WEE HUR STUDENT HOUSING

Ecologically Sustainable Development (ESD) Report

Prepared for:

The Trust Company (Australia) Limited ATF WH Gibbons Trust
c/-Allen Jack + Cottier
79 Myrtle Street
CHIPPENDALE 2008

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PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with The Trust Company (Australia) Limited ATF WH Gibbons Trust (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.18313-R07-v2.0	14 April 2020	Dr Neihad Al-Khalidy	Dr Peter Georgiou	Dr Neihad Al-Khalidy
610.18313-R07-v1.1	21 December 2018	Dr Neihad Al-Khalidy	Horatio Cai	Dr Neihad Al-Khalidy
610.18313-R07-v1.0	13 December 2018	Dr Neihad Al-Khalidy	Horatio Cai	Dr Neihad Al-Khalidy

EXECUTIVE SUMMARY

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by The Trust Company (Australia) Limited ATF WH Gibbons Trust to provide a qualitative Ecologically Sustainable Design (ESD) assessment, including energy efficiency for the proposed student housing development at 13-23 Gibbons Street, Redfern in accordance with the Secretary's Environmental Assessment Requirements (SEARs). The objective of the SEARs is to allow sustainability to be considered in site planning, building design and in the construction and operational phases of the development to achieve best sustainability outcome.

The proposed design consists of the following features:

- One level of basement including gym, movie room, laundry, garbage room and bike storage;
- Ground Floor (Level 1) with common area, retail unit, bike workshop and storage and office space;
- Level 2 and Level 3 with internal and external common areas, student units;
- Level 4 with internal and external common areas, student units;
- Levels 5-18 for student units; and
- Level 18 with common area.

The proposed building is located near multiple public transport options and within 150 m from Redfern Station and there are four buses that regularly stop on both sides of Gibbons Street plus cycling connections surrounding the site. This will encourage occupants and building staff to use public transport, along with other means of transportation and minimise automobile use. Sufficient recreational opportunities are easily accessible to student; eliminating the need for long distance motorised transport for most recreational activities. This would be a positive feature of the development with regards to sustainability as this clearly avoids greenhouse gas emissions that would otherwise have been produced if residents had to travel long distances for recreational activity.

Overall, positive Ecologically Sustainable Design (ESD) and energy efficiency features are currently in place in a number of design areas, incorporating the following:

- At least 30 kW PV solar system on the roof of the proposed development;
- High levels of natural light and solar access exposure especially for upper levels;
- The proposed development will incorporate passive and active energy saving measures such as operable windows to enhance natural ventilation through the residential units, where appropriate and acoustic conditions permit.

  Each room is also provided with a mechanical supply of fresh air through roof mounted fans in order to meet the acoustic requirements of Clauses 87 and 102 of the State Environmental Planning Policy (Infrastructure) 2007.

  The main corridors in the tower will be provided with ventilation from the façade located at the end of each corridor.
- The proposed development complies with the NCC Section JV3 requirements (Refer NCC Section J Compliance Report 20E-18-0323-TRP-6769262-0 dated 13 November 2019) to minimise heating and cooling loads.
    - Incorporation of thermal mass throughout the development.

EXECUTIVE SUMMARY

  - External wall, structural internal walls and slabs of the proposed development are predominantly concrete;
    - Ceiling / Roof Total R-Value = R4.2
    - External Wall Total R-Value = R2.8
    - Internal Wall Total R-Value = R1.8
    - Suspended Slab Total R-Value = R2.0
  - Glazing selections in accordance with NCC Section JV3 report.
- Water efficient bathroom and kitchen fittings
  - All shower heads are 3 Star with flow rate ≤6 Litres per minute
  - All toilet flushing systems are 4 star
  - All Kitchen taps are 5 star
  - All bathroom's taps are 5 star
- Landscaped elements proposed on ground floor and level 04 to increase green spaces;
- Incorporation of low water demand and low maintenance plant species in all areas to reduce mains consumption and fertiliser contamination of drainage water;
- Energy efficient VRV air conditioning system with heat recovery system;
- Three boilers connected to the proposed cooling towers to provide space heating;
- Gas fires boilers for the central hot water system. The proposed boilers are also connected into the water-cooling system to provide free domestic hot water during colder periods; The provision of free hot water where possible will significantly contribute to carbon abatement of the DHW system; and
- Preparation of green travel plan for the project. No car park is proposed to promote alternative modes of transport.

The following recommendations have been made to improve upon the existing key sustainability elements of the proposed development:

- LED and Fluorescent lighting throughout the project;
- Incorporate a Building Management System (BMS) to control, maintain and monitor the various operations and conditions for all mechanical services equipment and plant, as necessary to provide a fully operational distribution center;
- Electricity sub-metering for significant end uses that will consume more than 10,000 kWh/a; and
- Low levels of volatile organic compounds (VOC) paints and floor coverings and low formaldehyde wood products where possible.

With the recommendations contained within this report we find that the proposed development is able to achieve the relevant BASIX certificate ratings (Refer BASIX Certificate 1045175M dated 27 November 2019):

- Water efficiency of 46% (exceeding the target of 40%)
- Energy Efficiency of 31% (exceeding the target of 25%)

EXECUTIVE SUMMARY

Recommendations regarding the domestic other appliance and operational waste, etc., have also been made within the body of the report. These features will help to achieve significant reductions in the energy and water required by the development both in building and operation, as well as ensuring that the residential units are more pleasant spaces to reside.

It is recommended that ESD initiatives continue to be developed and implemented during the detailed design stage of the project.

CONTENTS

CONTENTS

TABLES

FIGURES

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by The Trust Company (Australia) Limited ATF WH Gibbons Trust to provide a qualitative Ecologically Sustainable Design (ESD) assessment, including energy efficiency for the proposed student housing development at 13-23 Gibbons Street, Redfern.

The site is identified as SP 60485 and is 35-38 m wide, east to west, and 34-35 m long north to south with a land area of 1,356 m^2. There is currently a four to five storey brick residential flat building, with basement parking, covering almost the entire site. It is proposed that this existing building will be demolished and the basement largely retained.

1.1 Site Description

The proposed site is bounded to the east by William Lane, to the south by Margaret Street and to the west by Gibbons Street, with a future development proposed to the north. Surrounds of the site are predominantly low level buildings, with there being some higher level development close to the site to the north and west. The exiting open landscape area, carpark and train station to the northwest results in some reduced shielding through this region.

