86-96 Stubbs Street, Kensington

ENVIRONMENTALLY SUSTAINABLE DEVELOPMENT (ESD) REPORT

MAY, 2020

atelier ten

Environmental Design Consultants + Strategic Sustainability Consultants + Lighting Designers
atelierten.com
PROJECT INFORMATION

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DATE: 30.09.2019

REVISIONS

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1.0 Introduction

1.1 Project Overview

86-96 Stubbs Street is a mixed-use, multi-residential development comprising 199 no. apartment units constructed on a former light industrial facility in Kensington. The project will incorporate a commercial office space (approx. 1,200m²), retail tenancies (café), community facilities and bike workshops at ground floor level and utilitarian communal terraces, community pavilion and barbeque area on the roof.

1.2 Project Sustainability Brief

Sustainable development principles are at the heart of the design proposals for the subject site. The project seeks to meet the needs of the local community through the provision of affordable, comfortable, low-running cost and low environmental impact housing.

The project incorporates the following key principles:

- To demonstrate design practice that is equivalent to Green Star 5 Star – ‘Australian Excellence’
- To be a low operational cost, low maintenance cost building to facilitate long-term financial affordability for residents
- To utilise passive design principles to minimise active systems requirements
- To be built for robust durability, minimising the need for materials or systems replacement over the life of the building
- To achieve high indoor air quality for the benefit of health and well-being of residents
- To optimise utilisation of daylight and provide good access to sunlight for residents
- To be an exemplar of sustainable water management
- To be an exemplar of native species planting and drought tolerant gardens and landscaping
- To minimise impact upon local utilities services requirements through application of sustainable development principles

1.3 Report Overview

The following report is written to address City of Melbourne requirements for ESD reporting at planning submission stage. Clause 22.19 (Energy, Water and Waste Efficiency) of the Melbourne Planning Scheme, and specifically the table in Clause 22.19-5 requires an accommodation building over 5,000m² to demonstrate:

- 1 point for Wat-1 credit under a current version of the Green Building Council of Australia’s Green Star – Multi Unit Residential rating tool or equivalent.
- A Waste Management Plan prepared in accordance with the current version of the City of Melbourne’s Guidelines for Waste Management Plans.
- A 5 Star rating under a current version of Green Star - Multi Unit Residential rating tool or equivalent.

Although certification against Green Star is not required, this report demonstrates that the design standards put forward for this project are in line with the requirements for a Green Star 5 Star rating. An initial Green Star Appraisal has been included with Appendix A of this report.

A Waste Management Plan is outside the scope of this report but has been provided by others as part of the town planning submission package.

Further to this, Clause 22.23 of the Melbourne Planning Scheme requires a Water Sensitive Urban Design (WSUD) Response including a report from an industry accepted measurement tool such as STORM or MUSIC (or equivalent). A MUSIC modelling report by Webber Design has been included in Appendix B to demonstrate compliance with the Melbourne Planning Scheme objectives.
## 2.0 Sustainable Management

### 2.1 Sustainable Management and Operation Targets:

- Achieve a design performance in line with Green Star 5 Star or equivalent.
- Building commissioning and tuning to be carried out in accordance with Green Star guidance
- Operational environmental performance targets established for greenhouse gas emissions, potable water consumption, indoor environment quality and waste
- Best practice environmental management procedures to be implemented during construction

#### 2.1.1
It is proposed that the Green Star benchmarking tool will be used as quality assurance methodology for the delivery of a design that represents ‘Australian Excellence’ in sustainability. A preliminary Green Star appraisal has been carried out at this early design stage to ensure that the design is on track for delivery of this ambition.

#### 2.1.2
The building will be designed and constructed with the end user in mind; to facilitate their ability to carefully manage energy and water consumption, minimise their running costs and environmental impact. During the design development stages, in-depth consultation will be held with user group representatives, and as part of this, the design team will engage with users on the proposed building systems and their sustainable management and operation principles.

#### 2.1.3
All key environmental building systems including indoor environment quality, energy and water will follow Green Star best practice with regards to design, commissioning and testing, to ensure that the building is handed over to the end-user in line with design intent.

