

APPENDIX 7 : MECHANICAL AND ELECTRICAL SERVICES REPORT
AND
ECOLOGICAL SUSTAINABLE DEVELOPMENT AND BASIX

ST LEONARDS MIXED USE DEVELOPMENT

ESD, ELECTRICAL AND MECHANICAL SERVICES

PART 3A SUBMISSION

 **STEENSEN VARMING**

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1 INTRODUCTION

This report has been prepared to assist FJMT to develop a Part 3A submission for the St Leonards Mixed Use Development.

This report is broken up into various sections incorporating a description of the mechanical and electrical services design. The report also includes details of the ESD initiatives for the proposed building, and details of the BASIX assessment.

2 BUILDING DESCRIPTION

The development comprises 5.5 levels of below ground car park, podium with recreational facilities, low rise hotel along with mid rise and high rise residential apartments.

3 BUILDING CLASSIFICATION

The requirements of the Building Code of Australia (BCA) 2010 have been applied. The preliminary assumption building classifications are as follows.

The building attracts the following classification as noted by the BCA consultant Dix Gardner.

- Residential – Class 2
- Service Apartments – Class 3
- Retail Area – Class 6
- Car park – Class 7a

4 BCA CLIMATE ZONE CLASSIFICATION

The BCA climate zone classification for the development is climate zone 5.

5 MECHANICAL SERVICES

5.1 GENERAL

The residential and services apartments are provided with mixed mode systems, which allow natural ventilation through openable windows and doors when conditions are favourable. When the conditions are not favourable the air conditioning system can be activated to provide heating or cooling.

The air conditioning system shall be comprised of water cooled package units that will be local to each apartment. These units will be connected to central cooling towers and boilers located on the roof of the building. The cooling towers will provide heat rejection from the package units during cooling mode. During heating modes hotwater shall be provided from the boiler plant located on the roof.

Where possible, the systems serving hotel areas and residential apartments will be separated so that metering of water and energy may be monitored separately.

Due to the infrequent use of the kitchens in the serviced apartments they shall be fitted with recirculating kitchen exhaust hoods. Residential apartments however shall be fitted with ducted kitchen exhaust systems which discharge into a central exhaust riser.

The lift lobbies are naturally ventilated. The apartment toilet, bathroom and laundries shall be mechanically exhausted. The waste disposal chute shall also be mechanically exhausted.

All exhaust systems will run continuously through the day ramping up and down as the use of the system is increased or decreased.

The basement carpark shall be fitted with a mechanical ventilation system, which modulates according to the carbon monoxide levels.

The water cooled packaged unit serving the pool retail space shall be fitted with an air to air heat exchanger to transfer heat from the exhaust system to the outdoor air.

The foyer lobby and retail spaces shall be fitted with water cooled reverse cycle packaged units fed from the central. The units shall be provided with outside air.

Fire requirements that are stipulated in the BCA and AS/NZS 1668.1 have been incorporated into the concept stages of the design to ensure that each system is compliant and will work effectively as proposed and as required.

To coincide with the requirements of such a building, a stair pressurisation system will be incorporated in the design complete with make-up air to the system.

Other areas of the building shall be provided with ventilation systems:-

- loading dock ventilation
- cleaners cupboard exhaust
- garbage rooms exhaust
- communication rooms air conditioning
- lift motor room ventilation
- grease arrestor exhaust
- hydraulic plantroom
- substation
- main switch room

5.2 DESIGN STANDARDS

All works shall be designed in accordance with the current BCA and Australian Standards in particular:

AS/NZS 1668.1:1998	Fire and smoke control in multi-compartment buildings
AS/NZS 1668.2:1991	Mechanical ventilation for acceptable indoor-air quality
AS/NZS 3666	Air-handling and water systems of buildings - Microbial control

With reference to relevant section and parts of the BCA the table below provides a brief summary of the services that will form part of the installation. Reference should be made to the relevant sections of this document.

BCA Reference	Description of Services Items Included
F4.5	Mechanical ventilation or air-conditioning systems complying with AS/NZS 1668.2: 1991
J2	External Glazing - performance limitations provided to meet maximum energy values.
J5	Air-Conditioning and Ventilation Systems

6 DESIGN PARAMETERS

The following are the proposed design parameters for the project:

6.1 AIR CONDITIONING SYSTEMS

Outside Design Conditions

Sydney

Summer: 32°C dry bulb, 23°C wet bulb
Winter: 7°C dry bulb

Inside Conditions

Residential

Summer: 24°C +/- 2°C dry bulb, 50% + 15%RH
(Note:- No lower RH limit)
Winter: 20°C +/- 1°C

Podium Retail Spaces

Summer: 24°C +/- 2°C dry bulb, 50% + 15%RH
(Note:- No lower RH limit)
Winter: 20°C +/- 1°C

Outdoor Air or Fresh Air

The outside air quantity shall be based on BCA F4.5 and AS/NZS 1668.2 as a minimum. Economy cycle shall be applied to systems as per the requirements of BCA Section J5.

6.2 VENTILATION SYSTEMS

The exhaust and supply air quantity shall be based on AS/NZS 1668.2 as a minimum and may exceed those requirements. All exhaust systems shall be fitted with self closing dampers as per Section J3 requirements.

6.3 NOISE LEVELS

All mechanical systems and plant shall be designed / selected in conjunction with the requirements of the Acoustic Consultants report.

AS 2107 Acoustics - Recommended design sound levels and reverberation times for building interiors shall be used as a guide, where noise levels have not been identified.

7 SYSTEMS DESCRIPTION

7.1 GENERAL PLANT

Packaged, reverse cycle air-conditioning units that serve the apartments are provided with heat rejection by the cooling towers and heat by the boilers. The cooling towers and boilers will be located in the roof plant space.

The roof plant space will be surrounded by an external screening, selected to not impede airflow. The kitchen exhaust discharges will be positioned more than 8m from the cooling towers. Cooling towers will have water treatment facilities to minimise the risk of legionella.

Adjacent to these plant items, will be the pumps required to circulate the condenser water and hot water throughout the building. The condenser water is directed to the apartments' packaged units by a condenser water riser, located in the central core riser.

Several exhaust fans, such as the toilet/laundry exhaust, kitchen exhaust, stair pressurisation, grease arrester exhaust, cafe kitchen exhaust, gym/pool exhaust and garbage room exhaust shall also be located in the roof plant space.

7.2 APARTMENTS

The services described below are applicable to both residential and serviced apartments. Kitchen exhaust is handled differently for serviced and residential apartments, as is detailed in sections 7.2.1 & 7.2.2.

The apartments are provided with a mixed mode strategy, which allows natural ventilation through openable doors and windows, when outside conditions are favourable. When the outside conditions are not favourable the air conditioning system can operate to provide heating or cooling. The air conditioning system shall be deactivated when any of the apartment doors or windows are open.

The design of the apartments optimises the natural ventilation strategy using cross-ventilation. The cross-ventilation strategy for apartments is detailed in the ESD section of this report.

Air conditioning shall be installed as a base provision and will generally comprise ducted reverse cycle packaged air conditioning systems serving each apartment. The packaged air conditioning units will be mounted in bulkheads within the apartments they serve and will be connected to the apartment's electricity supply, to facilitate a user pays system. The packaged air conditioning units will be provided with hot and cold water by the centralised boiler and cooling tower plant.

The packaged air conditioning units will be controlled by the apartment's occupants, by way of remote controller which allows the occupants to turn the unit on and off and adjust temperature set points.

Toilets and Laundries will be ventilated in accordance with AS1668.2-1991 via a centralised system that will operate continuously (subject to confirmation of new BCA section J constraints). Make up air shall be provided from the openable windows and door or the naturally ventilated corridor via undercut in apartment entry door.

An alternative solution is to install acoustically treated openings to allow make up air without noise infiltration.

7.2.1 Residential Apartments

Kitchen hoods will be ducted to a centralised extraction system and will operate continuously in accordance with AS1668.2-1991 (subject to confirmation of new BCA section J constraints). Make-up air is provided in the same way as described above for toilet/laundry exhaust.

7.2.2 Serviced Apartments

Due to the expected infrequent use of the kitchens in the serviced apartments, the apartments are fitted with recirculating kitchen exhaust hoods.

Kitchens in the serviced apartments will incorporate filtered recirculating kitchen exhaust hoods. These systems filter and recirculate kitchen exhaust within the apartment, while outside air is provided in sufficient quantities by the natural ventilation and infiltration measures described above, to ensure the air quality remains high.

These kitchen exhaust units shall be controlled manually by the apartment occupants.

7.3 CARPARK EXHAUST

Mechanical ventilation (i.e. supply and exhaust systems) will be provided for the 5 storeys of basement carpark. The exhaust will be discharged at low level through an exhaust grille, 3m above trafficable areas. The supply intake will also be local to the carpark, through a supply grille.

The carpark supply and exhaust fans are located in plantrooms on basement levels 1.

The car park exhaust fan operation shall be controlled using a carbon monoxide/dioxide monitoring system, so that it modulates according to the level of carbon monoxide. However a minimum air change rate of 0.5 air changes per hour shall be maintained.

7.4 STAIR PRESSURISATION

The main stairwells in the building, which travel the full length of the building, are to be fitted with a stair pressurisation system as per AS/NZS 1668.1 1991 and in accordance with ARUP 'Fire engineering – Zone Smoke Control' letter ref: 60111616/NLS dated 29 June 2010.

These systems shall comprise a low and high level supply fan. Each fan will be connected to its respective stair pressurisation riser. These risers travel the full length of the stairwells. The risers will connect to the stairwells via sub-ducts every five floors.

Relief air for the system is to be provided by four relief air risers, which emerge in the corridors on each level. Each riser will be powered by roof mounted extraction fan.

Other stairwells shall be provided with stairwell pressurisation as required.

7.5 POOL & GYM

The combined pool and gym area will be designed to enable natural ventilation when outside ambient conditions are favourable. During times when the outside conditions are not suitable for natural ventilation the space will be air-conditioned. As this is a mixed use space, combining pool and gym occupants, the air delivery method requires consideration to ensure comfortable and appropriate conditions are provided to all occupants.

Air conditioning shall be provided to the space through a multi-zone air conditioning system. The air-conditioning system will be located in the basement mezzanine level plantroom. Air shall be supplied and returned to the space from the core central riser. The return air will pre-condition the outside air via a heat exchanger. An air to air heat exchanger transfers heat to/from the exhaust air to/from the outside air. The exhaust air is then discharged at roof level.

