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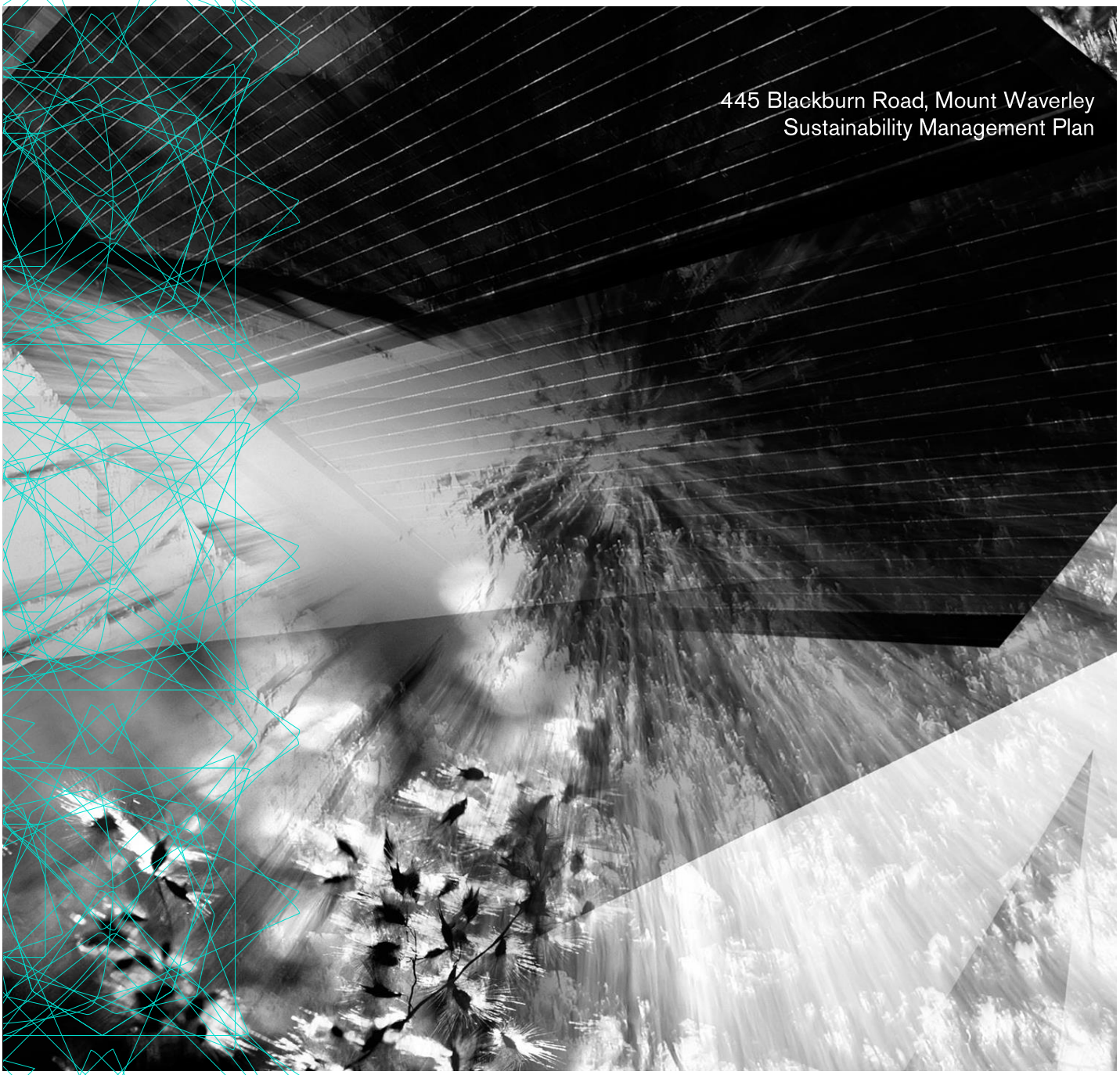

445 Blackburn Road, Mount Waverley
Sustainability Management Plan

SUSTAINABLE DEVELOPMENT
_CONSULTANTS

Proposed Mixed-Use Development
445 Blackburn Road, Mount Waverley

Sustainability Management Plan (SMP)

June 2017

S3018 SMP.V2

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Revision	Date of Issue	Description	Author	Reviewed	Checked
V1	07-06-2017	Final for submission to council	AW	MA	BdW
V2	08-06-2017	Revised as per comments	AW	MA	BdW

1. Introduction

This Sustainability Management Plan (SMP) has been prepared to assist the design, construction and operation of the proposed mixed-use development at 445 Blackburn Road, Mount Waverley to achieve a range of best-practice sustainable development objectives.

Sustainable Development Consultants has assessed the proposed development and provided input to the design team. This SMP captures initiatives which ensure that the development meets the sustainability objectives of the Monash City Council.

1.1 Site and Development Description

The site is located at 445 Blackburn Road and is currently occupied by a hotel, which is proposed to be demolished prior to the construction of the development. The site is located within a well-established residential area, approximately 20km southeast of the Melbourne CBD. Bus stations are located within walking distance of the site which will provide good public transport access for residents to other inner suburbs and the Melbourne CBD.

The proposed development consists of a nine-storey mixed-use building containing ground level retail, a hotel, 47 apartments, 10 townhouses, 60 Independent Living Units, eight serviced apartments, and a childcare facility. The development will be constructed above a basement garage.

Figure 1: 445 Blackburn Road, Mount Waverley site location (Source: NearMap)

The Development Summary is as follows:

Area Type	Inclusions
Total Site Area	6,352m^2
Apartments	47 Apartments (16 x 1-bedroom, 29 x 2-bedroom and 2 x 3-bedroom)
Serviced Apartments	8 Serviced Apartments

Area Type	Inclusions
Independent living units for Seniors	60 ILUs (16 x 1-bedroom, 44 x 2-bedroom)
Townhouses	10 – 3 bedroom Townhouses
Hotel	120 rooms
Facilities	1,504m^2
Childcare Services	706m^2
Basement level	135 residential car spaces