#### 2.1.4
The project will investigate employing smart metering systems for all apartments so that residents will be empowered with immediate information on energy and water consumption subject to cost review of options available. Options for cost effective integration of smart energy management technologies for residents will be explored in more detail in the next design development stage.

#### 2.1.5
In addition, the project proposes an on-site PV generation system located on the north and south plant roofs which will provide up to 45kWp of solar electricity to the development. The potential to use intelligent control to optimise direct use of PV power will be investigated, including the potential for central domestic hot water heat pump operation to replenish hot water storage during the daytime.

#### 2.1.6
During the construction period the contractor will follow best practice and develop a site specific environmental management plan. Sufficient support will be given to the site team such that they are educated in sustainable construction methods and understand the performance quality aspects required for this project.

#### 2.1.7
During building operation, waste-to-landfill will be minimised through the provision of a recyclable waste chute on each level in addition to non-recyclable waste. Space will also be provided in the lower level service room for residents to put additional waste stream items such as e-waste or organics, but this will be dependent upon the available collection regime to be determined.
3.0 Indoor Environment Quality

3.1 Indoor Environment Quality Targets:

- High internal air quality will be provided by occupant-controllable natural ventilation in line with AS 1668.4-2012. Allowance for openable façade area > 5% of the floor area for all habitable spaces.

- Provision of high-quality views out and targeted daylight amenity in line with Green Star best practice

- Avoidance of volatile organic compounds (VOCs) and formaldehyde emissions in indoor materials specifications in line with Green Star requirements

- Thermal Comfort throughout the seasons to be in line with ASHRAE best practice

Fig. 1 – Summary of Summer Passive Operation Principles
3.1.1 All dwellings have been designed to achieve excellent internal air quality through a dual aspect plan layout to facilitate natural cross-ventilation. Apartments will be designed with adequate provision of robust, easy-to-use, openable windows which will be located to avoid elimination of outdoor pollutants to the indoor air supply in line with Green Star requirements.

3.1.2 Further to this, apartments will have openable windows on opposing facades that will allow optimum control of low levels of cross ventilation, without having to open a window or door to achieve a background fresh air supply.

3.1.3 All apartments have good access to private outdoor space in line with the Better Apartments requirements. All north facing apartments receive more than 2 hours of sunlight to outdoor areas on the winter solstice.

3.1.4 The development is targeting best practice daylight amenity in line with Green Star Visual Comfort requirements.

3.1.5 During the next design development stages, the proposed internal fit-out materials specification will be reviewed in accordance with Green Star best practice to avoid internal off-gassing of pollutants that are detrimental to health and well-being.

3.1.6 Good summertime comfort will be achieved using passive design principles that includes well-shaded windows, excellent cross ventilation and provision of exposed internal thermal mass to optimise passive cooling potential.

4.0 Energy & Greenhouse Gas Emissions

4.1 Energy and Greenhouse Gas Emission Targets:

- Achieve a NatHERS area weighted average of 7.5 Star, surpassing Green Star 5 Star conditional requirements

- On site PV energy generation and distribution system to achieve up to 45kWp on-site renewable electricity supply

- Align with Victorian State Government Climate Change Framework to increase energy efficiency, generate green electricity and switch to clean, electric systems

4.1.1 The project has been designed to facilitate passive operation and minimise the energy use of active systems as much as possible through robust, simple and easy to operate passive systems. The strategy for natural cross ventilation, good solar shading and exposed thermal mass is combined with building fabric insulation and glazing performance specified in line with Green Star 5-Star requirements. This will ensure minimal energy requirements for ventilation and cooling.

4.1.2 The residential facades have been designed to allow optimum daylight through large, well-shaded window and sliding door openings to reduce reliance upon artificial lighting energy.

4.1.3 North facing glazed openings on a significant number of the residential units receive good amounts of solar gain during the mid-winter season to provide passive heating benefit.

4.1.4 The commercial offices façade will be designed to comply with the new NCC Section J 2019 building fabric energy performance requirements.

4.1.5 The artificial lighting systems will be specified to be LED lighting throughout and will meet the NCC maximum lighting power density requirement or better. All rooms will be provided with adequate lighting zoning for optimum user control.

