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LBS REFERENCE NUMBER
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CONTENTS

DOCUMENT CONTROL

Revision	Date	Description	Author	Reviewed
D1.0	*06.Sep18*	*Draft for client review*	*JM*	*MC*

1.0 INTRODUCTION

The proposed development is located within a transit corridor within the City of Vincent, meaning the development must be designed and constructed in accordance with the City's Policy 7.1.1 Built Form – P1.8 – Environmentally Sustainable Design. P.1.8 outlines that the development must:

- P1.8.1 - It maximises passive solar heating, cooling, natural ventilation and light penetration to reduce energy consumption;
- P1.8.2 - It is capable of recovery and re-use of rainwater, storm water, grey water and/or black water for non-potable water applications.
- P1.8.3 - Climate moderation devices can be incorporated to reduce passive solar gain in summer and increase passive solar gain in winter.
- P1.8.4 - That it is capable of achieving one of the environmental performance ratings shown in the below:
    - Green Star 5 Star; or
    - Life Cycle Assessment; or
    - Equivalent rating system

Living Building Solutions (LBS) has proposed to assess the proposed development using a Sustainable Design Assessment or SDA that is deemed equivalent to P1.8.4. This document demonstrates that the development has been designed to achieve ESD outcomes which are equivalent to a 5 Star Green Star Building under the Green Star Design & As Built V1.3 Tool.

The SDA will assess the development against following ESD Categories:

Indoor Environment Quality

Energy Efficiency

Water Efficiency

Stormwater Management

Building Materials

Transport

Waste Management

Urban Ecology

Innovation

Construction / Building Management

GREEN STAR POINTS SUMMARY

Table 2 outlines the equivalent Green Star Design & As Built points achieved through successful implementation of this SDA. Successful implementation of the Sustainable Initiatives will result in equivalent to a 5 Star Green rating (≥60 points).

Table 1 - Green Star Points Summary

Category	*Points Achieved*
MANAGEMENT	10 / 14
Suitable Consultant	1 / 1
Commissioning & Tuning	3 / 4
Adaptation & Resilience	0 / 2
Building Information	1 / 1
Commitment to Performance	0 / 2
Metering	1 / 1
Responsible Construction Practices	2 / 2
Operational Waste	1 / 1
INDOOR ENVIRONMENT QUALITY	13 / 17
Indoor Air Quality	4 / 4
Acoustic Comfort	1 / 3
Lighting Comfort	3 / 3
Visual Comfort	3 / 3
Indoor Pollutants	2 / 2
Thermal Comfort	0 / 2
ENERGY	11.1 / 22
Energy Consumption Reduction	3.6 / 4
Greenhouse Gas Emissions	5.1 / 12
Lighting	1 / 1
Domestic Hot Water	0.5 / 2
Appliances and Equipment	1 / 1
Peak Electricity Demand Reduction	0 / 2
SUSTAINABLE TRANSPORT	5 / 10
Access to Public Transport	3 / 3
Low Emission Vehicle Infrastructure	0 /1
Active Transport Facilities	1 / 1
Reduce Car Parking Provisions	0 / 1
Walkable Neighbourhoods	1 / 1
WATER	6 / 12
Sanitary Fixture Efficiency	1 / 1
Rainwater reuse	1 / 1
Heat Rejection	2 / 2
Landscape Irrigation	1 / 1
Fire Protection System Test Water	1 / 1
MATERIALS	3 / 26
Life Cycle Impacts	0 / 10
Life Cycle Impacts – Concrete	0 / 3
Life Cycle Impacts – Steel	0 / 2
Life Cycle Impacts – Building Reuse	0 / 4
Responsible Building Materials	2 / 3
Sustainable Products	0 / 3
Construction and Demolition Waste	1 / 1
LAND USE AND ECOLOGY	2 / 6
Ecological Value	0 / 3

Sustainable Sites	2 / 2
Heat Island Effect	0 / 1
EMISSIONS	2 / 5
Stormwater	0 / 2
Light Pollution	1 / 1
Microbial Control	1 / 1
Refrigerant Impacts	0 / 1
INNOVATION	8 / 10
TOTAL	60.2 / 110

ESD ASSESSMENT TOOLS

The following tools and / or modelling programs have been used as relevant benchmarks and to outline how the above objectives have been met.

