Sustainable Design Assessment

46 Theodore Avenue, Noble Park VIC

29/10/2024

Frater Consulting Services Pty Ltd

(03) 8691 6928
admin@fraterconsultingservices.com.au
fraterconsultingservices.com.au

a part of Sustainability Tech Partners Pty Ltd

Sustainable Design Assessment (SDA)

Proposed Residential Development

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T1, Level 17, 500 Collins St
Melbourne VIC 3000

03 8691 6928

admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

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T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

INITIATIVES TO BE MARKED ON DRAWINGS

Water & Stormwater Management

Mark-up showing roof catchment area to be diverted to the Rainwater tank for each dwelling – If required, the use of mechanically assisted (pumped) or charged pipe system will be explicitly acknowledged on the drawings and pipes will not be running underneath the building footprint.
Location and size of each Rainwater tank proposed
Note showing connection to the toilets and laundry
Mark-up showing area to be diverted to raingarden and type of raingarden selected (in-ground)
Location of the proposed 2.2m^2 of raingarden treating the driveway - The raingarden can be separated, and location should be chosen in accordance with the civil/drainage engineer and landscape consultant (minimum 300mm away from boundary or structural footings and LPOD location consideration)
Mark-up showing the 110m^2 of driveway areas to divert to the proposed raingardens
Note showing use of native or drought tolerant species for landscaped area. Watering will not be required after an initial period when plants are getting established. If irrigation is required, it will be connected to rainwater tanks
Note showing WELS rating for water fittings/fixtures (refer to report) – Fixtures (e.g. dishwasher) provided as part of base building work have to be chosen within one WELS star of best available at the time of purchase.

Energy Efficiency

Commitment to 6.5 Star average energy rating for the development (on planning and construction drawings)
Note showing commitment to 4W/m^2 lighting density in the dwellings
Retractable external clothes drying line
Lighting sensors for external lighting (motion detectors, timers etc.)

Indoor Environment Quality

Note showing double glazing on all habitable rooms (floor plans and elevations)

Transport

Bike space location for each dwelling – not installed over bonnet

Waste

Three bins system including rubbish, recycling and organic/garden waste as well as future glass waste provision

Urban Ecology

Show extent of vegetated areas around the site (includes lawn)

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Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
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INTRODUCTION

Frater Consulting Services have been engaged to undertake a Sustainable Design Assessment for the proposed townhouse development located at 46 Theodore Avenue, Noble Park. This has been prepared to address the Greater Dandenong City Council's sustainability requirements Planning Policy Clause 22.06 *Environmentally Sustainable Development*.

Within Clause 22.06, the City of Greater Dandenong has identified the following key categories to be addressed:

- Energy Performance;
- Water Resources;
- Stormwater Management;
- Indoor Environment Quality;
- Construction, Building & Waste Management;
- Building Materials;
- Transport; and
- Urban Ecology.

The site has been assessed using the BESS tool. BESS was developed by association of councils led by Moreland City Council. This tool assesses the energy and water efficiency, thermal comfort and overall environmental sustainability performance of new buildings or alterations. It was created to demonstrate how new development can meet sustainability requirements as part of a planning permit application for the participating council.

Each target area within the BESS tool generally receives a score of between 1% and 100%. A minimum score of 50% is required for the energy, water, stormwater and IEQ areas. An overall score of 50% represents 'Best Practice' while a score over 70% represent 'Excellence'. The result of the BESS assessment is included as Appendix D.

The Stormwater Treatment Objective – Relative Measure (STORM) calculator which addresses stormwater quality considerations has been used for the development to ensure that stormwater management best practice requirements have been achieved. The result of the STORM assessment is included as Appendix A.

T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

SITE DESCRIPTION

The proposed site is located at 46 Theodore Avenue, Noble Park. The 728.6m^2 site is currently occupied by a single storey house which is proposed to be demolished prior to the construction of the development. It is located in a residential area.

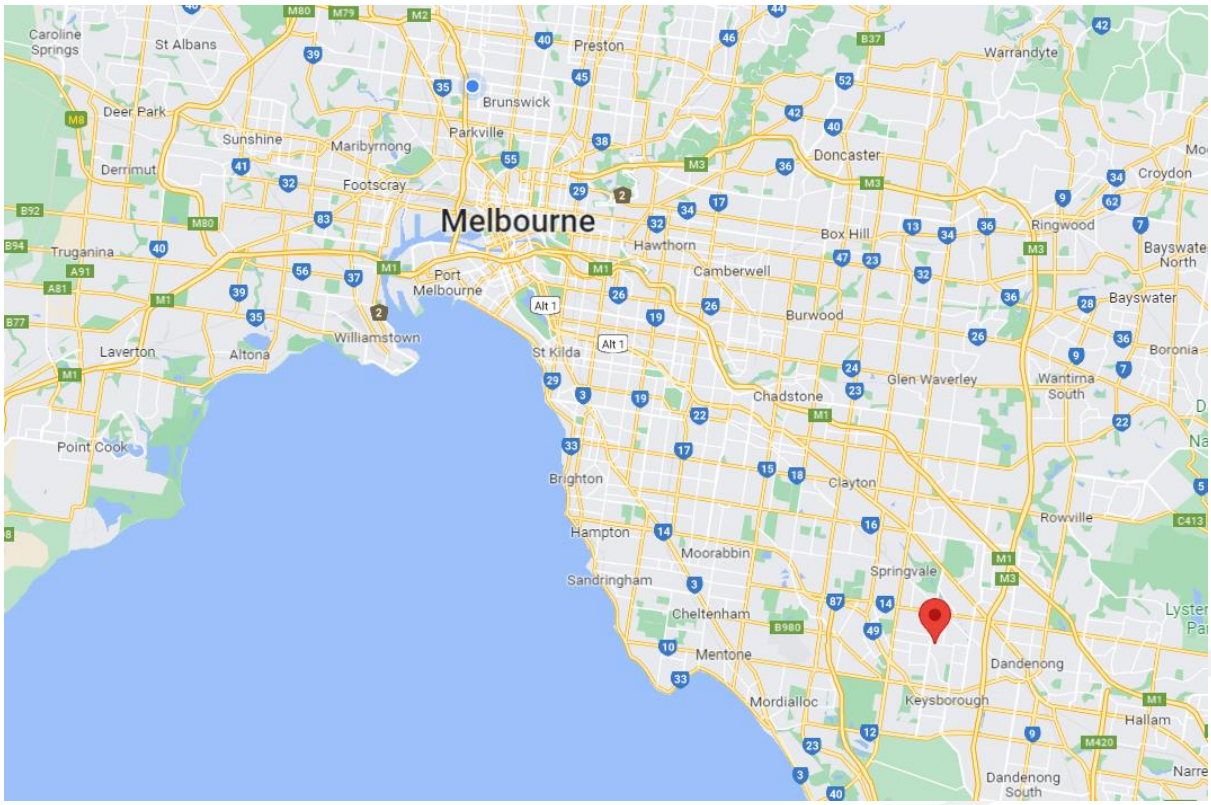

Figure 1: Location of the proposed development in Noble Park with relation to Melbourne CBD (Source: Google Maps)

PROPOSED DEVELOPMENT

The proposal consists of development of the site into three double storey townhouses (3 x 2-bedroom). The area of the site is 728.6m^2. Each townhouse will be provided with an undercover garage. A common driveway will be implemented to access all dwellings.

