All	No
Rainwater Tanks	
What is the total roof area connected to the rainwater tank?:	
RAIN TANK UNIT 1	31.0 m²
RAIN TANK UNIT 2	71.0 m²
RAIN TANK UNIT 3	38.0 m²
Tank Size:	
RAIN TANK UNIT 1	2,000 Litres
RAIN TANK UNIT 2	2,000 Litres
RAIN TANK UNIT 3	2,000 Litres
Irrigation area connected to tank:	
RAIN TANK UNIT 1	-
RAIN TANK UNIT 2	-
RAIN TANK UNIT 3	-
Is connected irrigation area a water efficient garden?:	
RAIN TANK UNIT 1	Yes
RAIN TANK UNIT 2	Yes
RAIN TANK UNIT 3	Yes

Other external water demand connected to tank?:	
RAIN TANK UNIT 1	-
RAIN TANK UNIT 2	-
RAIN TANK UNIT 3	-

1.1 Potable water use reduction		40%
Score Contribution	This credit contributes 83.3% 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	618 kL	
Output	Proposed (excluding rainwater and recycled water use)	
Project	473 kL	
Output	Proposed (including rainwater and recycled water use)	
Project	402 kL	
Output	% Reduction in Potable Water Consumption	
Project	35 %	
Output	% of connected demand met by rainwater	
Project	48 %	
Output	How often does the tank overflow?	
Project	Never / Rarely	
Output	Opportunity for additional rainwater connection	
Project	122 kL	

3.1 Water Efficient Landscaping		100%
Score Contribution	This credit contributes 16.7% towards the category score.	
Criteria	Will water efficient landscaping be installed?	
Question	Criteria Achieved ?	
Project	Yes	

Energy

Overall contribution 14% Minimum required 50%

Dwellings Energy Approach	
What approach do you want to use for Energy?:	Use the built in calculation tools
Project Energy Profile Question	
Are you installing any solar photovoltaic (PV) system(s)?:	No
Are you installing any other renewable energy system(s)?:	No
Gas supplied into building:	Natural Gas
Dwelling Energy Profiles	
Below the floor is: All	Ground or Carpark
Above the ceiling is: All	Outside
Exposed sides:	
UNIT 1 UNIT 3	3
UNIT 2	2
NatHERS Annual Energy Loads - Heat: All	102 MJ/sqm
NatHERS Annual Energy Loads - Cool: All	31.0 MJ/sqm
NatHERS star rating: All	6.0
Type of Heating System: All	D Reverse cycle space
Heating System Efficiency: All	5 Star
Type of Cooling System: All	Evaporative central
Cooling System Efficiency: All	5 Stars
Type of Hot Water System: All	J Gas Instantaneous 6 star
% Contribution from solar hot water system: All	-
Is the hot water system shared by multiple dwellings?: All	No
Clothes Line: All	D Private outdoor clothesline
Clothes Dryer: All	Occupant to Install

1.2 Thermal Performance Rating - Residential — 0%

Score Contribution	This credit contributes 30.0% towards the category score.
Criteria	What is the average NatHERS rating?
Output	Average NATHERS Rating (Weighted)
Townhouse	6.0 Stars

2.1 Greenhouse Gas Emissions — 100%

Score Contribution	This credit contributes 10.0% towards the category score.
Criteria	What is the % reduction in annual greenhouse gas emissions against the benchmark?
Output	Reference Building with Reference Services (BCA only)
Townhouse	25,502 kg CO2
Output	Proposed Building with Proposed Services (Actual Building)
Townhouse	7,290 kg CO2
Output	% Reduction in GHG Emissions
Townhouse	71 %