4.1.6 The project is designed to utilise an all-electric energy supply system without the need for burning natural gas on-site. On-site PV energy generation will be optimised to meet the building baseload and will supply residents with green power. This approach is in line with Victorian State Government Climate Change Framework objectives to increase PV energy generation and move over to clean electric systems.
4.1.7 A high efficiency electric heat pump centralised hot water generation system is proposed to offer optimum running costs and low-life cycle carbon emissions. The heat pump will be specified with a co-efficient of performance (COP) greater than 3.5 in line with Green Star requirements.

4.1.8 It is proposed that the supply of PV and electric heat pump hot water systems can be negotiated as a package with an embedded network provider in the next stages, subject to technical feasibility and economic viability review. It is anticipated that this will lead to lower running costs and reduced carbon emissions over the lifetime of the project.

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**Winter**

![Diagram of Winter Operation Principles](image)

Fig. 2 – Summary of Winter Operation Principles

4.1.9 High efficiency reverse-cycle space heating and cooling will be provided per apartment. The minimum energy star rating for air-conditioning equipment will be 3-star in accordance with Green Star requirements.

4.1.10 All energy consuming appliances in the fit-out will be selected for a high star rating under the Equipment Energy Efficiency (E3) Program. All appliances will be targeted to achieve a minimum Energy Star rating of 1 star below the maximum Energy Star rating available for that appliance type and capacity, subject to detailed cost review. Further to this, the application of smart technology will be investigated to optimise direct utilisation of PV energy generated during the daytime. This will facilitate energy cost savings and carbon emissions reductions.

4.1.11 All apartments will also have a master kill switch at apartment entry to enable all non-essential small power usage to be switched off when unoccupied.

4.1.12 Mechanical ventilation is required to meet ventilation requirements in the basement car park. The energy use of fan operation will be minimised using CO linked control.

4.1.13 Vertical transport will be selected for optimum energy efficiency in line with objectives for maximising use of available locally generated PV energy and minimising carbon emissions.
5.0 Transport

5.1 Sustainable Transport Targets:

- Provide resident and visitor bicycle parking facilities in line with Green Star best practice requirements
- Allow provision for car share, low emission vehicle infrastructure or electric vehicle charging

5.1.1 It is anticipated that bicycle parking will be highly popular among future residents and a provision of 430no. secure bicycle parking spaces have been provided to cater for residents and visitors. This is in excess of Green Star requirements.

5.1.2 The provision of electric vehicle charging spaces within the car park will be explored in more detail in the next stage subject to technical feasibility and cost review.

6.0 Water Management

6.1 Water Management Targets:

- To achieve up to 4 points under Green Star credit Wat-1 requirements for sustainable water management.
- Rainwater harvesting from apartment block roof surfaces to be used as WC flush supply to residences.
- WSUD design response in line with Melbourne Planning Scheme Requirements

6.1.1 The project will target water efficiency through specification of water outlets and sanitary fittings that achieve a minimum rating (subject to detailed cost review) as follows:

<table>
<thead>
<tr>
<th>Fixture / Equipment Type</th>
<th>Minimum WELS Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taps</td>
<td>5 Star</td>
</tr>
<tr>
<td>Toilet</td>
<td>5 Star</td>
</tr>
<tr>
<td>Showers</td>
<td>3 Star (&gt;4.5 but &lt;= 6.0)</td>
</tr>
<tr>
<td>Dishwashers</td>
<td>4.5 Star</td>
</tr>
</tbody>
</table>
6.1.2 A rainwater tank of 25,000 litres will be provided in the basement services room for the collection of roof rainwater run-off. This water will be constantly used for daily WC flush, thus minimising potable water demand and outflow to the storm water utility outlet. Provision of harvested rainwater outlets for watering of communal area planting will also be considered.

6.1.3 A raingarden will be incorporated into the central courtyard area to provide treatment from habitable roof areas. Please refer to the MUSIC modelling report included in Appendix B.

6.1.4 Soft landscaping has been designed with planting that is low maintenance and low water requirement. Preference is given to drought tolerant native species to reduce watering demand.