7.6 CAFE

The cafe is to be air conditioned by a ceiling mounted, ducted, packaged air conditioning unit. This unit will be connected to the central condenser water circuit. Outside air shall be ducted to the air conditioning unit.

The cafe's kitchen is to be mechanically ventilated in accordance with AS1668.2-1991 via a roof mounted fan connected to the kitchen's exhaust riser. The system will be controlled by the cafe staff by way of an on/off and speed control switch. A mechanical make-up air system may be required for the kitchen.

7.7 LOBBIES

The serviced and residential apartment lobbies on ground floor lobbies will be served by ducted, ceiling mounted, packaged air conditioning units. These will connect to the central condenser water circuit and outside air will be mechanically introduced outside air ducts.

The residential and serviced apartment lift lobbies on the apartment levels are to be naturally ventilated. This will be achieved in two ways. During times where the conditions are suited to natural ventilation of apartments - air flowing through the apartments and into the corridors will exhaust through opening in the facade of the corridors/lobbies. This movement of air will be sufficient to provide acceptable air quality. During times where the conditions are not suited to natural ventilation of apartments – air will flow from outside, through the openings in the facade of the corridor and into apartments as make up air for toilet/laundry and kitchen ventilation, This air movement will also be sufficient to provide acceptable air quality as per AS1668.2-1991.

Cross-ventilation of the corridor, through openings in the facade at each end, will also be contribute to the air movement required provide acceptable air quality.

Lift lobbies in the basement floors are mechanically ventilated as a consequence of the carpark exhaust and supply air system.

7.8 MISCELANEOUS

Several other mechanical systems are described here.

7.8.1 Garbage

The garbage system encompasses a garbage chute that travels from the penthouse level to B1, where a garbage compacter carousel operates in the garbage room to handle the rubbish. The garbage chute and garbage room are to be mechanically ventilated to control the associated odours.

The riser housing the garbage chute will be used as a means of ventilating the garbage room and the chute itself, by an exhaust fan located above the shoot. The garbage room will be ventilated in accordance with AS1668.2-1991.

7.8.2 Grease Arrestor

A grease arrestor room is located on B1 level. This room will be mechanically ventilated in accordance with AS1668.2-1991 to minimise the associated odours from circulating through the building.

The Grease Arrestor Riser is located in the core central riser. It continues from B1 level to the roof where an exhaust fan will be located.

8 ELECTRICAL SERVICES

8.1 GENERAL

Electrical installations shall comply with the requirements of AS/NZS3000, relevant communications standards, applicable Industry Regulator requirements and the Local Network Provider's requirements such as the Service and Installation Rules. In addition, electrical installations and equipment shall comply with all appropriate and relevant Australian standards, for the type of installation or equipment to be used. Where Australian standards are not available, recognised international or overseas national standards shall be used where they are relevant to the type of installation and to the installation conditions in Australia.

- Building Code of Australia (BCA)
- Wiring Rules AS/NZS 3000:2007
- Interior Lighting AS1680
- Control of the Obtrusive Effects of Outdoor Lighting AS 4282:1997
- Pedestrian Area Lighting AS/NZS 1158.3.1:2005
- Emergency and Exit Lighting AS/NZS2293
- Fire Detection, Warning and Intercom Systems AS1670.1 : 2004
- Telecommunication Generic cabling for commercial premises AS3080 (Int):2002
- Lightning Protection AS/NZS 1768 (Int):2003
- Lift Requirement AS 1735

Standards are generally focussed on safety and therefore other industry guides and benchmarks need to be adhered to ensure the project achieves a high level of quality and performance. Some other guides include but not limited to the following;

- BSRIA Power Quality Guide Application Guide 2/2000
- CIBSE Guide K Electricity in Buildings
- HB 300 Electrical Installations Guide to Using the Wiring Rules
- HB 301 Electrical Installations Designing to the Wiring Rules

The design of the electrical installation shall achieve the following design objectives:

- a. safety and reliability
- b. properly designed and appropriately sized to allow the full and proper functioning of all equipment, plant and fittings
- c. facilitates the operational requirements of the specific equipment, materials, processes and functions in the building
- d. sized with adequate capacity for expansion
- e. arranged and routed in an organised and systematic manner and be accessible for operations and maintenance
- f. provided with necessary flexibility and versatility to allow isolation, shutdown and removal of equipment and systems as required for maintenance and extension
- g. compatibility with existing services and systems on the establishment and in the facility
- h. labelled and colour coded for ease of identification and operation, to suit semi-skilled operation
- i. designed and installed to all relevant legislation, standards, codes and guidance that are appropriate and relevant to the type of electrical installation or equipment

8.2 INCOMING SERVICES

8.2.1 Power

The existing site has the following existing electrical supplies:

1. 800A direct distributor to 6-12 Atchison St
2. 200A overhead supply to 14 Atchison St
3. 200A overhead supply to 16-18 Atchison St

The arrangement of the above supplies is not appropriate for the new development and therefore shall not be reused. The new building shall be provided with a new chamber substation located on the ground floor. The exact size of the new substation shall be determined in conjunction with Energy Australia and shall be designed to accommodate the maximum electrical demand on the building.

The power supply to the building shall be provided by underground conduits from the mains to the primary substation within the building. In addition underground conduits for the purpose of power supply shall be provided along Atchison Street between Christie and Mitchell Streets. Any redundant power poles shall be removed. All works to be completed to Energy Australia requirements. Details to be provided with any application for Construction Certificate.

8.2.2 Telecommunications

The existing telecommunications services to the site shall be stripped out and replaced with new. New optical fibre and copper lead-in cabling shall be provided to the building, sized sufficiently to accommodate the telecommunication requirements for the building. Details of the telecommunications lead-in capacity shall be determined during the following design stages of the project.

A main telecommunication room is provided within the basement level to accommodate the communications building distributor and optical fibre terminations. Telecommunications cabling shall reticulate via dedicated communications cable trays throughout the building to provide the required telecommunications services. Each serviced apartment / residential floor shall incorporate a dedicated communications cupboard containing copper and optical fibre distribution points, to provide telecommunications services to each apartment.

8.3 MAIN SWITCHBOARD

The main switchboard shall be located within the main switch room located on the ground floor adjacent to the substation. The main switch room shall accommodate the main switchboard, required metering, power factor correction equipment, records and framed/laminated single line diagrams and drawings of the installation.

The position and features of the Main Switch room shall consider the following;

- Located in close proximity of the chamber substation to reduce the consumer mains length
- Located in close proximity of the large air conditioning load where possible to limit the submain length
- Electromagnetic Interference on adjacent environment
- Access for maintenance and emergency personnel
- Dual personnel egress doors at opposite ends of the room

- Large or double doors for maintenance equipment access
- Passive fire protection to code and a limit on wet fire sprinklers
- Above recorded flood zones and away from hazardous areas

The main switchboard consists of all the instruments, bus-bars, cable zones, circuit protection devices and labelling for the building. All of which, shall be an appropriate type, size and configured to accommodate the code requirements together with the functional and maintenance criteria.

The configuration of the Main Switchboard shall be determined by the following;

- Prospective short-circuit current at switchboard (based on substation rating from Supply Authority)
- Maximum demand and load characteristics
- Specific load requirements and dedicated supplies
- Metering and BMS remote control and monitoring
- Number of supplies from Supply Authority
- Redundancy and spare capacity
- Maintenance and emergency services isolation
- A balance of the insulation protection versus the temperature rise
- Other factors such as cable sizes, fault-loop impedance and ability of protective devices to electrically discriminate with each other.

8.4 DISTRIBUTION BOARDS

The design criteria for the Distribution Boards (DBs) shall generally be as detailed for the main switchboard. Due to the size and function of the building a number of distribution boards will be required. The tenant and house distribution boards shall be installed in their dedicated risers. The distribution boards in each unit shall be located in an appropriate location within the unit it serves.

It is proposed that the Distribution Boards shall be proprietary type Form 1 2 construction.

Every third floor shall be provided with a dedicated house distribution board which shall supply all the house services such as corridor lighting and power. Each house distribution board will service 3 levels, the level the board is located on and the level directly above and directly below.

Every residential floor shall have an unmetered tenant distribution board. This board provides metered supplies to each of the units on the same level.

Each unit shall be provided with a switchboard located appropriately with the unit which shall provide the power requirements of the unit.

8.5 METERING

Supply Authority meters shall be located in accordance with local authority requirements. It is proposed that authority meters be located within the main switch room and within the common tenancy cupboards located on each residential apartment floor. The main switchboard and the metering facilities shall be designed to enable tariff selection changes without the need to modify the switchboard busbar system. Additional private metering shall be positioned on the selected main supplies.

8.6 POWER FACTOR CORRECTION

Power factor correction (PFC) equipment shall be provided to the electrical system to provide a power factor of 0.95 minimum or as required by Energy Australia on the incoming power supplies. It is proposed that the power factor correction capacitors be arranged in banks to allow stepped increases to accommodate fluctuations in building load and incorporate anti-harmonic reactors.

The power factor correction equipment shall be located within the main switch room. To reduce impact on cost and to provide better flexibility in maintenance the PFC units shall be housed separately from the Main Switchboard.

8.7 RETICULATION

Cabling and reticulation consists of submains, cable trays, conduits, and ducting systems and shall be designed in accordance with AS/NZS 3008.1. All electrical cabling and reticulation shall be integrated into the architectural design of the building.

All submain cabling shall generally be reticulated from the main switchboard on dedicated cable trays/cable risers and that be accessible. Where submain cabling reticulates in ceiling spaces, they shall be reticulated along corridors as much as possible so as to minimise electromagnetic interference to adjacent working spaces.

Submains shall be provided to all required power supplies. Some loads will require dedicated supplies due to the type of load and its size. All cabling shall be designed and installed to allow for derating in accordance with AS3008.1

Submains may be reticulated on exposed cable tray within plantroom spaces and within services risers. It is proposed that cable trays are sized to incorporate spare space and submains are sized to incorporate spare capacity for future expansion.

It is proposed that sub circuit cabling shall also be reticulated within accessible ceiling space, wall mounted skirting duct, or within dry walls to access socket outlet locations. It is proposed that sub circuits be loaded to provide spare capacity for future expansion.

All cabling conductors shall be multi strand copper and cable trays and supports shall be of appropriate material to withstand long term use and comply with relevant standards.

8.8 ACCESSORIES

Accessories include the power outlets, switch plates, and floor boxes/ducting. The selection of accessories shall be done in conjunction with the architect. Power socket outlets shall be provided throughout the building to satisfy the functional requirements of the building and for cleaning purposes. Final arrangement of the power socket outlets shall be determined during the design stages of the project. Outlets for wet areas shall have adequate IP protection in accordance with AS/NZS3000. RCD safety device protection shall be provided on all final sub-circuits.