2.2 Peak Demand		0%
Score Contribution	This credit contributes 5.0% towards the category score.	
Criteria	What is the % reduction in the instantaneous (peak-hour) demand against the benchmark?	
Output	Peak Thermal Cooling Load - Baseline	
Townhouse	42.6 kW	
Output	Peak Thermal Cooling Load - Proposed	
Townhouse	42.3 kW	
Output	Peak Thermal Cooling Load - % Reduction	
Townhouse	0 %	
2.3 Electricity Consumption		100%
Score Contribution	This credit contributes 10.0% towards the category score.	
Criteria	What is the % reduction in annual electricity consumption against the benchmark?	
Output	Reference	
Townhouse	22,209 kWh	
Output	Proposed	
Townhouse	5,220 kWh	
Output	Improvement	
Townhouse	76 %	
2.4 Gas Consumption		100%
Score Contribution	This credit contributes 10.0% towards the category score.	
Criteria	What is the % reduction in annual gas consumption against the benchmark?	
Output	Reference	
Townhouse	55,442 MJ	
Output	Proposed	
Townhouse	38,239 MJ	
Output	Improvement	
Townhouse	31 %	
2.5 Wood Consumption		N/A ◇ Scoped Out
This credit was scoped out	No wood heating system present	
3.2 Hot Water		100%
Score Contribution	This credit contributes 5.0% towards the category score.	
Criteria	What is the % reduction in annual energy consumption (gas and electricity) of the hot water system against the benchmark?	
Output	Reference	
Townhouse	15,401 kWh	
Output	Proposed	
Townhouse	10,760 kWh	
Output	Improvement	
Townhouse	30 %	

3.3 External Lighting		100%	
Score Contribution	This credit contributes 5.0% towards the category score.		
Criteria	Is the external lighting controlled by a motion detector?		
Question	Criteria Achieved ?		
Townhouse	Yes		
3.4 Clothes Drying		100%	
Score Contribution	This credit contributes 5.0% towards the category score.		
Criteria	What is the % reduction in annual energy consumption (gas and electricity) from a combination of clothes lines and efficient driers against the benchmark?		
Output	Reference		
Townhouse	2,043 kWh		
Output	Proposed		
Townhouse	409 kWh		
Output	Improvement		
Townhouse	80 %		
3.5 Internal Lighting - Residential Single Dwelling		100%	
Score Contribution	This credit contributes 5.0% towards the category score.		
Criteria	Does the development achieve a maximum illumination power density of 4W/sqm or less?		
Question	Criteria Achieved?		
Townhouse	Yes		
4.4 Renewable Energy Systems - Other		N/A	⊘ Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.		
4.5 Solar PV - Houses and Townhouses		N/A	⊘ Disabled
This credit is disabled	No solar PV renewable energy is in use.		

Stormwater

Overall contribution 14% Minimum required 100%

Which stormwater modelling are you using?:	Melbourne Water STORM tool	
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	STORM score achieved	
Project	103	
Output	Min STORM Score	
Project	100	

IEQ Overall contribution 10% Minimum required 50%

2.2 Cross Flow Ventilation		0%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Are all habitable rooms designed to achieve natural cross flow ventilation?	
Question	Criteria Achieved ?	
Townhouse	No	

3.1 Thermal comfort - Double Glazing		100%
Score Contribution	This credit contributes 40.0% towards the category score.	
Criteria	Is double glazing (or better) used to all habitable areas?	
Question	Criteria Achieved ?	
Townhouse	Yes	

3.2 Thermal Comfort - External Shading		100%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Is appropriate external shading provided to east, west and north facing glazing?	
Question	Criteria Achieved ?	
Townhouse	Yes	

3.3 Thermal Comfort - Orientation		0%
Score Contribution	This credit contributes 20.0% towards the category score.	
Criteria	Are at least 50% of living areas orientated to the north?	
Question	Criteria Achieved ?	
Townhouse	No	

Transport Overall contribution 9%

1.1 Bicycle Parking - Residential		100%
Score Contribution	This credit contributes 50.0% towards the category score.	
Criteria	How many secure and undercover bicycle spaces are there per dwelling for residents?	
Question	Bicycle Spaces Provided ?	
Townhouse	3	
Output	Min Bicycle Spaces Required	
Townhouse	3	

1.2 Bicycle Parking - Residential Visitor		N/A	Scoped Out
This credit was scoped out	Not enough dwellings.		

2.1 Electric Vehicle Infrastructure		100%
Score Contribution	This credit contributes 50.0% towards the category score.	
Criteria	Are facilities provided for the charging of electric cars?	
Question	Criteria Achieved ?	
Project	Yes	