6.1.5 Current design provision allows for the ability to collect fire system test water, subject to review in the next design phase.

7.0 Materials Management

7.1 Materials Management Targets:

- Reduction in Portland cement content in concrete, replaced with supplementary cementitious materials, e.g. fly ash, GGBFS where possible
- Use of recycled aggregates where possible
- Certified sustainable sourcing for timber products in line with Green Star
- Employ best practice for sourcing certified sustainable and responsibly sourced products
- Targeted Construction waste sent to landfill <10kg/m² in line with Green Star best practice

7.1.1 All materials selection and sourcing within the development will be undertaken with the principles of sustainable development in mind.

7.1.2 Concrete has been selected as the primary structural material for its durability and thermal mass properties. Wherever possible, concrete elements will be factory prefabricated to improve efficiency and eliminate material wastage.

7.1.3 It is intended that concrete will incorporate alternative cementitious materials reclaimed from waste streams; such as ground granulated blast furnace slag or fly ash and recycled aggregates to minimise demand of virgin materials and reduce CO₂ emissions.

7.1.4 All timber products will be specified to come from sustainably managed sources.

7.1.5 Generally, where possible, materials will be selected to come from sustainable and responsible sources with supply chain certification.

7.1.6 On-site construction waste minimisation will be targeted in line with Green Star best practice and where possible off-site pre-fabricated components will be considered.
8.0 Land Use & Ecology

8.1 Land Use and Ecology Targets

- Improve ecological value of the site through creation of locally appropriate or native species as appropriate
- The urban heat island effect will be reduced through soft landscaping and the specification of high-albedo (light coloured) surfaces for landscape, walls and roof.

8.1.1 The project is a re-use of an existing brown-field development and will include provision of green roof areas, soft landscaping and planter boxes in communal and private balcony areas. It is envisaged that this will make a significant improvement to the ecology of the site, creating an improved habitat for birds and insects.

8.1.2 It is envisaged that the creation of a garden landscape within the common areas will provide a biophilic social benefit to the residents and will create opportunities for shared gardening and maintenance activities that will further help to bind the community together.

8.1.3 The internal common areas will be designed to promote good external summertime comfort using soft landscaping, overhead walkway shading and avoidance of external finishes and surfaces with high solar absorbance. This will provide a cool inner core spaces to the development that will encourage social interaction and strengthen the community. These strategies will also work well alongside the passive design principles of the building and reduce peak cooling loads as residents open their doors and windows to promote cross-ventilation.

8.1.4 High-albedo roof finishes and light-coloured terrace finishes will be considered for the reduction of urban heat island effect. It will also be important to reduce elevated roof temperatures around the proposed roof-top photovoltaic array so that the efficiency of the panels is not compromised. Specialist thermal paints or finishes will be considered for roof areas covered with photovoltaic panels.

9.0 Sustainable Community

9.1 Sustainable Community Targets

- Foster future community resilience through engagement with local stakeholders and potential future residents
- Design communal spaces and shared facilities to encourage community interaction and build community resilience

9.1.1 The project team will undertake extensive consultation with local stakeholders and future user groups to provide the opportunity for their input to feed into the design.

9.1.2 The common circulation ‘street’ has well daylit, open, outdoor walkways with green planter boxes to encourage active lifestyle and shared responsibility for care of plants.
9.1.3 The proposals incorporate shared facilities that encourage neighbours to come together and bond as a community. This includes potential clothes drying lines, vegetable and herb gardens and a generous shared rooftop communal space with great views across the city. This rooftop communal area has cooking facilities to encourage residents to eat with one another, and provides space for residents to allow their dogs to exercise. On the ground floor there is a community hall for events, a community lounge space and bike repair workshops.

10.0 References

This report has been compiled based on discussion with the client and design team and through the review of the following information:

1. Hayball Architectural Drawing Package 23/04/2020
3. Green Star Design & As-Built v1.2
11.0 Appendix A – Preliminary Green Star Appraisal

11.1 Summary

9.1.1 A preliminary Green Star appraisal has been undertaken for the project. Since at this stage of the project there is insufficient detail to determine all the credit outcomes, a probability weighting has been applied based on the likelihood that the project will achieve each of the Green Star credits. The projected score for the project, taking into account these weighting factors, is 65. This demonstrates that the project performs comfortably in line with the Green Star 5 Star rating which is equivalent to ‘Australian Excellence’ with a 5 point buffer over the threshold score of 60.