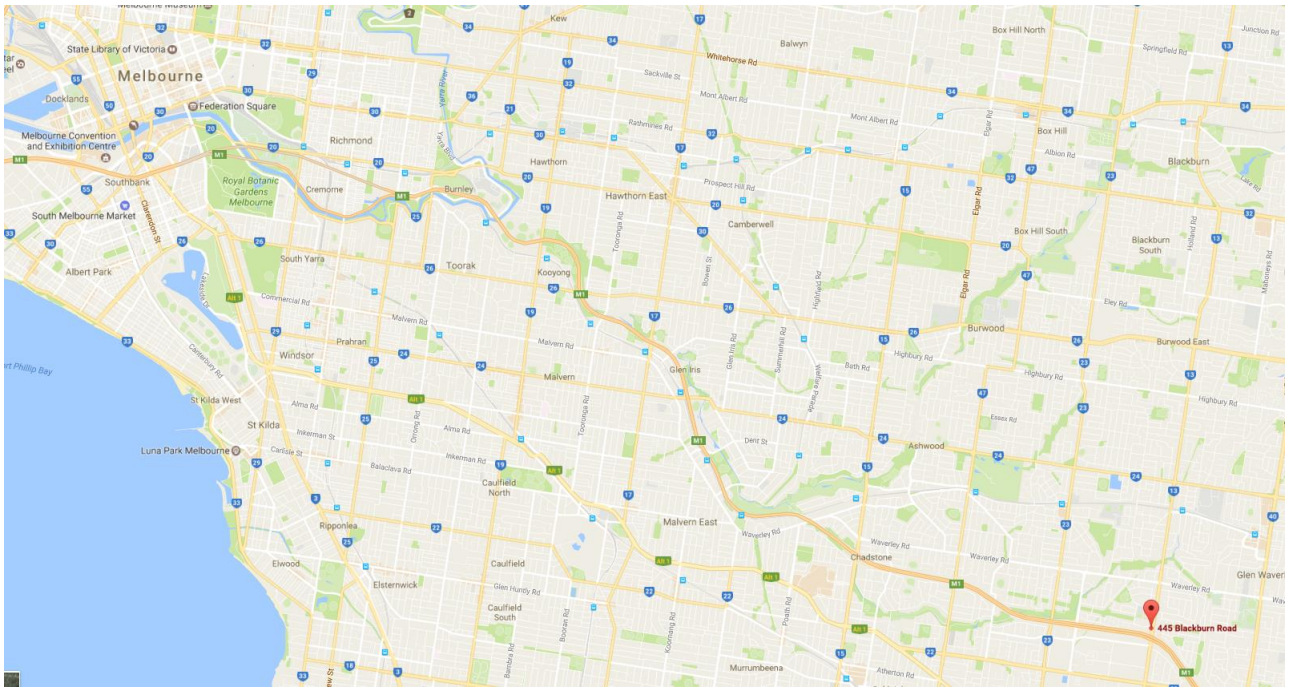


Figure 2: The red balloon shows the location of 445 Blackburn Road, Mount Waverley (Source: Google).

1.2 City of Monash Requirements

The City of Monash expects the Blackburn Road development to be designed, built and maintained at a level that provides good practice ESD outcomes as described in the Local Planning Scheme *Clause 21.13 "Sustainability and Environment"* and the Water Sensitive Urban Design requirements of Local Policy *Clause 22.04 "Stormwater Management Policy".* The development will address the following:

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

In order to address these categories, the proposed development will aim for good environmental practice; including compliance with required outcomes using the FirstRate 5 energy assessment tool. This will be in line with requirements of *Clause 21.13* of the City of Monash.

Key Council Nominated Objectives from the Clause 21.13 are as follows:

Energy performance:	• Minimise energy usage; • Reduce total operating greenhouse gas emissions; and • Reduce energy peak demand through particular design measures (e.g. appropriate building orientation, shading to glazed surfaces, optimise glazing to exposed surfaces, space allocation for solar panels and external heating and cooling systems).
Water efficiency and stormwater management:	• Improve water efficiency; • Reduce total operating potable water use; • Encourage collection and use of stormwater; • Incorporate water sensitive urban design, including stormwater re-use;
Waste Management:	• Promote waste avoidance, reuse and recycling during the design, construction and operation stages of development; • Ensure durability and long term reusability of building materials; and • To ensure sufficient space is allocated for future change in waste management needs, including (where possible) composting and green waste facilities.
Transport:	• Ensure that the built environment is designed to promote the use of walking, cycling and public transport and minimise car dependency.

1.3 ESD Assessment Tools

There are a number of calculators and modelling programs available in Victoria to assess proposed developments against benchmarks set by the Victorian government, local councils and the Building Code of Australia. Different tools are used to assess different aspects of the development including the:

- Built Environment Sustainability Scorecard (BESS) which covers the overall sustainability of the development;
- FirstRate5, which covers the thermal efficiency of the building envelope.
- Model for Urban Stormwater Improvement Conceptualisation (MUSIC), which addresses stormwater quality considerations.

FirstRate5 assessments tie to requirements that are mandatory for Victoria.

1.3.1 BUILT ENVIRONMENT SUSTAINABILITY SCORECARD (BESS)

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

A BESS assessment has been conducted for the proposed development. This provides a guide as to the level of sustainability achieved by the proposed development in the following target areas:

- Building Management;
- Energy;
- Water;
- Stormwater;
- Indoor Environment Quality (IEQ);
- Transport;
- Waste;

- Urban Ecology; and
- Innovation.

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% for the project represents 'Best Practice' while a score over 70% represents 'Excellence'.

The results of the BESS assessment can be found in Appendix 1.

1.3.2 FIRSTRATE 5

The energy efficiency of the townhouse and apartments' thermal envelopes has been assessed using FirstRate 5, which is an energy modelling software program to rate dwellings on a 10-Star scale. The tool uses the AccuRate engine (as a nationally recognised energy benchmarking) to rate dwellings based on climate zone, materials used in a structure, positioning, orientation and building sealing. Higher scores are achieved primarily through better material selection, improvements in glazing, and insulation. It is noted that the 2016 BCA (Building Code of Australia) will apply to this development. A representative sample has been modelled to predict the average heating and cooling energy use of the development. The results of the FirstRate assessments can be found in Appendix 1 of this report.

1.3.3 MODEL FOR URBAN STORMWATER IMPROVEMENT CONCEPTUALISATION V6

Stormwater runoff treatment and quality evaluation was conducted using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) V6. Developed by the Catchment Hydrology Cooperative Research Centre, this tool is capable of simulating stormwater runoff, its treatment and quality during a rainfall event for catchment areas up to 100km^2. The addition of treatment measures and processes that address the stormwater flow from a catchment is called the "treatment train". This is in reference to the various measures the stormwater flow will undergo prior to its discharge out of the catchment and into the receiving body of water. The results of the MUSIC assessment can be found in Appendix 3.

2. Sustainability Initiatives

The following sections outline the initiatives which will be included in the development and implemented throughout the design and construction process.

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

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

2.1 Construction, Building and Waste Management

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

Design Requirements	Responsibility & Implementation	Project Stage
Metering and Monitoring		
Separate meters (water, hot water and electricity) will be provided for each apartment and townhouse where appropriate. All common area services (e.g. common lighting, car park ventilation) will be separately sub metered.	Services Consultant	Construction Documentation
Construction Waste Management		
The builder will develop a waste management plan for the pre-construction, civil works and construction phases. This will include the following: • Waste generation; • Any waste systems; • Minimisation Strategy; • Performance / Reduction targets; • Bin quantity and size; • Collection frequency; • Waste contractors; • Signage; and • Monitoring and reporting including frequency and method. The waste management plan will include a requirement for not less than 80% of all demolition, land clearing, civil works and built form construction waste to be recycled or re-used. The waste management plan will require that all hazardous substances, pollutants and contaminants must be managed and disposed of in accordance with all state regulatory requirements. Where these materials are treated or used on site, they must be in accordance with a sanctioned remediation process.	Builder	Construction Documentation
Building User Guide		
A Building User's Guide (BUG) will be developed for the tenants, staff and residents in the development. The BUG will be comprehensive and will include training on inspection of the use of systems specific to the development, such as lighting and garbage chute, additional descriptions of systems installed in the building, sustainable transport in the area, and sustainable living suggestions in relation to the development.	Developer	Construction Documentation
Universal Access		
The development will be designed for universal access in accordance with AS1428.2 to allow patrons with limited mobility to enter and use the premises.	Architects	Design Development
Commissioning of Building Systems		
Central building services and operational features must be commissioned correctly in order for them to operate as designed and achieve the intended environmental benefits. Attention to commissioning is imperative as this process is commonly performed and/or documented poorly. As a result, a commitment will be made to commission building services to a relevant standard (e.g. AIRAH, ASHRAE, or CIBSE). In addition, simple, low tech controls are included which allow for systems to be managed manually rather than automatically. This will reduce risks and costs associated with the commissioning and maintenance of complex control systems, and ensure that systems have a longer operational life.	Services Contractor	Construction Documentation

Design Requirements	Responsibility & Implementation	Project Stage
Operational Waste		
The development will be provided with a conveniently accessible dedicated central storage room at the basement level which will be sufficiently sized for both waste and recycling. Provisions will also be made for the inclusion of both waste and recycling receptacles within the dwellings to help encourage occupants to separate their waste at the point of disposal.	Architect	Design Development

Figure 3: Examples of kitchen waste bins incorporated into joinery

2.2 Indoor Environment Quality

Indoor Environment Quality (IEQ) addresses initiatives which help to create a healthy indoor environment free from toxins with ample supply of daylight and outside air.