Waste

Overall contribution 0%

1.1 - Construction Waste - Building Re-Use	0%
Score Contribution	This credit contributes 50.0% towards the category score.
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been reused?
Question	Criteria Achieved ?
Project	No

2.1 - Operational Waste - Food & Garden Waste	0%
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	No

Urban Ecology

Overall contribution 4%

2.1 Vegetation		100%
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	48 %	
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	
2.4 Private Open Space - Balcony / Courtyard Ecology		100%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Is there a tap and floor waste on every balcony / in every courtyard?	
Question	Criteria Achieved ?	
Townhouse	Yes	
3.1 Food Production - Residential		100%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	What area of space per resident is dedicated to food production?	
Question	Food Production Area	
Townhouse	3.0 m^2	
Output	Min Food Production Area	
Townhouse	3 m^2	

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)?	

Disclaimer

The Built Environment Sustainability Scorecard (BESS) has been provided for the purpose of information and communication. While we make every effort to ensure that material is accurate and up to date (except where denoted as 'archival'), this material does in no way constitute the provision of professional or specific advice. You should seek appropriate, independent, professional advice before acting on any of the areas covered by BESS.

Rainwater Tanks

Stormwater Sensitive Homes

How does a rainwater tank help protect our local streams?

Most people install a rainwater tank primarily to harvest stormwater from their roof and conserve their mains water use. In addition to conserving water, a rainwater tank also helps treat stormwater and protect local streams from high storm flows by reducing the volume of stormwater and quantity of pollutants coming from a house block that would otherwise be delivered to the local stream.

What do I use my tank water for?

Garden irrigation, laundry and toilet flushing consume much of our home water use. In most cases these uses do not require the water to be of drinking quality standard that is provided by mains water. By plumbing your rainwater tank to your toilet or laundry and substituting these mains water needs with the rainwater harvested from your roof, you can conserve mains water whilst reducing the amount of stormwater that enters our streams.

A typical home uses approximately 250,000 litres of water each year.

MelbourneWater

Melbourne Water 131772
Melbourne Water Corporation, PO Box 4342, Melbourne Victoria 3001

Why can't I use my rainwater tank for my garden alone?

So that your tank is not too full to collect rainwater when it rains, you need to be consistently using your tank water all year round.

If tank water is used for your garden alone, your tank will remain full and unused during the winter months when your garden does not require watering. With a full tank, your capacity to capture and store the regular winter rainfall and thus benefit the local waterway is significantly reduced.

By plumbing your rainwater tank to your toilet or laundry, your tank water is used consistently all year round allowing rainfall to refill the tank more often especially in winter. This ultimately reduces the volume of stormwater that is delivered to the stream and the quantity of pollutants that are washed with it.

The Victorian Government has recognised the importance of plumbing your tank to your toilet and offers a cash rebate for the installation of connected rainwater tanks (www.dse.vic.gov.au). In addition, a 5 star energy standard has been introduced that requires a connected 2000Lt rainwater tank or solar hot water service to be installed in all new houses and apartments (class 1 and 2 buildings). (www.buildingcommission.com.au).

How do I choose a rainwater tank?

The most important thing to consider when choosing a rainwater tank is to first identify what you want from your rainwater tank. The size and type of rainwater tank you choose will vary depending on your homes water needs and the reliability you seek from your rainwater tank supply. There are a number of factors that may influence this and the following questions should be considered when planning your tank installation:

- what is the water demand of your home?
- how many people are living in your home?
- what is your intended use of rainwater?
- what reliability do you want from your tank?
- what is the total area of roof draining into your tank?
- what is average rainfall of your area?
- do you need extras like a pressure pump, the ability to top up your tank with drinking water, a backflow prevention device or a first flush device?
- are the materials used on your roof suitable to collect rainwater?
- are there physical constraints of your property that may influence the type of rainwater tank you need?

Once you know how much water you can collect and how much water you are going to use then a tank size can be selected to provide the reliability of water supply that you need.