8.9 ELECTRONIC SECURITY

An electronic security system shall be provided throughout the building to assist in providing a safe environment for all building users. Final details of the electronic security system shall be determined during the following design stages, however, it is anticipated that the electronic security system shall incorporate the following system elements.

- Access Control
- Intruder Alarms
- CCTV System
- Intercom System

8.10 FIRE DETECTION AND OCCUPANT WARNING SYSTEM

A fire detection and building occupant warning system shall be provided throughout the building in accordance with the requirements of the Building Code of Australia and relevant Australian Standards. The fire detection system shall comprise of a fire indicator panel and evacuation alarm panel located on the ground floor adjacent the main entrance. The fire detection and occupant warning systems shall incorporate various devices including smoke / thermal detectors, smoke detection within apartments, manual call points, speakers and WIP's. Final system details shall be determined during the following design stage of the project.

8.11 MATV

The building shall be provided with a MATV system to receive both free to air digital television and incorporate the facility for future connection to individual apartments of pay television.

8.12 LIGHTING

Generally the internal lighting shall be determined during the design development stage of the project however, the lighting shall be designed in accordance with the relevant Australian Standards, BCA Section J and Basix requirements for apartments.

The lighting arrangement shall incorporate energy efficient lamps, use of luminaires with high light output ratios, and be coupled with lighting controls in selected common spaces to reduce energy consumption.

8.13 EMERGENCY LIGHTING

Final details of the emergency lighting system are to be determined during the following design stage, however, an emergency lighting system shall be provided throughout the building in accordance with the requirements of the BCA and the relevant Australian Standards. It is anticipated that the system consists of single point units connected to a central monitoring system for system testing and

8.14 LIGHTNING PROTECTION

A lightning protection risk assessment will be undertaken for the building in accordance with AS 1768 (int)-2003. Protection consisting of bonding exposed metal work to the structural down conductors within nominated columns, in order to obtain connection to earth. Also protection consisting of surge protection on the telecommunications systems, main switchboard shall be provided throughout the installation in accordance with the relevant Australian Standards.

8.15 LIFT SERVICES

Based on initial lift analysis, the building shall incorporate five lifts in order to provide a good standard of lift services for the building occupants.

It is proposed that three lifts be dedicated to the residential levels. Preliminary assessment indicates that these lifts shall be MRL overhead traction type, with capacity for 21 persons. The lifts shall operate at a minimum speed of 2.5m/s and be sized to accommodate stretcher facility, enhanced disabled access requirements and be sufficient for transporting general items of furniture.

For the services apartment levels it is proposed that two motor room less lifts be provided. Preliminary assessment indicates that these lifts shall be overhead traction type, with capacity for 21 persons. The lifts shall operate at a minimum speed of 1.6m/s and be sized to accommodate stretcher facility, enhanced disabled access requirements and be sufficient for transporting general items of furniture.

9 ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD)

The purpose of this section is to provide background information on the ESD initiatives that have been included within the Bancor Apartment development at St.Leonards.

We understand that this project seeks to provide a development that embodies sensible initiatives for sustainable low energy design that demonstrate ESD best practice. The key design philosophy for Bancor development was to provide appropriate and sensible initiatives for the project that align with and support the functional and operational requirements.

In order to reduce the energy load of the proposed development, the building design has incorporated passive design measures to minimise energy consumption associated with air conditioning, lighting etc.

The ESD initiatives that have been considered appropriate for this project goes beyond current regulatory requirements and are based on best practice benchmarks and guidelines. A key priority for the building is to implement sound energy saving initiatives.

With respect to the energy component, the key design intent is to:

1. Minimise energy consumption – through highly efficient building services systems
2. Building envelope has been designed to maximise daylight access and natural ventilation to areas where it is desired. This reduces energy associated with lighting as well as air-conditioning. When outdoor air temperatures are favourable and in the region of 18 °C to 24 °C the air conditioning may be switched off depending on the loads in the space and the occupant's choice. This would not only reduce the buildings energy consumption but also the detrimental impact on the environment through emissions.
3. Hot water provided by Solar hot water systems that use renewable solar energy to offset greenhouse gas emissions.
4. Suggest ongoing testing, commissioning and calibration of major building services systems.
5. Compact Fluorescent Lighting (CFLs) to reduce energy use

In accordance with the above initiatives, energy efficiency and use of renewable energy sources have been established as fundamental project goals. Sensible and appropriate design measures have been considered to reduce energy wastage and carbon dioxide emissions arising from the operation of the building without reducing the functional standards necessary for a highly serviced building of this nature.

It is the client's intention that this proposed building will incorporate many ESD principles in the design, the construction and the ongoing development of the project.

Environmental performance is becoming an essential component of quality. The general public are looking for homes that contribute less to global warming, consume fewer natural resources, and ensure the health, comfort and safety of their families.

Such qualities are often difficult for people to judge for themselves in a housing development and hard for the developer to communicate, however, if this is done effectively the results can be very successful.

Following is a summary of the ESD strategies that are identified for the project:

- Low CO2 emissions (low energy lighting, space and water heating and air conditioning, building air tightness)
- Timber from managed regulated sources or re-used
- Reduction of internal pollutants such as formaldehyde, wood preservatives, toxic paints, volatile organic compounds (VOC's) and other particulates and fibres
- Use of recycled or demolition material
- Site development which minimises damage to local flora and fauna, re-use of existing sites and ecological improvements
- Domestic and rainwater management
- Daylighting, passive solar heating and passive ventilation techniques

9.1 DAYLIGHTING ACCESS AND CONTROL

In the proposed apartment development, access to natural light is available to majority of the living rooms and kitchens to reduce the reliance on artificial lighting.

The introduction of natural light to a building provides illumination without the need for artificial lighting, provides improved space ambience, better qualities of light, view links to outside and dynamic play of light to create effects in the specific indoor area.

Daylight is introduced via the double-glazed building envelope of the proposed development. Generally, daylight is provided to all spaces that have exposure to perimeter facades. External shading devices are incorporated to provide protection from the glare and heat from summer sun but allow diffuse light to penetrate into each apartment.

The envelope design has considered the following:

- Even daylight distribution across each space
- Control of solar gains (via double glazed units)
- Glare control (via External shading devices and Internal blinds)
- Integration with artificial lighting systems

Deep reveals offered by the winter gardens (enclosed balconies) allow for protection from the glare and heat from summer sun but allow diffuse light to penetrate into each apartment.

9.2 NATURAL VENTILATION

This section is applicable to both residential and serviced apartments. Natural ventilation has been achieved through the majority of the residential units and all circulation corridors. Natural ventilation relies on the movement of outside air throughout a building to remove heat gains from within the space and to provide fresh, oxygen-rich air to occupants.

For the Units, natural ventilation is available to all living rooms via openable windows and balcony doors. However, during extreme outdoor temperature conditions, the units can switch over to air-conditioning mode.

The proposed design includes the creation of air transfer plenums that facilitate secondary cross-ventilation to the circulation corridors via units.

The air-flow path allows air to enter the bedroom / living rooms and pass over the natural-ventilation plenum located over the kitchen / bathroom and out of the unit towards the corridor. This allows the use of natural ventilation while maintaining acoustic privacy between the corridor and the units. This method facilitates the corridors to be naturally ventilated.

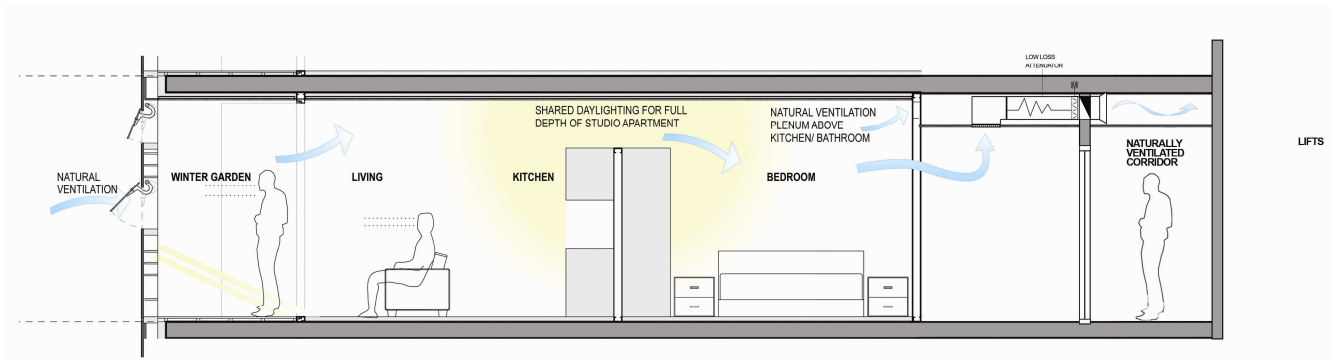


Fig: Sectional view of the path of secondary cross-ventilation via units

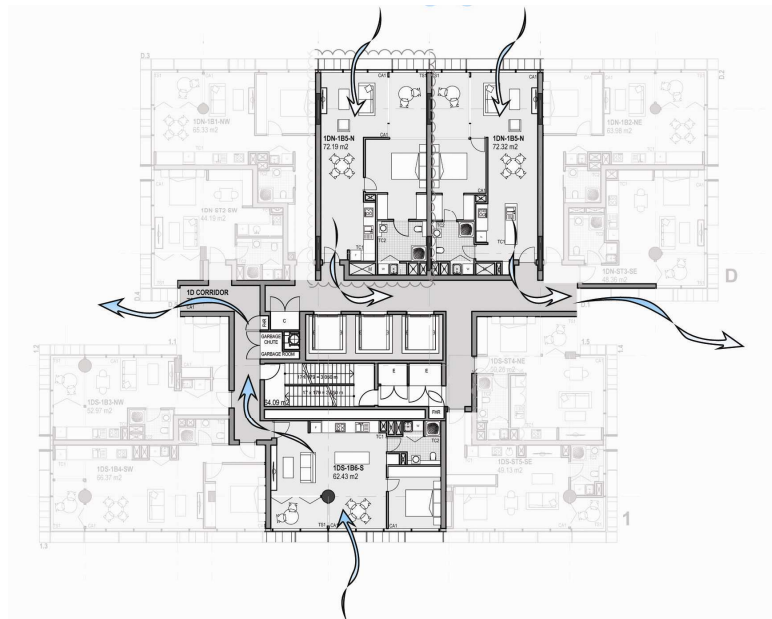


Fig: Path of secondary cross-ventilation to the corridors

The lift lobbies/ corridors on the apartment levels are to be naturally ventilated. This will be achieved in two ways. During times where the conditions are suited to natural ventilation of apartments - air flowing through the apartments and into the corridors will exhaust through opening in the facade of the corridors/lobbies. This movement of air will be sufficient to provide acceptable air quality.