- *Green Star Design & As Built V1.2*
- *Built Environment Sustainable Scorecard (BESS)*
- *NCC Volume 2 Section 3.12–Energy Efficiency*
- *NCC Volume 1 Section J – Energy Efficiency*
- *NCC Volume 2 – P2.6.1 & P2.6.2*
- American Society of Heating, Refrigeration and Air Conditioning (ASHRAE)
- *Australian Institute of Refrigeration, Air Conditioning and Heating (AIRAH)*
- *The Air Tightness Testing & Measurement Association*
- *Australian Standards*
- *InSIte Water Calculator*
- *Walk Score*

ENVIRONMENTAL SUSTAINABLE DESIGN (ESD) STRATEGY

The project team has collaborated to consider ESD principles and initiatives during the design phase, these principles have been based on the following ESD hierarchy:

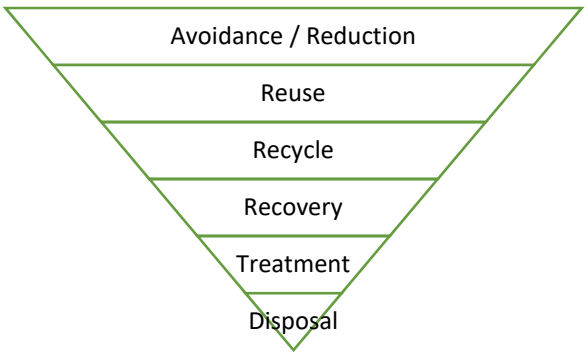

Figure 1 - ESD Hierarchy

SITE DESCRIPTION

Address	*4 x Units - Lot17 (157) Loftus Street, Leederville WA 6007*
Proposed building works	4 x Townhouses (Class 1 & Class 2)
Impervious area	460 m^2
Pervious Green Space	74 m^2
Total Site Area	534 m^2

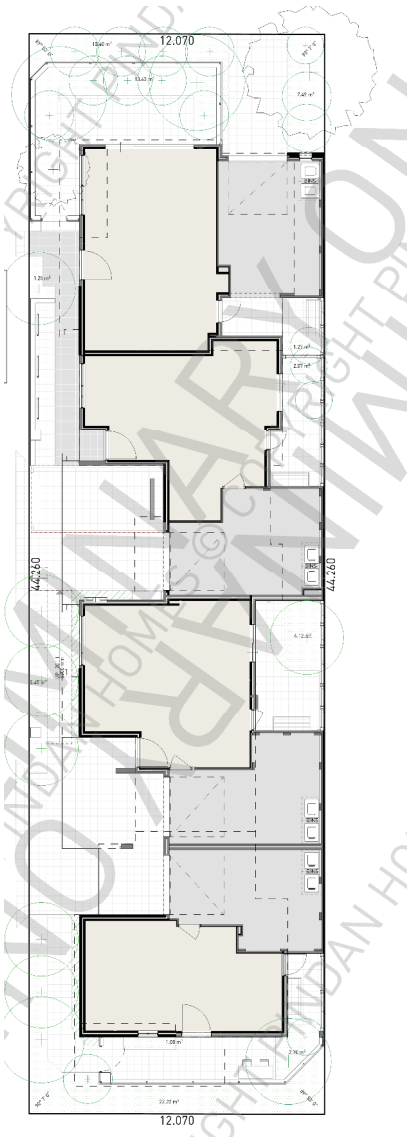

Figure 2 – 157 Loftus Street, Leederville Proposed Site

2.0 IMPLEMENTATION SCHEDULE

To assist in achieving the sustainable best practice objectives of the SDA, the following ESD Implementation Schedule has been prepared to assist the Development Manager and project team. The project team may include but is not limited to:

- Development Manager (DM)
- Architect (Arch)
- ESD Consultant (ESD)
- Building Services Consultant (SC)
- Civil Services Consultant (CS)
- Waste Management Consultant (WM)
- Fire Engineer (FM)

Each Design Initiative is outlined in further detail in Section 3.0 Sustainable Initiatives.