Design Requirements	Responsibility & Implementation	Project Stage
Volatile Organic Compounds (VOCs)		
All paints, adhesives and sealants and flooring will not exceed limits outlined in Appendix 3. Alternatively, products will be selected with no VOCs. Paints such as eColour, or equivalent, should be considered.	Architect	Construction Documentation
Formaldehyde Minimisation		
All engineered wood products will have 'low' formaldehyde emissions, certified as E0 or better. Alternatively, products will be specified with no formaldehyde. Emissions limits are listed in Appendix 4. Products such as Ecological Panel – 100% post-consumer recycled wood (or similar) will be considered for use within the development.	Architect	Construction Documentation
Acoustic Comfort		
Acoustic comfort will be achieved in the dwellings by limiting the internal ambient noise levels. Apartments, independent living units and townhouses will be constructed to ensure good acoustic separation between individual dwellings and between residential and non-residential uses. Air-conditioning units will be placed away from windows where possible.	Services Consultant	Construction Documentation
External Views		
All living areas will be provided with access to high quality external views.	Architect	Design Development

Design Requirements	Responsibility & Implementation	Project Stage
Daylight Access & Improvement		
All living areas, bedrooms and ground floor facilities will have access to an external window. The depth of living areas from a window has been limited to 8m for most dwellings, allowing daylight to spread evenly within the space. All glazing to the living areas will have a minimum 60% Visible Light Transmittance (VLT). Daylight penetration through windows/openings will be enhanced with the use of light internal colours, allowing for a better internal reflection of daylight.	Architect	Construction Documentation
Artificial Lighting Level		
A higher illuminance level will be provided for task areas such as the kitchen sink/benches and over bathroom/ensuite basins to ensure that there is adequate light to carry out tasks in these areas.	Services Consultant	Construction Documentation
Mechanical Exhaust - Kitchens		
All kitchens will have a separate dedicated exhaust fan (range hood) which will not be recycled to any enclosed space within the building.	Services Consultant	Construction Documentation
Glazing		
The dwellings will be fitted with single glazed windows. The double glazing brings multiple benefits to the dwellings such as a better thermal performance and the reduction of the amount of condensation that forms on the inside of the glass which will help prevent the formation of mould in the units.	Architect	Construction Documentation

2.3 Energy Efficiency

The Blackburn Road development will minimise energy use through a superior building envelope, efficient central hot water systems, efficient heating & air conditioning and lighting for each dwelling and non-residential tenancy.

Design Requirements	Responsibility & Implementation	Project Stage
Building Fabric and Energy Performance		
The sample energy ratings achieve an average 7 Star rating with the nomination of appropriate building fabric elements outlined within the preliminary sample energy report provided as Appendix 2.	Architect	Design Development
Heating and Cooling Systems		
Heating and cooling in the dwellings (apartments, independent living units and townhouses) will be provided with energy efficient air conditioners (within one star energy rating of the best available; COP>3.5).	Services Consultant	Design Development
Domestic Hot Water		
Hot water for the development will be provided via central condensing gas boiler with a minimum 90% efficiency. All delivery pipework will be suitably insulated.	Services Consultant	Design Development
Indoor Lighting		
Lighting throughout the development will generally be LED and designed to achieve a 20% reduction from BCA maximum lighting power densities. This will involve limiting lighting levels to: • $4W/m^2$ – dwellings and car park; • $6W/m^2$ - common corridors;	Services Consultant	Design Development

Design Requirements	Responsibility & Implementation	Project Stage
• 16W/m^2 – retail area; and • 20% reduction for any other areas. Motion sensors will be installed in all areas with sporadic use, such as staff toilets or storage rooms.		
Common Area Lighting		
Common area lighting will be LED and will have controls (e.g. light sensors, timers) to minimise consumption during off-peak times (e.g. 11pm-5am).	Services Consultant	Design Development
Car Park Ventilation		
Car park ventilation will be designed to best practice energy efficiency with all exhaust fans being installed with carbon monoxide (CO) sensors so as to make sure they only operate when necessary.	Services Consultant	Construction Documentation
Variable Speed Drives		
Variable speed drives will be installed on all major pumps and fans.	Services Consultant	Design Development
Energy Efficient Appliances		
All appliances provided in the development as part of the base building work will be selected within one energy efficiency star of the best available.	Developer	Construction Documentation
Cooking Appliances		
All dwellings will be provided with an electric oven and gas cooktop.	Architect	Construction Documentation
Building Sealing		
All windows, doors, exhaust fans and pipe penetrations will be constructed to minimise air leakage as required by the provisions outlined in Section J3 of the 2016 BCA. This will include the use of seals around operable windows and doors as well as caulking to pipe penetrations, and the addition of self-closing louvers or dampers to exhaust fans.	Architect	Design Development
Photovoltaic (PV) Panels		
The roof of the development will host a 80kW solar PV system (320 x 250W panels) for renewable energy generation. This will offset a portion of greenhouse gas emissions and energy use from central services for the project (lighting, pumps etc.) by producing over 104,244kWh[1] of green electricity per year. A connection for a potential future battery system will be made within the development. In addition, the PV system will help reduce Owners Corporation fees for all members. A purchaser option will be made available whereby owners can purchase 2kW system modules, connected directly to their dwelling/space. Solar panels not purchased will provide electricity to common areas. All renewable energy generated by panels which is either not used by residents or common areas, will be fed back to the embedded energy network and used within the building, thus ensuring that the building uses a percentage of green energy and this is locked into the development.	Architect / Services Consultant	Design Development
Embedded Network		
The development will incorporate an embedded energy network. This	Developer/	Design

[1] According to BESS Assessment

Design Requirements	Responsibility & Implementation	Project Stage
requires the installation of a "gate meter" for the development, to which the electricity distributor (wholesaler) supplies electricity. Beyond this meter, the development will have its own energy distribution network "embedded" in the building. This configuration allows the Owners Corporation, usually via a private energy retailer, to offer a full energy retailing service to all building residents, as well as to the Owners Corporation itself for all common area electricity used for building services such as lifts, pumps, fans, lighting etc. This commercial arrangement will include a private energy retailer who provides 100% Green Power for common areas and optional Green Power for dwellings and ground floor facilities. All residents will retain the freedom to select their retailer of choice. In practice, however, the private energy retailers typically achieve virtually 100% "sign-up" and ongoing retention because they provide lower electricity pricing and can match or better any other retail electricity offers. All energy generated by the proposed 80kW solar PV system will be fed firstly to common area meter, and then to other dwellings within the building. Alternatively, 10kW of solar panels will be allocated to the common area, and separate allocations of PV panels sold with individual owners. Ultimately, all solar power generated will be used within the building. This arrangement will be maintained on an on-going basis and incorporated into Owners Corporation Rules.	Services Consultant	Development

2.4 Transport

The Blackburn Road site has been assessed using the "Walk Score" locational performance tool. The tool was developed in 2007 by Front Seat using the Google Maps tools. This tool takes into account the number of facilities within close proximity and provides a numerical score of between 1 and 100, with 1 being heavily car dependant with access to community facilities that are located some distance away, and 100 reflecting a location that is easily accessible to abundant facilities by foot. The Blackburn Road development achieves a score of 80 out of 100, which is classified as "Very Walkable." High Walk Scores above 70+ indicate that the building occupants can complete most daily errands without requiring a car.