Types of rainwater tanks

Rainwater tanks come in a variety of materials, shapes and sizes and can be incorporated into building design so they don't impact on the aesthetics of the development. They can be located above ground, underground, under the house or can even be incorporated into fences or walls.

There are three main tank systems to consider and a variety of materials to choose from. Features of these are outlined below and in the pictures above:

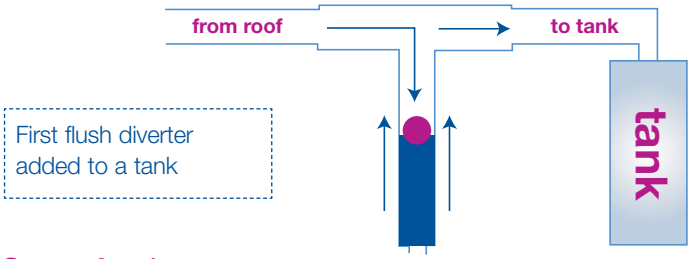
Tank systems:

Gravity Systems - rely on gravity to supply rainwater to the household and the garden by placing the tank on a stand at height.

Dual Supply Systems - top your rainwater tank with mains water when tank level is low ensuring reliable water supply.

Pressure Systems - use a pump to deliver rainwater to household and garden fixtures.

To reduce the amount of sediment and debris entering a tank, mesh screens and 'first flush diverters' can be fitted. A screen will filter large debris such as leaves and sticks while 'first flush diverters' store the 'first flush' of the rainfall that carries the sediment and other pollutants initially washed from your roof (see figure below).



Costs & rebates

Costs of installing a tank vary however a standard 2000Lt tank or bladder will cost around $1000.

Additional plumbing and/ or.....

- Above ground tanks cost approximately $250 for a 500 litre tank.
- Below ground tanks cost between $300-$600 per 1000 litres of storage
- The costs of pumps start from $200.

Additional plumbing and/or excavation costs vary on intended use, pipe layout, materials and site accessibility.

The Victorian Government offers a total rebate of $300 for the installation of a rainwater tank that is plumbed to toilet and connected by a licensed plumber. For further details refer to the Department of Sustainability and Environment website www.dse.vic.gov.au.

For more information:

Melbourne Water's Water Sensitive Urban Design Website: www.wsud.melbournewater.com.au

Municipal Association of Victoria Clearwater Program: www.clearwater.asn.au

Water Sensitive Urban Design in the Sydney Region: www.wsud.org

Urban Stormwater Best Practice Environmental Management Guidelines, Victorian Stormwater Committee, CSIRO publishing, 1999.

WSUD Engineering Procedures: Stormwater, Melbourne Water, 2005.

Delivering Water Sensitive Urban Design: Final Report of Urban Stormwater – a planning framework, ABM, 2004.

INSTRUCTION SHEET

Building a planter box raingarden (lined)

What is a planter box raingarden?

Building a raingarden is a simple way to help the environment and the health of our local waterways while providing a self-watering garden for your backyard.

A raingarden is a specially prepared garden designed to receive and filter rain run-off from roofs or hard surfaces such as driveways or paving. You can even create a raingarden in a planter box, positioning it to collect water from a diverted downpipe or rainwater tank overflow.

Featuring layers of soil for filtration, gravel for drainage, and plants that can tolerate periods without rain, a raingarden helps to protect our streams and rivers from stormwater pollutants.

With a slotted pipe beneath the soil to take away the filtered rainwater and an overflow pipe on the surface to prevent flooding, raingardens are designed to collect water from a diverted downpipe, rainwater tank overflow or pavement runoff.

Please note: A certified plumber must be used for stormwater connections and modifications.

Did you know that a raingarden is only wet during and immediately after rain, leaving it dry most of the time? This is due to the drainage and filtration properties of the soil combination used in the raingarden.

Building your raingarden

Step 1 – getting started

Location

Build your planter box as close as possible to the water source whether it be a downpipe or rainwater tank overflow. This will help minimise the additional plumbing needed to bring water to the raingarden. Your raingarden needs to sit at least 300mm away from your house.