9.1.2 Moving forward it is proposed that the Green Star appraisal will be used as a sustainability QA process with an additional appraisal carried out during the design development stage to review the progress of the project but without a commitment to certify the project.

9.1.3 Included below is a Green Star summary rating with appraisal sheets covering each credit in subsequent pages. Notes on current design allowance assumptions are included in the ‘Comments’ field.
<table>
<thead>
<tr>
<th>Management Area</th>
<th>Green Star Design &amp; As Built v1.2</th>
<th>Explanation</th>
<th>Responsible Party</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Star Accredited Professional</td>
<td></td>
<td>To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended.</td>
<td>Accredited Professional in all stages of project</td>
<td>Atelier Ten are Green Star Accredited Professionals</td>
</tr>
<tr>
<td>Commissioning and Tuning</td>
<td></td>
<td>To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential.</td>
<td>Accredited Professional</td>
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<tr>
<td>Adaptation and Resilience</td>
<td></td>
<td>To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters.</td>
<td>Implementation of a Climate Adaptation Plan</td>
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<tr>
<td>Building Information</td>
<td></td>
<td>To encourage the recognition of building owners, building occupants and facility management teams to set targets and monitor environmental performance in a collaborative way.</td>
<td>Environmental Building Reporting</td>
<td></td>
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<tr>
<td>Commitment to Performance</td>
<td></td>
<td>To encourage projects that plan to measure and report energy use.</td>
<td>End-user</td>
<td>Ownership model and ambition for low-cost, green operation likely to facilitate achieving this credit.</td>
</tr>
<tr>
<td>Monitoring and Monitoring</td>
<td></td>
<td>To encourage projects that use best practice formal environmental management procedures during construction.</td>
<td>End-user</td>
<td>Credit achievable. Baseline management must commit to maintaining the life of all common area finishes for 10 years.</td>
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<tr>
<td>Responsible Construction Practices</td>
<td></td>
<td>To encourage projects that implement waste management plans that facilitate the re-use, up-cycling or conversion of waste into energy and reduce the amount and impacts of waste.</td>
<td>End-user</td>
<td>Good practice, credits targeted</td>
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<tr>
<td>Operational Waste</td>
<td></td>
<td>To encourage projects that implement waste management plans that facilitate the re-use, up-cycling or conversion of waste into energy and reduce the amount and impacts of waste.</td>
<td>End-user</td>
<td>Good practice, credits targeted</td>
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# Indoor Environment Quality

## Quality of Indoor Air

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<th>Explanation</th>
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<tr>
<td>To recognise projects that provide high air quality to occupants.</td>
<td>Building Services Engineer / Mech Contractor</td>
<td>Good practice, should be achievable for 95% of nominated area. Some outdoor air pollutant sources to consider.</td>
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### Indoor Environment Quality

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<th>Explanation</th>
<th>Responsible Party</th>
<th>Comments</th>
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<tr>
<td>Outdoor pollutants mitigated, ventilation system designed for cleaning a maintenance access; ventilation system initially prior to use.</td>
<td>Building Services Engineer</td>
<td>Good cross-ventilation strategy for apartment units will ensure adequate fresh air provisions.</td>
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### Acoustic Comfort

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<th>Responsible Party</th>
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<tr>
<td>To reward projects that provide appropriate and comfortable acoustic conditions for occupants.</td>
<td>Acoustic Consultant</td>
<td>Good practice, credit targeted.</td>
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### Lighting Comfort

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<tr>
<td>To encourage and recognise well-lit spaces that provide a high degree of comfort to users.</td>
<td>Lighting Consultant</td>
<td>Good practice, credit targeted.</td>
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### Visual Comfort