Figure 1 Aerial View of Site Location

1.2 Proposed Development Description

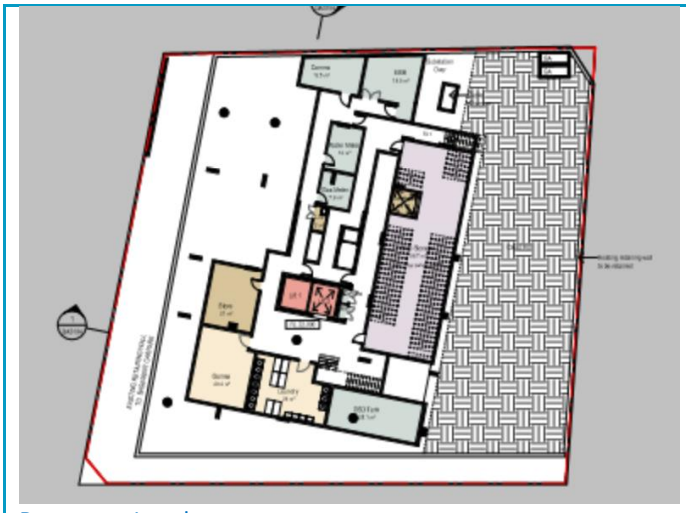
The proposed design consists of the following features:

1. One level of basement car parking;
2. Level 1 (Ground Floor) with building entry, common areas, retail unit;

3. Level 4 (Podium) with external common areas, student units;
4. Levels 2-3 and 5-18 for student units; and
5. Roof Level (Plant and Equipment).

The development comprises 419 student units.

Figure 2 Representative Architectural Plan Views of Proposal



Basement Level

Ground Level

Level 4

Typical Level

2 Ecologically Sustainable design

2.1 Definitions of Key Concepts

2.1.1 Ecologically Sustainable Development (ESD)

The concept of Ecologically Sustainable Development (ESD) was outlined in "Our Common Future", the report of the 1987 United Nations World Commission on the Environment and Development (the Brundtland Commission). It defined Sustainable Development as

"Development that meets the needs of the present
without compromising the ability of future generation to meet their own needs".

This concept was adopted within Australia in 1990 when the Council of Australian Governments endorsed a National Strategy for Ecologically Sustainable Development. The Commonwealth Government suggested the following definition for ESD in Australia:

"Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

Put more simply, ESD is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations. To do this, it is necessary to develop ways of using those environmental resources which form the basis of our economy in a way which maintains and, where possible, improves their range, variety and quality.

The National Strategy for Ecologically Sustainable Development notes that there is no identifiable point where it can be said that ESD has been achieved. The strategy further states that there are two main features which distinguish an ecologically sustainable approach to development:

- We need to consider, in an integrated way, the wider economic, social and environmental implications of our decisions and actions for Australia, the international community and the biosphere; and
- We need to take a long-term rather than short-term view when taking those decisions and actions.

Ultimately ESD should lead to changes in our patterns of resource use, including improvements in the quality of our air, land and water, and in the development of new, environmentally friendly products and processes.

2.1.2 National Strategy for ESD Objectives and Guiding Principles

The National Strategy for ESD sets its core objectives as:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations.
- To provide for equity within and between generations.
- To protect biological diversity and maintain essential ecological processes and life-support systems.

The Guiding Principles of the National Strategy for ESD are documented as:

- Decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations.
- Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- The global dimension of environmental impacts of actions and policies should be recognised and considered.
- The need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised.
- The need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised.
- Cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms.
- Decisions and actions should provide for broad community involvement on issues which affect them.

These guiding principles and core objectives need to be considered as a package. No objective or principle should predominate over the others. A balanced approach is required that takes into account all these objectives and principles to pursue the goal of ESD.

2.2 Specific Requirements for Compliance

Specifications for environmental design measures required for the proposed site are detailed in the following documents:

Mandatory ESD Measures for Consideration

- Secretary's Environmental Assessment Requirements (SEAR) – The following provides the relevant SEAR requirement for the project:

> **17. Ecologically Sustainable Development (ESD)**
> - Detail of how best practice ESD principles (as defined in clause 7(4) of Schedule 2 of the Regulation) will be incorporated in the design, construction and ongoing operation phases of the development.

- City of Sydney Council Energy Efficiency Development Control Plan (DCP), 2012.
- National Construction Code (NCC) 2016 Section J – it is a mandatory requirement for all BCA class buildings, except Class 4 and Class 10 buildings, to achieve efficient use of energy.

Voluntary ESD Measures

- Green Star Design and Built Rating Tool.
- Voluntary WELL Building Standard Rating Tool.

The objective of the SEARS is to allow sustainability to be considered in site planning, building design and in the construction and operational phases of the development to achieve best sustainability outcome. ESD initiative and recommendations are summarised in Section 3 in this study.

The Council DCP have produced a sustainable design principal, energy efficiency and water conservation document, which covers ESD topics like energy efficiency, passive solar design, thermal mass, water conservation, etc. The document discusses important aspects of building design where there is the potential to increase the energy efficiency of a development during the Concept Design stages of a project by ecologically sustainable means.

The current study proposes Ecologically Sustainable Design (ESD) measure to improve upon the existing key sustainability elements of the proposed development and comply with the energy performance requirements of the City of Sydney Council DCP where possible.

3 ESD INITIATIVES FOR THE PROPOSED DEVELOPMENT

In order to achieve a structured integrated approach to ESD, a series of indicators and strategic goals have been identified at the outset to be communicated to the design team. SLR Consulting's role, as the project's ESD consultant, has been to apply these principles to all aspects of the development ensuring a best possible ESD outcome.

ESD indicators identified for the proposed Concept Plan are:

- Energy efficiency;
- Water conservation;
- Transportation;
- Management practices;
- Indoor environment quality;
- Materials;
- Land use and Ecology; and
- Emissions.

The ESD initiatives to be committed for the proposed development will be outlined in the following sections below.

3.1 Passive Energy Efficiency

Passive energy efficiency refers to the choice of building materials, the placement of external facades and fenestration to effectively utilise solar energy for heating when required, and minimise solar gains when appropriate, thus 'passively' reducing the artificial heating and cooling requirements of the building. While high cooling and heating loads are typical in summer and winter months respectively, a good balance of heating and cooling load reduction techniques is required to produce a development with efficient passive design.