T1, Level 17, 500 Collins St
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www.fraterconsultingservices.com.au

ENERGY EFFICIENCY

Energy and its key elements should be integrated into the design of the proposed development. These elements contribute to reducing greenhouse gas emissions by utilising energy efficient appliances, energy conservation measures and renewable energy.

Thermal Performance

Energy ratings will be completed at the building approval stage. A commitment is made that the development will meet the energy efficiency requirements of a minimum 6.5-Star average energy rating with no individual dwellings scoring less than 6.0-Stars (10% improvement above BCA requirements). This will be achieved using appropriate insulation levels in all external walls, roofs and floors as well as the use of double-glazing windows throughout habitable rooms. For the purpose of the BESS assessment, 6.5-star average results have been assumed.

Heating and Cooling Systems

Heating and cooling systems can account to up to 40% of a household's energy use. Therefore, to reduce the energy consumption heating and cooling will be provided by energy efficient air conditioners (chosen **within one star of the best available** product in the range at the time of purchase). Please note that 3 Star energy rating has been entered in BESS as an average however actual star rating will depends on the product range.

Hot Water Heating

Hot water for the townhouses will be provided with gas instantaneous hot water units chosen as 6 Star minimum or within one star of the best available whichever is greater.

Internal Lighting

Energy consumption from artificial lighting within the townhouses will be reduced by using LED lighting. A lighting level of $4W/m^2$ will not be exceeded in the townhouses. The use of light internal colours will improve daylight penetration thus reducing the need for artificial lighting.

External Lighting

External lighting for the townhouses and common areas (driveway) will be LED and will include controls such as motion detectors or timers to minimise consumption during off-peak times.

Energy Efficient Appliances

All appliances if provided in the development as part of the base building work (e.g. dishwasher) will be chosen within one energy efficiency star of the best available.

Clothes Drying

External retractable clothes drying lines or racks will be provided for each townhouse within the identified private open spaces.

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03 8691 6928
admin@fraterconsultingservices.com.au
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Water saving-use and reuse and its key elements should be integrated into the design of the proposed development. These principles contribute to reducing the water demand in addition to promoting water reuse. Stormwater management and its key elements should be integrated into the design of the proposed development. These principles contribute to ensuring natural systems are protected and enhanced whilst promoting on-site retention and aims to reduce runoff or peak flows.

Water Efficient Fittings

The development will include efficient fittings and fixtures to reduce the volume of mains water used in the development. The following WELS star ratings will be specified;

- Toilets – 4 Star;
- Taps (bathroom and kitchen) – 5 Star; and
- Showerhead – 4 Star with aeration device (6.0-7.5L/min).

Rainwater Collection & Use

Rainwater runoff from part of the roof area of each townhouse will be collected and stored in rainwater tanks[1]. Each unit will be provided with a 2,000L tank.

If required, a charged pipe system or mechanically assisted system (pumped) or multiple tanks will be installed to collect water from part of the roof of each dwelling.

In the case of a charged pipe system the pipes will not be running underneath the building footprint (slab) and the stakeholders (builder/developer/architect) will be required to explicitly acknowledge this solution and have the capacity to install it.

Rainwater collected will be used for toilet flushing and laundry in each townhouse. These initiatives will reduce significantly the stormwater impacts of the development and help achieve compliance with the STORM calculator (See Appendix A).

Stormwater Treatment - Raingardens

Part of the driveway will be diverted towards a minimum of 2.2m^2 of raingarden before being released at the legal point of discharge.

This will treat the stormwater runoff from part of the roof areas by filtering coarse pollutants before releasing the outflows to the legal point of discharge on site (See Appendix A for details).

The raingardens could be implemented within the landscaped areas adjacent to driveway and will be installed at least 300mm away from the boundary or structural footings. The exact location should be confirmed with the civil/ drainage engineer and landscape consultant. The raingardens treating the roof areas can be installed in-ground.

The owner's corporation will be responsible for the ongoing maintenance of the raingardens.

[1] Please note that any stormwater detention volume requirement for the site will be in addition to the proposed rainwater retention and that the proposed tank will not be directly topped up by mains water.

T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

Water Efficient Appliances

All appliances if provided in the development as part of the base building work (e.g. dishwasher) will be chosen within one WELS star of the best available.

Landscape Irrigation

Native or drought-tolerant plants will be implemented for the landscaped areas on site. Use of water or irrigation will not be required after an initial period when plants are getting established. If irrigation is required, it will be connected to rainwater tanks.

T1, Level 17, 500 Collins St
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INDOOR ENVIRONMENT QUALITY

Indoor Environment Quality and its key elements should be integrated into the design of the proposed development. These elements play a significant role in the health, wellbeing and satisfaction of the development occupants. Facilitating a good (IEQ) design provides a naturally comfortable indoor environment and less dependence on building services such as, artificial lighting, mechanical ventilation and heating and cooling device.

Volatile Organic Compounds

All paints, adhesives and sealants and flooring will have low VOC content. Alternatively products will be selected with no VOCs. Paints such as eColour, or equivalent should be considered. Please refer to Appendix C for VOC limits.

Formaldehyde Minimisation

All engineered wood products will have 'low' formaldehyde emissions, certified as E0 or better. Alternatively, products will be specified with no Formaldehyde. Products such as ecological panel – 100% post-consumer recycled wood (or similar) will be considered for use within the development. Please refer to Appendix C for formaldehyde limits.

Daylight Levels

Daylight penetration will be enhanced with the use of light internal colours to improve daylight reflection. All bedrooms and living rooms will be provided with windows to allow for natural sunlight and ventilation. There are no bedrooms which rely on borrowed daylight. Installation of mirrored wardrobe doors could improve even further the daylight spread within the bedrooms.

Double Glazing

Glazing will be chosen in accordance with the energy rating requirements at the building approval stage. However, as a minimum double glazing will be provided to all living areas and bedrooms. This will provide better thermal performance and reduce condensation which helps prevent the formation of mould within the dwellings.

Task Lighting

A higher illuminance level (300Lux) will be provided for all task areas (e.g. kitchen bench, bathroom basin) to ensure appropriate light is provided to do any tasks in these areas.

Ventilation

All kitchens will have a separate dedicated exhaust fan (range-hood) which will be directly exhausted out of the building.

All townhouses will have access to effective cross flow ventilation. It will provide fresh air to the occupants and reduce the need for mechanical cooling. Window locks and door catches will be included to encourage and improve natural ventilation in the dwellings.

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Building Management and its key elements should be integrated into the design of the proposed development. These principles contribute to ensuring efficient and effective on-going building performance. Waste management and its key elements should be integrated into the design of the proposed development. These principles contribute to ensuring minimal waste is transported to landfill by means of disposal, recycling and on-site waste storage and/or collection methods.

Metering and Monitoring

Separate utility meters (water, gas and electricity) will be provided for each townhouse. This will allow residents to monitor and reduce their consumption.