During times when the conditions are not suited to natural ventilation of apartments – air will flow from outside, through the openings in the facade of the corridor and into apartments as make up air for toilet/laundry and kitchen ventilation.

Cross-ventilation of the corridor, through openings in the facade at each end, will also contribute to the air movement required to provide acceptable air quality.

Due to the height of this development protective winter gardens are proposed to buffer external wind forces and allow controllable ventilation to the apartments.

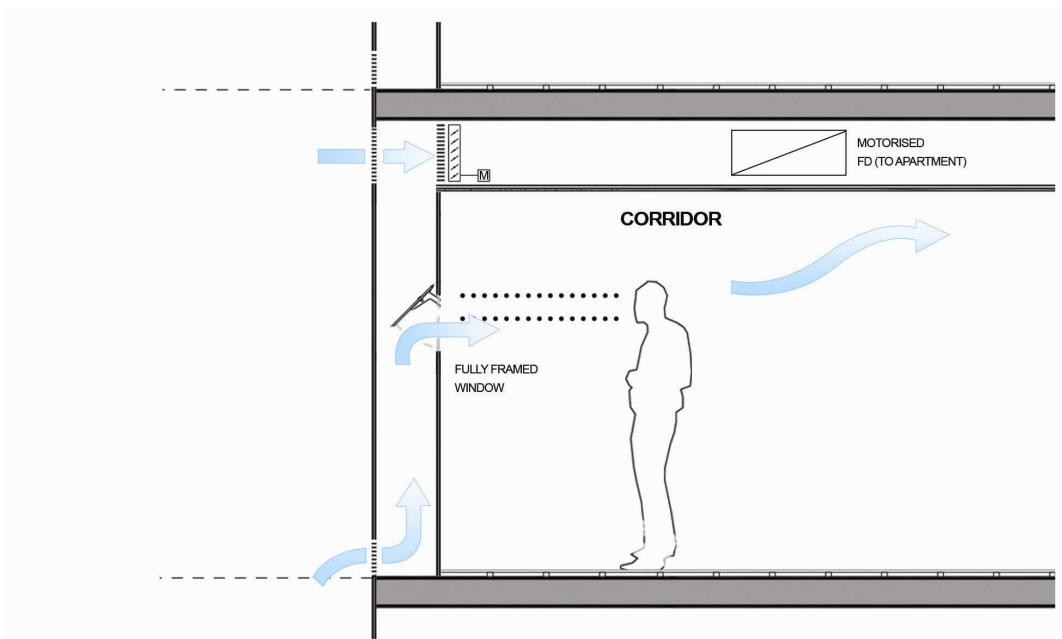


Fig: Cross-ventilation via corridor openings

9.3 SOLAR HOT WATER HEATING

One of the key ESD initiatives for the redevelopment is the adoption of a solar hot water heating system. The building is to be split between two main areas i.e. the upper levels which include the residential apartment units and the lower level which includes the serviced apartments. The reason for this is to ensure that both the apartment units and the serviced apartments are served from two separate systems.

For the residential apartments, it is proposed that a solar preheating plant be incorporated into the design to provide approximately 50% of the total daily demand during the most solar efficient summer months, i.e. around December. This will equate to a significant amount of annual CO₂ savings per year. Throughout the design stage of the project the available area reserved for the solar collectors may change. With this in mind the anticipated annual CO₂ savings may change to as a result.

A direct fired gas booster hot water system is required for periods of poor or no solar gain. It is necessary for the booster system to provide 100% of the hot water needs of the project.

The gas fired solar hot water booster system will be located at open roof level within a screened enclosure, along three (3) buffer storage vessels and a total of eighteen (18) solar preheat tanks. It is proposed that three (3) arrays of twenty four (24) solar panels (in each array – 72 panels in total) be installed on the roof of the level 33 penthouse apartments.

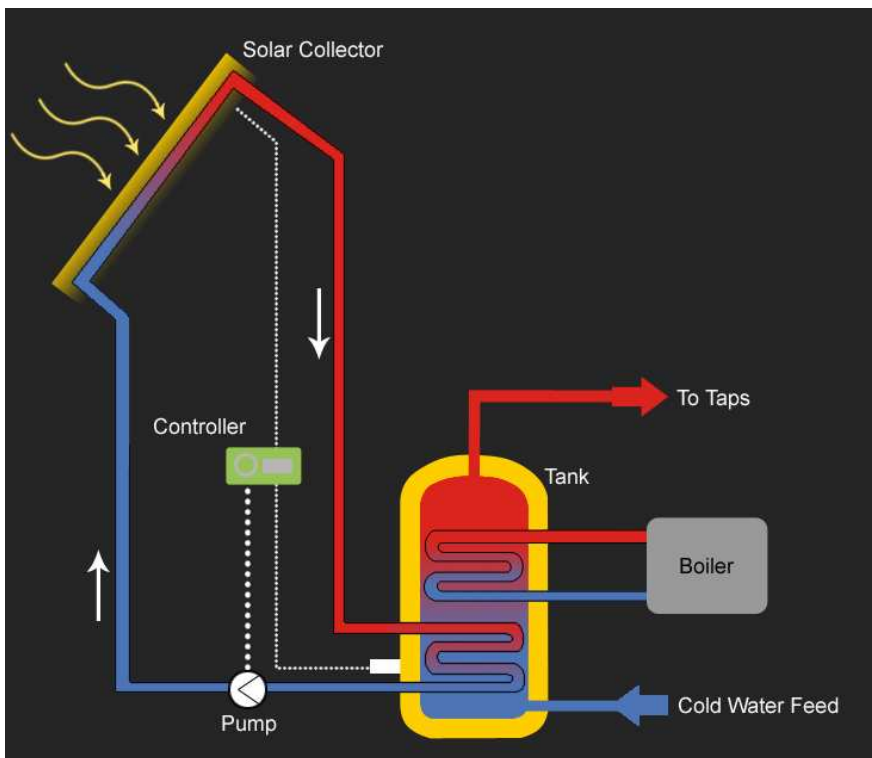


Fig: Solar hot water system

9.4 RAIN WATER HARVESTING

The proposed development is committed to reducing its environmental impact by reduction in potable water consumption. Rain water will be collected from the roof and would be re-used for landscaping and make-up water supply to the swimming pool.

The sustainable water management practices noted below have addressed this issue of decreasing potable water consumption:

- Incorporation of rain water harvesting
- Minimizing the extent of impervious surfaces to minimize run-off
- Reduce, protect and treat surface runoff
- Intensive landscape irrigation systems have been discouraged. Instead planting comprises of native plants suitable for the local climate.

9.5 ENERGY EFFICIENT APPLIANCES

In order to improve the energy consumption it is recommended that energy efficient appliances are provided as part of the base building provisions for the serviced apartments.

Appliances such as refrigerators, clothes washers, clothes dryers and dishwashers that will be provided are within one star of the best available rating. This initiative has also improved the BASIX performance of the proposed development.

9.6 WATER EFFICIENT FIXTURES AND FITTINGS

The use of water efficient products certified to the National Water Conservation Rating and Labelling Scheme conserves water without the difficult task of having to change behavioural habits, as the performance of these products is not compromised by their reduced water usage. A fitting with a 5A rating is defined by the Water Services Association of Australia as having an excellent level of water efficiency and a rating of 1A is considered a moderate level of water efficiency.

The development will be provided with the following types of water-efficient appliances as part of the base building provisions.

- All shower heads – 3 star
- All flushing systems- 4 star
- All kitchen taps – 4 star
- All bathroom taps- 4 star
- Clothes washer – 5 star
- Dishwasher – 5 star

The proposed design includes water meters for all major water uses in order to monitor and manage the building's water consumption.

10 ENVIRONMENTAL BENCHMARKING METHODS

10.1 BASIX

For the proposed development, a BASIX assessment has been undertaken to outline the environmental initiatives that have been included in the proposed design and to identify whether the proposal meets or exceeds the minimum BASIX requirements.

The proposed Bancor development consists of 227 residential apartment units and 50 service-apartments.

As per the Building Code of Australia (BCA) 2010, the residential units of the proposed development are classified as BCA Class 2 areas. In NSW, Class 2 and Class 4 components are subject to BASIX. It is a regulatory requirement to attain compliance with BASIX. Hence, BASIX assessment has been undertaken only for the residential units of BAN-ASD.

The serviced-apartments of the proposed development are generally classified as BCA Class 3. As stated in BCA, the Class 3 component must comply with the energy efficiency provisions of BCA Section-J. As such, the Class 3 component is not subject to BASIX.

BASIX assessment consists of three categories, namely:

- Water
- Thermal Comfort; and
- Energy

A BASIX certificate has been raised for the residential component of the Bancor development to demonstrate compliance with the BASIX targets and the kind of savings that will be made.

The target score for Water and Energy is 40 and 20 respectively. These are the minimum scores required to obtain compliance. For the thermal comfort category, the target is to obtain a PASS score.

CATEGORY	TARGET	CURRENT SCORE
Water	40	42
Thermal Comfort	Pass	Pass
Energy	20	25

In terms of water efficiency Bancor development is estimated to give water savings of more than 40%.

In terms of energy efficiency Bancor is estimated to give energy savings of more than 20%.

The project has attained a PASS score for the thermal comfort category.

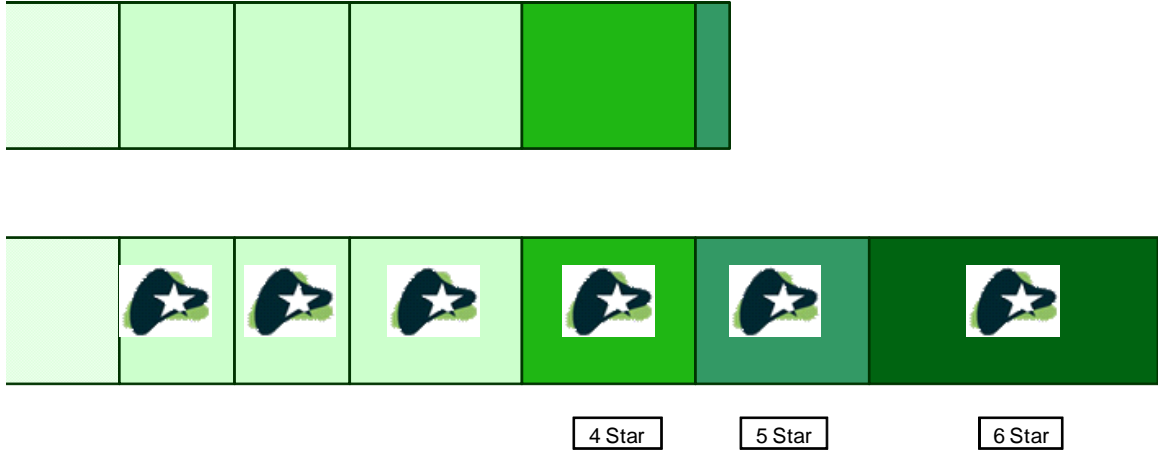
Please refer to the BASIX certificate for further details of the BASIX assessment.