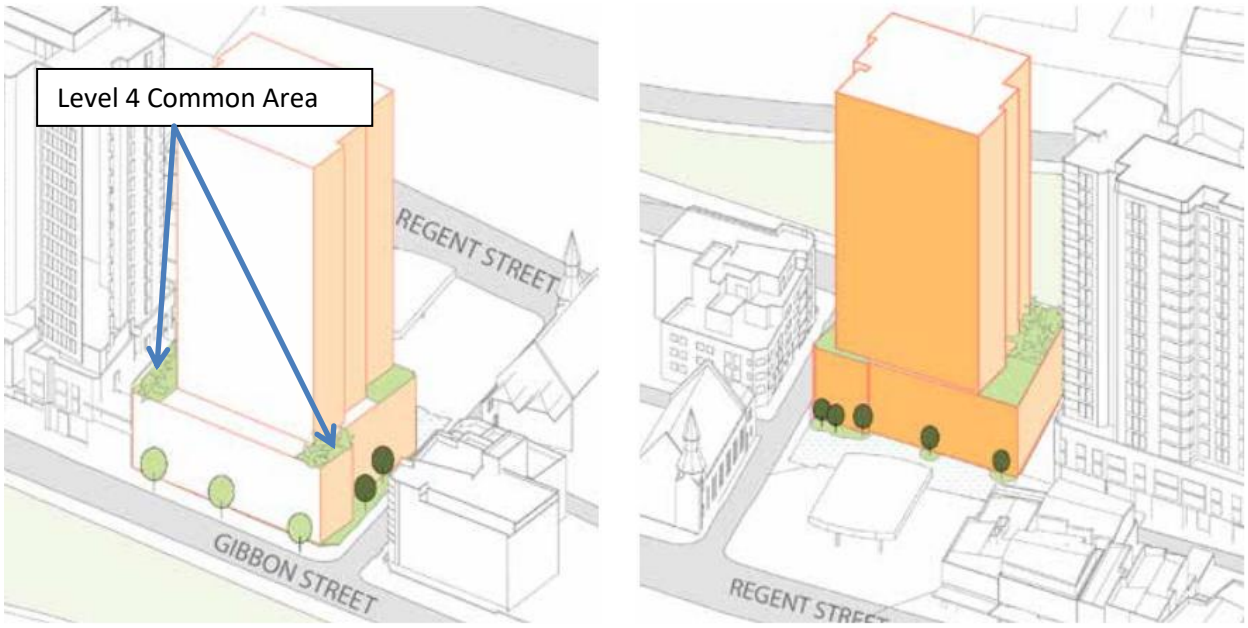
3.2 Site Analysis and Layout

A key ESD objective should be to optimise site conditions and minimise energy consumed for cooling and heating loads through proper selection of building orientation and internal layout.

The following points are noted with respect to the sitting of the proposed development:

- The sites are aligned with Gibbons Street, which runs roughly north-south, with the Margaret Street east-west between the sites. The sites orientation provides good solar access throughout the day.
- The façade of the proposed development faces east, west, north and south. Proper external shading devices (eg vertical screens) are recommended to the west façade to minimise the afternoon sun in summer.
- The site has potential views to the west towards the Blue Mountains and south towards the Sydney airport.

Figure 3 3D Model of the Proposed Development and Project Site



3.3 Solar Access and Overshadowing

One of the objectives of energy conservation is to minimise the heating and cooling requirements of buildings. Sunlight should preferably be able to penetrate the building in winter and be excluded from the building in summer. The form dictated by the site has been designed to maximise the solar access of the proposed development. Based on a detailed solar access modelling for the sites the following conclusions have been reached:

- Units will have solar access through the east, northwest west and southwest windows and will have excellent solar exposure throughout the day, year round.

The suns eye diagrams in **Figure 4** and **Figure 5** show the cumulative effect of the proposed building, envelopes for DA approved development at 11 Gibbons Street and 80-88 Regent Street and at 90-102 Regent Street, for which SEARs were issued on 30 July 2018.

The proposed building creates less overshadowing to 1 Margaret Street and the NCIE sports field by having a lower end more slender form compared to a compliant building envelope. Also by having a greater setback at the western corner of the tower, more direct sunlight can access 1 Margaret street in the afternoon.

Figure 4 Existing and Proposed Sun Eye Diagrams 9 am to 9:45 am

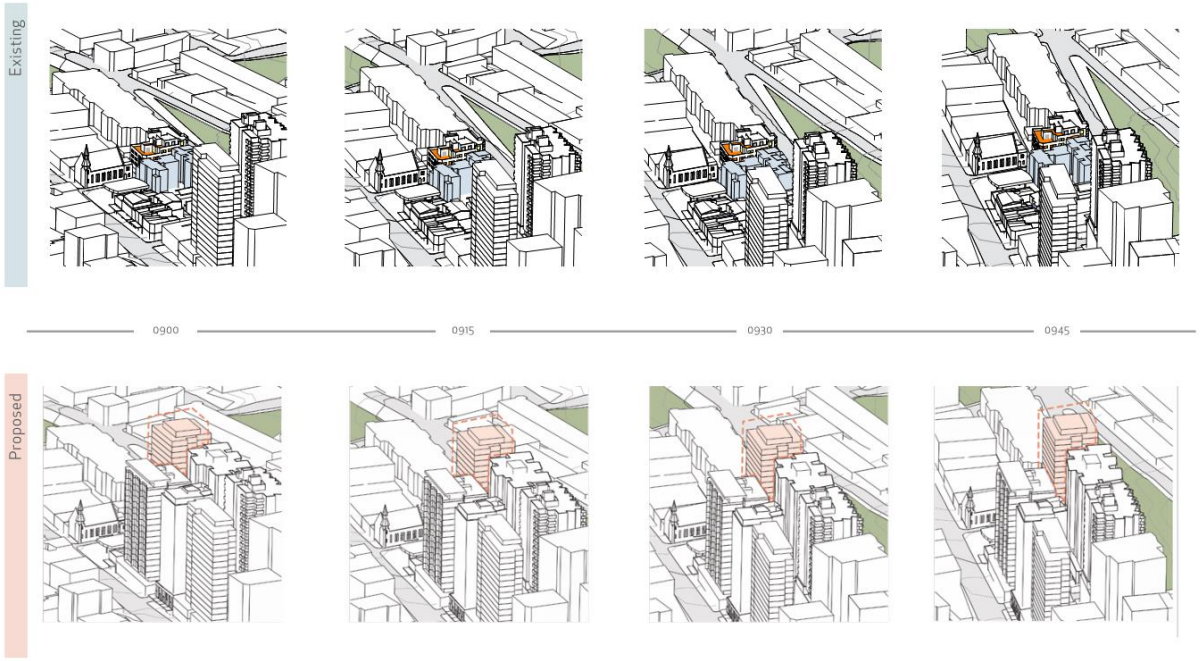
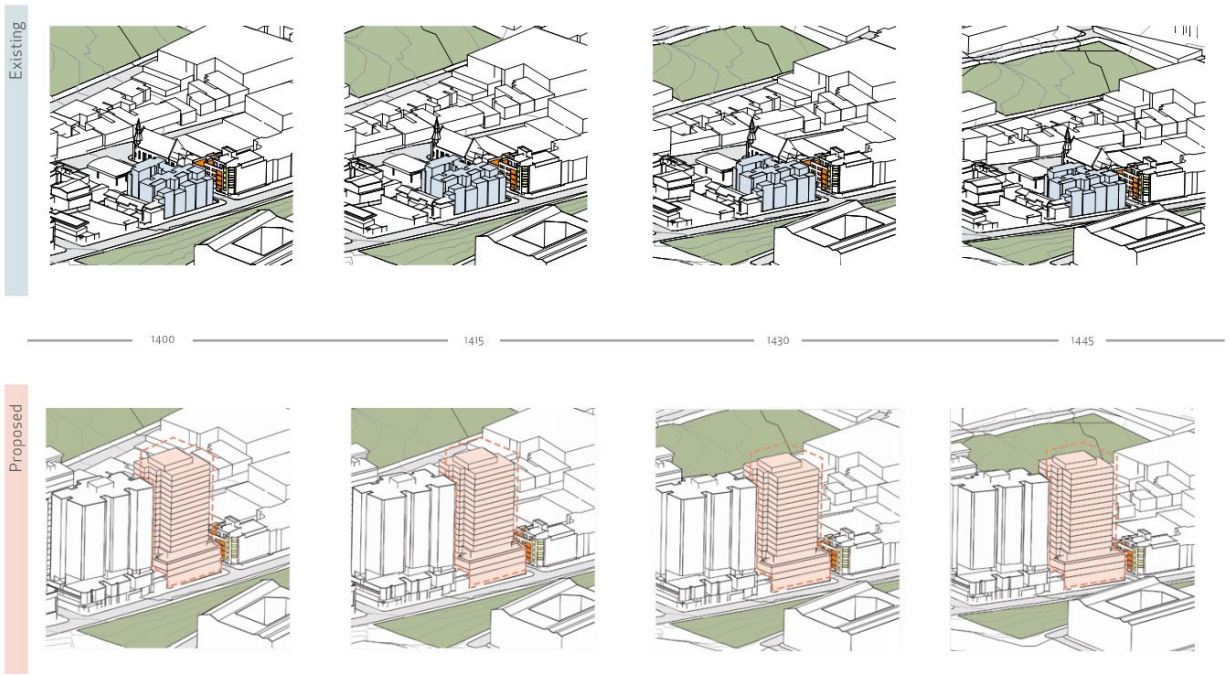