Design Initiative	*Design Response*	*Responsibility*
Building Commissioning	Pre-commissioning and commissioning assuring key building services are designed, installed and operated in accordance with project requirements. Sign off provided by relevant trades.	DM
Building Systems Tuning	Builder / owner commit to a tuning process for allkKey building services (HVAC, HWS, Lighting) following practical completion and during defects liability period	DM
Building Information	Key building services (HVAC, HWS, Lighting) manuals provided to all building owners	DM
Air Permeability Testing	Air permeability rate of <7.5m3(h.m2)@50 to be achieved. Verified through post construction air permeability testing in accordance with ATTMA TSL1	DM
Operation Waste	Each unit is to be provided with: - Internal general waste plastic lined bins ≥20L - Internal commingled recycling bins ≥20L General Waste and commingled recycling facilities are to be provided in accordance with local relevant authority	DM
Entry of Outdoor Pollutants	HVAC air intakes to be located in open space.	DM / Update on plans
Maintenance & Cleaning	Mechanical Ventilation Systems will be designed / located to provide adequate access for maintenance, to both sides of all moisture / debris catching components, within the air distribution system	DM
Exhaust Pollution	Kitchen exhaust extraction to be in accordance with AS1668.2 2012	DM
Acoustics	All boundary walls between units to achieve a Rw value of ≥45	DM / Update on plans
Low VOC Products	≥ 95% of paints, adhesives, sealants (by volume) or carpets (by area) meet the total VOC limits specified in Appendix A.	DM / Update on plans

	Compliance with carpets will be met by complying with VOC limits outlined in Appendix A or use of a product certified under Product Certification Scheme found on http://new.gbca.org.au/product-certification-schemes/ or equivalent	
Flicker Free Lighting	All lighting to be flicker free (excludes garage)	DM
Illuminance & Glare Reduction	- All downlights to have rated colour variation ≤3 MacAdam Ellipses - Bare light sources are to be fitted with baffles, louvers, translucent diffusers, design or other means that obscures the direct light source from all viewing angles of the occupants.	SC
Glare Reduction	Internal solar blinds to all habitable windows provided by the builder or occupants	DM
Surface Illuminance	≥ 95% of ceilings to have a surface reflectance of ≥ 0.75 (Matte flat white ceiling)	DM
Localised Lighting Control	- Sufficient power outlets to be provided for future task lights / lamps - Task lighting provided above Kitchen benches and bathroom vanities	DM/SC
Internal Lighting	-Lighting to have maximum wattage of 10% less than the maximum requirements of NCC Vol1 & Vol2 -Independent light switching to be provided to each room. In open plan living areas, each functional area must be separately switched.	DM/SC
Energy Efficiency	Refer to preliminary Section J / 3.12 report for specification	DM / Update on plans
Energy Efficiency	All heating and cooling to have the following coefficient of performance: E.E.R - ≥ 3.78 C.OP - ≥ 4.08	DM / Update on plans
Appliances	All appliances in the unit at handover are to have a minimum Energy Star rating of 1-star below the maximum Energy Star rating available for that appliance type and capacity - Washing machine (if applicable) - Dishwasher	DM
Metering	Accessible metering is to be provided to each tenancy for all building energy and water consumption	DM
Rainwater Re-use	Rainwater tanks ≥ 1000L provided to each unit. Tank to be connected to upper roof space of each unit and plumed to ≥ 1 toilet	DM
Landscape Irrigation	Water efficient landscaping is installed and if irrigation is required a drip or sub surface irrigation is installed	DM
Urban Ecology	A tap and floor waste is to be provided to each balcony to encourage the growth of plants	DM / Update on plans
Water Efficiency	Specify WELS fixtures in accordance with nominated WELS Star rating: - Taps: ≥ 5 Star - Showers: ≥ 3 Star (>4.5 but ≤ 6.0 flow rate) - Dishwashers: ≥ 4 Star - WC: ≥ 5 Star - Washing Machine: ≥ 4 Star	DM / Update on plans
Responsible Construction Practices	- Primary contractor is IS0 14001 accredited	DM
Responsible Construction Practices	- A program / policy is implemented to ensure occupational health and safety / positive mental and physical health of key trades. The program should address areas such as: - Healthy eating	DM

	- Reduce harmful alcohol and drug tobacco free living - Increase social cohesion, community and cultural participation - Understanding depression - Preventing violence and injury - Suicide prevention - Decrease psychological distress	
Construction Waste Management	≥90% (by weight) of the waste generated during construction and demolition to be diverted from landfill. Dumping certificates to be provides.	DM
Structural Steel	If steel framing is used: ≥95% (by mass) of the buildings steel is sourced from a responsible steel maker. Steel maker has current ISO 14004 certification or is a member of a recognised environmental group / charter	DM
Timber	≥95% of structural / joinery timber (by cost) is from a certified forest certification scheme	DM
Hazardous Materials	A hazardous materials survey has or will be conducted of any existing buildings, structures in accordance with relevant Environmental and Occupational Health Standards. If asbestos, lead or PCBs are identified, they are to be removed and disposed of in accordance with best practice guidelines	DM
Active Transport Facilities	1 bicycle park to be provided for each unit	DM / Update on Plans
Sustainable Transport	Information on local public transport and bicycle networks to be provided to building occupants as part of handover package	DM
Light Pollution	All external luminaries to face the ground resulting in an upward output ratio of less than 5%	DM
Financial Transparency	Builder to disclose the additional cost associated with achieving sustainable objectives	Practical Completion

3.0 SUSTAINABLE INITIATIVES

The following sections outline the sustainable initiatives and design responses that will be incorporated into the design, construction and operation of the proposed development. In addition, this section outlines applicable benchmark standards and the equivalent points achieve under Green Star Design & As Built V1.3.