Following is a schedule of BASIX commitments for the residential units:

Water	Fixtures	All shower heads – 3 star All flushing systems- 4 star All kitchen taps – 4 star All bathroom taps- 4 star Clothes washer – 5 star Dishwasher – 5 star
	Rain water collection & reuse	Run-off from at least 714 m ² of roof area will be collected. Rain water will be collected and reused for swimming pool make-up water and for common area landscape irrigation.
Energy	Hot water system	Central solar hot-water system
	Ventilation systems	Centrally ducted
	Appliance efficiency measures	Gas cooktop Electric oven Refrigerator – 5 star Dishwasher – 5 star Clothes Dryer – 5 star
	Lighting	Dedicated artificial lighting
	Lifts	Gearless traction lifts with VVVF motors.
Thermal Comfort	External Glazing	Low-e glazing with U-value not more than 4.0 and SHGC not more than 0.47.
	External Walls	Majority of the external walls would be fully glazed. Few parts of external walls that are not glazed would be composed of concrete panels finished with plasterboard. (Concrete panels + furring channels + plasterboard).
	Internal Walls	Inter-unit tenancy walls would be Gyprock walls 300mm wide. Walls within each tenancy will be plasterboard on studs.
	Floor Finishes	Living rooms and bedrooms would be covered with carpets.
	Ceiling Insulation	R2 Insulation (Required only for the top units).

10.2 GREEN STAR

We have undertaken a pre-assessment of the proposed residential development using the Green Star Multi-residential rating tool. Based on the initiatives that have been considered in the proposed design, it has been identified that the project has the potential to attain a 5 Star Green Star rating.



Opportunities considered under each category of the Green Star Multi-residential tool, have required a collaborative effort and input from the design team and stakeholders involved. Initially, the project team and stakeholders have reviewed each credit and identified the initiatives that are practical within the current design brief and cost plan. These have been noted under the “4 Star Points” column.

Other initiatives targeted for 5 star rating, will have to be rated in terms of cost and priority for the building owner. Accordingly, the project team can streamline the opportunities available.

Following summary indicates the key points that are being targeted in order to attain a 5 star Green Star rating.

Green Star - Multi Unit Residential v1

Credit Summary:

Category	Title	Credit No.	Points Available	Points Achieved
Management				
	Green Star Accredited Professional	Man-1	2	2
	Commissioning Clauses	Man-2	2	2
	Building Tuning	Man-3	1	1
	Independent Commissioning Agent	Man-4	1	1
	Building Users' Guide	Man-5	1	1
	Environmental Management	Man-6	3	3
	Waste Management	Man-7	2	2
	Metering	Man-16	6	6
		TOTAL	18	18
Indoor Environment Quality				
	Daylight	IEQ-4	2	1
	Thermal Comfort	IEQ-5	2	0
	Hazardous Materials	IEQ-6	0	na
	Internal Noise Levels	IEQ-7	2	2
	Volatile Organic Compounds	IEQ-8	4	4
	Formaldehyde Minimisation	IEQ-9	1	1
	Electric Lighting Levels	IEQ-13	1	1
	Private External Space	IEQ-20	1	1
	Dwelling Ventilation	IEQ-21	3	1
	Natural Ventilation	IEQ-22	3	1
		TOTAL	19	12
Energy				
	Conditional Requirement	Ene-Con	Yes	0
	Greenhouse Gas Emissions	Ene-1	20	14
	Unoccupied Areas	Ene-7	2	2
	Energy Efficient Appliances	Ene-11	2	2
	Peak Electricity Demand Reduction	Ene-12	2	0
		TOTAL	26	18
Transport				
	Provision of Car Parking	Tra-1	2	2
	Fuel-Efficient Transport	Tra-2	2	2
	Cyclist Facilities	Tra-3	3	3
	Commuting Mass Transport	Tra-4	5	4
	Trip Reduction - Mixed Use	Tra-5	2	2
		TOTAL	14	13

Category	Title	Credit No.	Points Available	Points Achieved
Water				
	Occupant Amenity Water	Wat-1	5	1
	Landscape Irrigation	Wat-3	1	1
	Heat Rejection Water	Wat-4	2	0
	Fire System Water	Wat-5	1	1
	Water Efficient Appliances	Wat-7	1	1
	Swimming Pool/Spa Water Efficiency	Wat-8	2	2
		TOTAL	12	6
Materials				
	Recycling Waste Storage	Mat-1	2	2
	Building Re-use	Mat-2	6	0
	Recycled-Content & Re-used Products and Materials	Mat-3	1	1
	Concrete	Mat-4	3	2
	Steel	Mat-5	2	1
	PVC Minimisation	Mat-6	2	2
	Sustainable Timber	Mat-7	2	2
	Design for Disassembly	Mat-8	1	0
	Dematerialisation	Mat-9	2	2
	Flooring	Mat-11	1	0
	Joinery	Mat-12	1	0
	Internal Walls	Mat-14	2	0
	Universal Design	Mat-15	1	1
		TOTAL	26	13
Land Use & Ecology				
	Conditional Requirement	Eco-Con	Yes	0
	Topsoil	Eco-1	1	0
	Re-use of Land	Eco-2	1	0
	Reclaimed Contaminated Land	Eco-3	2	0
	Change of Ecological Value	Eco-4	4	0
	Outdoor Communal Facilities	Eco-5	3	2
		TOTAL	11	2
Emissions				
	Refrigerant ODP	Emi-1	1	1
	Refrigerant GWP	Emi-2	2	0
	Refrigerant Leaks	Emi-3	1	1
	Insulant ODP	Emi-4	1	1
	Watercourse Pollution	Emi-5	3	2
	Discharge to Sewer	Emi-6	5	0
	Light Pollution	Emi-7	1	1
	Legionella	Emi-8	1	0
		TOTAL	15	6
Sub-total weighted points:			63	

11 SUGGESTED GREEN STAR DESIGN INCLUSIONS

11.1 MANAGEMENT

- Green Star accredited professional will be engaged to formally guide the submission process
- Commissioning clauses will be included in the relevant services specifications to ensure the services are commissioned as per the designer's intent
- Implement training of building management staff
- After handover, the building owner will implement tuning of all building services and a final re-commissioning after 12 months from handover
- An independent commissioning agent will be appointed to guide the commissioning process and provide expert advice to the design team
- A simple Building Users' Guide, which includes information relevant for the building residents and management, will be developed and made available to the building owner and residents.
- The Contractor would have a valid ISO14001 Environmental Management System (EMS) accreditation prior to and throughout the project. And the Contractor would implement a comprehensive, project-specific Environmental Management Plan (EMP) for the works in accordance with Section 3 of the NSW Environmental Management System guidelines 2007
- The contractor will implement a waste management plan
- 80% of the demolition and construction waste would be reused or recycled. The contractor would provide waste disposal records to the building owner
- Individual metering would be provided for each dwelling to monitor gas/ electricity & hot water flow
- Water meters will be installed for all major water uses in the building; and a domestic cold water meter will be installed in each dwelling
- Smart-metering will be provided to monitor the consumption of electricity, water and gas (if provided for other uses than cook tops, stoves and ovens).

11.2 INDOOR ENVIRONMENTAL QUALITY

- 95% of the apartments meet the daylight criteria for kitchens (Daylight Factor of no less than 2%) & at least 60% of the living areas in these apartments have a daylight factor of 1.5% minimum.
- An appropriately qualified acoustic professional has to be appointed to assist with the assessment and mitigation of external noise sources (from design phase through to completion and handover).
- Low VOC paints, adhesives & sealants, wall & ceiling coverings and flooring would be specified in the relevant architectural specifications.
- All engineered wood products will be specified to have low formaldehyde emissions.
- A minimum of 300 lux will be achieved on the surface (nominally 900mm above floor level) of the following the kitchen Sink; cook-top or stove; and vanity basins in bathrooms and ensuites.
- Balconies are provided for most of the units, (more than 75% of units) to serve as private external spaces.
- Kitchens will be provided with dedicated and separate extract fans.

11.3 ENERGY

- On the basis of NatHERS modelling undertaken for the proposed development, it has been established that the Green Star conditional requirement is satisfied.
- All apartments include occupancy controls to minimise air-conditioning and lighting energy
- All areas within the building, excluding the dwelling units, include automated controls to minimise air conditioning and lighting energy use when unoccupied.
- All clothes dryers and dishwashers are at or within one point of the highest available rating under the Australian Government's "Energy Rating" labelling system

11.4 TRANSPORT

- Number of car parking spaces does not exceed the minimum planning allowance by more than 10%
- 10% of the parking spaces are marked for fuel-efficient small cars (2.3 x 5.0 metres)
- Cyclist facilities would be provided for all dwellings in the building and also for visitors.
- St.Leonards has a well connected public transport network. The site is in close proximity to most of the transport facilities (Both bus and rail)
- More than 5 amenities are within 400m walking distance from the site.

11.5 WATER

- High efficiency water fixtures and fittings will be provided to each and every unit. This includes the following types of fixtures:
 - Showerheads – 3 Star
 - Kitchen Taps – 4 Star
 - Bathroom taps – 4 Star
 - Toilet flushing – 4 Star
 - Dishwashers – 5 Star
 - Washing Machines – 5 Star
- Rainwater will be provided for irrigation of all landscaping. This minimises the consumption of potable water where it is not essential.
- Fire system test water will be collected and reused. When test water is drawn from the fire services storage tank, it can be returned to the same tank. When test water is drawn directly from the town mains supply, it can be discharged to the rainwater re-use tank.
- 70% of the swimming pool make-up water would be non-potable water.