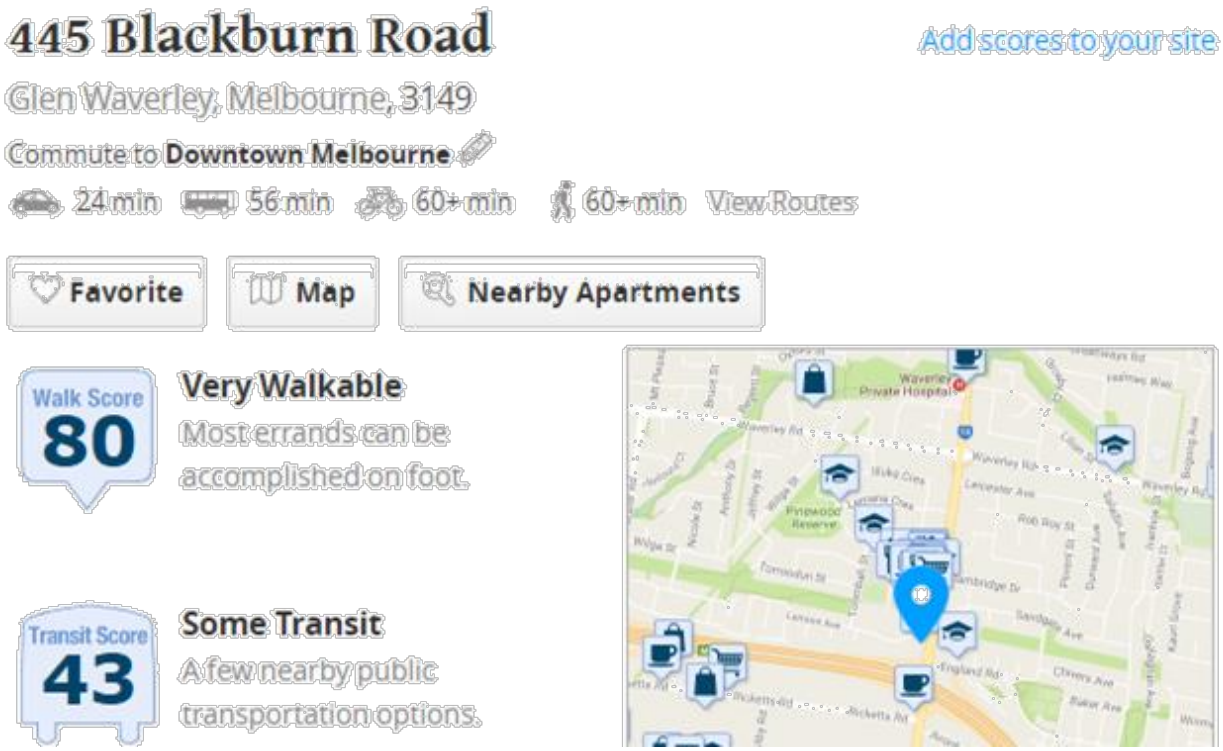


Figure 4: Walkscore and amenities around 445 Blackburn Road, Mount Waverley

Design Requirements	Responsibility & Implementation	Project Stage
Access to Public Transport		
The Blackburn Road site has access to a number of public transport options. These include Syndal Railway Station (Glen Waverley line) as well as Bus Route No. • 703 Middle Brighton - Blackburn • 737 Monash University - Croydon • 623 St. Kilda - Glen Waverley • 969 City - Ringwood • 693 Oakleigh - Belgrave • 742 Eastland SC - Chadstone SC	N/A - Inherent in Location	
Active Transport Facilities		
The development site is surrounded by numerous on-road and informal bike routes. We recommend 10 secure bicycle spaces to be provided for the townhouse residents and 107 for the apartment residents, located within the basement carpark levels. We also recommend 31 visitors bicycle spaces to be provided for the residential visitors. It is also recommended that least four showers and two lockers are provided for the staff. This will help to make cycling more convenient which, in turn, encourages people to adopt it as an alternative form of transport to using private motor vehicles.	Architect	Design Development
Car Parking		
A total of 135 car parking spaces will be provided in the development.	Architect	Design Development

2.5 Water Efficiency & Stormwater Treatment

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

Design Requirements	Responsibility & Implementation	Project Stage
Water Fixtures and Fittings		
The development will reduce its potable water usage through the inclusion of efficient fittings and fixtures to reduce the volume of mains water used. The following Water Efficiency Labelling Scheme (WELS) star ratings will be specified: • Toilets – 4 Star; • Taps (bathroom and kitchen) – 5 Star; and • Showerheads – 3 Star (>6.0 but ≤7.5/min).	Architect	Construction Documentation
Rainwater Use & Stormwater Management		
Rainwater runoff from the top roof area (3,487m^2) will be diverted to a 60,000L rainwater tank. The tank will be located in the basement with collected water to be used in all the retail and hotel toilets. The water will also be connected to the irrigation system. Runoff from the remaining site (balconies, driveways, pathways etc.) will be diverted to a minimum 20m^2 of raingarden. Catchment areas will be drained proportionately to areas of raingarden. These initiatives will greatly reduce stormwater impacts of the development. Please refer to Appendix 2 for more information.	Services Consultant	Construction Documentation
Water Efficient Appliances		
All water-using appliances (e.g. dishwasher) provided in the development as part of the base building work will be selected within one star WELS rating of the best available.	Developer	Design Development
Landscape Irrigation		
Any landscaping featured on site will use water efficiency principles, including low water use plant selection, use of mulch and drip irrigation system. Mains water will not be used for irrigation whenever possible (rainwater use).	Landscape Architect	Design Development/ Construction Documentation

Figure 5: Close up of an inline drip irrigation system on top of a mulched garden bed

2.6 Building Materials

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

Design Requirements	Responsibility & Implementation	Project Stage
Building Fabric Frames & Finishes		
Where possible, components of roofing, ceiling, wall, flooring and framing materials, classed as "environmentally innovative", will be specified. All relevant materials will be low VOC and be durable so as to not require frequent replacement. Sourcing these from either the Moreland Greenlist or Ecospecifier (or equivalent) will have assisted in reducing the environmental impact of materials.	Architect	Construction Documentation
Concrete		
Unless prevented by structural engineering considerations or product unavailability, a minimum of 50% of the concrete mix will contain recycled water (rainwater or purchased recycled water) and 25% of fine aggregate (sand) is to be recycled or manufactured sand (not virgin sand from a quarry).	Builder / Structural Engineer	Construction Documentation
Steel		
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.	Builder / Structural Engineer	Construction Documentation
Joinery		
Plywood or sustainable bamboo should be a preferred solution to MDF and melamine products due to better durability and the possibility of re-use after disassembly. The use of post-consumer recycled products such as Ecological Panel (or equivalent) or bio-composite materials such as EcoTop™ will be investigated.	Architect	Construction Documentation
PVC		
All PVC products will meet the Best Practice Manufacturing Guidelines – The manufacturer's facility will be certified ISO14001. This will ensure that the PVC used within the development will have a reduced environmental impact when compared to other products on the market.	Builder	Construction Documentation
Timber		
All timber used in the development will be Forest Stewardship Council (FSC) or Program for the Endorsement of Forest Certification (PEFC) certified, or recycled / reused.	Builder	Construction Documentation

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

Figure 6: Examples of approved environmental labels which may be incorporated for the development.