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<th>Explanation</th>
<th>Responsible Party</th>
<th>Comments</th>
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<tr>
<td>To recognise the delivery of well-lit spaces that provide high levels of visual comfort to building occupants.</td>
<td>Architect / Contractor</td>
<td>Good practice, credit targeted as part of health and well-being strategy.</td>
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### Indoor Pollutants

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<th>Explanation</th>
<th>Responsible Party</th>
<th>Comments</th>
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<tbody>
<tr>
<td>To recognise projects that safeguard occupant health through the reduction in indoor air pollutant levels.</td>
<td>Architect / Contractor</td>
<td>Good practice, credit targeted as part of health and well-being strategy.</td>
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### Thermal Comfort

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<th>Explanation</th>
<th>Responsible Party</th>
<th>Comments</th>
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<tbody>
<tr>
<td>To encourage and recognise projects that achieve high levels of thermal comfort.</td>
<td>ESD / Building Services Engineer</td>
<td>Unachieved, advanced thermal comfort can be achieved.</td>
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## Energy

### Greenhouse Gas Emissions

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<th>Comments</th>
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<tbody>
<tr>
<td>Demonstrate improvement over NatHERS reference energy ratings.</td>
<td>Initial First Rate 5.2 monitoring has been carried out and design allowances have been set to Green Star threshold requirements.</td>
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### Peak Electricity Demand Reduction

<table>
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<tr>
<th>Explanation</th>
<th>Comments</th>
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<tr>
<td>Reduce peak electrical demand relative to Reference Building by 80% of Base Rate.</td>
<td>Reduced mechanical cooling and smart load management linked to PV system will achieve this. Further modelling required.</td>
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<td>5</td>
<td>2</td>
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### Transport

**Sustainable Transport**
- **Prescriptive Pathway**: 17B
- **Explanation**: Reduce parking, motor vehicular, support transit, support active means of transportation
- **Comments**: Urban site supports significant sustainable transport. Opportunities targeted include dedicated car share spaces, bicycle parking provision (Green Star minimum 125 spaces + 11 visitor spaces)
- **Transport Consultant**

### Water

**Potable Water**
- **Prescriptive Pathway**: 18B
- **Explanation**: Reduce potable water and replace with non-potable where appropriate
- **Comments**: It is anticipated that at least four credits can be achieved through rainwater harvesting, reduced cooling water use, WELS rated fittings, for testing water capture and drought tolerant planting. More credits potentially achievable through modelled pathway

### Materials

**Life Cycle Impacts**
- **Life Cycle Assessment Model**: 19.A.1
- **Explanation**: Comparative Life Cycle Assessment
- **Comments**: Life cycle building material and product environmental impacts across a range of categories through LCA or prescriptive pathways

**Responsible Building Materials**
- **Explanation**: To reward projects that include materials that are responsibly sourced or have a sustainable supply chain.
- **Comments**: 95% of material sourced from Responsible Steel Maker; 65% reinforcing bar and mesh made using low-energy processes

**Sustainable Products**
- **Explanation**: To encourage sustainability and transparency in product specifications.
- **Comments**: 90% (by cost) of cables, pipes, floors, blinds either PVC free or meet Best Practice Guidelines

### Land Use & Ecology

**Ecological Value**
- **Explanation**: To reward projects that improve the ecological value of their site.
- **Comments**: No ecologically sensitive species or communities present on site of the project

**Sustainable Sites**
- **Explanation**: To reward projects that choose to develop sites that have limited ecological value, re-use previously developed land and remediate contaminated land
- **Comments**: In the sections that vegetation has previously been degraded and has been remediated