Construction Waste Management

A waste management plan will be introduced to all on-site staff at a site orientation session to ensure that the waste generated on site is minimised and disposed of correctly. A minimum 80% of all construction and demolition waste generated on site will be reused or recycled.

Construction Environmental Management

The builder will identify environmental risks related to construction and include management strategies such as maintaining effective erosion and sediment control measures during construction and operation and ensure that appropriate staging of earthworks (e.g. avoid bare earthworks in high risk areas of the site during dominant rainfall period).

Operational Waste

Each townhouse will be provided with bins for general, recycling waste and garden/organic waste and provision for future glass waste bins.

Figure 2: bins for each stream including future glass bin

Recycling bins will be provided next to general waste bins in the kitchen.

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admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

Figure 3: Examples of kitchen receptacles for general waste and recycling.

TRANSPORT

Bicycle Parking

Residents will be able to securely park their bicycle within each townhouse's garage or POS. This will provide for a total of at least four bicycle spaces provided for residents and their visitors. The bike spaces will not be installed over bonnet.

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Melbourne VIC 3000
03 8691 6928
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www.fraterconsultingservices.com.au

BUILDING MATERIALS

Materials selection should be integrated into the design of the proposed development. The criteria for appropriate materials used are based on economic and environmental costs.

Timber

All timber used in the development will be Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC) certified, or recycled/reused.

Flooring

The use of timber flooring will be preferred for all living areas and bedrooms. Wherever possible, flooring will be selected from products/materials certified under any of the following:

- Carpet Institute of Australia Limited, Environmental Certification Scheme (ECS);
- Global GreenTag - https://www.globalgreentag.com/; and/or
- Good Environmental Choice (GECA).

Alternatively, flooring must be durable, include some eco-preferred content, be modular and/or come from a manufacturer with a product stewardship program and ISO 14001 certification.

Joinery

Wherever possible, joinery will be manufactured from materials/products certified under any of the following:

- Global GreenTag - https://www.globalgreentag.com/; and/or
- Good Environmental Choice (GECA).

Steel

Wherever possible, steel for the development will be sourced from a Responsible Steel Maker[2]. Reinforcing steel for the project will be manufactured using energy reducing processes commonly used by large manufacturers such as Bluescope or OneSteel.

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

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URBAN ECOLOGY

In highly urbanised environments, such as metropolitan Melbourne, it is important to recognise the importance of maintaining and increasing the health of our urban ecosystems to improve living conditions not only for the fauna but also ourselves. We can improve our urban ecosystem through the incorporation of vegetation through landscaping for both new and existing developments.

Vegetation

Large, landscaped area will be provided around the site and within the private open spaces. It will provide the occupants with a pleasant surrounding environment. The design will incorporate a mix of native species to help maintain local biodiversity.

Insulant ODP

All thermal insulation used in the development will not contain any ozone-depleting substances and will not use any in its manufacturing.

IMPLEMENTATION & MONITORING

The proposed Theodore Avenue development will meet the best practice requirement of the City of Greater Dandenong through the different initiatives describe in this SDA such as thermally efficient building envelope, efficient air conditioning and hot water system and sustainable materials. An appropriate implementation and monitoring of the initiatives outlined within this SDA will be required.

Implementation of the ESD initiatives outlined in this report requires the following processes:

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

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APPENDIX A – WSUD REPORT / STORM ASSESSMENT

New development must comply with the best practice performance targets for suspended solids, total phosphorous and total nitrogen, as set out in the Urban Stormwater Best Practice Environmental Management Guidelines, Victoria Stormwater Committee 1999. Currently, these water quality performance targets 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.

The STORM tool, an industry accepted tool, was used to assess the development and ensure that the best practice targets described above are met. A minimum compliance score of 100% is required to achieve for the development.

Site Delineation

For the purpose of the assessment, the development has been delineated into the following surface types:

- Site area of 728.6m^2;
- Roof area runoff of unit 1 of 81.3m^2 which will be diverted into rainwater tank(s);
- Roof area runoff of unit 2 of 48.3m^2 which will be diverted into rainwater tank(s);
- Part of the roof area runoff of unit 3 of 81.2m^2 which will be diverted into rainwater tank(s);
- Permeable area of 275.6m^2 comprised of landscaped area and other pervious surfaces in the backyards;
- Part of driveway of 110m^2 will be diverted to raingarden(s); and
- Remainder of impervious areas of 132.2m^2 comprised of unconnected roof areas.

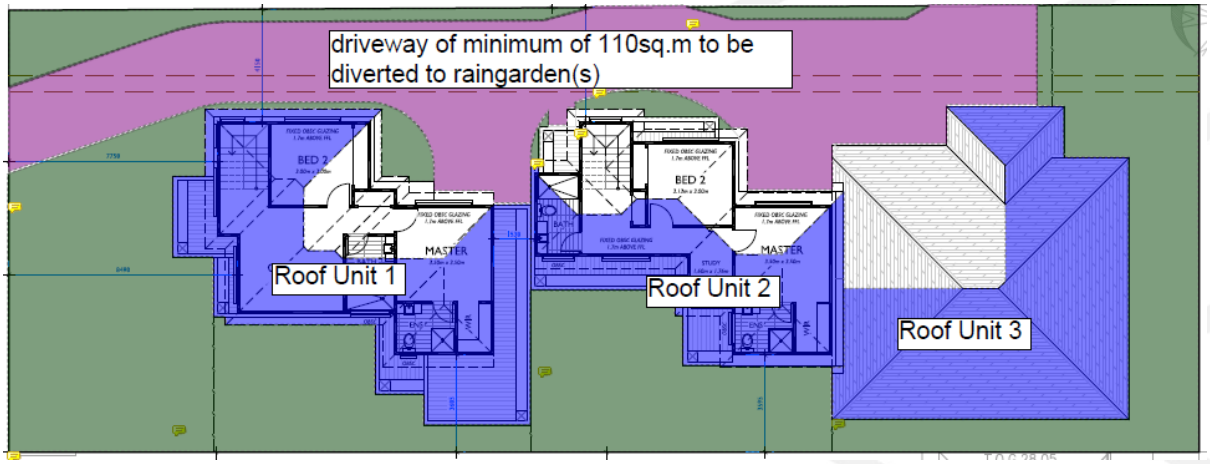

Figure 4: Driveway to divert to raingardens (purple), roof catchment (blue), and permeable landscape (green).

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03 8691 6928
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www.fraterconsultingservices.com.au

Stormwater initiatives

Rainwater Tank
(Rainwater tank for toilet flushing and laundry for each dwelling)

The roof catchment area of each townhouse (as described above) will be diverted to 2,000L for each dwelling. The rainwater collected will be used for toilet flushing and laundry in all townhouses.

If required, a charged pipe system or mechanically assisted system (pumped) or multiple tanks will be installed to collect water from part of the roof of each dwelling.