Figure 5 Existing and Proposed Sun Eye Diagrams 14:00 pm to 14:45pm



3.4 Natural Ventilation

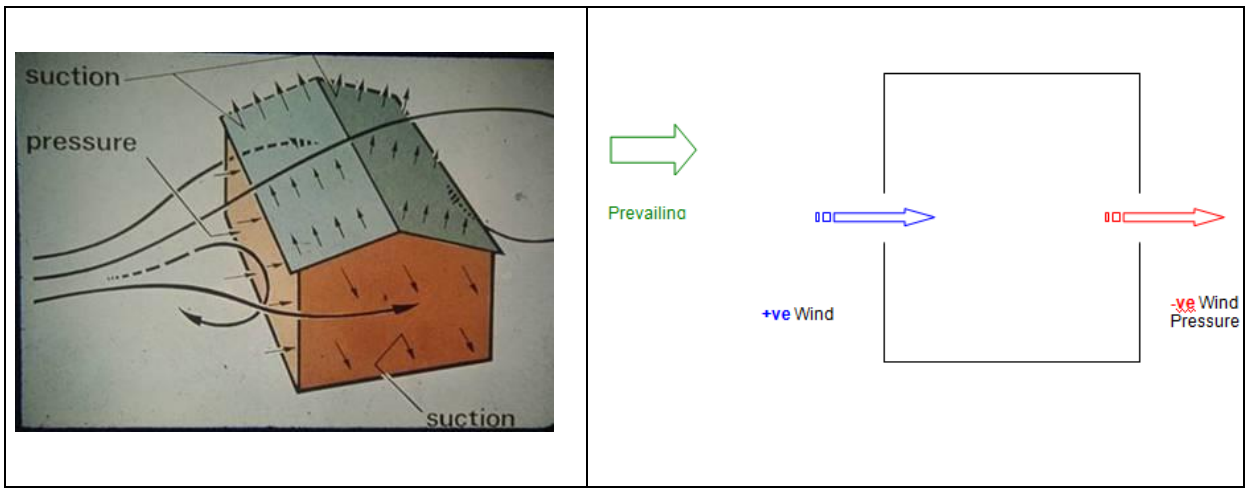
In relation to key characteristics of the Sydney Region Wind Climate relevant to the wind impact assessment of the proposed development, we note that Sydney is affected by two primary wind seasons:

- Summer winds occur mainly from the northeast, southeast and south. While northeast winds are the more common prevailing wind direction (occurring typically as offshore land-sea breezes), southeast and south winds generally provide the strongest gusts during summer.
- Winter/Early spring winds occur mainly from the west and the south west quadrant winds (southwest to northwest) provide the strongest winds during winter and in fact for the whole year.

Wind-induced natural ventilation works on the straightforward principle of differential pressure. If a building envelope has multiple openings and there exists a pressure difference between those openings, e.g. the wind pressure at one opening is greater than the pressure at the other opening, airflow will be pushed through the building in the direction positive to negative.

The resulting amount of airflow through the building envelope will be a function of the magnitude of the pressure differential, size of the various building openings and degree of "blockage" in between. These features are illustrated in **Figure 6.**

Figure 6 Wind-Induced Natural Ventilation via Differential Pressure



The common corridors have been proposed to be naturally ventilated, refer **Figure 7**. Operable windows are designed to be south and north-eastern oriented to draw a cool breeze during hot days.

The proposed Student units can be either naturally ventilated by opening the window when acoustic conditions permit or turn on the mechanical ventilation system to meet the acoustic and thermal comfort requirements when necessary.

Each room is also provided with a mechanical supply of fresh air through roof mounted fans in order to meet the requirements of Clauses 87 and 102 of the State Environmental Planning Policy (Infrastructure) 2007. Refer Northrop Acoustic Statement of Compliance SY181777-AUSOC01-A dated 14.10.2019.

Rooms located on Mezzanine Ground and basement will be provided with outside air ducted from various locations on the façade, including rooms like the cinema, gym and basement rooms, where rooms are provided with exhaust, make-up air will be drawn from the adjacent corridors.

The main corridors in the tower will be provided with ventilation from the façade located at the end of each corridor.

SLR recommends using mixed-mode ventilation strategy where possible to all the units to save more energy e.g. when window is open the air conditioning should be automatically turned off. These strategies are usually implemented during the detailed design when a BMS system is specified.

External windows will be properly sealed to reduce air leakage and heat loss/gain to the outdoor environment.

Figure 7 Proposed Naturally Ventilated Common Corridors - Typical Floor Plan

3.5 Lighting

Natural Lighting

All student units are designed to be open plan. Natural daylight will be able to access the entire room via the proposed window. **Figure 8** shows the proposed layouts which will allow excellent day light access throughout the day, year round. Therefore, this can minimise the use of artificial lighting.