**Heat Island Effect**
- **Explanation**: To encourage and recognise projects that reduce the contribution of the project site to the heat island effect.
- **Comments**: 75% of total project roof-facing area (monitored in plan) must be coolscaped
<table>
<thead>
<tr>
<th>Emissions</th>
<th>Explanation</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater</td>
<td>To reward projects that minimise peak stormwater flows and reduce pollutants entering public sewer infrastructure.</td>
<td>Civil Engineer</td>
</tr>
<tr>
<td>Light Pollution</td>
<td>To reward projects that minimise light pollution.</td>
<td>Architect/Lighting Consultant</td>
</tr>
<tr>
<td>Microbial Control</td>
<td>To recognise projects that implement systems to minimise the impacts associated with harmful microbes in building systems.</td>
<td>Building Services Engineer</td>
</tr>
<tr>
<td>Refrigerant Impacts</td>
<td>To recognise projects that implement systems that minimise the environmental impacts of refrigeration equipment.</td>
<td>Building Services Engineer</td>
</tr>
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<thead>
<tr>
<th>Innovation</th>
<th>Proposed Innovation Options:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative Technology or Process</td>
<td>The project meets the aims of an existing credit by using a technology or process that is considered innovative in Australia or the world.</td>
</tr>
<tr>
<td>Market Transformation</td>
<td>The project has undertaken a sustainability initiative that substantially contributes to the broader market transformation towards sustainable development in Australia or in the world.</td>
</tr>
<tr>
<td>Improving on Green Star Benchmarks</td>
<td>The project has achieved full points in a Green Star credit and demonstrates a substantial improvement on the benchmarks required to achieve full points.</td>
</tr>
<tr>
<td>Innovation Challenge</td>
<td>Where the project addresses an sustainability issue not included within any of the Credits in the existing Green Star rating tools.</td>
</tr>
<tr>
<td>Global Sustainability</td>
<td>Project teams may adopt an approved credit from a Global Green Building Rating tool that addresses a sustainability issue that is currently outside the scope of this Green Star rating tools.</td>
</tr>
</tbody>
</table>
12.0 Appendix B – MUSIC Modelling
Stormwater Management Plan

86-96 Stubbs Street, Kensington

Issue: Version 5

Prepared for: Assemble

Project No.: WD19110

30th APRIL 2020
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1.0 INTRODUCTION

Webber Design has been engaged by Assemble to carry out the stormwater quality treatment (MUSIC modelling) and on-site detention requirement.

The following site drainage review and attached documentation has generally been conducted in accordance with the guidelines contained within the City of Melbourne Water Sensitive Urban Design Guidelines and Australian Standard 2018 AS 3500.3 Part 3: Stormwater Drainage, and complies with Melbourne Planning Scheme Clause 22.23.

CLIENT AND PROJECT DETAILS

Client: Assemble

Development: Assemble

Project Architect: Hayball Pty Ltd

Base architectural drawings: This report is based on the architectural planning drawings issued on 23-April-2020.

RELEVANT CODES AND STANDARDS

NCC - 2019


PROPERTY DETAILS

The details of the property for the proposed development are as itemized within Table 1 below.

<table>
<thead>
<tr>
<th>Street Address</th>
<th>86-96 Stubbs Street, Kensington</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Area</td>
<td>3989m² (Approximate)</td>
</tr>
</tbody>
</table>

Table 1 – Property Details

The site encompasses frontages to Thompson Street and Stubbs Street. As marked on the below locality plan, Figure 1.
Figure 1 - Site Locality Plan
2.0 WATER QUALITY STRATEGY

The proposed development comprises a new multi-residential development with 199 No. of apartment units, this project will incorporate a café, community facilities and bike workshops at the groundfloor and utilitarian communal terraces, community pavilion and barbeque area on the roof.

The aim of the water quality strategy is to treat the stormwater to certain target before they discharging to the council drain. The objectives for on-site treatment relating to urban stormwater quality, as outlined by the Urban Stormwater: Best Practice Environmental Management Guidelines are:

- 80% retention of the typical urban annual load for Total Suspended Solids. (TSS)
- 45% retention of the typical urban annual load for Total Phosphorus. (TP).
- 45% retention of the typical urban annual load for Total Nitrogen. (TN).
- 70% retention of the typical urban annual load for gross pollutants. (Litter).

For the proposed catchment area, the non-trafficable roof area of 1140.0m², 0.114ha drains into rainwater tank. This roof area including both North and South building. This shall refer to hydraulic engineering drawings for suspended pipe networks and details.

The water in the rainwater tank will be harvested for toilet flushing. Once the rainwater tank is full, it will overflow to onsite detention tank. The water is stored and discharge slowly at the onsite detention tank and surcharge pit to the Legal Point of Discharge.