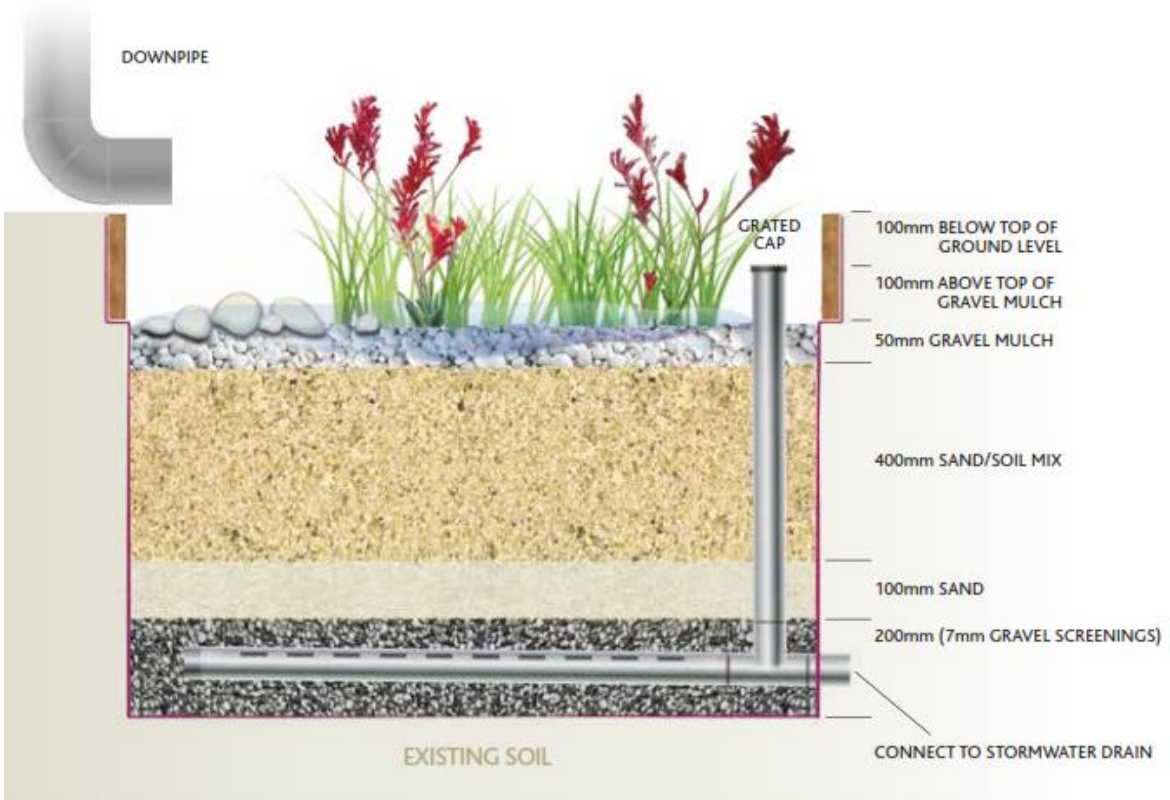
In the case of a charged pipe system the pipes will not be running underneath the slab and the stakeholders (builder/developer/architect) will be required to explicitly acknowledge this solution and have the capacity to install it.

Raingarden

Part of the driveway will be diverted towards a minimum of 2.2m^2 of raingarden before being released at the legal point of discharge.

The raingardens will be implemented within the landscaped areas adjacent to the driveway and will be installed at least 300mm away from the boundary or structural footings. The raingardens treating the driveway areas can be installed in-ground.

Outflows from the raingardens will be released at the legal point of discharge on site. The raingarden will help reduce the coarse and fine sediment levels in the outflows. For more information on how to build raingarden, please visit https://www.melbournewater.com.au/sites/default/files/INGROUND.pdf.



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The remainder of impervious areas will directly be released at the legal point of discharge on site.

Permeable areas are excluded from the STORM assessment.

Stormwater Results

The initiatives and areas described above have been applied to the STORM calculator and the proposed development has achieved a score of 100%.

Melbourne Water STORM Rating Report

TransactionID:	0
Municipality:	GREATER DANDENONG
Rainfall Station:	GREATER DANDENONG
Address:	46 Theodore Avenue
	Noble Park
	VIC 3174
Assessor:	Frater Consulting Services
Development Type:	Residential - Multiunit
Allotment Site (m2):	728.60
STORM Rating %:	100

Description	Impervious Area (m2)	Treatment Type	Treatment Area/Volume (m2 or L)	Occupants / Number Of Bedrooms	Treatment %	Tank Water Supply Reliability (%)
U1 Roof to RWT	81.30	Rainwater Tank	2,000.00	3	139.60	85.60
U2 Roof to RWT	48.30	Rainwater Tank	2,000.00	3	170.00	82.00
U3 Roof to RWT	81.20	Rainwater Tank	2,000.00	3	139.60	85.60
Driveway to raingarden	110.00	Raingarden 300mm	2.20	0	133.00	0.00
Other impervious areas	132.20	None	0.00	0	0.00	0.00

Please note that an additional occupant has been input in STORM for each dwelling to account for laundry connection.

We have assumed that on average a household will have a 3 WELS star washing machine and will run two loads per week. Based on data from WELS, 3-Star washing machine have an average consumption per load of 102 L. With two loads per week, this would represent 204 L/week for laundry or 29L/day. STORM input assume that one bedroom/occupant represent a daily consumption of 20L/day therefore connection to laundry (29L/day) has been input as an additional occupant.