2.7 Urban Ecology, Emissions & Innovation

Design Requirements	Responsibility & Implementation	Project Stage
Ecological Value		
The Blackburn Road development is on already developed land therefore it will maintain its current ecological value.	Architect	Construction Documentation
Common Roof Terrace		
A large common courtyard will be implemented for the residents. It will be equipped with seating areas to allow residents to interact and relax.	Architect	Design Development
Light Pollution		
No external luminaire on the project will have an Upward light Output Ratio (ULOR) exceeding 5%, relative to its mounted orientation.	Architect	Design Development
Insulation Ozone Depleting Potential (ODP)		
Insulants within the building will be specified to have an Ozone Depleting Potential (ODP) of zero.	Services Consultant	Construction Documentation

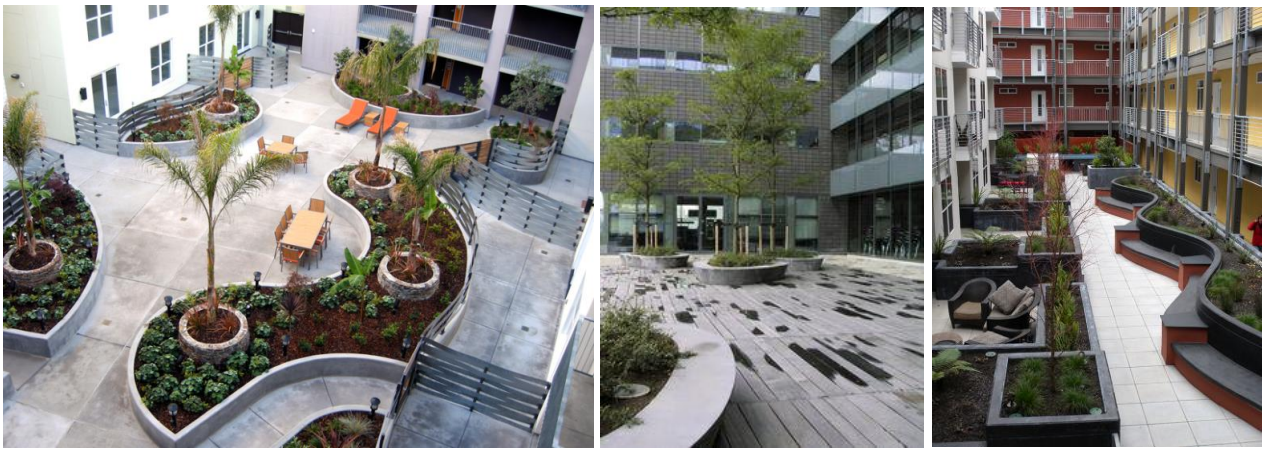


Figure 7: Examples of communal courtyards

3. Implementation of Initiatives

The proposed Blackburn Road development will meet the good practice ESD requirements set by the City of Monash through a number of initiatives such as the efficient thermal performance of the buildings' envelope and the reduction in greenhouse gas emissions through the use of efficient air conditioning, the installation of 80kW (min.) of solar PV panels; as well as reduced environmental impact during the construction stage through the specification of sustainable materials and a mindful construction team.

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

With appropriate implementation, management, monitoring and maintenance the initiatives outlined within this report will serve to provide the occupants with lower running costs, as well as benefit the surrounding environment of the 445 Blackburn Road, Mount Waverley development with an environmentally and economically sustainable development.

Appendix 1 BESS Assessment

445 Blackburn Rd, Mount Waverley 3149 Mount Waverley

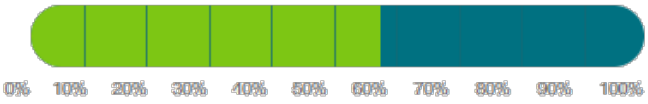
Site area: 6352 m² • **Building Floor Area:** 17791 m² •
Date of Assessment: 28 May 2017 • **Version:** V3, 1.5.0-B147 •
Applicant: alec@sdconsultants.com.au