For the purpose of this report the nominated area is considered all areas a person is expected to work or remain for an extended period of time.

MANAGEMENT

Design Requirement	*Standard*	*Design Response*	*Points*
Suitable Professional	GBCA 1.0	Design team has engaged a suitably qualified professional to provide advice, support and information related to the sustainable principles, structure, timing and process, at all stages of the project, leading to successful implementation of the SDA	1

Preliminary Modelling	BESS 2.2	Preliminary energy modelling has been undertaken on all thermally unique dwellings	1

COMMISSION & TUNING

Design Requirement	*Standard*	*Design Response*	*Points*
Building Commissioning	GBCA 2.2	Pre-commissioning and commissioning assuring key building services are designed, installed and operated in accordance with project requirements. Sign off provided by relevant trades.	1
Air Permeability Testing	GBCA 2.2	Post construction air permeability testing to be completed by Living Building Solutions or suitable qualified consultant in accordance with ATTMA TSL1. Air permeability rate of <7.5m3(h.m2)@50 to be achieved	1
Building Systems Tuning	GBCA 2.3	Following practical completion and during defects liability period the owner / client commit to a tuning process for all key building services	1
Building Information	GBCA 4.0	Operation and Maintenance Manuals for key building services to be provided to all owners.	1

OPERATIONAL WASTE

Design Requirement	*Standard*	*Design Response*	*Points*
Operational Waste	BESS WAS 2.2	- Waste recycling facilities to be as conveniently located as those for general waste - All waste streams are to be separated and clearly identified through adequate signage - General Waste and commingled recycling facilities are to be provided in accordance with local relevant authority - Each unit is to be provided with general waste plastic lined bins ≥20L -Each unit is to be provided with commingled recycling bins ≥20L	1

INDOOR ENVIRONMENT QUALITY

Design Requirement	*Standard*	*Design Response*	*Points*
Entry of Outdoor Pollutants	GBCA 9.1	Building ventilation systems to be designed with minimum separation distances between pollution sources and outdoor air intakes. Designed in accordance with ASHRAE Standard 62.1:2013: -Intake located in open space	1

Maintenance & Cleaning	GBCA 9.1.1	Mechanical Ventilation Systems will be designed / located to provide adequate access for maintenance, to both sides of all moisture / debris catching components, within the air distribution system	-
Provision for Outdoor Air	GBCA 9.2	All units are naturally ventilated and exceed the following requirements: -Health & Amenity NCC 2016 3.8 -Natural Ventilation NCC 2016 3.12.4	2
Exhausting Pollutants	GBCA 9.3B	All kitchens or designated cooking areas to be ventilated in accordance with AS1668.2:2012.	1
Acoustic Separation	GBCA 10.3A	Partition walls between units to achieve a Rw value of ≥45	1
Daylight	GBCA 12.1	Daylight modelling demonstrates that ≥60% of the nominated area achieves a daylight factor of at least 2.0%. Refer to separate Daylight report	2
External Views	GBCA 12.2	≥60% of the nominated floor area has a clear line of sight to a high quality external view	1
Low VOC Products	GBCA 13.1	≥ 95% of paints, adhesives, sealants (by volume) or carpets (by area) meet the total VOC limits specified in Appendix A. Compliance with carpets will be met by complying with VOC limits outlines in Appendix A or use of a product certified under Product Certification Scheme found on http://new.gbca.org.au/product-certification-schemes/ or equivalent	1
Engineered Wood Products	GBCA 13.2	No new engineered wood products are used in the proposed dwellings. This excludes timber veneers	1
Flicker Free Lighting	GBCA 11.0	All lighting in the nominated area to be flicker free (excludes garage)	-
Illuminance & Glare Reduction	GBCA 11.1	- The lighting design includes or permits general fixed lighting that provides good maintained illuminance values for the entire room - All downlights to have rated colour variation ≤3 MacAdam Ellipses - Bare light sources are to be fitted with baffles, louvers, translucent diffusers, design or other means that obscures the direct light source from all viewing angles of the occupants.	1
Glare Reduction	GBCA 12.0B	Internal solar blinds to all habitable windows provided by the builder or occupants	1
Surface Illuminance	GBCA 11.2	≥ 95% of ceilings within the nominated area to have a surface reflectance of ≥ 0.75 (Matte flat white ceiling)	1
Localised Lighting Control	GBCA 11.3	- Sufficient power outlets to be provided for future task lights / lamps - Task lighting provided above Kitchen benches and bathroom vanities	1
Solar Control	Best Practice / P1.8.3	The combination of external fixed shading, louvres and internal solar blinds has been incorporated into the design to minimise the impacts of unwanted heat gain and glare on building occupants	-