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03 8691 6928
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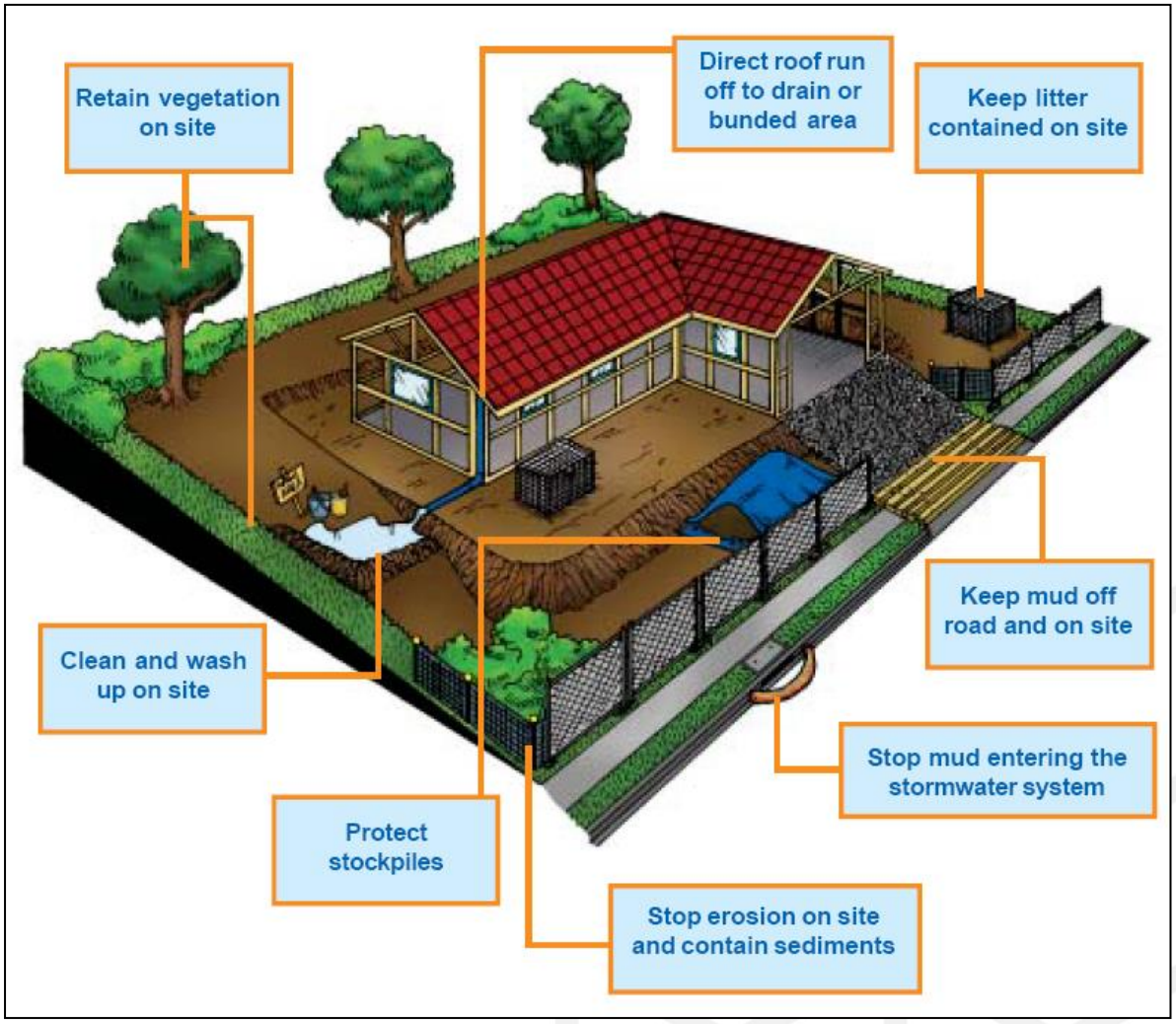
www.fraterconsultingservices.com.au

Stormwater Management at Construction Site

To manage stormwater management in the construction stage, measures will be put in place to minimise the likelihood of contaminating stormwater. This will mean ensuring buffer strips are in place, sediment traps are installed, and the site will be kept clean from any loose rubbish. The builder will follow the process outlined in "Keeping Our Stormwater Clean – A Builder's Guide" by Melbourne Water.



Copies of "Keeping Our Stormwater Clean – A Builder's Guide" booklet can be obtained from Melbourne Water by ringing on 131 722 or can be downloaded from the following website.

http://www.melbournewater.com.au/content/library/rivers_and_creeks/keeping_our_stormwater_clean-a_builders_guide.pdf

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APPENDIX B – WSUD MAINTENANCE & INSTALLATION

Installation

Rainwater Tank(s)

The rainwater tank(s) will be installed above ground. Its manufacturer or material has not been nominated. It will be installed with a mesh insect cover over the inlet pipe to ensure the tank does not become a breeding ground for pests. Mesh needs to be installed over overflow pipes and if a manhole is present it needs to be properly sealed.

Please refer to the architectural drawings for the location of the rainwater tank.

Pumps

The pumps required either to divert the stormwater runoff to the rainwater tank or to distribute the collected water to the end use (toilets & laundry) will be required to be installed as per the chosen manufacturer specifications.

Raingarden

The building of a raingarden should be designed by the landscape architect and in accordance with the Melbourne Water "Building an inground raingarden", "Building an infiltration raingarden", or "Building a planter box raingarden" document/s https://www.melbournewater.com.au/sites/default/files/INGROUND.pdf.

Inspection Requirements

Rainwater Tanks

Inspections of roof areas and gutters leading to the tank should take place every 6 months. Rainwater in the tanks should be checked every 6 months for mosquito infestation.

The rainwater tank should be examined every 2 years for sludge buildup.

Ensure the monitoring system (be it digital or a simple float system) is functioning properly by checking the water level in the rainwater tanks.

Pumps

The pumps required will be required to be routinely inspected by listening for the day-to-day operation of the pumps. Unusual noise or no noise should be investigated. Inspection should occur as per the chosen manufacturer's specifications.

Raingarden

Raingardens should be inspected for damage after large storm events (48.2mm in one hour is considered a large storm event in Melbourne – 1 in a 100-year storm) and should be inspected when garden maintenance occurs onsite (e.g. 3-monthly).

A full inspection of the raingarden should occur annually for a flow test, to identify any plant replacement requirements and whether silt build-up has occurred.

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info@fraterconsulting.com.au
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Inspection of driveway leading to the raingarden should take place every 6 months.

Clean Out / Maintenance Procedure

Rainwater Tank, Roof and Gutters

Rainwater tanks will require the roof and gutters onsite to be maintained; gutters should be checked, maintained and cleaned every six months to avoid blockages from occurring. If a leaf-blocking system is installed this can be completed annually.

Any trees onsite should be maintained every 6 months with branches overhanging the roof removed.

Water ponding in gutters should be avoided as this provides a breeding ground for mosquitos; tanks should also not become breeding grounds for mosquitoes. If mosquitoes are detected in the tank remedial steps need to occur to prevent breeding. If mosquitoes or other insects are found in rainwater tanks, the point of entry should be located and repaired. As well as preventing further access, this will prevent the escape of emerging adults. Gutters should be inspected to ensure they do not contain ponded water and be cleaned if necessary.

Please refer to https://www.health.vic.gov.au/sites/default/files/2022-11/Keeping-your-rainwater-tank-safe-from-mosquitos.pdf for more information on mosquito control.

Rainwater tanks should be checked by a regular maintenance person every 3-6 months to ensure that connection to the building is maintained and there are no blockages.

A simple way to ensure the tank is operating as intended would be through the installation of a smart monitoring device (e.g. OneBox®). These systems allow users to operate tanks remotely from the internet or smartphone, monitor and control the tanks in real time, allow the automatic release of stored water before storm events, alert users if there is any blockage and view tank history and usage patterns.

Alternatively, onsite tank gauges can help those familiar with the tank know if the tank is not working correctly.

Pumps

Maintenance should occur as per the chosen manufacturer's specifications. All strainers and filters should be cleaned every 6 months. Good quality pumps should provide trouble-free service for up to 10 years.

Raingarden

The following maintenance schedule for raingarden has been sourced from *WSUD Maintenance Guidelines* by Melbourne Water.