Figure 8 Student Units Internal Layouts

3.5.1 Artificial Lighting

Lighting installations require a design that properly considers the conservation of energy resources. Sustainable lighting design ensures that illuminance is not excessive, that the switching arrangements are such that unnecessary illumination may be turned off and that the illumination is provided in an efficient manner.

There are additional energy losses associated with inefficient lamps and lighting losses associated with luminaries. Consequently a lighting design which uses the more efficient lamp types and the least number of luminaries for a given design illuminance will be more efficient and usually have a lower capital cost.

It is recommended that the following lighting features be incorporated into the development to minimise energy consumption due to lighting:

- Maximise use of compact fluorescents/LED Lights and minimise or where possible eliminate the use of halogen down lights, as compact fluorescents are much more efficient than halogen lighting.
- Light switches to be located at room exits to encourage switching lights off when leaving a room. Separate switches to be installed for special purpose lighting.

3.5.2 Rating System

The proposed student housing development shall be designed to comply with NCC Section J requirements. A NCC Section J compliance report must be provided prior to issuing an occupancy certificate for the proposed development.

In Section J6 of the NCC, the requirement for the total lighting power load within the proposed spaces of a building is to be no greater than a maximum illumination power load, measured in Watts (W). The maximum allowable building illumination power load is based on the total illumination power load calculated for each space. The maximum illumination power density for each space will be dependent on the purpose of the space within the building (refer to Table J6.2a of NCC 2016 Volume One).

3.6 Mechanical Ventilation and Air conditioning

The building is proposed to be cooled using cooling towers connecting to indoor VRV condensing units, these units will then connect to fan coil units located in the occupant rooms and common areas.

VRV can provide simultaneous cooling and heating to different areas in the same building, with heat recovery performed between indoor units. This greatly increases energy efficiency for the air conditioning system. **Figure 9** below illustrates the concept of the proposed system. **Figure 9** shows a VRV system with cooling tower and heat recovery system.

The plant arrangement for the proposed development is detailed in Arcadis Services Report INF01-10026144 dated 10 December 2012 and shown in **Figure 10**.

Three boilers are connected into the water-cooling system to provide space heating.

Each room is also provided with a mechanical supply of fresh air through roof mounted fans in order to meet the requirements of Clauses 87 and 102 of the State Environmental Planning Policy (Infrastructure) 2007. Refer Northrop Acoustic Statement of Compliance SY181777-AUSOC01-A dated 14.10.2019.

The following sustainability initiatives are recommended:

- Incorporate a Building Management System (BMS) to control, maintain and monitor the various operations and conditions for all mechanical services equipment and plant, as necessary to provide a fully operational distribution center.

Where mechanical ventilation is required, the use of energy efficiency measures will be fully explored during detailed design. These measures include linking mechanical ventilation to manual switching where allowable under the NCC and using individual fans rather than a common ducted ventilation system with constant operation. These initiatives will provide significant savings in energy use and associated operational energy costs of the development.

Figure 9 VRV System with Cooling Tower and Heat Recovery System

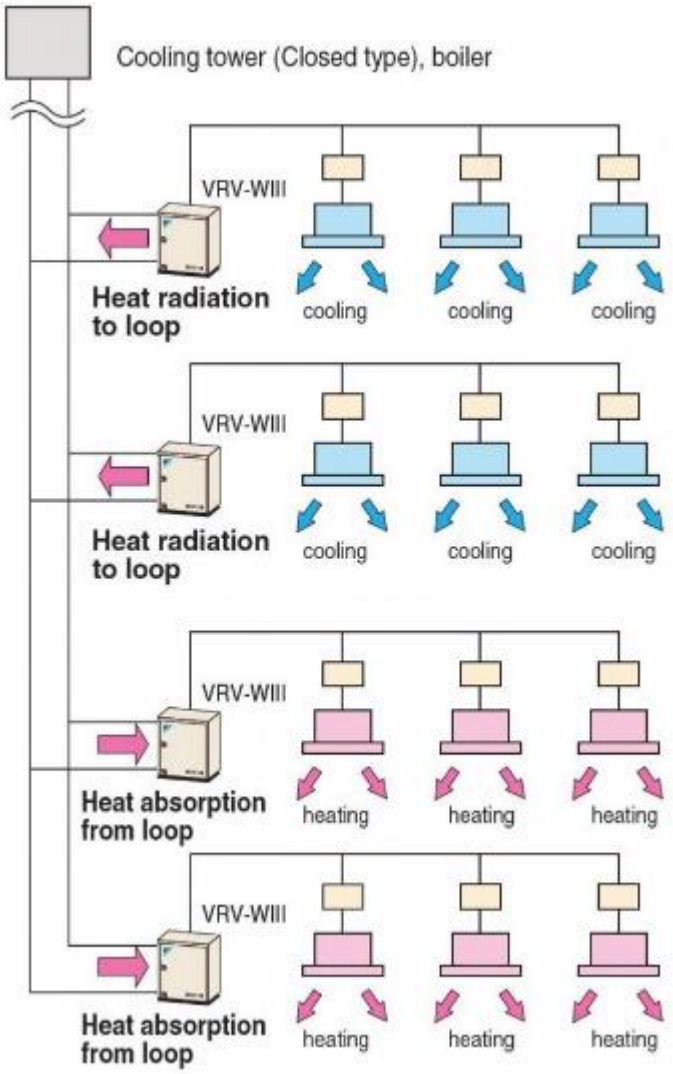
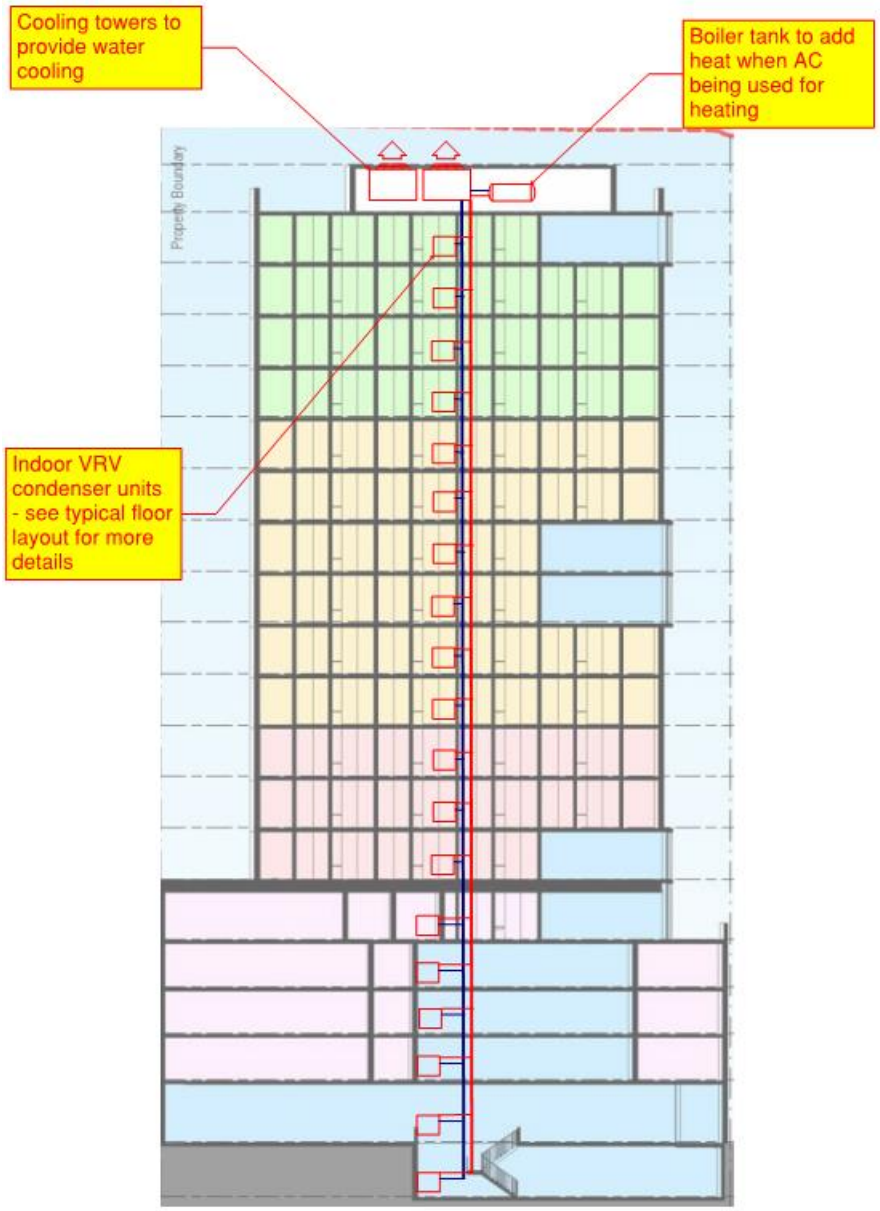