ENERGY EFFICIENCY

Design Requirement	*Standard*	*Design Response*	*Points*
Energy Consumption Reduction	GBCA 15E	On average, the proposed designs results in an energy consumption reduction of 17% when compared to a minimum compliance in accordance NCC Vol 1 and Vol 2. 2016	3.60
Greenhouse Gas Emissions Reduction	GBCA 15E	The proposed design results in a Greenhouse Gas Emission reduction of 32% when the building fabric, glazing and HVAC is compared to a Benchmark Building. The Benchmark Building represents a 10% improvement on the Reference Building. - HVAC system based on Daikin L-Series system: E.E.R - ≥ 3.78 C.OP - ≥ 4.08	5.14
Internal Lighting	GBCA 15B	-Lighting to have maximum wattage of 10% less than the maximum requirements of NCC Vol 1 and Vol 2 2016 -Independent light switching to be provided to each room. In open plan living areas, each functional area must be separately switched.	1
Domestic Hot Water	GBCA15B	Primary hot water service is instantaneous gas	0.5
Appliances & Equipment	GBCA 15B	All appliances in the unit at handover are to have a minimum Energy Star rating of 1-star below the maximum Energy Star rating available for that appliance type and capacity - Washing machine (if applicable) - Dishwasher	1
Metering	GBCA 6.0	Accessible metering is to be provided to each tenancy for all building energy and water consumption	1

WATER / STORMWATER

Design Requirement	*Standard*	*Design Response*	*Points*
Sanitary Fixture Efficiency	GBCA 18B.1	All fixtures and fittings to be WELS fixtures in accordance with nominated WELS Star rating: - Taps: ≥ 5 Star - Showers: ≥ 3 Star (>4.5 but ≤ 6.0 flow rate) - Dishwashers: ≥ 4 Star - WC: ≥ 4 Star - Washing Machine: ≥ 4 Star	1
Rainwater Re-use	GBCA 18B.2	Rainwater tanks ≥ 1000L provided to each unit. Tank to be connected to upper roof space of each unit and plumed to ≥ 1 toilet	1
Heat Rejection	GBCA 18B.3	HVAC System to use air cooled condenser components	2
Landscape Irrigation	GBCA 18B.4	Water efficient landscaping is to be installed and if irrigation is required a drip or sub surface irrigation is installed	1
Fire Protection System	GBCA 18B.5	No water sourced fire protection systems required	1

MATERIALS / CONSTRUCTION

Design Requirement	*Standard*	*Design Response*	*Points*
Structural Steel	GBCA20.1	If steel framing is used: ≥95% (by mass) of the buildings steel is sourced from a responsible steel maker. Steel maker has current ISO 14004 certification or is a member of a recognised environmental group / charter	1
Timber	GBCA20.2	≥95% of structural / joinery timber (by cost) is from a certified forest certification scheme	1
Construction Waste	GBCA 22B	≥90% (by weight) of the waste generated during construction and demolition will be diverted from landfill	1
Responsible Construction Practices	GBCA 7.0	An Environmental Management Plan and Environmental Management System to be developed in accordance with NSW Environmental Management Systems; or primary contractor is IS0 14001 accredited	1
High Quality Staff Support	GBCA 7.2	A program / policy is implemented to ensure occupational health and safety / positive mental and physical health. The program should address areas such as: - Healthy eating - Reduce harmful alcohol and drug tobacco free living - Increase social cohesion, community and cultural participation - Understanding depression - Preventing violence and injury - Suicide prevention - Decrease psychological distress	1