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Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

Item	What to check for	Action	Frequency
Civil components – Raingarden			
Inlet	No evidence of erosion, blockage, damage or standing water.	Clear inlet of accumulated sediment or debris. Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if the erosion is either recurring or severe.	Storm events 3 months
Outlet	No evidence of erosion, blockage, damage or standing water Outlet freely draining.	Clear outlet of accumulated sediment or debris. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if standing (backwatering into the raingarden) is present.	Storm events 3 months
Other structures	No evidence of erosion and damage to other structures, e.g. pits, pipes, access ramps, walls and rock protection.	Repair minor damage to structures. Eroded areas should be repaired (reinforced). This may involve minor re-profiling or re-planting works. For severe damage, i.e. where flows have scoured down the side of a structure refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Batters and bunds	No evidence of erosion.	Eroded areas should be locally re-profiled or reinforced, and re-planted if necessary.	Annually
Hydraulic conductivity	Filter media is draining freely. No water ponded on the surface of the raingarden for more than 12 hours after rainfall.	If water is ponded on the surface of the raingarden for more than 12 hours after rainfall, refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*. Note: the disposal of raingarden filter material must comply with EPA Victoria guidelines for the disposal of contaminated soil (Appendix C).	Storm events
Vegetation cover – filter media	Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.	Remove any dead or diseased vegetation. Replant individual bare patches (greater than 5% of the area) using either new plants or by dividing and translocating existing plants. If bare areas represent greater than 30% of the raingarden area, refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets*.	3 months
Vegetation cover – batters	Continuous vegetation cover along the lower batter. Greater than 90% vegetation cover. Plants healthy, free from disease and vigorously growing.		Annually
Weeds – filter media – batters	Less than 10% of the filter media surface area and batters covered in weeds.	Physically remove weeds from filter media surface and batters. Do not use herbicides as these may harm the desirable raingarden vegetation and contaminate the filter media. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if weed ingress is a persistent problem (i.e. weed coverage is persistently greater than 30%).	3 months
Litter	Filter media surface and batters free of litter (i.e. less than 1 piece litter per 4m^2).	Remove all litter and excessive debris	3 months
Pests	No damage by pest animals and insects.	Seek specialist advice if persistent insect damage is observed. Refer to Water by Design (2012) *Rectifying Vegetated Stormwater Treatment Assets* if there is evidence of pest animal damage.	3 months

Please note that the Water by Design documents "*Maintaining Vegetated Stormwater Assets*" and "*Rectifying Vegetated Stormwater Assets*" can be accessed online at http://waterbydesign.com.au/.

T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

Item	What to check for	Inspected	Maintenance undertaken	Further action required or comment
Civil components – Permeable pavement				
Permeability	Pavement area is free draining (i.e. no clogging of the pavement surface). Clogging is generally evident by water ponding on the surface of the permeable paving more than 2 hours after rainfall.			
Pavement surface	No uneven paver surface (i.e. pavement surface lifting and rutting). No physical damage to the pavement surface – look for cracks and holes.			
Infill material	Infill material is present between pavers. No scour occurring.			
Landscape components – Permeable pavement				
Weeds	Less than 10% of infill surface area (where present) covered by weeds.			

Commissioning

Rainwater Tank

All rainwater tanks should be washed or flushed out before use. All inlets and outlets should be correctly sealed to prevent insects from entering. Connection to all toilets & Laundry in the development should be tested (dye test or equivalent).

Please note if new roof coating or paint is to be installed then the first few run-offs after installation need to be discarded.

Pumps

Commissioning should occur as per the chosen manufacturer's specifications.

Raingarden

A flow test which equates to running water through the raingarden needs to occur to ensure underdrainage works correctly and the raingarden drains within 24 hours. A maintenance manual for the raingarden must be provided by the designer of the rain garden if any requirements differ from those outlined above. A full inspection including a flow test must be undertaken annually.

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Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
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Summary

The following needs to occur onsite to ensure compliance with WSUD requirements and maintain the operation of the rainwater tank and connections onsite.

Task	When?	Requirement
Inspect Rainwater tanks	Every 6 months	• Check for any damage/compression • Mosquitoes infestation
	Every 2 years	• Sludge Build up – if sludge build-up occurs a vacuum tank needs to be called out to the site.
Inspect roofs & gutters	Every 6 months	• Clean out of leaves/debris. • Remove any overhanging branches onsite.
Inspection of Raingardens	3-Monthly Following a large storm event	• Check slit levels • Check pollutants • Check for blockages • Check plant health • Overflow? Flooding?
	Annually	• Flow test needs to be undertaken to ensure underdrainage works properly • Silt and sediment build-up • Plant replacement requirement

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Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
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APPENDIX C – VOC & FORMALDEHYDE EMISSION LIMITS

The following table are an extract of the Green Star Design and as built submission guidelines:

Table 13.1.1: Maximum TVOC Limits for Paints, Adhesives and Sealants

Product Category	Max TVOC content in grams per litre (g/L) of ready to use product.
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Trim, varnishes and wood stains	75
Primers, sealers and prep coats	65
One and two pack performance coatings for floors	140
Acoustic sealants, architectural sealant, waterproofing membranes and sealant, fire retardant sealants and adhesives	250
Structural glazing adhesive, wood flooring and laminate adhesives and sealants	100

The product complies with the Total VOC (TVOC) limits specified in the Table below.

Carpet Test Standards and TVOC Emissions Limits

Test protocol	Limit
ASTM D5116 - Total VOC limit	0.5mg/m^2 per hour
ASTM D5116 - 4-PC (4-Phenylcyclohexene)	0.05mg/m^2 per hour
ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m^2 per hour
ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5mg/m^2 per hour

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Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
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Table 13.2: Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	Emission Limit/ Unit of Measurement
AS/NZS 2269:2004, testing procedure AS/NZS 2098.11:2005 method 10 for Plywood	≤1mg/ L
AS/NZS 1859.1:2004 - Particle Board, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1.5 mg/L
AS/NZS 1859.2:2004 - MDF, with use of testing procedure AS/NZS 4266.16:2004 method 16	≤1mg/ L
AS/NZS 4357.4 - Laminated Veneer Lumber (LVL)	≤1mg/ L
Japanese Agricultural Standard MAFF Notification No.701 Appendix Clause 3 (11) - LVL	≤1mg/ L
JIS A 5908:2003- Particle Board and Plywood, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A 5905:2003 - MDF, with use of testing procedure JIS A 1460	≤1mg/ L
JIS A1901 (not applicable to Plywood, applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr*
ASTM D5116 (applicable to high pressure laminates and compact laminates)	≤0.1 mg/m²hr
ISO 16000 part 9, 10 and 11 (also known as EN 13419), applicable to high pressure laminates and compact laminates	≤0.1 mg/m²hr (at 3 days)
ASTM D6007	≤0.12mg/m³**
ASTM E1333	≤0.12mg/m³***
EN 717-1 (also known as DIN EN 717-1)	≤0.12mg/m³
EN 717-2 (also known as DIN EN 717-2)	≤3.5mg/m²hr

*mg/m²hr may also be represented as mg/m²/hr.