Figure 10 Plant Arrangement for the Proposed Development.



3.7 Electrical Sub-Metering

Successful management of energy consumption of large uses within a building allows building managers to fine-tune operational procedures to minimise consumption and compare historical use. Sub-metering is recommended for all substantive (greater than 100kVa) energy uses within the future development. These uses may include condenser units, fans, lifts and common areas (lighting and power).

The Sydney DCP 2012 requires that Electricity sub-metering is provided for significant end uses that will consume more than 10,000 kWh/a.

3.8 Building Construction

3.8.1 Building Materials

3.8.1.1 Walls

The proposed building will consist of reinforced concrete wall for the external walls. R2.8 insulation for the external walls will be provided in accordance with Vipac NCC Section JV3 report 20E-18-0323-TRP-6769262-0 dated 3 November 2019.

3.8.1.2 Roof

The proposed building will consist of concert roof with a total R4.2 roof insulation requirements have been specified with NCC Section JV3 report 20E-18-0323-TRP-6769262-0 dated 3 November 2019.

3.8.1.3 Glazing

The glazing performance values for the proposed development must be lower or equal to U-Value 7 W/m2.K and SHGC 0.55 as per the NCC Section JV3 report 20E-18-0323-TRP-6769262-0 dated 3 November 2019).

3.8.1.4 Floor and Thermal Mass

Concrete slab construction with a total R2.0 is recommended for all floors throughout the development - concrete has the highest thermal mass capacity amongst a range of common building products, as presented in Table 1.

Generally, more dense materials have higher mass which has the ability to store heat energy and then release it slowly to the room. This storage effectively smoothes out daily temperature variations within conditioned spaces, with corresponding reductions in both heating and cooling loads.

Table 1 Indicative Thermal Mass Values of Some Common Building and Reference Materials

Dolerite (Rock / Stone)	200	433
10-31 Solid Brick	190	410
Concrete	100	221
Concrete block	90	194
10.01 regular brick	90	151
Clay brick (3.5 kg solid + 0.5 kg mortar)	110	142
Aerated concrete block	100	50
Fibre cement sheet (compressed)	18	32
Wood flooring (hardwood)	19	25
Weatherboard (softwood)	15	16
Fibre cement sheet	6	8
Plasterboard	10	8
Glass	3	6
Expanded polystyrene (EPS-class SL)	50	1.8
Cork	6	1.6
Rockwool (batts)	50	1.5
Fibreglass (batts)	50	0.5

Air	50	0.5

3.9 Domestic Hot Water (DHW)

The proposed design consists of a central gas fire boiler.

The proposed space heating boilers are also connected into the water-cooling system to provide free domestic hear water during colder periods (**Figure 10**). The provision of free hot water where possible will significantly contribute to carbon abatement of the DHW system.

With the installation of water efficient fixture, the hot water consumption will be decreased and thus the domestic hot water usage will also decrease. Therefore, there will be less energy consumption for DHW.

3.10 Building Sealing

The purpose of this subsection is to ensure that additional heating and cooling loads will not be introduced through building leakage.

A seal to restrict air infiltration must be fitted to each edge of an external door, operable external window or the like when serving a conditioned space in the proposed development. The seal may be a foam or rubber compressible strip, fibrous seal or the like.

The bathroom/toilet exhaust fans in the proposed development must be fitted with a sealing device such as a self-closing damper or the like.

3.11 Indoor Environmental Quality

Achieving enhanced Indoor Environment Quality (IEQ) ensures that the building and building services are designed and managed to benefit the health and well-being of building occupants and visitors.

3.11.1 Asbestos

It is recommended that Asbestos identification and removal procedures be included in the site Environmental Management Plan (EMP) where required.

3.11.2 Internal Noise Levels

Internal noise levels are a significant factor in determining occupant and customer satisfaction and well-being. The aim of controlling internal noise levels is to encourage and recognise buildings that are designed to maintain internal noise levels at an appropriate level in accordance with NCC requirements.

3.11.3 Carbon Dioxide Monitoring and Control

Elevated carbon dioxide (CO_2) levels are indicative of inadequate ventilation, affecting the quality of air within an enclosed occupied space, and the health of the occupants. CO_2 monitoring systems can detect elevated concentrations of CO_2 and automatically adjust ventilation supply rates before indoor air quality becomes problematic.

SLR Consulting recommends incorporating a CO_2 monitoring system where appropriate to satisfy NCC requirements.

3.11.4 Paints and Floor Coverings

SLR recommends the use of low levels of volatile organic compounds (VOC) paints and floor coverings and low formaldehyde wood products where possible as per the City DCP 2012 requirements.