Having decided on a location, it is important to determine the proximity of the existing stormwater pipe to make sure your raingarden is connected properly. Your local plumber can help with this and also how and when to divert your downpipe so that the area doesn't flood during construction.

Stormwater reconnection

All connections or modifications to existing stormwater pipes need to be done by a licensed plumber. The plumber should ensure that pipes are reconnected into the property's stormwater and not another services such as the sewer.

Underground services

Be aware of any underground services (gas, electricity, water) that run near your house as this may determine where you can build your raingarden. Raingardens should not be built over or in close proximity to a septic system.

Materials

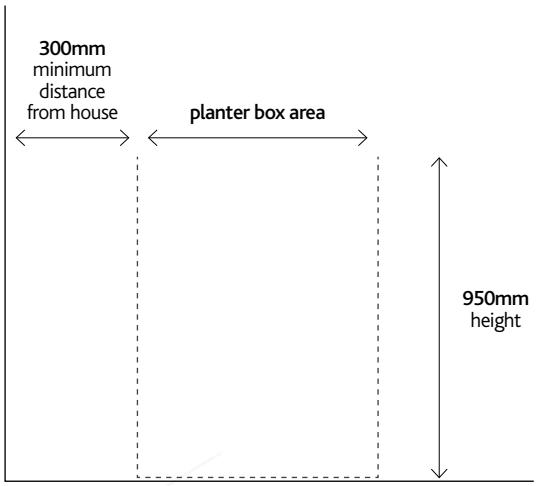
See *Materials List* for information about what you need to build a raingarden.