11.6 MATERIALS

- The proposed architectural design includes a dedicated storage area for recycling waste storage. Accessible waste chutes are also provided to serve every floor.
- Materials with a high post-consumer recycled content will be preferred.
- To reduce the use of Portland cement, it would be substituted with industrial waste products. (60% for in situ concrete, 40% for pre-cast concrete and 30% for stressed concrete).
- 60% of all steel, by mass, in the project would either have a post-consumer recycled content of greater than 50%, or is re-used.
- 60% of the total PVC (by cost) would comply with the GBCA's Best practice guidelines
- 95% (by cost) of all timber products used in the building and construction works will be sourced from any combination of the following:
 - Re-used timber;
 - Post-consumer recycled timber; or
 - Forest Stewardship Council (FSC) certified timber.
- 25% of the roof would have a dual function. Building consists of three roof-mounted solar arrays with 24 solar panels on each array (72 panels in total)
- More than 50% of the units meet the maximum size criteria stated in Green Star.
- Flooring, joinery and internal walls would be of environmentally preferable materials
- All publicly accessible areas and at least 10% of dwellings have been designed to comply with the Class A, B or C requirements of AS4299-1995 'Adaptable Housing' at a minimum.

11.7 EMISSIONS

- All HVAC refrigerants would have an ODP of zero
- Refrigerant leak detection system will be installed. Environmental damage due to refrigerant leaks would be substantially reduced.
- All thermal insulants specified for the project would avoid the use of ozone-depleting substances in both their manufacture and composition
- The development will not increase peak stormwater flows for rainfall events of up to a one-in-two year storm; and all stormwater leaving the site, at any time up to a one-in-twenty year storm event, is treated or filtered in accordance with either:
 - Urban Stormwater Best Practice Environmental Management Guidelines (CSIRO 1999); or
 - Australian and New Zealand Environment Conservation Council (ANZECC)'s Guidelines for Urban Stormwater Management.
- None of the lights would be directed into the night-sky. No external luminaire would have an upward light output ratio that exceeds 5%; and the lighting design complies with AS 4282 'Control of the Obtrusive Effects of Outdoor Lighting'.

12 APPENDIX - GREEN STAR SUMMARY

The following Green Star summary presents the initiatives that are considered in the current design. Opportunities considered under each category of the Green Star Education tool, have required a collaborative effort and input from the design team and stakeholders involved. Initially, the project team and stakeholders have reviewed each credit and identified the initiatives that are practical within the current design brief and cost plan. These have been noted under the “4 Star Points” column.

Other initiatives will have to be rated in terms of cost and priority for the building owner. Accordingly, the project team can streamline the opportunities available.

The data is set-out in the following manner:

Credit Title	Credit Number	Requirement	Responsibility	Points available	4 Star Points	Extra Points for 5 Star	Risk	Net Cost	Comments
									Benefit

“Credit requirement” enlists the criteria which are to be fulfilled to achieve compliance.

The “responsibility” section indicates the specific team who are responsible for implementing the credit deliverables.

“Points available” indicates the maximum number of points that can be attained for each credit.

“4 Star points” indicates the initiatives confirmed to date.

“Extra points for 5 star” indicates the additional points that are currently targeted. However, they need to be further reviewed at later stages of design.

“Benefit” summarises the environmental advantage associated with implementing the respective credits.

Note:

4 star points that have been confirmed indicate a score of 47 points. This would nominally equate to a 4 star rating.

Additional points that are being targeted, would improve the score to 72 points. This would nominally equate to a 5 star Green Star rating.

Credit Summary for: High Rise Residential Development, Atchison Street, St. Leonards
Green Star Multi-unit Residential Tool

Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	Extra Points for 5 Star	Risk	Net Cost \$ (QS)	Comments
Management										
1	Green Star Accredited Professional	Man-1	Two points are awarded where a principal participant in the design team is a Green Star Accredited Professional engaged to provide sustainability advice from the schematic design phase through to construction completion.		2	2		LOW		Responsibility: Delivery Risk: LOW Comments: Should be included as a 4 star requirement. Benefit / Recommendation: Green Star accredited professional would guide all members of the project team, and would co-ordinate the submission process. This would help achieve the desired rating.
2	Commissioning - Clauses	Man-2	One point is awarded where it is demonstrated that: • Comprehensive pre-commissioning, commissioning, and quality monitoring are contractually required to be performed for all building services (BMS, mechanical, electrical and hydraulic); and • The works outlined above are done in exact accordance with CIBSE Commissioning Codes or ASHRAE Commissioning Guideline 1-1996 (for mechanical services only) and CIBSE Commissioning Codes for the other Services.	Steensen Varming & Warren Smith and Partners	2	2		LOW		Responsibility: Delivery Risk: LOW Comments: Should be included as a 4 star requirement. Benefit / Recommendation: Commissioning is vital as it ensures that the services are commissioned as per the designer's intent. Highly beneficial for large buildings of this scale.
			An additional point is awarded when: • The design team and contractor are required to transfer project knowledge to the building owner/manager through all of the following: - Documented design intent; - As-built drawings; - Operations and Maintenance Manual; - Commissioning Report; and - Training of building management staff.					LOW		
3	Building Tuning	Man-3	One point is awarded where it is demonstrated that: • After handover, the building owner implements tuning of all building systems; • A relevant member of the design team is involved in the tuning process; • Monthly monitoring is undertaken and the outcomes are reported to the building owner quarterly; • Full re-commissioning is undertaken 12 months after practical completion; and • A Building Tuning Report on the outcomes of the tuning process will be provided to the building owner and made available to the design team.		1	1		LOW		Responsibility: Delivery Risk: LOW Comments: Should be included as a 4 star requirement. Benefit / Recommendation: Tuning of the major Building Services would verify whether or not systems are performing at their optimum efficiency. Thereby systems can be tuned to improve performance if necessary.
4	Independent Commissioning Agent	Man-4	One point is awarded where an Independent Commissioning Agent has been appointed to: • Provide commissioning advice to the building owner and the design team; and • Monitor and verify the commissioning of all building systems.		1	1		LOW		Responsibility: Delivery Risk: LOW Comments: Should be included as a 4 star requirement. Benefit / Recommendation:
Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	Extra Points for 5 Star	Risk	Net Cost \$ (QS)	Comments
Management										

5	Building Guides	Man-5	One point is awarded where a simple Building Users' Guide, which includes information relevant for the building residents and management, is developed and made available to the building owner and residents.		1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Should be included as a 4 star requirement.</p> <p>Benefit / Recommendation:</p> <p>A tenant guide would enable the users to maintain the building's environmental performance as per the initial design intent. This is highly beneficial for residential apartments, since there might be new tenants moving in periodically.</p>
6	Environmental Management	Man-6	<ul style="list-style-type: none"> Two points are awarded where it is demonstrated that: <ul style="list-style-type: none"> The Contractor implements a comprehensive, project-specific Environmental Management Plan (EMP) for the works in accordance with Section 3 of the NSW Environmental Management System guidelines 2007. 		2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Should be a 4 star requirement. Credit requirements should be included in the Projects tender documentation & specifications.</p> <p>Benefit / Recommendation:</p> <p>This credit would help minimise the adverse environmental impacts arising from construction activity such as pollution, construction waste, and water & energy usage. This would result in economic and environmental benefit.</p>
			<ul style="list-style-type: none"> One additional point is awarded where it is demonstrated that: <ul style="list-style-type: none"> The Contractor has a valid ISO14001 Environmental Management System (EMS) accreditation prior to and throughout the project. 		1	1				

Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	Extra Points for 5 Star	Risk	Net Cost \$ (QS)	Comments
Management										
7	Waste Management	Man-7	Up to two points are awarded where: <ul style="list-style-type: none"> The contractor implements a Waste Management Plan (WMP), retains waste records and quarterly reports to the building owner; and A percentage (by mass) of all demolition and construction waste is reused or recycled as follows: <ul style="list-style-type: none"> - One point for 60% of the waste; and - Two points for 80% of the waste. 		2	1	1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>4 star target- Reuse of 60% of construction waste. 5 Star target- Reuse / recycle 80% of waste.</p> <p>Benefit / Recommendation:</p> <p>Waste management would reduce landfill. Reduction of landfill is highly essentially for safeguarding the environment. Could be adopted since the project is seeking a high environmental outcome.</p>
8	Metering	Man-16	<p>Water Metering:</p> <ul style="list-style-type: none"> One point is awarded where Water meters are installed for all major water uses in the building; and Second point is awarded where a domestic cold water meter is installed in each dwelling; 	Warren Smith & Partners	2	1	1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>4 Star target- Metering of all major water uses in the building. 5 Star target- Provide a water meter for each dwelling to monitor cold water usage.</p> <p>Benefit / Recommendation:</p> <p>Metering of major water uses would help in identifying excessive consumption associated with defects; such as leakages.</p>
			<p>Energy Metering:</p> <ul style="list-style-type: none"> One point is awarded where it is demonstrated that Sub-metering is provided for: <ul style="list-style-type: none"> > substantive energy uses within the building (greater than 100kVA); & > For light and general power consumption for common areas. Second point is awarded where it is demonstrated that the following uses are sub-metered for each apartment: <ul style="list-style-type: none"> > electricity; > gas (if provided for other gas uses than cook tops, stoves and ovens); - hot water flow (where centralised hot water is provided). 	Steensen Varming	2	1	1			<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>4 Star target- Metering of all major energy uses in the building. 5 Star target- Provide individual metering for each dwelling to monitor gas/ electricity & hot water flow.</p> <p>Benefit / Recommendation:</p> <p>Energy sub-metering helps tenants in identifying areas of excessive energy usage. Accordingly they can reduce their excess usage. Sub-metering also assists in detecting operational problems.</p>
			<p>Smart Metering:</p> <ul style="list-style-type: none"> One point is awarded where smart-metering is provided for either the consumption of electricity, water or gas (if provided for other uses than cook tops, stoves and ovens); and Two points are awarded where smart-metering is provided for the consumption of electricity, water and gas (if provided for other uses than cook tops, stoves and ovens). 	Steensen Varming	2	0	2	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation:</p>
		TOTAL			18	13	5			

Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Indoor Environment Quality										
9	Daylight	IEQ-4	<ul style="list-style-type: none"> • One point is awarded if, 95% of the apartments meet the daylight criteria for kitchens (Daylight Factor of no less than 2%) & 60% of the living area in these apartments should have DF of 1.5%. • Two points are awarded if 95% of the apartments meet the daylight criteria for kitchens (Daylight Factor of no less than 2%) & 90% of the living area in these apartments should have DF of 1.5%. 	FJMT	2	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>This credit requires Daylight Modelling to be undertaken, in order to verify credit compliance. Initially the project should set a target of 1 point for 4 Star rating and 2 points for 5 Star rating. This could be verified at later stages of design.</p> <p>Benefit / Recommendation:</p> <p>Compliance with this credit should be targeted since daylight results in psychological, physiological and environmental benefits.</p>
10	Thermal Comfort	IEQ-5	<ul style="list-style-type: none"> • One point is awarded where ceiling fans are provided for at least 95% of all apartments; and • Two points are awarded where average heating and cooling loads of less than 30 MJ/m2 are achieved. <p>All heating and cooling loads must be calculated using NatHERS (second generation) approved software.</p>	FJMT / Steensen Varming	2		2	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Compliance with this credit depends on the efficiency of the building envelope. Score is determined on the basis of heating/cooling loads obtained from the NatHERS assessment.</p> <p>Benefit / Recommendation:</p> <p>Improved thermal comfort would increase occupant comfort and satisfaction.</p>
11	Hazardous Materials	IEQ-6	Credit is not applicable to new developments.	N/A	0		na			<p>Responsibility:</p> <p>Delivery Risk:</p> <p>Comments:</p> <p>This credit is not applicable to new developments.</p>

Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Indoor Environment Quality										
12	Internal Noise Levels	IEQ-7	For either of the points to be achieved, an appropriately qualified acoustic professional has to be appointed to assist the project team in the assessment and mitigation of external noise sources, through consultation at critical stages of the proposed development including at a minimum: <ul style="list-style-type: none"> • Design of the building; • Construction of the building; and • Post construction sign-off stage of the building. 		2	2		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation:</p> <p>Achieving compliance with this credit criteria would help control noise from external noise sources. Prolonged exposure to noise sources could cause permanent loss of hearing if the sound levels are above 85 decibels.</p>
13	Volatile Organic Compounds	IEQ-8	Four points can be attained, for using Low VOC Paints, Adhesives & sealants, Wall & ceiling coverings and Flooring.	FJMT	4	4		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Low VOC products should be mentioned in the specifications of Finishes.</p> <p>Benefit / Recommendation:</p> <p>VOC's are harmful chemical pollutants emitted by indoor furnishings. These have a detrimental effect on occupant health. Therefore, it is highly beneficial for residential spaces to avoid VOC's by proper selection of interior finishes.</p>
14	Formaldehyde Minimisation	IEQ-9	One point is awarded where all engineered wood products (including exposed and concealed applications) either: <ul style="list-style-type: none"> • Have low formaldehyde emissions, OR • Contain no formaldehyde. 	FJMT	1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>The credit requirements should be addressed in the Architectural specifications.</p> <p>Benefit / Recommendation:</p> <p>Formaldehyde is a harmful chemical which is used in particle boards and fibre boards. It emits harmful vapours which effect the quality of indoor air and lead to health disorders. We recommend to target compliance with this credit.</p>
15	Electric Lighting Levels	IEQ-13	One point is awarded where it is demonstrated that: <ul style="list-style-type: none"> • A minimum of 300 lux is achieved on the surface (nominally 900mm above floor level) of the following: <ul style="list-style-type: none"> - Kitchen Sink; - Cooktop or Stove; and - Vanity Basins in Bathrooms and Ensuites. 	Steensen Varming	1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Compliance with this credit should be set as a target. However, lighting modelling should be undertaken to confirm compliance of the final design.</p> <p>Benefit / Recommendation:</p> <p>In a residential environment, visual comfort is highly essential. Poor lighting would result in occupant discomfort and strain. This could be avoided by appropriate indoor electric lighting levels.</p>

Category	Title	Credit No.	Credit Requirement	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Indoor Environment Quality										
16	Private External Space	IEQ-20	One point is awarded when a private external space is provided for at least 90% of the dwellings. This space must: • Be equivalent in size to at least 15% of the living area of each dwelling or at least 2.0m x 3.0m whichever is greater; • Be directly adjacent and accessible from the dwelling; • Have managed solar access as follows: - A minimum of 80% of each private external space must be shaded from direct sunlight for a minimum of 3 hours between 9am and 5pm in mid-summer and receiving a minimum of three hours direct sunlight at anytime of the day in mid-winter.	FJMT	1		1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Compliance with this credit is likely to be achieved, since majority of the Units have been provided with private balconies.</p> <p>Benefit / Recommendation:</p> <p>Provision of external open spaces would provide a link to the outside environment, which would be beneficial to people, who would otherwise have to spend significant amount of time indoors.</p>
17	Dwelling Ventilation	IEQ-21	• Two points are awarded for provision of trickle-ventilators to all living areas.	FJMT	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Provision of trickle-ventilators is a simple but highly beneficial strategy. Compliance with this credit should be easy to achieve.</p> <p>Benefit / Recommendation:</p> <p>This would provide better access to fresh air, even on cold days, during which the windows are closed to avoid cold draughts.</p>
			• One additional point is awarded where 90% of kitchens are ventilated with dedicated and separated extract fans.		1		1			<p>Comments:</p> <p>Provision of dedicated kitchen exhausts will be confirmed, once mechanical design proceeds.</p>
18	Natural Ventilation	IEQ-22	• Up to two points are awarded where dual aspect design is provided in dwellings so that effective natural ventilation can be achieved in all living areas, as follows: - One point is awarded where 70% of dwellings are provided with effective natural ventilation; - Two points are awarded where 90% of dwellings are provided with effective natural ventilation.	FJMT	2	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Provision of natural ventilation, would be confirmed once the architectural drawings are made available.</p> <p>Benefit / Recommendation:</p> <p>Provision of natural ventilation would provide better access to fresh air..</p>
		TOTAL			19	12	6			

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments	
Energy										
19	Conditional Requirement	Ene-Con	Conditional Requirement				MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Compliance with this credit is mandatory to achieve.</p>	
20	Greenhouse Gas Emissions	Ene-1	20 points are available. This score is determined by undertaking energy assessment.	20	4	6	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Points for this credit would be determined on the basis of NatHERS modelling results.</p> <p>Benefit / Recommendation:</p> <p>Compliance with this credit would ensure reduction in operational energy and associated green house emissions. This would result in both environmental and economic benefits.</p>	
21	Unoccupied Areas	Ene-7	<ul style="list-style-type: none"> One point is awarded where it is demonstrated that each apartment includes occupancy controls to minimise air-conditioning and lighting energy. At a minimum this must include a dwelling shutdown switch near the main entry door to turn off all lighting and air-conditioning and heating. Second point is awarded where it is demonstrated that all areas within the building, excluding the dwelling units, includes automated controls to minimise air conditioning and lighting energy use when unoccupied. 	2	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation:</p> <p>Provision of occupancy controls would assist in reducing energy consumption during unoccupied times.</p>	
22	Energy Efficient Appliances	Ene-11	<ul style="list-style-type: none"> One point is awarded where it is demonstrated that: <ul style="list-style-type: none"> All clothes dryers and dishwashers are at or within one point of the highest available rating under the Australian Government's "Energy Rating" labelling system; AND Internal or external clothes lines and/or hoists are provided that have a total line length of not less than 7.5m per dwelling. Two points are awarded where it is demonstrated that: <ul style="list-style-type: none"> All clothes dryers, dishwashers, refrigerators, and clothes washers have the highest available rating under the Australian Government's "Energy Rating" labelling system; AND Internal or external clothes lines and/or hoists are provided that have a total line length of not less than 7.5m per dwelling. 	Client / FJMT	2	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Provision should be made for Energy efficient equipment & for an internal / external clothes line, to meet the credit requirements.</p> <p>Benefit / Recommendation:</p> <p>It is beneficial to provide energy-efficient appliances as a base-building provision. Building occupants should be advised to purchase equipment of similar or greater efficiency, in case of future replacement. It would significantly reduce the occupant's energy consumption.</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Energy									
23	Peak Electricity Demand Reduction	Ene-12	Steensen Varming	2	2		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Non-electric appliances should be preferred, if gas is available on site. (Cooking range, heaters, etc.). Renewable sources of energy should be included.</p> <p>Benefit / Recommendation:</p>
		TOTAL		26	8	8			

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Transport									
24	Provision of Car Parking	Tra-1	FJMT	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation:</p> <p>Providing car parking less than the local planning allowances would encourage reliance on alternative modes of transport.</p> <p>Use of public transport reduces usage of personal cars which are one of the prime contributor's to greenhouse gas emissions.</p>
25	Fuel-Efficient Transport	Tra-2	FJMT	1	1		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation:</p> <p>Small cars and bikes are considered to be fuel-efficient when compared to standard sized cars. Hence, parking should be designed and designated for smaller vehicles.</p>
				1	1				
26	Cyclist Facilities	Tra-3	FJMT	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Cyclist facilities should be provided for the building occupants and visitors.</p> <p>Benefit / Recommendation:</p> <p>Cycling is a healthy mode of travel and is highly beneficial both in economic and environmental terms. Encouraging cycling would reduce environmental damage.</p>
				1	1				
Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Transport									

27	Commuting Mass Transport	Tra-4	Points to be determined using Green Star Transport calculator.		5		3	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>This credit depends on site-selection, which dictates the public-transport availability around the site.</p> <p>Benefit / Recommendation:</p> <p>Proximity to public transport is highly beneficial. Especially for a high-rise residential tower, which is likely to have a large number of occupants.</p>
28	Trip Reduction - Mixed Use	Tra-5	<ul style="list-style-type: none"> One point is awarded where at least 5 amenities are within 400m walking distance of the development; and 		2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>It is beneficial to choose a site which has major amenities in close proximity. This would encourage walking instead of using cars / other vehicles.</p> <p>Benefit / Recommendation:</p>
			<ul style="list-style-type: none"> Two points are awarded where at least 10 amenities are within 400m walking distance of the development. 							
			Where there are two or more of any one amenity this will count as only 2 amenities. (For example; 3 restaurants will only count as 2 amenities, 4 convenience stores will only count as 2 and so on).							
		TOTAL			14	9	3			

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Water									
29	Occupant Amenity Water	Wat-1	Warren Smith & Partners	5	1	3	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Base building fixtures should target high-level of efficiency.</p> <p>Benefit / Recommendation:</p> <p>This credit encourages the use of water efficient products, which help reduce potable water consumption.</p>
30	Landscape Irrigation	Wat-3	Warren Smith & Partners	1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Potable water is a precious commodity, and usage should be reduced wherever possible. Landscaping can be designed to consist of low-water or no-water species.</p> <p>Benefit / Recommendation:</p> <p>Use of rain water (via rainwater harvesting) for landscaping would reduce the use of potable water.</p>
31	Heat Rejection Water	Wat-4	Steensen Varming	2	2		HIGH		<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>Credit compliance could be determined once the mechanical services design proceeds. It is difficult to achieve 50% reduction for a high-rise tower.</p> <p>Benefit / Recommendation:</p> <p>Water-cooled systems which use cooling towers to expel heat from the building are a common form of air-conditioning for large buildings. The amount of water used in this system is equal to almost 40-50% of the building's total water usage. Hence, mixed-mode ventilation & use of recycled water should be employed to reduce demand of potable water.</p>
			Steensen Varming						