3.12 Landscaping

The following points are noted with respect to the siting of the proposed development:

- Landscapes have been proposed along the perimeters of the proposed site and Level 4 communal terrace (Refer Figures below). All existing trees along the Gibbons Street will be retained. The use of trees and perimeter planting for shading is very effective in reducing the reflection of heat and light onto the building from surrounding paved areas. Planting also provides added cooling during the summer months through the leaf transpiration process.

Figure 11 Proposed Landscaping Areas

Ground Level

3.13 Water

Australians use more than one million litres of freshwater per person each year (*source:* Green Building Council of Australia 2006).

In addition to increased water use efficiency, new developments can reduce potable water demand by, occupants and visitors through the provision of an on-site alternative water supply. There are three principle forms of alternative water supply:

- Reticulation of reclaimed water to the site.
- Rainwater/storm water storage and reuse.
- Grey water storage and reuse.

The above water supply systems can be used for landscape irrigation and toilet flushing, reducing the demand on potable water supply.

3.13.1 Water Efficiency

The minimum sustainable standard for water efficient water fixtures and fittings is 3A. To achieve greater than the standard level, the development will consider installing the following water efficient fixtures and fittings (Refer BASIX Certificate 1045175M dated 27 November 2019):

- All shower heads are 3 Star with flow rate ≤6 Litres per minute
- All toilet flushing systems are 4 star
- All Kitchen taps are 5 star
- All bathrooms taps are 5 star

The above measures are currently considered to be good practice in sustainable building design.

3.14 Landscape Irrigation

Under international best practice guidelines, it is generally recommended that either 90% of the water requirement for landscape irrigation is sourced from on-site rainwater collection or recycled water. Alternatively, best practice would also be achieved with the installation of a water efficient irrigation system comprising subsoil drip systems and automatic timers with rainwater or soil moisture sensor control override.

Consideration has been given to the incorporation of low water demand and low maintenance plant species in all areas to reduce mains consumption and fertiliser contamination of drainage water.

A proprietary subsurface drip irrigation system will be provided to all soft landscape areas.

The landscape design should focus on using native coastal and other drought resistant species that rely primarily on rainwater for their water needs.

3.15 Transport

When designing a sustainable development, it is important to minimise the use of individual motorised transport where possible and thus enhance energy savings and environmental impact through reduced fossil fuel consumption and improved regional air quality. This can be achieved by encouraging the use of energy efficient public transport that is immediately at hand, reducing car parking facilities, and providing adequate bike storage facilities to minimise the requirement for individual motorised transport.

3.16 Provision of Car Parking

Transport emissions are one of the largest contributors of greenhouse gas emissions in Australia. The Green Building Council of Australia (GBCA) encourages the utilisation of alternative and mass transit forms of transport by limiting the availability of private vehicle spaces. Credits are awarded under the GBCA rating tools for car parking at least 25% less than the maximum planning allowance.

The proposed development promotes the utilisation of alternative modes of transport by eliminating car spaces.

3.17 Facilitation of Pedestrian and Non-Motorised Transport

Bike storage facilities will be installed in the proposed development, which will also help to minimise the requirement for individual motorised transport.

Sufficient recreational opportunities are easily accessible to occupants, eliminating the requirement for long-distance motorised transport for most recreational activities. This would be a positive feature of the development with regards to sustainability as this clearly avoids greenhouse gas emissions that would otherwise have been produced if residents had to travel long distances for recreational activity.

The proposed development is designed to add bike storage area to basement level. Bike storage area needs to be sufficient in accordance with DCP.

3.18 Commuting Using Public Transport

Developments that are within close proximity of good transport nodes with frequent service should be encouraged.

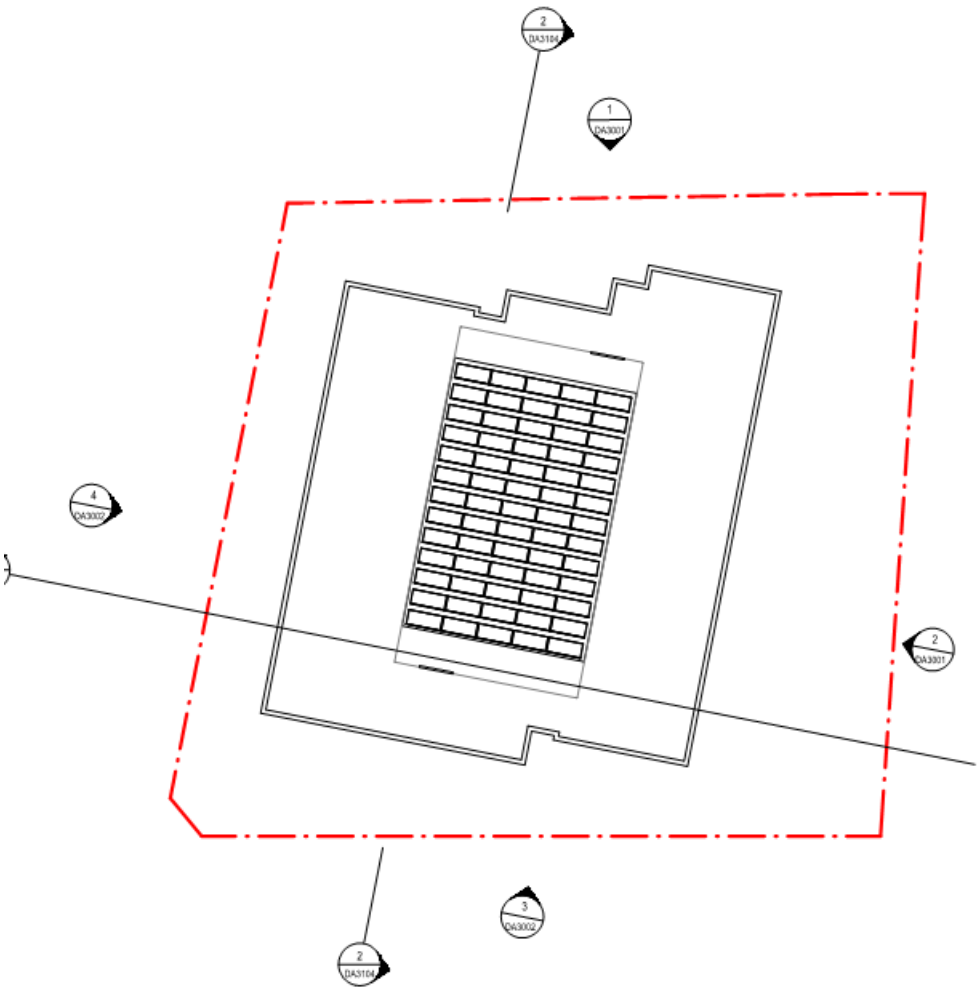
The proposed building is located near multiple public transport options. Redfern station is approximately 150 m to the north, while public bus stops are located on both sides of Gibbons street and regent street, which are the major bus arterial routes connecting the south and east suburbs to Sydney CBD.