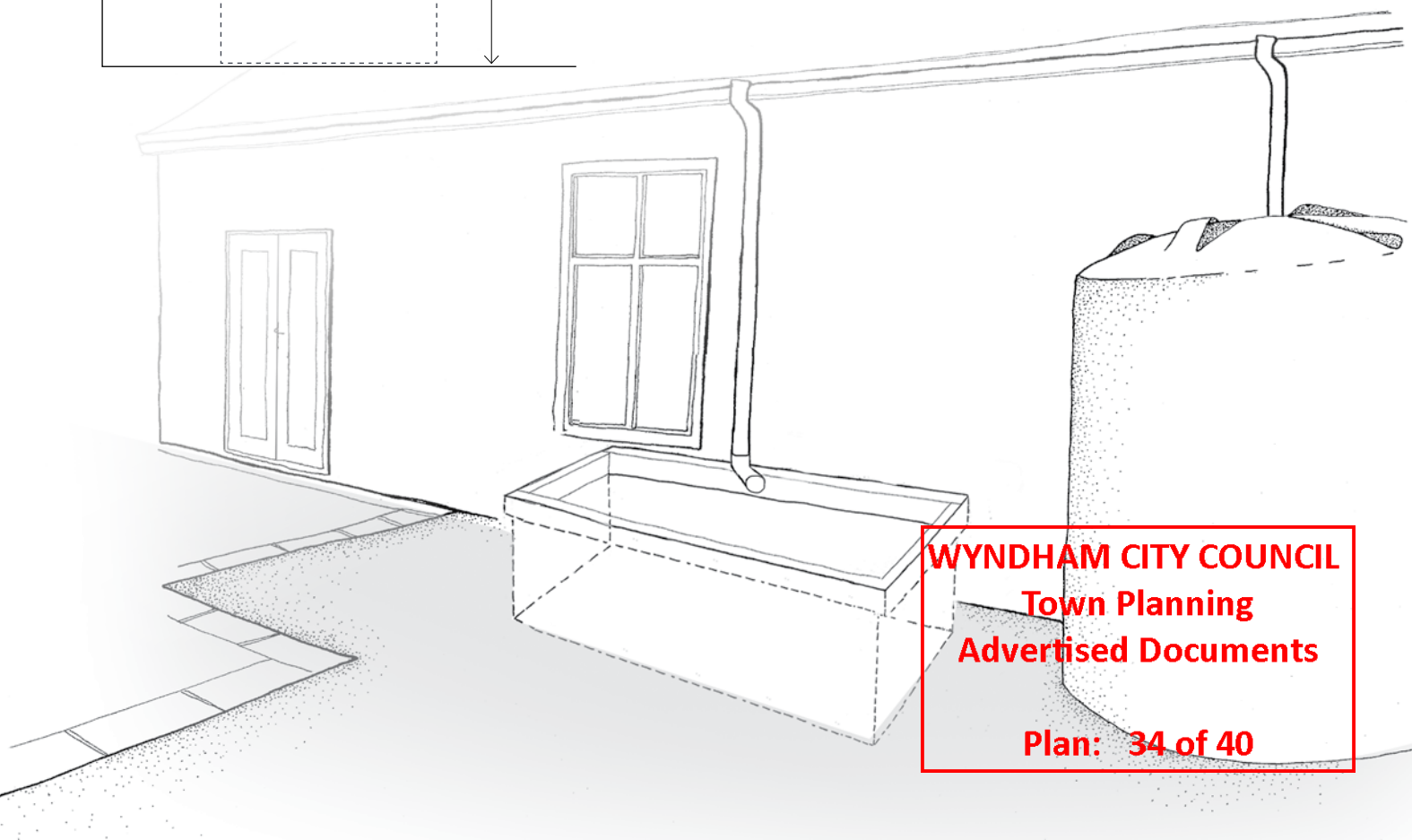
Size

You need to make sure that your raingarden is large enough to manage the amount of stormwater it will receive. If your raingarden is going to capture run-off from the roof via a downpipe, measure the area of roof that drains to that downpipe. Generally, the size of the raingarden should be approximately 2% of the run-off area. Table 1 will help you work out the correct size.

Table 1 – Raingarden sizing chart

AREA OF RUN-OFF (m²)	RAINGARDEN SIZE (m²)
50	1
100	2
150	3
200	4
250	5
300	6
350	7
400	8
450	9





Step 2 - planter box and pipe infrastructure

Preparing your planter box

You can create a planter box out of any material as long as it is strong enough to hold soil. This could be a corrugated iron 'tank', an old wine barrel, or you could build your own planter box using plantation hardwood or similar.

Line your planter box (sides and base) with a PVC liner. Overlap the sheets by 200mm and seal the joins with PVC tape.

Place the 7mm screenings (gravel) to a depth of 50mm. This will form a base for the slotted drainage pipe. Make sure the screenings are washed and cleaned of excess dirt as this can create blockages in the raingardens drainage.

Use the screenings to create a gentle slope towards the stormwater outlet (where the water will exit your planter box).

Pipe infrastructure

Lay a 90mm diametre slotted drainage pipe horizontally along the centre of the planter box base and cap one end of the slotted drainage pipe. Call your plumber to connect the drainage pipe back into the property's existing stormwater.

Handy Hint – If your raingarden is greater than 4m wide, you will need to install two slotted drainage pipes and two overflow pipes. These need to be evenly spaced across the planter box base to provide adequate drainage.

Connect the vertical 90mm diameter overflow pipe into the slotted drainage pipe using a 90 degree elbow pipe.

When the raingarden is finished the top of the overflow pipe should sit 100mm above the gravel mulch and 100mm below the top edge of the planter box.

Install a temporary cap on top of the overflow pipe to prevent materials dropping into it during construction. Some plastic taped across the top of the pipe will work fine.

Building your raingarden

Step 3 - soil layers

Screenings layer

Add 7mm screenings (gravel) to a depth of 150mm over the slotted drainage pipe in the base of your raingarden. This brings to total depth of screenings (gravel) to 200mm. Be careful when not to dislodge or damage the slotted drainage pipe when adding the additional screenings.

Sand layer

Place white washed sand to a depth of 100mm over the screenings (gravel) layer.

Sand/soil mix layer

Mix 4 parts white washed sand with 1 part topsoil. Add this mix to the raingarden to a depth of 400mm.

Handy Hint - Ensure you firmly pat down each layer of soil when building your raingarden to help reduce the layers from sinking.