The remain trafficable roof and terrace area 1960m², 0.196ha (level 1 and above) from both North and South building will discharge to the landscape raingarden on ground floor Prior entering to the raingarden, the North roof and terrace will discharge to a flow control pit OceanGuard litter basket, then discharge to the raingarden. the South roof and terrace will discharge to a flow control pit OceanGuard litter basket, then discharge to the raingarden, then discharge to the onsite detention tank.

The Impervious on ground floor area 530m²,0.053ha will drop down to basement stormwater drainage system, and pump up to the onsite detention tank, discharge to a flow control pit OceanGuard litter basket prior entering the onsite detention tank.

The water quality model for the site was established using Music (Version 6.3). the rainwater tank, raingarden, and OceanGuard basket characterises which were used in Music are provide and shown below.
Water Quality Model

The proposed site is divided into a number of sub-catchments shown in table below:

<table>
<thead>
<tr>
<th>Sub-Catchment</th>
<th>Description</th>
<th>Treatment Node</th>
<th>Area (Ha)</th>
<th>Impervious Fraction (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Non-trafficable roof (total)</td>
<td>RWT, OSD tank</td>
<td>0.114</td>
<td>100</td>
</tr>
<tr>
<td>02</td>
<td>North trafficable roof and terrace (level 1 and above)</td>
<td>Litter basket, Raingarden, OSD tank</td>
<td>0.083</td>
<td>90%</td>
</tr>
<tr>
<td>03</td>
<td>South trafficable roof and terrace (level 1 and above)</td>
<td>Litter basket, Raingarden, OSD tank</td>
<td>0.113</td>
<td>90%</td>
</tr>
<tr>
<td>04</td>
<td>Landscape on ground</td>
<td>Litter basket, OSD tank</td>
<td>0.029</td>
<td>30%</td>
</tr>
<tr>
<td>05</td>
<td>Impervious on Ground</td>
<td>Litter basket OSD tank</td>
<td>0.053</td>
<td>90%</td>
</tr>
</tbody>
</table>

WATER QUALITY RESULT

The MUSIC model results show that the pollutant removal rate achieves the reduction targets provided. The results from the MUSIC model are tabulated below:

![Treatment Train Effectiveness - LP0](image)

Table 5: Treatment Train Result (Music Modelling Result)
3.0 APPENDICES

APPENDIX A – POST DEVELOPMENT CATCHMENT AREAS
APPENDIX B – MUSIC MODELLING

Figure 2 - Overall Music Modelling Treatment Nodes

Figure 3 - Areas
Figure 4 - Properties of Litter Basket (Ocean Guard)
Figure 5 - Properties of Raingarden/Bio-retention
### Properties of Rainwater Tank

#### Inlet Properties
- Low Flow By-pass (cubic metres per sec): 0.000000
- High Flow By-pass (cubic metres per sec): 100.000000

#### Individual Tank Properties
- Number of Tanks: 1

#### Total Tank Properties
- Storage Properties
  - Volume below overflow pipe (kL): 25.00
  - Depth above overflow (metres): 0.20
  - Surface Area (square metres): 75.0
  - Initial Volume (kL): 0.00

- Outlet Properties
  - Overflow Pipe Diameter (mm): 50
  - Use Custom Outflow and Storage Relationship: Not Defined

---

**Figure 6 - Properties of Rainwater Tank**
### Figure 7 - Treatment Train Effectiveness

<table>
<thead>
<tr>
<th>Sources</th>
<th>Residual Load</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (ML/yr)</td>
<td>1.15</td>
<td>0.756</td>
</tr>
<tr>
<td>Total Suspended Solids (kg/yr)</td>
<td>173</td>
<td>11.5</td>
</tr>
<tr>
<td>Total Phosphorus (kg/yr)</td>
<td>0.379</td>
<td>0.0733</td>
</tr>
<tr>
<td>Total Nitrogen (kg/yr)</td>
<td>3.11</td>
<td>0.969</td>
</tr>
<tr>
<td>Gross Pollutants (kg/yr)</td>
<td>47.2</td>
<td>0</td>
</tr>
</tbody>
</table>