Project number
7953

Draft
http://bess.net.au/projects/7953

Your BESS score is

+ 57%

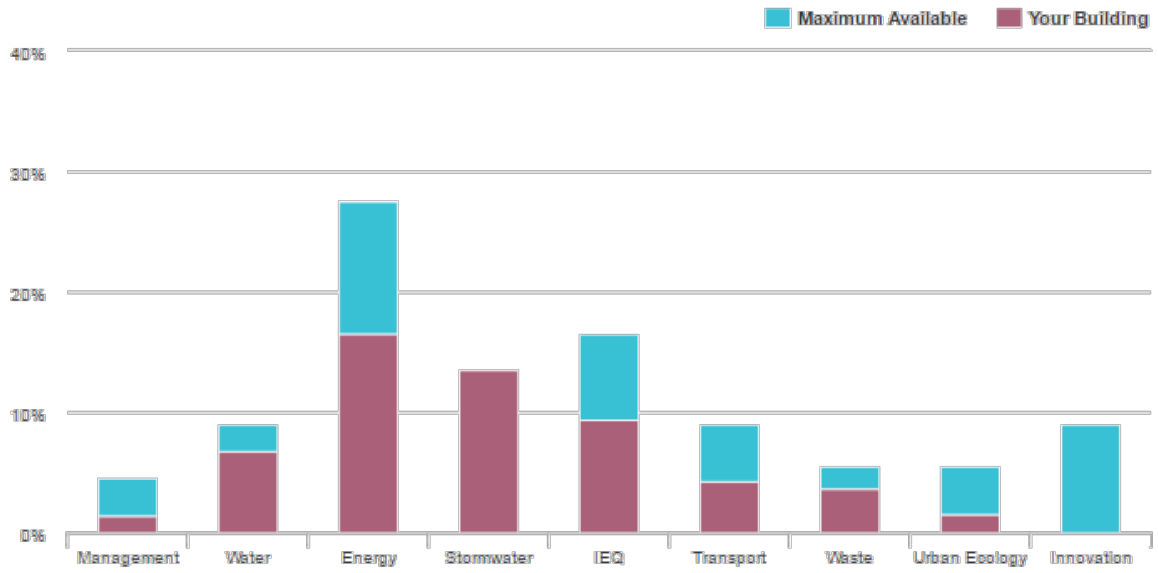


50% + Best Practice

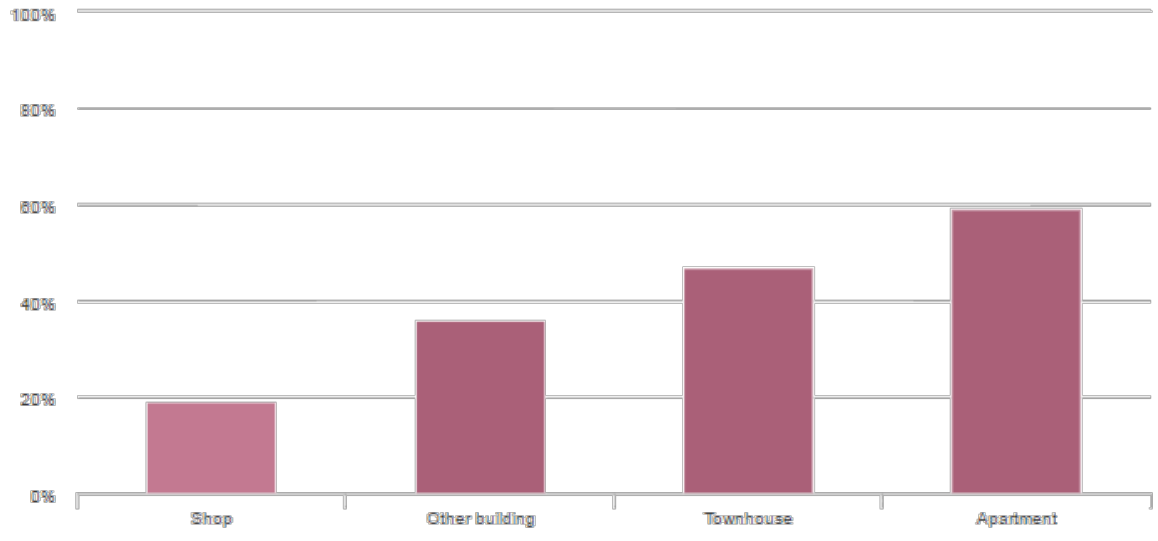
70% + Excellence

% of Total	Category	Score	Pass
1 %	Management	32 %	
6 %	Water	75 %	✓
16 %	Energy	60 %	✓
13 %	Stormwater	100 %	✓
9 %	IEQ	57 %	✓
4 %	Transport	47 %	
3 %	Waste	66 %	
0 %	Urban Ecology	5 %	
0 %	Innovation	0 %	

How did this Development Perform in each Environmental Category?



How does each Dwelling or Non-Residential Space type perform?



Appendix 2 – FirstRate 5 Assessment Results, Assumptions & Recommendations

The FirstRate energy rating program is the primary modelling method used in Victoria to indicate the required energy for heating and cooling based on the buildings thermal envelope. It does not take into account any heating or cooling systems installed; it only assesses walls, roof and floor materials; levels of insulation, building orientation, glazing and the area layout. The proposed development is located in Climate Zone 21 (Melbourne) and is required by the BESS to achieve an average energy rating of 6.4 Stars (102.5 MJ/m^2), with no dwelling rating lower than 5 stars.

Table 1: The following are the scores achieved by the sample dwellings

Units	Star Rating	Energy Use (MJ/m^2)	Heating Energy (MJ/m^2)	Cooling Energy (MJ/m^2)	Net Conditioned Floor Area (m^2)
1.01	6.3	114.8	88	26.8	70.4
TH-1.02	5.9	130.3	108.8	21.5	83.9
TH-1.07	5.4	147.4	109.5	37.8	101.1
1.12	7.6	70.1	58.2	11.9	52.8
1.16	7.4	78.2	67.6	10.6	73.6
2.05	6.7	100.7	42.4	58.3	108.7
2.06	7.9	62.3	37.6	24.7	81.2
2.10	7.6	72.8	61.9	10.9	57.3
7.03	7.5	74	25.7	48.3	37.6
7.07	7.6	70.4	51.9	18.5	60.2
7.09	7.2	83.8	49.9	33.9	60.3
Average	7.0	91.35	63.77	27.56	71.55

This has been completed with the following building fabric elements for the dwellings:

Building Fabric Element	Description
External Walls	Concrete external walls will require additional R2.0 insulation to be added. Insulation material with minimum 20% recycled material content will be selected. The options recommended above go beyond this requirement.
Party Walls	Party walls separating residences from common corridor areas and concrete party walls separating residences from the stairwell and lift are assumed to have R5.0 insulation added;
Internal Walls	Internal walls with no insulation added.
Floors	Floors of all ground floor dwellings require minimum R1.2 insulation where they are situated over the basement car park. No insulation is required for floors 1-8.

Building Fabric Element	Description
Floor Coverings	Floor coverings are assumed as carpets in bedrooms, floating timber in living areas and tiles in wet areas including kitchen, bathrooms and ensuites.
Roof Insulation	The roof is specified as metal deck roof. Additional roof insulation is required to possess an R-Value of R4.0. Some options include: • CSR Bradford Gold Ceiling Batts (R4.0); and • Fletcher Pink Batts (R4.0).
Windows and Glazing	Windows and glazed doors are required to have window system thermal performance values of: **Glazing Properties - U value = 4.8, SHGC =0.59.** **Glazing Properties - U value = 4.8, SHGC =0.51.** These values are commonly found in clear double glazed windows with standard aluminium frames.
Building Sealing	All doors, windows, exhaust fans and openings will be sealed so to not allow for air infiltration in the dwellings. Exhaust fans have been assumed in all kitchens, bathrooms, ensuites and laundry.
Downlights	All recessed down light fittings that have openings allowing air to pass through to a ceiling cavity (e.g. Adjustable down lights) shall be fitted with a cover that allows for ceiling insulation to closely enclose the sides and top of the down light.

Note: The above building elements may vary as the plans are refined for building approval, however the overall building energy rating performance will not be less than 7 Stars (average).

Appendix 3 Stormwater Management

Objectives

The quality and quantity of stormwater leaving a site can have a significant impact on the surrounding infrastructure and waterways. Impervious surfaces move water quickly and efficiently out of built up areas straight into stormwater infrastructure, which in turn quickly moves the untreated water into natural watercourses. This process does not treat the stormwater and as the water flows into natural water courses, it causes erosion and pollution of those waterways with the rubbish, sediments, pathogens, and other pollutants off the impervious surfaces into the stormwater drains.

The City of Monash has recognised the importance of managing stormwater flow and water quality. As a result, a local planning policy, Clause 22.04 "*Stormwater Management Policy",* has been introduced into the City of Monash Planning Scheme.

The relevant objectives that form part of the Stormwater Management Policy include:

- To minimise the introduction of polluted stormwater to the drainage and waterway system.
- To promote and enhance the contribution the drainage system can make to environmental, social and economic benefits to the region.
- To encourage the provision of on-site retention systems so that stormwater discharge is maintained at pre-development levels.

New developments must also encourage the use of measures to prevent litter being carried off-site in stormwater flows. The proposed development has addressed these requirements by identifying the impervious surfaces within the site and implementing treatments to mitigate the impacts and amount of stormwater leaving the site. To assess these initiatives, the MUSIC tool – which is an industry accepted tool – was used to determine the impact of these initiatives between the pre-development conditions and the post-development conditions.

Site Characteristics

For the purposes of the stormwater assessment, the development has been assessed under pre-development conditions and post development conditions to determine the impact of the proposed initiatives. The pre and post development site have been delineated into basic surface types listed below:

- Site area of 6,352m^2
- Roof catchment area of 3,487m^2 connected to a rainwater tank on site;
- Balconies: 73m^2
- Driveway 519m^2
- Permeable, Non-permeable soft landscape, and pavement 2,273m^2

Stormwater Management Initiatives

Stormwater treatment initiatives will need to be implemented. The following section presents the different surfaces that have been identified for treatment, and the required treatment. The initiatives to manage stormwater flows for the building area will underpin the overall performance of the building and its ability to meet stormwater management objectives.

Table 2: List of areas and their stormwater treatment measures.