LAND USE & URBAN ECOLOGY

Design Requirement	*Standard*	*Design Response*	*Points*
Endangered, Threatened & Vulnerable Species	GBCA 23.0	No critically endangered, endangered, vulnerable species, or ecological communities were present on the site at the time of purchase or contract	
Re-use Land	GBCA 24.1	The proposed site was previously developed as a detached Class 1 dwelling	1
Hazardous Materials	GBCA 24.2B	A hazardous materials survey has or will be conducted of any existing buildings, structures in accordance with relevant Environmental and Occupational Health Standards. If asbestos, lead or PCBs are identified, they are to be removed and disposed of in accordance with best practice guidelines	1

TRANSPORT

Design Requirement	*Standard*	*Design Response*	*Points*
Access to Public Transport	GBCA 17B	The proposed development in close proximity to a variety of public transport and achieves 16.7% under Green Star Design & As Built Access by Public Transport	3
Active Transport Facilities	GBCA 17B.4	1 bicycle park to be provided for each unit	1
Walkability	GBCA 17B.5	The proposed development achieves: - Walk Score – Very Walkable (78) - Transit Score – Good Transit (56) Commute to Downtown Perth: 5min 22min 11min 39+min	1

EMISSIONS

Design Requirement	*Standard*	*Design Response*	*Points*
Light Pollution	GBCA 27.1	All external luminaries to face the ground resulting in an upward output ratio of less than 5%	1
Microbial Control	GBCA 28.0	All building cooling heat rejection systems to not use or contain water	1

INNOVATION

Design Requirement	*Standard*	*Design Response*	*Points*
ISO 14001 Certification	International Best Practice	Primary contractor is IS0 14001 accredited	1
Urban Ecology	BESS	A tap and floor waste is provided to each balcony to encourage the growth of plants	1
Vegetation	BESS Urban Ecology 2.1	Vegetated areas are provided that serve the amenity and environmental performance of the development. An area of ≥ 15% of the total development area will be dedicated to on-site vegetation	1
Potable Water Reduction	InSite Water Best Practice	The combination of efficient fixtures / fittings and rainwater harvesting results in a 44.7% reduction in potable water use	2
Financial Transparency	Best Practice	Builder to disclose the additional cost associated with achieving sustainable objectives	1
Sustainable Materials	Best Practice	Consideration has been given to the choice of materials during the design phase: - Concrete has been specified to some of the structure, whilst this contains a high level of embodied energy it has a positive impact on the passive design / operational performance. This is demonstrated in the preliminary JV3 results - Steel roof sheets specified in the design also has high embodied energy but is easily recyclable at the end of buildings life cycle - Any timber used in the design will generally be sourced from sustainably managed plantations.	1
Maintenance / Durability	Best Practice	Durable low maintenance building fabric materials (aluminium windows, steel sheet, concrete) have been specified to reduce to need for maintenance / replacement during lifecycle of the building	1
Transport	Best Practice	Information on local public transport and bicycle networks to be provided to building occupants as part of handover package	1

4.0 CONCLUSION

If the content of this document and supporting documentation are followed the proposed development will achieve the key objectives of the Green Building Policy and have the equivalent performance to a 5 Star Green Star Development.

The contents of this document should be read in conjunction with the following supporting documentation:

- Preliminary Energy Results
- Daylight Report

DISCLAIMER

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5.0 APPENDIX A

Compliance with Low VOC products is met the product meets the requirements of Table 3 or is recognised under a Product Certification Scheme - http://new.gbca.org.au/product-certification-schemes/

Table 2 - Max TVOC Limits for Paints, Adhesive and Sealants

Product Category	*Max TVOC content in grams per litre of ready to use product*
General purpose adhesives and sealants	50
Interior wall and ceiling paint, all sheen levels	16
Interior wall and ceiling paint, all sheen levels	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

Compliance with Carpets is met by demonstrating the carpet meets the requirements of Table 4 or is recognised under a Product Certification Scheme - http://new.gbca.org.au/product-certification-schemes/

Table 3 - Carpet Test Standards and TVOC Emissions Limit

Compliance Option	*Test Protocol*	*Limit*
ASTM D5116	ASTM D5116 - Total VOC limit*	0.5mg/m2 per Hour
	ASTM D5116 - 4-PC (4-Phenylcyclohexene)*	0.05mg/m2 per Hour
ISO 16000 / EN 13419	ISO 16000 / EN 13419 - TVOC at three days	0.5 mg/m2 per hour

ISO 10580 / ISO/TC 219 (Document N238)	ISO 10580 / ISO/TC 219 (Document N238) - TVOC at 24 hours	0.5 mg/m2 per hour

* Both limits should be met when testing against ASTM D5116

Compliance with engineered wood products is met by demonstrating the product meets the requirements of Table 5 or is recognised under a Product Certification Scheme - http://new.gbca.org.au/product-certification-schemes/

Table 4 - Formaldehyde Emission Limit Values for Engineered Wood Products

Test Protocol	*Emission Limit / Unit of Measure*
S/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)	ASTM D5116 (applicable to high pressure laminates and compact laminates)
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.