3.19 Renewable and Green Power Initiative

As the worldwide demand for fuel increases, alternative and renewable energy sources are emerging as economical and sustainable options. Alternative renewable energy sources are becoming more attractive options because of increased global demand for fuels, environmental responsibility, affordability and new local, state and federal government legislations

The roof of the proposed development is dedicated for 30 kW PV solar installation (Refer **Figure 14**). It is recommended to conduct a detailed feasibility study during the detailed design stage to assess the potential for the installation of an optimal Photo Voltaic (PV) Solar Power.

Figure 12 Proposed 30kW PV Solar System for the Proposed Development



3.20 Management

Building management helps to reduce greenhouse gas emissions and energy consumption through adequate commissioning and user guides. It is also to reduce environmental impact during construction activities. The Management category is discussed in the Green Building Council of Australia which encourages the following practices. Note that the green Star rating tool is not mandatory and the following initiatives suggested have been included as opportunities for the Project Team to adopt ESD initiatives during the DA stage of the project:

- Having at least one ESD Professional on the design team;
- Improving building services performance and energy efficiency by incorporating comprehensive pre-commissioning, commissioning, and quality monitoring into a project;
- Building tuning period of 12 months. This ensures that the time and cost of building tuning is accounted for during the design phase. A 12 month building tuning period also incorporates quarterly reviews and a final recommissioning;
- Appointing an independent commissioning agent from design to handover to provide advice to the client and design team and to monitor and verify the commissioning of HVAC and building control systems;
- Providing Building User's and Resident user Guides to provide information on the design features and ensure that they are used efficiently; and
- Providing a comprehensive Environmental Management Plan (EMP) for the works in accordance with Section 4 of the NSW Environmental Management System Guidelines (1998).

SLR Consulting recommend incorporate the above initiatives where appropriate and possible.

3.21 Operational WASTE MANAGEMENT

An operational Waste and Recycling Management Plan is a minimum requirement to meet sustainable building design best practice. As a guideline, the Waste and Recycling Management Plan should include:

- Separate waste and recycling streams.
- Transfer of material to common storage area.
- Communal storage areas.
- Frequency of collection.
- Signage and educational initiatives for occupants.

The proposed development will implement a waste management system that complies with the City of Sydney Council's requirements.

4 Conclusions

SLR Consulting Australia Pty Ltd (SLR) has been commissioned by The Trust Company (Australia) Limited ATF WH Gibbons Trust to provide a qualitative Ecologically Sustainable Design (ESD) assessment, including energy efficiency for the proposed student housing development at 13-23 Gibbons Street, Redfern in accordance with the Secretary's Environmental Assessment Requirements (SEARs). The objective of the SEARs is to allow sustainability to be considered in site planning, building design and in the construction and operational phases of the development to achieve best sustainability outcome.

The proposed building is located near multiple public transport options and within 150 m from Redfern Station and there are four buses that regularly stop on both sides of Gibbons Street plus cycling connections surrounding the site. This will encourage occupants and building staff to use public transport, along with other means of transportation and minimise automobile use. Sufficient recreational opportunities are easily accessible to student; eliminating the need for long distance motorised transport for most recreational activities. This would be a positive feature of the development with regards to sustainability as this clearly avoids greenhouse gas emissions that would otherwise have been produced if residents had to travel long distances for recreational activity.

Overall, positive Ecologically Sustainable Design (ESD) and energy efficiency features are currently in place in a number of design areas, incorporating the following:

- At least 30 kW PV solar system on the roof of the proposed development;
- High levels of natural light and solar access exposure especially for upper levels;
- The proposed development will incorporate passive and active energy saving measures such as operable windows to enhance natural ventilation through the residential units, where appropriate and acoustic conditions permit.

  Each room is also provided with a mechanical supply of fresh air through roof mounted fans in order to meet the acoustic requirements of Clauses 87 and 102 of the State Environmental Planning Policy (Infrastructure) 2007.

  The main corridors in the tower will be provided with ventilation from the façade located at the end of each corridor.
- The proposed development complies with the NCC Section JV3 requirements (Refer Report 20E-18-0323-TRP-6769262-0 dated 13 November 2019) to minimise heating and cooling loads.
    - Incorporation of thermal mass throughout the development.
    - External wall, structural internal walls and slabs of the proposed development are predominantly concrete;
        - Ceiling / Roof Total R-Value = R4.2
        - External Wall Total R-Value = R2.8
        - Internal Wall Total R-Value = R1.8
        - Suspended Slab Total R-Value = R2.0
    - Glazing selections in accordance with NCC Section JV3 report.
- Water efficient bathroom and kitchen fittings:
    - All shower heads are 3 Star with flow rate ≤6 Litres per minute

  - All toilet flushing systems are 4 star
  - All Kitchen taps are 5 star
  - All bathrooms taps are 5 star
- Landscaped elements proposed on ground floor and level 04 to increase green spaces;
- Incorporation of low water demand and low maintenance plant species in all areas to reduce mains consumption and fertiliser contamination of drainage water;
- Energy efficient VRV air conditioning system with heat recovery system;
- Three boilers connected to the proposed cooling towers to provide space heating;
- Gas fires boilers for the central hot water system. The proposed boilers are also connected into the water-cooling system to provide free domestic hot water during colder periods; The provision of free hot water where possible will significantly contribute to carbon abatement of the DHW system; and
- Preparation of green travel plan for the project. No car park is proposed to promote alternative modes of transport.

The following recommendations have been made to improve upon the existing key sustainability elements of the proposed development:

- LED and Fluorescent lighting throughout the project;
- Incorporate a Building Management System (BMS) to control, maintain and monitor the various operations and conditions for all mechanical services equipment and plant, as necessary to provide a fully operational distribution center;
- Electricity sub-metering for significant end uses that will consume more than 10,000 kWh/a; and
- Low levels of volatile organic compounds (VOC) paints and floor coverings and low formaldehyde wood products where possible.

With the recommendations contained within this report we find that the proposed development is able to achieve the relevant BASIX certificate ratings (Refer BASIX Certificate 1045175M dated 27 November 2019):

- Water efficiency of 46% (exceeding the target of 40%)
- Energy Efficiency of 31% (exceeding the target of 25%)

Recommendations regarding the domestic other appliance and operational waste, etc., have also been made within the body of the report. These features will help to achieve significant reductions in the energy and water required by the development both in building and operation, as well as ensuring that the residential units are more pleasant spaces to reside.

It is recommended that ESD initiatives continue to be developed and implemented during the detailed design stage of the project.

5 Closure

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of The Trust Company (Australia) Limited ATF WH Gibbons Trust. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR Consulting.

SLR Consulting disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

GOLD COAST
Ground Floor, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

ROCKHAMPTON
rockhampton@slrconsulting.com
M: +61 407 810 417

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TAMWORTH
PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

NEW PLYMOUTH
Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695