Surfaces	Topographic Area (m^2)	Required Treatment
Roof Catchment Area	3,487m^2	Runoff to be diverted to rainwater tank(s) with an effective storage capacity of 60,000L for the development. The stored water is used for toilet flushing in hotel and retail tenancies.
Balconies	73m^2	Runoff to be diverted to 20m^2 of raingarden for treatment before being diverted to the LPD
Driveway	519m^2	Runoff to be diverted to 20m^2 of raingarden for treatment before being diverted to the LPD
Permeable, Non-permeable soft landscape, and pavement	2,273m^2	Runoff to be diverted to 20m^2 of raingarden for treatment before being diverted to the LPD

Stormwater quality modelling results

Table 2: Pollutant load reduction from the stormwater treatment systems

Pollutant Load	Minimum Benchmark Scores	Calculated Load Reduction
Total Suspended Solids	80%	84.4%
Total Phosphorus	45%	60.9%
Total Nitrogen	45%	54.3%
Gross Pollutants/Litter	90%	100%

MUSIC Input

Listed in the tables below are the basic inputs used for the MUSIC model (Figure below). All low and high-flow bypass volumes were left at default (0m^3/s and 100m^3/s respectively). The following guideline was used in the creation of the model:

- MUSIC Guidelines: Input parameters and modelling approaches for MUSIC users in Melbourne Water's service area (Melbourne Water 2016)

Figure 8: MUSIC interface layout of the stormwater treatment.

Weather

Rainfall Reference Station	Reference Year	Time Step
Melbourne	1959	6 Min

Source Node: Urban

Parameter	Input
Node Name	Roof
Total Area	0.348 Ha
Fraction Impervious	1.00
Rainfall-Runoff Parameters	MUSIC Default (Melbourne)
Pollutant Flow Concentration Parameters	MUSIC Default (Melbourne)

Source Node: Urban

Parameter	Input

Parameter	Input
Node Name	Balconies
Total Area	0.007 Ha
Fraction Impervious	1.00
Rainfall-Runoff Parameters	MUSIC Default (Melbourne)
Pollutant Flow Concentration Parameters	MUSIC Default (Melbourne)

Source Node: Urban

Parameter	Input
Node Name	Permeable, non-permeable soft, and pavement
Total Area	0.227 Ha
Fraction Impervious	0.77
Rainfall-Runoff Parameters	MUSIC Default (Melbourne)
Pollutant Flow Concentration Parameters	MUSIC Default (Melbourne)

Source Node: Urban

Parameter	Input
Node Name	Driveway
Total Area	0.051 Ha
Fraction Impervious	1.00
Rainfall-Runoff Parameters	MUSIC Default (Melbourne)
Pollutant Flow Concentration Parameters	MUSIC Default (Melbourne)

Treatment Node: Rainwater Tank

Parameter	Input
Node Name	Rainwater Tank
Total Tank System Properties	
Volume below overflow pipe	60.00 kL
Depth above overflow	0.2 m
Surface Area	10 m^2
Initial Volume	0.00 kL
Outlet Properties	
Overflow Pipe Diameter	50.00 mm
Advanced Properties	
Orifice Discharge Coefficient	0.600 (MUSIC Default)

Parameter	Input
Number of CSTR Cells	2
Pollutant k & C* Values	MUSIC Default
Re-use	
Max Drawdown Height	2 m (MUSIC Default)
Daily Demand	3.24 KL/day

Treatment Node: Bioretention

Parameter	Input
Node Name	Raingarden
Storage Properties	
Extended Detention Depth	0.30m
Surface Area	20.00 m^2
Filter and Media Properties	
Filter area	20.00 m^2
Unlined Filter Media Perimeter	22.00 m
Saturated Hydraulic Conductivity	100.00 mm/hour – sandy loam
Filter Depth	0.500 m
TN Content of Filter Media	800 mg/kg (MUSIC Default)
Orthophosphate Content of Filter Media	55.00 mg/kg (MUSIC Default)
Infiltration Properties	
Exfiltration Rate	0.00 mm/hour (MUSIC Default)
Lining Properties	
Is Base Lined?	No
Vegetation Properties	Vegetated with Effective Nutrient Removal Plants
Outlet Properties	
Overflow Weir Width	2.00 m
Underdrain Present?	Yes
Submerged Zone with Carbon Present	No (MUSIC Default)

Daily Demand

The daily rainwater use for the toilets has been estimated to be equivalent to 3.24 KL/day. This estimation is based on 240 occupants for the hotel and ground floor retail spaces using two and a half flushes per day.

Rainfall Calculator - Based on 7 years (2007 to 2013) weather data for Melbourne					
Building Type	Residential	Irrigation Area	0	Residents	240
Roof Area	3487	Irrigation Demand	0 L/year	Laundry Use	0.0 L/day
Collection Efficiency	0.8	Toilet Use	13.5 L/day	Total Laundry Use	0.0 L/day
Loss per month	2.00 mm	Total Toilet Use	3240.0 L/day	Hot water demand	14400.0 L/day
Irrigation Requirement	350.00 mm				

Month	Average Rainfall	Monthly Runoff	Average weekly Runoff	Monthly Toilet Demand	Average weekly Demand	Overall Balance
January	31.31 mm	109,193 L	24,656 L	100,440 L	22,680 L	8,753 L
February	51.60 mm	179,929 L	44,982 L	90,720 L	22,680 L	89,209 L
March	53.74 mm	187,401 L	42,316 L	100,440 L	22,680 L	86,961 L
April	39.74 mm	138,583 L	32,336 L	97,200 L	22,680 L	41,383 L
May	43.91 mm	153,129 L	34,578 L	100,440 L	22,680 L	52,689 L
June	50.71 mm	176,841 L	41,263 L	97,200 L	22,680 L	79,641 L
July	48.03 mm	167,476 L	37,817 L	100,440 L	22,680 L	67,036 L
August	42.80 mm	149,244 L	33,700 L	100,440 L	22,680 L	48,804 L
September	50.46 mm	175,944 L	41,054 L	97,200 L	22,680 L	78,744 L
October	48.47 mm	169,003 L	38,162 L	100,440 L	22,680 L	68,563 L
November	80.87 mm	281,982 L	65,796 L	97,200 L	22,680 L	184,782 L
December	67.27 mm	234,559 L	52,965 L	100,440 L	22,680 L	134,119 L
Total	**608.91 mm**	**2,123,284 L**	**489,625 L**	**1,182,600 L**	**272,160 L**	**940,684 L**
Average	**50.74 mm**	**176,940 L**	**40,802 L**	**98,550 L**	**22,680 L**	**78,390 L**

Figure 9: Rainwater catchment and demand calculator

Stormwater Runoff Treatment during the Construction Stage

Treatment – Various

Stormwater management in the construction stage will include measures which will be put in place to minimise the likelihood of contaminating stormwater discharge from the site as well as reduce the velocity of the flows generated from the building as it is being constructed. This will mean ensuring buffer strips are in place, and the site will be kept clean from any loose rubbish. More information is available from "*Keeping Our Stormwater Clean – A Builder's Guide*" by Melbourne Water[3]. The diagram below is an illustration of the various objectives which assist in minimising the impacts of stormwater runoff typical during the construction phase. Typical pollutants that are generated from a construction site during a rainfall event include:

- Dust
- Silt
- Mud
- Gravel
- Stockpiled materials
- Spills/oils
- Debris/litter