Step 4 -pipe adjustments, plants and mulch

Pipe adjustments

Redirect your downpipe into the raingarden using pipe bends where required. If possible, use two 45 degree bends connected together as this will provide a much gentler and more even flow of water, reducing the risk of erosion and prevent blockages within the downpipe. A 90 degree elbow pipe will do as an alternative.

Plants

In general, plants that grow well in a raingarden:

- like dry conditions but can tolerate temporary wet periods
- are perennial rather than annual
- have an extensive fibrous root system.

A wide range of plants are suitable for raingardens and your local nursery will be able to guide you on what is right for your area.

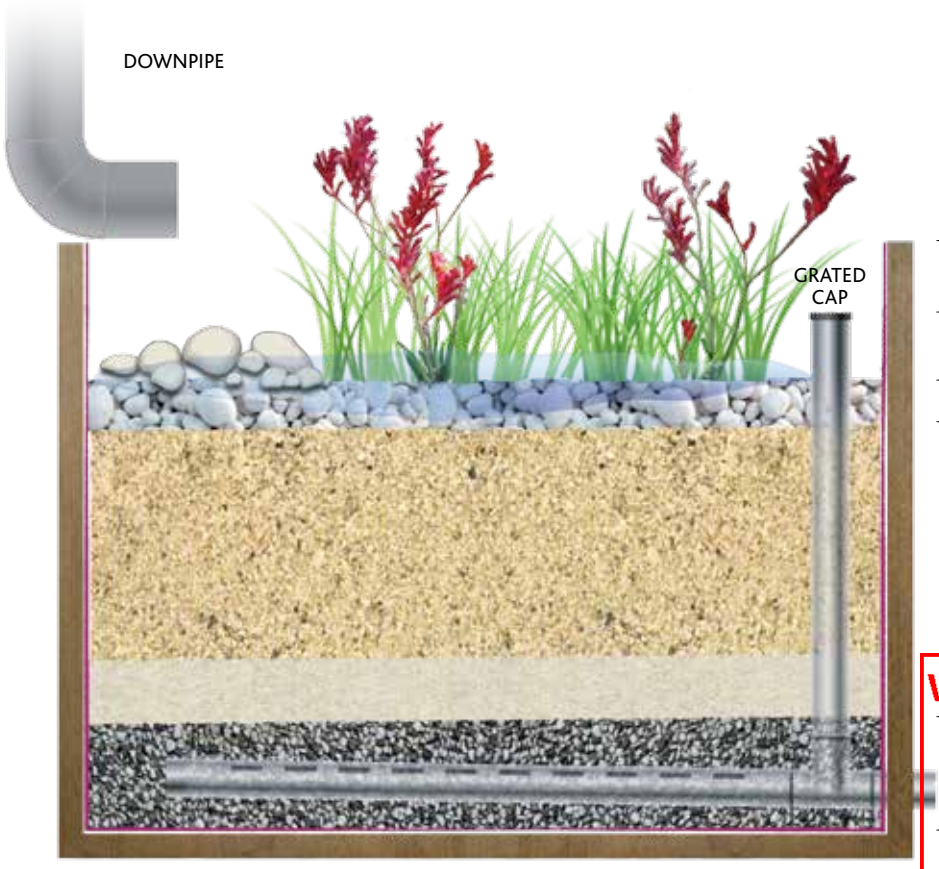
There are also particular plants that are really good at removing pollutants from stormwater. These include:

- *Carex appressa*
- *Lomandra longifolia*
- *Juncus flavidus*
- *Melaleuca ericifolia*
- *Goodenia ovate.*

50% of your raingarden should be planted with these species, the other 50% can be made up of plants that like a dry environment with intermittent wet periods. It is important that the plants you select are suitable for the amount of sun and shade on your raingarden. See the *Plant List* for a suggested list of suitable raingarden plants.

Regardless of the type of plants you select, it is important to plant densely to cover the raingarden. Set your plants out at roughly 6 plants per m². So for a 2m² raingarden, you will need to buy 12 plants. Now start planting.