T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

APPENDIX D – BESS ASSESSMENT

T1, Level 17, 500 Collins St
Melbourne VIC 3000
03 8691 6928
admin@fraterconsultingservices.com.au
www.fraterconsultingservices.com.au

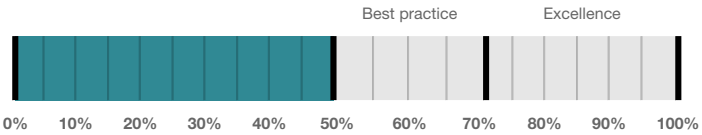
BESS Report

Built Environment Sustainability Scorecard

This BESS report outlines the sustainable design commitments of the proposed development at 46 Theodore Ave Noble Park Victoria 3174. 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 Greater Dandenong 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

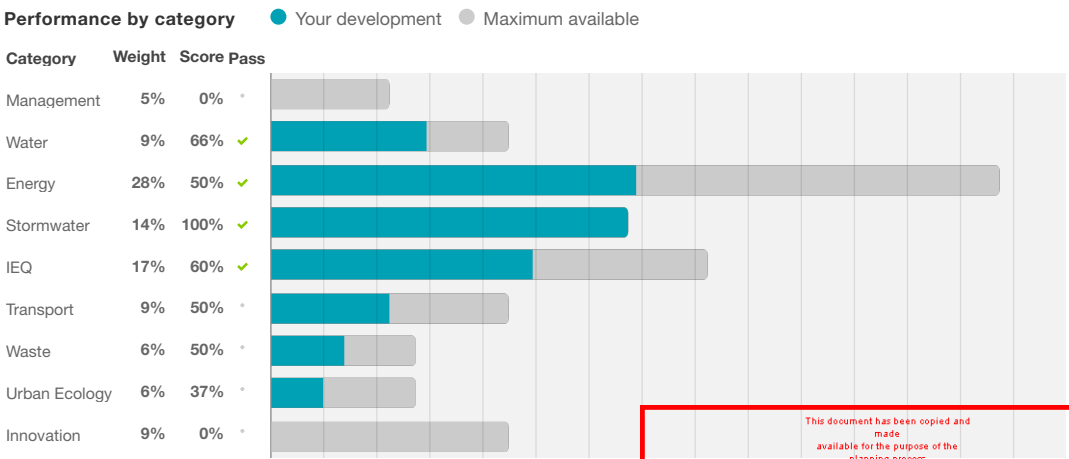


52%

Project details

Address	46 Theodore Ave Noble Park Victoria 3174
Project no	1C08160D-R3
BESS Version	BESS-7
Site type	Multi dwelling (dual occupancy, townhouse, villa unit etc)
Account	denis@fraterconsultingservices.com.au
Application no.	PLN23/0156
Site area	728.00 m²
Building floor area	339.25 m²
Date	29 October 2024
Software version	2.0.1-B.570

Performance by category



Dwellings & Non Res Spaces

Dwellings

Name	Quantity	Area	% of total area
Townhouse			
Unit 1	1	124 m²	36%
Unit 3	1	109 m²	32%
Unit 2	1	106 m²	31%
Total	**3**	**339 m²**	**100%**

Supporting information

Floorplans & elevation notes

Credit	Requirement	Response	Status
Water 3.1	Annotation: Water efficient garden details		-
Energy 3.3	Annotation: External lighting controlled by motion sensors		-
Energy 3.4	Location of clothes line (if proposed)		-
Stormwater 1.1	Location of any stormwater management systems (rainwater tanks, raingardens, buffer strips)		-
IEQ 2.2	Annotation: Dwellings designed for 'natural cross flow ventilation' (If not all dwellings, include a list of compliant dwellings)		-
IEQ 3.1	Annotation: Glazing specification (U-value, SHGC)		-
Transport 1.1	Location of residential bicycle parking spaces		-
Waste 2.1	Location of food and garden waste facilities		-
Urban Ecology 2.1	Location and size of vegetated areas		-

Supporting evidence

Credit	Requirement	Response	Status
Energy 3.5	Average lighting power density and lighting type(s) to be used		-
Stormwater 1.1	STORM report or MUSIC model		-
IEQ 2.2	A list of dwellings with natural cross flow ventilation		-
IEQ 3.1	Reference to floor plans or energy modelling showing the glazing specification (U-value and Solar Heat Gain Coefficient, SHGC)		-

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%	66%	Pass
1.1 Potable Water Use Reduction		60%	
3.1 Water Efficient Landscaping		100%	

Energy Overall contribution 27.5%

	Minimum required 50%	50%	Pass
1.2 Thermal Performance Rating - Residential		16%	
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	
2.6 Electrification		0%	Disabled
		Credit is available when project is declared to have no gas connection.	
3.2 Hot Water		100%	
3.3 External Lighting		100%	
3.4 Clothes Drying		100%	
3.5 Internal Lighting - Houses and Townhouses		100%	
4.4 Renewable Energy Systems - Other		0%	Disabled
		No other (non-solar PV) renewable energy is in use.	
4.5 Solar PV - Houses and Townhouses		0%	Disabled
		No solar PV renewable energy is in use.	

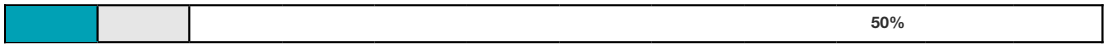
Stormwater Overall contribution 13.5%

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

IEQ Overall contribution 16.5%

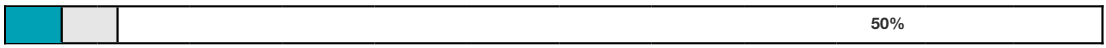
	Minimum required 50%	60%	Pass
2.2 Cross Flow Ventilation		100%	
3.1 Thermal comfort - Double Glazing		100%	
3.2 Thermal Comfort - External Shading		0%	
3.3 Thermal Comfort - Orientation		0%	

Transport Overall contribution 9.0%



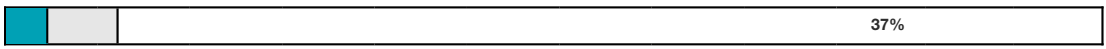
1.1 Bicycle Parking - Residential	100%	
1.2 Bicycle Parking - Residential Visitor	N/A	Scoped Out
		Not enough dwellings.
2.1 Electric Vehicle Infrastructure	0%	

Waste Overall contribution 5.5%



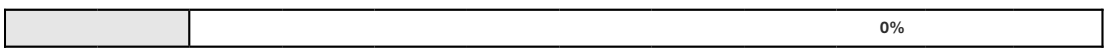
1.1 - Construction Waste - Building Re-Use	0%
2.1 - Operational Waste - Food & Garden Waste	100%

Urban Ecology Overall contribution 5.5%



2.1 Vegetation	75%
2.2 Green Roofs	0%
2.3 Green Walls and Facades	0%
2.4 Private Open Space - Balcony / Courtyard Ecology	0%
3.1 Food Production - Residential	0%

Innovation Overall contribution 9.0%



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 6% Minimum required 50%

Water Approach	
What approach do you want to use for Water?:	Use the built in calculation tools
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

Fixtures, fittings & connections profile	
Showerhead: All	4 Star WELS (>= 6.0 but <= 7.5)
Bath: All	Scope out
Kitchen Taps: All	>= 5 Star WELS rating
Bathroom Taps: All	>= 5 Star WELS rating
Dishwashers: All	>= 5 Star WELS rating
WC: All	>= 4 Star WELS rating
Urinals: All	Scope out
Washing Machine Water Efficiency: All	Occupant to Install
Which non-potable water source is the dwelling/space connected to?:	
Unit 1	RWT 1
Unit 2	RWT 2
Unit 3	RWT 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 tank profile	
What is the total roof area connected to the rainwater tank?:	
RWT 1	81.3 m²
RWT 2	48.3 m²
RWT 3	81.2 m²
Tank Size:	
RWT 1	2,000 Litres
RWT 2	2,000 Litres
RWT 3	2,000 Litres
Irrigation area connected to tank:	
RWT 1	-
RWT 2	-
RWT 3	-
Is connected irrigation area a water efficient garden?:	
RWT 1	-
RWT 2	-
RWT 3	-