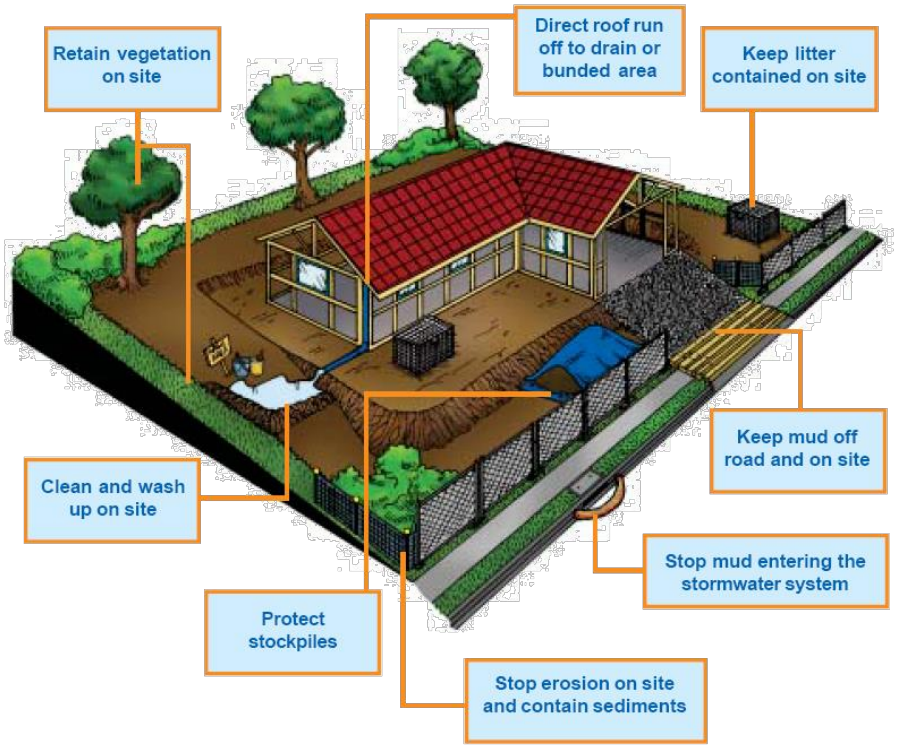
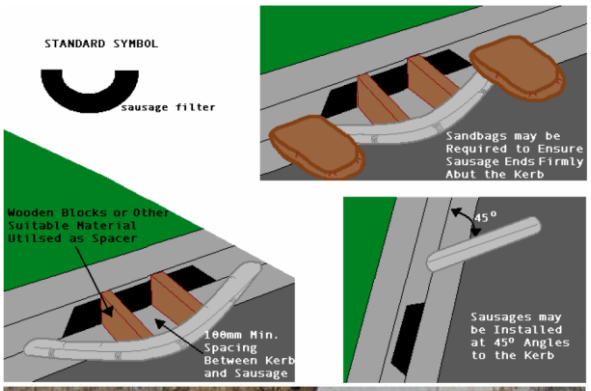


Figure 10: Stormwater will be effectively managed during construction phase according to the requirements listed in "Keeping Our Stormwater Clean – A Builder's Guide".

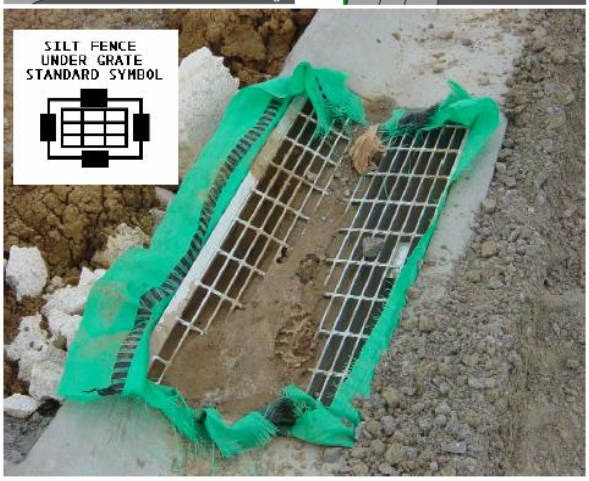
To reduce the impacts and minimise the generation of these pollutants the following measures are proposed. The symbols embedded within each image are typically used for Construction Environmental Management Plans.

[3] For copies please contact Melbourne Water on 131 722.

Gravel Sausage filters – to be placed at the entrance of pits/side stormwater inlets. These permeable sacks will filter the suspended soils and sediments and any other litter carried by the stormwater to prevent the pollutants entering the system



Silt Fences Under Grates - Silt fence material may be placed under the grate of surface-entry inlets to prevent sediment from entering the stormwater system.



Temporary Rumble Grids – these are designed to open the tread on tires and vibrate mud and dirt off the vehicle (in particular the chassis). This will heavily minimise the amount of soil/dirt deposited on local streets where it can be washed (by rainfall or other means) into the stormwater drains.

Conclusions and Recommendations

With the implementation of rainwater tank storage system for the roof runoff, the overall flow from the site during rainfall events have been significantly reduced. Overall the development has reduced the outflows and improved quality of stormwater runoff from the site significantly compared to the pre-development conditions

The builder will also be required to adhere to Melbourne Water's stormwater management guidelines during the construction stage.

Appendix 4 VOC and Formaldehyde Emissions Limits

Table 3 Maximum Volatile Organic Compound Levels for construction materials. (Source: Green Building Council Australia – Green Star Multi-unit Residential v1 2009 Manual)

Product Type/Sub Category	Max TVOC Content (g/L of ready-to-use-product)
Paints, Varnishes and Protective Coatings	
Walls and ceilings – interior semi-gloss	16
Walls and ceilings – interior low sheen	16
Walls and ceilings – interior flat washable	16
Ceilings – interior flat	14
Trim – gloss, semi-gloss, satin, varnishes, and wood stains	75
Timber and binding parameters	30
Latex primer for galvanised iron and zincalume	60
Interior latex undercoat	65
Interior sealer	65
One and Two pack performance coatings for floors	140
Any solvent-based coatings whose purpose is not covered in table	200
Adhesives and Sealants	
Indoor carpet adhesive	50
Carpet pad adhesive	50
Wood flooring and laminate adhesive	100
Rubber flooring adhesive	60
Sub-floor adhesive	50
Ceramic tile adhesive	65
Cove base adhesive	50
Dry wall and panel adhesive	50
Multipurpose construction adhesive (includes fire/waterproofing sealants)	70
Structural glazing adhesive	100
Architectural sealants	250
Carpets	
Total VOC limit	
4-PC (4-Phenylcyclohexene)	0.5mg/m² per hour

Table 3 Maximum Formaldehyde levels for processed wood products. (Source: Green Building Council Australia – Green Star Multi-unit residentialv.1 2009 Manual)

Formaldehyde emission limit values for different testing methods			
Test Method	**E1**	**E0**	Super E0
AS 2098.11 for plywood	<1.0mg/L	<0.5mg/L	<0.3mg/L
AS 4266.16 for particle board	<1.0mg/L	<0.5mg/L	<0.3mg/L
For MDF	<1.5mg/L		
JIS A1460 not applicable to plywood	<1.0mg/L	<0.5mg/L	<0.3mg/L
JAS 233 for plywood	<1.0mg/L	<0.5mg/L	<1.0mg/L
EN 120 for particle board and MDF For plywood	<9.0mg/(100g)	<6.0mg/(100g)	
	<6.0mg/(100g)	<9.0mg/L	
DIN EN 717 1	<0.12mg/m³h	<0.08mg/m³h	<0.04mg/m³h
DIN EN 717 2 not applicable to MDF	<0.12mg/m³h	<0.08mg/m³h	<0.12mg/m³h