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Water									

32	Fire System Water	Wat-5	<p>One point is awarded where:</p> <ul style="list-style-type: none"> • There is sufficient temporary storage for a minimum of 80% of the routine fire protection system test water and maintenance drain-downs, for reuse on-site; and • Each floor fitted with a sprinkler system has isolation valves or shut-off points for floor-by-floor testing; <p>OR</p> <p>One point is awarded where:</p> <ul style="list-style-type: none"> • The fire protection system does not expel water for testing. 	Warren Smith & Partners	1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Provision should be made for the collection of Fire system test-water. The fire-test water could be collected in the rainwater tank.</p> <p>Benefit / Recommendation:</p> <p>Collection of fire-test water would contribute towards reduction of potable-water usage.</p>
33	Water Efficient Appliances	Wat-7	<p>One point is awarded where:</p> <ul style="list-style-type: none"> • Dishwasher and clothes washers are installed as part of the base building works; and • All dishwashers and clothes washers are at or within one point of the highest available rating under the Australian Government's WELS rating system as per the WELS Standard AS/NZS6400:2005 <i>Water-efficient Products - Rating and Labelling</i>. 	Client	1	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Base building fixtures should target high-level of efficiency.</p> <p>Benefit / Recommendation:</p> <p>This credit encourages the use of water efficient products, which help reduce potable water consumption.</p>
34	Swimming Pool/Spa Water Efficiency	Wat-8	<p>Two points are awarded where it is demonstrated that:</p> <ul style="list-style-type: none"> • A pool blanket is included to prevent water loss from evaporation; and • The potable water consumption has been reduced by at least 70% through either or a combination of: <ul style="list-style-type: none"> - Efficient swimming pool filtration system compared to traditional sand filtration; - Backwash water is collected and treated for reuse on site; and - The pool makeup water is non-potable water. 	Warren Smith & Partners	2	0		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Swimming pool should be provided with adequate shade, to prevent evaporation.</p> <p>Benefit / Recommendation:</p> <p>Reducng the use of potable-water should be encouraged.</p>
		TOTAL			12	6	3			

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Materials									
35	Recycling Waste Storage	Mat-1	FJMT	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Recycling waste storage should be part of the base building provision & the building should implement a recycling strategy. Storage must be provided on each floor of a multi-storey tenancy.</p> <p>Benefit / Recommendation:</p> <p>Recycling would help in reducing the amount of waste going to landfill.</p>
36	Building Re-use	Mat-2		6					
37	Recycled-Content & Re-used Products and Materials	Mat-3	ALL	1		1	HIGH		<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>To achieve credit compliance, use of reused / recycled building materials should be included in the material specifications.</p> <p>Benefit / Recommendation:</p> <p>Procuring recycled materials would reduce the environmental impact associated with new/unused building materials.</p>
38	Concrete	Mat-4	Structural Consultant	2	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation:</p> <p>Reducing the use of portland cement by substituting with alternative materials, would significantly reduce the amount of Green house gas emissions associated with concrete.</p>
				1					

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Materials									
39	Steel	Mat-5	Structural Consultant	2	1		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation: Use of recycled/ reused steel obtained from existing buildings, would reduce the amount of virgin-steel.</p>
40	PVC Minimisation	Mat-6	ALL	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>PVC credit is likely to be updated by the GBCA. A draft set of guidelines have been issued recently. PVC products could be used for all major uses, provided they comply with GBCA's Best Practice Guidelines.</p> <p>Benefit / Recommendation: Improper manufacture of PVC products would pose serious threat to the health of building occupants. Compliance with this credit should be targeted & requirements should be included in the architectural specifications.</p>
41	Sustainable Timber	Mat-7	FJMT	2	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>FSC or AFS certified timber could be preferred for all timber uses within the building. This point should be discussed with the QS and the builder, to obtain their approval.</p> <p>Benefit / Recommendation: Use of certified timber would reduce illegal logging and deforestation.</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Materials									
42	Design for Disassembly	Mat-8	FJMT	1			MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation: Designing for disassembly would help to reuse or recycle the components in future. This would reduce the embodied energy and resources associated with demolition works.</p>
43	Dematerialisation	Mat-9	FJMT	2	2		MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments:</p> <p>Benefit / Recommendation: Significant reductions in construction materials can be achieved by meeting the credit requirements.</p>
44	Flooring	Mat-11	FJMT	1		1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation: The use of eco-friendly flooring products would greatly reduce the environmental impact of the building materials.</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Materials									
45	Joinery	Mat-12	Points are determined using Green Star Joinery calculator.	FJMT	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation: Joinery is also an item of high environmental impact. Joinery profiles should be designed to reduce off-cut waste. And joinery should prefer nailing instead of glue, in order to facilitate easy recycling in future.</p>
46	Internal Walls	Mat-14	Points are determined using Green Star calculator.	FJMT	2		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation: The use of eco-friendly wall finishes would greatly reduce the environmental impact of the building materials.</p>
47	Universal Design	Mat-15	One point is awarded where it is demonstrated that all publicly accessible areas and at least 10% of dwellings have been designed to comply with the Class A, B or C requirements of AS4299-1995 'Adaptable Housing' at a minimum.	FJMT	1		LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>We assume that the building design would be designed in accordance with AS4299-1995.</p> <p>Benefit / Recommendation:</p>
		TOTAL			26	11	3		

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Land Use & Ecology									
48	Conditional Requirement	Eco-Con							
49	Topsoil	Eco-1	<p>One point is awarded where:</p> <ul style="list-style-type: none"> All topsoil affected by the construction works is separated and protected from degradation, erosion or mixing with fill or waste; There is no net change in the volume of topsoil on the site; and 95% of all topsoil (by volume) retains its productivity. 	FJMT	1	0	0	HIGH	<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>Due to the scale of the project, it would be highly difficult to achieve compliance with this credit.</p> <p>Benefit / Recommendation:</p>
50	Re-use of Land	Eco-2	The proposed project is not a refurbishment or building extension. Hence, no points can be attained for this credit.		1	0	0	HIGH	<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>The proposed development is not a refurbishment. Hence, it is not possible to achieve any points for this credit.</p> <p>Benefit / Recommendation:</p>
51	Reclaimed Contaminated Land	Eco-3	<p>Two points are awarded where:</p> <ul style="list-style-type: none"> The site was contaminated at the time of purchase; and The developer has undertaken full remedial steps to decontaminate the site prior to construction. 	FJMT	2			LOW	<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation:</p>
52	Change of Ecological Value	Eco-4	Points determined by using Ecology calculator	FJMT	4			HIGH	<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>Difficult to achieve compliance with this credit, because a high-density apartment building would have a significant impact on the ecological value of the site.</p> <p>Benefit / Recommendation:</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Emissions									
54	Refrigerant ODP (Ozone Depleting Potential)	Emi-1	All HVAC refrigerants should have an ODP of zero. OR no refrigerants should be used.	Steensen Varming	1	1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments:</p> <p>Benefit / Recommendation: On-site recreational facilities for the community would improve the quality of life of the building occupants & will foster better relationship among them.</p>
55	Refrigerant GWP (Global Warming Potential)	Emi-2	50% of all HVAC refrigerants should have a GWP of 10 or less.	Steensen Varming	2		HIGH		<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments: Difficult to achieve compliance.</p> <p>Benefit / Recommendation:</p>
56	Refrigerant Leaks	Emi-3	One point is awarded where environmental damage due to refrigerant leaks is substantially reduced.	Steensen Varming	1	1	MEDIUM		<p>Responsibility:</p> <p>Delivery Risk: MEDIUM</p> <p>Comments: Leak detection would assist in reducing the environmental damage caused by refrigerant leaks.</p> <p>Benefit / Recommendation:</p>
57	Insulant ODP	Emi-4	One point is awarded where all thermal insulants in the project avoid the use of ozone-depleting substances in both their manufacture and composition.	ALL	1	1	LOW		<p>Responsibility:</p> <p>Delivery Risk: LOW</p> <p>Comments: Use of zero ODP insulation products would improve the Indoor environmental quality & reduces the negative impact on occupant health.</p> <p>Benefit / Recommendation:</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Emissions									
58	Watercourse Pollution	Emi-5	Warren Smith & Partners	2		2	MEDIUM		<p>Responsibility: Delivery Risk: MEDIUM Comments:</p> <p>Benefit / Recommendation: Generally, importance is laid on treatment of sewerage leaving the site. However, it should be noted that storm-water also needs to be treated before discharging into the waterways. Storm water has the risk of getting contaminated due to sediments and contaminants present on the building site. Discharge of untreated water will effect the health of Australia's waterways. Hence, this should be considered a priority.</p>
59	Discharge to Sewer	Emi-6	Warren Smith & Partners	4	0	2	MEDIUM		<p>Responsibility: Delivery Risk: MEDIUM Comments:</p> <p>Benefit / Recommendation: The majority of urban wastewater in Australia is disposed to coastal waters. This is a significant source of pollution. Treatment of this waste water would reduce the building outflows that are discharged into water bodies. Secondly, by reusing the treated water for landscaping and flushing, a building's demand for potable water could be reduced.</p>
				1			HIGH		<p>Responsibility: Delivery Risk: HIGH Comments:</p> <p>Benefit / Recommendation: Blackwater treatment plant is highly beneficial, due to the reasons mentioned above. However, this might involve high initial costs. Hydraulic services consultant should confirm whether this would be targeted.</p>
60	Light Pollution	Emi-7	Steensen Varming	1	1		LOW		<p>Responsibility: Delivery Risk: LOW Comments:</p> <p>Benefit / Recommendation: Well-designed outdoor lighting will reduce energy wastage associated with light directed into the night sky. It reduces pollution of night-sky & the electricity consumption of the building.</p>

Category	Title	Credit No.	Responsibility	Points Available	4 Star Points	5 Star Points	Risk	Net Cost \$	Comments
Emissions									
61	Legionella	Emi-8	Steensen Varming	1			HIGH		<p>Responsibility:</p> <p>Delivery Risk: HIGH</p> <p>Comments:</p> <p>The Green Star requirements set-out for this credit is highly difficult to achieve.</p> <p>Benefit / Recommendation:</p>
		TOTAL		14	4	4			