Other external water demand connected to tank?:	
RWT 1	-
RWT 2	-
RWT 3	-

1.1 Potable Water Use Reduction	60%
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	465 kL
Output	Proposed (excluding rainwater and recycled water use)
Project	372 kL
Output	Proposed (including rainwater and recycled water use)
Project	249 kL
Output	% Reduction in Potable Water Consumption
Project	46 %
Output	% of connected demand met by rainwater
Project	94 %
Output	How often does the tank overflow?
Project	Often
Output	Opportunity for additional rainwater connection
Project	93 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 Dwellings?:	Use the built in calculation tools
Are you installing any solar photovoltaic (PV) system(s)?:	No
Are you installing any other renewable energy system(s)?:	No
Energy Supply:	Electricity & Natural Gas

Dwelling Energy Profiles	
Below the floor is: All	Ground or Carpark
Above the ceiling is: All	Outside
Exposed sides: All	4
NatHERS Annual Energy Loads - Heat: All	83.0 MJ/sqm
NatHERS Annual Energy Loads - Cool: All	25.0 MJ/sqm
NatHERS star rating: All	6.5
Type of Heating System: All	Reverse cycle space
Heating System Efficiency: All	3 Star
Type of Cooling System: All	Refrigerative space
Cooling System Efficiency: All	3 Stars
Type of Hot Water System: All	Gas Instantaneous 6 star
Clothes Line: All	Private outdoor clothesline
Clothes Dryer: All	Occupant to Install

1.2 Thermal Performance Rating - Residential 16%

Score Contribution	This credit contributes 27.3% towards the category score.
Criteria	What is the average NatHERS rating?
Output	Average NATHERS Rating (Weighted)
Townhouse	6.5 Stars

2.1 Greenhouse Gas Emissions 100%

Score Contribution	This credit contributes 9.1% 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	18,386 kg CO2
Output	Proposed Building with Proposed Services (Actual Building)
Townhouse	6,630 kg CO2
Output	% Reduction in GHG Emissions
Townhouse	63 %

2.2 Peak Demand		0%	
Score Contribution	This credit contributes 4.5% 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	39.0 kW		
Output	Peak Thermal Cooling Load - Proposed		
Townhouse	38.7 kW		
Output	Peak Thermal Cooling Load - % Reduction		
Townhouse	< 1 %		
2.3 Electricity Consumption		100%	
Score Contribution	This credit contributes 9.1% towards the category score.		
Criteria	What is the % reduction in annual electricity consumption against the benchmark?		
Output	Reference		
Townhouse	15,680 kWh		
Output	Proposed		
Townhouse	4,944 kWh		
Output	Improvement		
Townhouse	68 %		
2.4 Gas Consumption		100%	
Score Contribution	This credit contributes 9.1% towards the category score.		
Criteria	What is the % reduction in annual gas consumption against the benchmark?		
Output	Reference		
Townhouse	46,538 MJ		
Output	Proposed		
Townhouse	30,896 MJ		
Output	Improvement		
Townhouse	33 %		
2.5 Wood Consumption		N/A	Scoped Out
This credit was scoped out	No wood heating system present		
2.6 Electrification		0%	Disabled
This credit is disabled	Credit is available when project is declared to have no gas connection.		

3.2 Hot Water		100%	
Score Contribution	This credit contributes 4.5% 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	46,538 MJ		
Output	Proposed		
Townhouse	31,366 MJ		
Output	Improvement		
Townhouse	32 %		

3.3 External Lighting		100%	
Score Contribution	This credit contributes 4.5% 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 4.5% 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	1,771 kWh		
Output	Proposed		
Townhouse	354 kWh		
Output	Improvement		
Townhouse	80 %		

3.5 Internal Lighting - Houses and Townhouses		100%	
Score Contribution	This credit contributes 4.5% 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		0%	⊘ Disabled
This credit is disabled	No other (non-solar PV) renewable energy is in use.		

4.5 Solar PV - Houses and Townhouses		0%	⊘ 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% towards the category score.
Criteria	Has best practice stormwater management been demonstrated?
Question	STORM score achieved
Project	100
Output	Min STORM Score
Project	100

IEQ

Overall contribution 10% Minimum required 50%

2.2 Cross Flow Ventilation	100%
Score Contribution	This credit contributes 20% towards the category score.
Criteria	Are all habitable rooms designed to achieve natural cross flow ventilation?
Question	Criteria Achieved ?
Townhouse	Yes
3.1 Thermal comfort - Double Glazing	100%
Score Contribution	This credit contributes 40% 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	0%
Score Contribution	This credit contributes 20% towards the category score.
Criteria	Is appropriate external shading provided to east, west and north facing glazing?
Question	Criteria Achieved ?
Townhouse	No
3.3 Thermal Comfort - Orientation	0%
Score Contribution	This credit contributes 20% towards the category score.
Criteria	Are at least 50% of living areas orientated to the north?
Question	Criteria Achieved ?
Townhouse	No

Transport Overall contribution 4%

1.1 Bicycle Parking - Residential		100%
Score Contribution	This credit contributes 50% 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		0%
Score Contribution	This credit contributes 50% towards the category score.	
Criteria	Are facilities provided for the charging of electric vehicles?	
Question	Criteria Achieved ?	
Project	No	

Waste Overall contribution 3%

1.1 - Construction Waste - Building Re-Use		0%
Score Contribution	This credit contributes 50% towards the category score.	
Criteria	If the development is on a site that has been previously developed, has at least 30% of the existing building been re-used?	
Question	Criteria Achieved ?	
Project	No	

2.1 - Operational Waste - Food & Garden Waste		100%
Score Contribution	This credit contributes 50% towards the category score.	
Criteria	Are facilities provided for on-site management of food and garden waste?	
Question	Criteria Achieved ?	
Project	Yes	

Urban Ecology Overall contribution 2%

2.1 Vegetation		75%
Score Contribution	This credit contributes 50% towards the category score.	
Criteria	How much of the site is covered with vegetation, expressed as a percentage of the total site area?	
Annotation	At least 20% (145sqm) will be permeable	
Question	Percentage Achieved ?	
Project	20 %	

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		0%
Score Contribution	This credit contributes 12.5% towards the category score.	
Criteria	Is there a tap and floor waste on every balcony and courtyard (including any roof terraces)?	
Question	Criteria Achieved ?	
Townhouse	No	

3.1 Food Production - Residential		0%
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	-	
Output	Min Food Production Area	
Townhouse	2 m^2	

Innovation Overall contribution 0%

1.1 Innovation		0%
Score Contribution	This credit contributes 100% towards the category score.	
Criteria	What percentage of the Innovation points have been claimed (10 points maximum)?	

Disclaimer

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