(continued on next page)



Looking after your raingarden

Mulch

To allow the spread of water gently over the raingarden, place some large flat rocks where water flows from the downpipe. Place smaller rocks in between the large rocks to fill the gaps and help prevent erosion. Alternatively a flow spreading device can be fitted to the downpipe.

Spread gravel mulch to a depth of 50mm around the plants.

Remove the temporary end cap from overflow pipe and replace with a 90mm PVC finishing collar and domed pipe grate.

Water the plants in – complying with your local water restrictions.

Once established, raingardens are low maintenance especially when planted with native plant species. They don't need to be watered, mowed or fertilised. However, a few simple tips can help your raingarden mature and function well.

- Gravel mulch will help retain moisture in your raingarden and prevent weeds from growing.
- Ensure that the overflow is never blocked.
- Remove any sediment or build up from the downpipe.
- Some weeding may need to take place until plants have matured.
- Evenly distribute water flow into your garden to limit erosion from heavy rainfall. Strategically placed rocks may help with this.
- Inspect your garden regularly – replace plants and repair erosion when necessary.

Note – If necessary, water your raingarden until your plants have established in compliance with your local water restrictions.

Need help?
If you have questions about building a raingarden, your landscape gardener or local plumber may be able to help. For more information visit melbournewater.com.au/raingardens

Materials List – what you need to build your raingarden

Table 2 details the materials required to create a 2m² raingarden. While item prices may vary depending on the materials you select, building a 2m² raingarden is likely to cost between $400 and $500 (plus the cost of a planter box and plumber).

QUANTITY	MATERIAL
2 l/m	90mm diameter slotted drainage pipe (Ag Pipe)
2 l/m	90mm diameter uPVC pipe*
0.4m³	7mm screenings
0.85m³	Sand (white washed)
0.15m³	Topsoil
12	Plants (150mm pots)
0.1m³	Gravel mulch
1	90mm diameter uPVC 90 degree bend or 2x 45 degree bends
1	PVC grate 90mm finishing collar
1	PVC 90mm diameter domed pipe grate
1	PVC 90mm tee
1	PVC 90mm cap
10m²	PVC liner
	PVC tape

**Costs per square meter will depend on the length of connections back to the existing stormwater drain.*

l/m = lineal metres m² = square metres m³ = cubic metres mm = millimetres

Plant List – the best plants for your raingarden

The following plants grow well in raingardens.

BOTANICAL NAME	COMMON NAME	CONDITIONS	SIZE (H x W) (cm)
Anigozanthos sp.	Kangaroo paw	Full sun	30-90 x 100-120
Blechnum nudum	Fishbone Water-fern	Full sun to partial shade	50-100 x 40-80
Calocephalus lacteus	Milky Beauty-heads	Full sun to partial shade	15-30 x 10-30
Carex Appressa	Tall Sedge	Full sun to partial shade	80-100 x 120
Carpobrotus modestus	Pigface	Full sun	20cm high and spreading
Chrysocephalum apiculatum	Common Everlasting	Full sun	30-90 x 10-30
Derwentia perfoliata	Digger's Speedwell	Full sun to partial shade	20-40 x 30-60
Dianella species		Full sun to partial shade	60-120 x 40-150
Ficinia nodosa	Knobby Club-rush	Full sun	50-150 x 60-200
Juncas amabilis	Hollow Rush	Full sun to partial shade	20-120 x 20-50
Juncas flavidus	Yellow Rush	Full sun to partial shade	40-120 x 20-100
Leucaphyta brownii	Cushion Bush	Full sun, salt tolerant	100 x 200
Lomandra species		Full sun to partial shade	60-120 x 50-100
Melaleuca ericifolia	Swamp paperback	Full sun to partial shade	4m high x 3m wide
Myoporum parvifolium	Creeping Boobialla	Full sun	20-30 x 300
Patersonia occidentalis	Native iris	Sun to partial shade	20-40 x 30-60
Pratia perdunculata	Matter Pratia	Partial shade	50-150 x 1.8-5
Wahlenbergia communis	Tufted Bluebell	Full sun	15-50 x 15

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