**The test report must confirm that the conditions of Table 3 comply for the particular wood product type, the final results must be presented in EN 717-1 equivalent (as presented in the table) using the correlation ratio of 0.98.

***The final results must be presented in EN 717-1 equivalent (as presented in the table), using the correlation ratio of 0.98.

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LBS REFERENCE NUMBER
LBS_614

DATE
31/08/2018

DAYLIGHT MODELLING REPORT

PROJECT NAME
Proposed Townhouse Development

PROJECT ADDRESS
Lot 17 (157) Loftus Street, Leederville WA 6007

BUILDING CLASS
Class 2

CLIMATE ZONE
5

REPORT COMMISSIONED BY
Pindan Homes

ON BEHALF OF
Kentville Holdings Pty Ltd

CLIENT REFERENCE NUMBER
180704

INTRODUCTION

The proposed development is located within a transit corridor within the City of Vincent, meaning the development must be designed and constructed in accordance with the City's Policy 7.1.1 Built Form – P1.8 – Environmentally Sustainable Design. P.1.8 outlines that the development must:

- P1.8.1 It maximises passive solar heating, cooling, natural ventilation and light penetration to reduce energy consumption;
- P1.8.2 It is capable of recovery and re-use of rainwater, storm water, grey water and/or black water for non-potable water applications.
- P1.8.3 Climate moderation devices can be incorporated to reduce passive solar gain in summer and increase passive solar gain in winter.
- P1.8.4 That it is capable of achieving one of the environmental performance ratings shown in the below:
    - Green Star 5 Star; or
    - Life Cycle Assessment; or
    - Equivalent rating system

Living Building Solutions (LBS) has proposed to assess the proposed development using a Sustainable Design Assessment that is deemed equivalent to P1.8.4. The SDA demonstrates that the development has been designed to achieve ESD outcomes which are equivalent to a 5 Star Green Star Building under the Green Star Design & As Built V1.3 Tool.

COMPLIANCE SUMMARY

The proposed development has been assessed using the prescribed Green Star Daylight Modelling Methodology: *12.1B Compliance Using Daylight Factor* to determine compliance with the Visual Comfort Credit **12.1 – Daylight**.

Compliance with Visual Comfort Credit 12.1 – Daylight is achieved where it is demonstrated that >40% of the nominated floor area achieves a daylight factor of at least 2%. Points are awarded as follows:

>40% of nominated floor area achieves daylight factor of 2% (**1 point**)
>60% of nominated floor area achieves daylight factor of 2% (**2 points**)

-The proposed development achieves 90% of the nominated floor area meeting the minimum 2% daylight factor and is awarded 2 points.

CALCULATION METHODOLOGY

The results were calculated using the DesignBuilder Radiance simulation engine which provides a detailed multi-zone physics-based calculation of illumination levels on the working planes of the building. The calculations allow light to be transmitted through exterior and interior windows and the shading and reflective effect of local shading devices and component/assembly blocks is included.

The modelling is based on the attached architectural drawings and the following assumptions:

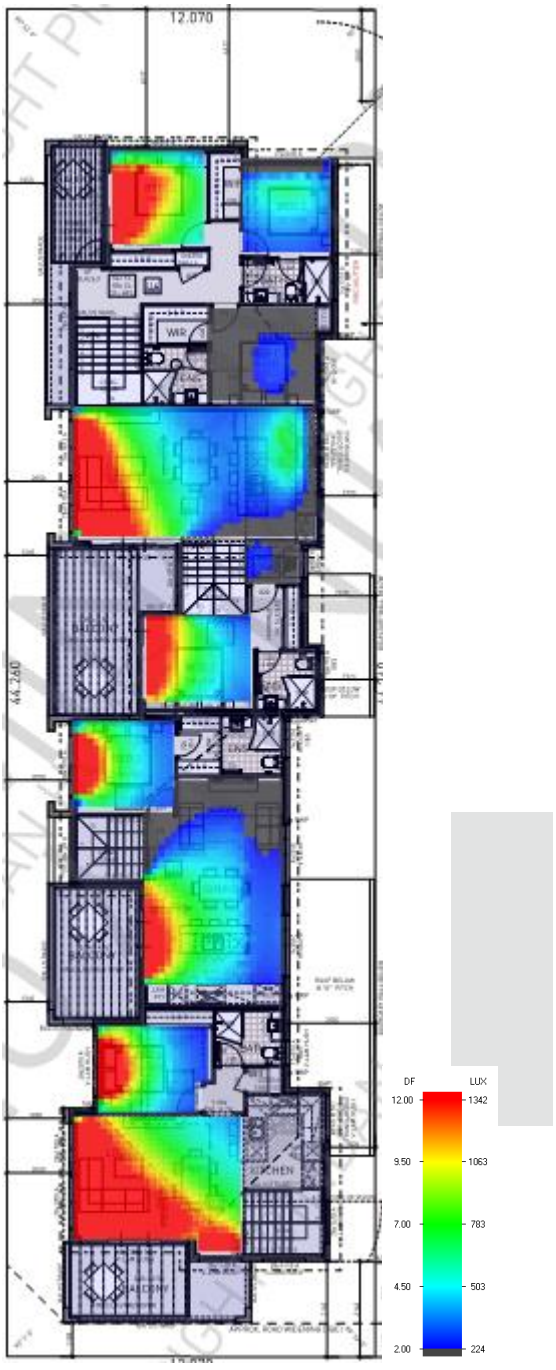
-Glazing visible light transmittance(VLT) of 60% (Clear/Low-E single glazing)
-Floor surface reflectance of 35%
-Internal wall surface reflectance of 70%
-Internal ceiling surface reflectance of 80%

-Working plane nominated as finished floor level
-No significant overshadowing elements
-CIE Overcast Day
-Modelling grid area of 0.1m x 0.1m
-Perimeter margin of 0.01m
-Perth (IWEC2) location/weather file

Daylight Factor is defined as the ratio of internal horizontal illuminance to external global horizontal illuminance. It represents the proportion of available external light which illuminates a given point inside the building.

MODELLING OUTPUT

GF



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SIMULATION SUMMARY

The proposed development has been assessed against the Green Star Visual Comfort Credit 12.1 – Daylight and 90% of the nominated floor area meets the minimum 2% daylight factor, achieving 2 Points.

LEVEL	AREA TYPE	FLOOR AREA (m2)	% FLOOR AREA ABOVE 2.0% DF
GROUND	LIVING/BED	67	94
FIRST	LIVING/BED	147	86
		214	**90**

DF = Daylight Factor

CONCLUSION

The results of the analysis demonstrate the Green Star requirements for Visual Comfort Credit 12.1 – Daylight have been satisfied.

DISCLAIMER

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LBS
LIVING BUILDING SOLUTIONS

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PO Box 3061
Port Adelaide SA 5015

[redacted]

ABN: 66 619 063 633

PRELIMINARY SECTION J & 3.12 RESULTS

PROJECT ADDRESS: 4 x Units - Lot17 (157) Loftus Street, Leederville WA 6007
BUILDING CLASS: Class 1 / 2
CLIMATE ZONE: 5
REPORT COMMISSIONED BY: Pindan Homes
CLIENT REFERENCE NUMBER: Loftus

Unit 1 -4

Base Specification

Plans	Construction as per plans
Insulation	R5.0 insulation to all roofs Reflective foil to roof space of upper level No cavity insulation to heavy weight walls R2.0 insulation to lightweight highlight walls
Glazing	Jason aluminium single glazed windows
Sealing	All exhaust fans are sealed to outside air and / or roof space
Services	If installed, all down lights are a sealed IC rated LED system

Unit No.	**Specification Upgrades Required**
Unit 1	- Aircell Permicav to external walls of Ktn, Dining, Living, Bed1-2, Entry (excluding boundary walls)
Unit 2	- Aircell Permicav to external walls of Ktn, Dining, Living (excluding boundary walls)
Unit 3	- Aircell Permicav to external walls of Ktn, Dining, Living, Bed1-2, Entry (excluding boundary walls) - Jason aluminium SP10 (Low-E) to all glazing
Unit 4	- Aircell Permicav to external walls of Ktn, Dining, Living, Bed1-2, Entry (excluding boundary walls) - Jason aluminium SP10 (Low-E) to Entry 28x1140, Dining 28x2410, Living 28x3610, Courtyard 28x940, Stair 28xSPA, Balcony 28x840, Bed3 28x2410, Bed1 9 x 2010 - ≥1200mm ceiling fan to Ktn, Living, Dining

DISCLAIMER

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